TSG-3800 Family of Timing Signal Generators

including the TSG-3800 and TSG-3800X (19 and 23-Inch shelf) and the TSG-3800E and TSG-3800EX (19-Inch shelf)

User Guide

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How to Use This Guide

This section describes the format, layout, and purpose of this guide.

In This Preface

- Who Should Read This Guide
- Structure of This Guide
- Conventions Used in this Guide
- Warnings, Cautions, Recommendations, and Notes
- Related Documents and Information
- Where to Find Answers to Product and Document Questions
- What's New in This Revision

Purpose of This Guide

The *TSG-3800 User Guide* is intended as a reference for the TSG-3800 family of products. In this guide, you will find an operational overview of the TSG-3800 family of products, the system and optional module specifications, and the procedures for installation, start-up, configuration options, commissioning, operation, repair, troubleshooting, maintenance, and a complete parts list.

Who Should Read This Guide

Chapter 1, Overview of the TSG-3800 Series, is written for non-technical audiences who need general information about the product. Chapter 2, Installing the TSG-3800, and subsequent chapters contain technical information about the product. Other chapters describe maintenance, and configuration instructions or details primarily intended for qualified maintenance personnel.

Structure of This Guide

This guide contains the following sections and appendixes:

Chapter, Title	Description
Chapter 1, Overview of the TSG-3800 Series	Provides a general overview of the TSG-3800 family of products. This section provides a high-level description of the hardware, software, and product configurations and features.
Appendix 2, Installing the TSG-3800	Provides information necessary for installing and preparing the TSG-3800 family of products for operation, covering the main shelf and expansion shelf configurations.
Chapter 3, Operating the TSG-3800	Describes the operating modes, indicators, alarms, and sample displays for the TSG-3800 family of products. This section also describes the software commands common to all the available shelf-types.
Chapter 4, Maintenance and Troubleshooting	Provides information required to order system components for all shelf-types and perform system-level troubleshooting.
Chapter 5, Input Modules	Provides a physical and functional description of the Input modules available for the TSG-3800. This section also provides module specifications and configurations that are common to all shelf-types.
Chapter 6, CPU, Frame Generator, and Clock Modules	Provides a physical and functional description of the CPU, Clock, and Frame Generator modules available for the TSG-3800.

Chapter, Title	Description
Chapter 7, Output Modules	Provides a physical and functional description of the Output modules available for the TSG-3800 systems.
Chapter 8, Subtending Operating Mode	Describes the Subtending mode of operation for the TSG-3800.
Appendix A, Part Numbers	Provides system hardware selection and procurement information for various available TSG-3800 system configurations and optional equipment.
Appendix B, System Administrator's Reference	Describes the ASCII command set used to communicate with the system.
Appendix C, TL1 Reference	Describes the TL1 command set used to communicate with the system.
Index	Provides references to individual topics within this guide.

Conventions Used in this Guide

This guide uses the following conventions:

- **Acronyms and Abbreviations** – Terms are spelled out the first time they appear in text. Thereafter, only the acronym or abbreviation is used.
- **Revision Control** – The title page lists the printing date and versions of the product this guide describes.
- **Typographical Conventions** – This guide uses the typographical conventions described in the table below.

When text appears this way...	... it means:
TSG-3800 User Guide	The title of a document.
CRITICAL PORT-A J1	An operating mode, alarm state, status, or shelf label.
Select **File**, **Open**...	Click the Open option on the File menu.
Press **Enter**. Press **Print Scrn**.	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
`TSG-3800` `Username:`	Text in a source file or a system prompt or other text that appears on a screen.

When text appears this way...	... it means:
`CONFIG` `STATUS`	A command you enter at a system prompt or text you enter in response to a program prompt. You must enter commands for case-sensitive operating systems exactly as shown.
A *subtending* application	A word or term being emphasized.
Symmetricom ***does not*** recommend...	A word or term given special emphasis.

Warnings, Cautions, Recommendations, and Notes

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this guide. The types of information included in each are explained in the following examples.

Warning: To avoid serious personal injury or death, *do not* disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.

Caution: To avoid personal injury, *do not* disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.

ESD Caution: To avoid personal injury and electrostatic discharge (ESD) damage to equipment, *do not* disregard ESD cautions. All ESD cautions use this symbol. ESD cautions are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in possible personal injury, electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.

Electrical Shock Caution: To avoid electrical shock and possible personal injury, do not disregard electrical shock cautions. All electrical shock cautions use this symbol. Electrical shock cautions are practices, procedures, or statements, that if not strictly observed, may result in possible personal injury, electrical shock damage to, or destruction of components of the equipment.

Recommendation: All recommendations use this symbol. Recommendations indicate manufacturer-tested methods or known functionality. Recommendations contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.

Note: All notes use this symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information, which may make your task easier or increase your understanding.

Related Documents and Information

Other helpful documents are listed below. See your Symmetricom representative or sales office for a complete list of available documentation.

Note: Symmetricom offers a number of applicable training courses designed to enhance product usability. Contact your Symmetricom representative or sales office for a complete list of courses and outlines.

Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your Symmetricom representative or local sales office.

We appreciate your suggestions of ways to improve any part of this guide. Please make your suggestions on a copy of the affected page and include it with the reader comment form.

What's New in This Revision

This guide is a complete revision of the previous version, and is reformatted to the 8.5 x 11 inch size; a new, larger typeface is used to help you comprehend the material. Visual cues, such as the header and the table of contents at the start of each chapter, help you locate material quickly. This guide contains the following new material:

- Factory Default information (Chapter 3)
- RS-422 Selective Rate Output module (Chapter 7)
- New item numbers added to Appendix A
- System software download and installation (Appendix B)
- TL1 language commands (Appendix C)
- Index

Chapter 1 Overview of the TSG-3800 Series

This chapter describes the TSG-3800, and provides a theory of operation for the unit. The available expansion shelves are introduced and described.

In This Chapter:

- TSG-3800 Series Overview
- Features Common to All Models
- Functional Description
- TSG-3800 19-Inch Main Shelf
- TSG-3800X 19-Inch Expansion Shelf
- TSG-3800 23-Inch Main Shelf
- TSG-3800X 23-Inch Expansion Shelf
- TSG-3800E EMC-Compliant Main Shelf
- TSG-3800EX Expansion Shelf

TSG-3800 Series Overview

The TSG-3800 and TSG-3800E are timing signal generators that generate and distribute network synchronization signals. Input signals can be DS1, E1, 2048 kHz, sinusoids, or square waves. The TSG-3800E and optional TSG-3800EX Expansion shelf are EMC-compliant, 19-inch, rack-mounted systems with a special metal chassis incorporating elements to reduce electromagnetic interference (EMI) emissions.

The *TSG-3800 User Guide* contains information about installing, configuring, operating, and maintaining the TSG-3800 Timing Signal Generator systems manufactured by Symmetricom. The TSG-3800 series of products is available in three versions:

- TSG-3800 19-inch Main Shelf and an optional 19-inch Expansion shelf
- TSG-3800E 19-inch electromagnetic compatibility (EMC) compliant Main Shelf and an optional 19-inch EMC compliant Expansion shelf
- TSG-3800 23-inch Main Shelf and an optional 23-inch Expansion shelf

Note: The information presented throughout this guide is common for all models and shelf-types unless otherwise specified. Functionally, the TSG-3800 19 and 23-inch, and the TSG-3800E 19-inch shelves are identical and use the same family of modules.

Features Common to All Models

The TSG-3800 series has three main shelf assemblies that share the following common features:

- External connections on rear panel
- Up to 12 input reference signals
- Generation of output signals (optional Expansion shelves are available for additional outputs)
- Power subsystems
- External alarm connections
- Controls and indicators
- Module functionality – the TSG-3800E uses a set of EMI-compliant modules that are functionally identical to the modules available in the TSG-3800
- Accessories

These common features are shared across the TSG-3800 series, and are described in the following paragraphs. For additional detail on the modules, refer to Chapters 5 through 7 in this guide.

External Connections

External connections to the main shelf, with the exception of an EIA-232 port located on the front panel of the CPU module, are available on the rear panel of the main shelf. The external connections include:

- Four connectors for input signals
- Two (or four) 50-pin output signal connectors, one for each redundant pair
- Power terminal block connector, a primary and a secondary power input
- Alarms (Major and Minor) terminal blocks, three sets of Form C alarm connections per block for Local, Remote and Audio alarms
- EIA-232 port for remote monitoring and control
- Expansion shelf connector
- RJ45 for Ethernet 10Base-T connector, or 15-pin “D” connector

Input Reference Signals

The TSG-3800 series has four input slots and supports up to 12 external input signals of matching or mixed types: framed, composite clock, and so forth. These signals are connected to the rear panel of the main shelf. Input signal specifications for each type of Input module are described in Chapter 5, Input Modules.

Each input reference signal is assigned a priority level from one to four for use as the frequency reference signal, with priority level one being the highest. A priority level of zero may also be assigned to any of the inputs, which sets that input for monitor use only. When set to zero, the input is never selected as a reference, but still provides full performance measurement information. In addition to the user-assigned priority level, the TSG uses the position of the Input module in the shelf (left to right) as well as the location of the input on the module (top to bottom) to select among ports with equal user-assigned priorities. The reference selection algorithm uses the priority level to along with fault conditions to select which input reference signal is used for frequency control of the clocks.

Switching between reference signals can occur repeatedly without accumulating phase or frequency error. This switching can be done revertive or non-revertive. Restoring the primary reference source can return the TSG-3800 to tracking the primary signal.

Output Signals

The TSG-3800 series 19-inch main shelf has four slots for Output modules, each with 20 outputs. The TSG-3800 23-inch Main Shelf provides an additional four slots, for a total of 160 outputs. Signals from similar Output modules merge on the backplane to provide redundancy. For example, channel 1 of the first module is merged with channel 1 of the second module. Operators can configure the TSG-3800 to provide multiple output signal types by installing desired output module pairs.

Up to 180 additional outputs are available in each of one or two optional 19-inch expansion shelves. Up to 220 additional outputs are available in each of one or two 23-inch expansion shelves. Outputs are at the rear of each shelf. Output signal specifications for each type of Output module are described in Chapter 7, Output Modules.

Power

The TSG-3800 series main shelf requires redundant –48 vDC power inputs. The power connects to the main shelf through terminal block connectors on the rear panel. The negative side of each power input is fused for protection. Both power inputs are available for each module in the shelf; each module has its own power converter and supplies power at the levels required by the individual module.

Alarms

The rear panel on the TSG-3800 series main shelf contains three sets of Form C relay contacts for Major and Minor alarms, specifically the Local, Remote, and Audio alarms. The user can reset the audio alarm from the front panel or by software command. The Local and Remote alarms clear automatically when the condition causing the alarm is corrected. Three levels of alarms can be reported: Minor, Major, and Critical.

Controls and Indicators

The TSG-3800 series main shelf automatically monitors signal inputs, outputs, and operating limits, and takes corrective action based on the condition of these monitored limits and factory or user defined operational provisions. Status is indicated on the front of the installed modules and rear panel alarm relays are set to indicate three levels of alarms; Major, Minor, and Critical.

The operator can change system operating limits and collect measurement data using a terminal emulation program on a personal computer, which can be connected through the use of a EIA-232 connector on the front panel or to the remote EIA-232 connector located on the rear of the unit. The main shelf can also be attached to a local area network (LAN) for remote access through the PC using an optional Ethernet 10Base-T connector.

Modules

Symmetricom provides a number of input, clock, frame generator, and output modules that can be used with any shelf in the TSG-3800 series. These modules are interchangeable among the shelf configurations with the following exceptions.

- EMI-compliant modules must be installed in TSG-3800E, and can be used in all other members of the TSG-3800 series.
- All other modules can be installed in the TSG-3800, but cannot be used in the TSG-3800E without affecting its EMI compliance.

Modules are plug-in assemblies that fasten into the main shelf and are secured with captive thumbscrews. Electrical connections between the modules and the backplane of the main shelves are accomplished through the use of gold-plated edge connectors that are hard-wired to corresponding connectors on the backplane. Each module contains status indicators and may also contain external connectors.

The main shelf contains a set of modules that are required for operation and a combination of other modules. Requirements for optional modules depend on the type of input and output signals and the quality of clock oscillator required by the user and required for the application.

The TSG-3800 shelf supports five types of modules: Input, CPU, Clock, Frame Generator, and Output. Modules, other than the CPU, are normally installed in pairs for functional redundancy. Figure 1-1 shows the locations in the main shelf for each type of module. Refer to Chapters 5 through 7 in this guide for the descriptions of available module types.

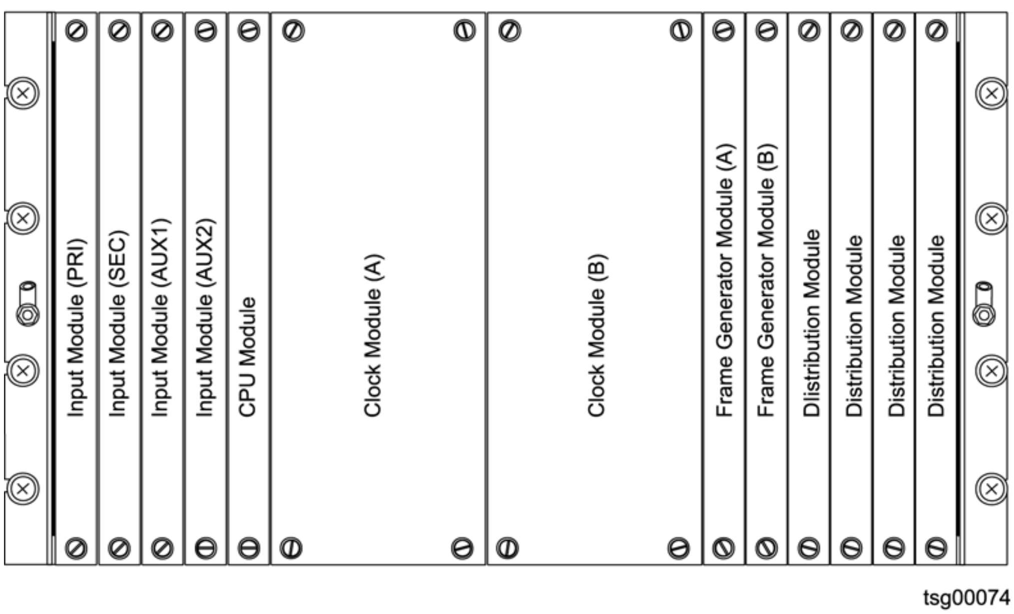


Figure 1-1. Location of Module Slots in the Main Shelf

Functional Description

A fully-configured TSG-3800 series shelf contains at least one each of the following modules:

- CPU
- Clocks (one or two)
- Inputs (up to four)
- Frame Generators (one or two)
- Outputs (up to four)

Figure 1-2 is a functional block diagram of the TSG-3800 series main shelf.

The TSG-3800 continuously monitors the integrity of the incoming reference signal. The operator defines input acceptance criteria and sets the parameters for alarm conditions. When a reference input signal is accepted by the TSG-3800, it phase locks to the signal with the highest priority. System performance depends upon the quality of the oscillators in the Clock modules.

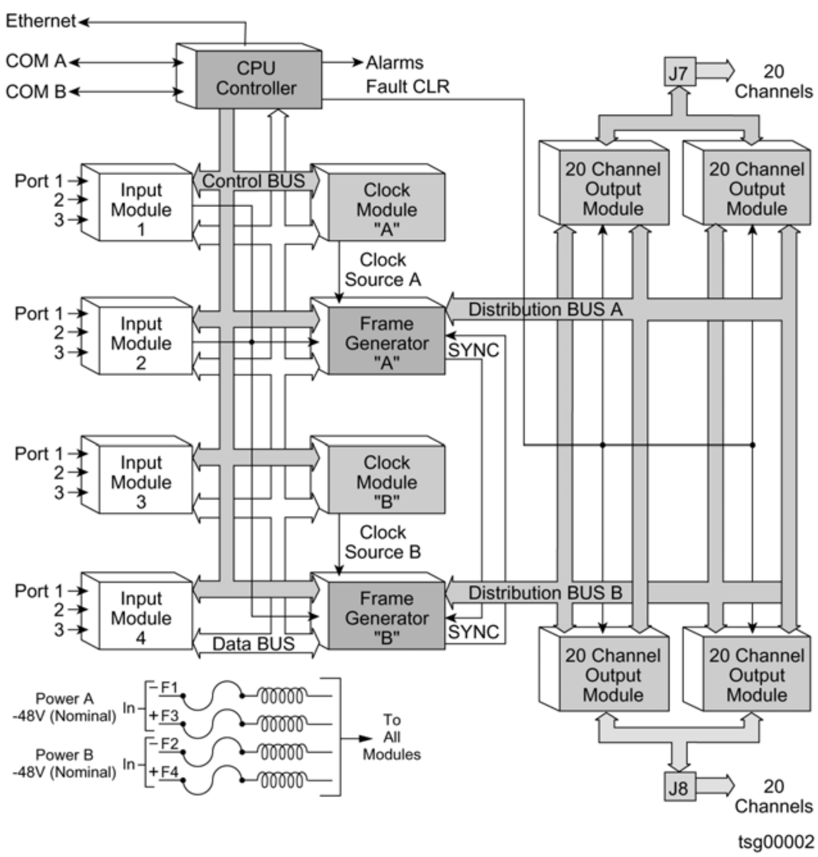


Figure 1-2. Functional Block Diagram of the Main Shelf

CPU Module

The TSG-3800 main shelf requires one Processor (CPU) module. The CPU Module controls and monitors main shelf operation. This module communicates with a peripheral device to provide operator-control of the TSG-3800. The CPU module performs the following processes:

- Reads the configuration data, identifies the types of modules installed, and sets operational parameters
- Collects and stores data, such as configuration data, collected measurement, alarm, and operator-control setting data. It also reports data through the use of two EIA-232 ports
- Analyzes the input signals and selects the active reference based upon the results
- Measures the phase and frequency of all input signals
- Calculates Maximum Time Interval Error (MTIE) and frequency
- Adjusts the frequency of each Clock module, based on phase changes in the selected reference
- Performs logic functions for activating Critical, Major, and Minor alarms. Triggers alarm relays, reports event, and takes corrective action
- Sets the TSG-3800 operating mode; Warm-up, Acquire, Locked, or Holdover
- Monitors system and module status; identifies and reports module failure

See Chapter 6, CPU, Frame Generator, and Clock Modules, for more information on the CPU module.

An internal microprocessor in the CPU module performs a high-resolution comparison of each input signal against the system clock. In comparing, the TSG-3800 measures the frequency and maximum time interval error (MTIE) deviations between each input and the internal clocks. The TSG-3800 also counts signal error events, for example, the number of measurement intervals containing a loss of signal. When the amount of input errors or MTIE/frequency derivation passes a threshold, the TSG-3800 declares a fault for that channel. The operator determines the severity of the alarm caused by this fault. Alarm responses include ignoring the fault, failing the input, switching references, and activating the remote, local, and audio relays. When a reference is not available for switching, an internal Clock module provides the synchronization reference for Holdover mode.

The microprocessor stores instrument configuration information, operating status, and signal data. It also records faults, changes in configuration, and changes in operating status. The operator can retrieve this information remotely as described in Chapter 3, Operating the TSG-3800.

The microprocessor performs all measurement, data processing, and control operations. It continuously checks for any module or system condition that exceeds alarm thresholds. If an alarm condition exists, the processor triggers the alarm relays and takes corrective action. The processor automatically reports faults through the EIA-232 ports. The operator can disable automatic event reporting. This is useful when an automatic collection of measurements is desired without event reporting interrupting them.

The TSG-3800 is shipped with operating settings at factory default values. As the operator specifies new limits, the TSG-3800 stores them in non-volatile memory. These settings remain until changed or the operator directs the TSG-3800 to return to default values. Table 3-6 and Table 3-7 list the factory default settings and provide a column where the operator can note new settings.

System operating limits and functions are operator-programmable. The TSG-3800 has two EIA-232 ports for connection to peripheral devices. Cable connections to the TSG-3800 are described in Chapter 2, Installing the TSG-3800.

Input Modules

Up to four Input modules can be installed in the TSG-3800 main shelf. Each Input module supports a different type of signal, such as Composite Clock, DS1, or E1. These modules measure the difference between the incoming signal and the signals generated by the Clock module(s) in the main shelf. The Input modules can be any combination of the available types. See Chapter 5, Input Modules, for more information on the Input modules available for the TSG-3800 series.

Clock Modules

One or two Clock modules in the TSG-3800 main shelf provide an internal reference for measuring the incoming input signals. The CPU module locks the clock to the selected input. If the input signal is not available, the clock enters the Holdover mode and the output signals are maintained at the last valid setting. See Chapter 6, CPU, Frame Generator, and Clock Modules, for more information on the Clock modules available for the TSG-3800 series.

The Clock modules provide the internal reference signals for generating the output timing signals. They are also the back-up timing sources if the reference input signals are lost. Clock modules may be of different types, allowing for lower cost option for the secondary module, which is only used when the primary module is out of service.

The frequency of each clock is locked to a valid reference input signal. A valid input signal is one that is free from input faults while meeting acceptable frequency and MTIE specifications. Current selections for internal clock oscillators are Rubidium Stratum 2E and Quartz Stratum 3E.

The TSG-3800 controls clock frequency by adjusting an internal control value. The CPU module uses the phase measurements between the selected input signal and the clock signals to calculate each oscillator's control value. The control value is also adjustable by the operator while the Clock module is in Holdover. The control value setting is held in each Clock module for operation without the CPU module.

Frame Generator Modules

The Frame Generator modules in the TSG-3800 main shelf produce timing signals used by the Output modules to generate the various outputs they produce. See Chapter 6, CPU, Frame Generator, and Clock Modules, for more information on the Frame Generator modules available for the TSG-3800 series.

The TSG-3800 Main Shelf accepts one or two Frame Generator modules. These modules produce formatted timing signals to drive the distribution modules. One Frame Generator module must accompany each Clock module. With two Frame Generator modules and a Clock module pair, the TSG-3800 synchronizes their outputs providing a minimal phase change of 25ns on switch-over between redundant modules. The T1/E1 Frame Generator Module provides two outputs and two clocks. Output 1 is either a framed T1 or a framed E1 signal. Output 2 can be set for framed E1 (2048 kbps) or Composite Clock (64/8 kHz) signals. The two clock output signals can be individually set to either 1.544 MHz, 2.048 MHz, or 8 kHz.

Output Modules

Symmetricom provides a variety of Output modules that create the signals distributed to network elements. When paired with a second Output module of the same type, each module provides 20 one-for-one redundant output signals. The 3800/3800E 19-inch main shelf supports four Output modules for a total of 40 redundant output signals; the 3800 23-inch main shelf supports eight Output modules for a total of 80 redundant output signals. See Chapter 7, Output Modules, for more information on the Output modules available for the TSG-3800 series.

Different types of Output module pairs may be used, dependent only on the signals provided by the frame generators selected.

TSG-3800 19-Inch Main Shelf

The TSG-3800 19-inch Main Shelf is shown in Figure 1-3 and Figure 1-4.

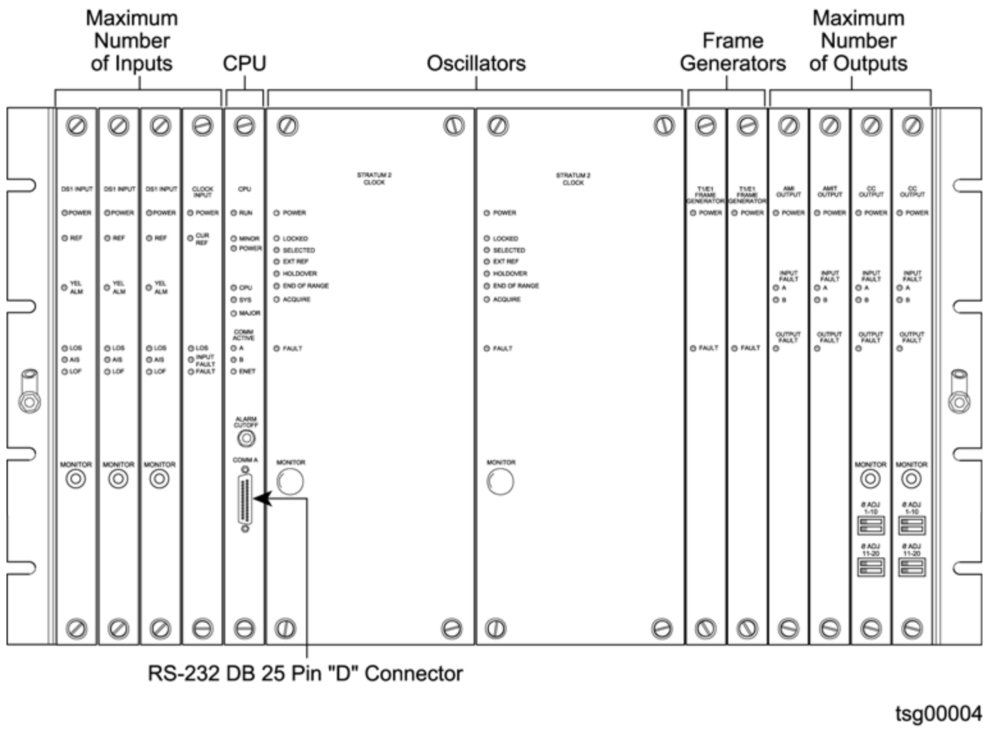


Figure 1-3. TSG-3800 19-Inch Main Shelf, Front View

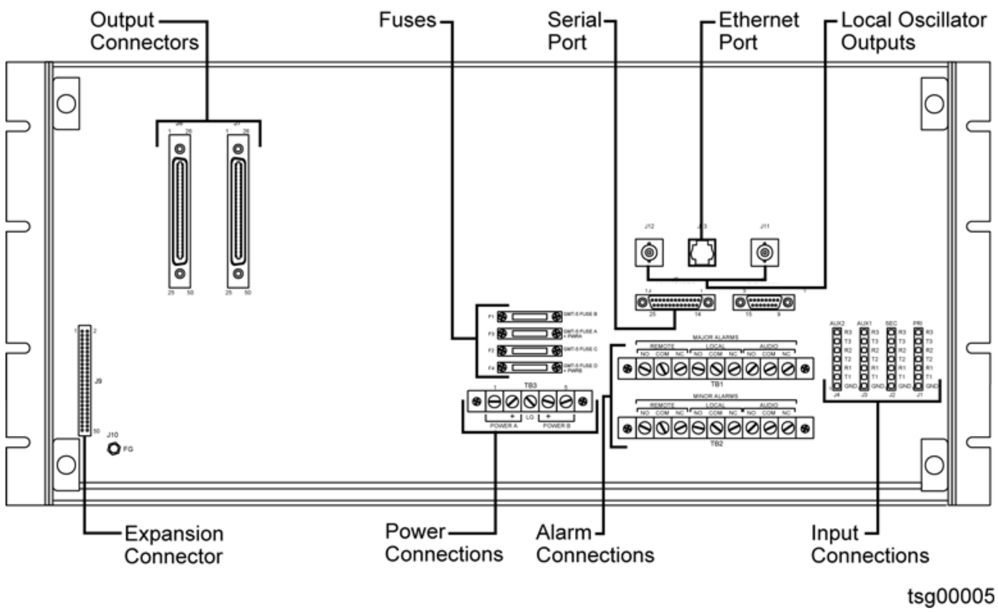


Figure 1-4. TSG-3800 19-Inch Main Shelf, Rear View

Description

The TSG-3800 19-inch Main Shelf assembly is a 19-inch aluminum chassis equipped with card guide slots for plug-in modules. The slots are partitioned into keyed sections. The main shelf has a rear plane assembly with connections for input, power, alarm, communication, and output signals. The main shelf assembly includes flanged brackets for mounting to a standard 19-inch relay or instrument rack. A rear cover and cable tie-bar are also included.

Specifications

Table 1-1 lists the general specifications for the TSG-3800 19-inch Main Shelf. For specifications on individual modules, refer to chapters 5 through 7 in this guide.

Table 1-1. Specifications of the TSG-3800 19-Inch Main Shelf

Specification	Characteristic
Long-term Frequency Error	Exceeds Stratum criteria defined in ANSI T1.101-1994
Clock Performance	Meets SONET requirements per ANSI T1.105-1988
Event Log	Stores up to 500 events including input and system faults, operator inputs, and system actions; time and date stamped to the nearest millisecond
System Interface	Dual EIA-232 connectors, 300 to 19,200 baud, 8-bit, no parity, 1 stop bit; also Ethernet 10 base-T (optional)
Measurements	
MTIE Measurements (each input)	Most recent 50 values, 100, 1,000, 10,000 second periods
Frequency Measurements (each input)	Most recent 50 values, 100, 1,000, 10,00 second averages
Phase Measurements (each input)	Most recent 100 values @ 1 second avg; 1,000 values @ 100 second avg
Control Value Calculations (each of 2 clocks)	Most recent 100 values @ 1 second avg; 1,000 values @ 100 second avg
Other Measurements (each input)	AIS, BPV, CRC, LOS, OOF errored and clear intervals
Distribution Capacity	
Main Shelf	2 module pairs (40 outputs) in 19″ shelf 4 module pairs (80 outputs) in 23″ shelf
Expansion Shelf #1	9 module pairs (180 outputs) in 19″ shelf 11 module pairs (220 outputs) in 23″ shelf
Expansion Shelf #2	9 module pairs (180 outputs) in 19″ shelf 11 module pairs (220 outputs) in 23″ shelf

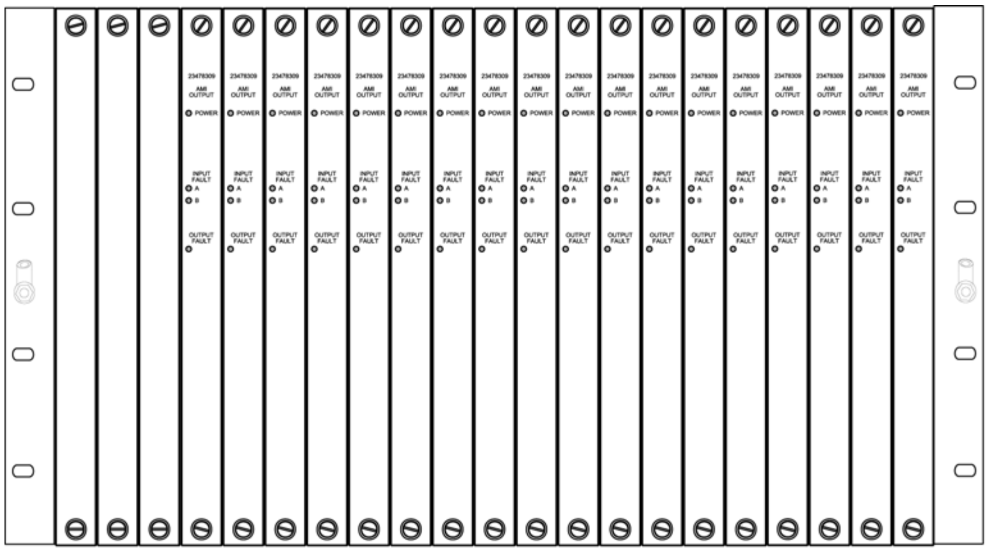
Table 1-1. Specifications of the TSG-3800 19-Inch Main Shelf (Continued)

Specification	Characteristic
Maximum Outputs	400 (19″ Main Shelf) 520 (23″ Main Shelf)
Environmental	
Operating Temperature Range	0 to 50°C
Humidity	0 to 95%, non-condensing
Power	
Power	Redundant Inputs: 38 to 72 vDC, 3.0 A (maximum) + 0.1 A/Dist. Module Either positive or negative ground
Connector	Terminal Block
Fuse Type/Rating	GMT-5A (4 fuses); (2 fuses on EMC version)
Alarm Relay Contact Rating	1 Amp, resistive
Mechanical	
Height	10.47 in (26.6 cm)
Depth	10.75 in (27.3 cm)
Width	17.12 in (48.3 cm), or 21.10 in (53.6 cm)
Weight	20 lbs (9 kg)

TSG-3800X 19-Inch Expansion Shelf

The TSG-3800X 19-inch Expansion Shelf can be used with the TSG-3800 19-inch Main Shelf to provide additional outputs. The 3800X 19-inch unit is shown in Figure 1-5.

Note: When you install an expansion shelf, note that the maximum length of cable available for connecting the main shelf to the expansion shelf is six feet (1.8 m).



tsg00006

Figure 1-5. TSG-3800X 19-Inch Expansion Shelf, Front View

Description

The TSG-3800X 19-Inch Expansion Shelf assembly, item number 25476672-000-0, is a rack-mounted system that provides additional signal distribution for the TSG-3800 19-inch Main Shelf assembly. The Expansion Shelf accepts up to 18 distribution modules in nine redundant pairs, providing 180 outputs, 20 outputs per module pair. Output signals are routed to nine, 50-pin connectors located on the rear panel.

The TSG-3800X 19-inch Expansion Shelf may also be used to house Timing Insertion Modules (TIM). A TIM may be inserted in one slot of any output pair with the TIM Bypass Relay assembly in the adjacent slot. Timing signals for the TIM are provided by the TSG-3800 19-inch Main Shelf. Input and Output connections for the TIM are routed to the 50-pin connectors located on the rear panel of the expansion shelf. For more information on the TIM, refer to Timing Insertion Module, on page 279.

The 19-inch Expansion Shelf receives input signals from the TSG-3800 19-inch Main Shelf through a cable assembly as shown in Figure 1-6.

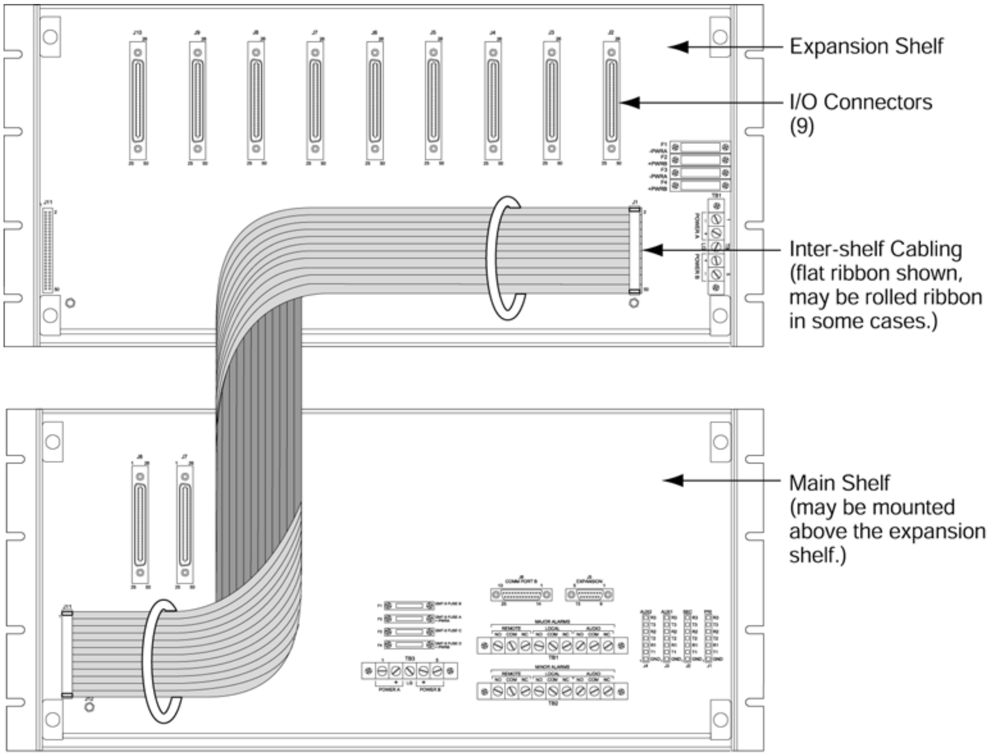


Figure 1-6. Inter-shelf Cable Connection, Rear View

Note: Blank panels occupy slots 1 through 3 and slot 24 in the Expansion shelf. The other 22 slots are available for installation of module pairs, and include slots 4 through 23.

Specifications

Table 1-2 lists the specifications for the TSG-3800X 19-inch Expansion Shelf.

Table 1-2. 19-Inch Expansion Shelf Specifications

Specification	Characteristic
Distribution Capacity	
Maximum Outputs (19-inch shelf)	9 module pairs (180 outputs)
Maximum Outputs (23-inch shelf)	11 module pairs (220 outputs)
Connector	50 contact connector, for example - Cinch #57-10500-8750
Inter-shelf Connector	50 pin header, 3M 3433-2303

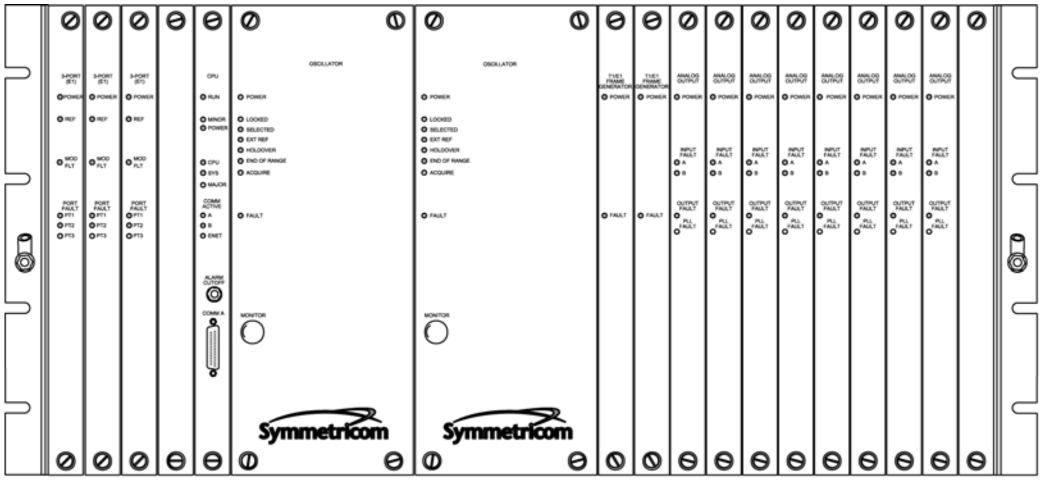
Table 1-2. 19-Inch Expansion Shelf Specifications (Continued)

Specification	Characteristic
Mating Connector	3M, 929-852-01-27-10
Operating Temperature Range	0 to 50° C
Humidity	0 to 90%, non-condensing
Power	
Inputs	Redundant Inputs –38 to –72 vDC, 3.0 A maximum Approx. 0.1 A/Dist. Module
Connector	Terminal Block
Fuse Type/Rating	GMT-5A (4 fuses)
Mechanical	
Height	10.5 in (26.7 cm)
Depth	12 in (30.5 cm)
Width	19 in or 23 in (48.3 or 58.4 cm)

TSG-3800 23-Inch Main Shelf

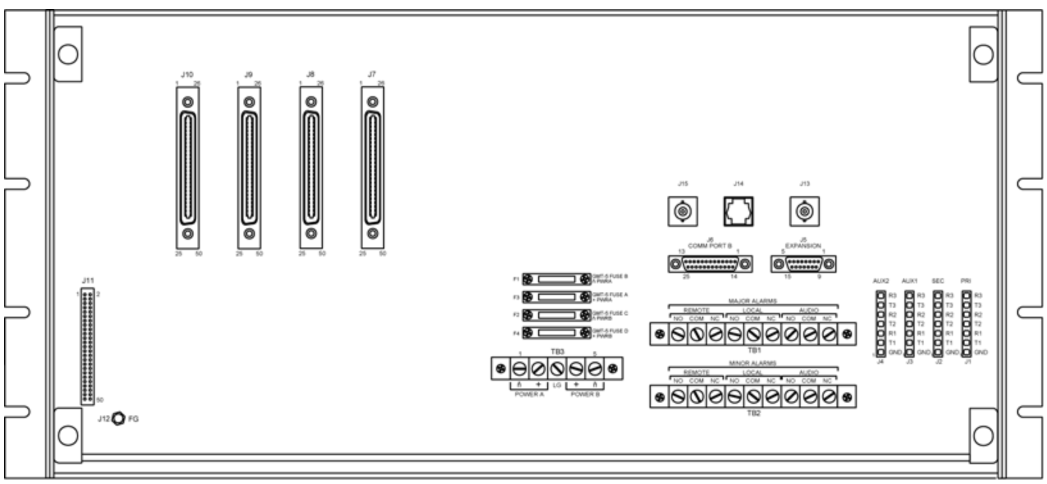
The TSG-3800 23-inch shelf is a larger version of the TSG-3800 19-inch Main Shelf Assembly. The TSG-3800 23-inch shelf provides up to 80 redundant outputs and is capable of driving two TSG-3800X 23-inch expansion shelves with 220 additional outputs available in each of the expansion shelf.

The TSG-3800 23-inch unit functions identically to the TSG-3800 19-inch unit, as described in Functional Description, on page 32. The TSG-3800 23-inch Main Shelf is shown in Figure 1-7 and Figure 1-8.



tsg00008

Figure 1-7. TSG-3800 23-Inch Main Shelf, Front View



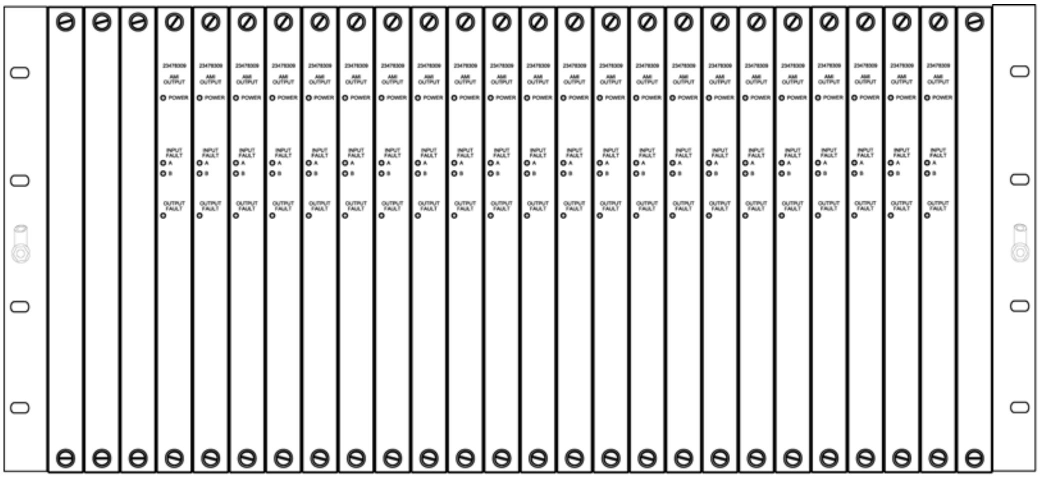
tsg00009

Figure 1-8. TSG-3800 23-Inch Main Shelf, Rear View

TSG-3800X 23-Inch Expansion Shelf

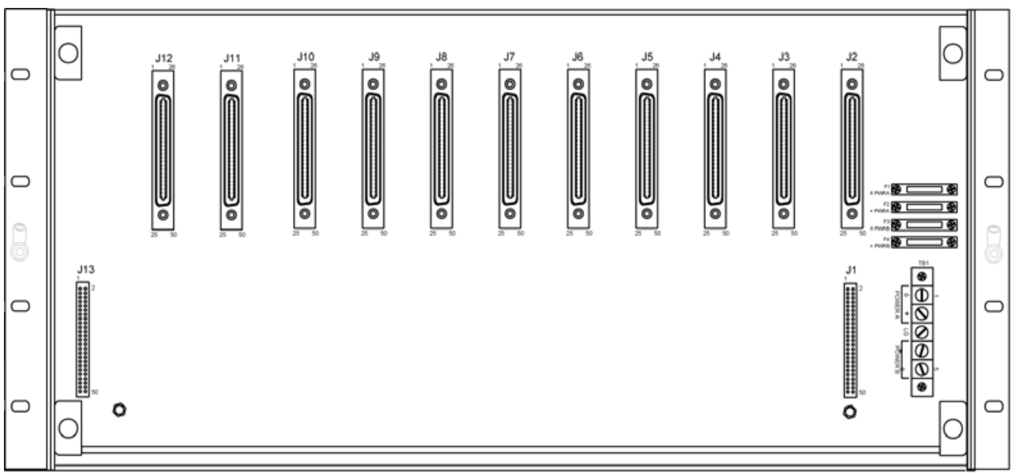
The TSG-3800X 23-inch Expansion Shelf can be used with the TSG-3800 23-inch Main Shelf to provide additional outputs. The 3800X 23-inch expansion shelf is shown in Figure 1-9 and Figure 1-10.

Note: When you install an expansion shelf, note that the maximum length of cable available for connecting the main shelf to the expansion shelf is six feet (1.8 m).



tsg00010

Figure 1-9. TSG-3800X 23-Inch Expansion Shelf, Front View



tsg00011

Figure 1-10. TSG-3800X 23-Inch Expansion Shelf, Rear View

TSG-3800E EMC-Compliant Main Shelf

The TSG-3800E Main Shelf is an EMC-compliant 19-inch version of the TSG-3800 with the same functionality. The 3800E Main Shelf is shown in Figure 1-11 and Figure 1-12.

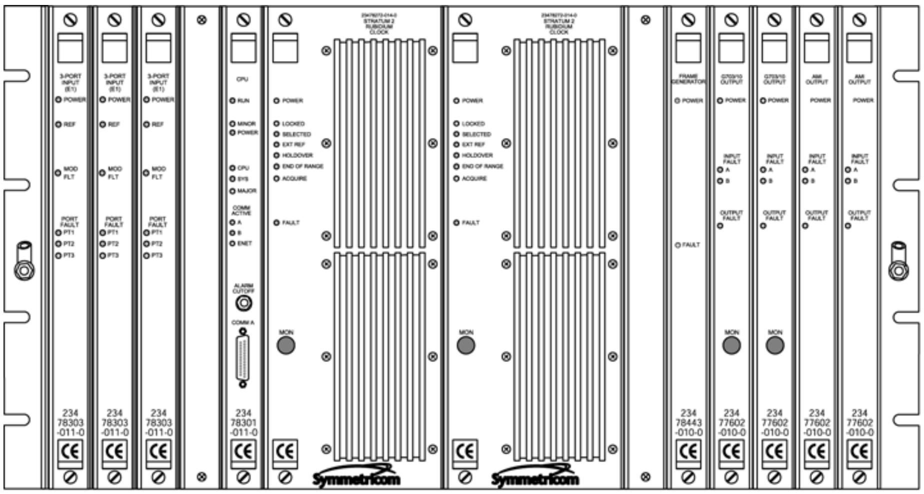


Figure 1-11. TSG-3800E Main Shelf, Front View

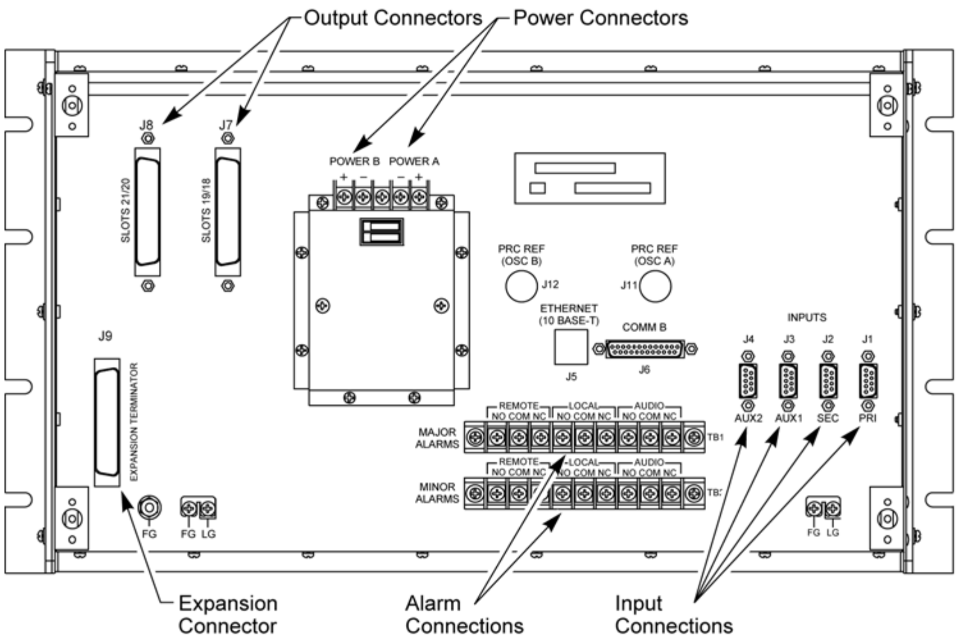


Figure 1-12. TSG-3800E Main Shelf, Rear View

TSG-3800EX Expansion Shelf

The TSG-3800EX 19-inch Expansion shelf was developed to support the TSG-3800E Main Shelf and is shown in Figure 1-13 and Figure 1-14.

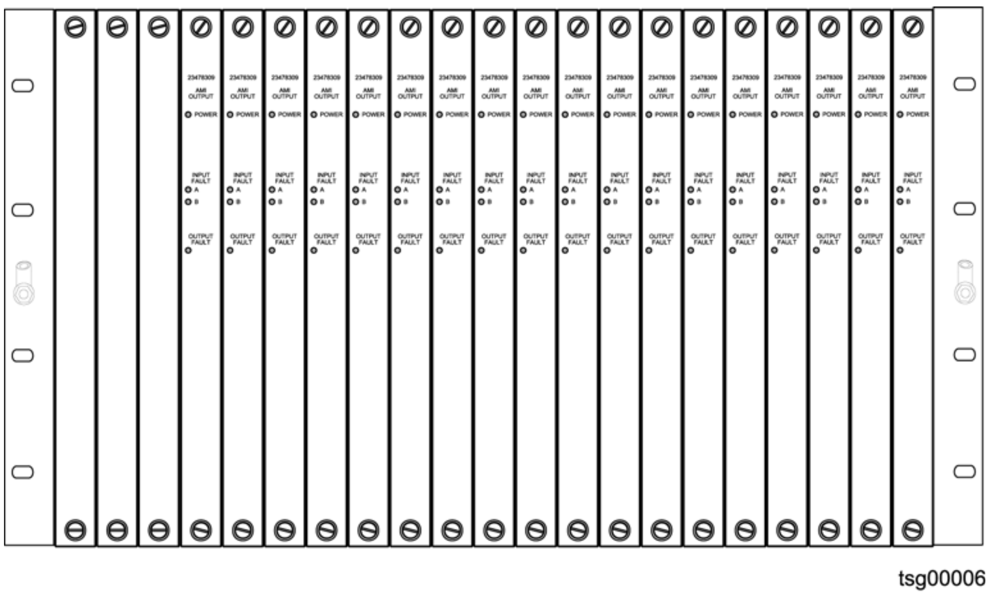


Figure 1-13. TSG-3800EX Expansion Shelf, Front View

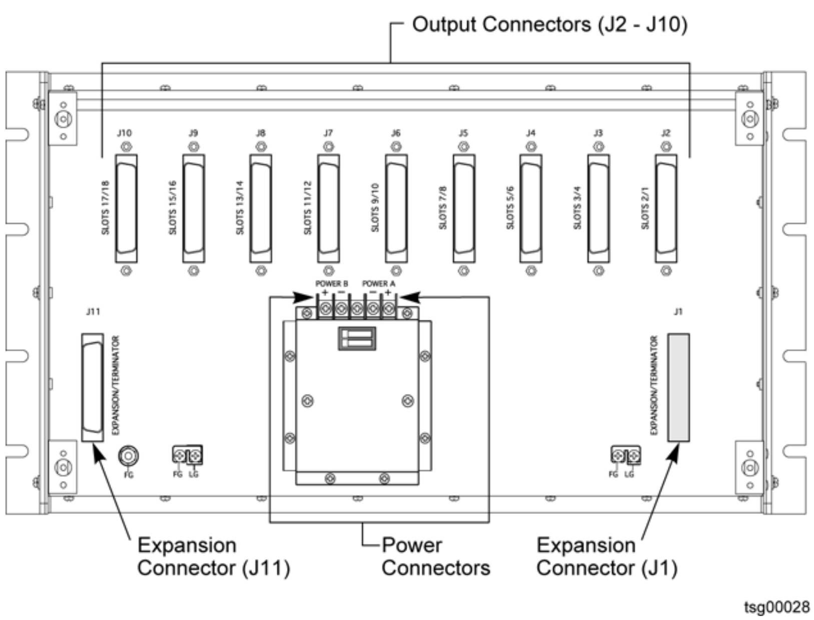


Figure 1-14. TSG-3800EX Expansion Shelf, Rear View

Chapter 2 Installing the TSG-3800

This chapter provides guidelines and procedures for unpacking, installing, and initial testing of the TSG-3800 family of products.

This chapter also provides instructions for installing each corresponding expansion shelf.

In This Chapter:

- Unpacking and Inspecting the TSG-3800
- Before You Begin
- Rack Mounting the TSG-3800
- Making Electrical Connections
- Installing and Removing Modules
- TSG-3800 Expansion Shelves
- Input/Output Adapter Panels

Unpacking and Inspecting the TSG-3800

Unpack all equipment carefully and check it against the purchase order.

Caution: To avoid damage to unprotected components, use proper static control precautionary measures when handling the modules. Protect the equipment against electrostatic discharge (ESD) by using a protective wrist-strap attached to ground and normal equipment grounding.

Inspect the equipment for shipping damage, including bent or loose hardware, broken connectors, or other visible defects. Notify Symmetricom and the carrier who delivered the equipment if you suspect that it was damaged in transit.

Recommendation: Symmetricom recommends that you keep all packaging materials in the event the system or components must be returned or shipped to another location.

Before You Begin

Make sure that the following preparations are in place before installation.

- Ensure that standard installation tools and materials are available, see Installation Tools and Materials, on page 49.
- Ensure that the system location does not cause electromagnetic interference with other equipment in the area, see Electromagnetic Interference Considerations, on page 49.
- Ensure that the mounting rack or equipment cabinet is properly grounded and has power available, see Making Ground Connections, on page 53.

Warning: To avoid the risk of shock, remove the fuses from the rear panel before beginning the installation. The unit is not equipped with a power on/off switch; both fuses must be removed to ensure the system is not accidentally powered up.

Caution: To avoid electrostatic discharge (ESD) damage to equipment, follow the ESD precautions as listed in this guide.

Recommendation: Follow all applicable local building electrical codes when installing the TSG-3800.

Installation Tools and Materials

The following required standard tools and materials (not supplied) are required for installing the TSG-3800:

- Standard tool kit
- Cable ties or acceptable cable clamps
- 16 AWG (minimum) wire for –48V, Return (RTN), and frame ground
- 18 AWG wire for connecting office alarms
- 22 AWG shielded twisted pair wire-wrap cable (Amp #640433-7 or equivalent)
- Wire-wrap tool
- Screws, flat washers, and locking washers for mounting the shelf to the equipment rack
- Digital Voltmeter
- Straight-through RS-232 cable
- Laptop or PC with a terminal emulation program such as HyperTerminal or ProComm Plus

Electromagnetic Interference Considerations

Electromagnetic interference (EMI) from one instrument can adversely affect the operation of nearby equipment. To prevent the TSG-3800 from interfering with other equipment, it must be installed and operated as described in the following paragraphs.

All cables connected to the TSG-3800 should be shielded with metal connector shells. The connectors on the back of the unit are shielded and connected to Frame Ground. The screws on all cable shells must be securely fastened to the connectors on the shelf's rear panel.

While the TSG-3800 is in operation, a module or blank filler panel (item number 10977120-000-0) must be installed in every slot. Captive screws located at the top and bottom of the module panel must be properly secured

Caution: To maintain EMC compliance, use only properly shielded cabling on all telecom signal wiring, including I/O, clocks, and Ethernet connections. Ensure that connections are appropriately grounded.

Rack Mounting the TSG-3800

The dimensions for each model are outlined in Table 2-1. A one RU (1.75 inch) space between shelves is recommended but not required when installing more than one TSG-3800 shelf.

Table 2-1. Shelf Dimensions

Main Shelf	Height	Depth	Width
3800/3800E 19-inch	10.5 in (26.7 cm)	12 in (30.5 cm)	19 in (48.26 cm)
3800 23-inch	10.5 in (26.7 cm)	12 in (30.5 cm)	23 in (58.42 cm)

Installing the Shelf

The shelves mount flush to the rack or at distances of two inches (5 cm) or five inches (12.7 cm) from the front of the rack. Mount the unit by performing the following steps.

1. Attach a mounting bracket, item number 00476807-*xxx*-1, to each side of the TSG-3800 Main Shelf, by aligning two columns (three holes per column) of the bracket with the holes on the side of the shelf. Use six 4-40 x 3/8″ screws to attach the mounting bracket, as shown in Figure 2-1. Ensure that both brackets are attached at equal distances from the front of the unit.

2. Mount the instrument to the front of the rack rails with eight screws and washers, as shown in Figure 2-1. Use the correct mating screws for the installation rack.

3. If you are not installing an expansion shelf, install the Bus Termination assembly in the appropriate connector, as listed in Table 2-2.

Table 2-2. Expansion Shelf Connections

Model	Expansion Connector
3800/3800E 19-inch Shelf	J9
3800 23-inch Shelf	J11

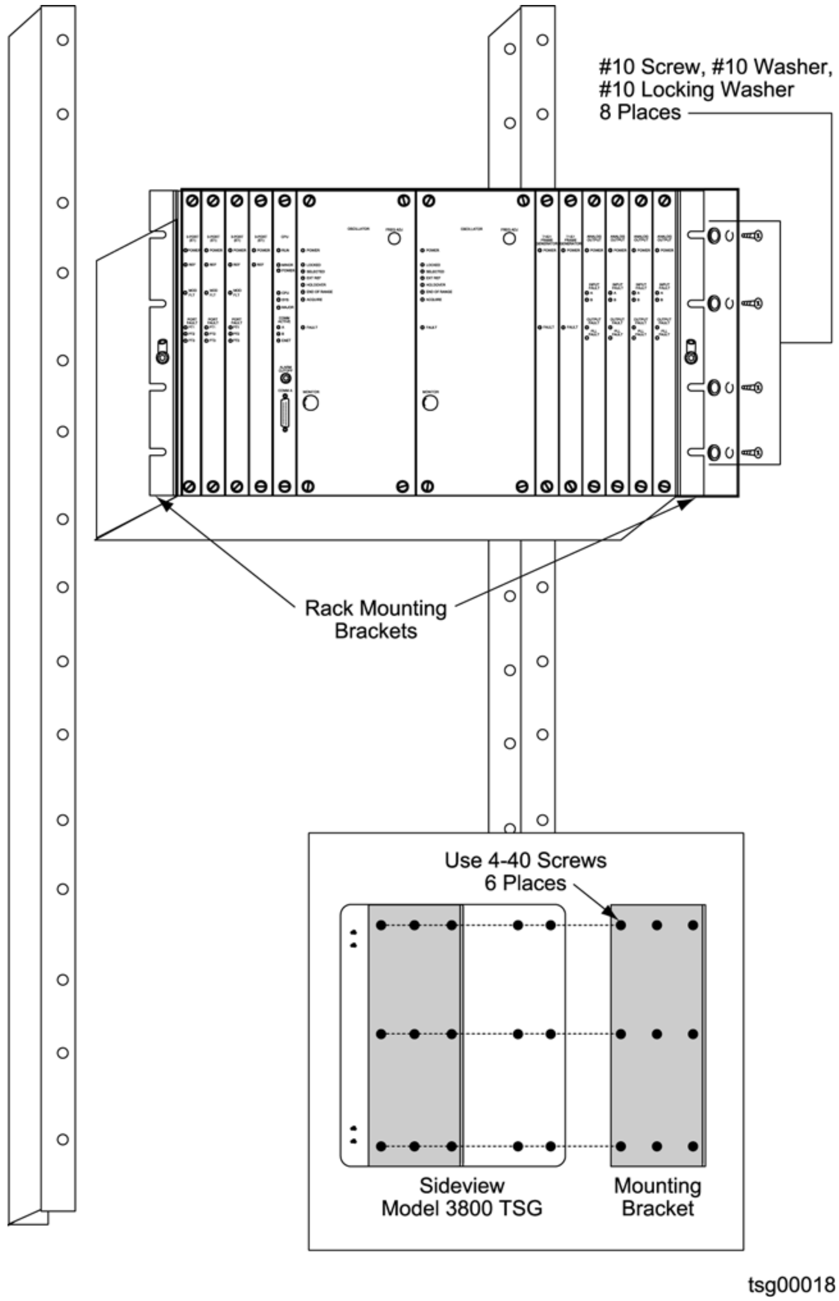


Figure 2-1. Rack Mounting the Shelf, Front View

Making Electrical Connections

Use the following procedures to make electrical connections to the TSG-3800. All connections referred to in these procedures are made on the rear panel of the shelf. Figure 2-2, Figure 2-3, and Figure 2-4 illustrate the rear panels of the TSG-3800 19-inch Main Shelf, the TSG-3800 23-inch Main Shelf, and the TSG-3800E 19-inch Main Shelf, respectively.

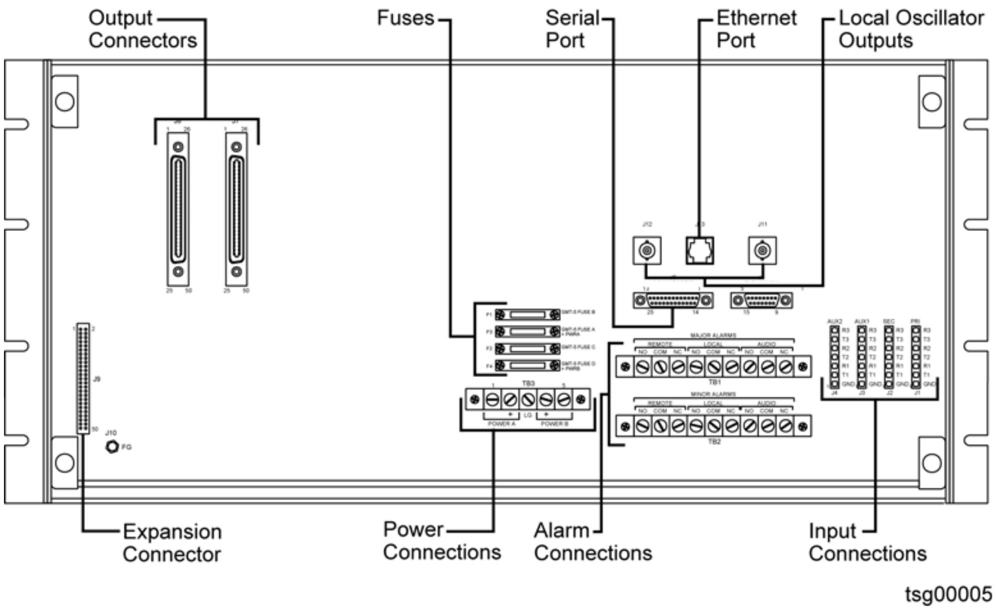


Figure 2-2.   TSG-3800 19-Inch Main Shelf, Rear View

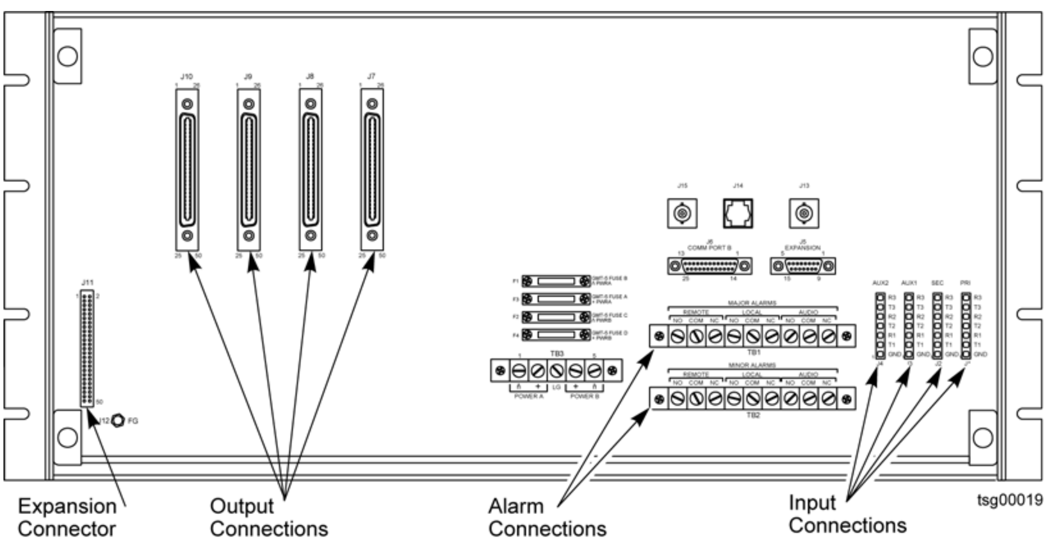


Figure 2-3.   TSG 3800 23-Inch Main Shelf, Rear View

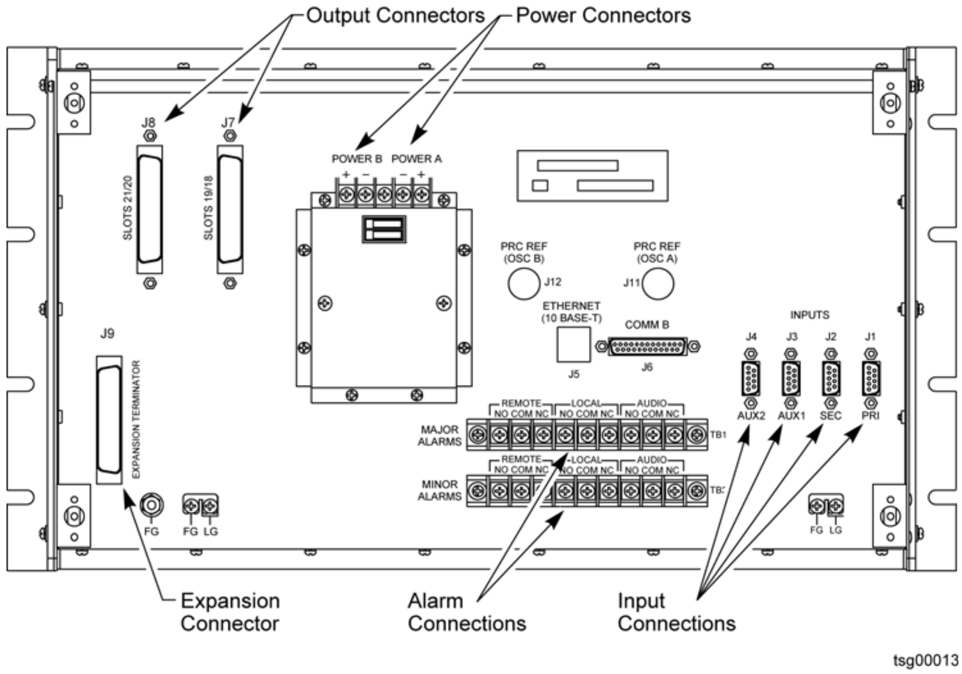


Figure 2-4.   TSG 3800E Main Shelf, Rear View

Making Ground Connections

After the TSG-3800 is installed in a rack, the shelf must be connected to a proper earth ground.

1. Run a cable from the frame ground (FG) lug to earth ground.

   Keep this cable as short as possible. Frame ground connections are made using the #8-32 stud labeled **FG** on the lower left corner of the rear panel.

2. Using a digital voltmeter, measure between ground and chassis and verify that no voltage potential exists between them.

Making Alarm Connections

To make alarm connections to the TSG-3800:

1. Locate the ALARM terminal block connectors labeled MAJOR ALARMS (TB1) and MINOR ALARMS (TB2) on the rear panel, see Figure 2-2, Figure 2-3, and Figure 2-4.

   Both terminals contain REMOTE, LOCAL, and AUDIO alarm connections. Three contacts are provided for each alarm: normally closed (NC), normally open (NO), and common (COM). Refer to Figure 2-5 for terminal screw assignments.

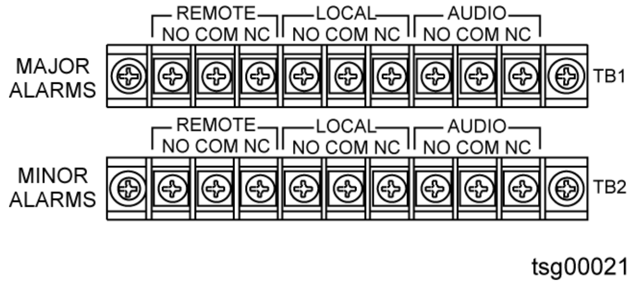


Figure 2-5. Alarm Connections

2. Connect office alarms to the REMOTE, LOCAL, and AUDIO terminals with 18 AWG (minimum) wire.

3. Verify that correct wiring connections have been made.

4. Reinstall the fuses.

Note: Using the NC connections results in an alarm when removing the CPU module, which contains the alarm relays. It also allows for alarming should a break occur in the alarm wiring.

In an alarm condition or loss of DC power, the contact between the NO and COM closes and the contact between the NC and COM opens.

Making Input Signal Connections

The TSG-3800 provides one 7-pin wire-wrap connector for each of the four Input module slots (see Table 2-3 for slot assignments and Input Port labels) and can be connected using Amp #640433-7 or equivalent 22 AWG shielded cable. The TSG-3800E provides one female DB-9 connector for each of the four Input module slots, and requires site-dependent custom EMC-compliant cable to be made.

Table 2-3. Input Port Labels

Slot	Priority	Label
1	Primary	INP1
2	Secondary	INP2
3	Auxiliary 1	INP3
4	Auxiliary 2	INP4

Note: Input Port labeling on the rear panel of the TSG-3800 may indicate the references used with previous software versions.

The Wire Wrap headers/DB-9 connectors are designated J1 (PRI), J2 (SEC), J3 (AUX1), and J4 (AUX2). Figure 2-6 shows the pinouts for these connectors. Pin 1 of each connector is connected to Ground and is usually connected to the cable shield (sleeve). Tip 1 (+) and Ring 1 (–) are the signal input pins used by all Input modules, and are the pins to which the external reference is connected. For 3-Port modules, Tip 2 (+) and Ring 2 (–) are used for input port 2. Tip 3 (+) and Ring 3 (–) are used for input port 3. Tip 2 (+) and Ring 2 (–) are used by the Clock Input module for connecting an external Fault Signal; for example, Cesium PRS.

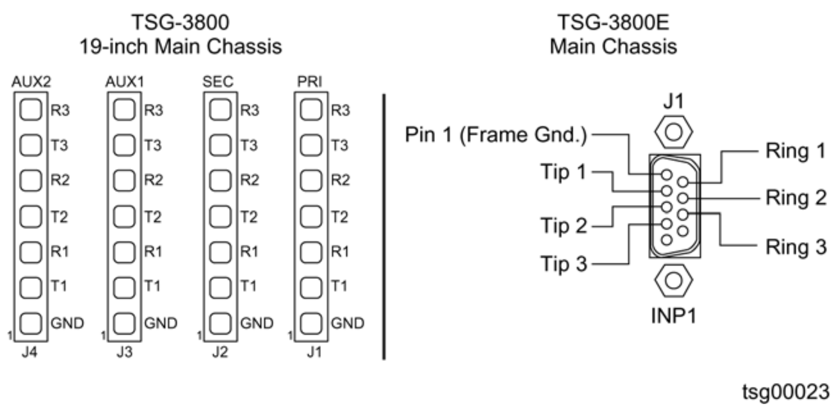


Figure 2-6. Signal Input Connections

Selectable input impedances are provided on the Input modules (see Table 2-4). A BNC- to-WW connector, item number 12012421-000-0, is available for connecting coaxial cable.

Table 2-4. Input Impedance Selections

Input Type	Selections	Default
DS1 Inputs	100 Ω 3.3 kΩ (for bridging)	100 Ω
E1 Inputs	75 Ω 120 Ω 3.3 kΩ (for bridging)	120 Ω
Clock Inputs	50 Ω	50 Ω

Note: Improper termination and cabling can cause pulse distortion, which may result in excessive bipolar violations (BPVs) or other problems.

The input can also come from a DSX monitor jack. When coming from a monitor, an internal amplifier increases the signal amplitude. The TSG-3800 is shipped with the amplifier disengaged. You must set a jumper on the Input module to activate the internal amplifier. Instructions for setting jumpers are found in Chapter 5, Input Modules. Figure 2-7 illustrates three typical input connections.

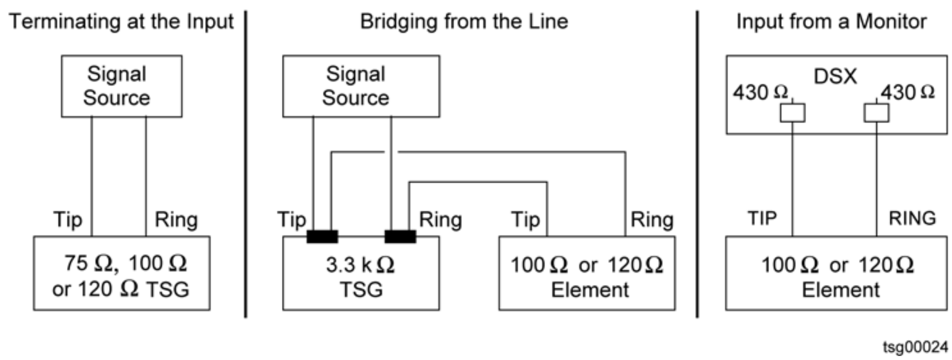


Figure 2-7. Typical Input Signal Interfaces

Making Output Signal Connections

Several different output modules are available for the TSG-3800 series, each with its own requirement for signal termination. Chapter 7, Output Modules, describes each of these modules in detail. The Specifications table for each module includes the required termination as well as other specifics for individual module outputs.

If an output is connected to one input on the receiving equipment, the input impedance should be equal to the required termination impedance for that signal. If two or more input ports are driven by one output, the input impedance for all of the inputs connected must equal the required termination impedance for the output. For best results, the terminated input port should be at the end of the line.

The signals generated by the output modules in slots 18 and 19 go to J7 on the rear panel, and those generated by the modules in slots 20 and 21 go to J8 (on the rear panel) of a 19-inch shelf. On a 23-inch shelf, slots 22 and 23 go to J9 and slots 24 and 25 go to J10. Tip and ring contacts are paired on opposite contacts (Ring = 1–20 and Tip = 26–45). Figure 2-8 illustrates the connector. Contacts 21 through 25 and 46 through 50 are frame grounds. For example, a typical mating connector is Cinch #57-10500 or AMP #3-229912-1.

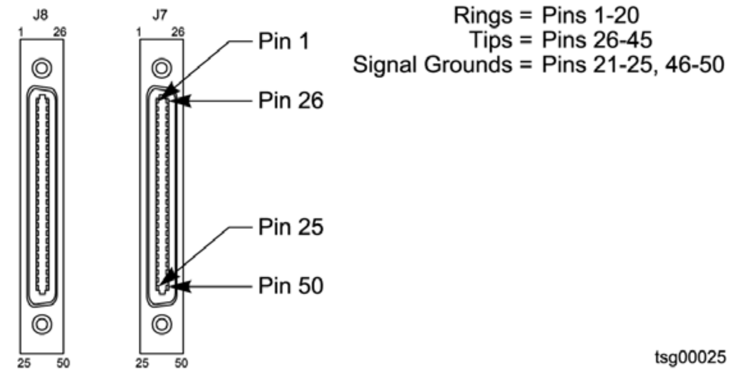


Figure 2-8. Output Signal Connectors, Rear View

Making Monitor Connections

Some modules provide Bantam jack monitor outputs on their front panels. Refer to the module descriptions in Chapter 5, Input Modules, Chapter 6, CPU, Frame Generator, and Clock Modules, and Chapter 7, Output Modules for details.

Making Power Connections

Perform the following steps to apply power to the TSG-3800:

1. Ensure all fuses are removed.

   For the TSG-3800 19-inch and TSG-3800 23-inch shelves, the fuses are located above the POWER terminal block as shown in Figure 2-2 and Figure 2-3. Power A is controlled by fuses F1 and F3. Power B is controlled by fuses F2 and F4.

   For the TSG-3800E 19-inch shelf, the fuses are located below the POWER terminal block, as shown in Figure 2-4.

2. Locate the POWER terminal block and make the connections using 16 AWG (minimum) stranded wire.

3. Connect primary power to the POWER A terminals and the secondary power to the POWER B terminals. A #6 spade lug termination for each power lead is recommended. Figure 2-9 illustrates the TSG-3800 power connectors.

4. Measure the voltage at POWER A and POWER B (if used) and verify that it measures from –38 to –72 volts DC (–48 vDC nominal). The inputs are protected against reverse polarity.

5. Using a digital voltmeter, measure between ground and chassis and verify that no voltage potential exists between them.

6. Insert the modules as described in Installing and Removing Modules, on page 61.

7. Insert the fuses, see Figure 2-10. This powers up the shelf

> **Caution:** For continued fire protection, replace fuse with specified type and rating. Fuse: GMT-5 (5A @ 60vDC). This unit must be grounded. Refer all servicing to qualified personnel.

8. Verify that all modules are receiving power; their POWER indicators are green. Check that the RUN indicator on the CPU module is green.

9. To ensure that *both* power inputs are valid, verify that the amber POWER indicator on the front of the CPU module is off; see Figure 6-1 for its location. If the POWER indicator is on, check the power inputs. This indicator lights if one of the power inputs is not present or malfunctioning.

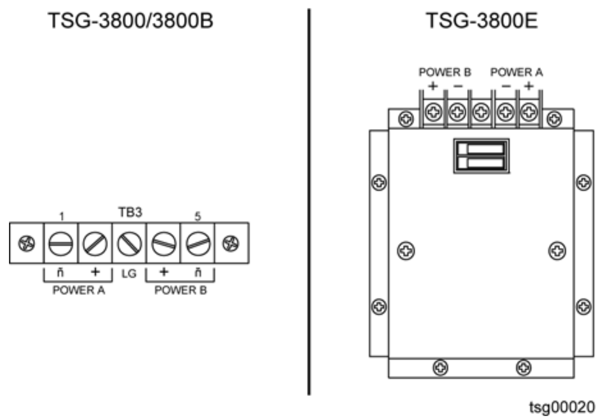


Figure 2-9. Power Connections

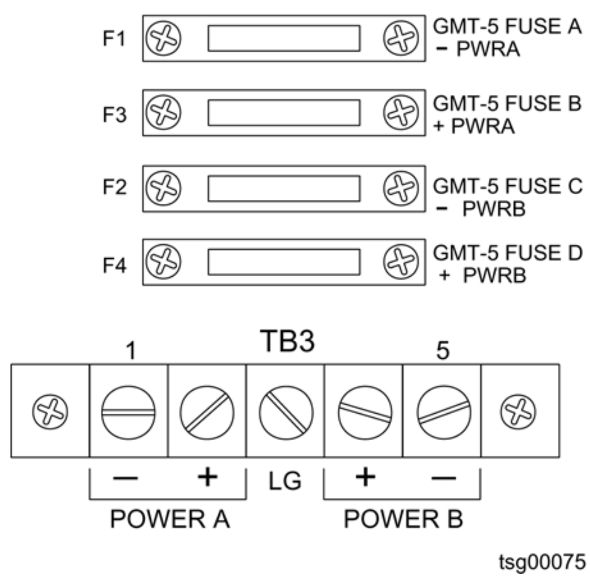


Figure 2-10. Fuse and Power Connection Details

EIA-232 Communications

An EIA-232, 25-pin, D-style connector is located on the rear panel of the TSG-3800 main shelf to allow connection to a terminal. This connection is for remote monitoring and control of the unit. From the connector to the terminal, use a shielded cable with the shield connected to pin 1 of that connector.

The port may be configured as Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). The default configuration is DCE, where the instrument is connected to a PC. The port may also be configured as DTE, when the unit is connected to a modem.

An EIA-232 25-pin D-style connector is also located on the CPU front panel to allow connections to a terminal. This connection is for local monitoring and control of the unit and is a DCE configuration only.

Note: The DCE setting allows direct connection of the unit to a standard PC communication port using a 1:1 cable. The DTE setting requires a null modem cable. If connecting to a modem, use DTE.

The default EIA-232 settings for the serial ports is 9600 baud, no parity, 8 data bits, 1 stop bit, echo on, ASCII mode, and handshaking disabled. To change these settings, the operator must first connect to a terminal device or PC using a serial communications program as described in Establishing Communications, on page 308. The port retains the new settings until the user changes them.

Ethernet Communications

The Ethernet connection is designed for 10Base-T communication. Table 2-5 lists the Ethernet connector for each model of TSG, Table 2-6 lists the pin assignments for the connectors, and Figure 2-11 shows the Ethernet connector pin numbers. The RJ45 is a standard 10Base-T connector. Before using the Ethernet connection, you must configure the TSG-3800 internet protocol (IP) address, gateway, and mask using the serial port. See Setting Ethernet Parameters, on page 318, for procedures and more information.

Note: Before connecting to Ethernet communications, the user must log into the unit through the serial port and configure the IP address, gateway and subnet mask. See Setting Ethernet Parameters, on page 318.

Table 2-5. Ethernet Connectors

Model	Connector
3800 19-inch Shelf	J13
3800 23-inch Shelf	J14
3800E 19-inch Shelf	J5

Table 2-6. Ethernet Connector Pin Assignments

Function	Pin
Tx+	1
Tx-	2
Rx+	3
Not Used	
Not Used	
Rx-	6
Not Used	
Not Used	

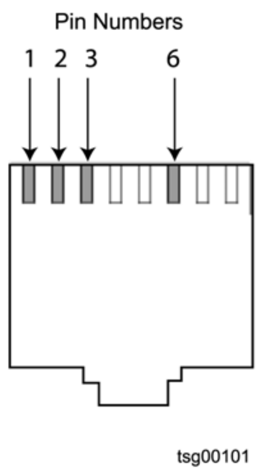


Figure 2-11. Ethernet Pin Numbers

Local Oscillator Outputs

Local Oscillator outputs on the rear panel of each shelf provide the unadjusted 10 MHz output from the Clock module oscillators for use with external global positioning satellite (GPS) receivers. These outputs are not frequency adjusted; rather they provide stable clock signals for the GPS receiver. Table 2-7 shows the pinouts for each TSG-3800 model.

Table 2-7. Local Oscillator Output Connector Pins

Model	Connection
3800/3800E 19-inch Shelf	J11 and J12
3800 23-inch Shelf	J13 and J15

Installing and Removing Modules

This section describes how to properly handle, install, and remove modules from any TSG-3800 series shelf.

Properly Handling the Modules

The following should be considered when handling modules.

- Use removal tool (item number 00478507-000-1) if available.
- Use proper static control precautions when handling modules.
- Protect the equipment against ESD by using a grounded protective wrist strap and normal equipment grounding.
- Two frame grounding lugs, one on each front mounting bracket of the TSG-3800, provide the ground connection for the protective wrist straps.
- Avoid touching component leads and the module’s edge-connector.
- Avoid laying the module on an ungrounded surface.
- Avoid touching the module to an insulated surface.

Slot Location and Keyed Modules

Locate the slot or slots allocated for the type of module being inserted. Modules are keyed to prevent inserting into the wrong locations. Figure 2-12 illustrates the TSG-3800 main shelf and slot locations.

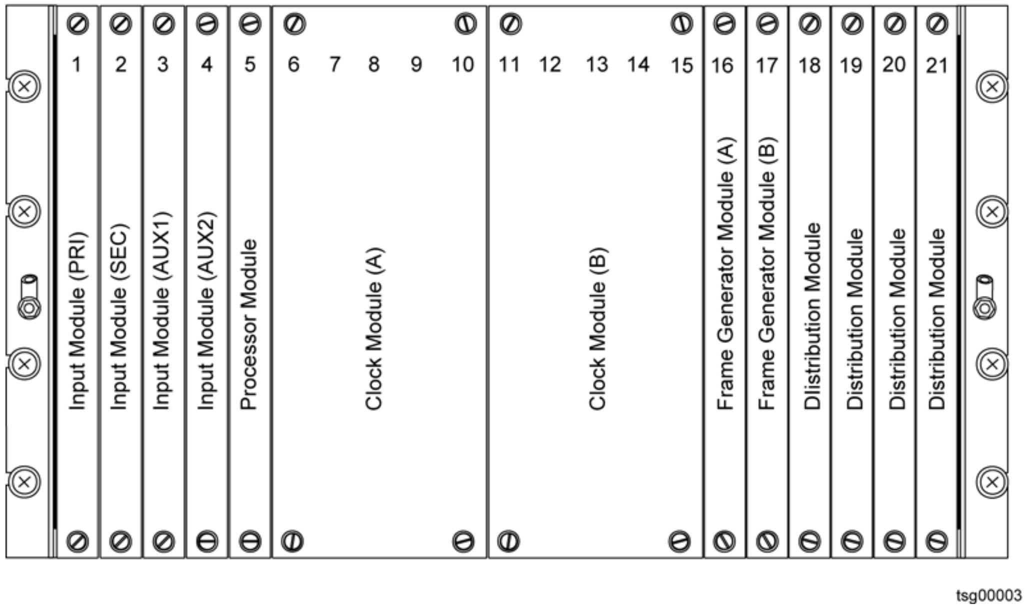


Figure 2-12. TSG-3800 19-Inch Module Slot Locations

The shelf slots are keyed according to Table 2-8.

Table 2-8. Module and Slot Guide Key

Module Type	Slot Numbers
Input Modules	Slots 1–4
CPU Module	Slot 5
Clock Modules	Slots 6–15 (6–10 and 11–15) are grouped together; Clock modules are 5 slots wide
Frame Generator Modules	Slots 16 and 17
Distribution Modules	Slots 18–21 for 19″ shelf
	Slots 18–25 for 23″ shelf

Note: When using two different quality oscillators (for instance, Stratum 2E and Stratum 3E), always install the higher quality oscillator in slots 6–10.

Installing Modules

The installation procedure is common for all modules. Some modules require the operator to set or verify jumper positions. Refer to Chapter 5, Input Modules, Chapter 6, CPU, Frame Generator, and Clock Modules, and Chapter 7, Output Modules for any other precautionary or special instructions for the modules you are installing.

Note: Modules can be installed and removed while system power is applied unless otherwise indicated.

To install a module:

1. Align the module card edges with the plastic card guides of the selected slot.

2. Slide the module evenly into the TSG-3800 Main shelf until it seats fully into the connector on the Interconnect Board.

3. Tighten the retaining screws located at the top and bottom of the module's front panel.

Caution: To avoid damage to the modules, be sure to completely insert the module into the Interconnect Board and securely tighten the retaining screws. A partially inserted module can easily become damaged.

Removing a Module

The removal procedure is common to all modules. Always use proper handling techniques when removing the modules. Refer to Chapter 5, Input Modules, Chapter 6, CPU, Frame Generator, and Clock Modules, and Chapter 7, Output Modules for any other precautionary or special instructions for the modules you are removing.

To remove a module from the shelf:

1. Loosen the retaining screws located at the top and bottom of the module. Ensure that these screws are completely disengaged from the shelf.

2. If the removal tool (item number 00478507-000-1) is available, insert it onto the shafts of the retaining screws and pull firmly and evenly to remove the module.

   If the removal tool is not available, grasp the retaining screws and pull firmly and evenly at the top and bottom of the module until it is completely out of the unit.

3. Replace an open slot with another module or with a blank filler slot (item number 10977120-000-0) to minimize electromagnetic interference.

TSG-3800 Expansion Shelves

This section describes the available expansion shelves and covers the installation and initial testing of the TSG-3800X 19-inch shelf, the TSG-3800X 23-inch shelf, and the TSG-3800EX 19-inch shelf. Unless otherwise noted, all units are referred to as the TSG-3800X.

Description

The Expansion shelf provides additional signal distribution for the TSG-3800 series. The TSG-3800X is an aluminum chassis equipped with card guide slots for plug-in modules. The rear of the Main shelf provides connections for input, power, and output signals. The Main shelf performs all logic and control functions. Timing and monitor signals transfer between shelves through an interconnecting cable assembly.

Note: When you install an expansion shelf, note that the maximum length of cable available for connecting the main shelf to the expansion shelf is six feet (1.8 m).

Output Modules

The TSG-3800X 19-inch shelf and the TSG-3800EX 19-inch shelf accepts up to 18 Output modules (in nine redundant pairs) providing 180 outputs (20 outputs per module pair). Output signals are on nine 50-pin connectors located on the rear panel. Figure 2-13 illustrates the TSG-3800X 19-inch shelf. The TSG-3800X 23-inch shelf can contain two additional pairs of Output modules with 40 additional outputs, for a total of 220 outputs. Figure 2-14 illustrates the TSG-3800X 23-inch shelf, and Figure 2-15 illustrates the TSG-3800EX 19-inch shelf.

Timing Insertion Modules

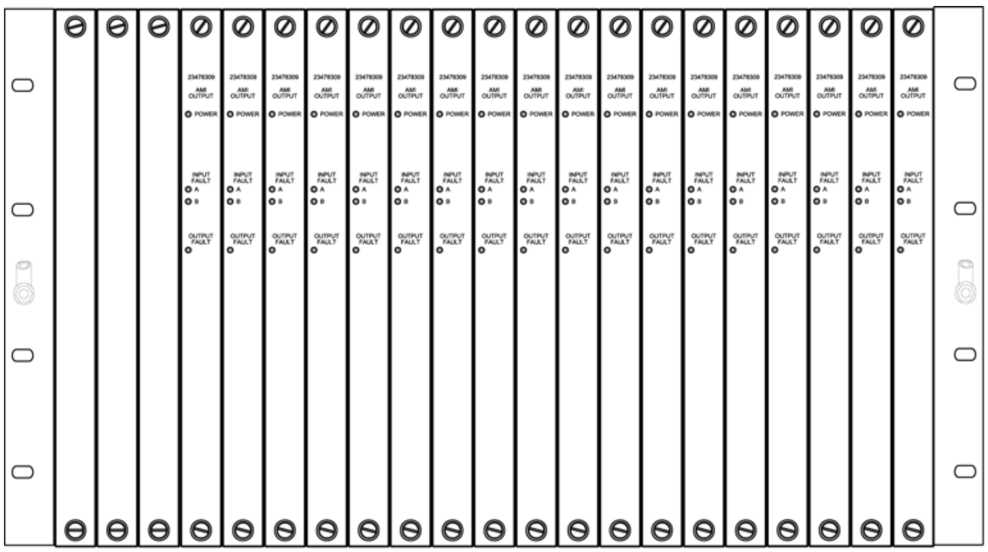
The TSG-3800EX may also be used to house Timing Insertion modules (TIMs). A TIM may be inserted in one slot of any output pair and the TIM Bypass Relay assembly in the adjacent slot. Timing signals for the TIM are provided by the TSG-3800 Main shelf. Input and Output connections for the TIM are on the 50-pin connectors located on the rear panel of the Expansion shelf. For more information, refer to Timing Insertion Module, on page 279.

Expansion Shelf Power Monitor

An optional module, the Expansion Shelf Power Monitor, allows for independently reporting power loss alarm conditions. This plug-in module:

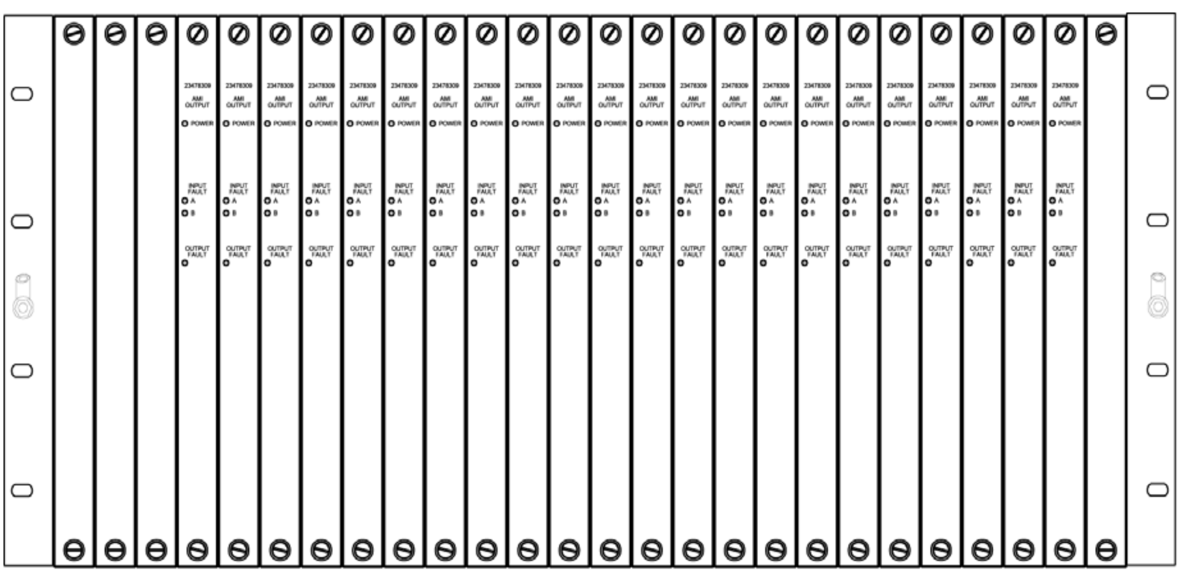
- Provides visual indication of A and B power
- Provides form “C” alarm relay closures upon power loss (Major alarm for loss of A and B power; Minor alarm for loss of A or B power)

- Allows user to wire alarm contacts (Major and Minor) to an external alarm panel or monitoring system through a wire-wrap adapter (item number 551306-0049, included)
- Requires no out-of-service modifications for installation
- Occupies space normally used by an output module pair (the module uses a single slot with an adjacent slot covered by a blank filler panel (item number 10977120-000-0)



tsg00006

Figure 2-13. TSG-3800X 19-Inch Expansion Shelf, Front View



tsg00010

Figure 2-14. TSG-3800X 23-Inch Expansion Shelf, Front View

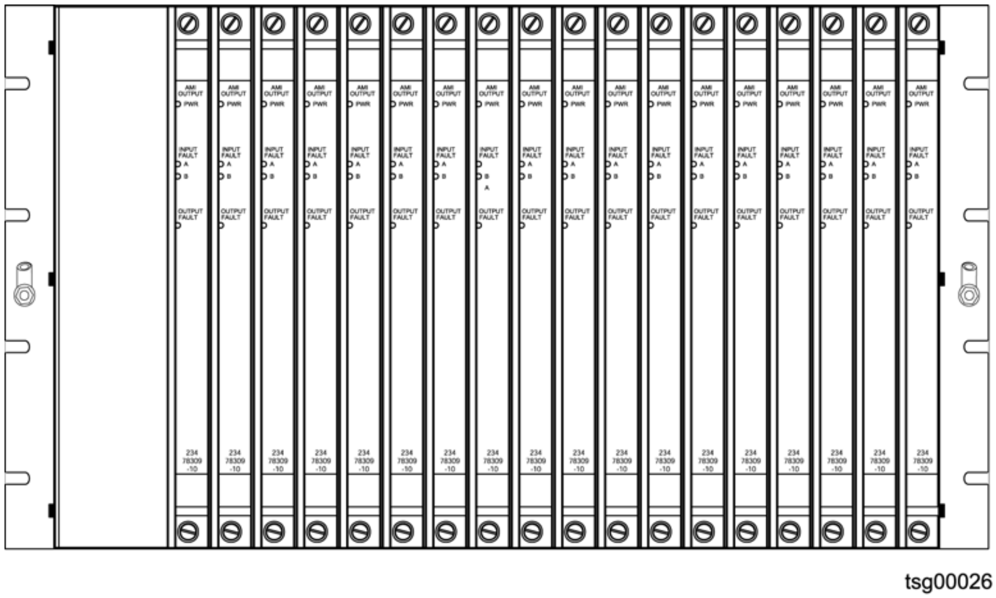


Figure 2-15. TSG-3800EX 19-Inch Expansion Shelf, Front View

Installing the Expansion Shelf

The TSG-3800X can be mounted on a standard 19-inch or 23-inch instrument rack. Power and signal connections are through rear panel connectors. This section provides instructions for installing the TSG-3800X.

Considerations

The expansion shelf occupies 10.5 inches (26.7 cm) of vertical rack space and a depth of 12 inches (30.5 cm). A 1RU (1.75 inch) space is recommended but not required when installing more than one TSG-3800 shelf.

Note: When you install an expansion shelf, note that the maximum length of cable available for connecting the main shelf to the expansion shelf is six feet (1.8 m).

Procedures

1. The expansion shelf mounts flush to the rack or at distances of two inches or five inches from the front of the rack. Attach a mounting bracket (00476807-xxx-1) to each side of the shelf. Align two columns (three holes per column) of the bracket with the holes on the side of the shelf. Use 4-40 x 18LG screws for attaching the mounting bracket. Ensure to attach both brackets at equal distances from the front of the unit, as shown in Figure 2-1.

2. Mount the expansion shelf to the front of the rack rails with eight sets of #10 screws, flat washers, and locking washers. The hardware attaches to the rack through the slots located on the front of both mounting brackets (four slots per bracket).

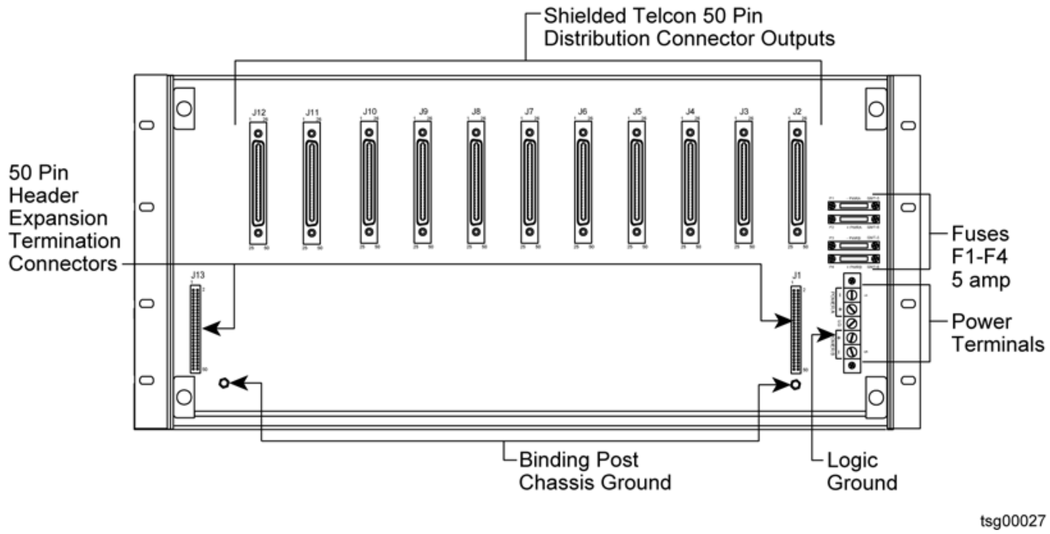


Figure 2-16. TSG-3800X 19-Inch Expansion Shelf, Rear View

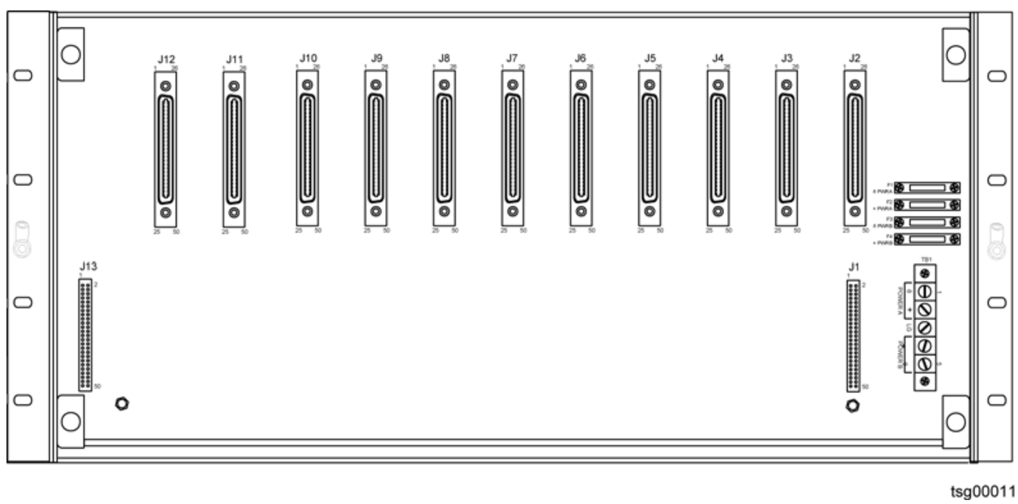


Figure 2-17. TSG-3800X 23-Inch Expansion Shelf, Rear View

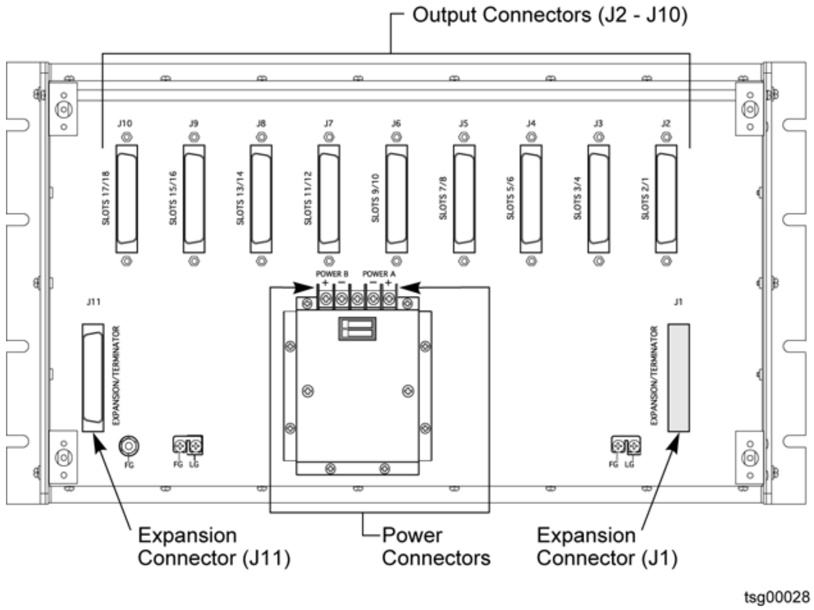


Figure 2-18. 3800EX Expansion Shelf, Rear View

Making Ground Connections

After the TSG-3800X is installed in a rack, the shelf must be connected to a proper earth ground.

1. Run a cable from the frame ground (J10) lug to earth ground.

   Keep this cable as short as possible. Frame ground connections are made using the #8-32 stud labeled FG/J10 on the lower left corner of the rear panel.

Note: The TSG-3800EX is shipped with a terminal jumper that connects Frame Ground (FG), which is also called chassis ground, to Logic Ground (LG), which is also called signal ground. These jumpers are located in the lower left corner of the rear panel. To isolate these two grounds, this jumper must be removed. Once the connections to LG have been opened, secure the jumper to the rear panel by tightening the FG screw. If desired, the LG terminal may be used to connect a separate LG cable.

2. Using a digital voltmeter, measure between ground and chassis and verify that no voltage potential exists between them.

Making Power Connections

To connect power to the expansion shelf, perform the following steps:

1. Remove PWR A and PWR B fuses from the rear of the expansion shelf.
2. Locate the POWER terminal block. Connect the ‘A’ power feed to the POWER A terminals. Connect the ‘B’ power feed to the POWER B terminals.
3. Measure the voltage from each –48 vDC to GND (of the Expansion shelf) and verify the proper level and polarity exists. There is reverse polarity protection for each input.
4. Measure between ground and chassis and verify that no voltage potential exists between them.
5. Insert the modules using the procedure in Installing Modules, on page 63.
6. Insert the PWR A and PWR B fuses and verify that all modules are receiving power by checking that their POWER indicators are lit.

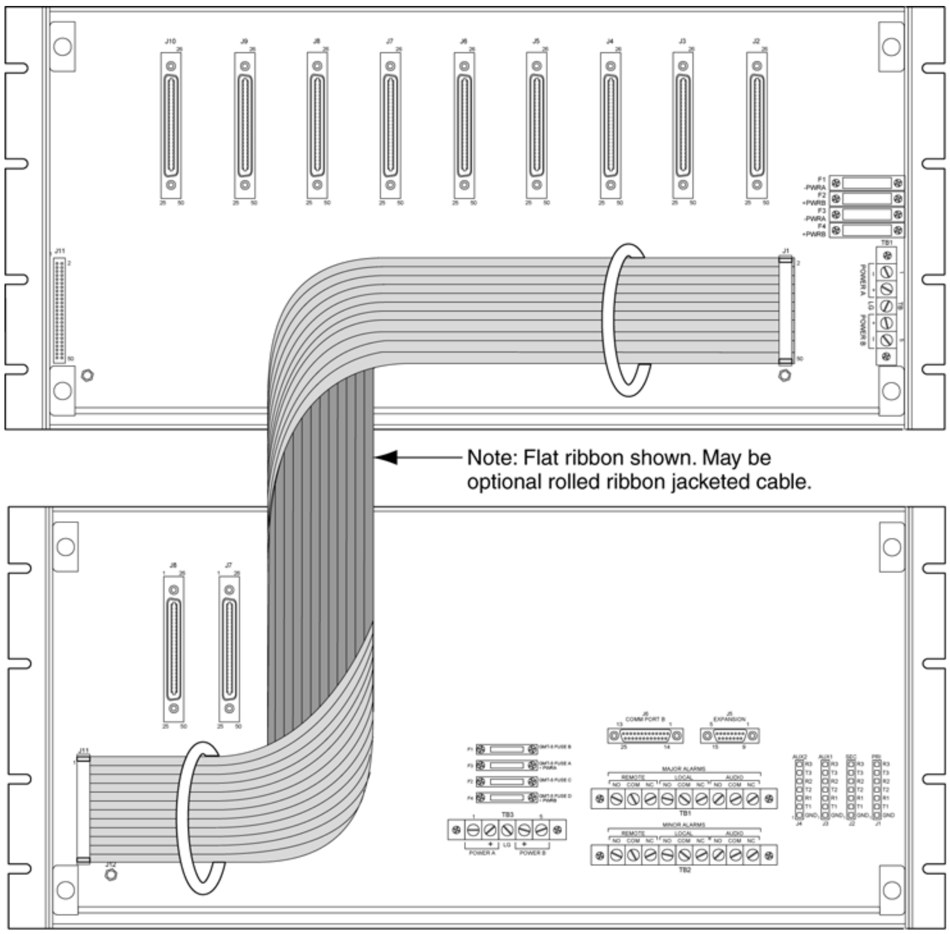
Main Shelf and Expansion Shelf Cabling

The expansion shelf receives input signals from the TSG-3800 Main Shelf through a cable assembly (see Appendix A, Part Numbers for a list of parts for the TSG-3800 and TSG-3800E). Refer to Figure 2-19 for the following example. Using the cable assembly, you can connect the expansion shelf connector *J1* to the 19-inch Main shelf connector J9, or J11 on the 23-inch Main Shelf. If you are connecting a second 19-inch Expansion Shelf, connect from the first expansion shelf connector *J11* to the second shelf connector *J1*. With 23-inch shelves, connect the first 23-inch shelf connector *J13* to the second shelf connector *J1*. Table 2-9 lists the connections required between shelves.

Table 2-9. Expansion Shelf Connections

TSG-3800 19-Inch Shelf		TSG-3800 23-Inch Shelf		TSG-3800E 19-Inch Shelf	
FROM Shelf/ Connector	**TO Shelf/ Connector**	**FROM Shelf/ Connector**	**TO Shelf/ Connector**	**FROM Shelf/ Connector**	**TO Shelf/ Connector**
Main J9	Expansion #1 J1	Main J11	Expansion #1 J1	Main/J9	Expansion J1
Expansion #1 J11	Expansion #2 J1	Expansion #1 J13	Expansion #2 J1	Bus Termination: Install on J11 of Expansion shelf	

Note: A black line on the ribbon cable identifies pin 1. Be sure to insert each cable connector with pin 1 connecting with pin 1 of the main or expansion shelf connector.



tsg00030

Figure 2-19. Expansion Shelf Inter-shelf Connections

EMC Expansion Shelf Cabling

The TSG-3800EX Expansion shelf receives input signals from the TSG-3800E through a cable assembly supplied with the expansion shelf. Remove the Bus Termination assembly from connector J9 on the TSG-3800E and install it on J11 of the TSG-3800EX (if it is the last in the daisy chain). Install the Cable Assembly between connector J9 on the TSG-3800E and connector J1 on the TSG-3800EX. Figure 2-20 illustrates the TSG-3800E and TSG-3800EX inter-shelf connections.

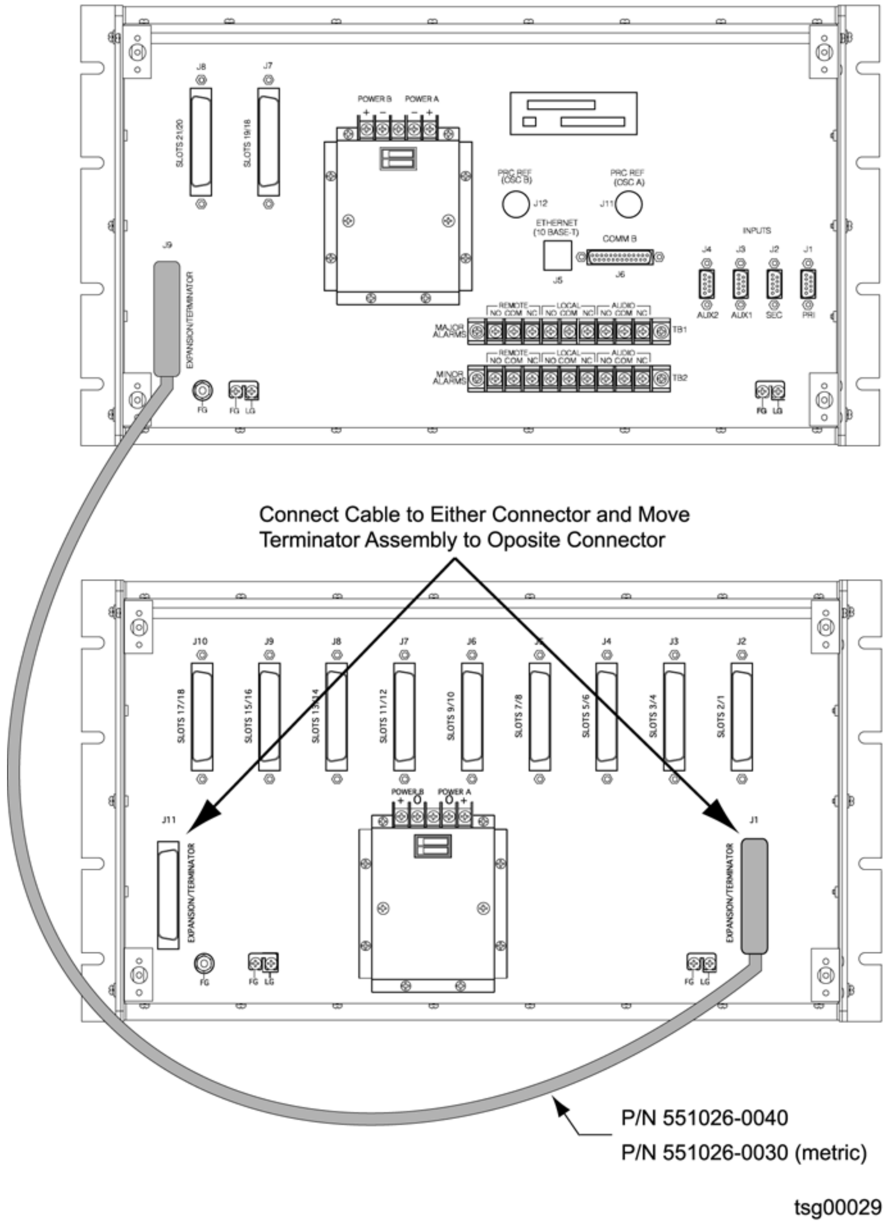


Figure 2-20. EMC Expansion Shelf Inter-shelf Connection

Terminating the Bus Connector

If you are using only one expansion shelf, insert the Bus Termination PCB Assembly (item number 10376838-000-0) into connector J11 on 19-inch Expansion Shelf, or J13 on 23-inch Expansion shelf. If you are using two expansion shelves, insert the Bus Termination PCB into J11 on 19-inch shelf, J13 on 23-inch shelf of the second expansion shelf.

J9 of 19-inch or J11 of 23-inch (Main Shelf) to J1 (Expansion Shelf) pin connections are 1 to 1 as are J11 on 19-inch or J13 on 23-inch (Expansion Shelf #1) to J1 (Expansion Shelf #2). Refer to Table 2-10 for pin assignments. All unlisted pins are ground connections.

Table 2-10. Pinout for Inter-Shelf Connection

Pin	Function	Description
2	AIF	Ch A Input Fault
4	BIF	Ch B Input Fault
6	OF	Output Fault
8	A/NB	Ch A/Ch B Enabled
12	D4PB	DS1 Ch B Positive
14	D4NB	DS1 Ch B Negative
18	CCPB	Comp Clock Ch B Positive
20	CCNB	Comp Clock Ch B Negative
24	D4PA	DS1 Ch A Positive
26	D4NA	DS1 Ch A Negative
30	CCPA	Comp Clk Ch A Positive
32	CCNA	Comp Clk Ch A Negative
36	CLK1	Clock 1 ‘B’ Signal
38	CLK1	Clock 1 ‘A’ Signal
42	CKFB	Clock Fault ‘B’ Signal
44	CLK2	Clock 2 ‘B’ Signal
46	CLK2	Clock 2 ‘A’ Signal
48	CKFA	Clock Fault ‘A’ Signal
50	FAULT CLR	Fault Clearing Line

Note: All unlisted pins are ground connections

Shelf Alarms

Alarm relays are on the rear of the TSG-3800 Main shelf. Faults that occur on a module in an expansion shelf are routed back to the CPU module located in the TSG-3800 Main shelf.

Making Output Signal Connections

The output signals are available at the 50-contact connectors, J2 through J10, on a 19-inch rear panel and J2 through J12 on a 23-inch rear panel. Tip and ring contact pairs are on opposite contacts (Ring = 1-20 and Tip = 26-45). Contacts 21 through 25 and 46 through 50 are shield grounds. Refer to Chapter 7, Output Modules, for additional connection details for the specific Output modules being used.

Installing Modules

The first three slots in the TSG-3800X, starting from the left, must be covered with blank filler panels (item number 10977120-000-0). Insert Output modules starting with the fourth slot, in matched pairs. Therefore, slots 4 and 5 must contain identical Output modules, slots 6 and 7 must contain identical Output modules, slots 8 and 9 must contain identical Output modules, and so forth. To properly install these modules, refer to Installing Modules, on page 63.

Input/Output Adapter Panels

A variety of connector panels are available to adapt the 50-pin input/output (I/O) connectors on the TSG-3800 series shelves to individual wire-wrap or balun connectors for attaching to the customer’s system.

Note: Distribution panels can be located at various distances from the shelf depending on the type of output signal being used. See Table 2-11 for signal type and the maximum cable length you can use when installing distribution panels.

Table 2-11. Distribution Signal Maximum Cable Length

Output Signal	Maximum Cable Length
T1	655 feet
E1	655 feet
CC	1500 feet
RS-422	150 feet

The input signal connections to the TSG-3800 shelves are grouped by input card slots; you make connections through seven position wire-wrap terminals. Output signals and the TIM I/O signals are accessible on female 50-pin connectors on the rear panel of the units. Each redundant pair of output modules uses 20 pairs (tip & ring) of pins; the remaining 10 pins are common shield connections. The TIM I/O connections are on four pairs of the 50 pins for East and West input and output. Selection of the proper wire-wrap panel and interconnecting cables depends on the installation configuration and customer preferences.

The 19-inch and 23-inch Output Panels developed for use with the TSG-3800 series are shown in Figure 2-21.

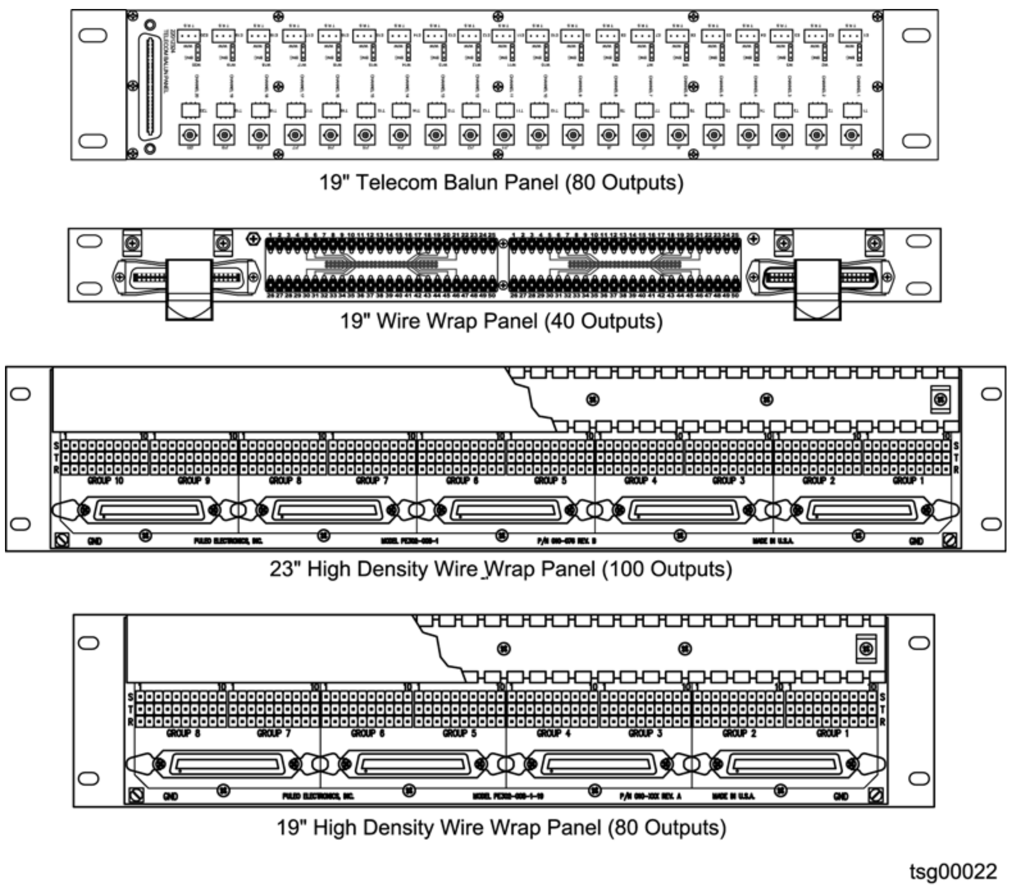


Figure 2-21.   19- and 23-Inch Output Panels

Installing the Panels

No power connections are required to install the wire-wrap panel assembly.

The 23-inch panel occupies 4.25 inches (108 mm) of vertical equipment rack space. Attach the 4.25 × 23-inch (108 mm × 584.2 mm) panel to a 23-inch equipment rack with four screws, two screws on each side.

Mount the panel in the equipment rack by performing the following steps.

1. Position the panel against the equipment rack directly above the associated tie bar. The cable tie bar and panel requires three rack units (3RU). One rack unit equals 1.75 inches (4.45 cm).

2. Attach the panel to the equipment rack with four screws and associated hardware. Ensure that the screws mate with the equipment rack into which you install the panel.

After installing the panel, secure and protect the cables on the panel. Follow the instructions below, and use the cable support bar, item number 00112914-000-1, and the appropriate screws.

Making Output Signal Connections

The telecommunication output signal connectors located on the panel, item number 010-076, are arranged in ten groups of pins that cross-connect with as many as five connectors, item number 551026-0032. Each group of pins is divided into two pairs of tip and ring wire connections.

Table 2-12. Input and Output Cross-Connection Signals for Connectors

Groups 2, 4, 6, 8, and 10				Groups 1, 3, 5, 7, and 9			
Tip	**Pin**	**Ring**	**Pin**	**Tip**	**Pin**	**Ring**	**Pin**
T1	26	R1	1	T1	36	R1	11
T2	27	R2	2	T2	37	R2	12
T3	28	R3	3	T3	38	R3	13
T4	29	R4	4	T4	39	R4	14
T5	30	R5	5	T5	40	R5	15
T6	31	R6	6	T6	41	R6	16
T7	32	R7	7	T7	42	R7	17
T8	33	R8	8	T8	43	R8	18
T9	34	R9	9	T9	44	R9	19
T10	35	R10	10	T10	45	R10	20

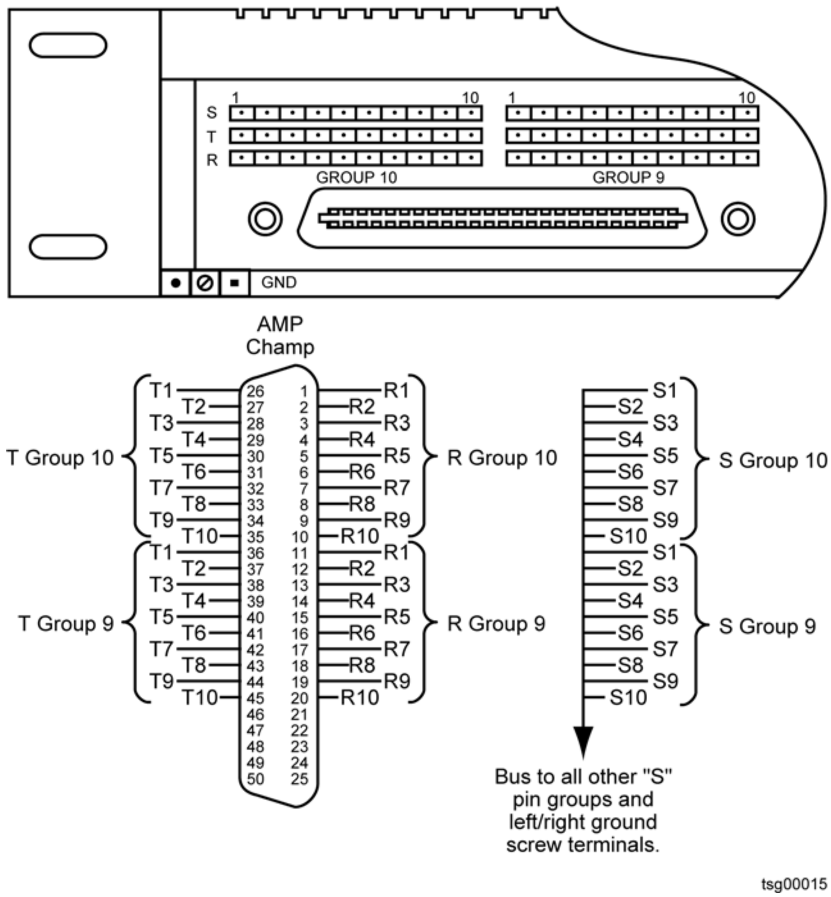


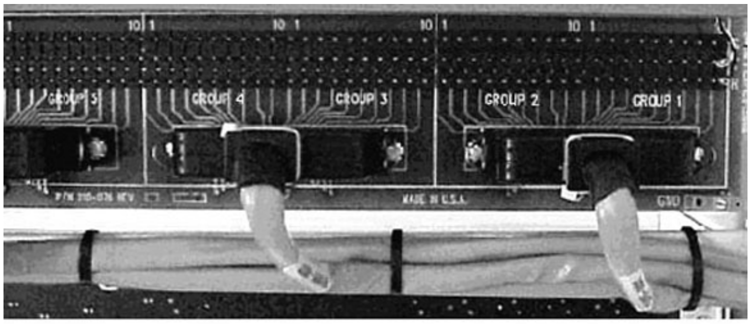
Figure 2-22.   Channel Output Signals for Panel and Connectors

Installing the Cable Support Bar

After installing the panel, secure and protect the cables on the panel. Perform the following steps and use the supplied cable support bar (item number 00112914-000-1) and all necessary screws to install the cable support bar on the equipment rack. Figure 2-23 shows a completed installation.

1. Align the holes in the bar with the holes on the equipment rack located immediately above the unit or resident panel.

2. Fasten the bar to the side of the equipment rack using the screws and lock washers provided.

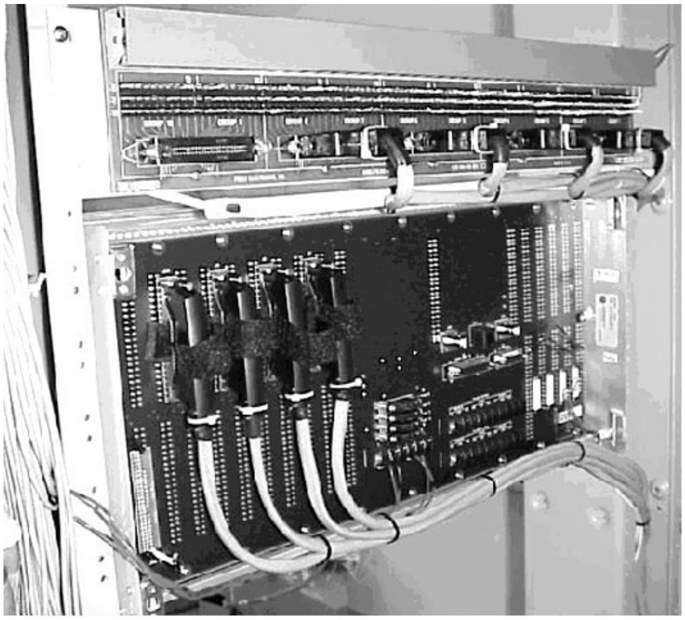


tsg00016

Figure 2-23. Cable Support Bar Detail

Routing Cables

Use all five cable connections to connect cables from the panel assembly to the expansion shelf. Use only the four cable connections to connect from the panel assembly to the main shelf. Figure 2-24 is an example of installed cables from the panel assembly that are tied to the cable bar.



tsg00017

Figure 2-24. Installed Cables from the Panel Assembly

Connecting Client Equipment to the Wire Wrap Panel

When connecting client equipment, follow these guidelines.

- Eliminate cross-talk by keeping wire pairs twisted.
- Use the grounding scheme approved for the installation.
- Symmetricom recommends that you follow all local operating practices when connecting wires and client equipment.

Chapter 3 Operating the TSG-3800

The TSG-3800 family of timing signal generators is controlled primarily by software command. This chapter provides detailed information and procedures that help you to provision the operating parameters of the TSG-3800 to meet specific requirements.

Note: To download and install new system software, refer to Installing New System Software, on page 321.

In This Chapter:

- Communications Settings
- User List and Access Levels
- Selecting the Input Reference Signal
- Setting Up Input Reference Controls
- Viewing Alarm Conditions
- Provisioning the Clock Modules
- System Commands
- Default Parameter Values

Communications Settings

TSG-3800 operation is automatic. Once you provision the operating parameters, the unit provides outputs. If you change parameter values, or if an event such as an input failure occurs, the changes are recorded in an event log. In addition, alarms are provided to make the operator aware of any fault conditions.

Operating limits are preset to factory default values when shipped, but can be changed by the operator through software control. See Default Parameter Values, on page 108, for a complete listing of default values. The new settings reside in non-volatile memory until changed again, or until you reset them to factory-default or user-default levels.

Note: You can save the current configuration as user-defined defaults. The user-defined defaults are stored in battery- backed RAM, and are separate from the factory defaults and operating defaults.

Individual modules contain front panel indicators and monitor connectors. Refer to the appropriate chapters in this guide for a complete description of each module.

There are two EIA-232 communication ports available: COMM A is located on the CPU module, COMM B is located on the rear panel of the shelf. An optional 10BaseT Ethernet port is also located on the rear panel. These ports allow data transfer between the TSG-3800 and a terminal. Each port can be configured independently. Refer to EIA-232 Communications, on page 59, for details on making connections to the ports.

The default EIA-232 communication settings are 9600 baud, no parity, 8 data bits, 1 stop bit, echo on, ASCII mode, and handshaking disabled. To change these settings, connect a terminal device using this protocol. The ports are set to DTE, allowing direct cables to connect to IBM compatible PCs. To change these settings, see Section 9.4.1, Provisioning EIA-232 Parameters, on page 298.

Ethernet Settings

The TL1 mode allows two sessions on port 4000, Passthru mode allows one session on port 4200, and a telnet session allows four sessions on port 23. However, you must have an Ethernet connection and set up the Internet Protocol settings (IP address, gateway address, and the subnet mask) through an EIA-232 port before using any of these modes. The networking parameters must be set before network communication is possible. The IP address is the unique address for the device. The gateway address is the default gateway address. This allows the unit to access other networks. The subnet mask is the mask for the network class.

To change the Ethernet settings, see Setting Ethernet Parameters, on page 318. Once the settings are complete, you can use a terminal emulation program to telnet into the IP address and log in using a user name and password.

Setting Time and Date

Set the time and date using the terminal equipment. If you do not set the time, the TSG-3800 defaults to a known time. To change the date and time settings, see Setting the Time and Date, on page 319.

User List and Access Levels

The TSG-3800 software provides for four levels of users:

- Administrator or System (Level 4)
- Supervisor (Level 3)
- Technician (Level 2)
- User (Level 1)

Each level provides a different amount of access to and control of the unit. Logging in at the Administrator level allows you to assign user levels and passwords to people who need access to the unit. The TSG-3800 stores this list of users and their passwords in non-volatile memory. You can also modify the user list and execute all commands, including commands that affect system performance, for instance, clock operating mode. The Supervisor level allows you to execute all commands except for saving the user configuration. The Technician level allows you to perform basic configuration commands. The User level only allows execution of non-critical commands.

If you do not define a user list, the TSG-3800 accepts all commands from anyone who connects to the unit.

For information and procedures on managing the user list in the TSG-3800, refer to Setting Up User Accounts, on page 312.

Logging In

Logging in to the TSG-3800 is only required when a system administrator has added users to the system. Initially, to add users you must physically connect to the TSG-3800. Refer to EIA-232 Communications, on page 59, for details on making connections to the ports. Once a connection is established, a user must log in to access the system. To log in at the system prompt:

1. Type `«username»` then press **Enter**. A prompt appears asking for the password.

2. Type `«password»` then press **Enter**. The system prompt appears. You can enter commands at the system prompt.

Logging Out

The TSG-3800 automatically disconnects and logs you out if you do not enter a command within the "timeout" period. The default timeout period is five minutes. After this period, you must log in again.

To stay logged in without issuing a command, press **Enter** periodically.

To disable automatic logout, type:

`DISABLE LOGOFF A|B` then press **Enter**

To log out manually, type:

`BYE` then press **Enter**

Selecting the Input Reference Signal

The TSG-3800 Main shelf provides slots for four Input modules, and it supports up to 12 separate input reference signals. After you connect the input signals (described in Making Input Signal Connections, on page 54), you must provision the shelf for selecting the signal to be used. This section describes the parameters you use to select the input signal; Setting Up Input Reference Controls, on page 87, describes how to provision the input signal.

There are several software-settable parameters that affect the selection of the input signal to be used as the TSG-3800 reference. These include input signal fault thresholds, frequency and MTIE limits, priority assignments, and synchronous status message (SSM) settings. The reference selection can be done by priority, SSM, or by selection of the *best* input. Software settings also allow for revertive or non-revertive selection, or manual selection only.

When changing input references, the phase is always reset to zero in software, and tracking proceeds with the new reference. The TSG-3800 does not follow phase differences between input signals as this would cause transient frequency excursions. Phase build-out will not create frequency or MTIE alarms, and will not affect the output signals.

Input Signal Faults

The input signal and measurement data is checked for errors each second. If no errors are found, the input is considered valid and may be selected as the reference input. Loss of Signal (LOS), Alarm Indication Signal (AIS), Bi-Polar Violations (BPV), Cyclic Redundancy Check (CRC) errors, and Out of Frame (OOF) occurrences can be used to disqualify an input signal for use as a reference. Timers are used for each of these occurrences, where the number of seconds before an input fails and for the number of error-free seconds required before the input is qualified. Table 3-6 lists the timer ranges and default values for input errors, as well as the default alarm condition.

When the error timer is exceeded, the fault condition can be set to FAIL the input, generate an ALARM but not FAIL the input, REPORT the condition only, or IGNORE the condition. LOS and AIS are set to FAIL, and BPV, OOF, and CRC are set to ALARM by default.

Detecting Input Errors, on page 330, describes how to display and to set the timer ranges and the alarm conditions for each of the input signal errors.

Maximum Time Interval Errors (MTIE) and Frequency errors may also cause input signal faults when exceeding the set thresholds, set in nanoseconds. There are two limits, L1 and L2, for each condition at 100, 1000, and 10000 Second time periods which may be set to the FAIL, ALARM, REPORT, or IGNORE mode. When a FAIL limit has been exceeded on an input, it is no longer valid for use as a reference signal. Limit (L1) for both, MTIE and FREQ, is set to FAIL and Limit 2 (L2) is set to ALARM by default. Setting these limits too small may cause all inputs to fail, placing the unit in Holdover mode.

Provisioning MTIE and Frequency Parameters, on page 334, describes how to display and to set the alarm limits for MTIE and FREQ errors.

Priority Level

The TSG-3800 never selects a failed input as a reference. The provisioned Priority level assigned to each input port controls selection of valid input signals. The assigned priority ranges from 1 (highest) to 4 (lowest), or 0 for monitor only. The priorities default to the module slot number for port 1, with ports 2 and 3 of the 3-Port modules set to Monitor. A module port may also be disabled so that no alarms or events are reported for that input and no data is collected. An input set to Monitor continues to collect and store data, generate alarms or reports (depending on fault setting), but it cannot be selected as a reference signal.

A set threshold of zero in both the MTIE and Frequency limit settings disables the alarm limit (sets it to ignore).

For information on the syntax for provisioning the Priority level, refer to Input Command, on page 350.

Synchronization Status Messages

Synchronization Status Message (SSM) provisioning is a dual purpose setting. When using the Automatic SSM Mode setting on the inputs, it may be used indicate the SSM quality level for signals that are SSM-capable. This setting may also be used in conjunction with the *SSM Alarm Mode* parameter to indicate that the received SSM is below this provisioned SSM. When using the Provisioned SSM Mode, the Input SSM is set to Stratum Unknown (STU) or default. The input ports default to STU Provisioned SSM. You can provision the input to be ST1 (stratum 1 or PRS), STU, ST2 (stratum 2) or ST3 (stratum 3); this assigns a minimum level for that input port, which can be used to inform the user that the received SSM is below this level.

For inputs that are not receiving SSMs, the provisioned SSM may be transmitted by the TSG-3800 if the input is selected as the reference. The action taken by this event is user defined to IGNORE, REPORT, ALARM (set minor alarm) or FAIL (invalid input). The provisioned level may also be used when input signals do not have received SSM to pass to SSM to provide the output SSM when that input is selected as reference.

Table 3-1 contains the accepted T1 and E1 standard SSM definitions.

Table 3-1. Standard SSM Definitions

SSM Description	SQL	T1	E1	Abbreviation
Stratum 1	1	$04	$2	PRS
Traceability Unknown	2	$08	$0	STU
Stratum 2	3	$0C	$4	ST2
Stratum 3	4	$10	$8	ST3
Sonet Minimum Clock	5	$22		SMC
Stratum 4	6	$28		ST4
Don't Use For Sync	7	$30	$F	DUS
Reserved	UA	$40		RES

SSMs and Input Modules

Certain Input modules can read received SSM which provides a Sync Quality Level (SQL) indication for the signal. You may provision an SSM for each port and set the fault condition to IGNORE, REPORT, ALARM, or FAIL if the received SSM is below the provisioned value. The input signal is checked each second for a valid SSM, and if none is received in the last second the module provides the provisioned value. The operator may also set the port to disregard the received SSM and always output the provisioned SQL. The SQL received or provisioned is passed to the frame generators for determining the output SSM when in Locked mode. If inputs are not receiving SSMs and are provisioned below the selected clock's stratum level, the clock enters holdover.

SSMs and Clock and Frame Generator Modules

The Clock modules compare their holdover SQLs to the reference SQL. If the clock SQL is better than the reference SQL, the clock enters holdover. If the reference SQL is equal to or better than the clock SQL, the clock operates normally.

When an input has been provisioned to *SSMs On* or *SSM Mode Auto*, the TSG-3800 determines if a received SSM is a valid SQL. The TSG-3800 interprets the SQLs listed in the SQL table (Table 3-1); any other SSM is considered unrecognized. According to GR-378, if an input has been receiving a valid SSM and then receives an invalid SSM, the input fails. When a valid SSM is received and re-qualified, the fault automatically clears. However, if the SSM remains invalid and the signal is ESF or E1, the operator can clear the alarm using the "Input #.# SSM Mode Auto" command.

The Frame Generators take the input SQL from the reference input and convert it to the appropriate SSM for output. The operator may override this by placing the framer in manual mode and then entering the output SSM directly (both T1 and E1). If the Clock module associated with the Frame Generator is in holdover, the Frame Generator outputs the clock's holdover SQL. With the *bypass* Frame Generator (PN 23478486-000-0) and backplane, when both clocks are in warmup or have failed and the SSM is set to STU, the signal from input 1.1 or 2.1.1 can be used to generate the output.

If the received T1 SSM does not have an E1 match, the E1 Frame Generator outputs the Stratum Unknown (STU) message. The operator should be able to provision the input to PRS, STU, ST2, and ST3.

Selecting the Reference Selection Mode

The TSG-3800 can choose input references using one of three modes:

- **Priority** – bases the reference selection on the port's provisioned priority. Secondary criteria is the SSM information.
- **SSM** – bases the reference selection on received or provisioned SSM, then priority and position.
- **Best** – bases the reference selection on the weight derived from the input stability calculations. Secondary criteria are the priority and SSM information.

Priority Mode

In Priority Mode, the provisioned Priority is the first criteria when selecting a reference.The selection order is as follows:

- Priority
- SQL
- Position

The primary selection criteria is the input signal priority level described in Priority Level, on page 83. The system selects the highest priority level (1-4). The selection order proceeds from highest priority to lowest priority. When two or more input signals have identical priority levels and the levels are the highest priority setting, the system uses the signal with the highest Synchronous Quality Level (SQL). SQL is the hierarchy the TSG-3800 assigns to the SSMs (provisioned or received). If the SQL is the same for all input signals, then the Input module in the lowest slot number (increases from left to right in the shelf) is used. If a three-input Input module is installed, then the lowest valid input channel is used.

If no input is error-free, the input with the least severe errors (but not failed) is selected. If no input signal is valid, then no input will be selected and the TSG-3800 switches to Holdover mode operation.

Setting the Input Reference Selection Mode, on page 327, describes how to set the priority mode of operation. The syntax for setting the priority for an input is described in Input Command, on page 350.

SSM Mode

In SSM mode, the input SQL is the first criteria when selecting a reference.The selection order is as follows:

- SQL
- Priority
- Position

The SQL comes from the SSM in the input signal or from the provisioned value. If the Clock SQL is higher than the input SQL, then the input will be passed over when selecting the reference. Otherwise, the SQL is used only to distinguish between references with the same priority.

Setting the Input Reference Selection Mode, on page 327, describes how to set the priority mode of operation. The syntax for setting the SQL for an input is described in SSMs and Input Modules, on page 84.

Best Mode

In the Best mode, the TSG-3800 uses Input priority, SQL, input stability, and position to automatically determine the best input signal as the reference signal. Input stability refers to measuring input signal noise and choosing the best input signal based on this noise measurement (the best signal has the least noise). To prevent excessive reference input switching, which is caused by changes in input signal noise levels, the software uses 20 percent hysteresis, or lagging. This means an input signal must have the least noise for a certain amount of time before it is used as the reference signal. All signal characteristics are weighted and the input with the highest weighted average is selected as the input reference.

Operating in Revertive, Non-Revertive, or Manual Mode

When the Auto Return mode is set to the default mode of ON, the reference automatically reverts to the highest selectable input available for the assigned provision or mode of operation at all times. Therefore, when a failed input of higher priority than the current selection is restored to a valid state, it is immediately reselected as the reference input. For example, if the preferred signal fails, the system switches to the second in priority. When the preferred signal becomes good again, the selected input switches back to the preferred signal immediately.

With Auto Return set to OFF, the current reference selection remains selected until it fails by some fault condition. In Best or SSM mode, this option has no effect and the highest quality input is always selected. For example, if the preferred signal fails, the system switches to the second in priority. When the preferred signal becomes good again, the selected input does not switch back until another input is of better quality than the current input.

When the Auto Switch option (default ON) is set to OFF, then selection is done manually only, and a fault on the selected input will cause a switch of Clock operating mode to Holdover. When using manual selection of the reference, Auto Return mode should be OFF to force the unit to remain on the selected input.

Setting Up Input Reference Controls

You can control the input reference signals using the following:

- Selection of the input reference in use
- Enabling or inhibiting automatic switching of references
- Enabling or inhibiting automatic return to a higher-priority input
- Selecting Input Reference Selection Mode
- Assigning fault modes for violation of operating limits
- Setting the number of faulted time intervals necessary to cause an alarm

- Setting the number of time intervals, without incident, necessary to clear an alarm
- Setting two limits for MTIE
- Setting two limits for frequency offset

On T1 or E1 X-Port modules:

- Set termination
- Set framing type
- Set zero suppression
- Set CRC
- Set SSM mode

Setting the Input Reference Selection Mode

The TSG-3800 can choose input references using one of three modes: Priority, SSM, and Best. Priority mode bases the reference selection on the port's provisioned priority; secondary criteria is the SSM information. SSM mode selects the reference based first on received or provisioned SSM, then on priority and position. Best mode selects the reference based on a weighting derived from the input stability calculations; secondary criteria are the priority and SSM information. Refer to Selecting the Reference Selection Mode, on page 85, for a discussion of reference selection modes.

Verifying the Input Reference

The TSG-3800 automatically selects the input reference signal. Upon failure of the input reference, the TSG-3800 selects the highest priority valid input providing that AUTOSWITCH is on.

To verify the reference in use, check which Input module has its REF indicator illuminated, or connect to the TSG-3800 and type:

`REFERENCE` and press **Enter**.

The following message appears:

```
->REFERENCE
The Current Reference is «input»
->
```

Manually Selecting the Reference

To select a channel as the input reference:

1. Connect to the TSG-3800 and described in Logging In, on page 81.

2. Ensure that **AUTORETURN** is off, This prevents the TSG-3800 from automatically switching back to a higher priority input channel. (To check the autoreturn state, type `INPUT AR` and press **Enter**.)

3. Type `REFERENCE «input»` and press **Enter**. Note that the REF indicator on the selected Input module illuminates.

Example

Purpose: Select the secondary input as reference.

Command: `REFERENCE INP2.1`

Display:

```
->REFERENCE INP2.1
«date» «time» «oper» set Input Reference to «input», was
«input»
+>
```

Detecting Input Errors

The TSG-3800 checks the incoming reference signals for eight types of signal faults. The faults are: AIS (alarm indication signal), BPV (bipolar violation), CRC (cyclic redundancy check), LOS (loss of signal), and OOF (out of frame), SSM (Synchronization Status Message), MTIE (Maximum Time Interval Error) Limits, and Frequency Limits.

Note: These faults are not characteristics for all types of input signals; for example, a sinusoidal input does not contain BPVs. Refer to Chapter 5, Input Modules.

For each input fault, you may:

- Assign a fault mode
- Specify a timer limit for each fault (the timer limit is the number of 1-second time intervals containing one or more errors, within the last hour)
- Specify the number of consecutive error-free 1-second intervals required for clearing the fault
- Reset the fault and clear counts

Note: Fault limits and modes are independent for each Input module and may be set differently.

You use the Input command to display and set the fault limits for the input signal; the command syntax is described in Input Command, on page 350.

Displaying Input Signal Fault Limits

To display the Input Signal fault mode assignment, error count, and clear count, type:

`INPUT {input} AIS|BPV|CRC|LOS|OOF` and press **Enter**.

A typical display shows:

```
TSG->INPUT LOS

 Module     Err Cnt    Clr Cnt    Err Lmt    Clr Lmt   Mode
 Inp1.1     14         0          10         2         Fail
 Inp2.1     0          57         10         2         Fail
 Inp3.1     0          33         10         2         Fail
 Inp4.1     0          57         10         2         Fail
 TSG->
```

LMT is the current value of the 1-second alarm thresholds. **MODE** is the current fault mode. INP1.1 through INP4.1 list the current 1-second error and clear count for each channel.

Assigning Input Fault Modes

The operator can assign an individual fault mode for each type of signal fault. Fault modes are: Fail, Alarm, Report, Ignore. Refer to Viewing Alarm Conditions, on page 94, for explanations.

Displaying Phase Measurements

The TSG-3800 measures the phase between each input and each clock. You can display:

- The most recent phase measurement for all inputs
- Up to the last one hundred 1-second interval phase readings between the clocks and a specified input
- Up to the last one thousand 100-second average phase readings (27 hours) between the clocks and a specified input

Phase data can indicate the general health of equipment and can be used for troubleshooting. For instance:

- Phase history can provide a general indication of whether or not clocks are following the input reference.
- Comparing phase history with clock control value history to isolate clock and input alarms.
- Phase data continuously ascending and descending indicates frequency offset. Phase data oscillation up and down indicates excessive network wander.

The display readings are in nanoseconds (chronological).

To display the most recent phase measurements for all inputs, type:

`PHASE` then press **Enter**

For more information, refer to Phase Command, on page 353.

Provisioning MTIE and Frequency Alarms

The TSG-3800 measures the Frequency offset and Maximum Time Interval Error (MTIE) between each input and the clock in use. MTIE limits are expressed in 10^{-9} s or nanoseconds. Frequency limits are expressed in 10^{-12} s/s or picoseconds/second. When an input exceeds a user-specified threshold, the instrument responds in a user-defined manner.

The operator can specify two fault threshold limits (designated as L1 and L2) and fault modes (Fail, Alarm, Report, and Ignore) for MTIE and frequency offsets. This allows one threshold to serve as an early warning of failure and the second to serve as a failure indicator. You can specify different fault thresholds and limits to each input port. There are three pre-defined L1 and L2 fault threshold limits for MTIE and Frequency: PRS, OCN, and MCD (see Input Command, on page 350). Table 3-2 shows the pre-defined MTIE settings for PRS, OCN, and MCD and Table 3-3 shows the pre-defined Frequency settings for PRS, OCN, and MCD.

Table 3-2. MTIE Pre-defined Settings

Configuration	Time Scale	Limit 1 (Fail)	Limit 2 (Alarm)
PRS	T100	270	216
	T1000	540	432
	T10000	1080	864
OCN (Factory Default Setting)	T100	324	270
	T1000	648	540
	T10000	1296	1080

Table 3-2. MTIE Pre-defined Settings (Continued)

Configuration	Time Scale	Limit 1 (Fail)	Limit 2 (Alarm)
MCD	T100	432	324
	T1000	864	648
	T10000	1728	1296

Table 3-3. Frequency Pre-defined Settings

Configuration	Time Scale	Limit 1 (Fail)	Limit 2 (Alarm)
PRS	T100	5000	2000
	T1000	500	200
	T10000	50	20
OCN (Factory Default Setting)	T100	5000	2000
	T1000	750	300
	T10000	60	30
MCD	T100	8000	4000
	T1000	800	400
	T10000	80	40

For Frequency and MTIE measurements, you can set a threshold and fault mode for each of three intervals (100, 1000, or 10000 seconds). If you do not define these limits, they remain at the default values; see Default Parameter Values, on page 108. The MTIE and Frequency command syntax is described in MTIE Command, on page 352, and Frequency Command, on page 348.

For example, you can assign a REPORT fault mode for a fractional frequency offset exceeding 1 x $10E^{-8}$ and a FAIL fault mode for an offset exceeding 1 x $10E^{-7}$. You can specify an offset threshold for each time scale (T100, T1000, or T10000) for both limits.

Note: IGNORE or ALARM fault modes are the other settings for L1 and L2. For consistency, use L1 for the more extreme limit and fault mode.

MTIE errors cause an immediate alarm and error message. The error message displays the time and date of the alarm, the MTIE measurement, and the relevant time interval.

Note: Recalling a list of the MTIE measurements may not show the actual reading that exceeds the limit. To see current MTIE data, enter *STATUS* or *MTIE*. Specifying a number on MTIE commands displays stored, completed data.

Monitoring Input Signal Performance

Two commands are available to provide additional input signal performance information. These are the MTIE command with start and stop times and the TDEV command. The start and stop times specify the observation period for the measurement. These commands provide information collected by the Input modules and passed on through the CPU module on request from the user. This information has no effect on system operation, but is provided for signal monitoring only. These commands provide signal stability information in addition to the phase, frequency, and current MTIE data previously described. They are primarily provided for performance monitoring systems that will give graphs of input signal performance. For more information, see MTIE Command, on page 352 and TDEV Command, on page 356.

Monitoring MTIE

To retrieve the MTIE data for an input signal over a selected time period, type:

`MTIE {input} [MM/DD/YY] [HH:MM:SS]` then press **Enter**

The first line of the response gives the ACTUAL start and stop date and times used in the calculation. These may vary from the requested times depending on the actual data available in the module. The response gives the MTIE in nanoseconds for the time intervals listed. The time intervals listed range from 0.05 to 10,000 seconds, with the highest determined by the observation time period covered by the command or the available data.

Monitoring TDEV

To retrieve the TDEV data for an input signal over a selected time period, type:

`TDEV {input} [MM/DD/YY] [HH:MM:SS]` then press **Enter**.

The response is multiple lines of output giving the data available for the time period specified.

The first line of the response gives the ACTUAL start and stop *date and times* used in the calculation. These may vary from the requested times depending on the actual data available in the module. The lines following give the TDEV in nanoseconds for the time intervals listed. The time intervals listed range from 0.05 to 1000 seconds, with the highest determined by the observation time period covered by the command or the available data. TDEV calculations for time intervals up to one third of the observation period are provided. However, some standards indicate that an observation period of at least 12 intervals should be used for the highest accuracy.

Viewing Alarm Conditions

The TSG-3800 reports three types of alarms: Critical, Major and Minor. A Critical alarm signifies that the output reference is invalid, or the Output modules have no clock source. A Critical alarm activates the major alarm relays and turns on the indicator. A Major alarm signifies that the output signals are not synchronized to an input. A Minor alarm signifies a condition that is not fatal to synchronization, but could lead to more significant problems. Both Major and Minor alarms contain relay contacts for Local, Remote, and Audio alarms. When an alarm condition arises, the CPU module activates corresponding contacts (on the rear panel of the shelf).

An ALARM CUT-OFF switch is available for turning off the Audio alarms. This switch is on the front panel of the CPU module. The ALARM CLEAR command (Resetting Alarms, on page 105) turns off the Major, Minor and Audio alarm contacts.

Alarm messages are available through the EIA-232 port. The EIA-232 port accepts commands for changing some fault limits. See Alarm Command, on page 341.

Events, Fault Thresholds, Faults, and Fault Modes

An event is an occurrence of a changed condition within the TSG-3800. This *change in condition* can be a lost signal (for instance LOS), or instrument related, for example, module failure. When the magnitude or number of errors surpass a specific threshold (default or operator settable), a fault condition exists.

A fault mode defines the action that the TSG-3800 takes with the occurrence of a fault. The operator can assign any of four fault modes to the individual input signal characteristics of any Input module: Frequency, MTIE, AIS, BPV, CRC, LOS, SSM and OOF. The operator can also define a threshold for causing a fault. For AIS, BPV, CRC, LOS, OOF, Frequency, and MTIE, a separate threshold for clearing the fault can be set.

Table 3-4 shows the relationship between fault modes and TSG-3800 action followed by a description of each mode.

Table 3-4. Fault Mode Responses and Actions

Mode	Fail the Input and Switch References	Set Alarm Relay and Illuminate Indicators	Report on EIA-232 Ports
FAIL	YES	YES	YES
Input reference is automatically rejected. The TSG-3800 switches to another input or into Holdover. Causes a minor alarm when exceeding the operator-set threshold if another valid reference is available. If no valid reference is available, the TSG-3800 causes a major alarm and places the clock(s) into Holdover. A failed input is automatically reported over the EIA-232 port. In a ST2E/ST3E TSG-3800 configuration, if the Stratum 2E clock enters Holdover, the ST3E clock is also placed in Holdover Mode.			
ALARM	NO	YES	YES
Causes a minor alarm when exceeding operator-set threshold and is reported over the EIA-232 port. Input reference or module is not automatically rejected.			
REPORT	NO	NO	YES
Reports the event to the EIA-232 ports, without alarming, when exceeding operator-set threshold.			
IGNORE	NO	NO	NO
Disables switching and alarming. Does not report to the EIA-232 ports.			

Operating in Failure Mode

In the event of a module failure, the TSG-3800 provides continuous operation through multiple levels of redundancy and multiple switching.

Input Module Failure

If an Input module fails, an alternate input is selected if available. If an alternate input is not available, the CPU module places the unit in the Holdover mode of operation until a reference input has been restored to service. Entry and exit from Holdover mode is done through processor control of the Clock modules such that no significant phase steps or frequency changes occur.

CPU Module Failure

If the CPU module fails or is removed for service, the Clock modules automatically switch to Holdover Mode, as described in Holdover Mode, on page 97.

Clock Module or Frame Generator Failure

The TSG-3800 uses Clock modules and Frame Generator modules in pairs: Clock A works with Frame Generator A and Clock B works with Frame Generator B. If the selected Clock Module or Frame Generator module fails, the alternate Clock/Frame Generator module pair is selected for use by the Output modules.

Output Module Failure

If there is a failure in any of the Output modules, the redundant module continues to provide outputs on a one-for-one basis if redundant output strategy is configures for the TSG-3800.

Provisioning the Clock Modules

This section describes the operating modes of the Clock module, and then describes how the operator can provision the following parameters on the Clock modules:

- Operating mode
- Automatic return to a higher-stratum clock
- Loop Time Constant
- Control Value

You can also enable and disable Clock and Frame Generator modules. Use the command syntax described in Clock Command, on page 342.

Clock Operating Modes

After start-up, each Clock module automatically sequences through three operating modes: Warm-Up, Acquire and Locked. A fourth operating mode, Holdover, is not part of the cycle unless a valid input signal is not available. All modes may be entered at user request. The following sections describe the operating modes.

Warm-Up Mode

Warm-up Mode starts when power is applied to the shelf. The warm-up period varies from 15 minutes to one hour, depending on the type of Clock module installed. The warmup period is 15 minutes for ST2 Rb modules, 30 minutes for ST3E modules and 60 minutes for ST2 modules.

Acquire Mode

After the oscillator warms up, the TSG-3800 phase-locks the Clock module to the most acceptable valid input reference signal. The system uses the following three criteria to determine this signal:

- Frequency stability
- Clock noise
- Phase offset

The TSG-3800 starts with a fast time constant (tau) and gradually increases it toward an operator-selected or default value once the phase error has stabilized near zero. Once the frequency stability is less than $1E^{-11}$, the oscillator enters the locked mode.

Locked Mode

In Locked mode, the tau increments until the Clock Module is phase locked and final tau is achieved, which maintains the output frequency with respect to the input reference. The processor continues to measure the phase of each input. It adjusts the control value based on phase changes of the selected reference.

Holdover Mode

When an acceptable input reference is not available, the TSG-3800 automatically enters *Holdover mode*. In Holdover, all outputs continue to be present without interruption, but the TSG-3800 stops updating the control value to the oscillator and uses the average control value of the last 24 hours. Changes in output frequency are now due to aging and environmental variations only.

When the TSG-3800 leaves Holdover, it compares the phase of the Clock modules to the reference. If the two phases agree, the TSG-3800 resumes operation in the phase-locked loop (Locked mode) using the pre-holdover phase setting. If the phase differs significantly (>110 ns), the TSG-3800 enters Acquire mode before returning to Locked mode.

Holdover mode may also be entered into manually. When entered into manually, the Clock module stays in Holdover until the operator changes operating modes.

Provisioning the Operating Mode of the Clock Module

The operator can check the type of Clock modules installed in the shelf, its operating state and loop time constant. To display this information, type:

`CLK` then press **Enter**

A typical display is:

```
TSG->CLK
CLK A, Stratum 2E Rubidium
Status          Mode: Acquire   Tau: 592         Sigma
Reference                                        3.2e-14
CV: -168        %CV: 49.21      Freq Off:        Range:+5.76e
                                3.73e-10         -0 8
WarmUp Time:    Min Tau: 500    Final Tau: 2500  Max Tau:
900                                              10000

Clk B, Stratum 2E DDS
Status: OK      Mode: Acquire   Tau: 423         Sigma:
                                                 8.96e-13
CV: -1510       %CV: 49.38      Freq Off:        Range:
                                3.35e-09         +-8.95e-0
WarmUp Time:    Min Tau: 100    Final Tau: 1500  Max Tau:
1800                                             5000
TSG->
```

Manually Setting the Operating Mode of the Clock Module

You can manually place the Clock Module into any operating mode. Holdover is the only mode that reports whether it was entered into automatically or manually. The terminal displays a message, depending upon the operating state.

To set the clock operating mode manually, type:

`CLOCK A|B MODE WARMUP|ACQUIRE|LOCKED|HOLDOVER` then press **Enter**

Example

Purpose: Change Clock B from Locked to Holdover operating mode.

Command: `CLK B MODE HOLDOVER`

Display:

```
->CLK B MODE HOLDOVER
«date» «time» «oper» put Clk B into Man HO, was Locked
+>
```

Provisioning Automatic Return to a Higher-Stratum Clock

When Auto Return is ON, the TSG-3800 returns to Clock A for output generation when it is of equal or higher operating mode than Clock B. When OFF, the TSG-3800 will stay on Clock B, once selected, until it has been disabled or faulted.

To set the AutoReturn Mode for the Clock module, type:

`CLOCK AR ON|OFF` then press **Enter**

Setting the Clock Module Loop Time Constant (Tau)

The time constant for the clock control loop sets the averaging time used to filter the short-term variations in frequency between the input reference signal and the clock oscillator. The time constant is also known as the Tau of the control loop. It is set to a default value that is best for typical operation, but it can be changed to optimize control in special cases. Increasing the Tau provides more filtering of short-term variations on the reference input, but it delays the response to environmental effects on the oscillator. Decreasing the Tau provides quicker response to changes in either the input or oscillator frequency, but reduces the smoothing effect of the filtering of unwanted changes. The default values are optimized for typical operation of each type of clock oscillator (quartz or Rubidium).

To change the clock control loop time constant, type:

`CLOCK A|B TC {number}` then press **Enter** where `{number}` is:

- 25 to 1000 for Stratum 3E
- 100 to 5000 for Stratum 2 (quartz)
- 500 to 10000 for Stratum 2E (Rubidium)
- MIN for minimum or MAX for maximum loop time constant

Example

Purpose: Set Clock A's time constant to 550.

Command: `CLK A TC 550`

A typical display is:

```
->CLK A TC 550
«date» «time» «oper» Set Clk A Time Constant to 550, was 100
>
```

Note: The TSG-3800 sends an error message asking for a time constant (tau) within the proper range if an invalid number is entered.

Provisioning the Control Value for the Clock Module

The Control Value for the clock control loop is a digital number that is applied to the Direct Digital Synthesizer (DDS) circuit, which sets the clock's output frequency. This number is generated by the clock control loop algorithm and is applied to the Clock module. You can display this number using the CLOCK CV command. You can change this number only when the control loop is in the USER HALT mode. Changes to the Control Value directly affect the output frequency by 2.2 x $10E^{-12}$ per step.

To display the current digital control value of the clock:

`CLOCK A|B CV` then press **Enter**

A typical display is:

```
->CLK CV

The Current Time is «date» «time»
The Control Value for Clk A is -168 (49%)
The Control Value for Clk B is -1558 (49%)
->
```

Note: The digital control value range is dependent on the clock type. The range is defined in GR-1244 as 1.2 x (2 x accuracy + pull-in).

Table 3-5. Maximum Clock Control Value Ranges

Clock Type	Range
Stratum 2E Rubidium	$\pm$ 4 x 10E^{-8}
Stratum 2 Rubidium	5.76 x 10E^{-8}
Stratum 2.0 DDS	8.95 x 10E^{-7}
Stratum 2.1 DDS	8.95 x 10E^{-7}
Stratum 2.0	8.95 x 10E^{-7}
Stratum 2.1	8.95 x 10E^{-7}
Stratum 3E	1.65 x 10E^{-5}

To display the last *n* control value readings for the clocks, type:

`CLOCK A|B CV T1|T100 {number}` then press **Enter**

where `{number}` is the number of readings to display.

Example

Purpose: To display the last three 1-second control voltages.

Command: `CLK CV T1 3`

Display:

```
TSG->CLK CV T1 3
The Control Value for Clk A is 962   (50%)
The Control Value for Clk A is -28   (49%)
The Control Value for Clk A is -1021 (49%)
The Control Value for Clk B is -394 (49%)
The Control Value for Clk B is -394 (49%)
The Control Value for Clk B is -394 (49%)
TSG->
```

Adjusting the Control Value on the Clock Module

You can manually adjust the control value while the Clock module is in Holdover mode. Once the module returns to Acquire or Locked mode, the TSG-3800 immediately reverts to the last control value used before entering Holdover.

To adjust the control value, place the oscillator into **Holdover** (see Manually Setting the Operating Mode of the Clock Module for instructions), and type:

`CLOCK A|B SET {number}` then press **Enter**

where `{number}` is the desired control value.

Example

Purpose: Change Clock A's control value.

Command: `CLK A SET –3000000`

Display:

```
->CLK A SET -3000000
->
```

Displaying the control value (while in Holdover) shows:

```
>CLK CV
The Control Value for CLK A is -3000000 (25%)
The Control Value for Clk B is -799 (49%)
>
```

Enabling and Disabling Clock Modules

The TSG-3800 uses Clock modules and Frame Generator modules in pairs: Clock A works with Frame Generator A and Clock B works with Frame Generator B. Both pairs use separate signal paths with no cross connections. A failure or disabling of one module of a pair removes the other module from the signal path.

Note: Before removing the *selected* Clock module or Frame Generator module, disable the module. This allows a smooth transition of internal reference.

Disabling a Clock module places it into Holdover mode. This prevents you from selecting the Clock/Frame Generator pair. Disabling the Frame Generator also prevents you from selecting the pair, but the Clock module remains in its current state. A blinking FAULT indicator signifies a disabled module.

To disable a module, type:

`DISABLE CLK|FG A|B` then press **Enter**

Example

Purpose: Disable Clock A before removing it.

Command: `DISABLE CLK A`

Display:

```
->DISABLE CLK A
«date» «time» «oper» Disabled Clk A
«date» «time» Clk B selected for output, Stratum 2.1
+>
```

You can only disable one module at a time, and you cannot disable either a Clock or Frame Generator module if the other Frame Generator and Clock pair are not present. If either situation exists when attempting to disable, the following message appears:

```
->DISABLE CLK B
CLK/FG is Already Disabled in Other Pair: Can't Disable
->
```

You must manually enable any disabled module. After enabling a disabled Clock, the Clock enters the Acquire mode.

Note: Removing and re-installing modules, or powering down the shelf also enables a module.

Note: Enabling a module clears all alarms associated with the enabled module. If the fault still exists, the alarm returns.

To enable a module:

`ENABLE CLK|FG A|B` then press **Enter**

Example

Purpose: Enable Clock A.

Command: `ENABLE CLK A`

Display:

```
->ENABLE CLK A
«date» «time» «oper» Enabled Clk A
+>
```

System Commands

Recalling Events

The TSG-3800 time and date stamps each event. A listing of up to the last 500 events is available. Use the syntax described in Enable Command, on page 346.

To display the last event, type:

`EVENT` then press **Enter**

A typical display is:

```
->EVENT
«date» «time» Minor Alarm Active
->
```

Listing Latest Multiple Events

The listing of multiple events starts with the most recent event first.

To list the last *n* events, type:

`EVENT {number}` then press **Enter**.

where `{number}` is between 1 and 500

Example

Purpose: List last five events.

Command: `EVENT 5`

Display:

```
->EVENT 5
«date» «time» «oper» Enabled Clk A
«date» «time» «oper» Set «input» LOS Clear Limit to 2, Was 1
«date» «time» Reference Input Valid
«date» «time» Clk A Entered Locked
«date» «time» «input» LOS Fault Cleared
->
```

Listing Previous Events

To list the last *n* events without displaying the latest previous events, starting *m* events back, type:

`EVENT {m} {number}` then press **Enter**

where:
`{m}` is the number of events before the latest event (this will be the last event displayed)
`{number}` is the number of events to display (between 1 and 500)

Example

Purpose: List last three events starting five events before the present.

Command: `EVENT 5 3`

Display:

```
->EVENT 5 3
«date» «time» «oper» Enabled Clk A
«date» «time» «oper» Set «input» LOS Clear Limit to 2, Was 1
«date» «time» Reference Input Valid
->
```

Disabling Automatic Event Reporting

As a default, the TSG-3800 reports events automatically. You can disable automatic reporting; when disabled, events still record in the event log but are not sent over the communication ports. This is useful if, for example, you want to transfer measurement data without the interruption of events. In this application, disable event reporting, collect the data, then re-enable event reporting.

After disabling, the operator can re-enable automatic reporting. The TSG-3800 automatically reports any events that occurred while event reporting was disabled.

To disable automatic event reporting, type:

`EVENT DISABLE` then press **Enter**

To re-enable automatic event reporting, type:

`EVENT ENABLE` then press **Enter**

Note: The *Disabling Automatic Event Reporting* option is not stored in non-volatile memory and is always enabled at start-up.

Retrieving Alarm Data

The operator can retrieve information concerning alarm status. The response shows all existing major and minor faults. Use the syntax described in Alarm Command, on page 341.

To access the alarm data, type:

`ALARM` then press **Enter**

A typical display is:

```
+>ALARM
Critical Alarms
 None
Major Alarms
 None
Minor Alarms
 T100 Limit 1 MTIE Alarm on INP4.1
 T100 Limit 2 MTIE Alarm on INP4.1
->
```

Note: Faults can be present with no alarm. This condition exists when alarms are cleared without fixing the faults. See Resetting Alarms, on page 105, for instructions.

Resetting Alarms

You can reset Audio, Major, Minor, or all alarms using a software command. When cleared, the appropriate indicators and audio alarms turn off. This action removes the fault condition. Remaining faults will reactivate the alarm. All faults must be cleared before an alarm will clear itself. Use the syntax described in Alarm Command, on page 341.

To clear the alarms, type:

`ALARM CLEAR CRITICAL|MANJOR|MINOR|AUDIO|ALL` then press **Enter**

Example

Purpose: Clear all alarms

Command: `ALARM CLEAR ALL`

Display:

```
->ALARM CLEAR ALL
«date» «time» Critical Alarm Cleared
«date» «time» Major Alarm Cleared
«date» «time» Minor Alarm Cleared
+>
```

Checking Instrument Status

You can display the instrument status using the Status command. Included in the display is information on major or minor alarms, input error status for each channel, and current oscillator operating mode.

Frequency and MTIE use the following abbreviations: ‘Ok’, ‘Mon’, ‘Inh’, ‘Alm’, and ‘Flt’. ‘Ok’ signifies the input signal is operating within alarm limits. ‘Mon’ indicates Input is O.K. but is set to Monitor Only Mode and will not be used as a reference. ‘Inh’ is displayed when the input alarm checking is inhibited. ‘Alm’ is displayed when the input is in alarm but not faulted. ‘Flt’ is displayed when the input is faulted.

AIS, BPV, CRC, LOS, and OOF use the following abbreviations: ‘E’, ‘A’, and ‘F’. ‘E’ is displayed when the input signal is in episode and not faulted or alarmed. ‘A’ is displayed when the input signal is in alarm but not faulted. ‘F’ is displayed when the input signal is faulted.

To access the status data, type:

STATUS then press **Enter**

A typical display is:

```
->STATUS
The Current Time is 29AUG2004 09:15:40.352

                                                          A B C L O
                                     MTIE          FREQ          I P R O O
 Port   Type       Status   Phase    100/1K /10K   100/1K /10K   S V C S F   SSM
 1.1    3Port/E1   Ref      7        Ok /Ok /Ok    Ok /Ok /Ok     / / / /    PRS
 1.2    3Port/E1   Mon      15       Ok /Ok /Ok    Ok /Ok /Ok     / / / /    ST2
 1.3    3Port/E1   Mon      -55      Ok /Ok /Ok    Ok /Ok /Ok     / / / /    STU
 2.1    DS1        Ok       0        Ok /Ok /Ok    Ok /Ok /Ok     / / / /    STU
 3.1    3Port/T1   Ok       9        Ok /Ok /Ok    Ok /Ok /Ok     / / / /    PRS
 3.2    3Port/T1   Mon      -146     Ok /Ok /Ok    Ok /Ok /Ok     / / / /    ST2
 3.3    3Port/T1   Dis      0        Ok /Ok /Ok    Ok /Ok /Ok     / / / /    STU
 4.1    Clock      Flt      -1232442 Ok /Flt       Flt /Flt /Ok   / / / /    STU
```

```
CPU
 Power A: On   Power B: On
        Type            Mode/Status   Stability   Tau     %Range
 Clk A  Stratum 2       Locked/Ref    1.68E-15    2500.0  49%
        Rubidium                                  0
 Clk B  Stratum 2 DDS   Locked/OK     1.06E-13    1500.0  49%
                                                  0

        Type            Mode/Status   Output SSM                 Bypass
 FG A   T1/E1 (SSM)     Ref/Auto      ST Unknown                 No
 FG B   T1/E1 (SSM)     OK/Auto       ST Unknown                 No

Alarms    Minor
->
```

Checking the Instrument Configuration

You can display a listing of all instrument settings stored in memory (fault limits, baud rates, and so forth) using the Setup command. Where the operator has not set a limit, the default value is shown. The operator can also reset the limits to factory default values or user defined default values.

To access the configuration data, type:

`SETUP [start input] [ending input]` then press **Enter**

A typical display is:

```
->SETUP INP1.1
Input: Mode - Best AutoSwitch - On AutoReturn - On
Clock: AutoReturn - On

Inp1.1
              Limit 1      Limit 2                    Limit 1     Limit 2
 Freq(100):    8000-Fail    4000-Alarm   MTIE(100):    432-Fail    324-Alarm
 Freq(1000):   800-Fail     400-Alarm    MTIE(1000):   864-Fail    648-Alarm
 Freq(10000):  80-Fail      40-Alarm     MTIE(10000:   1728-Fail   1296-Alarm

 AIS           BPV           CRC          LOS          OOF
 Set: 10       Set: 10       Set: 10      Set: 10      Set: 10
 Clr: 2        Clr: 2        Clr: 2       Clr: 2       Clr: 2
 Mode: Fail    Mode: Alarm   Mode: Fail   Mode: Fail   Mode: Alarm

Provisioned SSM: STU SSM Mode: Auto SSM Alarm Mode: Report E1 SSM
Bit#: 4
Priority: 1
->
```

Restarting the TSG-3800

You can restart the TSG-3800 and reset it to the default settings using the Restart command. When restarted, the Clock modules cycle through the Acquire and Locked operating modes again. This command has the same effect as powering down and re-applying power to the shelf.

Caution: The RESTART command causes the processor to execute the self-test routine. The self-test routine erases measurement history and clears all disabled or failed modules.

To restart the TSG-3800, type:

`RESTART` then press **Enter**

Default Parameter Values

This section describes the factory default values and the range of selections. Table 3-6 lists the software default settings and Table 3-7 lists the hardware default settings. Both tables have a column for entering your own settings.

Table 3-6. Default Software Configuration

Setting	Factory Default	Range	User Settings
SOFTWARE PROVISIONS (X-Port Input Module, P/N 23478303-00x-0)			
Input AUTORETURN	ON	ON/OFF	
Input AUTOSWITCH	ON	ON/OFF	
Signal Type	T1	T1/E1/CLOCK	
Signal Framing			
T1	ESF	ESF/D4	
E1	CCS	CCS/CAS	
Input Clock Freq	1MHz	1/ 1.544/ 2.048/ 5/ 10 MHz	
Zero Suppression ZS	OFF	ON/OFF	
CRC	OFF	ON/OFF	
SSM	OFF	ON/OFF	
Input Termination	3300	3300/ 120/ 100/ 75/ 50	
MTIE/FREQ Mask	MCD	PRS/OCN/MCD	

Table 3-6. Default Software Configuration (Continued)

Setting	Factory Default	Range	User Settings
Provisioned SQL	STU	ST1/STU/ST2/ST3	
SSM Mode	AUTO	PROV/AUTO	
SSM Alarm Mode	ALARM	Ignore/Report/Alarm/Fail	
Input Priority	1.1=1 / 2.1=2 / all others=0	0-4	
E1 SSM Bit	4	4/5/6/7/8	
Note: Input Module is either T1 or E1 but either also has option for CLOCK input signals.			
INPUT ERROR THRESHOLDS			
AIS Clear/Error	(2/10)		
AIS Mode	Fail	Ignore/Report/Alarm/Fail	
BPV Clear/Error	(2/10)		
BPV Mode	Alarm	Ignore/Report/Alarm/Fail	
LOS Clear/Error	(2/10)		
LOS Mode	Fail	Ignore/Report/Alarm/Fail	
OOF Clear/Error	(2/10)		
OOF Mode	Alarm	Ignore/Report/Alarm/Fail	
CRC Clear/Error	(2/10)		
CRC Mode	Alarm	Ignore/Report/Alarm/Fail	
FREQUENCY THRESHOLDS			
100s Limit 1	8000ns - Fail		
1000s L1	800ns - Fail		
10000s L1	80ns - Fail		
100s Limit 2	4000ns - Alarm		
1000s L2	400ns - Alarm		
10000s L2	40ns - Alarm		
MTIE THRESHOLDS			
100s Limit 1	432 ps/s - Fail		
1000s L1	864 ps/s - Fail		
10000s L1	1728 ps/s - Fail		

Table 3-6. Default Software Configuration (Continued)

Setting	Factory Default	Range	User Settings
100s Limit 2	324 ps/s - Alarm		
1000s L2	648 ps/s - Alarm		
10000s L2	1296 ps/s - Alarm		
SOFTWARE PROVISIONS, Communications			
BAUD RATE			
Comm A/B	9600	300/1200/2400/4800/19200	
ECHO	ON	ON/OFF	
EOL	CRLF	CR/LF/CRLF	
HANDSHAKING	OFF	OFF/HARDWARE/ SOFTWARE	
MODE	ASCII	ASCII/Binary/TL1/ PASSTHRU	
TIMEOUT	300	5 - 43200 seconds	
NAME	TSG	1-20 characters	
TELNET Timeout	Never	5 - 43200 seconds	
TELNET Ports			
23	ASCII (4)		
4000	TL1 (2)		
4200	PASSTHRU (1)		
SOFTWARE PROVISIONS (Clock Module, P/N 23478272-00x-0)			
Clock AUTORETURN	ON	ON/OFF	
Clock TC Final			
ST2 Rb	2500	500-10,000	
ST3E	50	25-1,000	
SOFTWARE PROVISIONS (Frame Generator)			
Mode	AUTO	AUTO/MANUAL	
Delay	1	0-30 seconds	

Table 3-7. Default Hardware Configuration

Jumper/Switch	Factory Default	Options	User Settings
HARDWARE PROVISIONS (X-Port Input Module, P/N 23478303-00x-0)			
W11 Port 1	(1-2) No amplification	(2-3) 20 dB amplification	
W10 Port 2	(1-2) No amplification	(2-3) 20 dB amplification	
W9 Port 3	(1-2) No amplification	(2-3) 20 dB amplification	
HARDWARE PROVISIONS (CPU Module, P/N 23478301-00x-0)			
W14 & W15	(1-2) and (3-4)		
W13 & W16	(3-4)		
W7 & W8	(1-2)		
W9 & W11	(4-6)		
Note: The jumper settings shown for the CPU configure COMM A and COMM B for connection to a PC. Refer to Configuring the CPU Module, on page 175 for proper settings for MAC or Modem connections.			
HARDWARE PROVISIONS (Frame Generator Module, P/N 23478443-000-0)			
Clock Frequency Selection			
W9 CLK1	1.544 MHz	1.544 MHz/2048 MHz/8 kHz	
W10 CLK2	2.048 MHz	1.544 MHz/2048 MHz/8 kHz	
Switch Block S3			
Rocker 1	OFF	Option shown is Bit #4	
Rocker 2	OFF		
Rocker 3	ON		
Note: S3 selects the bit position for insertion of SSM for E1 signals.			
Switch Block S2			
Rocker 1 (E1 only)	ON	On = Disable CRC4 Off = Enable CRC4	
Rocker 2 (E1 only)	ON	On = Select CAS signaling Off = Select CCS signaling	
Rocker 3 (E1 only)	ON	On = Select AMI encoding Off = Select HDB3 encoding	
Rocker 4	Not Used		

Table 3-7. Default Hardware Configuration (Continued)

Jumper/Switch	Factory Default	Options	User Settings
Rocker 5	OFF	On = Selects D4 framing Off = Selects ESF framing	
Rocker 6	ON	On = Disables SSM Off = Enables SSM	
Switch Block S1			
Rocker 1 (Out1)	ON	On = T1 Off = E1	
Rocker 2	ON	On = 63/37 CC Duty Cycle Off = 50/50 CC Duty Cycle	
Rocker 3 (Out2)	ON	ON/OFF	
Rocker 4 (Out2)	ON	ON/OFF	
Rocker 5 & 6	Not Used		
Note: Rocker 3 & 4 are selected together to provide one of four possible signal types for OUT2.			
HARDWARE PROVISIONS (Frame Generator Module, P/N 23478486-000-0)			
Clock Frequency Selection			
W6 CLK1	1.544 MHz	1.544 MHz/2048 MHz/8 kHz	
W5 CLK2	2.048 MHz	1.544 MHz/2048 MHz/8 kHz	
Clock Bypass Function			
W4-Signal Type	DS1	DS1/E1	
W2-Port 2.1	Enable	Enable/Disable	
W3-Port 1.1	Enable	Enable/Disable	
Switch Block S1			
Rocker 1	OFF	Option shown is Bit #4	
Rocker 2	OFF		
Rocker 3	ON		
Note: S1 selects the bit position for insertion of SSM for E1 signals.			
Switch Block S2			
Rocker 1 (E1 only)	ON	On = Disable CRC4 Off = Enable CRC4	
Rocker 2 (E1 only)	ON	On = Select CAS signaling Off = Select CCS signaling	

Table 3-7. Default Hardware Configuration (Continued)

Jumper/Switch	Factory Default	Options	User Settings
Rocker 3 (E1 only)	ON	On = Select AMI encoding Off = Select HDB3 encoding	
Rocker 4	Not Used		
Rocker 5	OFF	On = Selects D4 framing Off = Selects ESF framing	
Rocker 6	ON	On = Disables SSM Off = Enables SSM	
Switch Block S3			
Rocker 1 (Out1)	ON	On = T1 Off = E1	
Rocker 2	ON	On = 63/37 CC Duty Cycle Off = 50/50 CC Duty Cycle	
Rocker 3 (Out2)	ON	ON/OFF	
Rocker 4 (Out2)	ON	ON/OFF	
Rocker 5 & 6	Not Used		
Note: Rocker 3 & 4 are selected together to provide one of four possible signal types for OUT2.			
HARDWARE PROVISIONS (AMI Output Module, P/N 23478309-000-0)			
Switch 1			
Rocker 1 (LEN2)	ON	Refer to User Guide for options	
Rocker 2 (LEN1)	OFF	Refer to User Guide for options	
Rocker 3 (LEN0)	OFF	Refer to User Guide for options	
Rocker 4 (TCLKSEL)	ON	ON = 1.544, T1 applications OFF = 2.048, E1 applications	
Rocker 5 (INSEL)	ON	ON = IN1(signal from FG) OFF = IN2	
Rocker 6 (CLKSEL)	ON	ON = CLK1(signal from FG) OFF = CLK2	
Note: The jumper settings for Rocker 1-3 select line length of 0-133 feet (0-40 meters).			

Chapter 4 Maintenance and Troubleshooting

This chapter provides troubleshooting checklists, flowcharts, and maintenance procedures for the TSG-3800 shelves. The information is common to all configurations of the 19-inch and 23-inch shelves.

Note: To download and install new system software, refer to Installing New System Software, on page 321.

In This Chapter:

- Troubleshooting Guidelines
- Troubleshooting Charts
- Troubleshooting Flowchart
- Re-ordering Information
- Preparing the Unit for Shipment

Troubleshooting Guidelines

This section provides guidelines for determining and correcting alarm conditions. Visible signs of failure are the LED indicators and the EIA-232 error messages. Table 4-1 lists possible causes for alarms, indicators, and corrective action.

Table 4-1. Indicators, Alarms, and Corrective Action

Indicator Lit	Alarm	Module	Possible Cause of Alarm	Corrective Action
None	Major	All	No Power	Check power fuse and feeds
CPU	Major	CPU	Processor Failure	See System and CPU Alarms, on page 118
HOLDOVER	Minor	Clock	Entry into Holdover	Obtain error message over EIA-232 port
LOS	Major or Minor	Input	Loss of input signal	Check input signal; If input signal is present, replace Input module
MAJOR/MINOR; no input fault indicator lit	Major or Minor	CPU	MTIE errors Frequency offset errors	See Frequency and MTIE Errors, on page 119
NEW REF	—	CPU	New reference in use	Push ACO button to clear indicator
OOF	Major or Minor	Input	Out Of Frame (OOF)	Check input signal, jumpers, Monitor, and Module replacement
OOF and AIS	Major or MInor	Input	Alarm Indication Signal	Check input signal; If input signal is correct, replace Input module
POWER (amber indicator)	Minor	CPU	Loss of one –48V supply	Check fuse and feed
RUN (off)	Major	CPU	Processor Failure	Note the LED pattern, then call Symmetricom Global Services. Remove and re-install the CPU module. If ineffective, replace the CPU module.
SYS	Major	CPU	System Failure	See System and CPU Alarms, on page 118

Test Equipment and Tools

Table 4-2 lists test equipment and tools required to perform maintenance and diagnostics. The frequency reference is only required when checking input signal accuracy.

During troubleshooting, when a terminal is directly connected to Comm port A or B and you inadvertently set the mode to Binary, TL1, or Passthru, the CPU will not respond to typed characters. To exit from TL1 mode, type the Esc key three times. To exit from Passthru mode, type Alt B. To exit from Binary mode, type the ? key.

When a terminal is directly connected to Comm port A or B and you inadvertently set the mode of the opposite port to Binary, TL1, or Passthru, use the COMM «port» ASCII command to return the other port to ASCII mode.

If hardware handshaking is enabled and the CTS line cannot be pulled high, there is no communication. To correct this, use the other Comm port to turn CTS/RTS handshaking off. An alternative method is to jumper RTS to CTS on the CPU module.

Table 4-2. Test Equipment and Usage

Test Equipment	Characteristics	Purpose
Oscilloscope	Dual Trace; 10 MHz sweep (equivalent to Tektronik #745)	Frequency comparisons; Signal amplitude measurements
Terminal	Capable of 9600 Baud	Receiving error messages and entering commands
Frequency reference	Meeting or exceeding the accuracy of the signals to be measured	Reference for frequency comparisons

Fault Indicators

Most fault lights indicate a hardware failure (for instance, loss of output signal, LOS) or a detected input signal defect (for example, Out of Frame, OOF). Computed errors, such as MTIE, can trigger the MAJOR and MINOR indicators. Chapter 5, Input Modules, Chapter 6, CPU, Frame Generator, and Clock Modules, and Chapter 7, Output Modules describe the indicators on each module.

Error Messages

Error messages are automatically sent to the EIA-232 ports. Each message is date and time stamped and lists the cause of alarm and any relevant data (for example, a frequency difference between the active reference and the clock). Appendix B provides a listing of alarm messages.

Note: Not all messages are errors. The TSG-3800 also reports changes in operating parameters.

System and CPU Alarms

A system alarm indicates a problem not directly traceable to a specific input, output, or module. When the System indicator lights, use the Event command to retrieve a listing of events (as many as needed to trace back to the System alarm). The System Alarm event causes the following error message.

```
>09SEP2004 12:45:13 System Bus Failed
```

When a system alarm occurs, remove and re-install each module one at a time. If the System indicator turns off after removing a module, replace that module. Remove and re-install the modules in the following sequence:

1. Unselected Input modules
2. Unselected Frame Generator (use DISABLE command before removing)
3. Unselected Clock (use DISABLE command before removing)
4. Selected Input Reference module
5. Selected Frame Generator (use DISABLE command before removing)
6. Selected Clock (use DISABLE command before removing)
7. CPU module

Note: If possible, contact Symmetricom Global Services before acting on a CPU alarm to allow for diagnosis.

A CPU alarm indicates a malfunction of the processor. If this alarm occurs, record the indicator pattern (which indicators are on). To reset the problem, remove, then re-insert the CPU module. If the problem persists, contact Symmetricom Global Services. Address and telephone information appears in Equipment Return Procedure, on page 137.

Frequency and MTIE Errors

The TSG-3800 makes frequency and MTIE measurements between each input signal and both of the Clock modules in use. Clocks, whether selected for providing outputs or not, track the selected input reference. In tracking, their control values are adjusted to follow that input. With an MTIE or frequency error, the source of error is not always apparent. Any input or clock can cause the problem.

The history of each input signal's phase relationship to each clock and each oscillator's control value provide valuable information for determining the source of error.

When receiving an MTIE or frequency error, retrieve the control value history for the clocks and the phase history for each input. Use the CLK CV T100 command for listing the control value history and PHASE INP1.1 (or INP2.1) T100 command for listing the phase history. Use Table 4-3 as guidelines for tracing the error source.

Note: This procedure assumes that two input signals and two clocks are used.
The difference between minor and significant change varies with the model of clock used. Contact Symmetricom Global Services if you need assistance in making this determination.

Table 4-3. Synchronization Diagnostic Tests

Condition	Symptoms	Probable Source
1	■ Clock A selected for output. ■ INP1.1 and INP2.1 phase history shows minor or no change. ■ Clock A's control value shows significant change. ■ Clock B's control value shows only minor or no change.	Clock A
2	■ Clock B selected for output. ■ INP1.1 and INP2.1 phase history shows minor or no change. ■ Clock A's control value shows only minor or no change. ■ Clock B's control value shows significant change.	Clock B
3	■ INP1.1 phase history shows minor or no change. ■ INP2.1 phase history shows significant change. ■ Clock A's control value shows significant change. ■ Clock B's control value shows significant change.	INP1.1 input signal
4	■ INP1.1 phase history shows minor or no change. ■ INP2.1 phase history shows significant change. ■ Clock A's control value shows only minor or no change. ■ Clock B's control value shows only minor or no change.	INP2.1 input signal

To further test the synchronization of the suspected clock or input signal, compare that signal to an independent signal reference. To compare, apply the suspected signal to channel A to an oscilloscope and the independent reference, of the same frequency, to the external trigger (see Figure 4-1). If the signal on channel A is not stationary, or traverses the oscilloscope display, it is defective.

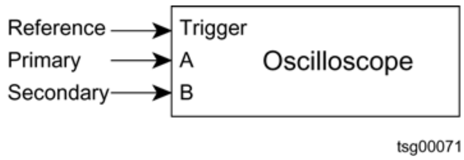


Figure 4-1. Frequency Comparison

Forcing a Clock Module Out of Holdover

In some situations the Clock module cannot exit Holdover. This occurs when a bad reference causes an accumulation history of large frequency and MTIE offsets and the Frequency/MTIE mode is set to Fail. This history is held even though a good reference is now available. The stored accumulation error causes the new reference to fail the 10,000 second measurement interval. It can take up to two 10,000 second intervals (over five hours) to establish a new history.

To prevent accumulated MTIE or frequency data from affecting the current measurement, use the MTIE or Frequency Inhibit command with the syntax:

```
MTIE | FREQUENCY {input} INHIBIT
```

Example

Purpose: Prevent previous MTIE data for the INP1.1 input from causing an MTIE fault at the end of the measurement cycle.

Command: `MTIE INP1.1 INHIBIT`

Response:

```
>MTIE INP1.1 INHIBIT
05APR2004 10:20:42.130 User A temporarily inhibited MTIE
faults for Inp1.1
```

Establishing Nominal Phase Setting

The TSG-3800 tracks the phase offset between the input references and the selected clock oscillator. Upon entry into Acquire mode, the TSG-3800 uses the phase between the reference in use and the selected clock oscillator, as a reference phase. The TSG-3800 then attempts to maintain this phase relationship.

The TSG re-establishes the reference phase whenever:

- The clock oscillator enters Acquire Mode
- The input reference switches

Testing and maintenance of the TSG-3800 can lead to an excessive accumulated phase offset. The internal oscillator frequency changes in an attempt to minimize the phase error. Re-establishing a new reference phase offset corrects for this problem. To do this, use the `PHASE {input} ZERO` command.

Loss of Signal Faults

Loss of signal (LOS) errors report automatically to the EIA-232 ports. A LOS fault does not necessarily light the LOS indicator. These errors can result from:

- No input reference signal (LOS indicator is on)
- An intermittent input reference signal (LOS indicator may be on)
- Jitter exceeding specification on the input reference signal (LOS indicator off)

Troubleshooting Charts

This section contains troubleshooting charts for individual modules.

Troubleshooting the CPU Module

The CPU module (item number 23478301-001-0) has nine LED indicators. Table 4-4 shows the normal and fault indications and provides troubleshooting information.

Table 4-4. Troubleshooting the CPU Module

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Run	Green	Off	CPU microprocessor/ software shut down	1. Microprocessor failure. Replace the CPU module. 2. Rebooting the CPU may resolve the problem, but is usually only a temporary fix.
Minor	Off	Amber	Minor alarm is present	1. Observe alarm indicator(s) on other modules and troubleshoot alarmed modules. 2. Use the Alarm command to determine the alarm type. 3. Troubleshoot the alarm according to the alarm type.
Power	Green	Off	Power failed on either A or B inputs DC/DC converter on module failed	1. Check Power indicator on other modules. If they are lit, then replace this module. 2. If power is not available to shelf, check rear panel fuses and power source. 3. Replace fuses as necessary.
CPU	Off	Red	CPU hardware failure. Major indicator is also red	1. Issue the Restart command to re-initialize the CPU. Restart forces clocks into Holdover. 2. If alarm persists, replace CPU module.
SYS	Off	Red	System bus failure. A bus driver chip has failed on one or more of the modules. Major indicator is also red	1. Alarm is a system bus failure - Escalate. 2. Issue the Status command to verify that all modules are listed; missing module(s) are likely to contain a failed bus driver chip.[1]

Table 4-4. Troubleshooting the CPU Module (Continued)

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Major	Off	Red	Major alarm is present. Alarm could be on any module except Outputs. Output signals are degraded but present.	1. Observe alarm indicator(s) on other modules and troubleshoot alarmed modules. 2. Use the Alarm command to determine the alarm type. 3. Troubleshoot the alarm according to the alarm type.
A B Net	Green Green Green		Indicated Comm port is active. LED flickers during data transfer	Status indicator only – no action required

Note:

[1] Troubleshooting system bus failures can be difficult. There is often no alarm indicator on the affected module(s). Troubleshooting may require systematically removing modules to isolate the alarm. Output modules are not on the system bus.

Troubleshooting Clock Modules

This section describes troubleshooting procedures for the following modules:

- Crystal Stratum 3E (item number 23478272-001-0)
- Rubidium Stratum 2E (item number 23478272-004-0)
- Crystal Stratum 3E EMI (item number 23478272-011-0)
- Rubidium Stratum 2E EMI (item number 23478272-014-0)

Table 4-5 shows the normal and fault indications and provides troubleshooting information.

Table 4-5. Troubleshooting the Clock Module

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Power	Green	Off	Power failed on either A or B inputs DC/DC converter on module failed	1. Check Power indicator on other modules. If they are lit, then replace this module. 2. If power is not available to shelf, check rear panel fuses and power source. 3. Replace fuses as necessary.

Table 4-5. Troubleshooting the Clock Module (Continued)

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Locked	Green		Normal operating condition. Off in Warm-up, Acquire, or Holdover modes	Status indicator only. No action required
Selected	Green		Module is selected to generate signal to paired Frame Generator module as the source for output signals	Status indicator only. No action required Only one Clock module is selected at a time
EXT Ref	Off		Not used	No action needed
Holdover	Off	Amber	1. Module is in Warm-up mode. 2. No valid input is available. This should be regarded as a Major fault condition.	1. Use the Clock command to verify status. No action required if module is in Warm-up mode for under 30 minutes. 2. Check Input module alarm indicators. 3. Use Status or Alarm command to verify input-related faults. 4. Troubleshoot the alarm according to the alarm type.
End of Range	Off	Amber	Tuning range is <25% or >75%. 1. Input reference may be pulling oscillator to end of range. 2. Clock module failure	1. Use the Alarm command to determine the alarm type. It may be helpful to view the Event History to isolate the fault condition. 2. Troubleshoot the alarm according to the alarm type. 3. Use the Restart command to re-initialize the CPU module. Restart forces clocks into Holdover. 4. If problem persists, replace module.
Acquire	Off	Amber	Indicator is Amber when locking to the input reference signal. Indicator is Off in the normal operating condition	Status indicator only. No action required ST2 clock should recover from holdover in <1000 s (16.6 min) ST3E clock should recover from holdover in <700 s (11.6 min)

Troubleshooting Frame Generator Modules

The Frame Generator module (23478301-001-0) has two LED indicators. Table 4-6 shows the normal and fault indications and provides troubleshooting information.

Table 4-6. Troubleshooting the Frame Generator Module

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Power	Green	Off	Power failed on either A or B inputs DC/DC converter on module failed	1. Check Power indicator on other modules. If they are lit, then replace this module. 2. If power is not available to shelf, check rear panel fuses and power source. 3. Replace fuses as necessary.
Fault	Off	Red	Module has failed If blinking, module is disabled	1. Use the Disable command prior to removing this module from the shelf. 2. Replace with a known good spare with the same configured options. Verify all hardware settings on the replacement module against the faulted module. 3. Use the Enable command after installing the module.

Troubleshooting the T1 Input Module

The T1 Input module (23478303-002-0) has four LED indicators. Table 4-7 shows the normal and fault indications and provides troubleshooting information.

Table 4-7. Troubleshooting the T1 Input Module

Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Power	Green	Off	Power failed on either A or B inputs DC/DC converter on module failed	1. Check Power indicator on other modules. If they are lit, then replace this module. 2. If power is not available to shelf, check rear panel fuses and power source. 3. Replace fuses as necessary.
REF	Green		Status indicator only. The port identified is the BITS Reference	The TSG requires only one input port as a reference. Only one REF indicator should be lit on all installed Input modules.
Mod Flt	Off	Red	Input module hardware fault	Replace defective module with a known good spare with the same configured options. **Caution:** To allow the CPU module to auto-configure the Input module, do not disable the Input module before removing it.
Port Fault	Off	Red	1. Faulted input reference signal. 2. Possible faulty Clock module Input reference switches to alternate Input module, or Clock module enters Holdover mode.	1. Use test equipment to test the integrity of the input signal. 2. Use the Alarm command to determine the alarm type. 3. Troubleshoot the alarm according to the alarm type. This is not an Input module hardware fault. To avoid data loss, *do not* re-boot or restart the CPU module.

Troubleshooting AMI and CC Output Modules

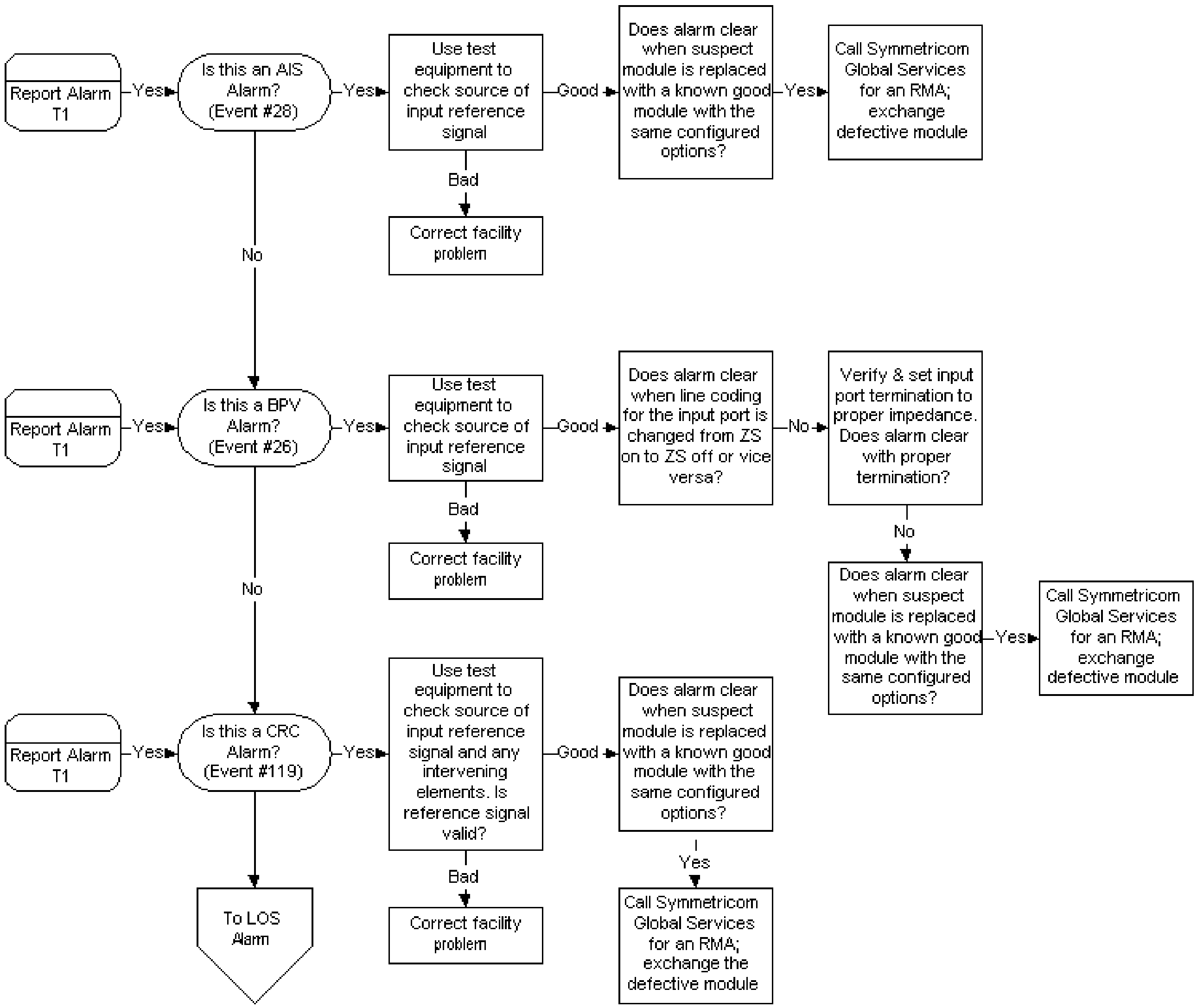
The AMI Output module (23478309-000-0) and the Composite Clock Output module (23477337-000-0) have four LED indicators. Table 4-8 shows the normal and fault indications and provides troubleshooting information.

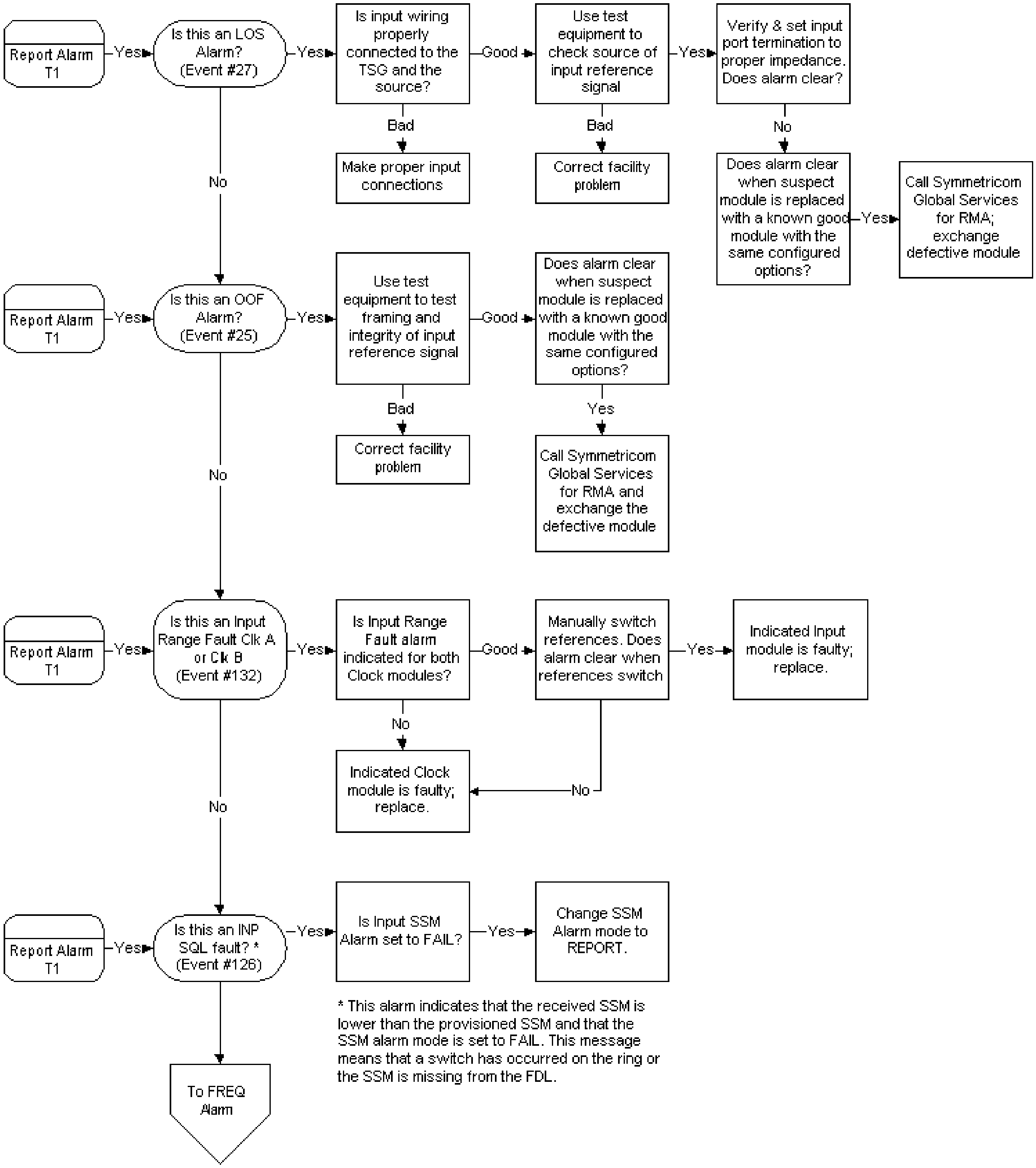
Table 4-8. Troubleshooting the AMI and CC Output Module

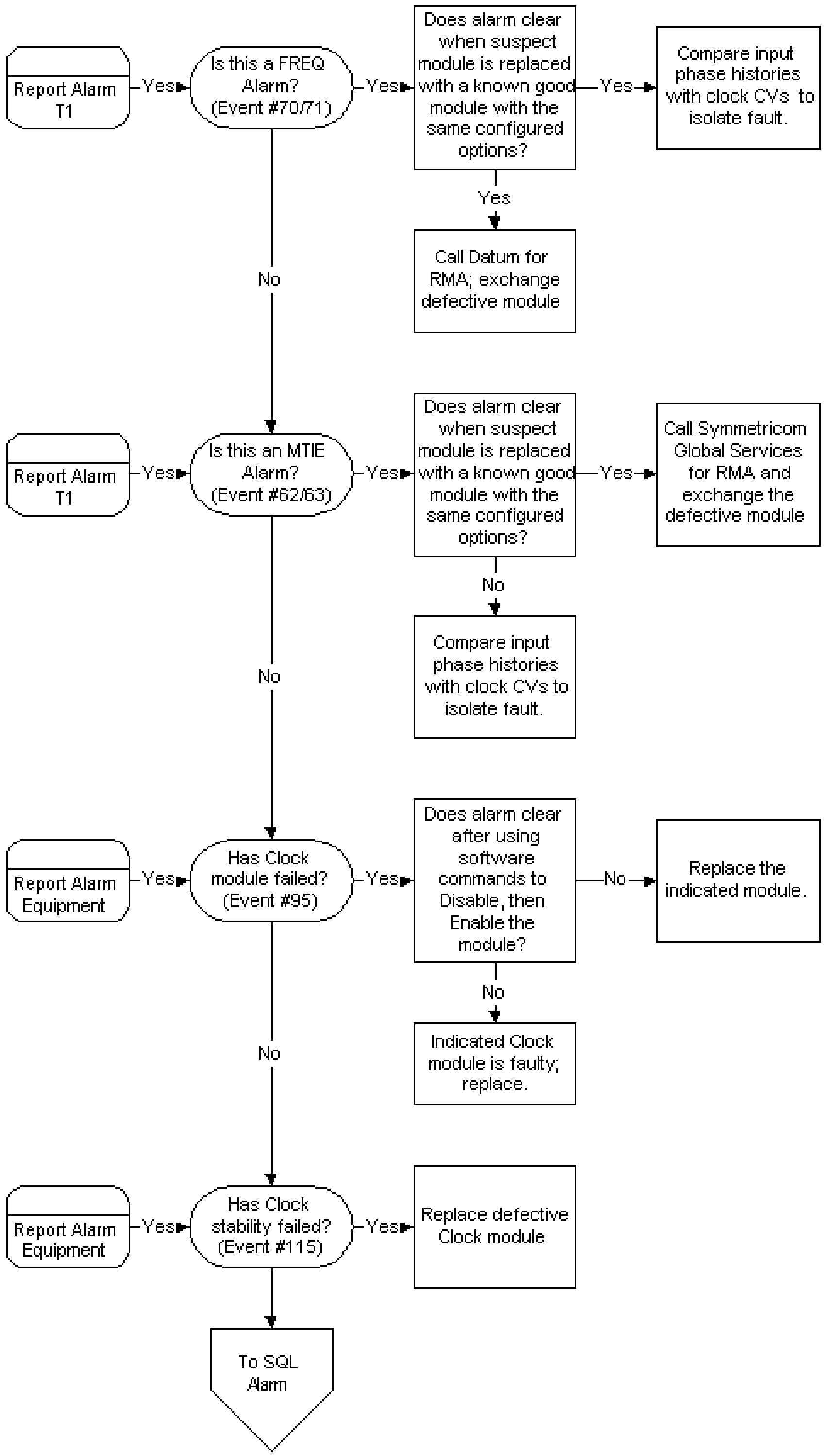
Indicator	Indicator Status		Cause	Corrective Action
	Normal	Fault		
Power	Green	Off	Power failed on either A or B inputs DC/DC converter on module failed	1. Check Power indicator on other modules. If they are lit, then replace this module. 2. If power is not available to shelf, check rear panel fuses and power source. 3. Replace fuses as necessary.
Input FLT A	Off	Amber	No signal or incorrect signal from FG A Failure of module’s input buffers	1. Check Input Fault A indicator on other Output modules. 2. If all Output modules indicate Input Fault A, check Clock/FG pair A for faults. Troubleshoot Clock/FG. 3. If no other Output modules indicate Input Fault A, verify all hardware settings on the faulted module. 4. Replace Output module with a known good spare with the same configured options.
Input FLT B	Off	Amber	No signal or incorrect signal from FG B Failure of module’s input buffers	Use troubleshooting procedure for Input FLT A
Output FLT	Off	Red	Output failure of one or more ports If both Output modules indicate a fault, then the fault is likely due to a termination problem. Only 1 of 2 modules in fault is commonly a hardware failure.	1. Replace with a known good module with the same configured options. 2. If replacement does not clear fault, check for unterminated or improperly terminated outputs (shorts and opens). 3. Check for short on distribution panel.

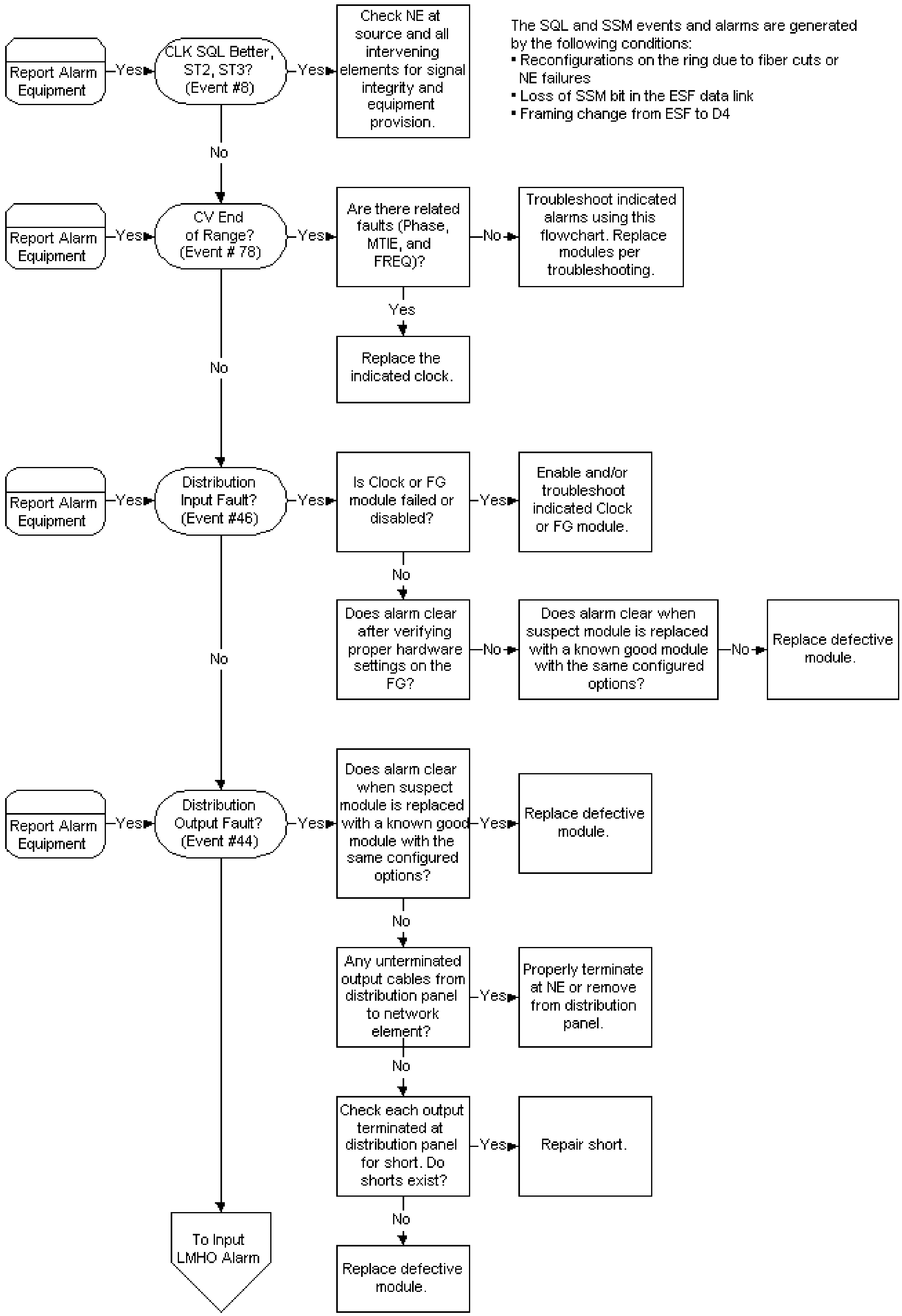
Troubleshooting Flowchart

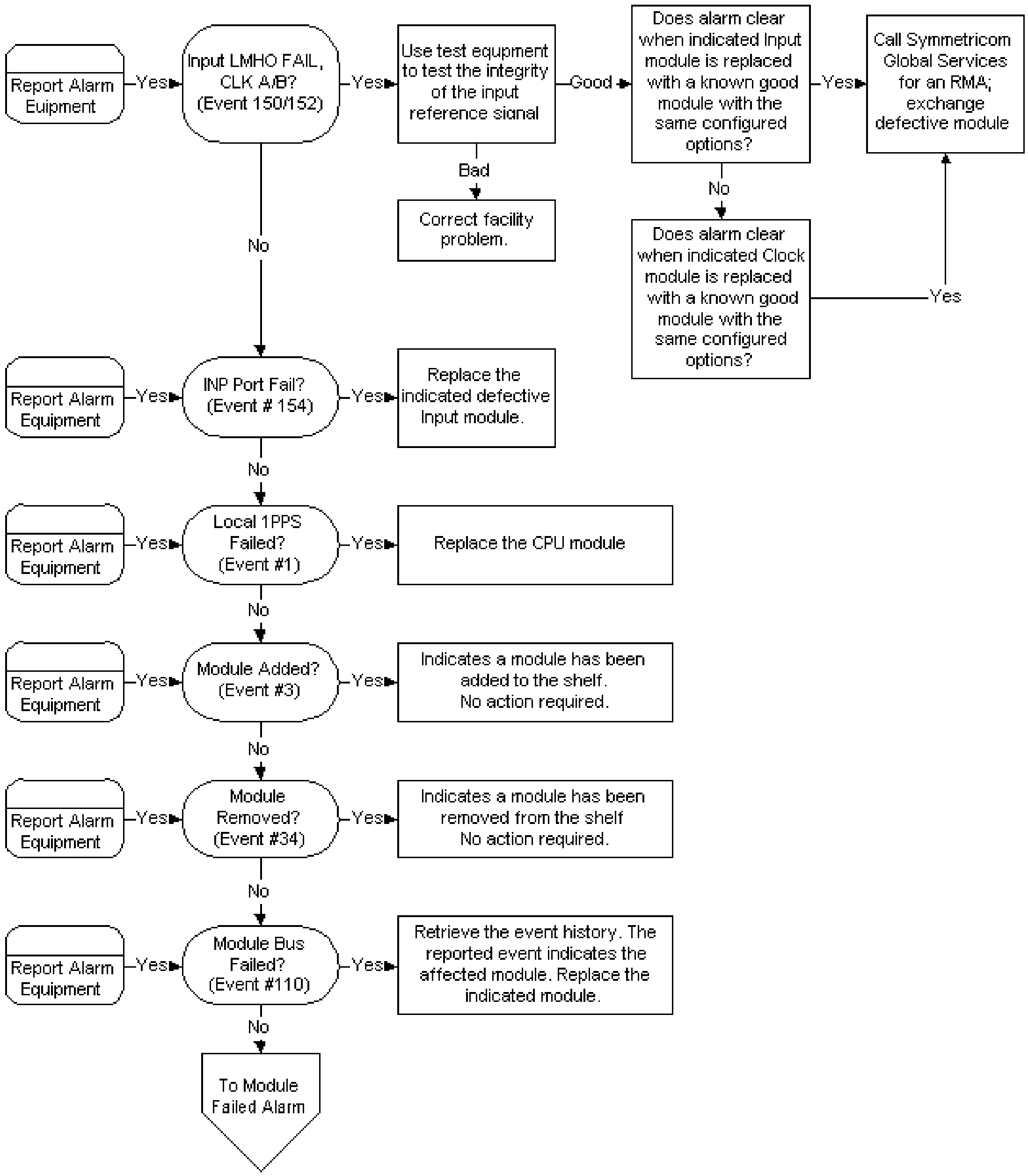
This section contains a flowchart that describes how to isolate, identify, and correct alarm messages that come from the TSG-3800.

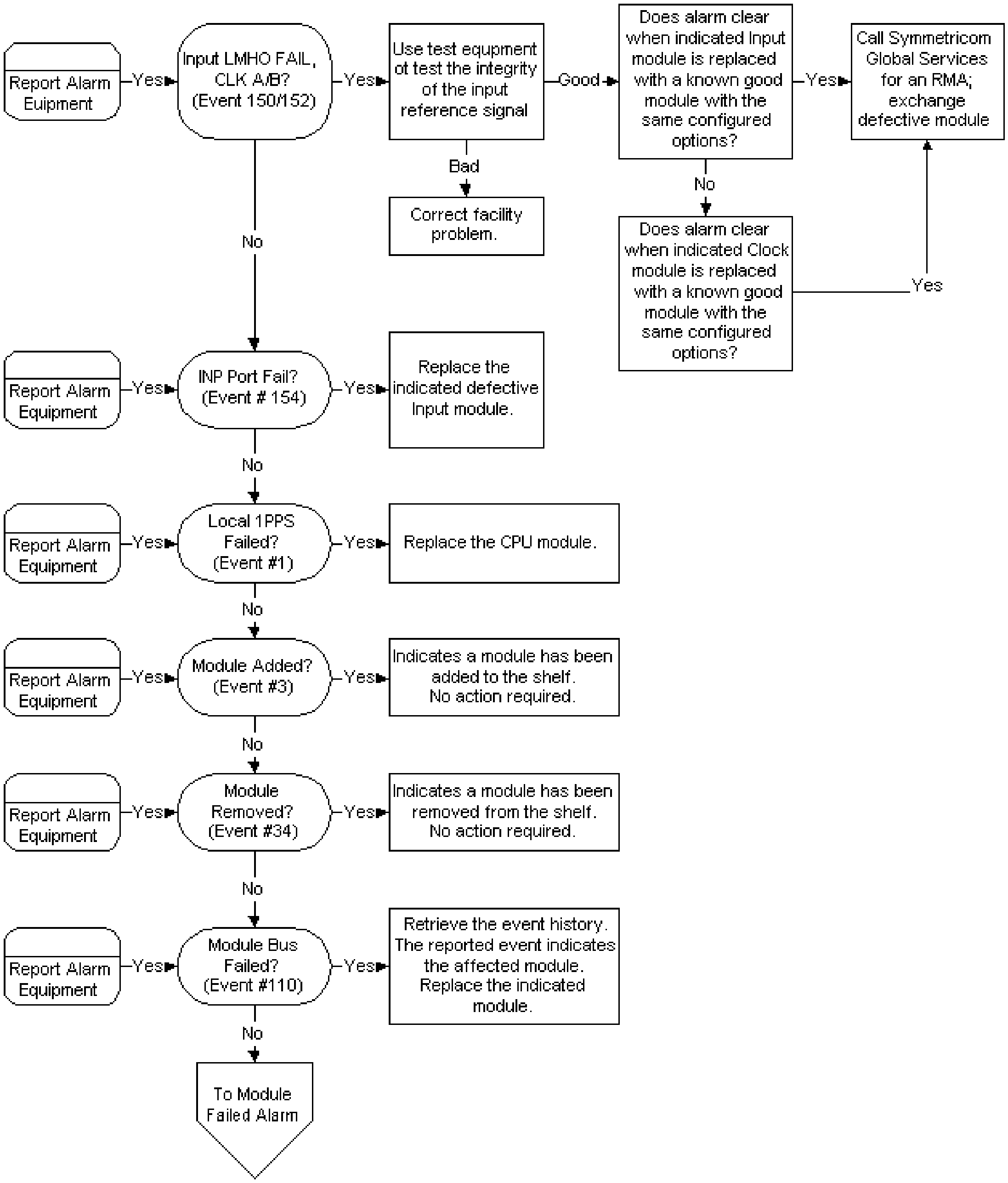


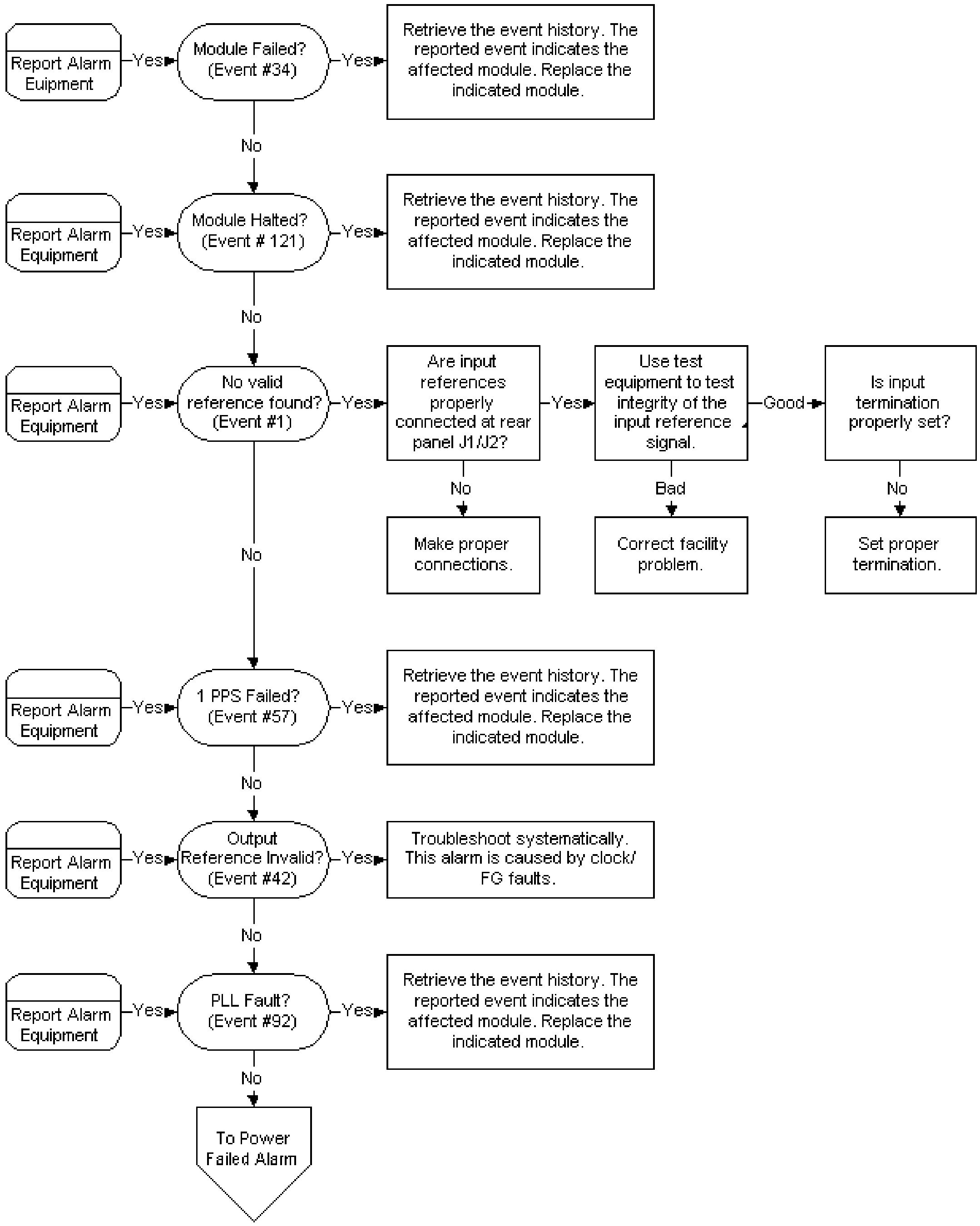

Report Alarm T1
Yes
Is this an LOS Alarm? (Event #27)
Yes
Is input wiring properly connected to the TSG and the source?
Good
Use test equipment to check source of input reference signal
Yes
Verify & set input port termination to proper impedance. Does alarm clear?
Bad
Make proper input connections
Bad
Correct facility problem
No
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
Yes
Call Symmetricom Global Services for RMA; exchange defective module
No
Report Alarm T1
Yes
Is this an OOF Alarm? (Event #25)
Yes
Use test equipment to test framing and integrity of input reference signal
Good
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
Bad
Correct facility problem
Yes
Call Symmetricom Global Services for RMA and exchange the defective module
No
Report Alarm T1
Yes
Is this an Input Range Fault Clk A or Clk B (Event #132)
Yes
Is Input Range Fault alarm indicated for both Clock modules?
Good
Manually switch references. Does alarm clear when references switch
Yes
Indicated Input module is faulty; replace.
No
Indicated Clock module is faulty; replace.
No
No
Report Alarm T1
Yes
Is this an INP SQL fault? * (Event #126)
Yes
Is Input SSM Alarm set to FAIL?
Yes
Change SSM Alarm mode to REPORT.
* This alarm indicates that the received SSM is lower than the provisioned SSM and that the SSM alarm mode is set to FAIL. This message means that a switch has occurred on the ring or the SSM is missing from the FDL.
To FREQ Alarm

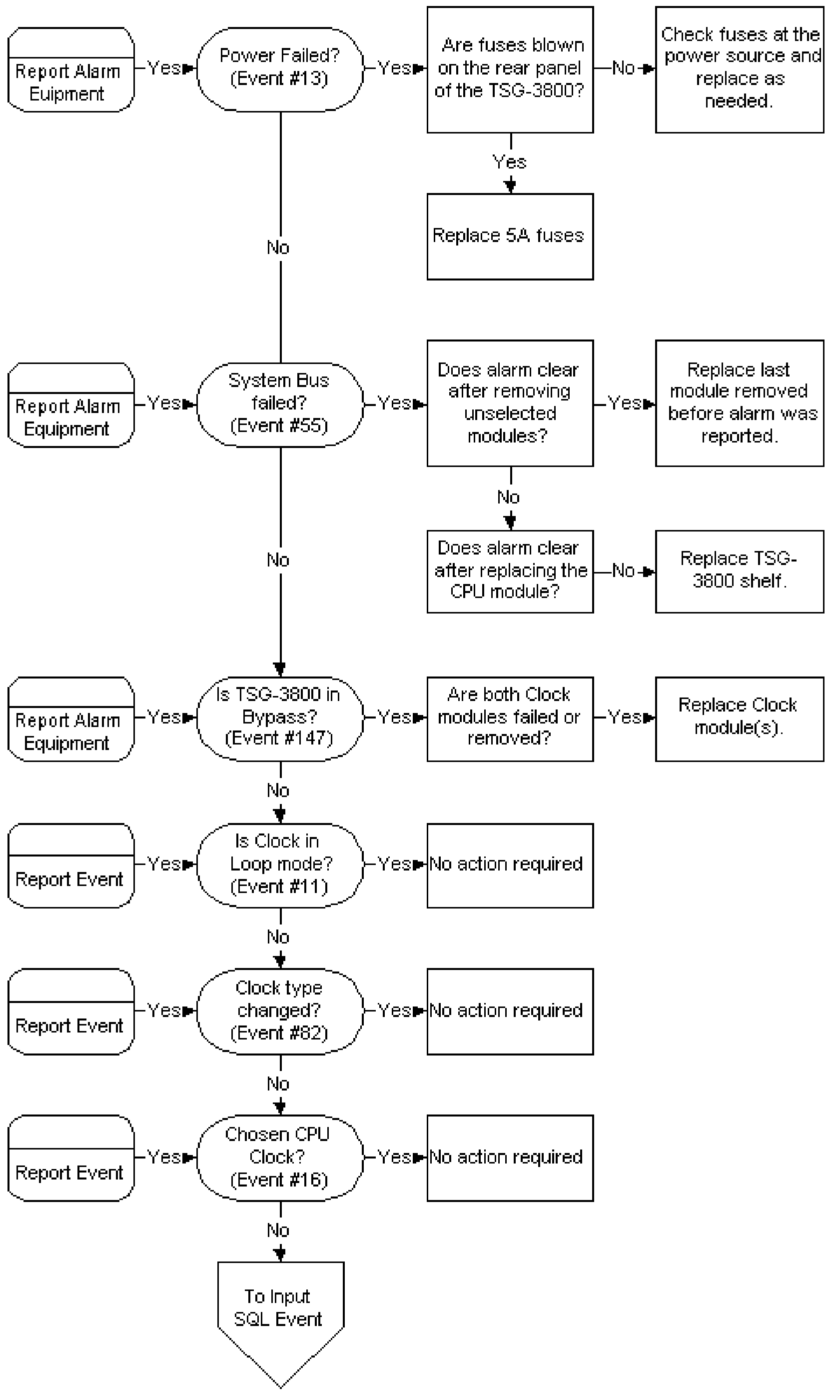

Report Alarm T1
Yes
Is this a FREQ Alarm? (Event #70/71)
Yes
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
Yes
Compare input phase histories with clock CVs to isolate fault.
Yes
Call Datum for RMA; exchange defective module
No
Report Alarm T1
Yes
Is this an MTIE Alarm? (Event #62/63)
Yes
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
Yes
Call Symmetricom Global Services for RMA and exchange the defective module
No
Compare input phase histories with clock CVs to isolate fault.
No
Report Alarm Equipment
Yes
Has Clock module failed? (Event #95)
Yes
Does alarm clear after using software commands to Disable, then Enable the module?
No
Replace the indicated module.
No
Indicated Clock module is faulty; replace.
No
Report Alarm Equipment
Yes
Has Clock stability failed? (Event #115)
Yes
Replace defective Clock module
To SQL Alarm

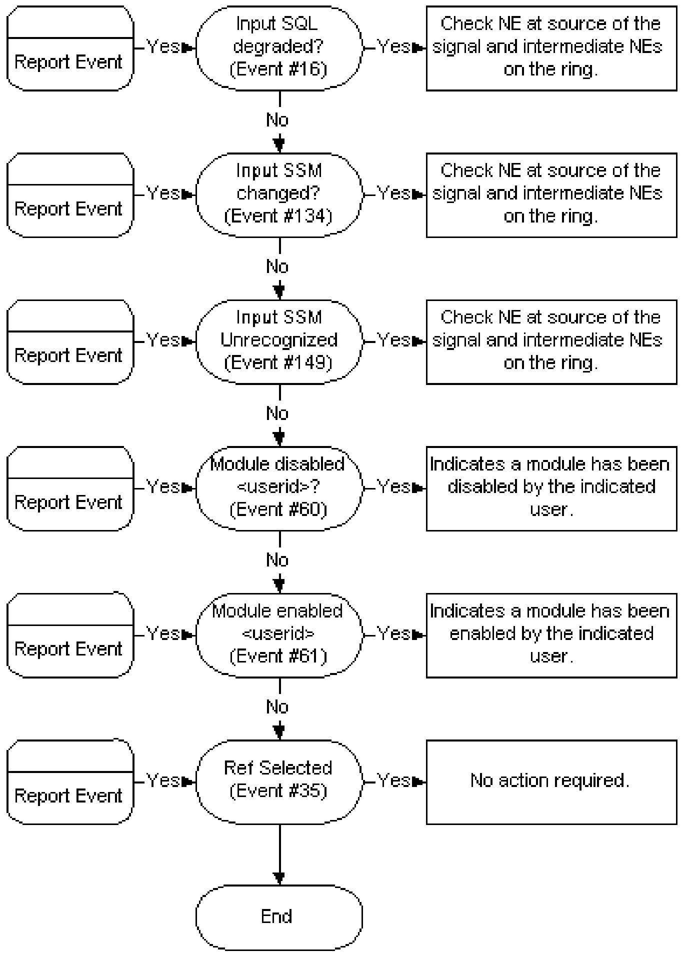

Report Alarm Equipment
Yes
CLK SQL Better, ST2, ST3? (Event #8)
Yes
Check NE at source and all intervening elements for signal integrity and equipment provision.
The SQL and SSM events and alarms are generated by the following conditions:
• Reconfigurations on the ring due to fiber cuts or NE failures
• Loss of SSM bit in the ESF data link
• Framing change from ESF to D4
No
Report Alarm Equipment
Yes
CV End of Range? (Event # 78)
Yes
Are there related faults (Phase, MTIE, and FREQ)?
No
Troubleshoot indicated alarms using this flowchart. Replace modules per troubleshooting.
Yes
Replace the indicated clock.
No
Report Alarm Equipment
Yes
Distribution Input Fault? (Event #46)
Yes
Is Clock or FG module failed or disabled?
Yes
Enable and/or troubleshoot indicated Clock or FG module.
No
Does alarm clear after verifying proper hardware settings on the FG?
No
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
No
Replace defective module.
No
Report Alarm Equipment
Yes
Distribution Output Fault? (Event #44)
Yes
Does alarm clear when suspect module is replaced with a known good module with the same configured options?
Yes
Replace defective module.
No
Any unterminated output cables from distribution panel to network element?
Yes
Properly terminate at NE or remove from distribution panel.
No
Check each output terminated at distribution panel for short. Do shorts exist?
Yes
Repair short.
No
Replace defective module.
To Input LMHO Alarm


Report Alarm Euipment
Yes
Input LMHO FAIL, CLK A/B? (Event 150/152)
Yes
Use test equpment to test the integrity of the input reference signal
Good
Does alarm clear when indicated Input module is replaced with a known good module with the same configured options?
Yes
Call Symmetricom Global Services for an RMA; exchange defective module
Bad
Correct facility problem.
No
Does alarm clear when indicated Clock module is replaced with a known good module with the same configured options?
Yes
No
Report Alarm Equipment
INP Port Fail? (Event # 154)
Replace the indicated defective Input module.
Local 1PPS Failed? (Event #1)
Replace the CPU module
Module Added? (Event #3)
Indicates a module has been added to the shelf. No action required.
Module Removed? (Event #34)
Indicates a module has been removed from the shelf No action required.
Module Bus Failed? (Event #110)
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
To Module Failed Alarm


Report Alarm
Euipment
Yes
Input LMHO FAIL, CLK A/B? (Event 150/152)
Yes
Use test equpment ot test the integrity of the input reference signal
Good
Bad
Correct facility problem.
Does alarm clear when indicated Input module is replaced with a known good module with the same configured options?
Yes
Call Symmetricom Global Services for an RMA; exchange defective module
No
Does alarm clear when indicated Clock module is replaced with a known good module with the same configured options?
Yes
No
Report Alarm Equipment
Yes
INP Port Fail? (Event # 154)
Yes
Replace the indicated defective Input module.
No
Report Alarm Equipment
Yes
Local 1PPS Failed? (Event #1)
Yes
Replace the CPU module.
No
Report Alarm Equipment
Yes
Module Added? (Event #3)
Yes
Indicates a module has been added to the shelf. No action required.
No
Report Alarm Equipment
Yes
Module Removed? (Event #34)
Yes
Indicates a module has been removed from the shelf. No action required.
No
Report Alarm Equipment
Yes
Module Bus Failed? (Event #110)
Yes
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
No
To Module Failed Alarm


Report Alarm Euipment
Yes
Module Failed? (Event #34)
Yes
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
No
Report Alarm Equipment
Yes
Module Halted? (Event # 121)
Yes
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
No
Report Alarm Equipment
Yes
No valid reference found? (Event #1)
Yes
Are input references properly connected at rear panel J1/J2?
Yes
Use test equipment to test integrity of the input reference signal.
Good
Is input termination properly set?
No
Make proper connections.
Bad
Correct facility problem.
No
Set proper termination.
No
Report Alarm Equipment
Yes
1 PPS Failed? (Event #57)
Yes
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
No
Report Alarm Equipment
Yes
Output Reference Invalid? (Event #42)
Yes
Troubleshoot systematically. This alarm is caused by clock/ FG faults.
No
Report Alarm Equipment
Yes
PLL Fault? (Event #92)
Yes
Retrieve the event history. The reported event indicates the affected module. Replace the indicated module.
No
To Power Failed Alarm


Report Alarm Euipment
Yes
Power Failed? (Event #13)
Yes
Are fuses blown on the rear panel of the TSG-3800?
No
Check fuses at the power source and replace as needed.
Yes
Replace 5A fuses
No
Report Alarm Equipment
Yes
System Bus failed? (Event #55)
Yes
Does alarm clear after removing unselected modules?
Yes
Replace last module removed before alarm was reported.
No
Does alarm clear after replacing the CPU module?
No
Replace TSG-3800 shelf.
No
Report Alarm Equipment
Yes
Is TSG-3800 in Bypass? (Event #147)
Yes
Are both Clock modules failed or removed?
Yes
Replace Clock module(s).
No
Report Event
Yes
Is Clock in Loop mode? (Event #11)
Yes
No action required
No
Report Event
Yes
Clock type changed? (Event #82)
Yes
No action required
No
Report Event
Yes
Chosen CPU Clock? (Event #16)
Yes
No action required
No
To Input SQL Event



Re-ordering Information

To re-order any module or accessory, contact the Sales Department at Symmetricom. Provide the module or accessory name and its part number along with a purchase order number. A current list of modules and accessories and their Symmetricom part numbers are provided in Appendix A, Part Numbers.

Preparing the Unit for Shipment

Repacking

When you ship the TSG-3800, take special precautions to protect the front and rear panels from damage. Connectors should be covered with protective connector covers. The TSG-3800 should be wrapped in plastic before packaging. Symmetricom recommends that custom foam packing material be used, as it conforms to the shape of the instrument and offers better protection during shipping.

Equipment Return Procedure

To return a module to the factory or local representative for repair:

1. Obtain a return authorization from Symmetricom prior to returning a module for service. Call Symmetricom Global Services for a return authorization number.

2. Provide a description of the trouble, module item number, serial number, and warranty expiration date.

3. Provide return shipping information (customer field contact, address, phone number, etc.).

4. Ship the unit to Symmetricom, transportation prepaid and insured, with the Return Authorization Number and unit serial number clearly marked on the outside of the carton, to:

   ATTN: Global Services
   Symmetricom, Inc.
   Aguadilla Site
   Montana Industrial Park
   Street B, Lot 52
   Aguadilla, PR 00603
   Tel: 787-658-3535
   Fax: 787-658-3560

Chapter 5 Input Modules

This chapter describes the different Input modules that are available for the TSG-3800 series, their functionality, functional block diagrams, switch and jumper settings.

Note: All shelves have identical functionality; however, only EMI-compliant modules should be used in the TSG-3800E shelf (see Appendix A, Part Numbers).

In This Chapter:

- Composite Clock Input Module
- G.703/9 Input Module
- Single-Port Input Module
- Three-Port Input Module

Composite Clock Input Module

The Composite Clock Input module (23476674-xxx-0) measures the phase between a composite clock (CC) input signal and the oscillator in the active Clock module. The module also detects and provides visible indication of Loss Of Signal (LOS). Figure 5-1 shows the front panel.

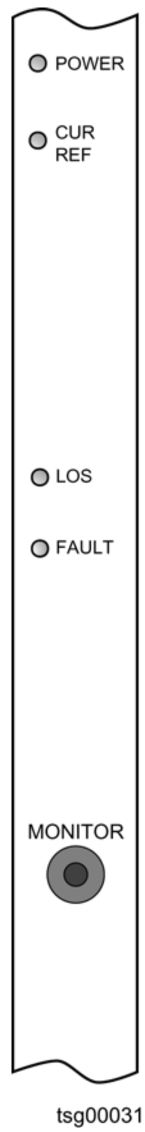


Figure 5-1. Composite Clock Input Module

The CC Input module front panel contains:

- Status indicators
- A Bantam jack for monitoring the CC input signal

Table 5-1 describes the indicators located on the front panel of the CC Input module.

Table 5-1. Indicators on the Composite Clock Input Module

Indicator	Color	Description
POWER	Green	On = Power is applied.
REF	Green	On = The oscillator is phase locked to the input reference applied to this module.
LOS	Red	On = Loss of Signal.
FAULT	Red	On = Module Failure

The CC input signal is accessible at the front panel MONITOR jack and is available whenever an input signal is present. This monitor is isolated from the input by 860 Ω.

Functional Description

Figure 5-2 is a block diagram of the CC Input module. The CC Input module extracts clock and data from the CC input signal. A divide-by circuit reduces the input signal to 1 Hz. A Phase Detector then measures the phase between the CC input signal and the system clock over a 1 second interval.

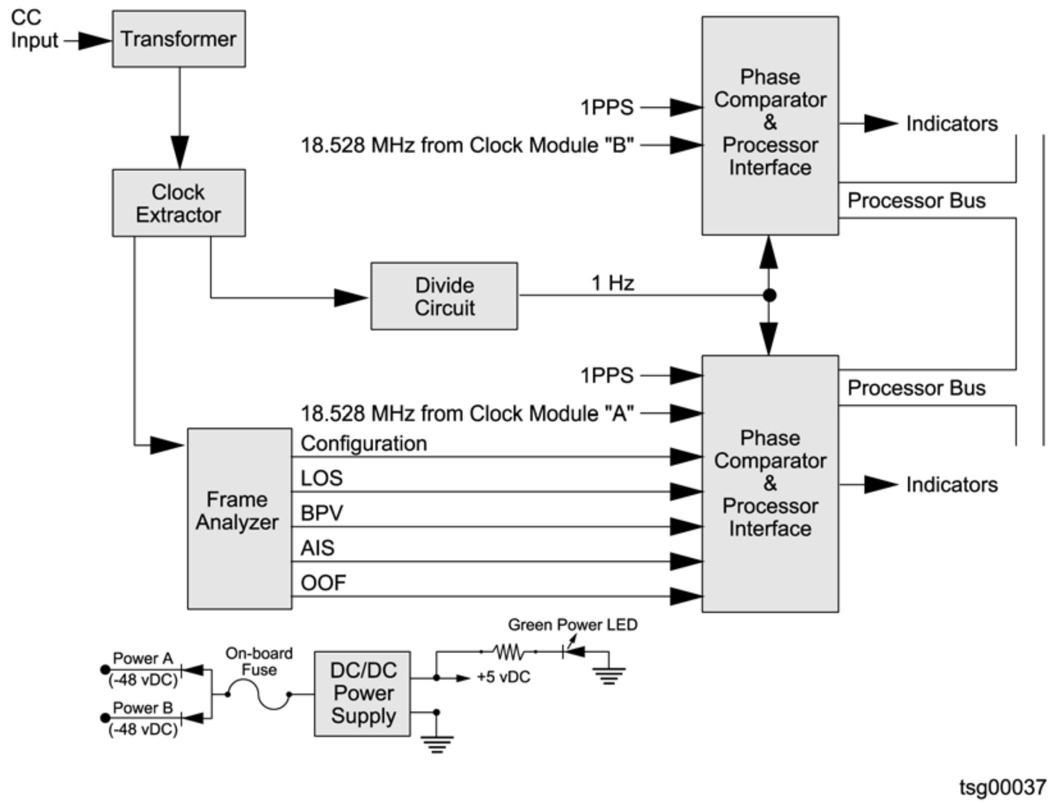


Figure 5-2. Block Diagram of the Composite Clock Input Module

A loss-of-signal detector circuit monitors for signal presence. Should the signal be lost, the front panel LOS indicator is lit.

The main shelf supplies –48 V input power to the module. A regulator converts the input power to the required levels. When receiving power, the Power indicator is lit.

Specifications

Table 5-2 lists specifications for the CC Input module.

Table 5-2. Specifications, Composite Clock Input Module

Signal Characteristics	Specification
Frequency	64/8 kb/s
Waveshape	Rectangular, AMI
Amplitude	2.7 to 5.5 V base to peak (3 V nominal)
Error Threshold (LOS)	0 to 255 intervals per hour
Input Impedance	133 Ω ± 5% resistive
Monitor	Bantam jack, 860 Ω isolation

Installing the CC Input Module

The CC Input module can be installed in slots 1 through 4 of the TSG-3800 main shelf. The slot determines the priority level of the input signal; see Slot Location and Keyed Modules, on page 61.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Making Signal Connections

Each Input module slot in the TSG-3800 main shelf has a corresponding input connector on the rear panel, Locate the connector on the rear panel that corresponds to the slot in which the CC Input module is installed, then connect the external reference signal as described in Making Input Signal Connections, on page 54.

Operational Check

Perform the following operational checks after installing the CC Input module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify that the module is receiving the proper CC input signals by observing the indicators. For locked operation the indicators should appear as described in Table 5-3.

Table 5-3. Indicator Status

Indicator Name	State
POWER	On
REF	On or Off
LOS	Off
FAULT	Off

Note: The indicators may take a few seconds to reach proper status after you insert the module.

G.703/9 Input Module

The G.703/9 Input Module (23477682-xxx-0) measures the phase between a G.703/9 input signal and the oscillator in the active Clock module. The module also detects signal quality errors on the G.703/9 input and provides indication of their occurrence. Figure 5-3 shows the front panel.

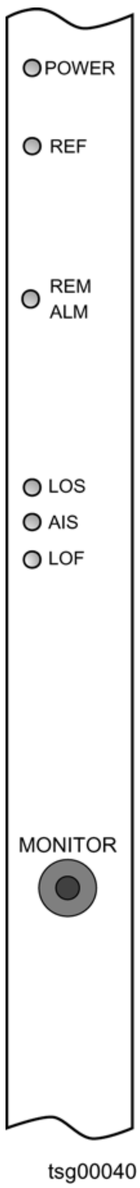


Figure 5-3.   G.703/9 Input Module

The G.703/9 Input Module front panel contains:

- Status indicators
- A Bantam jack for monitoring the G.703/9 input signal

The module is selectable for:

- Accepting a G.703/9 input in either CAS or CCS format.
- Accepting a G.703/9 input in either HDB3 or AMI format.
- Setting the input impedance for terminating the G.703/9 line, attaching to a monitor point or providing a high impedance bridge.

Table 5-4 describes the indicators located on the front panel of the G.703/9 Input Module.

Table 5-4. Indicators, G.703/9 Input Module

Indicator	Color	Description
POWER	Green	On = Power is applied
REF	Green	On = The oscillator is phase locked to the input reference applied to this module
REM ALM	Amber	On = A remote alarm is received
LOS	Red	On = Loss of Signal. ≥ 32 consecutive zeros
AIS	Red	On = Alarm Indication Signal. < 3 zeros in the last two multiframes read
LOF	Red	On = Loss Of Frame

The G.703/9 input signal is available at the front panel MONITOR jack whenever an input signal is present. This monitor is isolated from the input by 860 Ω.

Functional Description

Figure 5-4 is a block diagram of the G.703/9 Input Module, which extracts clock and data from a G.703/9 input signal. A Frame Analyzer detects frame and superframe alignment markers and examines the G.703/9 input for errors (BPV, LOS, AIS, LOF).

A Phase Detector measures the phase between the G.703/9 input signal and the system clock over a 1 second interval.

The Backplane Assembly supplies –48 V input power to the module. A regulator converts the input power to the required levels. When receiving power, the front panel POWER indicator is lit.

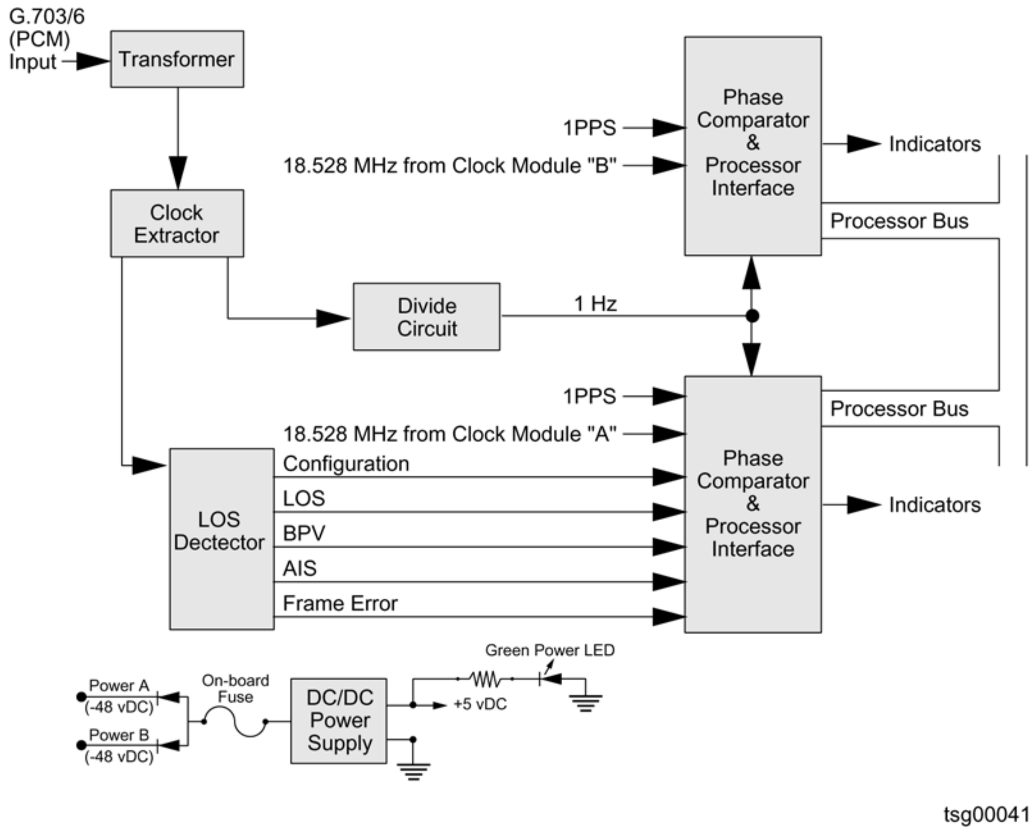


Figure 5-4. Block Diagram of the G.703/9 Input Module

Specifications

Table 5-5 lists specifications for the G.703/9 Input module.

Table 5-5. Specifications, G.703/9 Input Module

Signal Characteristic	Specification
Type	G.703/9 PCM signal
Bit Rate	2048 kb/s
Format	CAS or CCS (jumper selectable) CRC4 enabled/disabled (jumper selectable) HDB3 or AMI
Amplitude (nominal)	0.75 to 3.6 Volts (base to peak)
Amplitude (with amplifier)	–15 dB below nominal
Pulse Width	194 to 269 ns at the peak (244 ns nominal)
Jitter Tolerance	per CCITT G.823
Input Error Threshold	0 to 3600 intervals per hour (AIS, LOS, LOF, BPV)

Table 5-5. Specifications, G.703/9 Input Module (Continued)

Signal Characteristic	Specification
Input Impedance	75, 120, or 3.3 kΩ (jumper selectable)
Monitor	Bantam jack, 860 Ω isolation

Configuring the G.703/9 Input Module

The user can modify operations of the G.703/9 Input module by setting jumpers. The jumpers are labeled TB1 through TB5. Figure 5-5 illustrates one of the terminal blocks. Pin A is identified by the arrow.

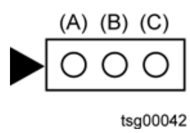


Figure 5-5. Terminal Block on the G.703/9 Input Module

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Selecting CAS/CCS Framing

You must configure the G.703/9 Input module to match the G.703/9 framing of the input signal (CAS or CCS). To select CAS or CCS framing, set the jumper on TB5 as shown in Table 5-6.

Table 5-6. Selecting CAS/CCS Framing

Framing Selection	TB5 Jumper Position
CAS	B to C
CCS	A to B

Selecting HDB3/AMI Format

To select DB3 or AMI formatting, set the jumper on TB3 as shown in Table 5-7.

Table 5-7. Selecting HDB3/AMI Framing

Framing Selection	TB3 Jumper Position
HDB3	A to B
AMI	B to C

Enabling CRC Checking

You can configure the G.703/9 Input module to enable CRC checking when CAS is also enabled. To configure CRC checking, set the jumper on TB2 as shown in Table 5-8.

Table 5-8. Enabling CRC Checking

CRC	TB2 Jumper Position
Enabled	A to B
Disabled	B to C

Selecting the Input Impedance

You can terminate the G.703/9 input line with 75 Ω, 120 Ω, or 3.3 kΩ (bridging). To select the impedance, set the jumper on TB4 as shown in Table 5-9.

Table 5-9. Selecting the Impedance

Input Impedance	TB4 Jumper Position
120 Ω	A to B
75 Ω	B to C
3.3 kΩ (bridging)	Remove jumper

Connecting to a Monitor Point

You can set the G.703/9 Input module for connection to a G.703/9 monitor point. To connect the input signal to a 15 dB gain amplifier, set the jumper on TB1 as shown in Table 5-10.

Table 5-10. Enabling the Amplifier

Amplifier	TB1 Jumper Position
Disabled	A to B
Enabled	B to C

Installing the G.703/9 Input Module

The G.703/9 Input module can be installed in slots 1 through 4 of the TSG-3800 main shelf. The slot determines the priority level of the input signal; see Slot Location and Keyed Modules, on page 61.

Making Signal Connections

Each Input module slot in the TSG-3800 main shelf has a corresponding input connector on the rear panel, Locate the connector on the rear panel that corresponds to the slot in which the G.703/9 Input module is installed, then connect the external reference signal as described in Making Input Signal Connections, on page 54.

Operational Check

Perform the following operational checks after installing the G703/9 Input module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify the module is receiving the proper G.703/9 input signals by observing the indicators. For locked operation the indicators should be as shown in Table 5-11.

Table 5-11. Indicator Status

Indicator Name	State
POWER	On
REF	On or Off
REMOTE ALARM	Off
LOS	Off
AIS	Off
LOF	Off

Note: The indicators may take a few seconds to reach proper status after you insert the module.

Single-Port Input Module

The Single-Port Input module (23478303-0*x*2-0) provides enhanced measurement resolution and synchronous status message (SSM) reading in addition to the combined capabilities of the current Input modules. This module allows you to connect a single channel that can be used as a reference input or as a monitor-only input. This module accepts DS1 (1.544 Mb/s) or E1 (2.048 Mb/s) framed AMI inputs as well as Clock or Sine inputs at several frequencies. Figure 5-6 shows the front panel of the module.

Note: This module requires the CPU module, item number 23478301-*xxx*-0, running S/W Revision C or higher.

The input signal type, format and termination impedance are user- selectable parameters; you provision these parameters through one of the TSG-3800 Communications ports using the *INP* command described in Input Command, on page 350.

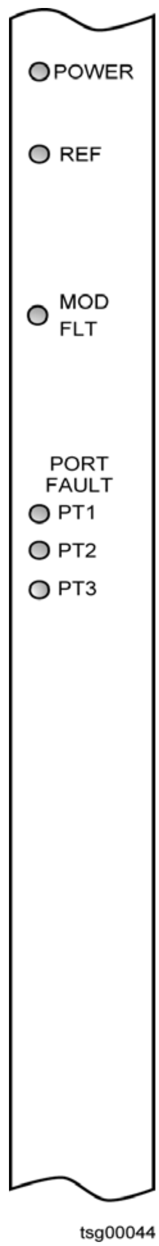


Figure 5-6. Single-Port Input Module

This module can replace:

- DS1 Input module, part number 23476554-*xxx*-0
- G703/6 (E1) Input module, part number 23477682-*xxx*-0
- Sine Input module, part number 23476935-*xxx*-0
- Clock Input module, part number 23478297-*xxx*-0

Table 5-12 describes the status indicators (LEDs) located on the front panel of the Single-Port Input module.

Table 5-12. Single-Port Input Module Indicators

Indicator	Color	Description
POWER	GREEN	On = Power is applied
REF	GREEN	On = The Clock Modules are locked to on of the references applied to this module
MOD FLT	RED	On = A non-input signal related fault condition exists on this module
PORT FAULT PT1	RED	On = A fault condition exists with the input signal on this module

Functional Description

Refer to Figure 5-7 for the following functional discussion. The T1 version accepts DS1 signals in SF (D4) or ESF format with or without B8ZS zero suppression. The input circuits provide DC blocking and transformer isolation for balanced AMI signals. The termination is user-selectable for 100 ohm (line) or 3.3k ohm (bridging) at levels of +3 to –24 dBDSX (line). The module monitors and reports occurrences of loss of signal (LOS), alarm indicator signal (AIS), out of frame (OOF), and bipolar violations (BPV). In ESF mode the module also monitors and reports CRC errors, and the synchronous quality level SSM messages in the FDL channel.

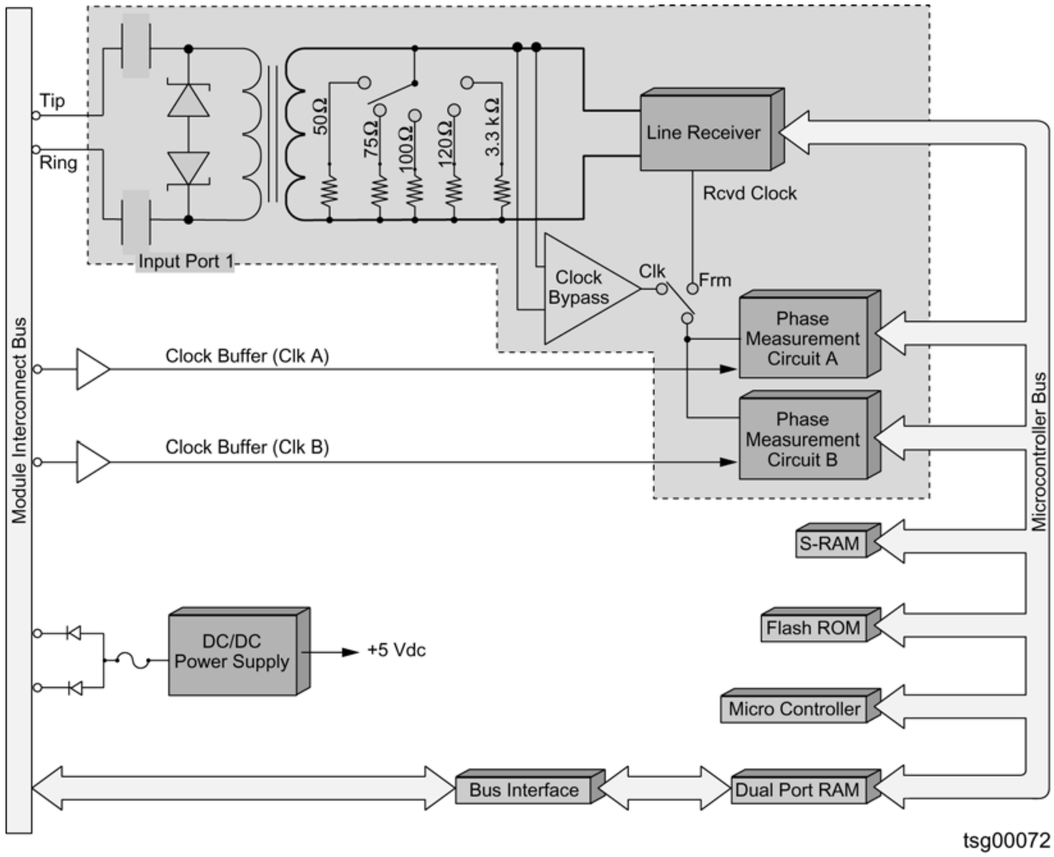


Figure 5-7. Single-Port Input Module Block Diagram

The E1 version accepts 2048 kHz PCM signals in either CAS or CCS format with or without HDB3 zero suppression. The input circuits provide DC blocking and transformer isolation for balanced or single-ended AMI signals. The termination is selectable for 120 Ω (balanced), 75 Ω (single-ended), or 3.3 kΩ (bridging) with a level of +3 dB to -27dBTLO. The module monitors and reports occurrences of loss of signal (LOS), alarm indicator signal (AIS), loss of frame alignment (LOF), and bipolar violations (BPV). When set for CAS mode, the CRC4 checking may also be enabled. The synchronous quality level SSM message in TS0 can be read and reported, if available.

In addition to the input transformer, amplification is available to allow for proper operation of the Input module when a port is connected to a monitor source. A monitor source is a high impedance source, providing isolation of a critical DS1/E1 signal from the TSG-3800 input. With the isolation comes a loss of approximately 20 dB in signal strength at the TSG-3800 input. For this type of input signal, amplification must be provided to restore the signal level. This is available either through input transformer and jumper configuration, or by a transistor amplifier circuit selected by jumper, depending on the revision level of the module being used. For all DS1/E1 signals that do not pass through an isolation circuit, and for all clock input signals, the amplifier is not used.

All versions accept square wave or sine wave input signals at a selectable rate of 1 MHz, 1.544 MHz, 2.048 MHz, 5 MHz, or 10 MHz. This allows use of a 2.048 MHz signal conforming to ITU-T Rec. G.703/10 or other standard reference signals such as 5 MHz or 10 MHz signals from a PRS. The input circuits provide DC blocking and transformer isolated for either single ended, balanced, or differential inputs with the termination selectable for 50 Ω, 75 Ω, 100 Ω, 120 Ω, or 3.3 k Ω. Clock inputs report occurrences of loss of signal (LOS) or frequency out of range.

The single channel versions contain two counters to monitor the phase of the input signals with respect to the system clocks. Phase measurements have a resolution of 1 nanosecond and accuracy of 5 nanoseconds or better with a sample rate of 20 per second. The one second averaged phase reading and the MTIE measurements are reported to the CPU module each second. TDEV and MTIE calculations are performed on the 20 samples per second measurements and results presented to the CPU module when requested. The module configuration for each input of framed or clock, frequency, and termination is settable and readable through the use of software commands. Any mismatch between input signal and module configuration will be detected and reported when possible.

The module uses a micro-controller to make the measurements, perform the calculations, and interface to the unit CPU through dual port RAM (memory). The phase measurements are read and stored from two counters, 1 input in contrast with 2 clocks, 20 times each second. The one second averages for each measurement are computed and stored for transfer to the CPU each second. The minimum and maximum phase reading for MTIE and the TDEV calculations are also stored for the 20 samples each second for the three inputs against the selected clock. This data can be retrieved by the CPU to provide MTIE and TDEV results over any portion of the previous 24 hours of continuous operation.

The micro-controller performs power-up self tests on the module to verify correct operation and configures the input circuits to the setup stored in the non-volatile RAM. The setup information identifies each expected input as a framed or clock signal, frequency, termination, framing format, zero suppression mode, and CRC checking. If the module is replacing a same type, the setup information is updated by the CPU, else the setup is transferred to the CPU. The module provides the module Item Number (I/N), Serial Number (S/N), and Firmware (F/W) Rev to the CPU. For framed input signals the micro-controller monitors for LOS, AIS, OOF, BPV, and CRC errors each second and reads the SSM if available. For clock signals the input is checked for LOS and a valid frequency. The micro-controller also operates the front panel LED indicators to provide a visual status indication. A watchdog timer circuit provides detection of improper micro-controller operation.

This module gets power from the Shelf Interconnect board, Power A and B. These redundant sources of –48 vDC are diode coupled and fused, allowing it to draw power from either source. The internal fuse labeled F1, protects the circuitry from excessive current. The DC-TO-DC CONVERTER changes the negative voltage into +5 vDC and the green POWER LED on the front panel indicates power is available to the module. The POWER indicator turns off in the event of any loss of power, such as the fuse on the module opens, loss of both –48 vDC power inputs, or if the regulator fails.

Specifications

Table 5-13 list functional specifications for the Single-Port Input module.

Table 5-13. Single-Port Input Module Specifications

Signal Characteristic	Specification
DS1 Inputs	
Type	D4/SF or ESF (user-selectable)
Bit Rate	1544 kb/s
Format	AMI or B8ZS (per ANSI T1.102 & ITU-TG.703/2)
Amplitude Range	+3 to –24 dBDSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Section 4.
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, OOF, BPV, CRC)
Input Impedance	100 or 3.3 kΩ (user-selectable)
E1 Inputs	
Type	G.703/6 Framed E1
Bit Rate	2048 kb/s
Format	CAS or CCS (per ITU-TG.703/2 & ANSI T1.102 DS1A CRC4 enabled/disabled AMI or HDB3)
Amplitude Range	+3 to -27 dBTLO (Transmit Line Output)
Jitter and Wander Tolerance	Meets the requirements of ITU-TG.823
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, LOF, BPV, CRC)
Clock Inputs	
Frequency	1, 1.544, 2.048, 5, or 10 MHz (user-selectable)
Wave Shape	Sine or Square
Amplitude Range	1.5 to 10 Volts (peak to peak)
Input Error Threshold	0 to 255 Intervals per hour (LOS)
Input Impedance	50, 75, 100, 120 or 3.3 kΩ (user-selectable)

Configuring the Single-Port Input Module

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

There is one setting that must be set appropriately before the module is installed. This controls the amplification of the input signal for use with monitor inputs. There are two variations of this depending on the module revision level. Earlier version modules include a daughter card installed on the module containing two transformers and a jumper. The jumper is installed in the lower position, and the transformers are installed in the upper position for normal input signal operation. To use the port with monitor level (–20 dB) signals, move the jumper for that port to the upper position, and both transformers for that port to the lower position.

For revision D and later modules, the daughter board is not present and monitor signal operation is selected by moving the appropriate port jumper from pins 1-2 to pins 2-3. This sets the amplifier for a gain of approximately 20 dB. If the signal is not from a monitor port, or if it is any clock signal, then the amplification is not used. The jumper is set to W11-port 1. Pin 1 of the jumper is the top pin of the 3-pin header (from the component side), with the module panel at the top and the circuit board edge connector at the bottom.

Default Settings

The user can modify operation of this module through the use of one of the TSG-3800 communications ports using the *INP* command describe in Input Command, on page 350. The Factory Default setting, unless otherwise specified for a DS1 Input version all ports, include the following:

- Type: ESF
- Format: B8ZS
- Impedance: 100 Ω
- SSM: OFF

The Factory Default setting unless otherwise specified for a E1 Input version all ports are:

- Type: G.703/6
- Format: CAS, CRC4 enabled, HDB3
- Impedance: 120 Ω
- SSM: OFF

Installing the Single-Port Input Module

The Single-Port Input module can be installed in slots 1 through 4 of the TSG-3800 main shelf. The slot determines the priority level of the input signal; see Slot Location and Keyed Modules, on page 61.

Making Signal Connections

Each Input module slot in the TSG-3800 main shelf has a corresponding input connector on the rear panel. Locate the connector on the rear panel that corresponds to the slot in which the Single-Port Input module is installed, then connect the external reference signal as described in Making Input Signal Connections, on page 54.

The input signal connector is a set of wire-wrap pins or a DB-9 connector. For the wire-wrap connector, the shield of the input cable is connected to Pin 1, ground (GND), which is connected to Frame Ground (FG). Pins 2 and 3, labeled T1 (tip) and R1 (ring), are the balanced reference input pins for the external reference source. The remaining pins (4 and above) in this connector are not used by this module.

The DB-9 connector completely shields the external reference from the source to the input. On this connector, the Frame Ground connection is made at Pin 1. The external reference is connected to Pin 2 (labeled T1) and to Pin 6 (labeled R1). The remaining pins (pins 3, 4, 5, 7, 8, and 9) in this connector are not used by this module.

Operational Check

Perform the following operational checks after installing the One-Port Input module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify the module is receiving the proper input signals by observing the indicators. For locked operation, the indicators should be as described in Figure 5-14.

Table 5-14. Locked Operation Indicators

Indicator	State
POWER	On
REF	On or Off
MOD FLT	Off
PORT FAULT PT1	Off

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Three-Port Input Module

The Three-Port Input Module (23478303-0*x*1-0) provides enhanced measurement resolution and synchronous status message (SSM) reading in addition to the combined capabilities of the current Input modules. This Input module provides three channel capability, where any one of the three inputs may be selected as reference inputs, or they may be used as monitor-only inputs. This module provides input for DS1 (1.544 Mb/s) or E1 (2.048 Mb/s) framed AMI inputs. It accepts Clock or Sine inputs at several frequencies on any input. Figure 5-8 shows the front panel of the Three-Port Input module.

Note: This module requires the CPU Module (23478301-*xxx*-0) running software Revision C or higher.

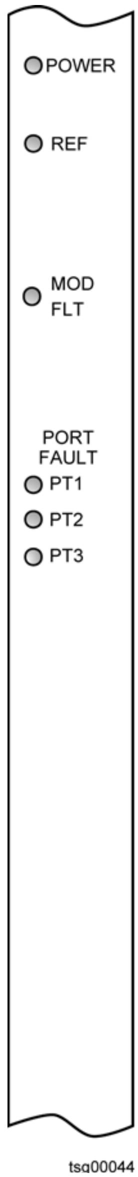


Figure 5-8. Three-Port Input Module

This module can replace:

- DS1 Input Module (23476554-*xxx*-0)
- G703/6 (E1) Input Module (23477682-*xxx*-0)
- Sine Input Module (23476935-*xxx*-0)
- Clock Input Module (23478297-*xxx*-0)

Selection of input signal type, format and termination impedance are user-selectable parameters and is done through one of the TSG-3800 Communications ports using the *INP* command described in Input Command, on page 350.

Table 5-15 describes the status indicators (LEDs) located on the front panel of the Three-Port Input module.

Table 5-15. Three-Port Input Module Indicators

Indicator	Color	Description
POWER	GREEN	On = Power is applied
REF	GREEN	On = The Clock Modules are locked to one of the references applied to this module.
MOD FLT	RED	On = A fault condition not related to the input signal exists on this module.
PORT FAULT PT1	RED	On = A fault condition exists with the input signal on port ONE of this module.
PORT FAULT PT2	RED	On = A fault condition exists with the input signal on port TWO of this module.
PORT FAULT PT3	RED	On = A fault condition exists with the input signal on port THREE of this module.

Functional Description

Refer to Figure 5-9 for the following functional discussion. The T1 version accepts DS1 signals in SF (D4) or ESF format with or without B8ZS zero suppression. The input circuits provide DC blocking and transformer isolation for balanced AMI signals. The termination is user-selectable for 100 Ω (line) or 3.3 kΩ (bridging) at levels of +3 to –24 dBDSX (line). The module monitors and reports occurrences of loss of signal (LOS), alarm indicator signal (AIS), out of frame (OOF), and bipolar violations (BPV). In ESF mode the module also monitors and reports CRC errors, and the sync quality level (SSM) messages in the FDL channel.

The E1 version accepts 2048 kHz PCM signals in either CAS or CCS format with or without HDB3 zero suppression. The input circuits provide DC blocking and transformer isolation for balanced or single-ended AMI signals. The termination is selectable for 120 ohm (balanced), 75 ohm (single-ended), or 3.3k ohm (bridging) with a level of +3 dB to –27dBTLO. The module monitors and reports occurrences of loss of signal (LOS), alarm indicator signal (AIS), loss of frame alignment (LOF), and bipolar violations (BPV). When set for CAS mode, the CRC4 checking may also be enabled. The sync quality level message (SSM) in TS0 can be read and reported, if available.

In addition to the input transformer, amplification is available to allow for proper operation of the Input module when a port is connected to a monitor source. A monitor source is a high impedance source, providing isolation of a critical DS1/E1 signal from the TSG input. With the isolation comes a loss of approximately 20 dB in signal strength at the TSG input. For this type of input signal, amplification must be provided to restore the signal level. This is available either through input transformer and jumper configuration, or by a transistor amplifier circuit selected by jumper, depending on the revision level of the module being used. For all DS1/E1 signals that do not pass through an isolation circuit, and for all clock input signals, the amplifier is not used.

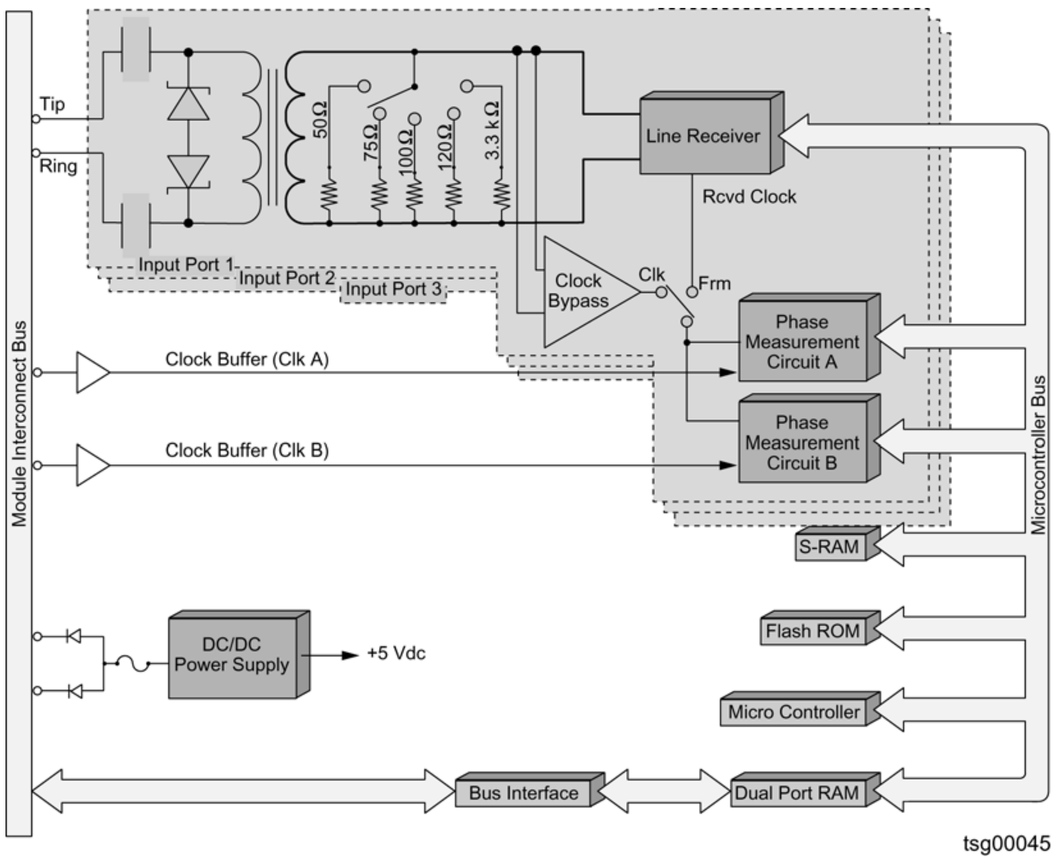


Figure 5-9. Three-Port Input Module Block Diagram

All versions accept square wave or sine wave input signals at a selectable rate of 1 MHz, 1.544 MHz, 2.048 MHz, 5 MHz, or 10 MHz. This allows use of a 2.048 MHz signal conforming to ITU-T Rec. G.703/10 or other standard reference signals such as 5 MHz or 10 MHz signals from a PRS. The input circuits provide DC blocking and transformer isolated for either single ended, balanced, or differential inputs with the termination selectable for 50 Ω, 75 Ω, 100 Ω, 120 Ω, or 3.3 k Ω. Clock inputs report occurrences of loss of signal (LOS) or frequency out of range.

The three-channel version of this module contains six counters to monitor the phase of the input signals with respect to the system clocks. Phase measurements have a resolution of 1 nanosecond and accuracy of 5 nanoseconds or better with a sample rate of 20 per second. The one second averaged phase reading and the MTIE measurements are reported to the CPU module each second. TDEV and MTIE calculations are performed on the 20 samples per second measurements and results presented to the CPU module when requested. The module configuration for each input of framed or clock, frequency, and termination can be set and read using software commands. Any mismatch between input signal and module configuration is detected and reported when possible.

The module uses a micro-controller to make the measurements, perform the calculations, and interface to the unit CPU through dual port RAM (memory). The phase measurements are read and stored from six counters, 3 inputs in contrast with 2 clocks, 20 times each second. The one second averages for each measurement are computed and stored for transfer to the CPU each second. The minimum and maximum phase reading for MTIE and the TDEV calculations are also stored for the 20 samples each second for the three inputs against the selected clock. This data can be retrieved by the CPU to provide MTIE and TDEV results over any portion of the previous 24 hours of continuous operation.

The micro-controller performs power-up self tests on the module to verify correct operation and configures the input circuits to the setup stored in the non-volatile RAM. The setup information identifies each expected input as a framed or clock signal, frequency, termination, framing format, zero suppression mode, and CRC checking. If the module is replacing a same type, the setup information is updated by the CPU, else the setup is transferred to the CPU. The module provides the module Item Number (I/N), Serial Number (S/N), and Firmware (F/W) Rev to the CPU. For framed input signals the micro-controller monitors for LOS, AIS, OOF, BPV, and CRC errors each second and reads the SSM if available. For clock signals the input is checked for LOS and a valid frequency. The micro-controller also operates the front panel LED indicators to provide a visual status indication. A watchdog timer circuit provides detection of improper micro-controller operation.

This module gets power from the main shelf, Power A and B. These redundant sources of –48 vDC are diode coupled and fused, allowing it to draw power from either source. The internal fuse labeled F1, protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC and the green POWER LED on the front panel indicates power is available to the module. The POWER indicator turns off in the event of any loss of power, such as the fuse on the module opens, loss of both –48 vDC power inputs, or if the regulator fails.

Specifications

Table 5-16 lists the functional specifications for the Three-Port Input module.

Table 5-16. Three-Port Input Module Specifications

Signal Characteristic	Specification
	DS1 Inputs
Type	D4/SF or ESF (user-selectable)
Bit Rate	1544 kb/s
Format	AMI or B8ZS (per ANSI T1.102 & ITU-TG.703/2)
Amplitude Range	+3 to –24 dBDSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Section 4.
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, OOF, BPV, CRC)
Input Impedance	100 or 3.3 kΩ (user-selectable)
	E1 Inputs
Type	G.703/6 Framed E1
Bit Rate	2048 kb/s
Format	CAS or CCS (per ITU-TG.703/2 & ANSI T1.102 DS1A CRC4 enabled/disabled AMI or HDB3)
Amplitude Range	+3 to -27 dBTLO (Transmit Line Output)
Jitter and Wander Tolerance	Meets the requirements of ITU-TG.823
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, LOF, BPV, CRC)
	Clock Inputs
Frequency	1, 1.544, 2.048, 5 or 10 MHz (user-selectable)
Wave Shape	Sine or Square
Amplitude Range	1.5 to 10 Volts (peak to peak)
Input Error Threshold	0 to 255 Intervals per hour (LOS)
Input Impedance	50, 75, 100, 120 or 3.3 kΩ (user-selectable)

Configuring the Three-Port Input Module

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

There is one setting for each port that must be set appropriately before the module is installed. This controls the amplification of the input signal for use with monitor inputs. There are two variations of this depending on the module revision level. Earlier version modules include a daughter card installed on the module containing two transformers and a jumper for each port. The jumper will be installed in the lower position, and the transformers installed in the upper position for normal input signal operation. To use the port with monitor level (–20 dB) signals, move the jumper for that port to the upper position, and both transformers for that port to the lower position.

For revision D and later modules, the daughter board is not present, and monitor signal operation is selected by moving the appropriate port jumper from pins 1-2 to 2-3 position. This sets the amplifier for a gain of approximately 20 dB. If the signal is not from a monitor port, or is any clock signal, then the amplification is not used. The jumpers are W11-port 1, W10-port 2, and W9-port 3. Pin 1 of the jumper is the top pin of the 3-pin header when the module is viewed from the component side, with the module panel at the top and the circuit board edge connector at the bottom.

Default Settings

The user can modify operation of this module through the use of one of the TSG-3800 communications ports using the *INP* command as described in Input Command, on page 350. The Factory Default settings for all ports on the DS1 Input version, unless otherwise specified, are:

- Type: ESF
- Format: B8ZS
- Impedance: 100 Ω
- SSM: OFF

The Factory Default setting for all ports on the E1 Input version, unless otherwise specified, are:

- Type: G.703/6
- Format: CAS, CRC4 enabled, HDB3
- Impedance: 120 Ω
- SSM: OFF

Installing the Three-Port Input Module

The Three-Port Input module can be installed in slots 1 through 4 of the TSG-3800 main shelf. The slot determines the priority level of the input signal; see Slot Location and Keyed Modules, on page 61.

Making Signal Connections

Each Input module slot in the TSG-3800 main shelf has a corresponding input connector on the rear panel. Locate the connector on the rear panel that corresponds to the slot in which the Single-Port Input module is installed, then connect the external reference signal as described in Making Input Signal Connections, on page 54.

The input signal connector is a set of wire-wrap pins or a DB-9 connector. For the wire-wrap connector, the shield of the input cable is connected to Pin 1, ground (GND), which is connected to Frame Ground (FG). Pins 2 and 3, labeled T1 (tip) and R1 (ring), are the balanced reference input pins for the external reference source. The remaining pins (4 and above) in this connector are not used by this module.

The DB-9 connector completely shields the external reference from the source to the input. On this connector, the Frame Ground connection is made at Pin 1. The external reference is connected to Pin 2 (labeled T1) and to Pin 6 (labeled R1). The remaining pins (pins 3, 4, 5, 7, 8, and 9) in this connector are not used by this module.

Operational Check

Perform the following operational checks after installing the Three-Port Input module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify the module is receiving the proper input signals by observing the indicators. For locked operation, the indicators should be as described in Table 5-17.

Table 5-17. Locked Operation Indicators

Indicator	State
POWER	On
REF	On or Off
MOD FLT	Off
PORT FAULT PT1	Off

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Chapter 6 CPU, Frame Generator, and Clock Modules

This chapter describes the CPU module, the Clock modules, and the Frame Generator modules that are available for the TSG-3800 series, their functionality, functional block diagrams, switch, and jumper settings.

Note: All shelves have identical functionality; however, only EMI-compliant modules should be used in the TSG-3800E shelf (see Appendix A, Part Numbers).

In This Chapter:

- CPU Module
- Clock Module
- T1/E1 Frame Generator Module with SSM
- T1/E1 Frame Generator Module with Clock Bypass

CPU Module

The CPU module (23478301-011-0) controls and monitors the operation of the Timing Signal Generator. This module also provides a common interface for operator control of other modules. The CPU module contains:

- Front panel status indicators
- EIA-232 connectors for executing control adjustments and obtaining data readout
- Alarm relay contacts for major and minor alarms (remote, local, and audio)
- A front panel ALARM CUTOFF push-button switch for resetting the Audio Alarm

The front panel of the CPU Module is shown in Figure 6-1.

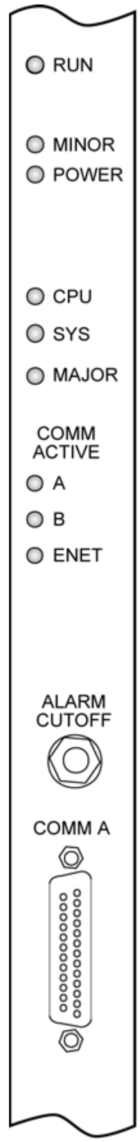


Figure 6-1. CPU Module

Table 6-1 describes the CPU module's front panel status indicators.

Table 6-1. CPU Module Indicators

Indicator	Color	Description
RUN	Green	On = The module is receiving power and processor is operational. Off = Processor is not operational.
MINOR	Amber	On = A failure exists
POWER	Amber	On = One of the –48 V power inputs has failed.

Table 6-1. CPU Module Indicators (Continued)

Indicator	Color	Description
CPU	Red	On = Microprocessor has malfunctioned. This condition causes a major alarm.
SYS	Red	On = A hardware fault within the TSG system. This condition causes a major alarm.
MAJOR	Red	On = Loss of synchronization. Immediate action required
COMM ACTIVE A	Green	On = Front panel EIA-232 port is in use. This indicator on only during data transfer.
COMM ACTIVE B	Green	On = Rear panel EIA-232 port is in use. This indicator is used only during data transfer.
ENET	Green	On = Ethernet packets transmitted or received.

Push the ALARM CUTOFF switch on the front panel to turn off the AUDIO alarm. This does not clear the alarm condition. Correcting the alarm condition deactivates the MAJOR or MINOR local and remote contacts and turns off the corresponding indicators. The **ALARM CLEAR** command also turns off the audio alarm as well as the MAJOR and MINOR alarm indicators.

Functional Description

Refer to Figure 6-2 for the following functional discussion of the CPU module. This module contains a microprocessor that performs measurements, monitors for errors, and collects data. Two EIA-232 ports allow the microprocessor to communicate with the operator. One port is on the CPU Module front panel, the other is on the rear panel of the main shelf.

The processor determines when an alarm condition exists and activates the appropriate relays. This module accepts an external command for resetting the AUDIO alarm contacts.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

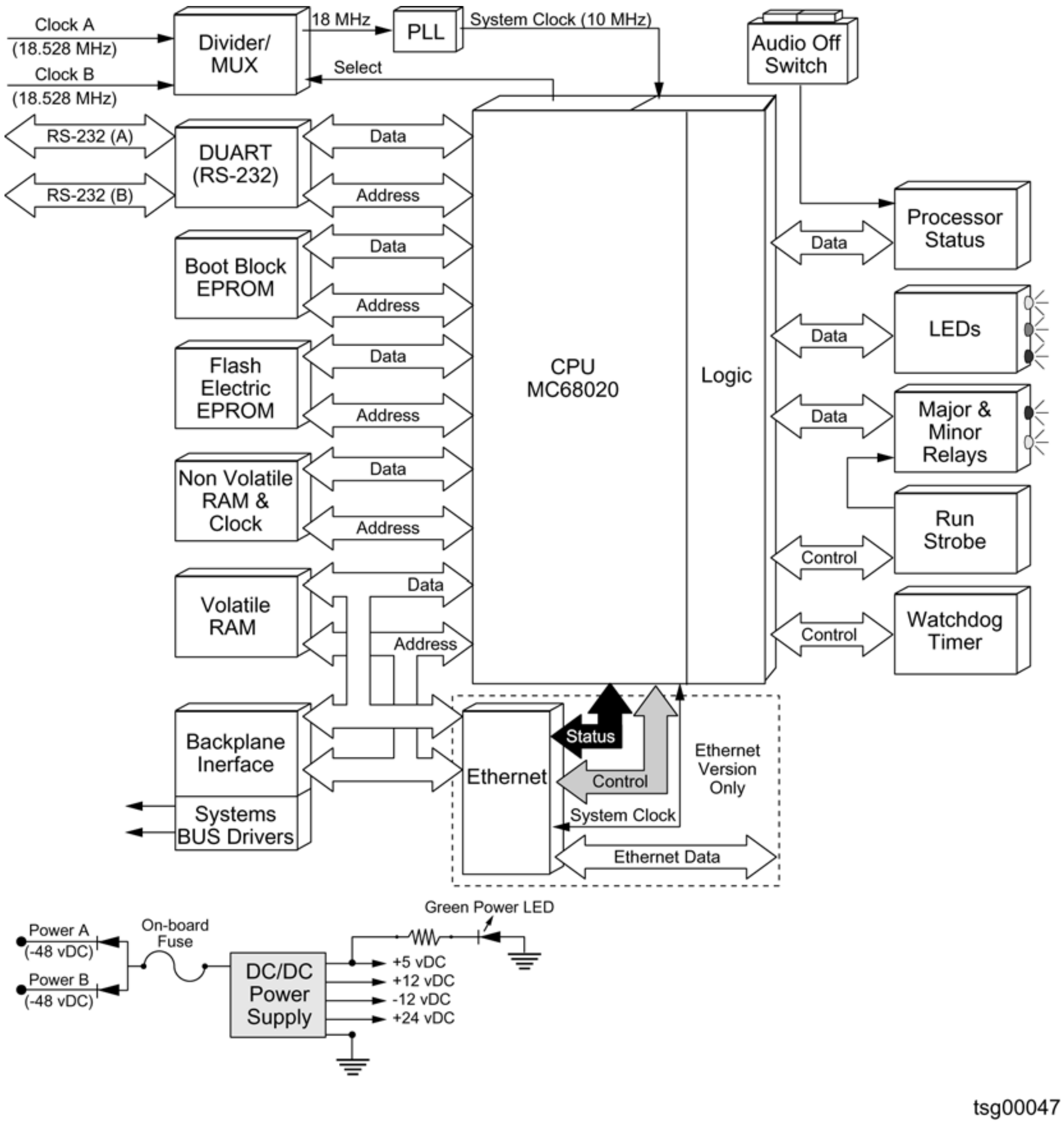


Figure 6-2. Block Diagram of the CPU Module

Specifications

Table 6-2 lists the functional specifications for the CPU module.

Table 6-2. CPU Module Specifications

Signal Characteristic	Specification
MTIE Measurements (each input)	Most recent 50 values, 100, 1000, 10000 seconds
Frequency Measurements (each input)	Most recent 50 values, 100, 1000, 10000 seconds

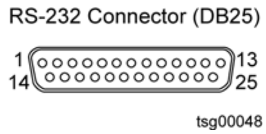
Table 6-2. CPU Module Specifications (Continued)

Signal Characteristic	Specification
Phase Measurements (each input)	Most recent 100 values @ 1 second avg; 1000 values @ 100 second avg
Control Value Calculations (each of 2 oscillators)	Most recent 100 values @ 1 second avg; 1000 values @ 100 second avg
Other Measurements (each input)	AIS, BPV, CRC, LOS, OOF errored and clear intervals
Event Log	Stores up to 500 events including input and system faults, operator inputs, and system actions; time and date stamped to the nearest millisecond
System Interface	Dual EIA-232 connectors, 300-19,200 baud, 8-bit, no parity, 1 stop bit; also Ethernet 10 base-T (optional)
EIA-232 Monitor	Activity monitor: COMMA, COMMB

Making Signal Connections

All external connections to this module use the Comm A and Comm B EIA-232 ports. Comm A is located on the front of the CPU module and Comm B is on the rear panel of the TSG-3800 main shelf. The connectors are 25-pin female, D-style connectors secured with two screws. See Table 6-3 for pin assignments and locations.

Table 6-3. EIA-232 Communications Pinout Specifications

DTE				**DCE**		
PIN		FUNCTION		PIN		FUNCTION
1	——	Chassis Ground		1	——	Chassis Ground
2*	→	TXD		2*	←	TXD
3*	←	RXD		3*	→	RXD
4	→	RTS		4	←	RTS
5	←	CTS		5	→	CTS
6	←	DSR		6	→	DSR
7*	——	Signal Ground		7*	——	Signal Ground
8	←	DCD		8	→	DCD
20	→	DTR		20	←	DTR

NOTE: Pins 9–19, and 21–25 are not used. * Denotes minimum connections necessary. See Section 3 for use of control lines. Avoid connecting pins 1 and 7 together if signal ground and chassis ground are isolated in installation.

Configuring the CPU Module

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Before connecting a peripheral device, be sure to set the baud rate. The default baud rate is 9600. The EIA-232 port uses 8-bit, no parity, 1 stop bit character framing.

Connections for COMM A and COMM B may be set independently for communicating with different devices (COMM A to a PC and COMM B to a modem). You must configure a set of jumpers for each EIA-232 port for use with the desired device. The jumper positions for COMM A and COMM B are identical if you are using the same type of device for both ports. Refer to Table 6-4 for jumper positions.

Table 6-4. Jumper Positions for Different Devices

COMM A	W14	W13	W7	W11
PC	1-2, 3-4	3-4	1-2	4-6
Mac	1-3, 2-4	7-8	5-6	1-2
Modem	1-3, 2-4	1-2	3-4	4-6
COMM B	**W15**	**W16**	**W8**	**W9**
PC	1-2, 3-4	3-4	1-2	4-6
Mac	1-3, 2-4	7-8	5-6	1-2
Modem	1-3, 2-4	1-2	3-4	4-6

Figure 6-3 illustrates COMM A jumper settings configured for connection to a PC, and COMM B jumper settings configured for connection to a modem.

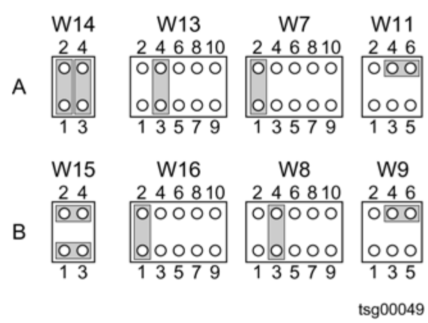


Figure 6-3. Jumper Settings

Installing the CPU Module

The CPU module must be installed in slot 5 of the TSG-3800 main shelf. See Slot Location and Keyed Modules, on page 61.

Operational Check

Perform the following operational checks after installing the CPU module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify the module is receiving the proper input signals by observing the indicators. For locked operation, the indicators should be as described in Table 6-5.

Table 6-5. Indicator Status

Indicator Name	State
RUN	On
COMM ACTIVE A	On or Off
COMM ACTIVE B	On or Off
POWER	On or Off
MINOR	Off
CPU	Off
SYS	Off
MAJOR	Off
ENET	On or Off

Note: The indicators may take a few seconds to reach proper status after you insert the module.

Clock Module

The Clock module (23478272-*xxx*-0) provides an internal reference for measuring the phase of the input signal. The CPU module locks the clock to the selected input and maintains tracking with a variable control value. When the inputs are not available, the clock enters the Holdover mode, and the frequency is maintained at the last valid setting. The Clock module also supplies reference signals to the Frame Generator module for all output signal generation. The front panel of the Clock module is shown in Figure 6-4.

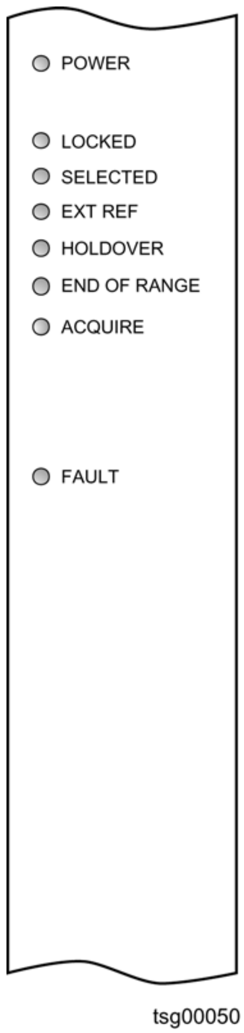


Figure 6-4. *Clock Module*

The Clock module front panel contains status indicators. Table 6-6 describes the front panel Clock module status indicators.

Table 6-6. Clock Output Module Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power
LOCKED	Green	On = Unit is in Normal mode of operation
SELECTED	Green	On = Module selected for providing outputs
EXT REF	Green	This indicator not used
HOLDOVER	Amber	On = Unit is in Holdover mode of operation
END OF RANGE	Amber	On = Tuning is below 25% or above 75% of full scale
ACQUIRE	Amber	On = Unit is in Acquire mode of operation
FAULT	Red	On = Fault within the Module Blinking = Module is disabled

Functional Description

The Clock Output module consists of the following five sections, as shown in Figure 6-5:

- Oscillator
- Direct Digital Synthesizer (DDS)
- Timing Circuitry
- Module Control

The Oscillator provides a 10 MHz sinusoidal output signal for the DDS circuitry. The type of oscillator varies depending on the Clock module. It may be a Rubidium oscillator for the highest quality Stratum 2 performance, or various Quartz ovenized oscillators for the lower quality levels. The output signal is buffered to provide a 10 MHz logic signal as a clock to the DDS circuitry. A separately buffered signal is provided to the local oscillator (LO) output jacks on the rear panel of the main shelf for connecting to external equipment such as a GPS receiver.

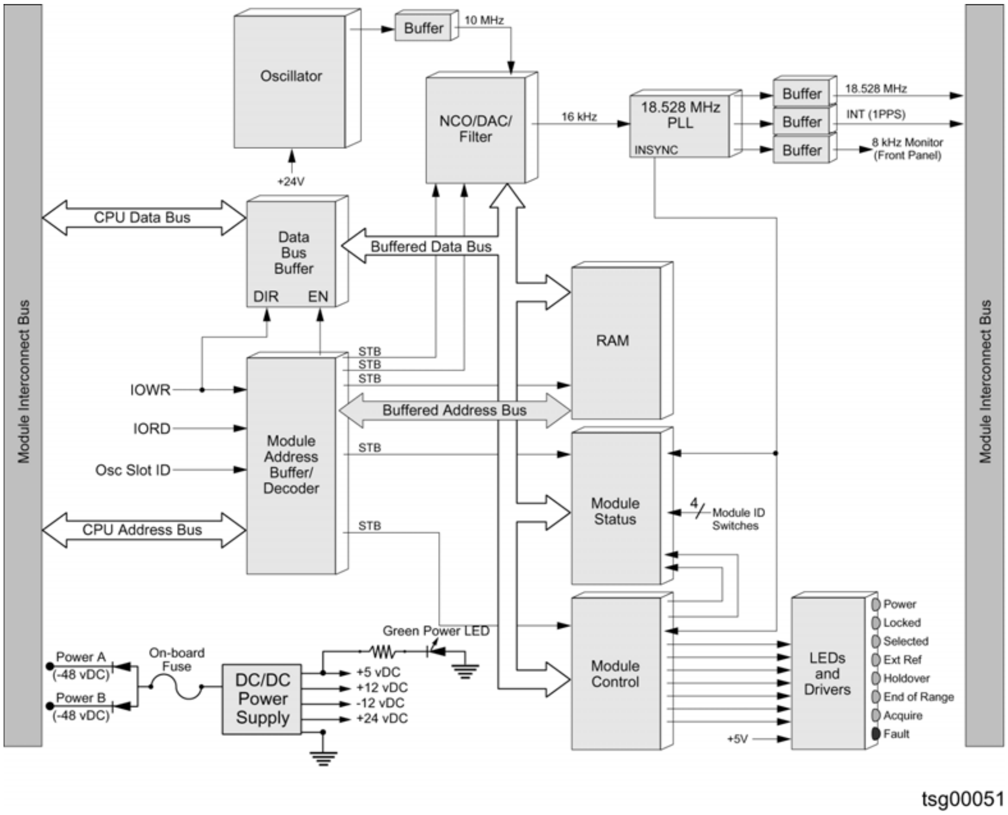


Figure 6-5. Block Diagram of the Clock Module

The Direct Digital Synthesizer receives a digital control value from the module control circuits. It then uses this value to generate a precise 16 kHz frequency from the Numeric Controlled Oscillator (NCO) and associated Digital to Analog Converter (DAC) and filter circuit. The digital Control Value (CV) is a 48-bit word that provides adjustment of the output frequencies in steps of approximately 2.2 parts in 10^{12} over the required tuning range.

The Timing Circuitry consists of a phase locked loop (PLL) using a voltage controlled crystal oscillator (VCXO) to produce an 18.528 MHz output signal and a divider to produce a one pulse per second (1PPS) timing signal. Included in the timing circuits is provision to allow synchronization of these outputs between redundant modules through CPU control. These output signals go to all Input modules to be used for measurement of the input signals, and to the associated Frame Generator module for generating the output signals.

The Module Control section includes the address and data buffers to communicate with the CPU module via the system backplane and the CV memory and status registers to control operation. This section also operates the front panel indicators to show the status of the module. A watchdog timer is included which will automatically switch the module into Holdover mode of operation if the CV is not updated by the CPU each second.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC, ± 12 vDC power for the analog sections, and +24 vDC power for the oscillator. The green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

Symmetricom offers several different Clock modules, as listed in Table 6-7. Contact your local distributor for price and availability of these and other modules for the TSG-3800.

Table 6-7. Available Clock Modules

Item Number	Description
23478272-001-0	Stratum 3E Quartz Clock Module
23478272-004-0	Stratum 2E Rubidium Clock Module
23478272-011-0	Stratum 3E Quartz Clock Module, EMI
23478272-014-0	Stratum 2E Rubidium Clock module, EMI

These Clock modules meet and exceed a wide range of specifications and requirements. For signal characteristics and specifications, please refer to, Table 6-8 and Table 6-9 for the different types of Clock modules.

Table 6-8. Stratum 2E Rubidium Clock Module Specifications

Signal Characteristic	Specification
Accuracy (Free Running)	< ± 1 x 10E^{-9} per 20 years
Stability (Holdover)0 to 24 hrs @ 25° C ± 15°C 0 to 24 hrs -5 to 50°C	< ± 2 x 10E^{-11} < ±1 x 10E^{-10}
Pull-In Range (Acquire Mode)	± 4 x 10E^{-8}
Tuning Resolution (Locked Mode)	2.2 x 10E^{-12}
Warm-Up Time (Warmup Mode)	<10 Minutes
Acquisition Time (Acquire Mode)	< 20 Minutes to enter Lock Mode

Table 6-8. Stratum 2E Rubidium Clock Module Specifications (Continued)

Signal Characteristic	Specification
Wander Output(Locked or Holdover)MTIE and TDEV	Includes effects of all TSG modules:Exceeds requirements of T1.101-1999, GR-378-Core, GR1244-Core, ETS 300 462, and ITU G.812.
Jitter Output (Locked or Holdover)	< 0.01 UI
Operating Temperature Range	–5° to 50°C
Storage Temperature Range	–40° to 70°C
Time Constant Range	500 to 10000 seconds

Table 6-9. Stratum 3E Quartz Clock Module Specifications

Signal Characteristic	Specification
Accuracy (Free Running)	$\pm$ 1.8 x $10E^{-7}$ per year $\pm$ 3 x $10E^{-6}$ per 20 years
Stability (Holdover) 0 to 24 hrs @ 25° C $\pm$ 15°C 0 to 24 hrs 0 to 50°C	 $\pm$ 5 x $10E^{-9}$ $\pm$ 1 x $10E^{-8}$
Pull-In Range (Acquire Mode)	$\pm$ 1.65 x $10E^{-5}$
Tuning Resolution (Locked Mode)	2.2 x $10E^{-12}$
Warm-Up Time (Warmup Mode)	15 minutes
Acquisition Time (Acquire Mode)	$\leq$ 1 hour to enter Locked Mode
Wander Output (Locked or Holdover) MTIE and TDEV	Includes effects of all TSG modules: Exceeds requirements of T1.101-1999, GR-378-Core, GR1244-Core, ETS 300 462, and ITU G.812.
Jitter Output (Locked or Holdover)	< 0.01 UI
Operating Temperature Range	0° to 50°C
Storage Temperature Range	–40° to 70°C
Time Constant Range	25 to 300 seconds

Table 6-10. Clock Characteristics Definitions

Characteristic	Definition
Accuracy (Free Run Mode)	The maximum long-term deviation from the nominal frequency with no external reference applied. In typical operation the Clock module is never in this mode after initial start up.
Stability (Holdover Mode)	The maximum rate of change of the clock frequency over time and temperature after loss of all external frequency reference.
Pull-In Range (Acquire Mode)	The minimum frequency deviation from the nominal clock rate that can be overcome by the clock to synchronize with an external reference signal.
Lock Range (Locked Mode)	The maximum frequency deviation from the average frequency of the external reference signal when in normal operation.
Tuning Resolution (Locked Mode)	The nominal step size of the frequency corrections to the clock applied by the control algorithm.
Tau	Time constant (secs) used for oscillator control loop.
Warm-Up Time (Warm-Up Mode)	The maximum time required from initial power application until the Clock module begins the acquisition process.
Acquisition Time (Acquire Mode)	The nominal time required for the clock to progress from the Warm-Up mode to the Locked mode of operation.
Wander (TIE) MTIE TDEV	The long-term variation of a signal from the ideal position in time. (<10 Hz) The maximum time interval error over a specified time period. The time variation of a signal as a function of integration time.
Jitter	The short-term variation of a signal from the ideal position in time. (>10 Hz)
Operating Temperature	The maximum frequency deviation from the average frequency of the external reference signal when in normal operation.

Note: Some clock parameters such as input jitter and wander tolerance, filtering requirements, and rearrangements are determined by other modules within the Timing Signal Generator.

Configuring the Clock Module

This section describes how to configure the Clock module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Verifying the Default Switch Settings

Clock modules are equipped with two 4-section switches labeled S1 and S2. All sections of switches S1 and S2 are set to factory-specified positions and should not be changed. Before installing the module, verify that switches S1 and S2 are in the proper positions as shown in Table 6-11.

Table 6-11. Factory-Set Positions for S1 and S2

Clock Type	S1 Settings	S2 Settings	TB1 Setting
Stratum 2E	OFF, ON, ON, ON	ON, OFF, ON, ON	A-B
Stratum 3E	OFF, ON, ON, ON	ON, OFF, OFF, ON	B-C

Installing the Clock Module

The Clock module must be installed in slots 6–10 or slots 11–15 of the TSG-3800 main shelf. Each Clock module is five slots wide. See Slot Location and Keyed Modules, on page 61. If you are using clocks of differing quality, install the higher-quality Clock module in slots 6–10.

Operational Check

Perform the following operational checks after installing the Clock module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify the module is receiving the proper input signals by observing the indicators, as shown in Table 6-12.

Table 6-12. Indicator Status

Indicator Name	Status
POWER	On
LOCKED	Off
SELECTED	On or Off
EXT REF	Off
HOLDOVER	Off
END OF RANGE	Off

Table 6-12. Indicator Status (Continued)

Indicator Name	Status
POWER	On
ACQUIRE	On
FAULT	Off

3. The ACQUIRE indicator shows that the process of phase locking the clock to the input signal is not complete.

4. After the Acquire process is complete, verify that the ACQUIRE indicator is off and the LOCKED indicator is on. This signifies the instrument is in a Locked mode.

Note: The indicators may take a few seconds to reach proper status after you insert the module.

T1/E1 Frame Generator Module with SSM

The T1/E1 Frame Generator module (23478305-*xxx*-0 and 23478443-*xxx*-0) produces the timing signals to create DS1, E1 (CEPT) and Composite Clock (CC) outputs. This module also provides two clock outputs, which can be independently set to 8 kHz, 1.544 MHz, or 2.048 MHz. The 23478305-*xxx*-0 module provides Synchronization Status Messages (SSM) on DS1 Extended Super Frame (ESF) signals only. The 23478443-*xxx*-0 module provides SSM on both ESF and E1 signals. Figure 6-6 shows the front panel of the Frame Generator module.

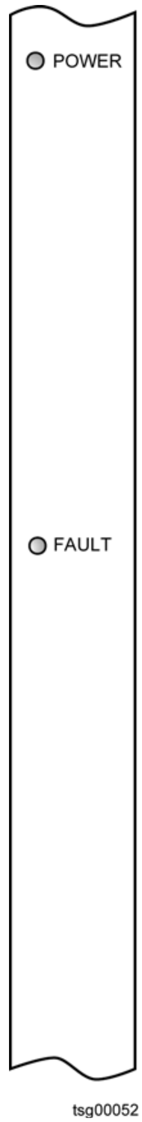


Figure 6-6. T1/E1 Frame Generator Module with SSM

Table 6-13 describes the front panel status indicators (LEDs) on the T1/E1 Frame Generator Module.

Table 6-13. T1/E1 Frame Generator Module Status Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power.
FAULT	Red	On = Module failure. Blinking = Module is disabled.

Functional Description

Refer to Figure 6-7 for the following functional discussion. The T1/E1 Frame Generator combines the functions of the T1/CC Frame Generator (23476568-*xxx*-0), the CEPT Frame Generator (23477799-*xxx*-0), and the T1/E1 Frame Generator (23478305-xxx-0), into one module with the addition of CEPT SSM. Two timing outputs and two clock signals are provided, making it possible for the TSG-3800 to simultaneously output T1/E1, T1/CC, or E1/CC timing signals. In addition, this module supports SSM on the DS1-FSF and E1 outputs.

The T1 output is derived from an 18.528 MHz reference signal from the corresponding Clock module in the main shelf. The reference signal is divided to 1.544 MHz and sent to the DS1-D4/ESF Format Generator. This circuit produces balanced TTL level signals that represent a framed, all ONEs DS1 signal. A rocker switch on the module determines the framing format used (D4 or ESF).

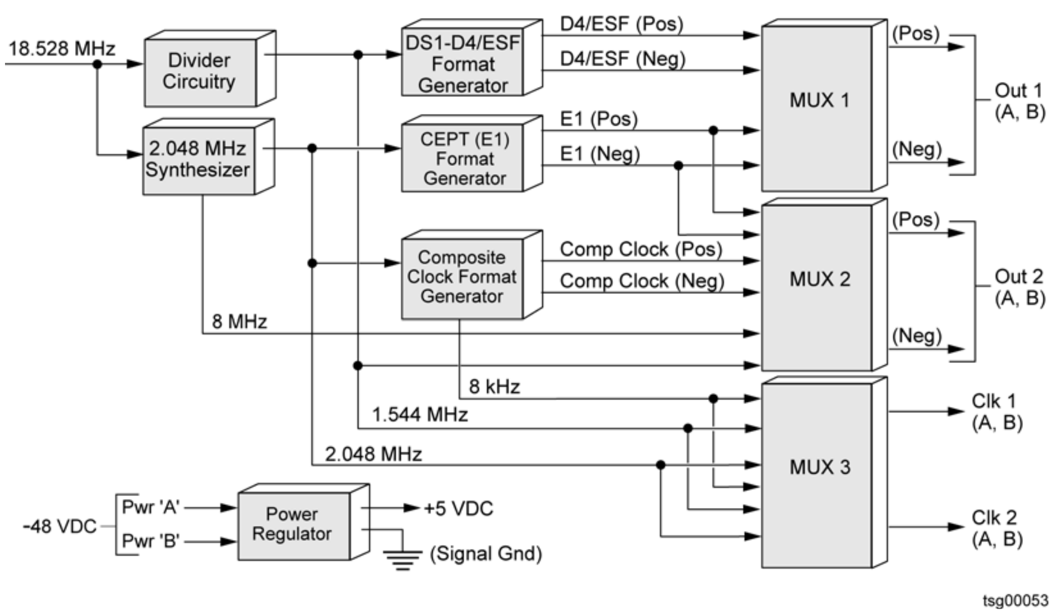


Figure 6-7. Block Diagram of the T1/E1 Frame Generator with SSM

The E1 timing signals are also created from the 18.528 MHz reference. A phase locked loop locked to this reference produces a frequency which is divided to 2.048 MHz. This clock is then used to create the framed all ONEs timing signal on balanced TTL level.

When two Frame Generator modules are installed, the TSG-3800 aligns the frames of their output signals. This allows synchronization of the frame marker and output timing signals to each other for minimal phase hits and no change of frame alignment. Synchronization is accomplished automatically when the second Frame Generator is installed.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Configuring the Frame Generator Module

The T1/E1 Frame Generator module with SSM can be customized for different TSG-3800 configurations by setting several rocker switches and two jumpers, as shown in Figure 6-8. Before installing the Frame Generator module in the TSG-3800, these switches must be set for the Output modules installed in the main shelf.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Note: You must set the rocker switches and jumpers before you install the Frame Generator module in the TSG-3800.

Caution: When two Frame Generator modules are installed in the main shelf, the switches and jumpers on both Frame Generators ***must*** be set the same. The module does not support a mix of input signals and it is limited to two framed signals and/or one unframed signal.

Caution: Jumpers W2 and W5 are reserved for factory use only. For proper module operation, both jumpers *must always* be installed between pins A and B.

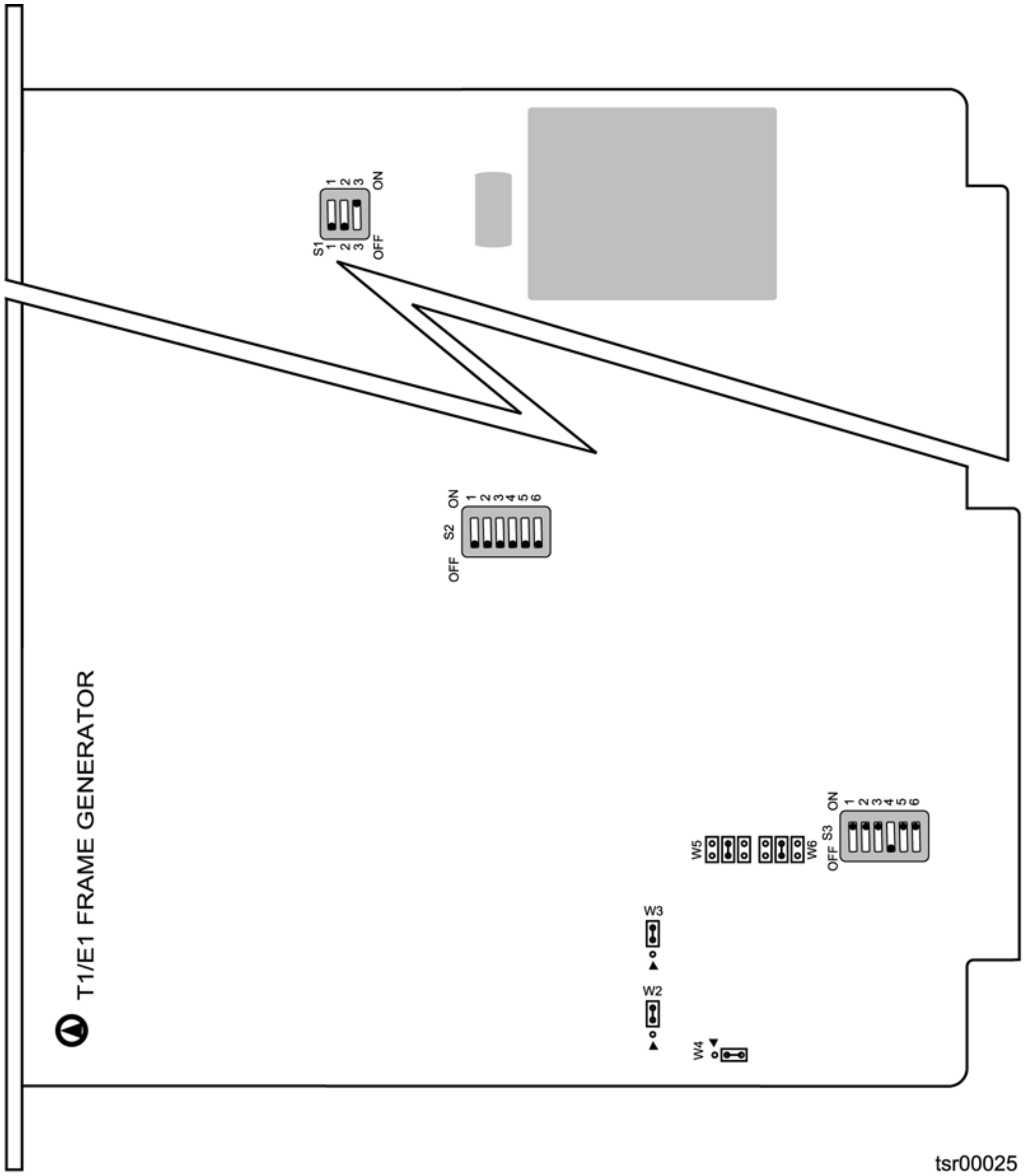


Figure 6-8. *Frame Generator Module Switches and Jumper Locations*

Selecting the Clock Frequency

The T1/E1 Frame Generator module with SSM provides two clock outputs. Each output can be independently set to provide 8 kHz, 1.544 MHz or 2.048 MHz. A jumper on W9 selects the CLK1 output frequency, and a jumper on W10 selects the CLK2 output frequency. The frequency of each position is shown on the right side of each header. Install the jumper across the header in line with the desired frequency.

Setting Switch Block S1

The switch blocks S1 and S2 each contain six rocker switches. S3 contains four rocker switches. The number of each rocker is located on both sides of the switch block, 1 through 4, or 1 through 6. A switch is ***OFF*** when the left side of the rocker is pressed down. A switch is ***ON*** when the right side of the rocker is pressed down.

Switch Block S1 is located in the lower left corner of the module (see Figure 6-8) and sets the two timing signals that this module generates. Various output modules use these signals to generate their own outputs. Some modules use Output 1 and/or Clock 1, while other modules use Output 2 and/or Clock 2. Some modules, like the AMI Output Module, can be configured to use either Output 1 or Output 2, and to use either Clock 1 or Clock 2. Table 6-14 lists the Output modules available and the output and clock signal each module requires from the T1/E1 Frame Generator module.

Table 6-14. T1/E1 Frame Generator with SSM Signal Requirements

Module Name	Item Number	Output 1	Output 2	Clock 1	Clock 2
AMI 20-Output AMI 10-Output ESF/D4 (10)	23478309-*xxx*-0 23478401-*xxx*-0 23478399-*xxx*-0	YES	YES	YES	YES
Composite Clock	23477337-*xxx*-0	NO	YES	NO	NO
56K Bit	23477342-*xxx*-0	NO	YES	NO	NO
RS-422 RS-422 8 kHz	23477134-*xxx*-0	YES	YES	YES	NO
TTL TTL 8 kHz	23477134-*xxx*-0	YES	YES	YES	NO
G.703/10 Analog Output	23477602-*xxx*-0 23478444-*xxx*-0	NO	NO	YES	YES

(yes = signal used, no = signal not used)

Determine which Output modules are required in your application, then refer to this table and the following paragraphs to set the S1 switches appropriately. Table 6-15 summarizes the functions controlled by S1.

Table 6-15. T1/E1 Frame Generator with SSM Switch Block S1

Rocker	Function	Off	On
1	Selects Output 1 signal	E1	T1
2	Selects Composite Clock duty cycle	50/50	63/37
3	Selects Output 2 with rocker 4 off Selects Output 2 with rocker 4 on	8 kHz 1.544 MHz	CC E1
4	Used with rocker 3		
5	Not used		
6	Not used		

The T1/E1 Frame Generator Module has two timing signal outputs. Output 1 is controlled by Rocker 1. In the OFF position, Output 1 is a framed E1 signal. This balanced TTL level signal is used by the AMI Output module (23478309-*xxx*-0) to produce a bipolar E1 timing signal. In the ON position, Rocker 1 selects a framed T1 signal for output. Like the E1 signal, the T1 signal is a balanced TTL level signal, but with T1 framing and frequency.

Rocker 2 of S1 controls the duty cycle of the Composite Clock (CC) timing signal. In the OFF position, the CC duty cycle is set to 50/50, that is, the period of a mark and a space is half the period of the 64 kHz clock (7.81 µs). In the ON position, the duty cycle of the CC is 63/37, or 9.77 µs for a mark and 5.86 µs for a space.

Rockers 3 and 4 function together to select a signal for output through Output 2. As shown in Table 6-15, four signals are available for output through this port. When Rocker 4 is OFF, Rocker 3 selects either an 8 kHz clock (Rocker 3 is OFF), or a CC timing signal (Rocker 3 is ON). When Rocker 4 is ON, Rocker 3 selects either a 1.544 MHz clock (Rocker 3 is OFF), or a framed E1 timing signal (Rocker 3 is ON). Rockers 5 and 6 are not used.

Setting Switch Block S2

S2 is located approximately in the center of the module (see Figure 6-8). This block of rocker switches controls the T1 and E1 frame generators, allowing you to customize some of these outputs. Features such as framing formats and error messages can be enabled, disabled or changed, depending upon the application. Table 6-16 summarizes the functions controlled by S2.

Table 6-16. Switch Block S2

Rocker	Function	Off	On
1	Select CRC4 (E1)	Enabled	Disabled
2	Select signaling (E1)	CCS	CAS
3	Select Encoding (E1)	HDB3	AMI
4	(not used)		
5	Select Multiframe format (T1)	ESF	D4
6	Select SSM (T1)	Enable	Disable

The rocker switches in S2 are separated into two groups. Rockers 1 through 3 allow customizing of the E1 frame generator, while Rocker 5 and Rocker 6 control the T1 frame generator. Rocker 4 is not used.

Rocker 1 controls the CRC4 function of the E1 frame generator. When this switch is in the OFF position, CRC4 coding is enabled. In the ON position, CRC4 coding is disabled. Set this switch appropriately for the equipment receiving this signal.

The setting of Rocker 2 determines the type of framing used by the E1 frame generator.

On Rocker 3, the OFF position selects HDB3 encoding. The ON position selects AMI encoding.

The setting of Rocker 5 determines the multiframe format generated by the T1 frame generator. In the OFF position the ESF format is enabled. In the ON position, Rocker 5 enables D4 framing. Set this according to the equipment using the framed, all ones output of the output modules.

SSM is controlled by Rocker 6. When this function is enabled (Rocker 6 OFF), the CPU sends a status message to the frame generator, which transmits it through the Facility Data Link of the ESF signal (Rocker 5 OFF). If the CPU module is removed from the TSG, the frame generator begins sending the SSM, “00001000”, which indicates “Sync Quality Unknown” in the DS1 ESF signal. SSM is disabled when Rocker 6 is ON. This causes all of the message bits on the Facility Data Link to be sent as ONEs.

Setting Switch Block S3

This switch is only present on the 23478443-*xxx*-0 modules; E1 SSMs are not available on the 23478305-*xxx*-0 modules. S3 is located in the upper right corner of the module (see Figure 6-8). S3 consists of three rocker switches labeled 1, 2 and 3, which are used to set the bit position in *time slot zero* of the *not frame alignment word* of an E1 signal, where the SSM will be inserted. By setting these switches to a specific combination of *OFFs* and *ONs*, the SSM will be inserted into the desired bit position in the bit stream. The following table shows the settings of the three rocker switches for each of the five allowed bit positions. Be careful to set the S3 rockers on both Frame Generators in the TSG-3800 to the same positions. If this is not done, the SSM will change bit position when the selected Frame Generator is changed from A to B, or B to A.

The SSM inserted into the bit stream is written to a register on the Frame Generator module by the CPU module. The SSM can be automatically determined and inserted, or it can be manually set. For a description of the SSM function, refer to the FG command in Appendix , Software Commands.

Table 6-17. T1/E1 Frame Generator with SSM Switch Block S3

Rocker	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
1	OFF	ON	OFF	ON	OFF
2	OFF	ON	ON	OFF	OFF
3	ON	OFF	OFF	OFF	OFF

Setting Jumpers W2 and W5

Caution: Jumpers W2 and W5 are reserved for factory use only. For proper module operation, both jumpers *must always* be installed between pins A and B.

Installing the Frame Generator Module

The Frame Generator module must be installed in slot 16 or 17 of the TSG-3800 main shelf. See Slot Location and Keyed Modules, on page 61. A Clock module must be installed in the slot that supplies a reference signal to the Frame Generator. That is,

- the Clock module in slots 6-10 works with the Frame Generator in slot 16
- the Clock module in slots 11-15 works with the Frame Generator in slot 17

Making Signal Connections

There are no external connections to this module. Signals, data, and power are connected internally.

Operational Check

Perform the following operational checks after installing the Clock module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify that the FAULT indicator on the Frame Generator module is off.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

T1/E1 Frame Generator Module with Clock Bypass

The T1/E1 Frame Generator module with Clock Bypass (23478486-000-0) produces timing signals used by various output modules to create DS1, E1 (CEPT), and Composite Clock (CC) output signals. The DS1 (ESF only) and E1 signals can include Synchronization Status Messages (SSM), if required. This module also provides two clock output signals which can be independently set to 8 kHz, 1.544 MHz, or 2.048 MHz. The front panel is shown in Figure 6-9.

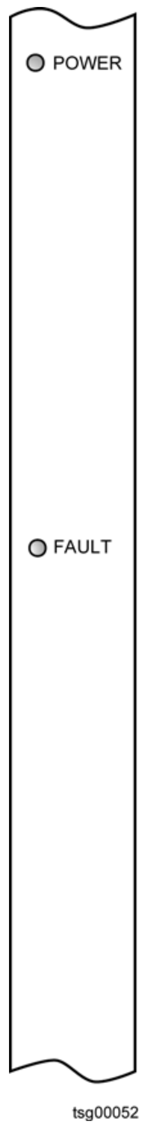


Figure 6-9. T1/E1 Frame Generator Module with Clock Bypass

The Clock Bypass function allows the module to continue generating normal output signals when both Clock modules are in warm-up mode or are when the clocks have been removed from the unit. When there is a framed signal connected to either input port 1.1 (PRI) or input port 2.1 (SEC), the module continues to output signals. When either Clock module begins normal operation, the Frame Generator module uses the reference from the selected Clock module. When the Clock Bypass function is active and SSMs are enabled, the SSM stratum unknown (STU) is broadcast.

Table 6-18 describes the front panel status indicators (LEDs) on the T1/E1 Frame Generator module.

Table 6-18. T1/E1 Frame Generator Module with Clock Bypass Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power.
FAULT	Red	On = Module failure. Blinking = Module is disabled.

Functional Description

Refer to Figure 6-10 for the following functional discussion. The T1/E1 Frame Generator module provides two timing output signals and two clock signals, making it possible for the TSG-3800 to simultaneously output T1/E1, T1/CC, or E1/CC timing signals. The module also supports SSM on the DS1-FSF and E1 outputs.

The T1 output is derived from an 18.528 MHz reference signal from the corresponding Clock module in the TSG-3800. The reference signal is divided to 1.544 MHz and sent to the DS1-D4/ESF Format Generator. This circuit produces balanced TTL level signals that represent a framed, all ONEs DS1 signal. The setting of a rocker switch on the board determines whether the framing format used is D4 or ESF.

The E1 timing signals are also created from the 18.529 MHz reference. A phase-locked loop locked to this reference produces a frequency which is divided to 2.048 MHz. This clock is then used to create the framed all ONEs timing signal (balanced TTL level).

When two Frame Generator modules are installed, the TSG-3800 aligns the frames of their output signals. This allows synchronization of the frame marker and output timing signals to each other for minimal phase hits and no change of frame alignment. Synchronization is done automatically when the second Frame Generator module is installed.

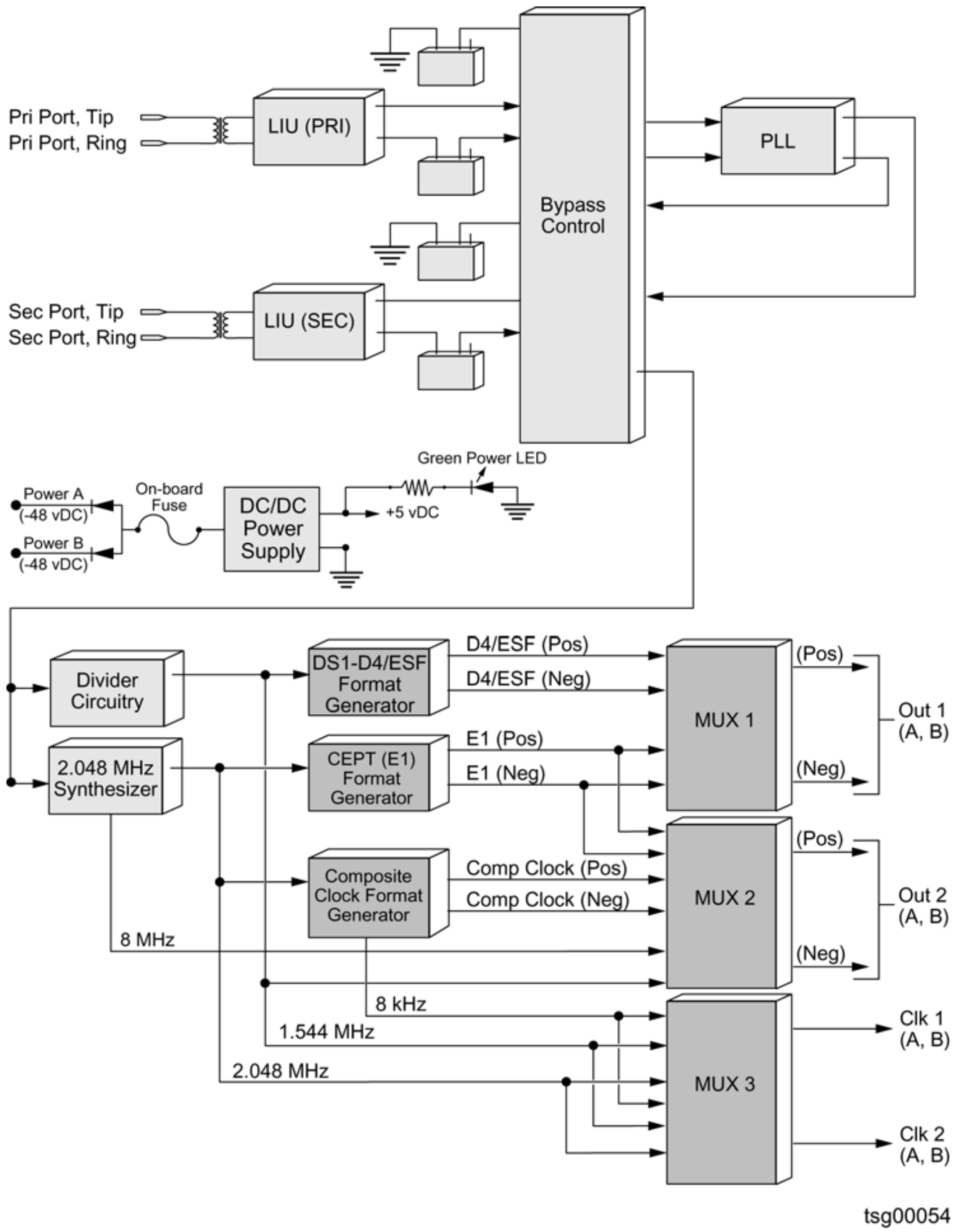


Figure 6-10. Block Diagram of the T1/E1 Frame Generator with Clock Bypass

The module provides a Clock Bypass function that is not found in the other Frame Generator modules. When a DS1 or E1 signal is connected to either Input module port 1.1 (PRI) or Input module port 2.1 (SEC), the Frame Generator module continues to function while both Clock modules are in warm-up or are removed. The module accomplishes this by using the recovered clock from the input signal to generate the reference it requires. This function is automatically selected when there is no reference from the Clock modules, and is deselected when one or both Clock modules begin normal operation. While Clock Bypass is active, the stability of the selected reference determines the stability of the signals generated by the

Frame Generator module. If framed signals are connected to both Input module port 1.1 and Input module port 2.1, the Frame Generator module automatically selects input 2.1 when input 1.1 is lost, and returns to input 1.1 when the input is again located. The Clock Bypass mode requires both input signals to be of the same type, where both input signals must be DS1 or E1.

This module gets power from the main shelf, Power A and B. These redundant sources of –48 vDC are diode coupled and fused, allowing it to draw power from either source. The internal fuse labeled F1, protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC, and the green POWER indicator on the front panel indicates that power is available to the module. The POWER indicator turns off in the event of any loss of power, such as the fuse on the module opens, loss of both –48 vDC power inputs, or if the regulator fails.

Configuring the Frame Generator Module

The T1/E1 Frame Generator module with Clock Bypass can be customized for different TSG-3800 configurations by setting several rocker switches and two jumpers, as shown in Figure 6-8. Before installing the Frame Generator in the TSG-3800, you must set these switches for the Output modules installed in the main shelf.

Note: You must set the rocker switches and jumpers before you install the Frame Generator Module in the TSG-3800.

Caution: When two Frame Generators are installed in the main shelf, the switches and jumpers on both Frame Generators ***must*** be set the same. The module does not support a mix of input signals.

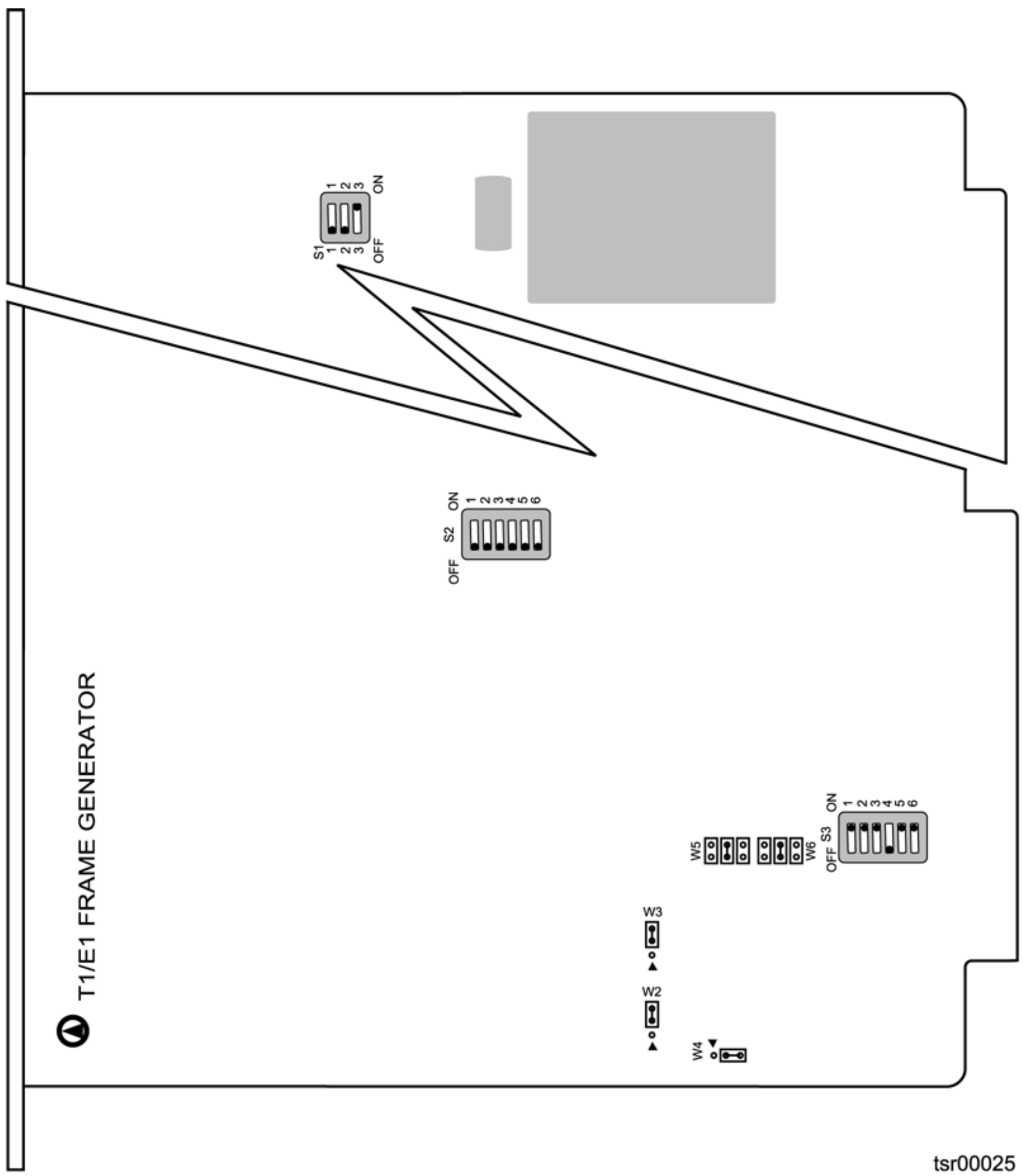


Figure 6-11. Frame Generator Module Switches and Jumper Locations

Switch blocks S3 and S2 each contain six rocker switches. S12 contains three rocker switches. The number of each rocker is located on the side of the switch block (1 though 3, or 6). A switch is ***OFF*** when the left side of the rocker is pressed down. A switch is ***ON*** when the right side of the rocker is pressed down.

Selecting the Clock Frequency

The T1/E1 Frame Generator module with Clock Bypass provides two clock output signals. Each output can be independently set to provide an 8 kHz, 1.544 MHz, or 2.048 MHz signal. You select the output signal frequency by installing a jumper in the appropriate location on W6 for the CLK1 output signal, and on W5 for the CLK2 output signal. The frequency of each position is shown on the right side of each header. Install the jumper across the header, in line with the desired frequency.

Setting Switch Block S3

Switch Block S3, located in the lower left corner of the module (see Figure 6-11), determines the two timing signals that this module generates. Various output modules use these signals to generate their own outputs. Some modules use Output 1 and Clock 1, while other modules use Output 2 and Clock 2. For example, some modules, such as the AMI Output module, can be configured to use either Output 1 or Output 2, and to use either Clock 1 or Clock 2. Table 6-19 lists the output modules available and the output and clock signal each module requires from the T1/E1 Frame Generator module.

Table 6-19. T1/E1 Frame Generator with Clock Bypass Signal Requirements

Module Name	Item Number	Output 1	Output 2	Clock 1	Clock 2
AMI 20-Output AMI 10-Output ESF/D4 (10)	23478309-*xxx*-0 23478401-*xxx*-0 23478399-*xxx*-0	Yes	Yes	Yes	Yes
Composite Clock	23477337-*xxx*-0	No	Yes	No	No
56K Bit	23477342-*xxx*-0	No	Yes	No	No
RS-422 RS-422 8 kHz	23477134-*xxx*-0	Yes	Yes	Yes	No
TTL TTL 8 kHz	23477134-*xxx*-0	Yes	Yes	Yes	No
G.703/10 Analog Output	23477602-*xxx*-0 23478444-*xxx*-0	No	No	Yes	Yes

(Yes = signal used, No = signal not used)

Determine which Output modules are required in your application, then refer to this table and the following paragraphs to set the S4 switches appropriately. Table 6-20 summarizes the functions controlled by the S3 block of switches.

Table 6-20. Switch Block S3

Rocker	Function	Off	On
1	Selects output 1 signal	E1	T1
2	Selects Composite Clock duty cycle	50/50	63/37
3	Selects output 2 with rocker 4 off Selects output 2 with rocker 4 on	8 kHz 1.544 MHz	Composite Clock E1
4	Used with rocker 3		
5	Not used		
6	Not used		

The T1/E1 Frame Generator Module has two timing signal outputs. Output 1 is controlled by Rocker 1. In the OFF position, Output 1 is a framed E1 signal. This balanced TTL level signal is used by the AMI Output Module (23478309-xxx-0) to produce a bipolar E1 timing signal. The ON position of Rocker 1 selects a framed T1 signal for output. Like the E1 signal, the T1 signal is a balanced TTL level signal, but with T1 framing and frequency.

Rocker 2 of S3 controls the duty cycle of the Composite Clock timing signal. In the OFF position, the Composite Clock duty cycle is set to 50/50, that is, the period of a mark and of a space is half of the period of the 64 kHz clock (7.81 μs). In the ON position, the duty cycle of the Composite Clock is 63/37, or 9.77 μs for a mark and 5.86 μs for a space.

Rockers 3 and 4 function together to select a signal for output through Output 2. As shown in Table 6-20, four signals are available for output through this port. If Rocker 4 is in the OFF position, Rocker 3 selects either an 8 kHz clock (with Rocker 3 OFF), or a Composite Clock timing signal (with Rocker 3 ON). When Rocker 4 is ON, Rocker 3 selects either a 1.544 MHz clock (with Rocker 3 OFF), or a framed E1 timing signal (with Rocker 3 ON). Rockers 5 and 6 are not used.

Setting Switch Block S2

S2 is located approximately in the center of the module (see Figure 6-11). This block of rocker switches controls the T1 and E1 frame generators, allowing you to customize some of the outputs. Features such as framing formats and error messages can be enabled, disabled, or changed, depending upon the application. Table 6-21 summarizes the functions controlled by S2. The conventional North American application is 63/37.

Table 6-21. Frame Generator Module with Clock Bypass Switch Block S2

Rocker	Function	Off	On
1	Select CRC4 (E1)	Enabled	Disabled
2	Select signaling (E1)	CCS	CAS
3	Select Encoding (E1)	HDB3	AMI
4	(not used)		
5	Select Multiframe format (T1)	ESF	D4
6	Select SSM (T1)	Enable	Disable

The rocker switches in S2 are separated into two groups. Rockers 1 through 3 allow customizing of the E1 frame generator, while Rocker 5 and Rocker 6 control the T1 framing. Rocker 4 is currently not used.

Rocker 1 controls the CRC4 function of the E1 framing. When this switch is in the OFF position, CRC4 coding is enabled. In the ON position, CRC4 coding is disabled. Set this switch appropriately for the equipment receiving this signal.

The setting of Rocker 2 determines the type of framing used by the E1 frame generator.

On Rocker 3, the OFF position selects HDB3 encoding. The ON position selects AMI encoding.

The setting of Rocker 5 determines the multiframe format generated by the T1 frame generator. In the OFF position the Extended Super Frame (ESF) format is enabled. In the ON position, Rocker 5 enables D4 framing. Set this according to the equipment using the framed, all ONEs output of the output modules.

SSMs are controlled by Rocker 6. When this function is enabled (Rocker 6 OFF), the CPU sends a status message to the frame generator, which transmits it through the Facility Data Link of the ESF signal (Rocker 5 OFF). If the CPU module is removed from the TSG-3800, the frame generator begins sending the SSM, “00001000,” which indicates “Sync Quality Unknown” in the DS1 ESF signal. SSMs are disabled when Rocker 6 is ON. This causes all of the message bits on the Facility Data Link to be sent as ONEs.

Setting Switch Block S1

S1 is located in the upper right corner of the module (see Figure 6-11). It consists of three rocker switches labeled 1, 2 and 3, which are used to set the bit position in *time slot zero* of the *not frame alignment word* of an E1 signal, where the SSM will be inserted. By setting these switches to a specific combination of *OFFs* (switches depressed on the OFF side) and *ONs* (switches depressed on the ON side), the SSM will be inserted into the desired bit position in the bit stream.

Table 6-22 shows the settings of the three rocker switches for each of the five allowed bit positions. Be careful to set the S1 rockers on both Frame Generators in the TSG-3800 to the same positions. If this is not done, the SSM will change bit position when the selected Frame Generator is changed from A to B, or B to A.

Table 6-22. Frame Generator Module with Clock Bypass Switch Block S1

Rocker	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
1	Off	On	Off	On	Off
2	Off	On	On	Off	Off
3	On	Off	Off	Off	Off
1	Off	On	On	On	Off
2	Off	On	On	Off	Off

The SSM being inserted into the bit stream is written to a register on the Frame Generator module by the CPU module. The SSM can be automatically determined and inserted, or it can be manually set. For a description of the SSM function, refer to the *FG* command in Software Commands, on page 323.

Clock Bypass Function

The Clock Bypass function is controlled by jumpers W2, W3, and W4 (see Figure 6-11). If two Frame Generator modules are installed, these jumpers *must* be configured the same way on both modules.

Jumper W4 specifies the type of signal (DS1 or E1) that may be connected to input 1.1 (PRI) and input 2.1 (SEC), if they are to be used for the Clock Bypass function. Set this jumper as required. If both inputs are to be used by the Frame Generator module, be sure they are both DS1 signals or both E1 signals. The module does not support a mix of input signals.

Jumpers W2 and W3 determine whether the corresponding Bypass port may be used for Clock Bypass: W2 = port 2.1, and W3 = port 1.1). Their normal position is ENAB (pin 2 connected to pin 1) to enable Bypass. Use these jumpers to disable one or both of the ports if the signals connected to the corresponding Input module ports are not suitable for Bypass, or if you do not wish to use the ports for Bypass. If both ports are disabled, Clock Bypass is disabled.

Caution: The configurations of W2, W3, and W4 are important. If they are not set up properly, Bypass mode may not be possible and the outputs of the Frame Generator will be turned off.

Although the Frame Generator module uses an external signal for the Clock Bypass mode, it is not connected directly to that signal. Instead, it uses the signal connected to the Input module. The Input module provides termination for this signal, or, if the Input module is set for 3.3 kΩ termination, by external equipment. If the device providing termination is removed, Clock Bypass may not function properly because the Frame Generator module provides no termination of its own. Therefore it is important not to interrupt signal termination while the Frame Generator module is in the Clock Bypass mode.

Installing the Frame Generator Module

The Frame Generator module must be installed in slot 16 or 17 of the TSG-3800 main shelf. See Slot Location and Keyed Modules, on page 61. A Clock module must be installed in the slot that supplies a reference signal to the Frame Generator, that is:

- the Clock module in slots 6-10 works with the Frame Generator in slot 16
- the Clock module in slots 11-15 works with the Frame Generator in slot 17

Making Signal Connections

There are no external connections to this module. Signals, data, and power are connected internally.

Operational Check

Perform the following operational checks after installing the Frame Generator module in the main shelf. It is assumed that power has been connected to the shelf and is turned on, and that there is a CPU module installed and functioning properly. A proper external reference signal must be connected to the corresponding connector on the rear panel of the main shelf. If used, the fault signal should also be connected to the main shelf.

1. Verify that the POWER indicator is lit.

2. Verify that the FAULT indicator on the Frame Generator module is off.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Chapter 7 Output Modules

This chapter describes the different output modules that are available for the TSG-3800 series, their functionality, functional block diagrams, switch and jumper settings.

Note: All shelves have identical functionality; however, only EMI-compliant modules should be used in the TSG-3800E shelf (see Section 6 for item numbers).

In This Chapter:

- AMI 20-Output Module
- AMI 10-Output Module
- ESF/D4 10-Output Module
- Analog Output Module
- RS-422 Clock Output Module
- RS-422 8 kHz Clock Output Module
- RS-422 Selective Rate Clock Module
- 56 kBit Clock Output Module
- TTL Clock Output Module
- TTL 8 kHz Clock Output Module
- G.703/13 Output Module
- Timing Insertion Module

AMI 20-Output Module

The AMI 20-Output module (23478309-*xxx*-0) provides 20 balanced outputs. This Output module is normally paired with a second AMI 20-Output module; in this configuration the outputs of each module are tied together to form 20 redundant output signal pairs. Figure 7-1 illustrates the front panel of the module.

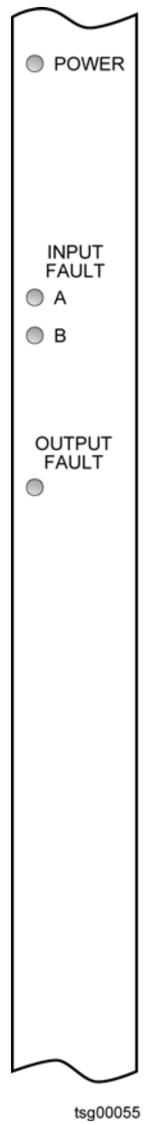


Figure 7-1. AMI 20-Output Module

Table 7-1 describes the AMI 20-Output module front panel status indicators (LEDs).

Table 7-1. AMI 20-Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power. Off = Module is not receiving power.
INPUT A	Amber	On = No reference signal at input A, or failure of module input buffers. Off = Reference signal at input A.
INPUT FAULT B	Amber	On = No reference signal at input B, or failure of module input buffers. Off = Reference signal at input B.
OUTPUT FAULT	Red	On = Output failure (one or more). Off = All outputs available.

Functional Description

Refer to Figure 7-2 for the following functional discussion. Two pairs of inputs can be connected to the module, depending upon the Frame Generator settings in the TSG-3800. Each pair consists of A and B signals, coming from Frame Generator A and Frame Generator B, respectively. The A and B inputs are identical signals providing redundant input signals to the AMI 20-Output module.

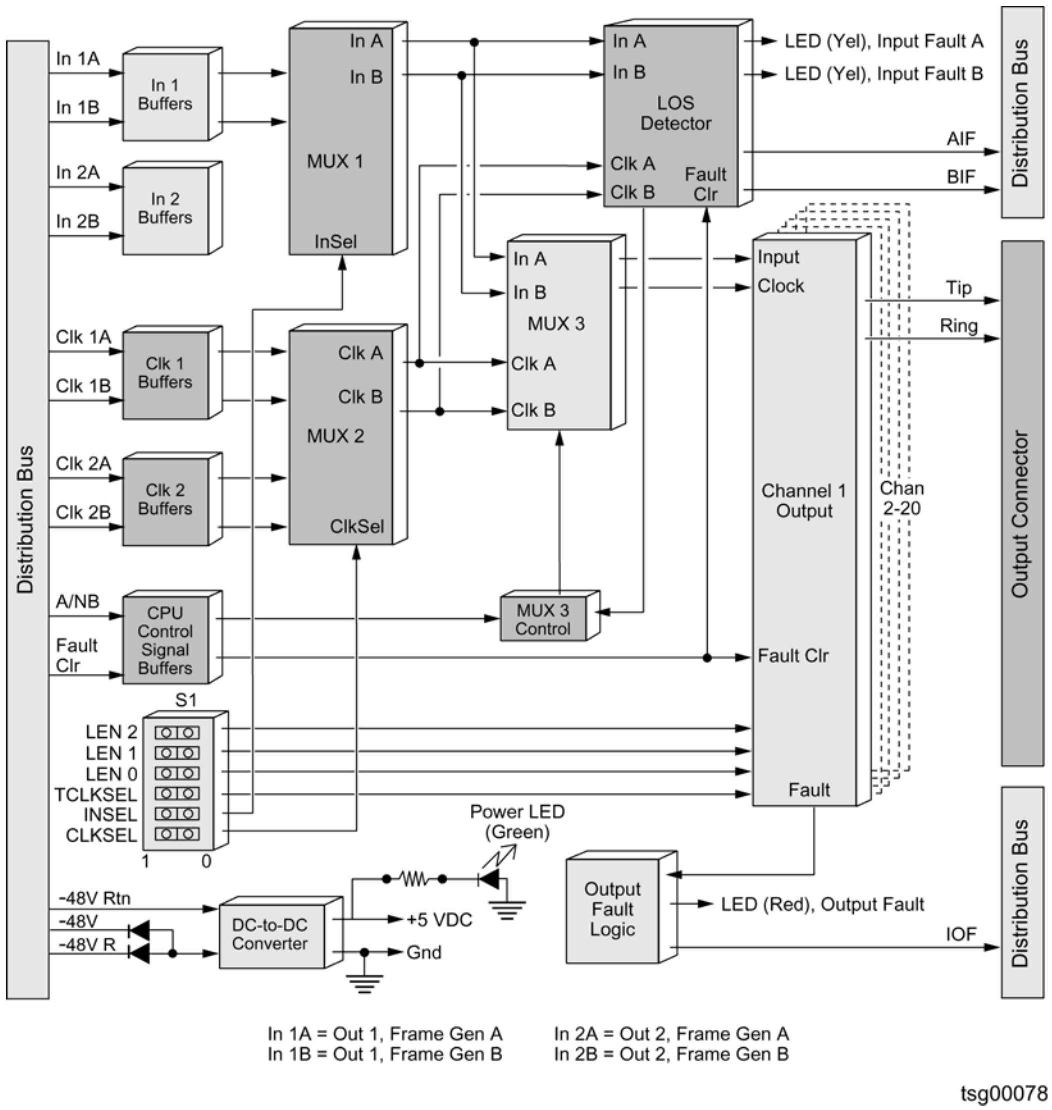


Figure 7-2. Block Diagram of the AMI 20-Output Module

Rocker switch S1 and MUX 1 control the selection of the A/B signal pair used by the module. S1 consists of six rocker switches, each performing a different function. Pressing a rocker switch on the left side sets the switch to Off; pressing the right side sets the switch to On. MUX 1 (also MUX 2 and MUX3 discussed below) is a digital multiplexer which routes the selected inputs to the outputs.

The INSEL rocker switch controls MUX 1. When INSEL is On, it causes MUX 1 to select the IN1 inputs. When it is Off, the IN2 inputs are selected.

One or two pairs of clocks can be connected to the module, depending upon the Frame Generator settings. Each pair consists of A and B clocks, coming from Frame Generator A and Frame Generator B, respectively. These are identical clocks providing redundant clocks to the module.

Rocker switch S1 and MUX 2 control the selection of the A/B clock pair used by the module to generate its outputs. When the CLKSEL switch is On, MUX 2 selects the CLK1 inputs. When it is Off, the CLK2 inputs are selected.

A third rocker switch in S1, labeled TCLKSEL, configures the output drivers for the frequency of the clock selected by MUX 2. When this switch is Off, the drivers are configured for a clock of 1.544 MHz (T1); when the switch is On, the drivers are configured for 2.048 MHz (E1).

The shape of the output waveform is controlled by the output drivers and by the three remaining switches in S1, labeled LEN0, LEN1, and LEN2 (TCLKSEL = On), that are connected to the drivers. Depending upon the settings of these switches, the output drivers will produce the appropriate output pulse shape to meet the DSX-1 or CSU templates over a wide variety of cable types and lengths.

When TCLKSEL is Off, the E1 mode is enabled. In this mode only one output pulse shape is available. LEN0, LEN1, and LEN2 may be in any state, except all On. A safe setting for these three switches is Off.

MUX 3 selects either the A input and A clock (default) or the B input and B clock from the input and clock pairs selected by MUX 1 and MUX 2. These signals are used by the output buffers to generate the desired outputs.

If the A input or A clock fails, the module detects this and switches to the B signals automatically. The amber INPUT FAULT A indicator is turned on and the CPU is notified. The module continues to operate from the B inputs with a fault indicated until it is replaced or the A inputs return. If the A inputs return, the module automatically switches back to them. This is the preferred operating condition.

A failure of the B signals causes the module to turn on the amber INPUT FAULT B indicator and to notify the CPU module. There is no automatic switchover to the A inputs, because the module will already be using them if they are good. The module can be made to change its reference through the CPU module.

The module checks the outputs to confirm signal presence. If an output fails, the OUTPUT FAULT indicator (red) on the front panel is turned on. The CPU is also informed of this condition through the Frame Generator module. The relay through which the output is connected to the rear panel is de-energized, disconnecting the failed output on this module from the corresponding output on the backup module.

When an output fails, there may be a temporary loss of the corresponding signal on the backup module. However, this is cleared automatically within one second, when the CPU attempts to clear the faults generated by both modules. The other outputs are not affected.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

The functional specifications of the AMI 20-Output module are listed in Table 7-2.

Table 7-2. AMI 20-Output Module Specifications

Signal Characteristic	Specification (E1)	Specification (T1)
Signal	Alternate Mark Inversion (AMI)	Alternate Mark Inversion (AMI)
Format	Framed, (Set by Frame Generator)	Framed, (Set by Frame Generator)
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Per ITU-T Rec. G.703 < 100 ns < 244 ns, nominal 488 ns, nominal 50%	Per ANSI T1.102 < 100 ns < 324 ns, nominal 648 ns, nominal 50%
Amplitude	2.2 to 3.3 volts	2.4 to 3.6 volts
Jitter	< 0.03 UI	< 0.03 UI
Drive Capability	Per ITU-T Rec. G.703	0 to 655 feet (197 m), 22AWG ABAM cable or similar
Termination Impedance	120 Ω ±5%	100 Ω ±5%
Number of outputs	20	20

Configuring the AMI 20-Output Module

This section describes how to configure the AMI 20-Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Setting Rocker Switch S1

Before installing the AMI 20-Output module in the TSG, you must set Rocker Switch S1 appropriately. The configuration of these switches must be done carefully, taking into account the type of outputs required.

Note: In most applications, AMI 20-Output modules are used in pairs. If this is true in your application, be sure that the rocker switches are set identically on both modules.

The rocker switches that are part of S1 have the names and functions shown in Table 7-3. A switch is *OFF* when the left side of the rocker is pressed down. A switch is *ON* when the right side of the rocker is pressed down.

Table 7-3. AMI 20-Output Module Switch S1 Name and Functions

Rocker	Function
LEN2, LEN1, LEN0	Set according to the length of cable connected to the outputs (for T1 applications). See Table 7-4. For E1 applications, set these three switches to OFF.
TCLKSEL	Sets the frequency expected by the output buffers. ON = 1.544 MHz, T1 applications OFF = 2.048 MHz, E1 applications
INSEL	Selects the inputs to be used. ON = IN1 (A and B), OFF = IN2 (A and B).
CLKSEL	Selects the clocks to be used. ON = CLK1 (A and B), OFF = CLK2 (A and B).

Note: The LEN0, LEN1 and LEN2 switches control the T1 output wave shape when TCLKSEL = ON. Refer to Table 7-4.

The INSEL switch is used to select either IN1 or IN2 signals. The Frame Generators produce timing signals for either T1 or E1 at the IN1 inputs of the AMI 20-Output module, and either E1 or CC at the IN2 inputs. Set INSEL in combination with the FG settings for the desired output signal.

The CLKSEL switch selects either CLK1 or CLK2 inputs from the Frame Generator. Set this switch to On if the clocks on the CLK1 inputs are the proper frequency; set this switch to Off if the clocks on the CLK2 inputs are the proper frequency. For a T1 output, a 1.544 MHz clock must be selected, or for an E1 output, a 2.048 MHz clock must be selected.

Finally, the output drivers must be configured for the length of cable being used. This is accomplished by setting the LEN0, LEN1 and LEN2 rocker switches in S1. Table 7-4 shows the possible switch settings, the option selected and the applications. If the module is generating E1 signals, these switches do not affect the outputs, and can be set to any value except all On. A safe setting for these three switches is all Off when E1 signals are being generated.

Set these three switches for your application. Remember the settings apply to all 20 outputs of the AMI Output module, which means that the same length and type of cable must be used on all outputs for the pulse shapes to be correct. If the cable length is not known, change the switches while monitoring the wave shape until a suitable wave shape is obtained. This may also be a useful method for setting the switches when different types of cables are used, see Table 7-4.

Table 7-4. T1 Line Length Selections

LEN2	LEN1	LEN0	Option Selected
ON	OFF	OFF	0–133 feet (0 – 40 m)
OFF	ON	ON	133–266 feet (40–80 m)
OFF	ON	OFF	266–399 feet (80–120 m)
OFF	OFF	ON	399–533 feet (120–160 m)
OFF	OFF	OFF	533–655 feet (160–197 m)

Installing the AMI 20-Output Module

The AMI 20-Output modules are designed to operate in pairs. Insert one module in the primary distribution slot; insert the other in the secondary distribution slot. Table 7-5 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-5. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through twenty are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the main shelf, install the AMI 20-Output modules in the appropriate slots and verify that each POWER indicator is lit. This indicates that the modules are receiving power and the power supplies are working.

Check the INPUT FAULT A and INPUT FAULT B indicators. With two functional Frame Generators installed, both indicators should be off. If one or no Frame Generator is installed, the appropriate indicator should be on, indicating that the signals from that Frame Generator are missing.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the AMI 20-Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (for example, it may be shorted). The indicator will remain on if there is no reference connected, because there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

AMI 10-Output Module

The AMI 10-Output Module (23478401-*xxx*-0) provides 10 balanced outputs. This distribution module is normally paired with a second AMI 10-Output module; in this configuration, the outputs of each module are tied together to form 10 redundant output signal pairs. Figure 7-3 illustrates the front panel of the module.

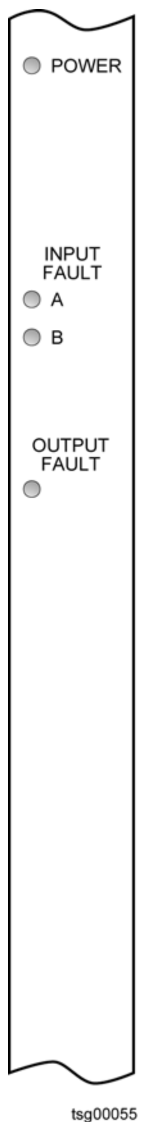


Figure 7-3. AMI 10-Output Module

Table 7-6 describes the front panel status indicators (LEDs) on the AMI 10-Output module.

Table 7-6. AMI 10-Output Module Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power. Off = Module is not receiving power.
INPUT FAULT A	Amber	On = No reference signal at input A, or failure of module input buffers. Off = Reference signal at input A.
INPUT FAULT B	Amber	On = No reference signal at input B, or failure of module input buffers. Off = Reference signal at input B.
OUTPUT FAULT	Red	On = Output failure (one or more). Off = All outputs available.

Functional Description

Refer to Figure 7-4 for the following functional discussion. Two pairs of inputs can be connected to the module, depending upon the Frame Generator settings in the TSG-3800. Each pair consists of A and B signals, coming from Frame Generator A and Frame Generator B, respectively. The A and B inputs are identical signals providing redundant input signals to the AMI 10-Output module.

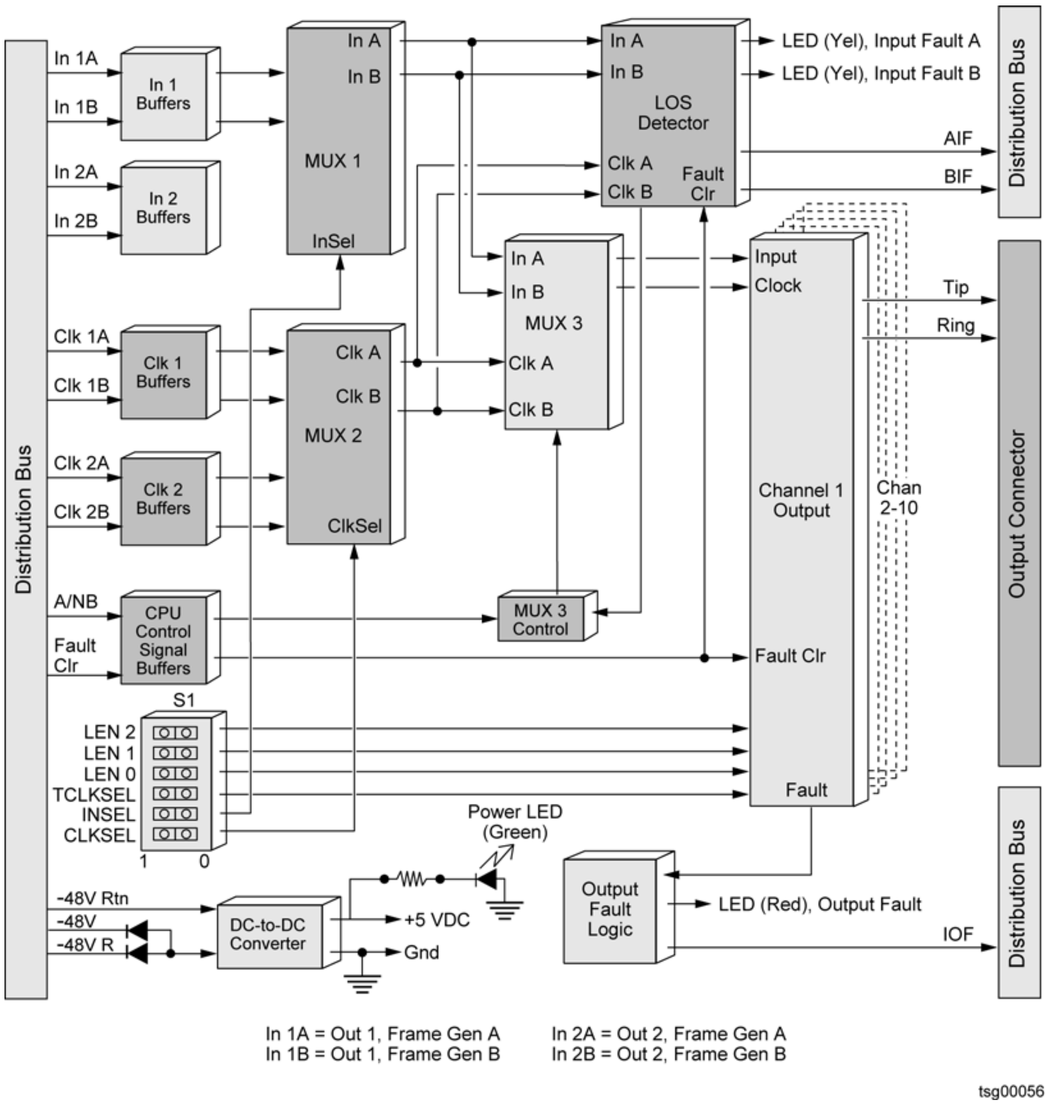


Figure 7-4. Block Diagram of the AMI 10-Output Module

Rocker switch S1 and MUX 1 control the selection of the A/B signal pair used by the module. S1 consists of six rocker switches, each performing a different function. The output of the switch is set to either a “1” or a “0”, depending upon the side that is pressed. Pressing a rocker switch on the left side (side next to the labels) sets the output to “1”; pressing the right side sets the output to “0”. MUX 1 (also MUX 2 and MUX3 discussed below) is a digital multiplexer, which routes the selected inputs to the outputs.

The INSEL rocker switch controls MUX 1. When INSEL is pressed on the “0” side, it causes MUX 1 to select the IN1 inputs. When the “1” side is pressed, the IN2 inputs are selected.

There can also be two pairs of clocks connected to the module, depending upon the Frame Generator settings. Each pair consists of A and B clocks, coming from Frame Generator A and Frame Generator B, respectively. These are identical clocks, providing redundant clocks to the module.

Rocker switch S1 and MUX 2 control the selection of the A/B clock pair used by the module to generate its outputs. When the CLKSEL switch is pressed on the “0” side, it causes MUX 2 to select the CLK1 inputs. When the “1 side is pressed, the CLK2 inputs are selected.

A third rocker switch in S1, labeled TCLKSEL, configures the output drivers for the frequency of the clock selected by MUX 2. When this switch is pressed on the “0” side, the drivers are configured for a clock of 1.544 MHz (T1); when the “1” side is pressed, the drivers are configured for 2.048 MHz (E1).

The shape of the output waveform is controlled by the output drivers, and by the three remaining switches in S1, labeled LEN0, LEN1, and LEN2 (TCLKSEL = 0), that are connected to the drivers. Depending upon the settings of these switches, the output drivers will produce the appropriate output pulse shape to meet the DSX-1 or CSU templates, over a wide variety of cable types and lengths.

When TCLKSEL is set to 1, the E1 mode is enabled. In this mode only one output pulse shape is available. LEN0, LEN1, and LEN2 may be in any state, except all zeros. A safe setting for these three switches is OFF.

MUX 3 selects either the A-input and A-clock, or the B-input and B-clock (normally A), from the input and clock pairs selected by MUX 1 and MUX 2. These signals are used by the output buffers to generate the desired outputs.

If the A input or A clock fails, the module detects this and switches to the B signals automatically. The INPUT FAULT A LED (yellow) is turned on and the CPU module is notified. The module continues to operate from the B inputs, with a fault indicated, until it is replaced or the A inputs return. If the A inputs return, the module will automatically switch back to them. This is the preferred operating condition.

A failure of the B signals causes the module to turn on the INPUT FAULT B LED (yellow) and to notify the CPU module. There is no automatic switchover to the A inputs, since the module will already be using them if they are good. The module can be made to change its reference, through the CPU module.

The module checks the outputs to confirm signal presence. If an output fails, the OUTPUT FAULT LED (red) on the front panel is turned on. The CPU module is also informed of this condition, through the Frame Generator module. The relay, through which the output is connected to the rear panel, is de-energized, disconnecting the failed output on this module from the corresponding output on the backup module.

When an output fails, there may be a temporary loss of the corresponding signal on the backup module. However, this is cleared automatically within one second, when the CPU attempts to clear the faults generated by both modules. The other outputs are not affected.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

The functional specifications of the AMI 10-Output module are listed in Table 7-7.

Table 7-7. AMI 10-Output Module Specifications

Signal Characteristic	Specification (E1)	Specification (T1)
Signal	Alternate Mark Inversion (AMI)	Alternate Mark Inversion (AMI)
Format	Framed, (Set by Frame Generator)	Framed, (Set by Frame Generator)
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Per ITU-T Rec. G.703 <100 ns <244 ns, nominal 488 ns, nominal 50%	Per ANSI T1.102 <100 ns <324 ns, nominal 648 ns, nominal 50%
Amplitude	2.2 to 3.3 volts	2.4 to 3.6 volts
Jitter	< 0.03 UI	< 0.03 UI
Drive Capability	Per ITU-T Rec. G.703	0 to 655 feet (197 m), 22AWG ABAM cable or similar
Termination Impedance	120 Ω ±5%	100 Ω ±5%
Number of outputs	10	10

Configuring the AMI 10-Output Module

This section describes how to configure the AMI 10-Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Setting Rocker Switch S1

Before installing the AMI 10-Output module in the TSG, you must set Rocker Switch S1 appropriately. The configuration of these switches must be done carefully, taking into account the type of outputs required.

Note: In most applications, AMI 10-Output modules are used in pairs. If this is true in your application, be sure that the rocker switches are set identically on both modules.

The rocker switches that are part of S1 have the names and functions shown in Table 7-3. A switch is *OFF* when the left side of the rocker is pressed down. A switch is *ON* when the right side of the rocker is pressed down.

Table 7-8. AMI 10-Output Module Switch S1 Name and Functions

Rocker	Function
LEN2, LEN1, LEN0	Set according to the length of cable connected to the outputs (for T1 applications). See Table 7-9. For E1 applications, set these three switches to OFF.
TCLKSEL	Sets the frequency expected by the output buffers. ON = 1.544 MHz, T1 applications, OFF = 2.048 MHz, E1 applications
INSEL	Selects the inputs to be used. ON = IN1 (A and B), OFF = IN2 (A and B).
CLKSEL	Selects the clocks to be used. ON = CLK1 (A and B), OFF = CLK2 (A and B).

Note: The LEN0, LEN1 and LEN2 switches control the T1 output wave shape when TCLKSEL is ON. Refer to Table 7-9.

The INSEL switch is used to select either IN1 or IN2 signals. The Frame Generators produce timing signals for either T1 or E1 at the IN1 inputs of the AMI 10-Output module, and either E1 or CC at the IN2 inputs. Set INSEL in combination with the FG settings for the desired output signal.

The CLKSEL switch selects either CLK1 or CLK2 inputs from the Frame Generator. Set this switch to On if the clocks on the CLK1 inputs are the proper frequency; set this switch to Off if the clocks on the CLK2 inputs are the proper frequency. For a T1 output, a 1.544 MHz clock must be selected, or for an E1 output, a 2.048 MHz clock must be selected.

Finally, the output drivers must be configured for the length of cable being used. This is accomplished by setting the LEN0, LEN1 and LEN2 rocker switches in S1. Table 7-9 shows the possible switch settings, the option selected and the applications. If the module is generating E1 signals, these switches do not affect the outputs and can be set to any value except all On. A safe setting for these three switches is all Off when E1 signals are being generated.

Set these three switches for your application. Remember the settings apply to all 10 outputs of the AMI Output module, which means that the same length and type of cable must be used on all outputs for the pulse shapes to be correct. If the cable length is not known, change the switches while monitoring the wave shape until a suitable wave shape is obtained. This may also be a useful method for setting the switches when different types of cables are used, see Table 7-9.

Table 7-9. T1 Line Length Selections

LEN2	LEN1	LEN0	Option Selected
ON	OFF	OFF	0–133 feet (0–40 m)
OFF	ON	ON	133–266 feet (40–80 m)
OFF	ON	OFF	266–399 feet (80–120 m)
OFF	OFF	ON	399–533 feet (120–160 m)
OFF	OFF	OFF	533–655 feet (160–197 m)

Setting Jumper W4

Caution: Jumper W4 is for factory use only. For proper module operation, jumpers **must** always be installed between pins 4 and 6, and between 3 and 5.

Installing the AMI 10-Output Module

The AMI 10-Output modules are designed to operate in pairs. Insert one module in the primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-5 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-10. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through ten are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the AMI 10-Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and its power supply is working.

Check the INPUT FAULT A and INPUT FAULT B indicators. With two functional Frame Generators installed, both LEDs should be off. If one or no Frame Generator is installed, the appropriate indicator should be lit, indicating that the signals from that Frame Generator are missing.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the AMI 10-Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (for example, it may be shorted). The indicator will remain on if there is no reference connected, because there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

ESF/D4 10-Output Module

The ESF/D4 10-Output Module (23478399-*xxx*-0) converts an ESF framed DS1 signal into a D4 framed DS1 signal, making it possible for the TSG-3800 to output both formats at the same time in the same shelf. The module has 10 individual outputs. In a standard configuration, this module is paired with a second ESF/D4 10-Output module, providing 10 redundant output signal pairs. Figure 7-5 illustrates the front panel of the module.

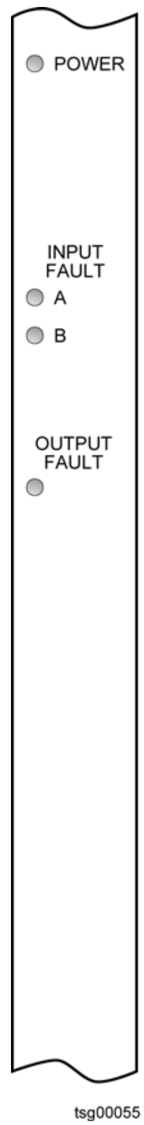


Figure 7-5. *ESF/D4 10-Output Module*

Table 7-11 describes the front panel status indicators (LEDs) on the ESF/D4 Output module.

Table 7-11. ESF/D4 Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power. Off = Module is not receiving power.
INPUT FAULT A	Amber	On = No reference signal at input A, or failure of module input buffers. Off = Reference signal at input A.
INPUT FAULT B	Amber	On = No reference signal at input B, or failure of module input buffers. Off = Reference signal at input B.
OUTPUT FAULT	Red	On = Output failure (one or more). Off = All outputs available.

Functional Description

Refer to Figure 7-6 for the following functional discussion. Frame Generator A and Frame Generator B provide the signals, IN1A and IN1B, and the clocks, CLK1A and CLK1B, respectively, to the Output module. The signals are DS1 signals, with the ESF framing format. The Output module buffers these signals, then sends them to the A/B Selector and to the LOS Detector.

The A/B Selector normally selects the signals and clock from Frame Generator A. However, the CPU can force the Output module to select Frame Generator B by setting the A/NB signal to a logic “0”. This happens when the User instructs the CPU to disable Oscillator A or Frame Generator A, or if the CPU determines there is a problem with Oscillator A or Frame Generator A. The module itself will switch to Frame Generator B if the LOS Detector determines that one or more of the signals from Frame Generator A has (have) been lost. When this occurs, the INPUT FAULT A indicator is turned on and the CPU is informed. The INPUT FAULT B indicator is turned on if a problem with the signal or clock from Frame Generator B is detected, and the CPU is informed. INPUT FAULT B does not cause the TSG to change the selected Frame Generator.

From the A/B Selector, the selected signal and clock are sent to the ESF/D4 Converter. The ESF/D4 Converter converts the ESF input into a D4 framed, “all ONEs” signal, which is then sent to the 10 output channels.

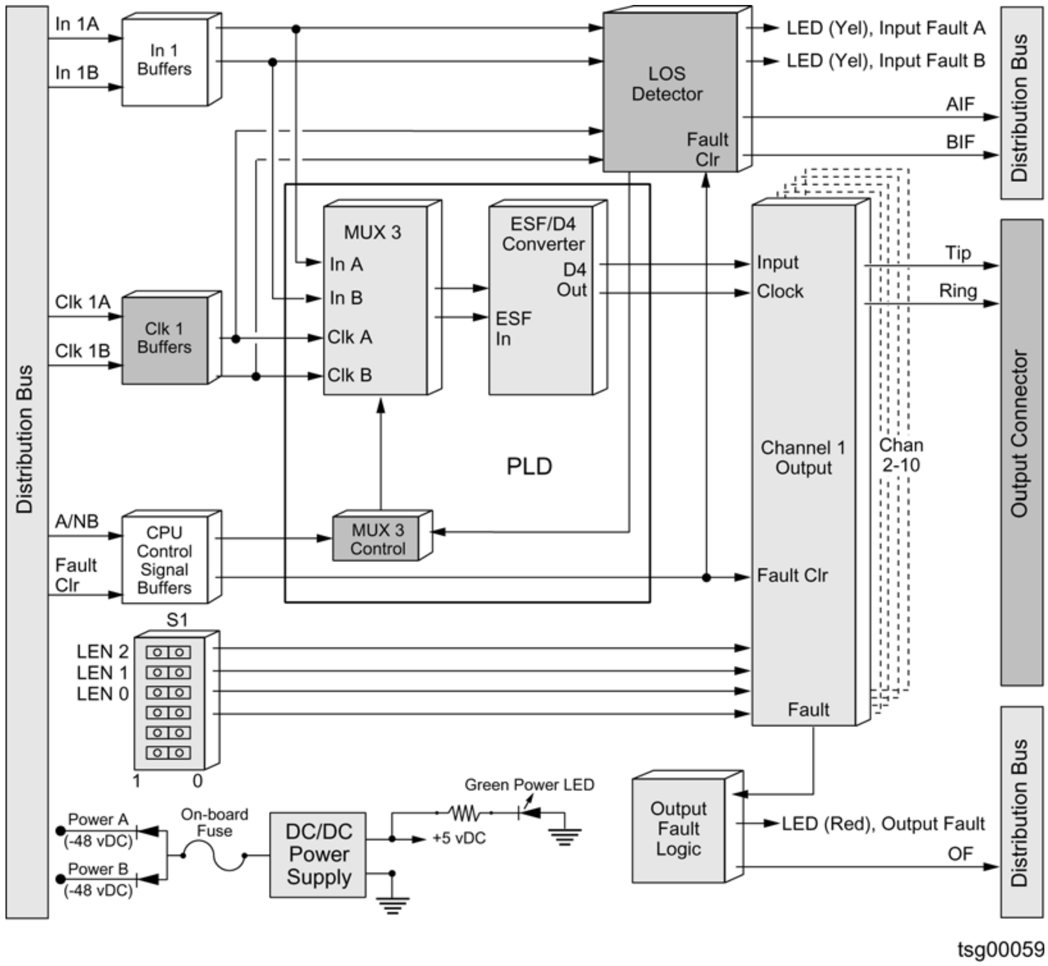


Figure 7-6. Block Diagram of the ESF/D4 10-Output Module

Each output channel consists of a driver, an output transformer and an isolation relay. The driver converts the signals from the Frame Generator into AMI Signals, suitable for the output. The output of the transformer goes to the relay, which connects the signal to the output connector on the TSG-3800 Interconnect PCB. Each output channel is monitored for proper operation. If an output fails, the isolation relay is opened to protect the corresponding signal from the redundant module. The OUTPUT FAULT LED on the front panel is on, and the CPU is informed of an output failure on one of the output modules.

The shape of the output waveform is controlled by the output drivers, and by the top three switches of S1, labeled LEN0, LEN1, and LEN2. Each switch is connected to a corresponding pin on each of the output drivers. Depending on the settings of these switches, the output drivers will produce the appropriate pulse shape to meet the DSX-1 template, over a wide variety of cable types and lengths.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

The functional specifications of the ESF/D4 10-Output module are listed in Table 7-12.

Table 7-12. ESF/D4 10-Output Module Specifications

Signal Characteristic	Specification
Signal	DS1, D4 Framing, All ONEs Data
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Per ANSI T1.102-1987 < 100 ns 324 ns, nominal 648 ns, nominal 50%
Amplitude	3 ± 0.6 V, peak-to-peak
Overshoot	≤ 10% of peak-to-base amplitude
Jitter	< 0.03 UI
Long-term Frequency Error	Exceeds MTIE criteria defined in ANSI T1.101-1987
Clock Performance	Meets SONET requirements per ANSI T1.105-1988
Drive Capability	0 to 655 feet (197 m)
Termination Impedance	100 to 120 Ω ±5%
Number of outputs	10

Configuring the ESF/D4 10-Output Module

This section describes how to configure the ESF/D4 10-Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Setting Rocker Switch S1

Before installing the ESF/D4 10-Output module in the TSG, you must set Rocker Switch S1 appropriately. The configuration of these switches must be done carefully, taking into account the type of outputs required.

Note: In most applications, ESF/D4 10-Output modules are used in pairs. If this is true in your application, be sure that the rocker switches are set identically on both modules.

The rocker switches that are part of S1 have the names and functions shown in Table 7-3. A switch is *OFF* when the left side of the rocker is pressed down. A switch is *ON* when the right side of the rocker is pressed down.

Table 7-13. T1 Line Length Selections

LEN2	LEN1	LEN0	Option Selected
ON	OFF	OFF	0-133 feet (0 - 40 m)
OFF	ON	ON	133-266 feet (40 - 80 m)
OFF	ON	OFF	266-399 feet (80 - 120 m)
OFF	OFF	ON	399-533 feet (120 - 160 m)
OFF	OFF	OFF	533-655 feet (160 - 197 m)

Set these three switches for your application. Remember, the settings apply to all 20 outputs of the module. This means the same length and type of cable must be used on all outputs for the pulse shapes to be correct. If the cable length is not known, the switches can be changed while monitoring the wave shape until a suitable wave shape is obtained. This may also be a useful method for setting the switches when different types of cables are used.

There are four types of Frame Generators available for the TSG that are compatible with the ESF/D4 Output module. The following paragraphs discuss each of these Frame Generators and the proper settings for the rocker switches on the ESF/D4 Output module. Locate the item number for the Frame Generator installed in the TSG, then locate that number in the following paragraphs.

Configuring the Frame Generator Module

For proper operation of the ESF/D4 10-Output module with the Frame Generator (06568-501 or 23476568-*xxx*-0), the jumpers on the Frame Generator *must* be configured as shown in Table 7-14.

Table 7-14. Frame Generator Jumper Settings

Terminal Block	Setting	Function
TB1	A-B	Select ESF Framing
TB2	B-C	Select 1.544 MHz Clock

Configuring the T1/E1 Frame Generator

The rocker switches and jumpers on the T1/E1 Frame Generator Module (23478305-*xxx*-0), or T1/E1 SSM Frame Generator Module (23478443-*xxx*-0) *must* be set as shown Table 7-15 for the ESF/D4 10-Output module to function properly.

Set jumper W9 to the 1.544 MHz position to provide a 1.544 MHz clock at CLK1. Jumper W10 may be set as desired.

Set S1 and S2 as shown in Table 7-15. The number of each rocker is located on both sides of the switch block (1 through 6). A switch is ***OFF*** when the left side of the rocker is pressed down. A switch is ***ON*** when the right side of the rocker is pressed down.

Table 7-15. T1/E1 Frame Generator S1 and S2 Rocker Settings

Switch	Setting	Function
	Switch S1	
1	ON (required)	Sets Output 1 for T1
2,3,4,5,6	(Not used by ESF/D4 Output Module. Settings are optional.)	(Refer to Frame Generator section)
	Switch S2	
1,2,3	(Not used by ESF/D4 Output module. Settings are optional.)	(Refer to Frame Generator section)
4	(Rocker not used)	NA
5	OFF (required)	Selects ESF Framing
6	OFF or ON	Enable/Disable BOM

Configuring the T1/E1 Frame Generator with Bypass

The rocker switches and jumpers on the Frame Generator with Bypass (23478468-*xxx*-0) *must* be set as shown below for the ESF/D4 10-Output module to function properly. Set jumper W6 to the 1.544 MHz position to provide a 1.544 MHz clock at CLK1. Jumper W5 may be set as desired.

Set S2 and S3 as shown in Table 5-53. The number of each rocker is located on both sides of the switch block (1 through 6). A switch is ***OFF*** when the left side of the rocker is pressed down. A switch is ***ON*** when the right side of the rocker is pressed down.

Table 7-16. T1/E1 Frame Generator S3 and S2 Rocker Settings

Switch	Setting	Function
Switch S3		
1	ON (required)	Sets Output 1 for T1
2,3,4,5,6	Not used by ESF/D4 10-Output Module. Settings are optional.	Refer to Frame Generator section
Switch S2		
1,2,3	Not used by ESF/D4 10-Output module. Settings are optional.	Refer to Frame Generator section
4	(Rocker not used)	NA
5	OFF (required)	Selects ESF Framing
6	OFF or ON	Enable/Disable BOM

Installing the ESF/D4 10-Output Modules

The ESF/D4 10-Output modules are designed to operate in pairs. Insert one module in the primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-17 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-17. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through ten are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the ESF/D4 10-Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates the module is receiving power and the module power supply is working.

Check the INPUT FAULT A and INPUT FAULT B indicators. With two functional Frame Generators installed, both indicators should be off. If one or no Frame Generator is installed, the appropriate indicator should be lit, indicating the signals from one or both Frame Generators are missing.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the ESF/D4 10-Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Analog Output Module

The Analog Output module (23478444-*xxx*-0) generates six sine wave output signals which can be independently set to 1 MHz, 5 MHz, or 10 MHz. This module is used in a non-redundant configuration. It is designed to function with both T1/E1 Frame Generators (23478305-*xxx*-0 or 23487443-*xxx*-0). The front panel of the module is shown in Figure 7-7.

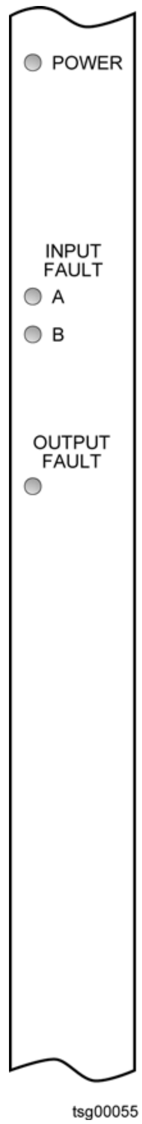


Figure 7-7. Analog Output Module

A blank filler panel (10977170-000-0) is available to cover the corresponding secondary distribution slot. All unused slots must contain a blank filler panel.

Table 7-18 describes the Analog Output Module front panel status indicators.

Table 7-18. Analog Output Module Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = PLL unlocked
PLL FAULT	Amber	On = Output failure on one or more channels.

Functional Description

Refer to Figure 7-8 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator modules. The module selects one of these signals (normally A) and applies it to a 20 MHz PLL circuit.

The PLL circuit has a 1 MHz, 5 MHz, and 10 MHz output which feeds sine filter circuits for each frequency. The sine filter outputs are jumper-selectable to six output buffer circuits.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The phase lock loop (PLL) circuit has a lock detect circuit which creates four PLL faults and turns on the PLL fault indicator on the front panel.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

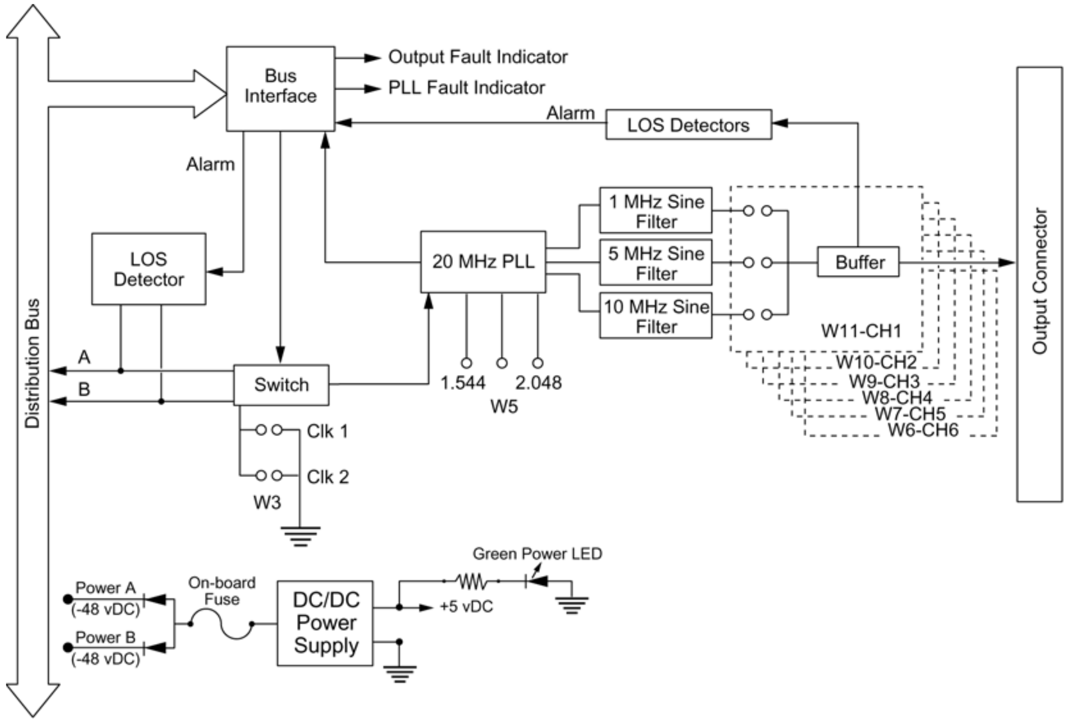


Figure 7-8. Block Diagram of the Analog Output Module

Specifications

Table 7-19 lists the functional specifications for the Analog Output module.

Table 7-19. Analog Output Module Specifications

Signal Characteristic	Specification
Frequency	1, 5, or 10 MHz (each channel jumper selectable)
Waveshape	Sine
Level	1 Vrms ±20% into 50 Ω
Harmonic distortion	>-25 dBc
Non-harmonic	>-60 dBc
Impedance	50 Ω ±20%
Number of Outputs	6

Configuring the Analog Output Module

This section describes how to configure the Analog Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Setting Jumpers W3 and W5

Use jumpers on W3 and W5 to define the source of the clock signal to be used by the module. These jumpers also configure the module for compatibility with the Frame Generator you are using. Table 7-20 describes the appropriate settings.

Table 7-20. Frame Generator Compatibility Jumper Settings

Frame Generator Clock (MHz)	W3	W5 (MHz)
Clock 1 = 1.544 (default)	Clock 1	1.544
Clock 1 = 2.048	Clock 1	2.048
Clock 2 = 1.544	Clock 2	1.544
Clock 2 = 2.048	Clock 2	2.048

Setting the Output Frequency

Jumpers W11-Ch1, W10-Ch2, W9-Ch3, W8-Ch4, W7-Ch5, and W6-Ch6 must be set to the 1 MHz, 5 MHz, or 10 MHz position. Each channel’s output frequency is independent of the other channels.

Caution: To avoid improper operation of the module, do not change jumpers W1, W2, and W4.

Installing the Analog Output Module

The Analog Output module is designed to operate in a non-redundant mode. Insert the module in one of the primary distribution slots. Table 7-21 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-21. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through ten are used by this module. Refer to Making Output Signal Connections, on page 56, for more information. Connect the six outputs as shown in Table 7-22.

Table 7-22. Output Wiring Connections for the Analog Output Module

Channel	Conductor	Pin
1	Center	28
	Shield	3
2	Center	31
	Shield	6
3	Center	34
	Shield	9
4	Center	37
	Shield	12
5	Center	40
	Shield	15
6	Center	43
	Shield	18

Accessory

Refer to Appendix A, Part Numbers, for an optional output panel available for use with this module.

Operational Check

With power applied to the shelf, install the Analog Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the Analog Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if a reference is not connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Composite Clock Output Module

The Composite Clock Output module (23477337-*xxx*-0) provides 20 balanced composite clock (CC) outputs. This module is normally paired with a second Composite Clock Output module; in this configuration, the outputs from both modules are tied together to form 20 redundant output signal pairs. Figure 7-9 illustrates the front panel of the module.

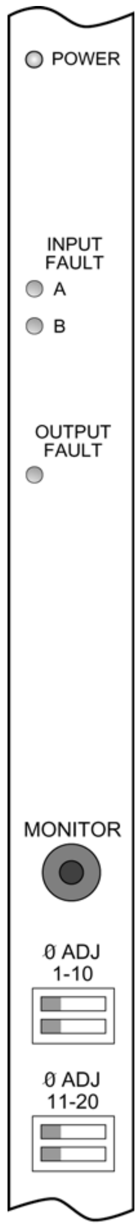


Figure 7-9. Composite Clock Output Module

Table 7-23 describes the status indicators (LEDs) located on the front panel of the Composite Clock Output module.

Table 7-23. Composite Clock Output Module Indicators

Indicator	Color	Description
POWER	Green	On = Module is receiving power. Off = Module is not receiving power.
INPUT FAULT A	Amber	On = No reference signal at input A, or failure of module input buffers. Off = Reference signal at input A.
INPUT FAULT B	Amber	On = No reference signal at input B, or failure of module input buffers. Off = Reference signal at input B.
OUTPUT FAULT	Red	On = Output failure (one or more). Off = All outputs available.

Functional Description

Refer to Figure 7-10 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator Modules and selects one signal (normally A). If the selected reference signal fails, the module detects the loss and switches to the alternate signal. The processor can also switch references on fault conditions or by operator command. The selected reference signal is then sent through delay circuits to allow phase adjustment for cable length compensation. This signal is then amplified and coupled to the output ports through transformers. There are separate phase adjustment switches on the front panel for the first ten and second ten outputs.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

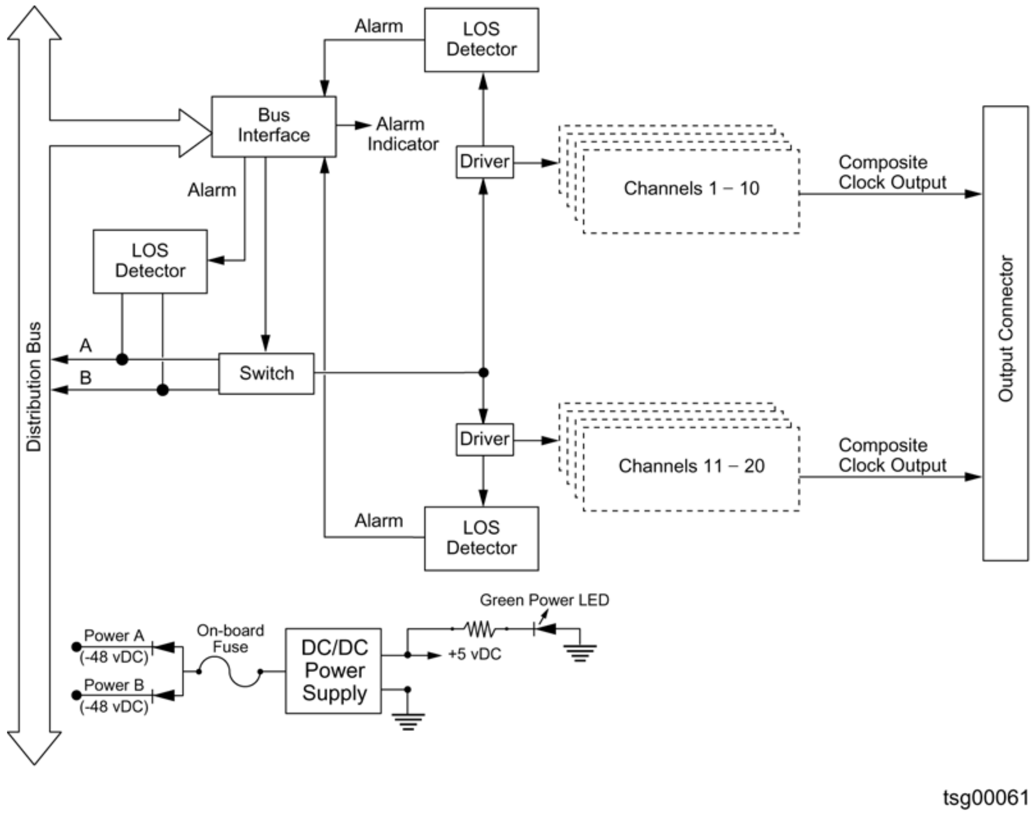


Figure 7-10. Block Diagram of the Composite Clock Output Module

Specifications

Table 7-24 lists the functional specifications for the Composite Clock Output module.

Table 7-24. Composite Clock Output Module Specifications

Signal Characteristic	Specification
Output Format	AMI with BPV every eight pulses
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Rectangular < 500 ns 9.8 µs ± 5% 15.6 µs ± 5% 62.5%
Output Level	2.7 to 5.5 V peak; 3.5 V peak nominal
Termination Impedance	133 Ω ± 5% resistive
Drive Capability	0 to 1500 ft., 22 AWG ABAM cable
Phase Compensation	0 to 2 µs, 4 steps

Table 7-24. Composite Clock Output Module Specifications (Continued)

Signal Characteristic	Specification
Monitor	860 Ω, Bantam jack
Number of Outputs	20

Configuring the Composite Clock Output Module

This section describes how to configure the Composite Clock Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Setting the Phase Adjustment

The relative phase of the output signals may be adjusted in groups of ten outputs (1–10 and 11–20, as shown in Figure 7-10). Set the front panel switches for phase delay as shown in Table 7-25.

Table 7-25. Switch Settings for Phase Adjustment

Delay Time	Delay Length	Switch Settings
0 ns	>1965 ft. (599 m)	On, On
700 ns	1310 – 1965 ft. (399 – 599 m)	Off, On
1400 ns	655 – 1310 ft. (200 – 399 m)	On, Off
2000 ns	0 – 655 ft. (0 – 200 m)	Off, Off

Note: When redundant modules are installed in a shelf, you *must* set both modules to the same phase adjust settings.

Installing the Composite Clock Output Module

The Composite Clock Output module is designed to operate in pairs. Insert one module in the primary distribution slot; insert the other in the secondary distribution slot. Table 7-21 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-26. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the Composite Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the Composite Clock Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

RS-422 Clock Output Module

The RS-422 Clock Output module (23477134-xxx-0) provides 20 balanced 1544 kHz or 2048 kHz square wave output signals in an RS-422 format, depending upon setting in the Frame Generator module. This distribution module is normally paired with a second RS-422 Output module; in this configuration, the outputs from both modules are tied together to form 20 redundant output signal pairs. Figure 7-11 illustrates the front panel of the module.

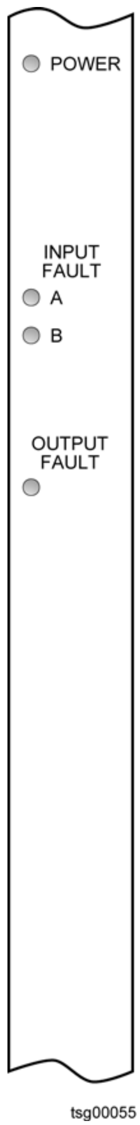


Figure 7-11. RS-422 Clock Output Module

Table 7-27 describes the RS-422 Clock Output module front panel status indicators (LEDs).

Table 7-27. RS-422 Clock Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = Output failure on one or more channel.

Functional Description

Refer to Figure 7-12 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator modules. The module selects one of these signals (normally A) and applies it to two drivers. Each driver supplies 10 square wave outputs in an RS-422 format.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

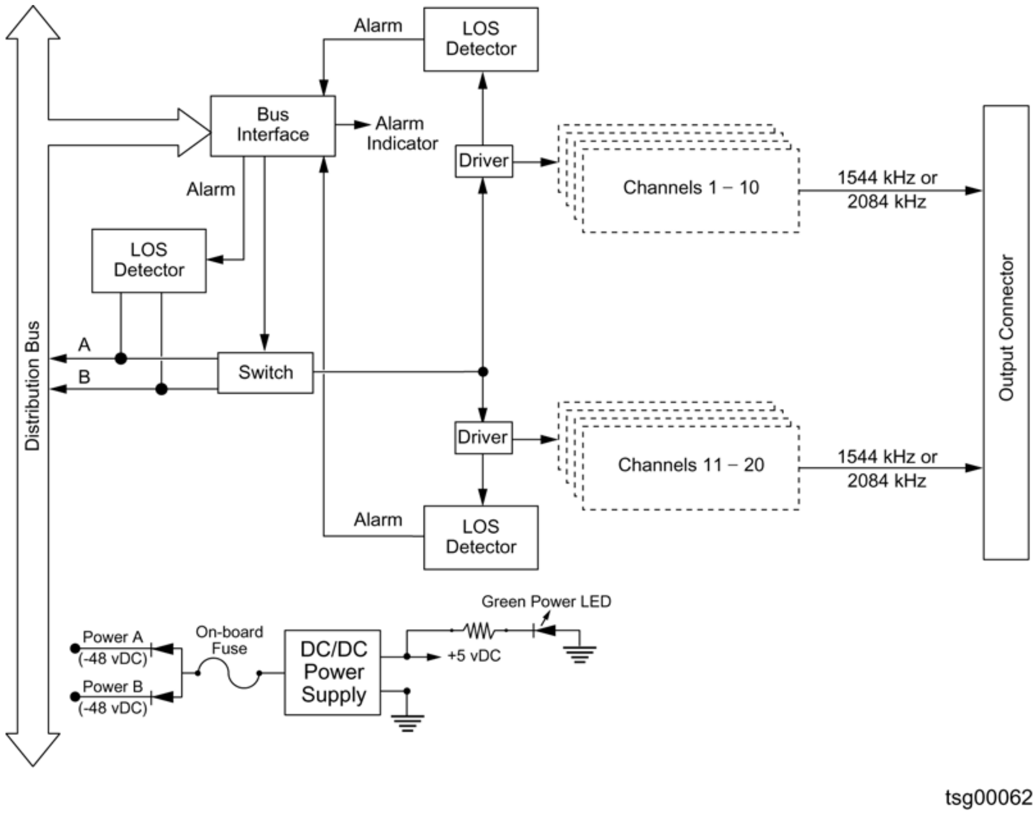


Figure 7-12. Block Diagram of the RS-422 Clock Output Module

Specifications

Table 7-28 lists the functional specifications for the RS-422 Clock Output module.

Table 7-28. RS-422 Clock Output Module Specifications

Signal Characteristic	Specification
Frequency	1544 or 2048 kHz
Format	Per EIA RS-422
Waveshape Width Period Rise Time Fall Time	Squarewave 324 or 244 ns (± 30 ns) 648 or 488 ns (± 30 ns) < 50 ns <50 ns
Amplitude	4.0 to 6.0 $V_{p\text{-}p}$
Jitter	< 0.03 UI
Impedance	100 Ω ±20%
Number of Outputs	20

Configuring the RS-422 Clock Output Module

This section describes how to configure the RS-422 Clock Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Selecting the Input Signals

The input signals can be selected by installing jumpers on TB1, TB2, TB3, TB4, TB5, TB6, and TB7.

The options are as follows:

- If the Frame Generator installed is 23476568-*xxx*-0 or 23478305-*xxx*-0, then set TB1 through TB7 to Position C. Frequency selection (1544 or 2048 kHz) is made on the Frame Generator module. Refer to the appropriate Frame Generator.
- If the Frame Generator installed is 23477799-*xxx*-0, then the frequency can be selected either on this module or on the Frame Generator module. Set TB2, TB4, TB5, TB6, TB7 to position C.

  Use TB1 and TB3 to select the signal supplied by the Frame Generator as follows:

  – **Position C** selects either 1544 kHz or 2048 kHz, whichever is configured at the Frame Generator

  – **Position A** selects 1544 kHz

Installing the RS-422 Clock Output Module

The RS-422 Clock Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-29 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-29. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23

Table 7-29. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the RS-422 Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the RS-422 Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

RS-422 8 kHz Clock Output Module

The RS-422 8 kHz Clock Output module (23477134-*xxx*-0) provides 20 balanced square wave signals in an RS-422 format. This distribution module is designed to function with a T1/E1 Frame Generator (23478305-*xxx*-0) or a 2048 kHz Frame Generator (23477799-*xxx*-0). This module is normally paired with a second RS-422 8 kHz Output module; in this configuration, the outputs from both modules are tied together to form 20 redundant output signal pairs. Figure 7-13 illustrates the front panel of the module.

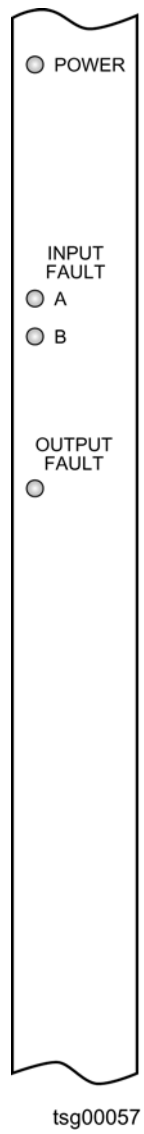


Figure 7-13. RS-422 8 kHz Clock Output Module

Table 7-30 describes the RS-422 8 kHz Clock Output Module front panel status indicators (LEDs).

Table 7-30. RS-422 8 kHz Output Module Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = Output failure on one or more channel.

Functional Description

Refer to Figure 7-14 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator Modules. The module selects one of these signals (normally A) and applies it to two drivers. Each driver supplies 10 square wave outputs in an RS-422 format.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

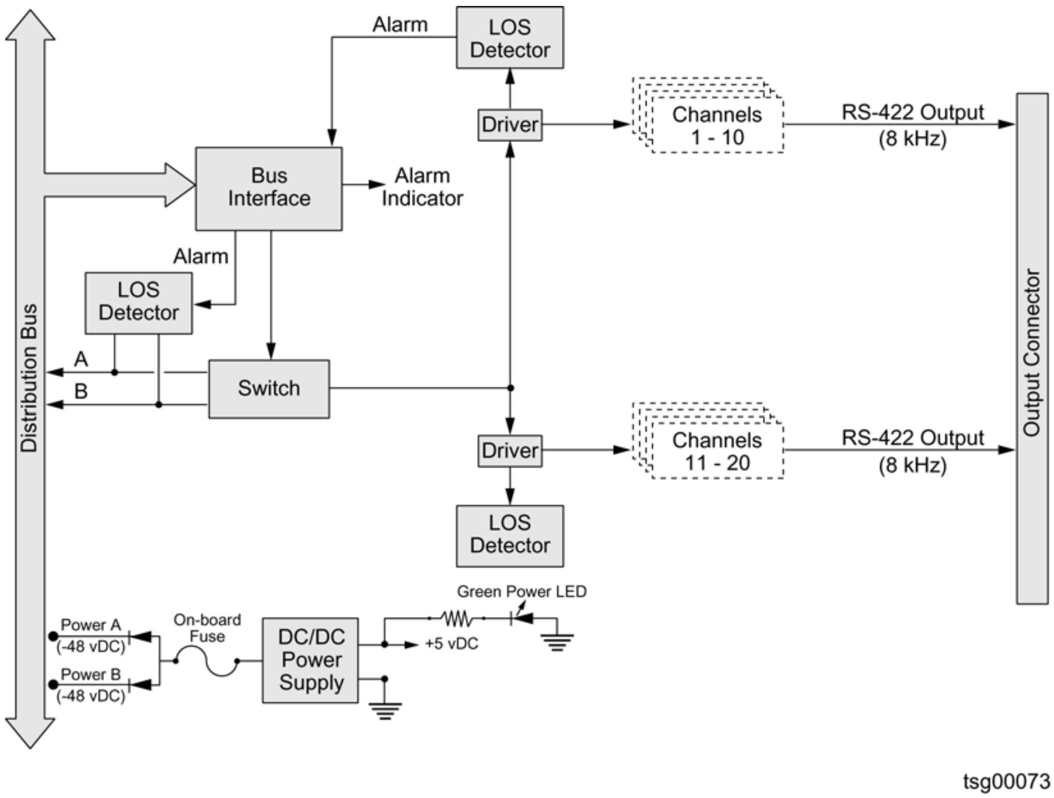


Figure 7-14. Block Diagram of the RS-422 8 kHz Clock Output Module

Specifications

Table 7-31 lists the functional specifications for the RS-422 8 kHz Clock Output module.

Table 7-31. RS-422 8 kHz Clock Output Module Specifications

Signal Characteristic	Specification
Frequency	8 kHz
Format	Per EIA RS-422
Amplitude	4.0 to 6.0 V_{p-p}
Jitter	< 0.03 UI
Waveshape Width Period Rise Time Fall Time	Square wave 62.5 μs ± 5 μs 125 μs ± 5 μs < 50 ns <50 ns
Impedance	100 Ω ±20%
Number of Outputs	20

Configuring the RS-422 8 kHz Clock Output Module

This section describes how to configure the RS-422 8 kHz Clock Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Selecting the Input Signals

TB1 and TB2 determine the source of the clock signal to be used by the module. Use the jumpers on TB1 and TB3 to configure the module for compatibility with the Frame Generator installed in the main shelf. Use Table 7-32 to determine the correct settings.

Table 7-32. Frame Generator Compatibility Jumper Settings

Frame Generator Used	TB1	TB3
2048 kHz Frame Generator (23477799-xxx-0)	A	A
T1/E1 Frame Generator (23478305-xxx-0) 8 kHz set to Output Signal 2 (Rockers 3 and 4 on S1 are set to off)	A	A
T1/E1 Frame Generator (23478305-xxx-0) 8 kHz set to Clock 2 Output	C	C

Caution: To avoid improper operation, the following jumpers *must* be set as follows:

- TB2 and TB4 set to position C
- TB5, TB6, and TB7 set from B to C

Installing the RS-422 Clock Output Module

The RS-422 Clock Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-33 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-33. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the RS-422 8 kHz Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the RS-422 8 kHz Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

RS-422 Selective Rate Clock Module

The RS-422 Selective Rate Clock module (12578512-000-1) provides 10 independent output ports (“A” in the port select display indicates port 10). You can select the desired port by pressing the port select button on the front panel. Each port is programmable with up to 512 frequencies. From 8 kHz to 4 MHz you can set the frequency in 8 kHz increments. From 4 MHz to 4.096 MHz you can set the frequency in 16 kHz increments. You change the frequency by pressing the CNT UP and CNT DWN buttons on the front panel, and you select the desired frequency by pressing both buttons at the same time for approximately two seconds. Figure 7-15 illustrates the module front panel.

This distribution module is normally paired with a second RS-422 Output module. In this configuration, the outputs from both modules are tied together to form 10 redundant output signal pairs. When redundant modules are installed and the frequency is changed on one module, the redundant module turns its output off, changes to the new frequency and locks in phase with it, and then turns its output back on.

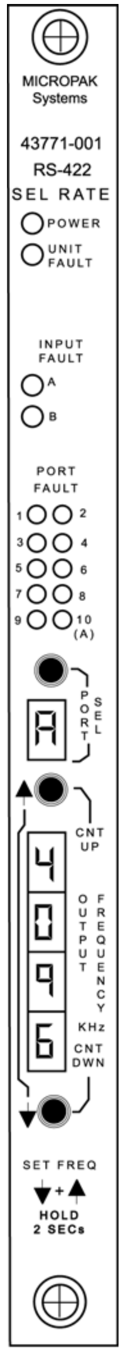


Figure 7-15. RS-422 Selective Rate Clock Module

Table 7-34 describes the RS-422 Selective Rate Clock module front panel status indicators (LEDs), Selection Indicators, and Buttons.

Table 7-34. RS-422 Selective Rate Clock Module Indicators and Buttons

Label		Description
Status Indicators		
POWER	Green	On = The module is receiving power.
UNIT FAULT	Red	On = Power supply fault or processor failure.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
PORT FAULT	Red	On = Driver fault on corresponding port. Blinking = Program mismatch between redundant units.
Selection Indicators		
PORT SEL		Displays selected port of ports 1 through 10 (A = port 10)
OUTPUT FREQUENCY		Displays selected frequency
Buttons		
PORT SEL		Press to select ports 1 through 10 (A = port 10)
CNT UP		Press to increase output frequency display
CNT DWN		Press to decrease output frequency display

Note: Press the CNT UP and CNT DWN buttons at the same time and hold for approximately two seconds to select the displayed frequency.

Functional Description

Refer to Figure 7-16 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator modules. The module selects one of these signals (normally A) and applies it to the ten port drivers. Each driver supplies 1 square wave output in an RS-422 format.

If reference signal A fails, the module detects its loss and switches to reference signal B. If an output fails, the corresponding front panel PORT FAULT indicator turns on.

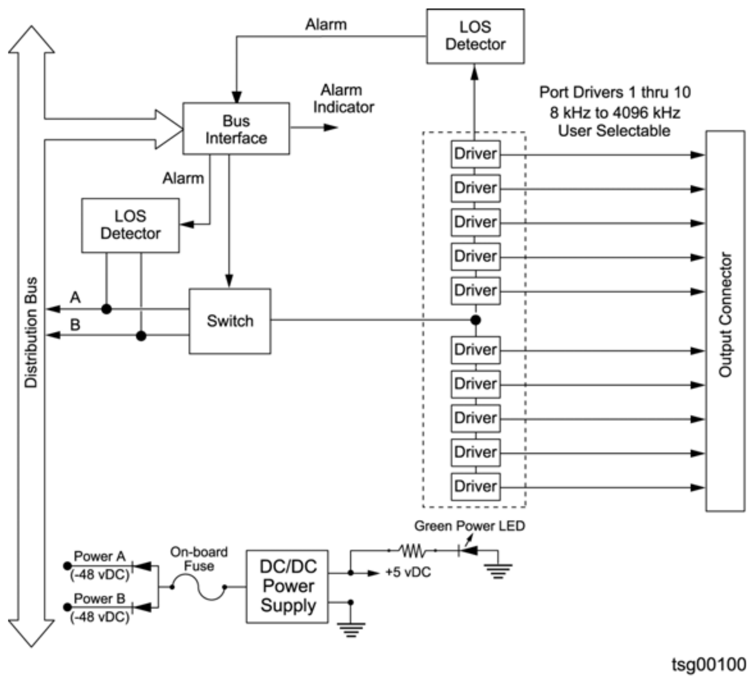


Figure 7-16. Block Diagram of the RS-422 Selective Rate Clock Module

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse, labeled F1, protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

Table 7-35 lists the functional specifications for the RS-422 Selective Rate Clock module.

Table 7-35. RS-422 Selective Rate Clock Module Specifications

Signal Characteristic	Specification
Frequency	User Selectable Per Channel, 8 kHz to 4096 kHz in increments of 8 kHz
Format	Per TIA/EIA -422-B
Waveshape Width Period Rise Time Fall Time	Squarewave 324 or 244 ns (± 30 ns) 648 or 488 ns (± 30 ns) < 50 ns <50 ns
Amplitude	4.0 to 6.0 V_{p-p}
Jitter	< 0.01 UI
Impedance	100 Ω ±20%
Number of Outputs	10 Differential Outputs

Configuring the RS-422 Selective Rate Clock Module

This section describes how to configure the RS-422 Selective Rate Clock module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Use the following steps to set the output frequency of each port.

1. Press the PORT SEL button until the desired port is displayed. The port display will increment from 1 to 9 and A, indicating ports 1 to 9 and “A” indicating port 10.

2. Press the count up, (CNT UP), or count down, (CNT DWN), push buttons to select the desired output frequency. Count up and down has four incremental speeds. When either switch is held, the count speed increases. When you release the push button, it resets to the lowest speed.

3. Verify that the port indicator is flashing indicating the selected frequency does not agree with the frequency in memory for the selected port.

Note: If five seconds elapse before the frequency selection is set in the step below, the port display stops flashing and the frequency display reverts to the previously programmed frequency.

4. Push both CNT UP and CNT DWN buttons simultaneously and hold for two seconds.The output frequency is now set into memory for the selected port.

Note: Immediately after the port display quits flashing the processor is reprogramming the selected synthesizer and the port select is disabled. The nominal time for this task is less than five seconds. When the synthesizer is locked, you can program the next port.

When the Synthesizer for the selected port is locked, the output is enabled.

You can check the port frequencies at any time by incrementing the port select display to the desired channel. The Output Frequency display shows the programmed frequency for the selected port.

Installing the RS-422 Selective Rate Clock Module

The RS-422 Selective Rate Clock module is designed to operate in pairs. Insert one module in a primary distribution slot and insert the other in the corresponding secondary distribution slot. Refer to Installing and Removing Modules, on page 61 for details on how to properly handle, install, and remove modules. Table 7-36 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-36. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Signal Connections

Input Signals

The RS-422 Selective Rate Clock module automatically operates from any framer unit configuration. The module detects the input from the framer unit and divides it by the appropriate number to generate an 8 kHz signal. Each of ten independent synthesizers is locked to this frequency and can be programmed to the selected output frequency for that particular port.

Output Signals

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Table 7-37 provides the tip and ring pin connections for each port. Refer to Making Output Signal Connections, on page 56, for more information.

Caution: To prevent damage to the unit and to insure proper operation, unused connections must be left open .

Table 7-37. Output Connections

Port	Tip Pin	Ring Pin
1	26	1
2	27	2
3	28	3
4	29	4
5	30	5
6	31	6
7	32	7
8	33	8
9	34	9
10 (A)	35	19

Operational Check

When the RS-422 Selective Rate Clock module is installed and power is applied to the shelf, all LEDs and seven segment displays turn on for a lamp test.

Note: If any display fails to turn on, the unit will not give correct indications and should be returned for repair.

The initial state of the module indicators is shown in Table 7-38.

Table 7-38. RS-422 Selective Rate Clock Initial Indicator State

Indicator	State
POWER	GREEN
UNIT FAULT	OFF
INPUT FAULT	OFF
PORT FAULT	OFF
PORT SEL	1
OUTPUT FREQUENCY	0000

Verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

Note: The INPUT FAULT LEDs indicate an alarm until the input clock is qualified to be one of three acceptable input frequencies, 8 kHz, 1.544 MHz or 2.048 MHz, and the clock is stable.

If at least one functional Frame Generator is installed, the PORT FAULT indicators should be off within eight seconds after the module is installed. If a port fault indicator is on, an output may be bad or it may have an excessive load connected to it: a short, for example. The indicator remains on if there is no reference connected since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

At initial power-up, all ten channels initialize in the off state: the output frequency is 0000 kHz, indicating the output port is off.

56 kBit Clock Output Module

The 56 kBit Clock Output module (23477342-*xxx*-0) provides eight balanced, 56 kBit outputs conforming to CCITT Recommendation V.35. This distribution module is normally paired with a second 56 kBit Clock Output module; in this configuration, the outputs from both modules are tied together to form 20 redundant output signal pairs. Figure 7-17 illustrates the front panel of the module.

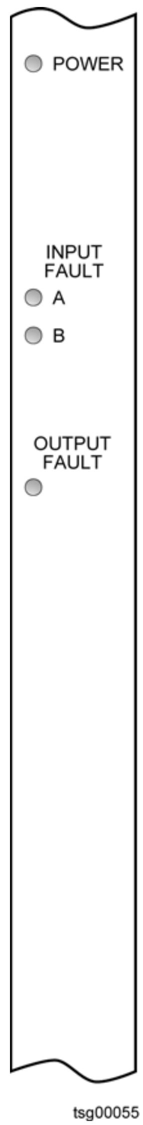


Figure 7-17. 56 kBit Clock Output Module

Table 7-39 describes the 56 kBit Clock Output Module front panel status indicators (LEDs).

Table 7-39. 56 kBit Clock Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = Output failure on one or more channel.

Functional Description

Refer to Figure 7-18 for the following functional discussion. The module accepts two 64 kHz Composite Clock reference inputs (A and B) from separate Frame Generator modules. Each signal enters a Byte Alignment Extractor which generates an 8 kHz output. Internal 56 kHz signals are phase locked to the 8 kHz signals.

A multiplexer receives both phase locked 56 kHz signals. The module selects and drives one of them (normally A). This signal couples to the output ports through transformers.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

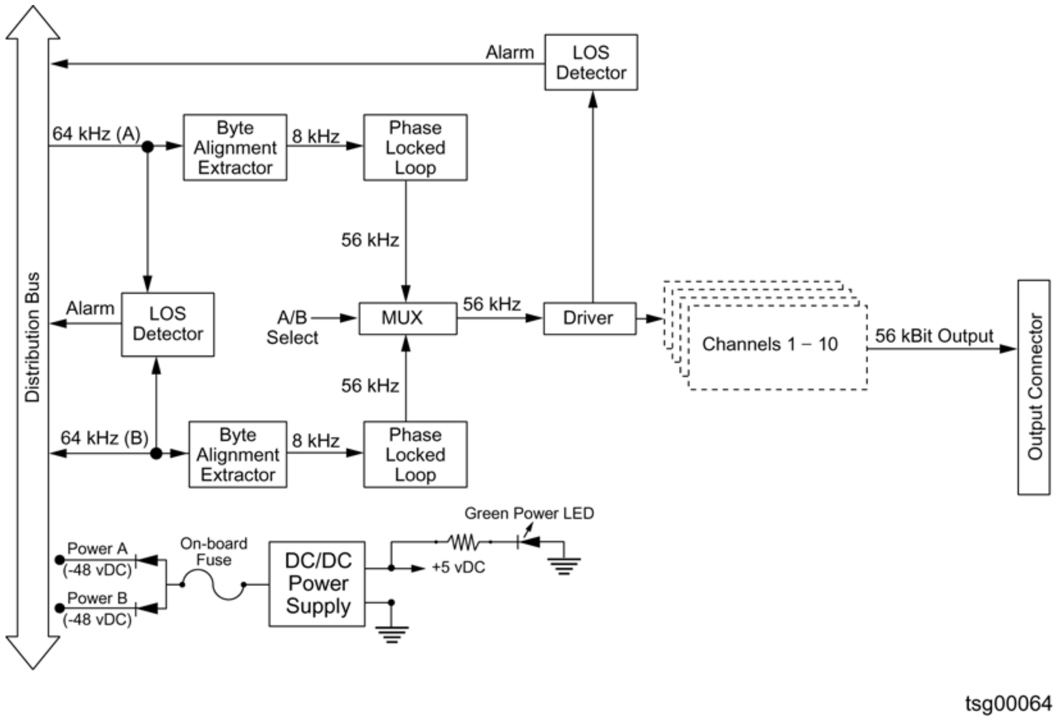


Figure 7-18. Block Diagram of the 56 kBit Clock Output

Specifications

Table 7-40 lists the functional specifications for the 56 kBit Clock Output module.

Table 7-40. 56 kBit Clock Output Module Specifications

Signal Characteristic	Specification
Frequency	56 kBits/second
Format	Per CCITT Recommendation V.35
Amplitude	0.55 V peak ± 20%
Jitter	< 20 ns
Impedance	100 Ω ±5%
Number of Outputs	8

Installing the 56 kBit Clock Output Module

The 56 kBit Clock Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-41 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-41. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs 1 through 8 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information. The (+) signals are on pins 1–8 and the (–) signals are on pins 26–33. Pins 9–20 and 34–45 have no connection, and pins 21–25 and 46–50 are shield grounds. Outputs should be terminated with a 100 Ω resistor between (+) and (–) contacts. For example, a typical mating connector is Cinch #57-10500-8750.

Operational Check

With power applied to the shelf, install the 56 kBit Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the 56 kBit Clock Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

TTL Clock Output Module

The TTL Clock Output Module, item number 23477134-xxx-0, provides 8 kHz, 1544 kHz, or 2048 kHz square wave signals in a TTL format, depending upon Frame Generator setting. This distribution module is normally paired with a second TTL Output module; in this configuration, the module's outputs tie together to form 20 redundant output pairs. Figure 7-19 illustrates the front panel of this module.

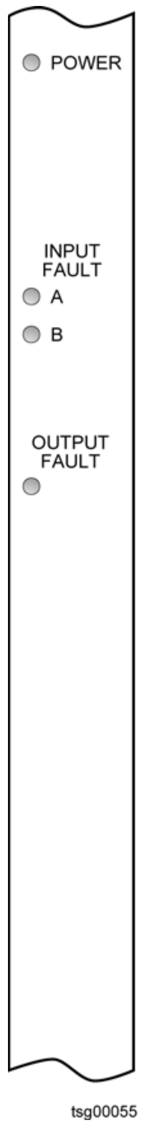


Figure 7-19. TTL Clock Output Module

Table 7-42 describes the TTL Clock Output module front panel status indicators (LEDs).

Table 7-42. TTL Clock Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = Output failure on one or more channels.

Functional Description

Refer to Figure 7-20 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator Modules. The module selects one of these signals (normally A) and applies it to two drivers. Each driver supplies 10 square wave outputs in a TTL format.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

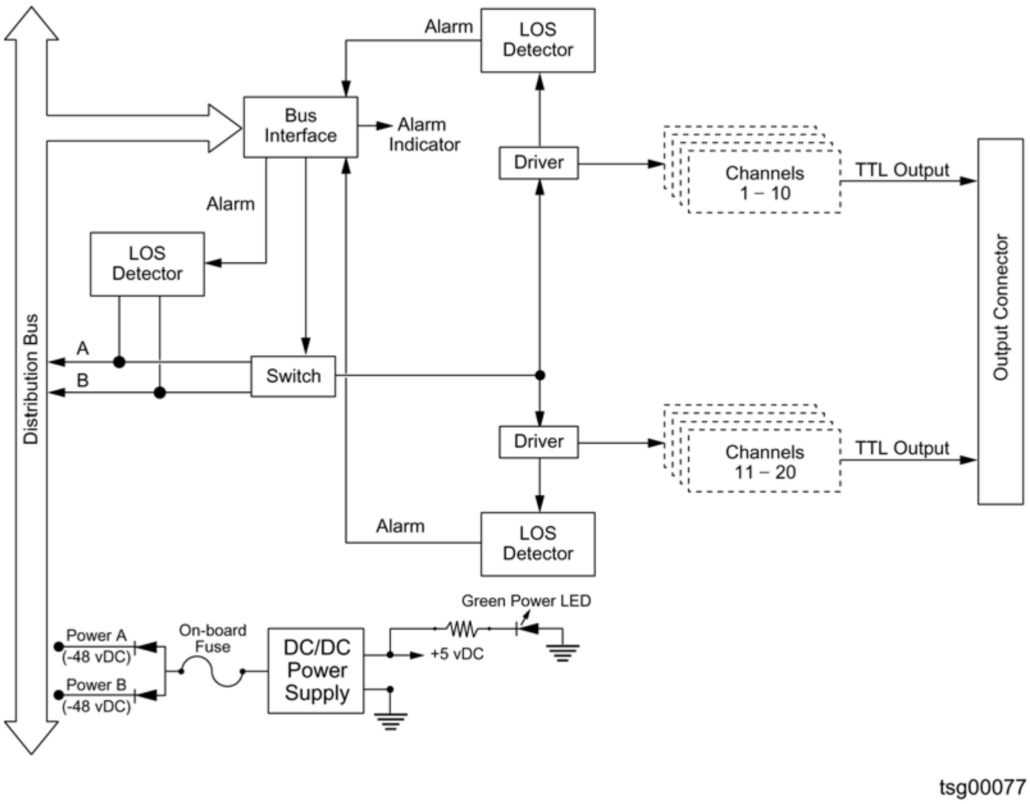


Figure 7-20. Block Diagram of the TTL Clock Output Module

Specifications

Table 7-43 lists the functional specifications for the TTL Clock Output module.

Table 7-43. TTL Clock Output Module Specifications

Signal Characteristic	Specification
Frequency	1544 kHz or 2048 kHz
Level	TTL
Amplitude	2.8 to 3.5 V_{p-p}
Jitter	< 0.03 UI
Impedance	100 Ω ±20%
Number of Outputs	20

Configuring the TTL Clock Output Module

This section describes how to configure the TTL Clock Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Selecting the Input Signals

The input signals can be selected by installing jumpers on TB1, TB2, TB3, TB4, TB5, TB6, and TB7.

The options are as follows:

- If the Frame Generator for the system is type 23476568-xxx-0 or 23478305-xxx-0, then the only option for this board is for TB1 through TB7 to be set to Position C. Frequency selection (1544 or 2048 kHz) is done on the Frame Generator. Refer to the appropriate Frame Generator.
- If the Frame Generator for the system is type 23477799-xxx-0, then the frequency selection can be done on this module as well as the Frame Generator. TB2, TB4, TB5, TB6, TB7 are set to position C.

Set TB1 and TB3 to select the signal supplied by the Frame Generator as follows:

- – **Position C** selects either 1544 or 2048 kHz, whichever was programmed at the Frame Generator
- – **Position A** selects 1544 kHz

Installing the TTL Clock Output Module

The RS-422 Clock Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-29 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-44. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23

Table 7-44. Primary and Secondary Distribution Slots (Continued)

Model	Primary Distribution Slots	Secondary Distribution Slots
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the TTL Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the TTL Clock Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

TTL 8 kHz Clock Output Module

The TTL 8 kHz Clock Output Module, item number 23477134-*xxx*-0, provides 20 balanced square wave signals in an TTL format. This module is designed to function with a T1/E1 Frame Generator item number 23478305-*xxx*-0, or a 2048 kHz Frame Generator item number 23477799-*xxx*-0. This distribution module is normally paired with a second RS-422 8 kHz Output module; in this configuration, the module's outputs tie together to form 20 redundant output pairs. Figure 7-21 illustrates the front panel of the module.

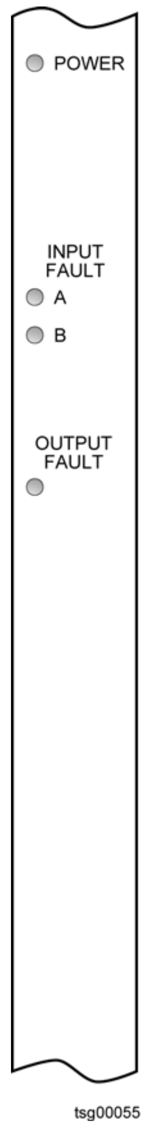


Figure 7-21. TTL 8 kHz Clock Output Module

Table 7-45 describes the TTL 8 kHz Clock Output module front panel status indicators (LEDs).

Table 7-45. TTL 8 kHz Clock Output Module Status Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving power.
INPUT FAULT A	Amber	On = No reference signal applied to input A.
INPUT FAULT B	Amber	On = No reference signal applied to input B.
OUTPUT FAULT	Red	On = Output failure on one or more channel.

Functional Description

Refer to Figure 7-22 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator Modules. The module selects one of these signals (normally A) and applies it to two drivers. Each driver supplies 10 square wave outputs in a TTL format.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

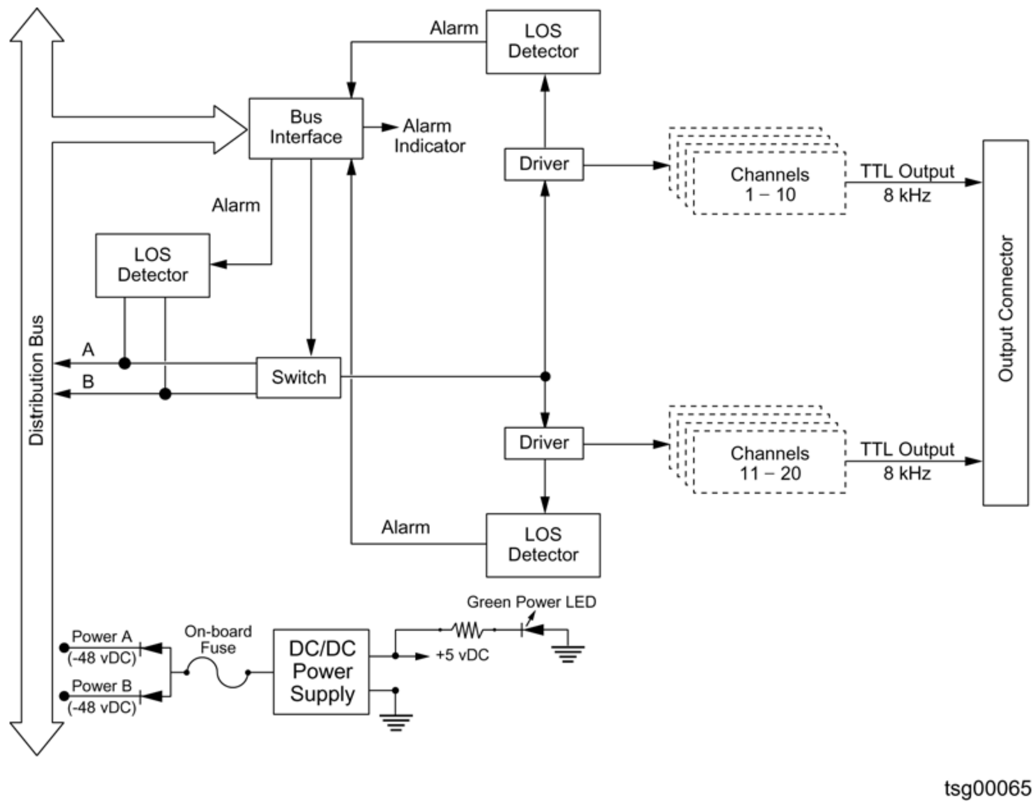


Figure 7-22. Block Diagram of the TTL 8 kHz Clock Output Module

Specifications

Table 7-46 lists the functional specifications for the TTL 8 kHz Clock Output Module.

Table 7-46. TTL 8 kHz Clock Output Module Specifications

Signal Characteristic	Specification
Frequency	8 kHz
Format	Per EIA RS-422
Amplitude	4.0 to 6.0 V_{p-p}
Jitter	< 0.03 UI
Waveshape Width Period Rise Time Fall Time	Squarewave 62.5 μs ± 5 μs 125 μs ± 5 μs < 50 ns < 50 ns
Impedance	100 Ω ±20%
Number of Outputs	20

Configuring the TTL 8 kHz Clock Output Module

This section describes how to configure the TTL 8 kHz Clock Output module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

Caution: To avoid improper operation, the following jumpers *must* be set as follows:

- TB2 and TB4 set to position C
- TB5, TB6, and TB7 set from B to C.

Selecting the Input Signals

In order for the TTL 8 kHz Clock Output module to function properly, the source of the clock signal to be used by the module must be determined. Use the jumpers on TB1 and TB3 to configure the module for compatibility with the Frame Generator you are using. Use Table 7-47 to determine the correct settings.

Table 7-47. Frame Generator Compatibility Jumper Settings

Frame Generator Used	TB1	TB3
2048 kHz Frame Generator (23477799-xxx-0)	A	A
T1/E1 Frame Generator (23478305-xxx-0) 8 kHz set to Output Signal 2 (Rockers 3 and 4 on S1 are set to off)	A	A
T1/E1 Frame Generator (23478305-xxx-0) 8 kHz set to Clock 2 Output	C	C

Installing the TTL 8 kHz Clock Output Module

The TTL 8 kHz Clock Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-48 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-48. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Operational Check

With power applied to the shelf, install the TTL 8 kHz Clock Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the TTL 8 kHz Clock Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

G.703/13 Output Module

The G.703/13 Output module (23477602-000-0) provides 20 balanced, 2048 kHz outputs per G.703/13. This distribution module is normally paired with a second G.703/13 Output module; in this configuration, the module's outputs tie together to form 20 redundant output pairs. Figure 7-23 illustrates the front panel of the module.

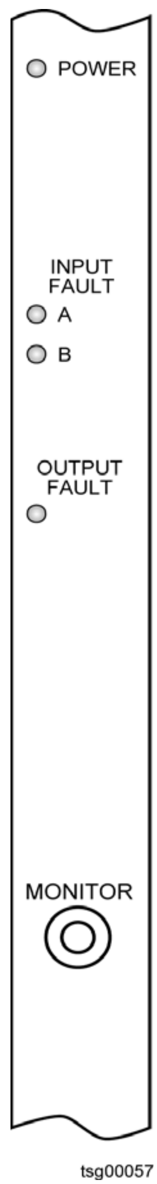


Figure 7-23. G.703/13 Output Module

Table 7-49 describes the G.703/13 Output module front panel status indicators (LEDs).

Table 7-49. G.703/13 Output Module Status Indicators

Indicator	Color	Description
Power	Green	On = The module is receiving power.
Input Fault A	Amber	On = No reference signal applied to input A.
Input Fault B	Amber	On = No reference signal applied to input B.
Output Fault	Red	On = Output failure on one or more channels.

Functional Description

Refer to Figure 7-24 for the following functional discussion. The module accepts two reference input signals (A and B) from separate Frame Generator Modules. The module selects and amplifies one signal (normally A). This signal couples to the output ports through transformers.

If reference signal A fails, the module detects its loss and switches to reference signal B. The processor can also switch references.

The module checks the outputs to confirm signal presence. Should an output fail, the front panel OUTPUT FAULT indicator lights.

Newer versions of this module have a switch, S1, located in the lower left corner (as viewed from the component side, with the edge connector down). This switch selects between two pairs of reference input signals. In the pressed or “down” position (default setting), the G.703/13 Output module uses the pair of signals on the “CLK1” inputs. These are the reference signals used by all versions of this module. In the “up” position, the “CLK2” inputs are selected. The CLK2 signals are typically generated by the T1/E1 Frame Generator, 23478305-xxx-0. If this frame generator is installed, S1 may be set to the “up” position. Otherwise, S1 must be pressed to select the CLK1 inputs.

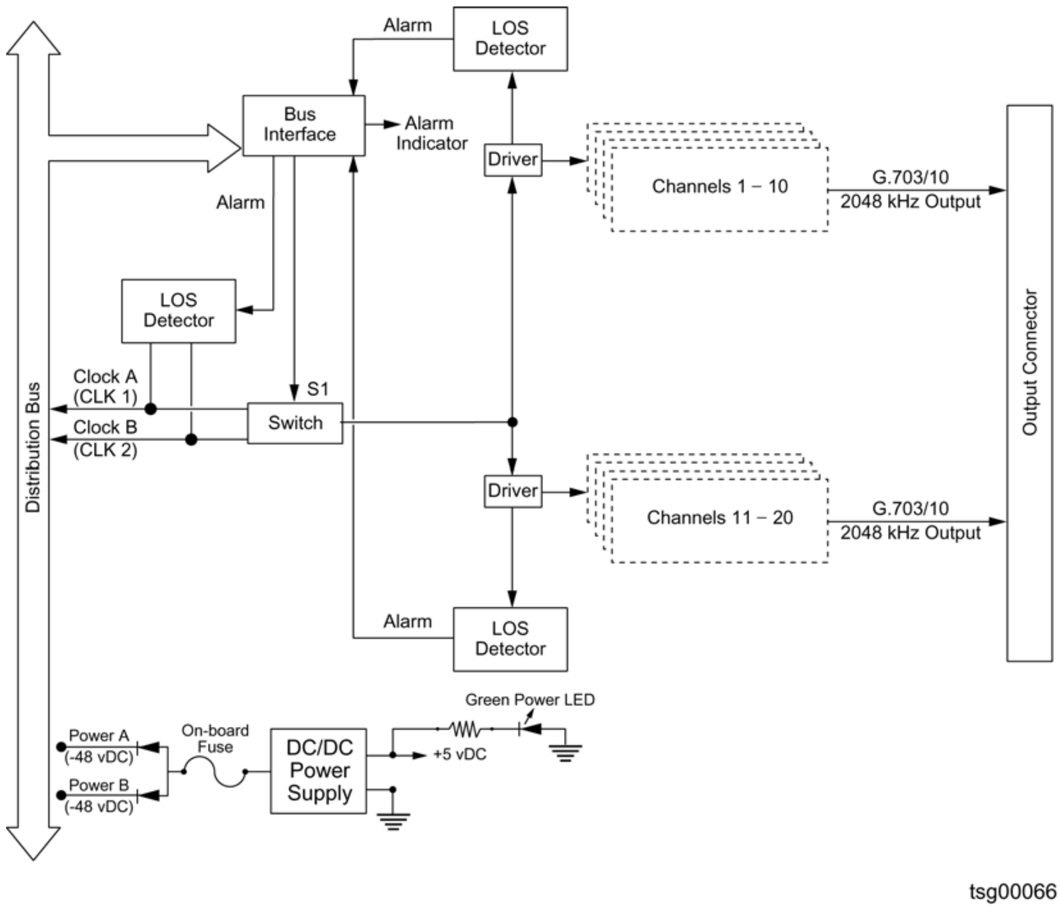


Figure 7-24. Block Diagram of the G.703/13 Output Module

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

Table 7-50 lists the functional specifications for the G.703/13 Output module.

Table 7-50. G.703/13 Output Module Specifications

Signal Characteristic	Specification (E1)	Specification (T1)
Pulse Shape	ITU-T G.703/13	ITU-T G.703/13
Type of Cable Pair	Coaxial Pair	Symmetrical Pair
Maximum peak voltage	1.5	1.9
Minimum peak voltage	0.75	1.0
Maximum jitter	< 0.03 UI	< 0.03 UI
Number of Outputs	20	20

Installing the G.703/13 Output Module

The G.703/13 Output module is designed to operate in pairs. Insert one module in a primary distribution slot; insert the other in the corresponding secondary distribution slot. Table 7-51 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-51. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information.

Note: Frame Generator modules must be configured to provide 2048 kHz reference signals.

Operational Check

With power applied to the shelf, install the G.703/13 Output module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the input signals by observing the A and B INPUT FAULT indicators. For Locked operation and with two references applied, both indicators should be off.

If at least one functional Frame Generator is installed, the OUTPUT FAULT indicator should go out within eight seconds after the G.703/13 Output module is installed. If it does not, an output may be bad or has an excessive load connected to it (example, shorted). The indicator will remain on if there is no reference connected, since there can be no outputs.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Timing Insertion Module

The Timing Insertion Module (TIM) (23477756-*xxx*-0) buffers a DS1 data stream and re-times that data stream to an external timing reference. The TIM also monitors signal quality and reports faults to the system. Figure 7-25 illustrates the front panel of the module.

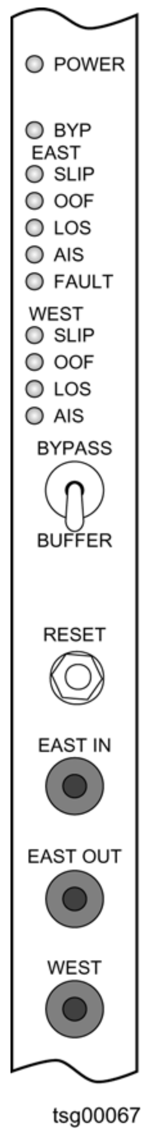


Figure 7-25. Timing Insertion Module

Table 7-52 describes the status indicators (LEDs) located on the front panel of the TIM.

Table 7-52. Timing Insertion Module Status Indicators

	Indicator	Color	Description
	POWER	Green	On = Power is applied
	BYPASS	Red	On = Re-timing function bypassed by relays
EAST	SLIP	Red	On = A slip occurred (latching)
	OOF	Red	On = 2 out of 4 consecutive framing bits in error
	LOS	Red	On = Loss of Signal
	AIS	Red	On = Alarm Indication from Source
	FAULT	Red	On = Hardware failure of transmitter
WEST	OOF	Red	On = 2 out of 4 consecutive framing bits in error
	LOS	Red	On = Loss of Signal
	AIS	Red	On = Alarm Indication from Source

Functional Description

Refer to Figure 7-26 for the following functional discussion. The TIM accepts a DS1 data stream and re-clocks it with the TSG-3800 system clock. The data stream is passed through a frame (386 bit) buffer.

The TIM modules can be set for D4 or ESF framing, and for AMI or B8ZS mode through the PCB jumper blocks on each module. The DS1 line-interface signal on the output can be adjusted to compensate for the cable length.

Clock signals from each of the two Clock/Frame Generator Module pairs are brought onto each TIM card. Under normal operation the TIM will use the input from the ‘A’ Clock/Frame Generator. If the selected pair fails, the TIM will automatically switch to the other pair of modules. A phase lock loop (PLL) filters the clock feed, so that when the TIM switches from one Clock Module to the other, the re-timed output will shift less than ±324 ns at a rate which never exceeds 81 ns change in a 14 ms interval (per ANSI T1.101). If both clock inputs fail, a MAJOR alarm will be generated, and the signal will be passively by-passed.

The TIM monitors the outgoing DS1 signal and if it fails, the by-pass relays are activated and the DS1 line is routed around the module.

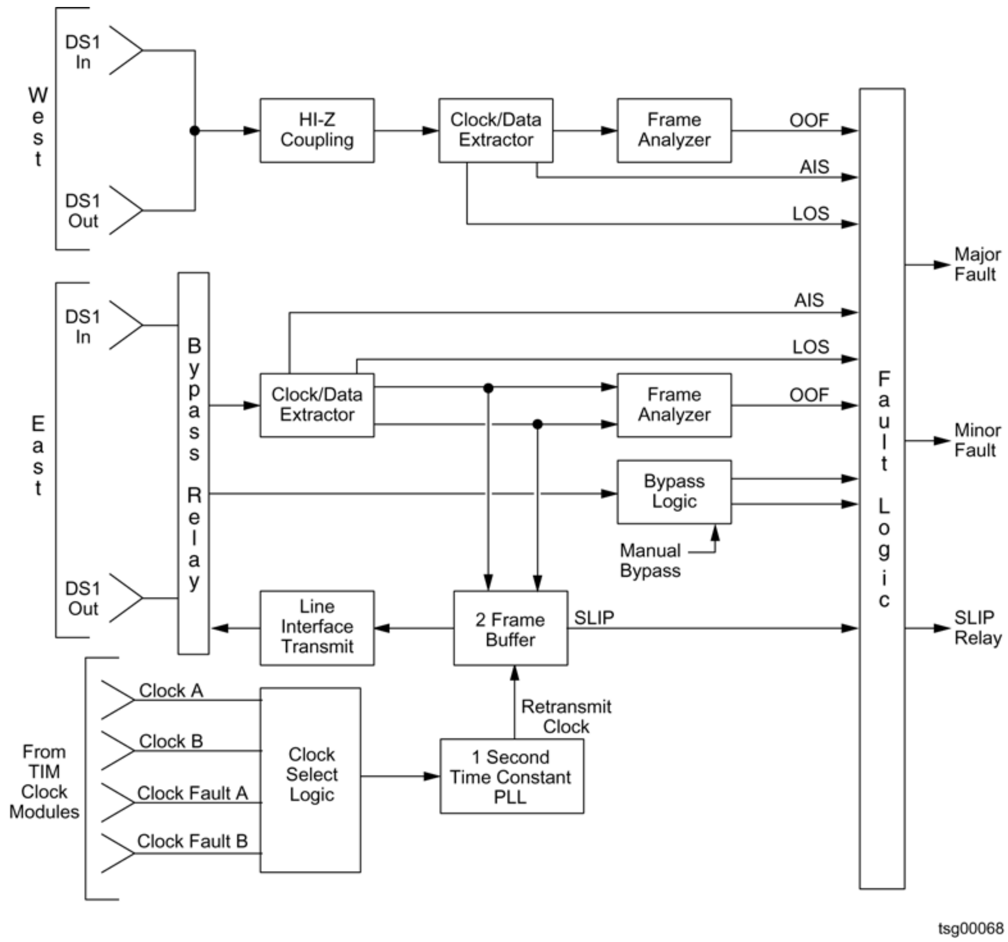


Figure 7-26. Block Diagram of the Timing Insertion Module

The incoming signal is monitored for LOS, OOF, and implicitly AIS conditions. When one of these is detected, the TIM inserts an AIS signal (re-timed to the system clock) on the outgoing line. Alternatively, a framed all “ONE’s” signal can be sent under these conditions. This is selected by a jumper block. Receipt of an LOS, AIS, or OOF signal creates a MAJOR alarm condition.

When buffer slips occur, the TIM indicates this in three ways. A Relay Closure line on the output connector is toggled for 2.5 seconds. A red SLIP indicator on the front panel is latched on. An alarm is generated (selectable as MAJOR/ MINOR/ IGNORED by PCB switches). Depressing a front panel switch on the TIM clears the slip indication and resultant alarm.

Power A and B on the main shelf provide power to the module. These redundant sources of –48 vDC are diode-coupled and fused, allowing the module to draw power from either source. The internal fuse labeled F1 protects the circuitry from excessive current. The DC-to-DC Converter changes the negative voltage into +5 vDC; the green POWER indicator on the front panel is lit when either power source is available to the module. The POWER indicator turns off when power is lost, for example if the fuse on the module opens, if both –48 vDC power inputs are lost, or if the converter fails.

Specifications

Table 7-53 lists the functional specifications of the Timing Insertion module.

Table 7-53. Timing Insertion Module Specifications

Signal Characteristic	Specification
DS1 Input to TIM	
Signal Type	DS1
Connector	50 contact connector, example Cinch #57-10500-8750
Format	D4 or ESF, AMI or B8ZS (jumper selectable)
Amplitude (nominal)	0.5 to 3.6 V (base to peak)
Signal Faults detected	LOS, OOF, AIS
Input Impedance	100 Ω
Monitor	Bantam jack, 860 Ω isolation
Jitter Tolerance	per TA-TSY-000378
Retuning Buffer	
Buffer Size	386 bits
Delay	approx. 135 µs when centered
System Timing source	TIU Clock Module A or B or AUSTRON 3800 TSG (automatic switch on Clock Module failure)
DS1 Output From TIM	
Signal Type	DS1
Connector	50 contact connector, example Cinch #57-10500-8750
Format	D4 or ESF, B8ZS/AMI (same as input)
Waveshape	Per ANSI T1.102-1987
Amplitude (at 0’ LBO)	3 ± 0.6 V base to peak

Table 7-53. Timing Insertion Module Specifications (Continued)

Signal Characteristic	Specification
Overshoot (at 0’ LBO)	10% of peak to base amplitude
Jitter	< 0.03 UI
Drive Capability	0 to 655 feet, 22AWG ABAM cable
Termination Impedance	100 Ω ±5%
Line Build Out	0-655 ft. in 4 steps
Passive bypass capability	Relay bypasses module on fault
Output on LOS or OOF	AIS or framed all ONEs (switch selectable)
Alarm Conditions	
Major Faults	■ Loss of (or fault in) both clock feeds ■ Failure of both Clock Modules ■ Module failure ■ LOS or OOF on input to TIM
Programmable Faults	SLIP (Major/Minor/Ignored)

Configuring the Timing Insertion Module

This section describes how to configure the Timing Insertion module to meet the requirements of your particular installation.

Caution: To prevent ESD damage to the module, always observe the precautions described in Properly Handling the Modules, on page 61.

The user can modify operations of this module by setting jumpers. The jumpers are labeled TB101 through TB107, and TB202 and TB203. The possible configurations are listed in Table 7-54 and Table 7-55.

Table 7-54. Timing Insertion Module Jumper Configurations

	TB #	Jumper	Description
EAST	101	A-B	Transmit all ONEs on LOS or OOF
		B-C	Transmit framed all ONEs on LOS or OOF
	102	B-C	193S Framing (D4)
		A-B	193E Framing (ESF or Fe)
	103	A-B	B8ZS Disabled (AMI)
		B-C	B8ZS Enabled
	104	A-B	SLIP = Minor Fault
		B-C	SLIP = Major Fault
		None	SLIP = Ignored
WEST	202	B-C	193S Framing (D4)
		A-B	193E Framing (ESF or Fe)
	203	A-B	B8ZS Disabled (AMI)
		B-C	B8ZS Enabled

Table 7-55. Timing Insertion Module Line Length Selection

Line Length	TB105	TB106	TB107
0–133	A–B	A–B	B-C
134–266	B–C	B–C	A-B
267–399	A–B	B–C	A-B
400–533	B–C	A–B	A-B
534–655	A–B	A–B	A-B

Setting the Bypass/Buffer Switch

The TIM has one switch, the BYPASS/BUFFER, on the front panel to manually control the function of the module. In the activated mode (UP), the TIM function is bypassed and the DS1 data stream is not re-timed.

Setting the Slip Reset Switch

A slip fault (SLIP) or an output fault (FAULT) can be cleared by pressing the RESET switch.

Monitors

The DS1 signals can be monitored at the front panel as follows:

- EAST IN
- EAST OUT (re-timed)
- WEST (through)

TIM Bypass Relay Assembly

The TIM Bypass Relay Assembly is plugged into the adjacent output slot of the shelf to provide an alternate signal path in case the TIM is removed for service. When the TIM is operational, the relays are opened to allow the signals to be routed through the re-timing and monitoring functions of the TIM. When the TIM is in “BYPASS” mode or is removed from the shelf, the relays close, bypassing both the East and West signal paths from input connections to output connections. The TIM then can be removed for service without disrupting the signals.

Installing the Timing Insertion Module

The Timing Insertion module is designed to operate singly. Insert the module in a primary distribution slot. Insert the TIM Bypass Relay Assembly into the corresponding secondary distribution slot. Table 7-56 lists the primary and secondary distribution slots in the TSG-3800 series.

Table 7-56. Primary and Secondary Distribution Slots

Model	Primary Distribution Slots	Secondary Distribution Slots
3800/3800E 19-inch Shelves	18, 20	19,21
3800 23-inch Shelf	18, 20, 22	19, 21, 23
3800X/3800EX 19-inch Shelves	4, 6, 8, 10, 12, 14, 16, 18, 20	5, 7, 9, 11, 13, 15, 17, 19, 21
3800X 23-inch Shelf	4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25

Making Signal Connections

The output signals are available at the 50-pin connectors located on the rear panel of the shelf. Outputs one through 20 are used by this module. Refer to Making Output Signal Connections, on page 56, for more information. Make DS1 input/output signal connections as shown in Table 7-57.

Table 7-57. List of Modules and Accessories

Pin	Description
1	EAST Tip In
2	EAST Tip Out (re-timed)
3	WEST Tip In
4	WEST Tip Out
5	Slip relay (normally open)
26	EAST Ring In
27	EAST Ring Out (re-timed)
28	WEST Ring In
29	WEST Ring Out
30	Slip relay (normally open)

Operational Check

With power applied to the shelf, install the Timing Insertion module in the appropriate slot and verify that the POWER indicator is lit. This indicates that the module is receiving power and the module power supply is working.

Verify that the module is receiving the proper DS1 input signals by observing the indicators. For normal operation the Power indicators should be lit; all others should be off.

Note: The module indicators may take a few seconds after installation to reach proper operating status.

Output Fault Analyzer

The Output Fault Analyzer (23478511-000-0) is an optional troubleshooting tool used to identify a failing port. When inserted into a slot in the TSG-3800 shelf, the Analyzer (see Figure 7-27) identifies output faults on every port associated with the slot. The Analyzer can check outputs on DS1 and Composite Clock (CC) Output modules, and indicates when adequate output levels are present for each port on an AMI Output module.

The Analyzer detects pulses on each Tip and Ring pair and provides an LED indication on the front panel for each output port. A green LED indicates a valid signal level, and a red LED indicates a signal that is below the valid level. The Analyzer indicates momentary as well as continuous faults. When the module detects a fault, it does not automatically return to a pass indication when the fault is cleared: the operator must manually reset the module.

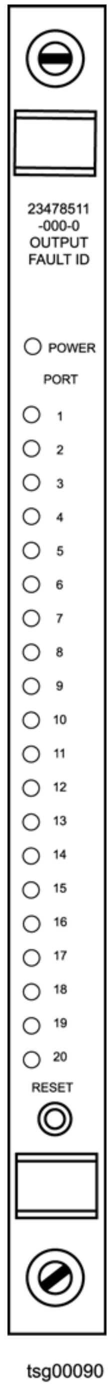


Figure 7-27. *Output Fault Analyzer Module*

Functional Description

The functional block diagram of the Output Fault Analyzer is shown in Figure 7-28. The 20 output signal (Ring/Tip) pairs enter the Analyzer on the card edge connector. Each signal is transformer-coupled; any DC component is removed by a blocking capacitor. The signal then goes to a diode detector and R/C filter to a comparator circuit, where it is converted to a TTL-level signal. When this TTL signal is Low, a latching flip-flop is Set, which drives a red LED indicating a Fault condition. The latching flip-flop is cleared when the user presses the Reset button, setting the LEDs to green. Any output signal that drops below the fault threshold causes the LED to turn red again.

When the Analyzer is initially installed, all LEDs are red until the Reset button is pushed; they then indicate the current status of the output signals.

Power for the logic circuits and the LEDs is provided by a DC/DC converter, which converts the fused, summed, and filtered –48 vDC input power from the TSG-3800 to 5 vDC. When power is present, the green Power LED is lit.

The input termination of the Analyzer is high impedance to minimize loading of the output signals being tested.

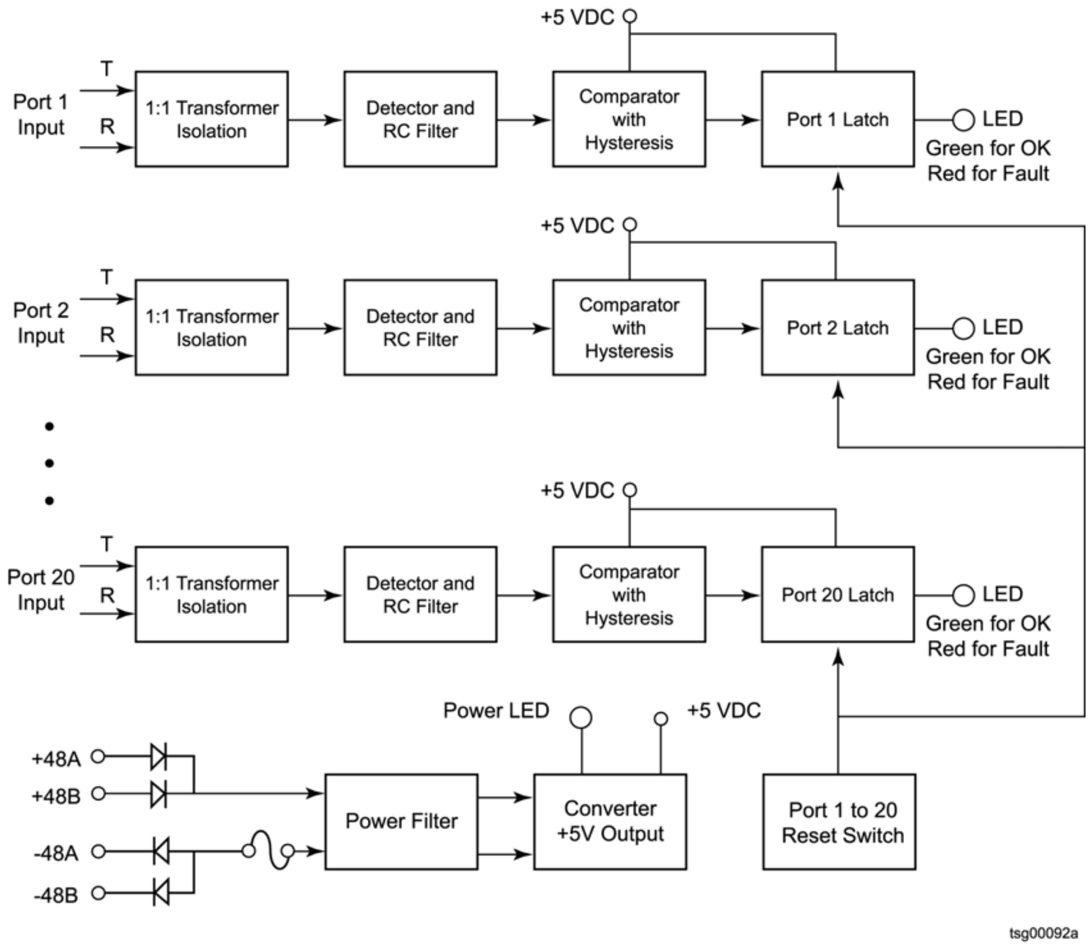


Figure 7-28. Functional Block Diagram

Specifications

The specifications for the Output Fault Analyzer are listed in Table 7-58.

Table 7-58. Specifications

Signal Type	Expected Level	Fault Threshold
DS1 (1.544 MBPS) AMI	2.4 to 3.6 Vp (3.0 Vp nominal)	2.0 V ±10%
CC (64/8 kHz) AMI	2.7 to 5.5 Vp (3.5 Vp nominal)	2.0 V ±10%

Input Signal Frequency

The Analyzer operates on DS1 or Composite Clock Alternate Mark Inversion signals; change between input signals is automatic.

Input Fault Level

The input signal fault level is preset to 2.0 Vp ±10%, and is not user-selectable. Signals at or below this level may not be suitable for synchronization of external equipment.

Installing the Output Fault Analyzer

The Analyzer can be installed and removed while power is applied to the TSG-3800 shelf. How you install the Analyzer depends on whether redundant Output modules are installed in the shelf.

Non-Redundant Operation

To install the Analyzer:

1. Install the Analyzer into the unoccupied slot associated with the suspect module.
2. Press the Analyzer firmly into the connectors in the backplane of the shelf. It is not necessary to tighten the captive screws on the front panel of the Analyzer.
3. Continue with the procedure described in Operating the Output Fault Analyzer, on page 291.

Redundant Operation

If a redundant pair of modules is being tested, remove one of the modules before installing the Analyzer. To install the Analyzer:

1. Remove the Output module with a suspected fault.
2. Insert the Analyzer in the slot, ensuring that it is aligned in the card guides.
3. Press the Analyzer firmly into the connectors in the backplane of the shelf. It is not necessary to tighten the captive screws on the front panel of the Analyzer.
4. Continue with the procedure described in Operating the Output Fault Analyzer, on page 291.

Operating the Output Fault Analyzer

The Analyzer begins operating as soon as it is installed in the shelf. There are no settings or configurations to install. The Analyzer may be stored in an inactive slot at the extreme right of the shelf; in this slot the Analyzer is neither powered nor operational.

Make the following operational checks after the Analyzer is installed in the TSG-3800. It is assumed that power is connected to the shelf and that there is an AMI or CC Output module installed in either slot of a redundant output pair.

1. Verify that the Power LED is on.

2. The 20 Port LEDs are initially red. These LEDs indicate that a loss of signal has occurred.

3. Press the Reset button on the front panel of the Analyzer. All 20 Port LEDs change to green.

   If any port has a signal level below the threshold, either continuously or momentarily, the corresponding Port LED changes to red. Refer to Troubleshooting Using the Output Fault Analyzer, on page 292, for information on diagnosing faults using the Analyzer.

When testing is completed, remove the Analyzer from the slot. Return the Analyzer to the unpowered storage slot. Do not leave the Analyzer installed in an active slot.

Troubleshooting Using the Output Fault Analyzer

Non-Redundant Modules

If the Analyzer does not indicate a fault (even though a fault is indicated elsewhere), an improper or incorrect signal may be present. The Output module could be faulty.

If the Analyzer indicates a fault, inspect the wiring on the indicated port.

Redundant Modules

If the Analyzer does not indicate a fault, an improper or incorrect signal may be present. If both Output modules indicate a fault before installing the Analyzer, install the Analyzer and inspect the wiring on the indicated port. If only one Output module indicates a fault before installing the Analyzer, then the Output module with the fault could be defective.

Installing the Card Guides

This section describes how to install the optional Output Fault Analyzer Accessory Kit (12878511-000-0) in the TSG-3800B Main shelf. When installed, the card guides allow you to store the Output Fault Analyzer in the shelf.

Please read this Appendix completely before attempting to install the card guides.

The Accessory Kit contains the following items:

- Modified card guides, p/n 12578511-001-1 (two per kit)
- Installation tool, p/n 02078511-000-1
- Self-saturating swab, p/n 100000-0000

The card guides install in the right-most slot of the TSG-3800 19-Inch Main Shelf, as shown in Figure 7-29.

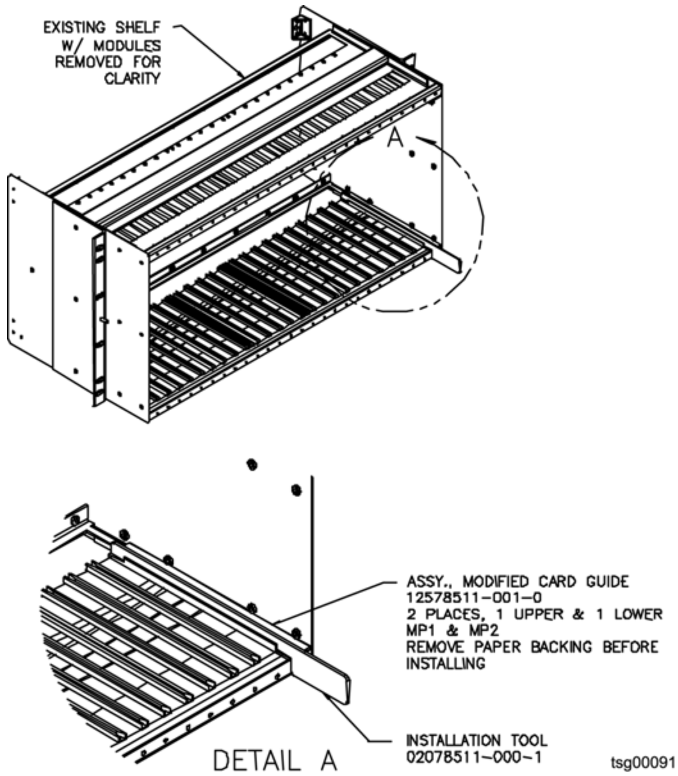


Figure 7-29. Installing the Card Guides

To install the card guides:

1. Clean the shelf where the upper and lower card guides are to be installed using the self-saturating swab.

2. Mount the card guide onto the installation tool, as shown in Figure 7-30.

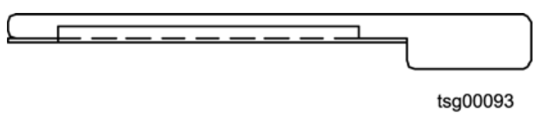


Figure 7-30. Card Guide Attached to Installation Tool

3. Remove the protective tape from the bottom of the card guide.

4. Align the card guide so that it is flush with the inner right side of the shelf and under the rivet, as shown in Figure 7-31. Press down on the card guide to secure it to the shelf. Remove the installation tool.

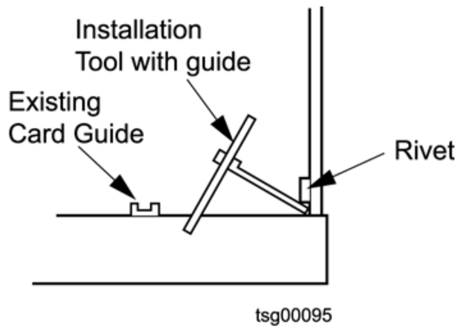


Figure 7-31. Installing the Card Guide into the Shelf

5. Repeat step 4 for the upper card guide. The shelf should appear as shown in Figure 7-32 when you are finished.

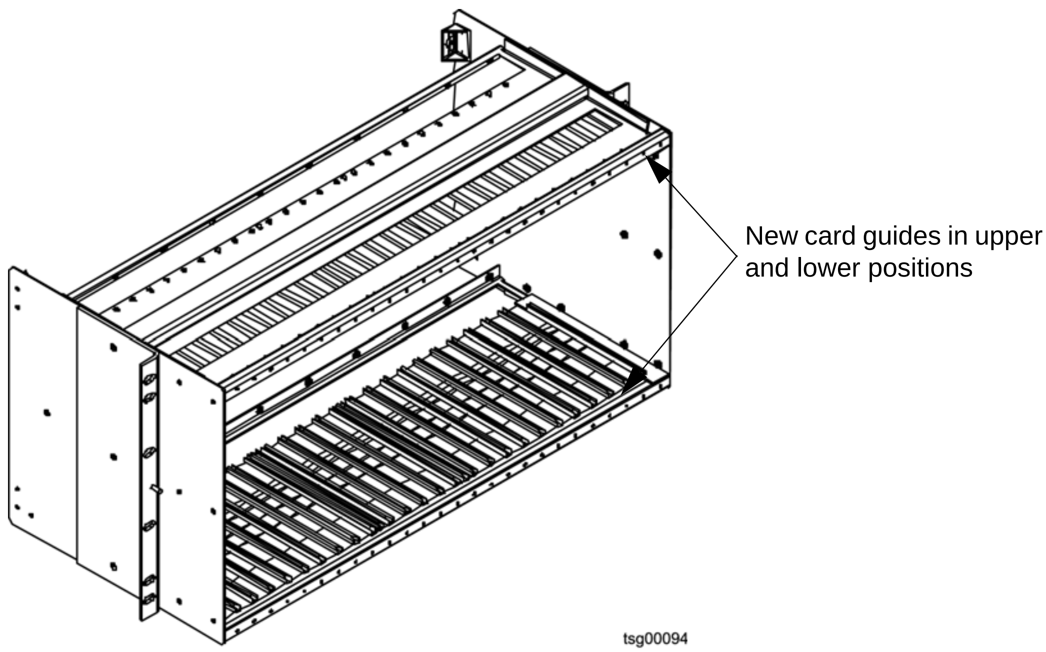


Figure 7-32. Completed Installation

Chapter 8 Subtending Operating Mode

This chapter describes how to configure the TSG-3800 as a Subtending TSG. The information is common to all configurations of the TSG-3800, TSG-3800E.

This is a reference for specific software and hardware configuration information for the TSG-3800 configured as a Subtending TSG. This document contains an introduction to the hardware and software that is specific to a subtending TSG configuration, installation procedures of these items, system-specific configuration, operation, and maintenance information.

The 3800 configured as a Subtending TSG broadens the TSG-3800 family of products by providing subtending clock functionality when referenced to a master TSG/BITS equipped with a Stratum 3E or better clock. The following combination of hardware and software configuration meets Subtending TSG criteria described in Section 7 of Telcordia Specification GR-378-CORE.

In This Chapter:

- Functional Description
- Modules
- Output Wire Wrap Panel

Functional Description

The TSG-3800 is designed in accordance with the Building Integrated Timing Supply (BITS) concept for intraoffice synchronization distribution. The BITS concept provides a synchronization hierarchy that is traceable back to one master clock (TSG), or redundant master clock pairs, referred to as the BITS. The BITS provides DS1 and Composite Clock (CC) timing to all synchronized clocks in the office, which provides timing inputs for all remote (subtending) TSGs.

The TSG-3800 configured as a Subtending TSG provides remote phase synchronization and holdover capabilities to telecom network elements, such as digital switches, Digital Access Crossover Systems (DACS), and channel banks for customers with very large equipment offices. For further information on Subtending TSGs, refer to Section 7 of Telcordia Specification GR-378-CORE.

Hardware

The 3800 Subtending TSG is used when there is a need for more timing outputs than can be supplied by a single TSG. The 3800 Subtending TSG receives redundant Composite Clock (CC) and DS1 reference signals directly from the Master BITS Clock. The CC signals are used for primary and secondary inputs and the 3800 phase locks to the selected reference to ensure proper DS0 phase alignment throughout the office. The redundant DS1 reference inputs are used only for Clock Bypass operation. If both CC reference inputs fail, the shelf provides Stratum 3E holdover stability. If both CC reference inputs fail and both 3E Clock modules fail the 3800 Subtending TSG uses the DS1 reference inputs for clock bypass operation

Input Reference Signals

The 3800 Subtending TSG configuration requires two composite clock and two DS1 reference input signals. The CC inputs are used as the reference signals and the DS1 inputs are used for Clock Bypass signals only. In the 3800 Subtending TSG configuration, the DS1 inputs are connected to T1 and R1 of inputs 1.1 and 2.1. The 1-Port DS1 Input modules (P/N 23478303-002-0) located in slots 1 and 2 provide monitoring and termination capability of the DS1 bypass signals. The Composite Clock input signals are connected to T1 and R1 of inputs 3.1 and 4.1 and are internally terminated. Switching references can occur repeatedly without accumulating phase or frequency error. The operator can manually or automatically select the reference. Restoring the primary reference source can return the 3800 to tracking the primary signal. Refer to Modules, on page 298, for a list of the output modules supported by this configuration.

Subtending Software

The 3800 Subtending TSG software differs from the standard TSG-3800 software version by supporting hardware and functionality changes in the following categories:

- Specific hardware support
- System default settings
- TL1 support

The 3800 Subtending TSG software supports specific modules in the Input, CPU, Clock, and Frame Generator slot positions. They are: *1-Port DS1 Input module* (P/N 23478303-002-0), *Composite Clock Input module* (P/N 23476674-000-0) in the input slots, *CPU w/Ethernet Module* (P/N 23478301-001-0) in the CPU slot, *Stratum 3E Clock Module* (P/N 23478272-001-0) in the clock slot, and *T1/E1 Frame Generator module W/Bypass* (P/N 23478486-001-0) in the frame generator slots and are the only modules supported in this configuration of the TSG-3800, other than Output modules, which are all supported.

A CPU module that has 3800 Subtending TSG software installed will identify the Input, Clock, and Frame Generator modules that are provisioned in the system. If the wrong modules are installed the software generates a Major Alarm indicating that the installed hardware is not supported and that the system has an *invalid configuration*.

The functionality of the Frame Generator module differs in the 3800 Subtending TSG software from the standard TSG-3800 software. This difference in functionality is required for the 3800's phase-following feature, a Telcordia requirement for Subtending TSGs.

The 3800 Subtending TSG software operates similar to the standard software but does not allow the user to provision some aspects of the system, including the system default settings, in order to meet the Telcordia requirements. The settings that are affected are the signal fault alarm modes as shown in Table 8-1. Changing these parameters for the alarm modes allows the 3800 Subtending configuration to properly phase-follow any reference signal that is within the Subtending TSG's specified signal stability range.

Table 8-1. Default Signal and Alarm Modes

Fault	CC Input	DS1 Input
AIS	Ignore	Fail
OOF	Ignore	Fail
BPV	Ignore	Fail
CRC	Ignore	Fail

Table 8-1. Default Signal and Alarm Modes (Continued)

Fault	CC Input	DS1 Input
MTIE L1	Ignore	Ignore
MTIE L2	Ignore	Ignore
FREQ L1	Ignore	Ignore
FREQ L2	Ignore	Ignore

The TL1 interface is designed to be compliant with Southwestern Bell Corporation's (SBC) Network Management Architecture (NMA). This allows for SBC's NMA to remotely monitor and provision the 3800 Subtending TSG.

Modules

The following is a list of the only modules supported by the 3800 Subtending software (item 14378500-000-5 Rev A.02) that can be provisioned for a valid configuration.

- CPU w/Ethernet — 23478301-001-0 (With above software installed)
- 1-Port DS1 Input — 23478303-002-0
- Composite Clock Input — 23476674-000-0
- T1/E1 Frame Generator W/Bypass — 23478486-001-0
- Stratum 3E Clock — 23478272-001-0
- Composite Clock Output — 23477337-000-0
- AMI Output (20 outputs) — 23478309-000-0
- ESF to D4 Output — 23478399-000-0

All main shelves contain a set of required modules and a combination of Output modules depending upon the type

Output Wire Wrap Panel

The 3800 Subtending TSG requires a 23-inch high-density wire-wrap output panel that adapts the 50-pin output connectors on the 3800 Main and Expansion shelves to individual wire-wrap pins.

The Main shelf uses one, 23-inch high-density wire-wrap output panel to terminate up to 100 outputs. The Expansion shelf requires two wire-wrap output panels to provide 200 outputs (100 outputs per panel). The cables connecting the 3800 Subtending TSG outputs to the wire-wrap panel carry twenty circuits each. The wire-wrap panel, four cables, and tie bar assembly item number is 22078488-001-0. Refer to Input/Output Adapter Panels, on page 73, and Figure 8-1 for more information on the 23-inch high-density wire-wrap output panel.

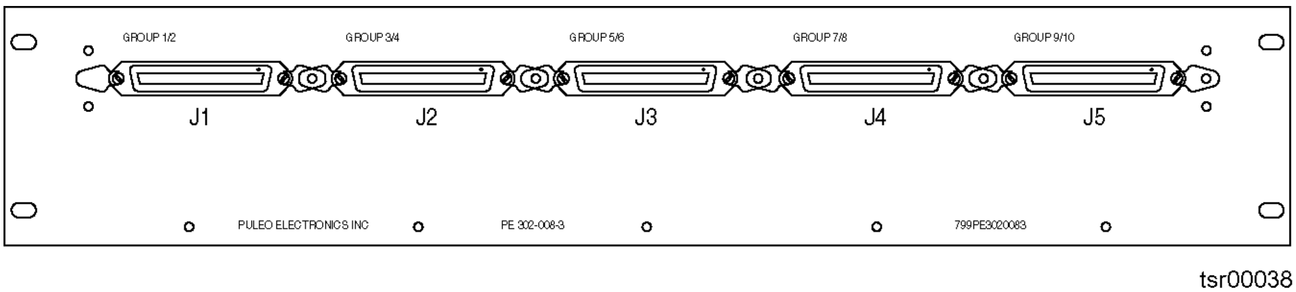


Figure 8-1. 3800 Wire Wrap Output Panel

Appendix A Part Numbers

This appendix contains parts listings for the TSG-3800 Series of Timing Signal Generators. Included are the TSG-3800, TSG-3800E, Expansion Shelf, and accessories.

In This Appendix:

- TSG-3800 Part Numbers
- TSG-3800E Part Numbers
- PartNumbers Common to the TSG-3800 Series

TSG-3800 Part Numbers

Table A-1 lists all the parts available for the TSG-3800 19-inch and 23-inch units. It provides a description, item number, and function for each part.

Table A-1. TSG-3800 Components

Description	Part Number	Function
TSG-3800 Main Shelf, 19-inch	25476585-000-0	19-inch main shelf that houses all modules for the TSG-3800
TSG-3800 Expansion Shelf, 19-inch	25476672-000-0	19-inch expansion shelf provides additional signal distribution for the TSG-3800. Functionally identical to 25476585-000-0
TSG-3800 Main Shelf, 23-inch	25477362-000-0	23-inch main shelf that houses all modules for the TSG-3800
TSG-3800 Expansion Shelf, 23-inch	25477363-000-0	23-inch expansion shelf provides additional signal distribution for the TSG-3800. Functionally identical to 25477362-000-0
Rolled Ribbon Cable Assembly	805RIDC-0050	The expansion shelf receives input signals from the TSG main shelf via the cable assembly.
Flat Ribbon Cable Assembly (Alternate for 805RIDC-0050)	11577152-000-0	The expansion shelf receives input signals from the TSG main shelf via the cable assembly.
Expansion Shelf Power Monitor	23478489-000-0	This module provides independent reporting of power loss alarm conditions on the TSG-3800 expansion shelf.
1 Input, DS1	23478303-002-0	This Input module for the Model 3800 Timing Signal Generator provides enhanced measurement resolution and Sync Status Message reading in addition to the combined capabilities of the current Input modules.
3 Input, DS1	23478303-000-0	This Input module is similar to the 1 Input DS1 with two additional input signals for three channel capability. Any of the three inputs may be selected as reference inputs or used as monitor-only inputs.
1 Input, E1	23478303-003-0	This Input module provides single channel capability that is used as a reference E1 input or it may be used as monitor only input.
3 Input, E1	23478303-001-0	This Input module is similar to the 1 Input E1 with two additional input signals for three channel capability. Any of the three inputs may be selected as reference inputs or used as monitor-only inputs.

Table A-1. TSG-3800 Components (Continued)

Description	Part Number	Function
CPU w/ Ethernet	23478301-001-0	The CPU module controls and monitors Timing Signal Generator operation. It also provides a common interface for operator control of the modules. This module supports Ethernet.
Stratum 3E Clock	23478272-001-0	The Clock module provides an internal reference for measuring input signal phase. The module also supplies reference signals to the Frame Generator Module and maintains stratum 3E holdover in case of reference loss.
Stratum 2E Rb Clock	23478272-004-0	The Clock module provides an internal reference for measuring input signal phase. The module also supplies reference signals to the Frame Generator Module and maintains stratum 2E holdover in case of reference loss.
T1/E1 SSM Frame Generator	23478443-000-0	The T1/E1 Frame Generator module produces the timing signals to create DS1, E1, and Composite Clock outputs. This module also provides two clock outputs, which can be independently set to 8 kHz, 1.544 MHz, or 2.048 MHz.
T1/E1 Frame Generator with clock bypass	23478486-000-0	The T1/E1 Frame Generator module produces the timing signals to create DS1, E1 (CEPT) and Composite Clock (CC) outputs.
Composite Clock Input	23476674-000-0	This Input module measures the phase between a composite clock (CC) input signal and the system clocks.
Composite Clock Output	23477337-000-0	This Output module provides 20 balanced Composite Clock (CC) outputs.
G.703/10 Output (20 outputs)	23477602-000-0	This Output module provides 20 balanced 2.048 kHz outputs per G.703/10.
AMI Output (20 outputs)	23478309-000-0	This Output module provides 20 balanced outputs. This module is normally paired with a second AMI Output module; in this configuration, the outputs of each module tie together forming 20 redundant pairs.
ESF to D4 Output (10 outputs)	23478399-000-0	This Output module converts an ESF-framed DS1 signal into a D4-framed DS1 signal, making it possible for the TSG to output both formats at the same time from the same shelf.
RS-422 Selective Rate Clock	12578512-000-1	This module generates 10 independent RS-422 outputs; each output can be individually set to 512 frequencies between 8 kHz and 4096 kHz.

Table A-1. TSG-3800 Components (Continued)

Description	Part Number	Function
Wire Wrap Panel, 19-inch 2 x 25 pair (40 outputs)	22078314-000-0	This output panel provides access to the TSG-3800 timing outputs via wire-wrap pins. It has two 50 pin connectors to terminate the outputs of a 19-inch Main or Expansion shelf. Two 3′ shielded cables with mating connectors are included. This panel may also be used for TIM I/O connections.
H/D Wire Wrap output panel, 23-inch	22078488-000-0	This output panel makes the TSG-3800 timing outputs accessible to user equipment. It is capable of providing 100 clock outputs via wire-wrap connections. These panel comes with 5 ea. 3800B interface cables and a tie bar for cable support.
Blank Panel, I/O	10977170-000-0	Blank filler panels are required in all unused slots in a TSG-3800 series shelf.
Blank Panel, Clk	10978316-000-0	Blank filler panels are required in unused clock slots in a TSG-3800 series shelf.

TSG-3800E Part Numbers

Table A-2 lists all the parts available for the TSG-3800E. It provides a description, item number, and function for each part.

Table A-2. TSG-3800E Components

Description	Part Number	Function
TSG-3800E Main Shelf *MD	25478350-000-0	The TSG-3800E main shelf is an EMC-hardened version of the TSG-3800 with the same functionality.
TSG-3800E Expansion Shelf Assembly **A & M as of 10-31-04	25478388-000-0	This shelf provides additional signal distribution for the TSG-3800E. The TSG Expansion Shelf Assembly accepts up to 18 distribution modules (in 9 redundant pairs) providing 180 outputs (20 outputs per module pair.
CPU Module *MD as of 10-31-04	23478301-010-0	The CPU module controls and monitors Timing Signal Generator operation. It also provides a common interface for operator control of the modules.
Stratum 3E Clock, EMI *MD as of 10-31-04	23478272-011-0	The Clock module provides an internal reference for measuring input signal phase. The module also supplies reference signals to the Frame Generator Module and maintains stratum 3E holdover in case of reference loss.

Table A-2. TSG-3800E Components

Description	Part Number	Function
Stratum 2E Rb Clock, EMI	23478272-014-0	The Clock module provides an internal reference for measuring input signal phase. The module also supplies reference signals to the Frame Generator Module and maintains stratum 3E holdover in case of reference loss.
Frame Generator Module (T1/E1 SSM)	23478443-010-0	The T1/E1 Frame Generator module produces the timing signals to create DS1, E1 (CEPT) and Composite Clock (CC) outputs.
AMI Output T1/E1 Module	23478309-010-0	This Output module provides 20 balanced outputs. This module is normally paired with a second AMI Output module; in this configuration, the outputs of each module tie together forming 20 redundant pairs.
Blank Panel, I/O	10978369-000-0	Blank filler panels are required in all unused slots in a TSG-3800E series shelf.
Blank Panel, Clk	10978371-001-0	Filler panel for unused Clock module slots.
BNC/Wire Wrap Connector Adapter (dual)	12012421-000-0	This adapter may be used to connect signal and alarm coax cables to the TSG inputs. It is typically used with the Sine Input module.

* MD - Manufacture Discontinue
** A & M - Additions and Maintenance

PartNumbers Common to the TSG-3800 Series

Table A-3 lists parts that are common to the TSG-3800 19-inch and 23-inch units and to the TSG-3800E 19-inch units. It provides a description, item number, and function for each part.

Table A-3. Common Components in the TSG-3800 Series

Description	Part Number	Function
Mounting Bracket	00476807-xxx-1 (xxx = shelf size)	Attaches to each side of the expansion shelf for installation on mounting racks.
Bus Termination Assembly	10376838-000-0	Attaches to the final expansion shelf on daisy-chained system.
BNC to Wire Wrap Adapter	22078442-000-0	This panel provides BNC connections for the 12 inputs to the TSG. It also provides via rocker switches, frame ground connection for each input if the signal is not grounded at the source.

Table A-3. Common Components in the TSG-3800 Series (Continued)

Description	Part Number	Function
Telecom BALUN Panel, 19-inch (20 outputs)	22012324-00x-0	This panel provides Wire Wrap balanced connections or single-ended BNC connections through a BALUN transformer for each of 20 outputs. This panel is used when unbalanced outputs are required, i.e., G.703 signals. Each of the 20 outputs is jumper-selectable for balanced (100 Ω Wire Wrap) or unbalanced (75 Ω BNC) connection. A 3′ shielded interconnect cable is included for connection to the TSG.
50 Pin to Wire Wrap Connector Adapter	551306-0049	This adapter may be plugged directly into the TSG or Expansion shelf and has the 50 Wire Wrap posts mounted on the connector. It is typically used with the TIM modules or when only a few TSG outputs are needed.
25 Pair Shielded Cable with Male 50-pin connectors.	551026-0030	This is a standard 25 pair shielded interconnect cable 1 meter long.
25 Pair Shielded Cable with Male 50-pin connectors.	551026-0040	This is a standard 25 pair shielded interconnect cable 3 feet long.
Sinewave Output Panel	10978450-000-0	This panel provides six BNC output connections for the outputs of the Analog Output Module, 23478444-000-0.

Appendix B System Administrator’s Reference

This appendix contains procedures for establishing communications, procedures for managing the list of users, and a software reference guide that lists the commands necessary to manage the TSG-3800.

In This Appendix:

- Establishing Communications
- Overview of the TSG-3800 Security System
- Setting Up User Accounts
- Setting Communication Parameters
- Software Commands
- Provisioning Input Reference Signals

Establishing Communications

This section describes the procedures to establish serial communications between a computer, laptop, or terminal and the Comm A and Comm B ports on the TSG-3800.

You need the equipment listed in Table B-1 to make a connection to the TSG-3800.

Table B-1. Required Equipment

Item #	Item
1	A computer with a 3.5 in floppy disk drive.
2	A terminal emulation program, such as HyperTerminal, or ProComm Plus, that can write (save) data to a file.
3	Straight-through 9-to-25 pin RS-232 cable for a serial connection.
4	The TSG-3800 Download Utility Program floppy disk, item number 14178418-000-5 (version C.03 or higher).
5	The applicable 3800 software upgrade disk (if you are upgrading software).

The serial port Comm A on the front of the CPU module (Figure B-1) is a convenient port to perform these procedures. The Comm B connector is on the rear panel of the TSG-3800.

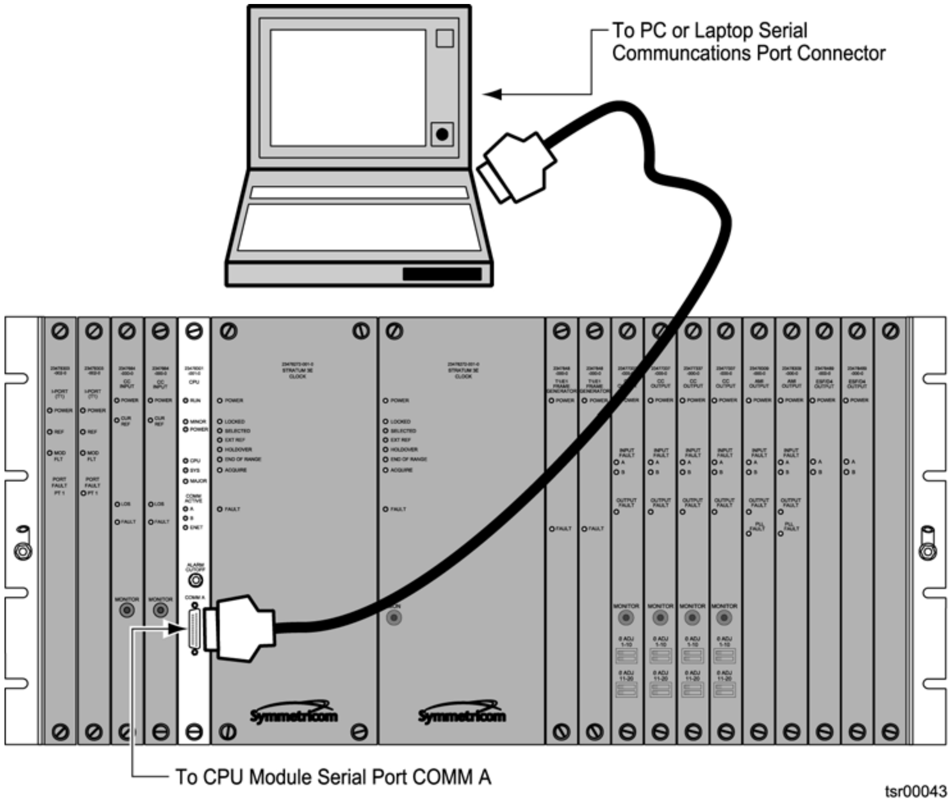


Figure B-1. Connecting a Computer to the Comm A Port

To establish communications (and log in) through either serial port, perform the following steps.

1. Ensure that the required equipment listed in Table B-1 is available.

2. Connect one end of the straight-through RS-232 cable to the serial connector on the computer.

3. Connect the other end of the cable to either Comm A on the CPU module or Comm B on the rear panel of the TSG-3800.

4. Power up the computer and establish a connection from the computer to the TSG-3800 using terminal emulation software, such as HyperTerminal or ProComm Plus. Ensure the terminal emulation software is configured for VT-100 emulation, 8 data bits, no parity, 1 stop bit, and 9600 baud rate.

5. Press **Enter**. If the **`tsg->`** command prompt and the name of the TSG appears on your screen, then communications are established. Otherwise, the command prompt `User Name:` appears.

6. Type your user name and press **Enter**. The command prompt `Password:` appears.

7. Type your password and press **Enter**. If the command prompt appears, then communications are established.

8. If you have forgotten your user name and password, contact your system administrator or call Symmetricom Global Services for assistance.

9. Type `bye` and press **Enter** to log off the system after all tasks have been performed.

Overview of the TSG-3800 Security System

The software in the CPU module contains a hierarchy of user levels that permit an increasing level of access to system parameters. This allows Administrator-level users to add users that can, for example, view but not change system parameters; users at other levels can view and change system parameters.

For a first-time installation, the default login is at the Administrator level. When adding users, first add an Administrator-level user and password to avoid a service call. Users at the Administrator level set up other users, their passwords, and their level of security.

There are four user privilege levels: Administrator or System (Level 4), Supervisor (Level 3), Technician (Level 2), and User (Level 1) The Administrator level allows the user to modify the user list. and to execute all commands. These include commands that affect system performance, for instance, clock operating mode. The Supervisor level allows execution of all commands except for saving the user configuration. The Technician level allows the operator to perform basic configuration commands. The User level only allows execution of non-critical commands. Table B-2 summarizes each security level, ID number, and the privileges available at each level.

If you do not define a user list, the TSG-3800 accepts all commands.

Table B-2. User Access (Security) Levels

Level	ID	Description
User	1	User-level users can: ■ View information about the current configuration and operation ■ Change communication settings such as line termination and echo ■ Changes made by users at this level remain in effect only until the user logs out.
Technician	2	Technician-level users (CRAFT persons) can: ■ Perform level 1 functions ■ Read or set all installation functions

Table B-2. User Access (Security) Levels (Continued)

Level	ID	Description
Supervisor	3	Supervisor-level users can: ■ Perform level 1 and 2 functions ■ Read or set all functions
Administrator	4	Administrator-level users can: ■ Perform level 1 through 3 functions ■ View and set software configurations ■ Add, delete, or modify the user table ■ Log off any user from any port

Adding the Administrator-Level User

An Administrator-level user must be added to the system when you log in for the first time. An Administrator-level user performs initial setup and can assign user privileges and access codes as needed; the Administrator-level user can also configure all system parameters. If you do not create an Administrator-level user, the TSG-3800 accepts commands from anyone with access to the COMM port.

Caution: To avoid a service call, you must add an Administrator-level user and password before adding any other users. If you add a user that is not at the Administrator level before adding an Administrator-level user, you must contact Symmetricom for a password that will allow you to log into the unit at that level again.

Perform the following steps to add an Administrator-level user for a first-time installation.

1. Connect to the TSG-3800 using the procedure in Establishing Communications, on page 308. The system prompt appears.
2. Type `user add` and press **Enter**. The TSG-3800 prompts you for a user name.
3. Enter a username and press **Enter**. The name you enter is the log-in name for an Administrator-level user. The TSG-3800 prompts you for a password.
4. Enter a password and press **Enter**. The characters are echoed as '*'. The password you enter will be the log-in password for the Administrator-level user. The TSG-3800 prompts you for an access level.
5. Type `4` and press **Enter**. This selects the Administrator access level. The system prompt appears.
6. Type `bye` and press **Enter** to log off the system.

7. Log back in as the new Administrator-level user to verify that the account exists (repeat steps 3 and 4).

8. Type `bye` and press **Enter** to log off the TSG-3800.

Logging In

Once you connect to the TSG-3800, you must log in to access the system.

To log in at the system prompt:

1. Enter a valid username and press **Enter**.

2. Enter the appropriate password and press **Enter**.

To log in as another user while you are already logged in:

1. Type `LOGIN «username»` and press **Enter**.

2. Enter the appropriate password and press **Enter**.

Logging Out

The TSG-3800 software contains a time-out parameter (default of five minutes); the unit automatically logs out the current user if you do not enter a command within the "time-out" period. To restart the time-out period without entering a command, press **Enter**. If the unit logs you off, you must log in again.

To disable the automatic logout feature, type:

`DISABLE LOGOFF [A|B]` then press **Enter**

To logout manually, type:

`BYE` then press **Enter**

Setting Up User Accounts

This section describes how to set up and maintain user accounts in the TSG-3800. It includes the following sections:

- Adding Users
- Modifying a User's Data
- Deleting a User

Adding Users

Only an Administrator-level user can add new users to the user list in the TSG-3800. You can store up to 19 users in the TSG-3800 user list. Perform the following steps to add a user.

1. Connect to the TSG-3800 using the procedure in Establishing Communications, on page 308. The system prompt appears.

2. Log in as an Administrator-level user (see Logging In, on page 312).

3. Type `USER ADD` and press **Enter**. The TSG-3800 prompts for the new username.

4. Enter a new username and press **Enter**. The TSG-3800 prompts for the new user's password.

Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set ":;<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as `"USER:NAME"` or `"PASS:WORD"`. To enter lowercase letters, enclose the input in quotes, as `"UserName"` or `"PassWord"`. *Do not* use spaces in usernames.

---

5. Enter the new user's password and press **Enter**. If no password is desired, press **Enter**. The characters are echoed as '*'. The TSG-3800 prompts for an access level.

6. Enter the appropriate access level and press **Enter**. Refer to Overview of the TSG-3800 Security System, on page 310, for more information.

7. Type `bye` and press **Enter** to log off.

8. Log back in using the new user's username and password to verify that the account exists.

9. Type `BYE` and press **Enter** to log off the system.

Modifying a User's Data

An Administrator-level user can modify a user's password or access level. All values default to the current values.

To modify a user's data:

1. Connect to the TSG-3800 using the procedure in Establishing Communications, on page 308. The system prompt appears.

2. Log in as an Administrator-level user (see Logging In, on page 312).

3. Type `USER MODIFY` and press **Enter**. The terminal requests the username.

4. Type in the `«username»`. The terminal responds with
   `User «username» Exists; Modifying Data; ESC Aborts`
   `Password:*****`

5. Type in the new password for the user and press **Enter**, or press **Enter** to leave the password unchanged. The terminal responds with
   `Access Level: «level»`

6. Type in the new level for the user and press **Enter**, or press **Enter** to leave the level unchanged. The terminal responds with
   `Modified User «username» User Data: Access Level is now «level».`

Deleting a User

An Administrator-level user can delete usernames from the user list. The operator must specify the username to delete. Once the username has been deleted from the list, the TSG-3800 will not be recognize the username.

To delete a username:

1. Connect to the TSG-3800 using the procedure in Establishing Communications, on page 308. The system prompt appears.

2. Log in as an Administrator-level user (see Logging In, on page 312).

3. Type `USER DELETE «username»` then press **Enter**.

Setting Communication Parameters

The TSG-3800 has two EIA-232 communication ports available: COMM A is located on the CPU module, COMM B is located on the rear panel. An optional 10BaseT Ethernet port is also located on the rear panel. These ports allow data transfer between the TSG-3800 and a terminal. You can configure each port independently using the commands described in this section. Refer to EIA-232 Communications, on page 59, for details on making connections to the ports.

This section describes how to set the parameters for the EIS-232 and Ethernet ports.

Provisioning EIA-232 Parameters

Before issuing commands and collecting data, you must establish communication between the terminal and the TSG-3800. You can customize the communication parameters to match the requirements of your equipment. The TSG-3800 allows you to set the following communication parameters:

- Baud rate
- Echoing on or off
- <EOL> to CR, LF, or CRLF
- Operating mode
- Handshaking to hardware, software, or off

The TSG-3800 stores these settings in non-volatile memory. The settings remain until changed or when the SETUP DEFAULT/FACTORY command is issued, see Checking the Instrument Configuration, on page 107.

To display the current settings for the selected port, type:

`COMM [A|B]` then press **Enter**

A typical response from the TSG is:

```
TSG->COMM
COMM A
Mode: ASCII     Time Out: 300
Baud: 9600     Hand: Off Echo: On EOL: CRLF
Operator: TELNET A
TSG->
```

Setting the Operating Mode

The two EIA-232 ports can be individually set to one of four different operating modes:

- ASCII – the normal configuration interface
- Binary – a proprietary binary interface designed for machine-machine communications
- TL1 – the telecom standard machine-machine language
- Passthru – allows the operator to communicate with another device connected to the EIA-232 port (two sessions allowed through Ethernet)

For a telnet session (up to four concurrent sessions are allowed through Ethernet), you must have an Ethernet connection; you must first set up the Internet Protocol settings through an EIA-232 port. Telnet sessions are discussed in Section B.2.2, Ethernet Settings.

To use the Binary mode, you must request the appropriate document giving the command set and responses, as well as a listing of the supported events. These documents are available from Symmetricom.

To change the command mode, type:

`COMM [A|B] MODE [ASCII|BINARY|TL1|PASSTHRU]` then press **Enter**

Note: When a terminal is directly connected to Comm port A or B and you inadvertently set the connected port's mode to Binary, TL1, or Passthru, the CPU will not respond to typed characters. To exit from TL1 mode, type the Esc key three times. To exit from Passthru mode, type Alt B. To exit from Binary mode, type the ? key.

When a terminal is directly connected to Comm port A or B and you inadvertently set the mode of the opposite port to Binary, TL1, or Passthru, use the COMM «port» ASCII command to return the other port to ASCII mode.

Displaying the Current Baud Rate

The baud rate is stored in non-volatile memory. The default value is 9600 baud. You can select a new setting for either port using a connection at either port.

To display the current baud rate for a specific port, type:

`COMM [A|B] BAUD` then press **Enter**

Changing the Current Baud Rate

To change the baud rate:

1. Connect a device that can match the *current* baud rate to either port.
2. Type `COMM [A|B] BAUD [300|1200|2400|4800|9600|19200]` then press **Enter**.
3. Set the peripheral device to the selected baud rate.

Enabling/Disabling Handshaking

The TSG-3800 allows the operator to enable handshaking. The factory default is Off. With hardware handshaking enabled, the TSG-3800 suspends data transfer when CTS is low and pulls RTS low when the receive buffer is full. With software handshaking enabled, the TSG-3800 suspends data transfer when XOFF is received and begins transmitting when XON is received.

When handshaking is set to hardware, the TSG-3800 sets the RTS line low if it is unable to accept any more input. If the receiving equipment is unable to accept more input, it sets the CTS line low. When handshaking is on and CTS is low, the TSG-3800 accepts input but does not act upon it. When CTS goes high, the TSG-3800 echoes back and executes any commands previously entered.

Note: If hardware handshaking is enabled and the CTS line cannot be pulled high, there is no communication. To correct this, use the other Comm port to turn CTS/RTS handshaking off. An alternative method is to jumper RTS to CTS on the CPU module.

To verify whether handshaking is on or off, use the SETUP command (see Checking the Instrument Configuration, on page 107), or type:

`COMM [A|B] HANDSHAKE` then press **Enter**

A typical response from the TSG is:

```
TSG->COMM A HANDSHAKE
COMM A
Mode: ASCIITime Out: 300
Baud: 9600Hand: Off Echo: On EOL: CRLF
Operator: Telnet A
TSG->
```

To change the current handshake setting, type:

`COMM [A|B] HANDSHAKE [SOFTWARE|HARDWARE|OFF]` then press **Enter**

Enabling and Disabling Echoing

The operator can turn echoing off and on. The default is on. With echoing on, the TSG-3800 retransmits the characters received. If no characters appear on the terminal when typing, try setting the echo to on. If characters appear twice (half duplex operation), set the echo to off.

To verify whether echoing is on or off, use the SETUP command (see Checking the Instrument Configuration, on page 107), or type:

`COMM [A|B] ECHO` then press **Enter**

A typical response from the TSG is:

```
TSG->COMM A ECHO
COMM A
Mode: ASCII   Time Out: 300
Baud: 9600    Hand: Off Echo: On EOL: CRLF
Operator: Telnet A
TSG->
```

To change the current setting:

`COMM [A|B] ECHO [ON|OFF]` then press **Enter**

Changing the Output End of Line

The operator can change the output end of line (EOL). The default is carriage return (CR). With EOL set to CR, the TSG-3800 transmits a carriage return at the end of output lines. If the terminal will not advance the line at the end of each line, set EOL to CRLF. If there is a blank line between every output line, set EOL to CR.

To verify the current EOL setting, use the Setup command (see Checking the Instrument Configuration, on page 107), or type:

`COMM [A|B] EOL` then press **Enter**

A typical response from the TSG is:

```
TSG->COMM A EOL
COMM A
Mode: ASCII     TimeOut: 300
Baud: 9600     Hand: Off Echo: On EOL: CRLF
Operator: COMM A
TSG->
```

To change the current EOL setting, type:

`COMM [A|B] EOL [CR|LF|CRLF]` then press **Enter**

Using the PASSTHRU Mode

The PASSTHRU mode is used to pass commands through the TSG-3800 from one COMM port to another instrument connected to a serial port. The port to be connected to another instrument is placed in PASSTHRU mode by issuing the COMM MODE command. A connection to that port may be established by issuing the ENABLE PASSTHRU command. To end this mode of operation, disable PASSTHRU by sending a *Break* character. Procomm uses the `ALT-B` keys to send a break.

Setting Ethernet Parameters

The TL1 operating mode allows two sessions on port 4000. Passthru mode allows one session on port 4200. A telnet session allows four sessions on port 23. Before starting these sessions, you must have an Ethernet connection and set up the Internet Protocol settings (IP address, gateway address, and the subnet mask) through an EIA-232 port. You must set up the network parameters before network communications are possible. The IP address is the unique address for the device. The gateway address is the default gateway address. This allows the unit to access other networks. The subnet mask is the mask for the network class. To write the IP parameters to non-volatile memory, you must restart the CPU by issuing the **RESTART** command.

To change the IP address, type:

`IP ADDR {address}` then press **Enter**
`A typical value is 255.255.255.0`

To change the gateway address, type:

`IP GATE {address}` then press **Enter**
`A typical value is 255.255.0.0`

To change the subnet mask, type:

`IP MASK {address}` then press **Enter**
`A typical value is 255.0.0.0`

Once the Internet Protocol settings are complete, you can telnet to the IP address and log in as usual.

Setting the Time and Date

Set the time and date using a computer connected to a serial port. If you do not set the date and time, the TSG-3800 defaults to a known time.

Setting the Date

To set the date, type:

`DATE MM/DD/YY` then press **Enter**
All digits must be entered for a valid entry

Displaying the Date

To display the date, type:

`DATE` then press **Enter**

A typical response from the TSG is:

```
TSG->DATE
The Current Date is 20JUN2002
Day Of Year is 171
TSG->
```

Setting the Time

To set the time, type:

`TIME HH:MM:SS` then press **Enter**
`Type all digits for a valid entry. Set time in 24 hour format`

Displaying the Time

To display the time, type:

`TIME` then press **Enter**.

A typical response from the TSG is:

```
TSG->TIME
The Current Time is 20JUN2002 08:05:41.065
The Processor was Started on 20JUN2002 07:55:16
TSG->
```

Displaying the Software Version

To display the current version of software installed in the TSG, type:

`ID` then press **Enter**

A typical response from the TSG is:

```
TSG->id
Model 3800 Timing Signal Generator w/ Ethernet
Software Ver E.14      Bootloader Ver E.00
Created on Feb 26 2003 14:32:11
Copyright Symmetricom, 1999-2003
Customer Support:
Phone: 1(408)428-7907
1(888)367-7466 (Toll-free, US only)
Email: support@symmetricom.com
```

Naming the TSG-3800 Target Identifier

You can display, assign or remove a name to the TSG-3800. The name is also used as the TL1 Target Identifier (TID). Once assigned, the name appears in front of the prompt. This is useful when monitoring more than one TSG-3800.

To display the name, type:

`NAME` then press **Enter**

A typical response from the TSG is:

```
TSG->NAME
The Unit Name is TSG.
TSG->
```

To assign a name, type:

`NAME name` then press **Enter**
`where` ***`name`*** `is a string of 1 to 20 characters.`

To remove a name, type:

`NAME NONAME` then press **Enter**

Installing New System Software

This section provides instructions on installing new system software in a TSG-3800. The software is located on Symmetricom's internet site, and customers must be registered to access the software. Perform the following steps to download TSG-3800 software.

1. Point your web browser to Symmetricom's Home site at www.symmetricom.com.

2. Click **Online Support** in the **Support** drop down list (see Figure B-2).

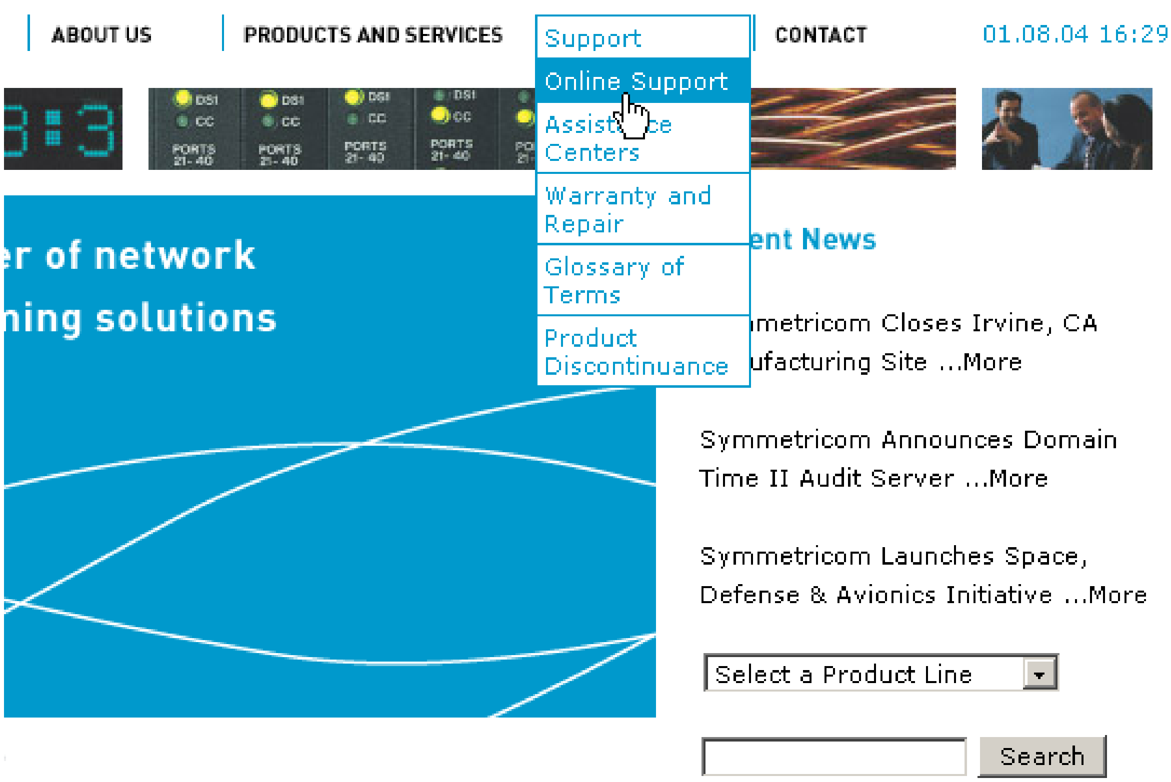


Figure B-2. Online Support

3. If you are not a registered user, click **Register now** (see Figure B-3) and follow the instructions on the screen. If you are a registered user, enter your **Username** and **Password** and click **Login**.

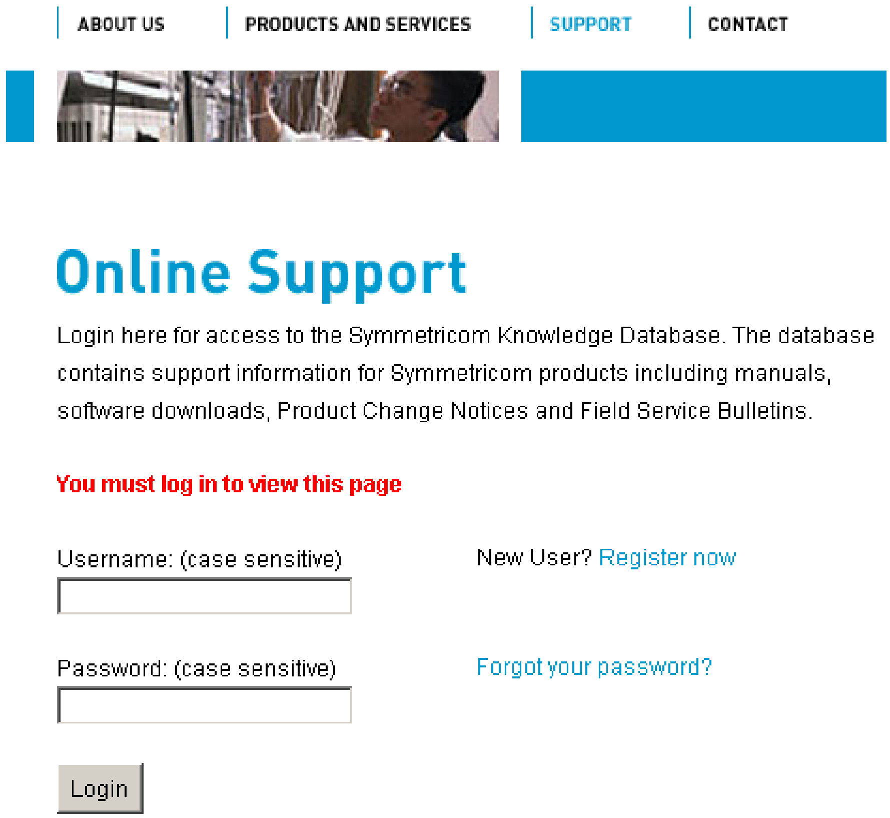


Figure B-3.   Support Login

4. Select **Software Download** from the **Choose a category** drop down list, select a date category in the **Show date added** drop down list, choose a search method, enter a keyword (such as TSG-3800) and click **Search** (see Figure B-4).

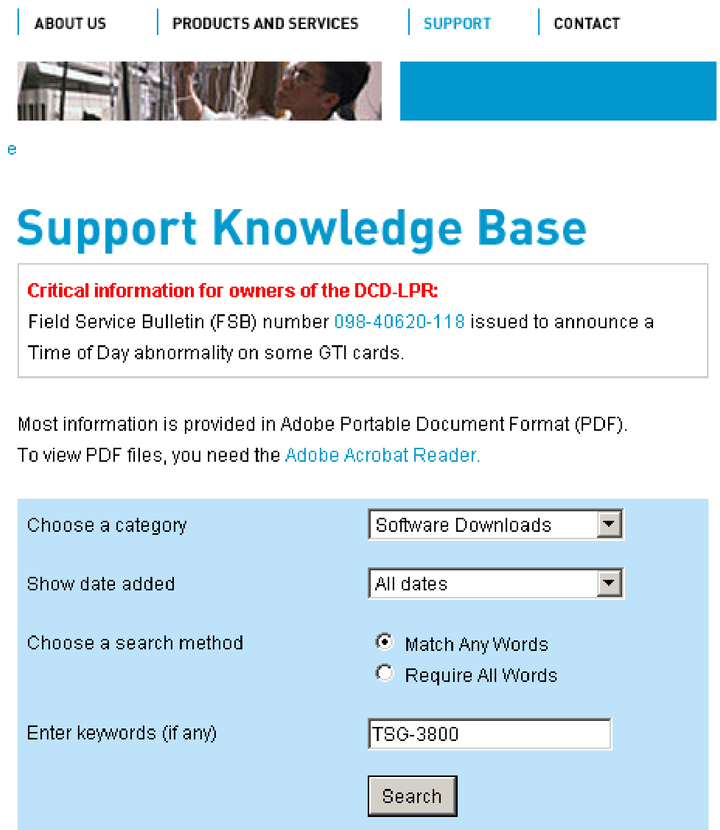


Figure B-4. Software Download Search Screen

5. Click the hyperlinked text for the appropriate software version and follow the instructions on the screen to download system software.

6. When the download is complete, extract the compressed files.

7. Refer to the Software Release Document (extracted PDF document) for software installation instructions.

Software Commands

This section presents a description of commands available to control TSG-3800 operation. Commands are entered locally through a terminal attached to one of the EIA-232 ports, or remotely through a TCP/IP Ethernet connection on the rear of the unit. One port is at the rear of the instrument and the other is on the front of the CPU Module.

Command Structure

The structure of each command is COMMAND followed by an EOL (End Of Line), or COMMAND followed by a ";" (a semicolon is used as a command separator), another command and then by an EOL (End Of Line).

Enter the entire command on one line. Separate each word of the command with a space.

Some commands have an abbreviated form. Abbreviations are the minimal amount of letters for each command word necessary to distinguish that command. For example, the **A**LARM command needs only the A. The EVENT command needs EV because another command, ENABLE, starts with E. Software Commands, on page 323, describes each command.

Use the backspace or delete key to correct entry mistakes. To erase an entire command line, press ESC. A fore-slash (/) at the start of the line repeats the last command entered. Press Control-C to stop the current output and empties the transmit buffer.

Note: The TSG-3800 automatically erases any partial or unsent commands if left inactive for more than 180 seconds.

Commands are not case-sensitive. The commands listed in this guide are capitalized for readability only.

An illegal command or syntax error returns the following message:

```
->XXX is not a valid command
```

An illegal command option returns the following message:

```
->Invalid parameter
```

Message Displays

Many of the command descriptions in this section contain examples of terminal displays. Some of these displays contain variables that are specific to each unit or configuration, such as the date, time, port or input channel in use. For these examples, « » (chevrons) contain the display variable as shown in Table B-3.

Table B-3. Terminal Display Variables

Variable	Description
«date»	Current date[1]
«time»	Current time[2]
«port»	COMA, COMB, Telnet (optional), Binary (optional)
«input»	Input signal. The value can be INP1.1 – INP1.3, INP2.1 – INP2.3, INP3.1 – INP3.3, or INP4.1 – INP4.3; they describe the Input module slot and channel of the input signal
«clk»	Clock A or Clock B
«fg»	Frame Generator A or Frame Generator B
«reason»	Short statement describing an event
«level»	User Privilege Level (1-4)
«oper»	Displays port ID

Note:

[1] Display shows the default time and date if date and time have not been set.
[2] Display shows the default time and date if date and time have not been set.

Command Selections

When a command applies to more than one item (for example, Input, Clock, or FG), the operator chooses among them. Type the selection in the command line where {*select*} appears.

In several commands, an input source is selectable. The input source selections are INP1.1 through INP4.3. Without an input source specified, the TSG-3800 defaults to all installed inputs.

Displaying a List of Commands

A help display is available. This command lists all root commands, for example, **PHASE**. The HELP command may be used to display command specific help.

To access the help display, type `HELP` then press **Enter**.

A typical display is:

```
TSG-> Help
```

```
The following commands are available:
```

Alarm	Bye	Clk	Comm
Configuration	Date	Disable	Enable
Event	Fg	Frequency	Help
Id	Input	IP	Msg
MTIE	Name	Network	Phase
Ping	Reference	Restart	Setup
Status	TDEV	Time	User
Who			
TSG->			

To access command-specific help, type:

`HELP «command»` then press **Enter**
`where «command» is any of the commands in the list above.`

Provisioning Input Reference Signals

The operator has the following controls over the input reference signals:

- Selection of the input reference in use
- Enabling or inhibiting automatic switching of references
- Enabling or inhibiting automatic return to a higher-priority input
- Selecting Input Reference Selection Mode
- Assigning fault modes for violation of operating limits
- Setting the number of faulted time intervals necessary to cause an alarm
- Setting the number of time intervals, without incident, necessary to clear an alarm
- Setting two limits for MTIE
- Setting two limits for frequency offset

On T1 or E1 X-Port modules:

- Set termination
- Set framing type
- Set zero suppression
- Set CRC
- Set SSM mode

Setting the Input Reference Selection Mode

The TSG-3800 can choose input references using one of three modes:

- **Priority** – bases the reference selection on the port's provisioned priority. Secondary criteria is the SSM information.
- **SSM** – bases the reference selection on received or provisioned SSM, then priority and position.
- **Best** – bases the reference selection on the weight derived from the input stability calculations. Secondary criteria are the priority and SSM information.

To check the reference mode, type:

`REF MODE` then press **Enter**

A typical response from the TSG-3800 is:

```
TSG->REF MODE
Unit in Priority Mode
TSG->
```

To set the Reference Selection Mode to either PRIORITY, SSM, or BEST, use the following syntax:

```
REF MODE [PRI|SSM|BEST]
```

Automatic Reference Switching Controls

Two commands affect automatic reference switching. They are Input AS (AutoSwitch) and Input AR (AutoReturn). When Input AS is On, the TSG-3800 automatically switches references upon failure of the current reference. The default is On. When Input AS is Off, then the reference switching is done by manual command only. The TSG-3800 switches to Holdover if the current reference fails.

When Input AR is On, the TSG-3800 automatically switches to the highest priority input if it is not currently selected. The default is On. This switch occurs when a valid higher priority input recovers from a previous failure. Switching occurs even if the current reference is valid.

Note: Input Autoswitch must be ON for Input Autoreturn to function properly.

To check the state of Autoswitch, type:

`INPUT AS` then press **Enter**

A typical response from the TSG-3800 is:

```
TSG->INPUT AS
Autoswitch is On
TSG->
```

To check the state of Autoreturn:

`INPUT AR` then press **Enter**

A typical response from the TSG-3800 is:

```
TSG->INPUT AR
Autoreturn is Off
TSG->
```

Enabling and Disabling Automatic Switching

To enable automatic reference switching, type:

`INPUT AS ON` then press **Enter**

The TSG-3800 responds with:

```
TSG->INPUT AS ON
«date» «time» «oper» Set Input AutoSwitch On
TSG->
```

To disable automatic reference switching, type:

`INPUT AS OFF` then press **Enter**

The TSG-3800 responds with:

```
TSG->INPUT AS OFF
«date» «time» «oper» Set Input AutoSwitch Off
TSG->
```

Automatic Return to a Higher Priority Reference

To allow the TSG-3800 to return automatically to the highest valid priority reference:

1. Type `INPUT AS ON` and press **Enter** to enable automatic switching.

2. Type `INPUT AR ON` and press **Enter** to enable autoreturn.

The TSG-3800 automatically selects the highest priority input providing it is a valid signal. The REF indicator on the selected Input module lights, and the terminal displays the following messages:

```
TSG->INPUT AS ON
«date» «time» «oper» set Input Autoswitch on
TSG->INPUT AR ON
«date» «time» «oper» set Input autoreturn on
«date» «time» «input» selected as reference, Sine
TSG->
```

Verifying the Input Reference Signal

The TSG-3800 automatically selects the input reference signal. Upon failure of the input reference, the TSG-3800 selects the highest priority valid input providing that Autoswitch is On. If Autoswitch is Off and the input reference fails, the TSG-3800 enters the Holdover mode.

The Input module providing the reference signal has its REF indicator illuminated; to verify the reference in use, type:

`REFERENCE` and press **Enter**.

The TSG-3800 responds with:

```
TSG->REFERENCE
The Current Reference is «input»
TSG->
```

For more information, refer to Reference Command, on page 354.

Manually Selecting the Reference

To select a channel as the input reference:

1. Ensure that Autoreturn is Off. This prevents the TSG-3800 from automatically switching back to a higher priority input channel.
2. Type `INPUT AR` then press **Enter** to check the autoreturn state.
3. Type `REFERENCE «input»` and press **Enter**. (Note that the REF indicator on the selected Input module illuminates.)

For more information, refer to Reference Command, on page 354.

Provisioning the Reference Selection Mode

The parameters used in the Reference Selection mode are described in Selecting the Reference Selection Mode, on page 85. To check the reference mode, type:

`REF MODE` then press **Enter**

A typical response from the TSG-3800 is:

```
>TSG->    REF MODE
Ref is using SSM Mode
TSG->
```

To set the Reference Selection mode, use the following command:

`REF MODE [PRI|SSM|BEST]` and press **Enter**.

For more information, refer to Reference Command, on page 354.

Detecting Input Errors

The TSG-3800 checks the incoming reference signals for eight types of signal faults. The faults are: AIS (alarm indication signal), BPV (bipolar violation), CRC (cyclic redundancy check), LOS (loss of signal), and OOF (out of frame), SSM (Synchronization Status Message), MTIE (Maximum Time Interval Error) Limits, and Frequency Limits.

Note: These faults are not characteristics for all types of input signals; for example, a sinusoidal input does not contain BPVs. Refer to the appropriate module section for applicable input faults.

For each input fault, you may:

- Assign a fault mode
- Specify a timer limit for each fault
- The timer limit is the number of 1-second time intervals containing one or more errors, within the last hour
- Specify the number of consecutive error-free 1-second intervals required to clear the fault
- Reset the fault and clear counts

Note: Fault limits and modes are independent for each Input module and may be set to different values.

Displaying Input Signal Fault Limits

To display the Input Signal fault mode assignment, error count, and clear count, type:

`INPUT [LOS|CRC|AIS|BPV|OOF]` then press **Enter**

A typical response of the TSG-3800 is:

```
TSG->INPUT LOS

Module     Err Cnt    Clr Cnt    Err Lmt    Clr Lmt   Mode
Inp1.1     14         0          10         2         Fail
Inp2.1     0          57         10         2         Fail
Inp3.1     0          33         10         2         Fail
Inp4.1     0          57         10         2         Fail
TSG->
```

LMT is the current value of the 1-second alarm thresholds. MODE is the current fault mode. INP1.1 through INP4.1 list the current 1-second error and clear count for each channel.

Assigning Input Fault Modes

You can assign an individual fault mode for each type of signal fault. Fault modes are: Fail, Alarm, Report, Ignore. Refer to section 3.5, Alarm Conditions for explanations.

To assign a fault mode to an input fault, type:

`INPUT «input» [LOS|CRC|AIS|BPV|OOF]`
`[FAIL|ALARM|REPORT|IGNORE]` then press **Enter**

`where «input» is described in` Table B-3

Example

Purpose: Change the INP4.1 AIS fault mode to Alarm.

Command: `INPUT INP4.1 AIS ALARM`

Display:
```
TSG->INPUT INP4.1 AIS ALARM
«date» «time» «oper» set AIS Alarm mode to Alarm, was
Report for «input»
TSG->
```

Setting the Error Limit

The TSG-3800 counts the number of 1-second intervals that contain one or more episodes. Each input fault has a separate timer. When this timer exceeds the error limit, the TSG-3800 will respond according to the user specified fault mode.

The default error limit is 10. Changing this limit affects this limit only.

To change the error limit, type:

`INPUT «input» [LOS|CRC|AIS|BPV|OOF] ERROR «threshold»` then press **Enter**.

`where «input» is described in` Table B-3
`«threshold» is a number from 1 to 43,200 for OOF, BPU and CRC and 1 to 100 for LOS and AIS`

Example

Purpose: Change the OOF error limit from 10 to 15.

Command: `INPUT ALL OOF ERROR 15`

Display:
```
TSG->INPUT ALL OOF ERROR 15
«date» «time» «oper» set OOF error limit to 15, was 10 for
«input»
TSG->
```

Setting the Clear Limit

The TSG-3800 automatically clears a fault caused by an input error that exceeds its error limit. This is done by counting the number of consecutive 1-second intervals that do not contain an error. When the counter exceeds this limit, the alarm clears.

Clearing the alarm resets the error count. The default clear limit is 2. For LOS and AIS, the clear limit can be set to 1 to 100 seconds. For OOF, BPV and CRC, the clear limit can be set from 1 to 43200 seconds. Changing this limit affects *all* input references.

To change the clear limit, type:

`INPUT «input» [LOS|CRC|AIS|BPV|OOF] CLEAR «threshold»` then press **Enter**

`where «input» is described in` Table B-3
`«threshold» is a number from 1 to 43,200`

Example

Purpose: Change the OOF clear limit from 2 to 10.

Command: `INPUT 1.1 OOF CLEAR 10`

Display:
```
TSG->INPUT 1.1 OOF CLEAR 10
«date» «time» «oper» set OOF clear limit to 10, was 2 for
«input»
TSG->
```

Resetting the Error Timer

The operator can reset the input reference error timer to zero for each error type. Each channel can be reset individually. To reset, type:

`INPUT «input» [LOS|CRC|AIS|BPV|OOF] ZERO` and press **Enter**.

`where «input» is described in` Table B-3

Example

Purpose: Reset the AIS error timer on the INP4.1 input to zero.

`Command: INPUT 4.1 AIS ZERO`

```
Display: TSG->INPUT 4.1 AIS ZERO
         «date» «time» «oper» zeroed AIS error counter for «input»
         TSG->
```

Viewing Phase Measurements

The TSG-3800 measures the phase between each input and each clock. You can display:

- The most recent phase measurement for all inputs
- Up to the last one hundred 1-second interval phase readings between the clocks and a specified input
- Up to the last one thousand 100-second average phase readings (27 hours) between the clocks and a specified input

The readings are displayed in nanoseconds (chronological).

To view the most recent phase measurements for all inputs, type:

`PHASE` then press **Enter**

A typical response from the TSG-3800 is:

```
->PHASE
The Current Time is 20JUN2004 08:32:01.122

 The Phase (1 sec) for Inp1.1 is     0        0
 The Phase (1 sec) for Inp1.2 is     0        0
 The Phase (1 sec) for Inp1.3 is     0        0
 The Phase (1 sec) for Inp2.1 is     1        0
 The Phase (1 sec) for Inp3.1 is     0        -1
 The Phase (1 sec) for Inp3.2 is     0        0
 The Phase (1 sec) for Inp3.3 is     -12      0
 The Phase (1 sec) for Inp4.1 is     0        0
 ->
```

To display the last *n* phase readings on a specified input, type:

`PHASE «input» [T1|T100] «n»` then press **Enter**

`where «input» is described in` Table B-3 `(default is the selected reference)`
`T1 is 1-s averages (default) T100 is 100-s averages`
`«n» is 1 to 100 for 1-s averages and 1 to 1000 for 100-s averages.`

Example

Purpose: To display the last five 100-second phase measurements of the INP2.1 input with timestands (TS) on each measurement.

Command: `PHASE TS 2.1 T100 5`

Display:

```
TSG->PHASE TS 2.1 T100 5
25OCT2000 13:24:56 Inp2.1 T100 6, -1
25OCT2000 13:26:36 Inp2.1 T100 6, -1
25OCT2000 13:28:16 Inp2.1 T100 6, -1
25OCT2000 13:29:56 Inp2.1 T100 5, -1
25OCT2000 13:31:36 Inp2.1 T100 4, 0
TSG->
```

To zero a selected input’s phase measurement count, type:

`PHASE «input» ZERO` and press **Enter**

where «input» is described in Table B-3 (default is the selected reference).

Provisioning MTIE and Frequency Parameters

The TSG-3800 measures the Frequency offset and Maximum Time Interval Error (MTIE) between each input and the clock in use. MTIE limits are expressed in nanoseconds. Frequency limits are expressed in picoseconds/second. When an input exceeds a specified threshold, the TSG-3800 enters the user-specified fault mode.

You can specify two fault threshold limits (designated as L1 and L2) and fault modes (Fail, Alarm, Report, and Ignore) for MTIE and frequency offsets. This allows one threshold to serve as an early warning of failure. The fault thresholds and limits chosen apply to the selected input.

For Frequency and MTIE measurements, you can set a threshold and fault mode for each of three intervals (100, 1000, or 10000 seconds). If you do not define these limits, the factory default values stored in non-volatile memory are used; see Appendix B, FACTORY DEFAULT CONFIGURATION. For example, you can assign a REPORT fault mode for a fractional frequency offset exceeding 1 x 10E^{-8} and a FAIL fault mode for an offset exceeding 1 x 10E^{-7}. You can set an offset threshold for each time scale (T100, T1000, or T10000) for both limits.

Recommendation: For consistency, Symmetricom recommends that you use L1 for the more extreme limit and fault mode.

MTIE errors cause an immediate alarm and error message. The error message displays the time and date of the alarm, the MTIE measurement, and the relevant time interval.

Note: Recalling a list of the MTIE measurements may not show the actual reading that exceeds the limit. To view current MTIE data, use the *STATUS* or *MTIE* command. Specifying a number on the MTIE command displays stored, completed data.

Displaying MTIE Measurements

To display the most recent 100-second MTIE readings for all inputs, type:

`MTIE` then press **Enter**

A typical response from the TSG-3800 is:

```
->MTIE
«date» «time» The MTIE Data (100 sec) for Inp1.1 was 54
«date» «time» The MTIE Data (100 sec) for Inp2.1 was 0
->
```

Note: Maximum Time Interval Error (MTIE) units are expressed in nanoseconds (ns).

To display *n* MTIE measurements for a selected input at a given time interval, type:

`MTIE «input» [T100|T1000|T10000] «n»` then press **Enter**

```
where «input» is described in Table B-3 (default is all inputs)
T100, T1000 and T10000 is the time scale in seconds (default
is T100)
«n» is the number of measurements to display (from 1 to 50;
default is 1).
```

Example

Purpose: Display the last two 100 second MTIE measurements for the INP3.1 channel.

Command: `MTIE 3.1 T100 2`

Display:

```
TSG->MTIE 3.1 T100 2
«date» «time» The MTIE Data (100 sec) for Inp3.1 was 0
«date» «time» The MTIE Data (100 sec) for Inp3.1 was 0
TSG->
```

Displaying MTIE Fault Modes

To display the current MTIE fault mode:

`MTIE {input} MODE` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

A typical response from the TSG-3800 is:

```
TSG->MTIE 1.1 MODE
The MTIE Limit 1 Alarm Mode for Inp1.1 is Alarm
The MTIE Limit 2 Alarm Mode for Inp1.1 is Report
TSG->
```

Setting MTIE Fault Modes

To set an MTIE fault mode, type:

`MTIE «input» MODE [L1|L2] [FAIL|ALARM|REPORT|IGNORE]` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

Example

Purpose: Set the MTIE limit 1 to REPORT fault mode.

Command: `MTIE 1.1 MODE L1 REPORT`

Display:

```
TSG->MTIE 1.1 MODE L1 REPORT
«date» «time» «oper» Set Inp1.1 MTIE Alarm Mode l to
Report, was Alarm
TSG->
```

Displaying MTIE Limits

To display the current MTIE fault limits, type:

`MTIE «input» [T100|T1000|T10000] LIMIT` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`
`T100, T1000 and T10000 is the time scale in seconds (default is T100).`

A typical response from the TSG-3800 is:

```
TSG->MTIE 1.1 T1000 LIMIT
The MTIE T1000 Limit 1 Alarm Mode for Inp1.1 is Alarm 432
The MTIE T1000 Limit 2 Alarm Mode for Inp1.1 is Ignore 324
TSG->
```

Setting MTIE Limits

To set the MTIE fault limits, type:

`MTIE «input» [T100|T1000|T10000] LIMIT [T1|T2] «limit»` then press **Enter**

```
where «input» is described in Table B-3 (default is all inputs)
T100, T1000 and T10000 is the time scale in seconds (default
is T100)
T1 is alarm limit 1 and T2 is alarm limit 2
«limit» is the value in ns (maximum 1000000 ns)
```

Example

Purpose: Set the INP2.1 MTIE limit 1, 100-second interval, to 6000 ns.

Command: `MTIE 2.1 T100 LIMIT L1 6000`

Display:

```
TSG->MTIE 2.1 T100 LIMIT L1 6000
«date» «time» «oper» Set «input» MTIE (100 secs) Limit 1 to
6,000, was 5,022
TSG->
```

Displaying Frequency Measurements

To display the most recent 100 s, 1,000 s, and 10,000 s interval frequency measurement for each input, type:

`FREQUENCY` then press **Enter**

A typical response from the TSG-3800 is:

```
TSG->FREQUENCY
«date» «time» The Freq Data (100 sec) for Inp1.1 was 70
«date» «time» The Freq Data (100 sec) for Inp2.1 was 0
«date» «time» The Freq Data (100 sec) for Inp3.1 was 0
TSG->
```

Note: Frequency units are expressed in picoseconds/second (ps/sec), where one ps/sec is equivalent to 1 part in 10^{-12}.

To display *n* frequency measurements for a selected input at a given time interval, type:

`FREQUENCY «input» [T100|T1000|T10000] «n»` then press **Enter**

```
where «input» is described in Table B-3 (default is all inputs)
T100, T1000 and T10000 is the time scale in seconds (default
is T100)
«n» is the number of measurements to display (1 to 50;
default is 1)
```

Example

Purpose: Display the last three 100-second frequency measurements for the INP2.1 input.

Command: `FREQUENCY 2.1 T100 3`

Display:
```
TSG->FREQUENCY 2.1 T100 3
«date» «time» The Freq Data (100 sec) for Inp2.1 was 34
«date» «time» The Freq Data (100 sec) for Inp2.1 was 0
«date» «time» The Freq Data (100 sec) for Inp2.1 was 15
TSG->
```

Displaying Frequency Fault Modes

To display the current Frequency fault mode, type:

`FREQUENCY {input} MODE` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

A typical response from the TSG-3800 is:

```
TSG->FREQUENCY 3.1 MODE
The Freq Limit 1 Alarm Mode for Inp3.1 is Alarm
The Freq Limit 2 Alarm Mode for Inp3.1 is Ignore
TSG->
```

Displaying Frequency Limits

To display the current frequency fault limits, type:

`FREQUENCY «input» LIMIT` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

A typical response from the TSG-3800 is:

```
TSG->FREQUENCY LIMIT
The Freq T100 Limit 1 for Inp2.1 is 50220
The Freq T100 Limit 2 for Inp2.1 is 24840
The Freq T100 Limit 1 for Inp3.1 is 50220
The Freq T100 Limit 2 for Inp3.1 is 24840
TSG->
```

Setting Frequency Fault Modes

To set a fault mode, type:

`FREQUENCY «input» MODE [L1|L2] [FAIL|ALARM|REPORT|IGNORE]`
then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

Example

Purpose: Set the INP2.1 Frequency limit 1 to REPORT fault mode.

Command: `FREQUENCY 2.1 MODE L1 REPORT`

Display:
```
TSG->FREQUENCY 2.1 MODE L1 REPORT
«date» «time» «oper» Set «input» Freq Alarm Mode 1 to
Report, was Alarm
TSG->
```

Setting Frequency Limits

To set the Frequency fault limits, type:

`FREQUENCY «input» [T100|T1000|T10000] LIMIT [L1|L2] «limit»` then press **Enter**

where «input» is described in Table B-3 (default is all inputs)
T100, T1000 and T10000 is the time scale in seconds (default is T100)
«limit» is the limit in ps/s (maximum 1 000 000)

Example

Purpose: Set the Frequency limit 2, 10,000-second interval, to 700 ps/s.

Command: `FREQUENCY INP2.1 T10000 LIMIT L2 700`

Display:
```
TSG->FREQUENCY 2.1 T10000 LIMIT L2 700
«date» «time» «oper» Set «input» Freq (10,000 secs) Limit 2
to 700, was 248
TSG->
```

Preventing Faults in MTIE and FREQ Data

In some situations, bad references can accumulate large frequency and MTIE offsets. Even after correcting the problem, the accumulated phase/frequency offset data is maintained. This can cause the reference to fail the next interval's measurement, which can be up to be three hours later.

To prevent MTIE or frequency measurements from causing a fault at the end of the next measurement interval, you can issue the Inhibit command. After entering the command, the TSG-3800 will not fault due to excessive MTIE/frequency offsets during the measurement interval. Use this command is after a bad reference has been replaced or corrected.

To prevent previous MTIE data from generating a fault in the next measurement interval, type:

`MTIE «input» INHIBIT` then press **Enter**

where «input» is described in Table B-3 (default is all inputs)

Example

Purpose: Prevent previous MTIE data for the primary input from causing a MTIE fault at the end of the measurement cycle.

Command: `MTIE 1.1 INHIBIT`

Display:
```
TSG->MTIE INP1.1 INHIBIT
«date» «time» «oper» Temporarily Inhibited MTIE Faults for
«input»
TSG->
```

To prevent previous frequency data from affecting current measurements, type:

`FREQUENCY «input» INHIBIT` then press **Enter**

`where «input» is described in` Table B-3 `(default is all inputs)`

Example

Purpose: Prevent previous frequency data for the secondary input from causing a frequency fault at the end of the measurement cycle.

Command: `FREQUENCY INP2.1 INHIBIT`

Display:
```
TSG->FREQUENCY INP2.1 INHIBIT
«date» «time» «oper» Temporarily Inhibited Frequency Faults
for «input»
TSG->
```

Command Reference

This section describes the complete syntax for each software command available in the TSG-3800. For information on command structure and message displays, refer to Software Commands, on page 323.

Alarm Command

Use this command to acknowledge, display, and clear alarms as well as turn off the audio alarm and the alarm indicators on the front panel of the modules.

Level 0	Not applicable
Level 1	`ALARM`
Level 2	`ALARM CLEAR [CRITICAL|MAJOR|MINOR|AUDIO|ALL]`
Level 3	Same as Level 2 operation
Level 4	Same as Level 2 operation
Remarks	None
Related	
Restrictions	None

Bye Command

Use this command to log the current user off the TSG-3800.

Level 0	Not applicable
Level 1	`BYE`
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	`LOGON`
Restrictions	None

Clock Command

Use this command to display and provision the Clock module parameters.

Level 0	Not applicable

Level 1	`CLK [A|B] [MODE]`
	`CLK [A|B] AR`
	`CLK [A|B] CV`
	`CLK [A|B] TC`
	where:
	■ A|B selects which clock the command is to affect
	■ Mode displays the current mode: Warmup, Acquire, Locked, Holdover
	■ AR displays the current status of Autoreturn
	■ CV displays the current control value
	■ TC displays the final tau value (time constant)

Level 2	Same as Level 1 operation

Level 3	Same as Level 1 operation, adding:
	`CLK [A|B] AR [OFF|ON]`
	`CLK [A|B] MODE [WARMUP|ACQUIRE|LOCKED|HOLDOVER]`
	`CLK [A|B] CV [T1|T100][[1-100]|[1-1000]]`
	`CLK [A|B] TC [number|MIN|MAX]`
	where:
	■ AR sets the AutoReturn mode on the selected clock to On or Off
	■ Mode selects the operating mode:
	■ Warmup = The Clock module is not yet stable
	■ Acquire = The Clock module is syncing with the Input reference signal
	■ Locked = The Clock module is locked to the Input reference signal
	■ Holdover = Input reference signal is invalid
	■ CV sets the control value for the time period of the selected clock
	■ T1 = 1 s average (default); range: 1–100
	■ T100 = 100 s average; range: 1–1000
	■ TC sets the time constant to the specified value or to Min or Max. See Table B-4

Level 4	Same as Level 3 operation
Remarks	None
Related	
Restrictions	None

Table B-4. Time Constant Values for Each Type of Clock Module

Type	Starting TC	Minimum TC	Maximum TC	Pull-in Range
Stratum 2 Rb	100	500	10000	$+5.76 \times 10E^{-8}$
Stratum 2.0 DDS	50	100	5000	$+5.76 \times 10E^{-8}$
Stratum 2.0	50	100	5000	$+5.76 \times 10E^{-8}$
Stratum 2.1 DDS	50	100	5000	$+5.76 \times 10E^{-8}$
Stratum 2.1	50	100	5000	$+5.76 \times 10E^{-8}$
Stratum 3E	20	20	1000	$+1.6 \times 10E^{-5}$

Communication Command

This command allows you to display and modify the parameters that affect the EIA-232 ports on the TSG-3800.

Level 0 Not applicable

Level 1 `COMM [A|B] [BAUD|ECHO|EOL|HAND|MODE|TIMEOUT]`
Displays the values for each parameter

Level 2
```
COMM [A|B] BAUD [300|1200|2400|4800|9600|19200]
COMM [A|B] ECHO [OFF|ON]
COMM [A|B] EOL [LF|CR|CRLF]
COMM [A|B] HANDSHAKE [OFF|HARDWARE|SOFTWARE]
COMM [A|B|TELNET|BINARY] TIMEOUT [5 - 43200]
```
All values set at this level revert to default/stored values at logoff.
where:

- Baud is the baud rate of the port (default = 9600)
- Echo is used for full/half duplex operation (default = On)
- EOL sets the End of Line termination (default = CRLF)
- Handshake determines the method of connection (default = Off)
- Timeout sets the length of inactive time before automatically logging off the user (default = 300)

Level 3	Same as Level 2 operation, but all values set at this level are stored. Add the following commands:
	`COMM [A|B] MODE [ASCII|BINARY|TL1|PASSTHRU]`
	`COMM [A|B] RESET`
	where:
	■ Mode is the operating mode of the specified port:
	■ ASCII: ASCII commands are executed
	■ Binary:
	■ TL1: The TL1 command set is executed
	■ Passthru: Commands received on the specified port are passed through a device connected to the other port
	■ Reset restores the default settings to all parameters

Level 4	Same as Level 3 operation
Remarks	None
Related	
Restrictions	None

Configuration Command

This command allows you to display the configuration of the selected Input modules and the Clock and Frame Generator modules.

Level 0	Not applicable
Level 1	`CONFIG [NONE| [{start input} [stop input]]` where «input» is described in Table B-3 (default is all inputs) where: ■ None displays only Clock and Frame Generator data ■ Start input defines the first Input module data to display ■ Stop input defines the last Input module data to display
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	`CLK, FG`
Restrictions	None

Date Command

Use this command to view and set the date in the TSG-3800. If you do not specify a date at start-up, the TSG-3800 reverts to the default setting.

Level 0	Not applicable
Level 1	`DATE`
Level 2	Same as Level 1 operation
Level 3	`DATE [MM/DD/YY]`
Level 4	Same as Level 3 operation
Remarks	None
Related	`TIME`
Restrictions	None

Disable Command

Use this command to disable operations in the TSG-3800.

Level 0	Not applicable

Level 1	`DISABLE EVENT [MESSAGE|INPUT|EQUIPMENT|ALL]`
	`DISABLE LOGOFF`
	where:
	Event displays or disables logging of the specified event type
	Logoff disables automatic logoff on the port

Level 2	`DISABLE PASSTHRU` where: ■ Passthru disables the passthru port

Level 3	`DISABLE [CLK|FG] [A|B]`
	`DISABLE EVENT [A|B] [MESSAGE|INPUT|EQUIPMENT|ALL]`
	where:
	■ CLK disables the selected Clock module
	■ FG disables the selected Frame Generator module
	■ Event disables the specified automatic event logs
	■ PORT = event logs from the specified port are disabled
	■ MESSAGE = message logs are disabled
	■ INPUT = input logs are disabled
	■ EQUIPMENT = equipment logs are disabled
	■ ALL = all automatic event logs are disabled (Default)

Level 4	`DISABLE TL1_SECU]` Disables the TL1 security feature; a TL1 user does not need to log in using an assigned name and password
Remarks	None

Related `ENABLE`
`COMM MODE`
`Event`

Restrictions None

Enable Command

Use this command to enable operations in the TSG-3800.

Level 0 Not applicable

Level 1 `ENABLE EVENT [MESSAGE|INPUT|EQUIPMENT|ALL]`
`ENABLE LOGOFF`
where:
Event displays or enables logging of the specified event type
Logoff enables automatic logoff on the port

Level 2 `ENABLE PASSTHRU`
where:
Passthru enables the passthru port

Level 3 `ENABLE [CLK|FG] [A|B]`
`ENABLE EVENT [A|B] [MESSAGE|INPUT|EQUIPMENT|ALL]`
where:

- CLK restarts the selected Clock module, which enters the Acquire mode; all error flags are cleared
- FG restarts the selected Frame Generator module; all error flags are cleared
- Event enables the specified automatic event logs
- PORT = event logs from the specified port are enabled
- MESSAGE = message logs are enabled
- INPUT = input logs are enabled
- EQUIPMENT = equipment logs are enabled
- ALL = all automatic event logs are enabled (Default)

Level 4 `ENABLE TL1_SECU`
Enables the TL1 security feature; a TL1 user must log in using an assigned name and password

Remarks None

Related `DISABLE`
`COMM MODE LOGOFF`

Restrictions None

Event Command

Use this command to display up to 500 prior event messages or to clear prior event messages.

Level 0 Not applicable

Level 1
```
EVENT [TYPE] [start number] [number]
EVENT [TYPE] [[startdate] [starttime]] [[stopdate]
[stoptime]
```
where:
- Type is the type of message:
- Message = informational messages
- Input = messages related to the Input signals
- Equipment = messages related to the hardware
- All = above three types of messages
- start number is the first message number
- number is the number of messages to display in chronological order
- startdate/stopdate is entered as mm/dd/yyyy
- starttime/stoptime is entered as hh:mm

Level 2 Same as Level 1 operation

Level 3
```
EVENT [TYPE] [start number] [number of events]
EVENT [TYPE] [[startdate] [starttime]] [[stopdate]
[stoptime]
EVENT CLEAR
```
where:
- Clear deletes every entry in the event list

Level 4 Same as Level 3 operation

Remarks None

Related
```
DISABLE
COMM MODE
```

Restrictions None

Frame Generator Command

Use this command to display and provision the Frame Generator modules.

Level 0 Not applicable

Level 1
```
FG [A|B] [MODE]
FG [A|B] SET
FG DELAY
```
where:
- Set displays the SSM value. If the SSM mode is manual, then hex values are displayed; if it is auto, then the ASCII equivalent is displayed
- Delay displays the amount of time before a change in SSM takes place

Level 2 `FG DELAY [time]`
where:
- time is the time in seconds (1 – 30, default 1) that delays the output SSM changing to a newly-received SSM.

Level 3
```
FG [A|B] MODE [AUTO|MANUAL]
FG [A|B] SET [T1|E1] $[ssm in hex]]
```
where:
- Mode is the SSM output mode, determining the output SSM source
- Set is the output SSM value for T1 or E1. SSM output mode *must* be set to Manual in order to change the output SSM

Level 4 Same as Level 3 operation

Remarks None

Related `CLOCK`

Restrictions None

Frequency Command

Use this command to display and provision all frequency-related parameters.

Level 0 Not applicable

Level 1
```
FREQ «input»
FREQ «input» LIMIT
FREQ «input» MODE
```
where:
- Freq displays the frequency data for the selected input
- Limit displays the alarm limits L1 and L2 for the selected input
- Mode displays the alarm modes (L1 and L2) for the selected input

Level 2 Same as Level 1 operation, adding:
```
FREQ «input» INHIBIT
```
where:
- Inhibit disables frequency alarms for the selected input

Level 3 Same as Level 2 operation, adding:
```
FREQ «input» [T100|T1000|T10000] LIMIT [L1 [1-100000]|L2
[1-100000]]
FREQ «input» MODE [L1 [alarm mode]| L2 [alarm mode]]
```
where:
- L1/L2 = the Level 1 and Level 2 alarm limits
- Mode = the Level 1 and Level 2 alarm modes (Critical, Major, Minor, Report, Audio); applies to all time scales (T100, T1000, and T10000)

Level 4 Same as Level 3 operation

Remarks None

Related

Restrictions None

Help Command

This command displays a list of the commands available for use in the TSG-3800.

Level 0	

Level 1	`HELP`
	`HELP «command»`
	Displays a short overview of syntax options for each command

Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	
Restrictions	None

ID Command

Use this command to display the model, type, and software version level of the TSG-3800.

Level 0	Not applicable
Level 1	`ID «input»`
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	
Restrictions	None

Input Command

Use this command to display and provision the Input modules in the TSG-3800.

Level 0 Not applicable

Level 1
```
INPUT [«input»|ALL] [AIS|BPV|CRC|LOS|OOF] [ERROR|CLEAR|
MODE]
INPUT [«input»|ALL] [T1|E1]
INPUT [«input»|ALL] MODE
INPUT [«input»|ALL] PRIORITY
INPUT [«input»|ALL] [AR|AS]
```
where:

- AIS displays...
  BPV displays bipolar violation error data for the selected channel
- CRC displays cyclical redundancy check data for the selected channel
- LOS displays loss of signal error data for the selected channel
- OOF displays out of frame error data for the selected channel
- Error displays the error limit for the selected channel
- Clear displays the clear limit for the selected channel
- T1/E1 displays provisioned data for the selected channel
- Mode displays the alarm mode for the selected channel
- Priority displays the provisioned priority level for the selected channel
- AR/AS displays the Autoreturn/Autoswitch status for the selected channel

Level 2 Same as Level 1 operation

Level 3
```
INPUT [«input»|ALL] [AIS|BPV|CRC|LOS|OOF] MODE [IGNORE|
REPORT|ALARM|FAIL]
INPUT [«input»|ALL] [AIS|BPV|CRC|LOS|OOF] [ERROR|CLEAR]
[threshold]
INPUT [«input»|ALL] [AIS|BPV|CRC|LOS|OOF] ZERO
INPUT [«input»|ALL] [T1 [ESF|D4]|E1[CCS|CAS]]
INPUT [«input»|ALL] CLK
[1MHZ|1.544MHZ|2.048MHZ|5MHZ|10MHZ]
INPUT [«input»|ALL] TERMINATION [3300|120|100|75|50]
INPUT [«input»|ALL] SET [PRS|OCN|MCD]
INPUT [«input»|ALL] SSM [ST1|STU|ST2|ST3]
INPUT [«input»|ALL] MODE [IGNORE|REPORT|ALARM|FAIL]
INPUT [«input»|ALL] [PRIORITY [0-4]|SSM BIT [4-8]]
INPUT [AR|AS] [ON|OFF]
```

Level 4 Same as Level 3 operation

Remarks None

Related

Restrictions None

IP Command

This command allows you to display and provision the Internet Protocol (IP) addresses of the TSG-3800.

Level 0	Not applicable
Level 1	`IP`
Level 2	Same as level 1 operation
Level 3	Same as level 1 operation
Level 4	`IP [ADDR|MASK|GATEWAY] [ip address]`
Remarks	None
Related	
Restrictions	None

Message Command

Use this command to send a broadcast message to other users logged on to the TSG-3800. The message can be up to 50 characters long.

Level 0	Not applicable
Level 1	Same as level 0 operation
Level 2	Same as level 0 operation
Level 3	Same as level 0 operation
Level 4	`MSG [message string]`
Remarks	None
Related	
Restrictions	None

MTIE Command

Use this command to display and provision all Maximum Time Interval Error (MTIE) parameters.

Level 0 Not applicable

Level 1
```
MTIE «input» [T100|T1000|T10000] [CURRENT|[number]]
MTIE «input» [[startdate] [starttime]] [[stopdate] [stoptime]]
MTIE «input» MODE
```
where:
- T100/T1000/T10000 is the time scale (window size)
- startdate/stopdate is in the format mm/dd/yyyy
- starttime/stoptime is in the format hh:mm
- Current displays the current calculation
- number displays 1 to 50 (default 1) MTIE calculations
- Mode displays the alarm mode for the selected channel

Level 2
```
MTIE INHIBIT
```
where:
Inhibit disables MTIE alarms

Level 3
```
MTIE «input» [T100|T1000|T10000] LIMIT [L1 [1-100000]|L2 [1-100000]
MTIE «input» MODE [L1 [alarm mode]|L2 [alarm mode]]
```
where:
- Limit displays/sets the L1/L2 alarm threshold limits
- Mode displays/sets the L1/L2 alarm modes

Level 4 Same as Level 3 operation

Remarks None

Related `TDEV`

Restrictions None

Name Command

Use this command to display and name the TSG-3800. The name is used as the [tid] in TL1 communications.

Level 0 Not applicable

Level 1 `NAME`

Level 2 Same as level 1 operation

Level 3 Same as level 1 operation

Level 4	`NAME [NONAME| name]` where: ■ Noname deletes the name of the unit ■ Name can be a string of up to 20 characters
Remarks	None
Related	
Restrictions	None

Network Command

This command displays the network statistics.

Level 0	Not applicable
Level 1	Not applicable
Level 2	Not applicable
Level 3	Not applicable
Level 4	`NETWORK`
Remarks	None
Related	
Restrictions	None

Phase Command

This command displays and resets the phase data stored in the TSG-3800.

Level 0	Not applicable
Level 1	`PHASE [TS] «input» [T1|T100] [1-100] [1-1000]` where: ■ TS = displays the requested data from the selected input with a date and time stamp for each phase sample ■ T1/T100 = length in seconds of phase measurement (default T1) ■ 1-100 = number of T1 phase measurements to display (default 1) ■ 1-1000 = number 0f T100 phase measurements to display (default 1)
Level 2	Same as Level 1 operation
Level 3	`PHASE «input» ZERO` Erases the stored phase data for the selected input
Level 4	Same as Level 3 operation
Remarks	None

Related	
Restrictions	None

Ping Command

This commands allows you to ping other network elements to verify connection.

Level 0 — Not applicable

Level 1 — `PING [-s] [host address] [timeout]`

where:

- -s = request 10 packets from the target
- host address = dotted decimal address of target
- timeout = 2 – 30 s

Level 2 — Same as Level 1 operation

Level 3 — Same as Level 1 operation

Level 4 — Same as Level 1 operation

Remarks — None

Related

Restrictions — None

Reference Command

This commands allows you to display or provision the input reference signal parameters.

Level 0 — Not applicable

Level 1 — `REF [LASTSWITCH|MODE]`

where:

- Lastswitch displays the time of the last reference switch, the previous and the current reference port
- Mode displays the current reference selection mode (priority, best, or SSM)

Level 2 — Same as Level 1 operation

Level 3 — Same as Level 1 operation

Level 4 —

```
REF «input»
REF MODE [BEST|PRIORITY|SSM]
```

where:

`«input» is the new reference port`

Remarks — None

Related

Restrictions — None

Restart Command

This commands restarts the TSG-3800 in the number of seconds specified. The default is 5 seconds.

Level 0	Not applicable
Level 1	Not applicable
Level 2	Not applicable
Level 3	`RESTART [5-600]`
Level 4	Same as Level 3 operation
Remarks	None
Related	
Restrictions	None

Setup Command

Use this command to display and provision the TSG-3800 software setup. These values are stored in nonvolatile RAM.

Level 0	Not applicable
Level 1	`SETUP [[start input] [stop input]|NONE]]`
Level 2	Same as Level 1 operation
Level 3	`SETUP [DEFAULT|FACTORY]` `SETUP SAVE`
Level 4	Same as Level 3 operation
Remarks	None
Related	
Restrictions	None

Status Command

Use this command to display the TSG-3800 status. The response includes status of the following modules:

- Selected Input channels
- Communications
- Clock(s)
- Frame Generator(s)

Level 0	Not applicable
Level 1	`STATUS [NONE| [start input] [stop input]]` where: ■ None = do not display status of any input channels ■ start input = the first «input» channel ■ stop input = the last «input» channel
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	
Restrictions	None

TDEV Command

Use this command to display the Time Deviation (TDEV) data in the TSG-3800.

Level 0	Not applicable

Level 1	`TDEV «input» [starttime] [stoptime] [elapsed hours]`
	`TDEV «input» [[startdate] [starttime]] [[stopdate] [stoptime]]`
	where:
	■ starttime = days:hours (default = 24 hours before current time)
	■ stoptime = days:hours (default = current time)
	■ elapsed hours =
	■ startdate =
	■ stopdate =

Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	
Restrictions	None

Time Command

Use this command to display and set the time of day stored in the TSG-3800.

Level 0	Not applicable
Level 1	`TIME`
Level 2	Same as Level 1 operation
Level 3	`TIME HH:MM:SS`
Level 4	Same as Level 3 operation
Remarks	None
Related	`DATE`
Restrictions	None

User Command

Use this command to manage the list of users who can access the TSG-3800.

Level 0	Not applicable
Level 1	`USER [MODIFY] [username]` Allows the current user to modify the current password.
Level 2	Same as level 1 operation
Level 3	Same as level 1 operation

Level 4	`USER`
	`USER INITUSERTABLE`
	`USER [ADD|MODIFY] [username]`
	`USER DELETE [username]`
	`USER LOGOFF [username]`
	where:
	■ Initusertable = removes all users from the user table in the TSG-3800
	■ Add = adds a new user to the user table; you must specify a password (can be empty) for the new user
	■ Modify = change a user name or change a user's password
	■ Delete = removes the specified user from the user table
	■ Logoff = force the specified user off the TSG-3800

Remarks	None
Related	
Restrictions	None

Who Command

Use this command to display a list of users that are logged on to the TSG-3800.

Level 0	Not applicable
Level 1	`WHO`
Level 2	Same as level 1 operation
Level 3	Same as level 1 operation
Level 4	Same as level 1 operation
Remarks	None
Related	
Restrictions	None

System Messages

Each event may be classified by three parameters. The first parameter is category. Events may be categorized as Input, Message, Equipment, or Output. Input events are generated by input signal faults or problems. Equipment events are alarms that are not generated by input alarms. Message and Output events are information displayed to the user. Output events are not stored in the event history.

Events may be classified by their alarm level. The alarm level may be critical, major, minor, or event. Critical, major, and minor correspond to the appropriate alarm level. Events do not have a corresponding alarm level or are no alarm. This is only relevant when using TL1.

Events may be further classified by a condition code. The condition code is used in TL1 to qualify the event. The condition code attempts to give some indication as to the cause of the event. For example, PHA condition code indicates that the event was created because of the input phase measurement.

The Condition Type is defined as follows:

- AIS, BPV, CRC, LOS, OOF (input signal fault)
- MTIE, TDEV, FREQ (input signal limit)
- PHA, REF, SQL (input phase/ref /sql fault)
- PWR (power fault)
- BUS (bus fault)
- INTIFCFAIL (equipment faults)
- ADDED, RESTORED, REMOVED(module operations)

- ALARM(CPU alarm operation)
- OPER, MSG (operator setting/ message)

Abbreviations:

- SSMSync Status Message (E1) or Bit-Oriented Message (T1)
- SQLSync Quality Level

Table B-5. Event Listing

Event No.	Type	Description	Comment
1	Equipment, Minor, Intifcfail	Local 1 PPS Failed	Occurs when the 1 PPS signal from the CPU's internal clock is too far off frequency to lock to. This normally indicates that the CPU module needs servicing.
2	Equipment, Event, Restored	Local 1 PPS Restored	Occurs when the 1 PPS signal from the CPU's internal clock has stabilized when it had previously failed.
3	Message, Event, Added	Module Added	Occurs when a new module is added to the system. It gives the slot and the module type.
4	Message, Minor, Removed	Module Removed	Occurs when an module is removed from the system. It will also occur if power is lost on the module.
5	Message, Event, Oper	User Set Priority	Signals that the operator has set the provisioned input priority for the given port.
6	Message, Event, Oper	User Set SSM Alarm Mode	Signals that the operator has set the provisioned input priority alarm mode for the given port.
7	Message, Event, Oper	User Set Input SSM Selection Mode	This event signals that the operator has set the SSM selection mode for the output SSM.
8	Input, Minor, SQL	Clock SQL is Better Than Input Reference SQL	This event signals that the Clock module SQL is better than the SQL of the input reference. This event will not occur in Ensemble Mode.
9	Equipment, Event, Msg	Non-Volatile Clock Initialized	This event occurs during bootup and signals that the time stored in the battery-backed clock is not operating.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
10	Equipment, Event, Msg	Non-Volatile Ram Initialized	This event occurs during bootup and signals that the configuration stored in the battery-backed ram does not appear to be correct.
11	Message, Event, Msg	Clock Entered Loop Mode	This event occurs when the Clock modules change operating modes. This will occur periodically during normal operation.
12	Message, Event, Msg	Changed Clock Masters	This event signals that the system has determined that a different clock source is better than the current clock master.
13	Equipment, Minor, Pwr	Power Input Failed	This event signals that the CPU has lost 48 volts on the power input lines. This typically signals a problem with the power system supplying these lines.
14	Equipment, Event, Pwr	Power Input Restored	This event signals that the CPU has regained 48 volts on the power input lines.
15	Message, Event, Alarm	Audio Alarms Cleared	This event signals that the operator has pressed the alarm cutoff switch disabling audible alarms.
16	Message, Event, Msg	Chosen CPU Internal Clock	This event signals that the CPU has determined that none of the Clock modules are able to be the master so it is switching to the CPU's internal clock.
17	Message, Event, LOS	Began LOS	This event signals that the given Input module has detected an LOS (loss of signal).
18	Message, Event, BPV	Began BPV	This event signals that the given Input module has detected a BPV (bipolar violation).
19	Message, Event, OOF	Began OOF	This event signals that the given Input module has detected an OOF (out of frame).
20	Message, Event, AIS	Began AIS	This event signals that the given Input module has detected an AIS (alarm indication signal).
21	Message, Event, LOS	LOS Ended	This event signals that the LOS condition is no longer present on the given Input module.
22	Message, Event, OOF	OOF Ended	This event signals that the OOF condition is no longer present on the given Input module.
23	Message, Event, AIS	AIS Ended	This event signals that the AIS condition is no longer present on the given Input module.
24	Message, Event, BPV	BPV Ended	This event signals that the BPV condition is no longer present on the given Input module.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
25	Input, Minor, OOF	OOF Input Fault	This event signals that the given Input module has detected an OOF (out of frame) and is reporting that the input error counter has incremented past the error limit. **NOTE**: This event only occurs when the alarm mode is REPORT or ALARM.
26	Input, Minor, BPV	BPV Input Fault	This event signals that the given Input module has detected an BPV (bipolar violation) and is reporting that the input error counter has incremented past the error limit. **NOTE:** This event only occurs when the alarm mode is REPORT or ALARM.
27	Input, Minor, LOS	LOS Input Fault	This event signals that the given Input module has detected an LOS (loss of signal) and is reporting that the input error counter has incremented past the error limit. **NOTE:** This event only occurs when the alarm mode is REPORT or ALARM.
28	Input, Minor, AIS	AIS Input Fault	This event signals that the given Input module has detected an AIS (alarm indication signal) and is reporting that the input error counter has incremented past the error limit. **NOTE:** This event only occurs when the alarm mode is REPORT or ALARM.
29	Input, Event, OOF	Input Restored From OOF Fault	This event signals that the given Input module is not indicating OOF and the clear counter has incremented past the clear limit.
30	Input, Event, AIS	Input Restored From AIS Fault	This event signals that the given Input module is not indicating AIS and the clear counter has incremented past the clear limit.
31	Input, Event, LOS	Input Restored From LOS Fault	This event signals that the given Input module is not indicating LOS and the clear counter has incremented past the clear limit.
32	Input, Event, BPV	Input Restored From BPV Fault	This event signals that the given Input module is not indicating BPV and the clear counter has incremented past the clear limit.
33	Equipment, Event, Restored	Module Restored Event	This event signals that the given module has been cleared of all fail conditions and is now operating properly.
34	Equipment, Major, Intifcfail	Module Failed Event	This event signals that the given module has failed and gives the hex value for the cause if possible.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
35	Message, Event, Ref	Input Module Selected as Reference	This event signals that the system has chosen a new Input module as reference.
37	Equipment, Event, Alarm	Minor Alarm Cleared	This event signals that the CPU has turned off the minor alarm LED and relays
39	Equipment, Event, Alarm	Major Alarm Cleared	This event signals that the CPU has turned off the major alarm LED and relays.
40	Input, Major, Ref	No Valid Reference Found	This event signals that the CPU has determined that no input should be used as a reference.
41	Input, Event, Ref	Valid Reference Found	This event signals that the CPU has determined that an input or inputs may be used as a reference.
42	Equipment, Critical, Intifcfail	Output Reference Invalid	This event signals that the CPU has determined that none of the Clock modules are suitable for use as a master clock. This typically means that the Clock modules are in warmup, holdover, or have a problem.
43	Equipment, Event, Msg	Output Reference Valid	This event signals that the CPU has determined that at least one of the Clock modules are suitable for use as a master clock.
44	Equipment, Major, Alarm	Distribution Output Fault	This event occurs when the output modules signal the CPU that they are no longer able to produce a suitable output. Typically means that one or more of the output signals has a problem.
45	Equipment, Event, Alarm	Distribution Output Fault Cleared	This event signals that the output modules have restored normal output signals.
46	Equipment, Minor, Alarm	Distribution Input Fault	This event signals that the output modules are not receiving timing information from the frame generator. This typically occurs when there is a problem with the frame generator.
47	Equipment, Event, Alarm	Distribution Input Fault Cleared	This event signals that the output modules timing information from the frame generator has been restored.
48	Equipment, Event, Msg	Configuration Loaded	This event occurs on bootup and signals that the user default configuration has been restored from non-volatile memory.
49	Equipment, Event, Msg	Default Configuration Loaded	This event signals that the unit has reloaded the factory default configuration from eprom. This event will only occur on bootup.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
50	Message, Event, Oper	User Set Reference Module	This event signals that an operator has set the reference module that the unit is to use. Unless autoswitch and/or autoreturn is off, the unit will return to the most suitable reference.
51	Message, Event, Oper	User Set Loop Mode	This event signifies that the operator has set the Clock modules operating mode.
52	Message, Event, Oper	User Set Alarm Parameter	This event signals that the operator has changed one of the Input modules alarm error or clear limits.
53	Message, Event, Oper	User Zeroed Alarm Parameter	This event signals that the operator has zeroed, cleared, the specified error counter for the given Input module.
54	Message, Event, Oper	User Set Alarm Mode	This event signals that the operator has set the alarm mode for the given Input module.
55	Equipment, Major, Intifcfail	System Bus Failed	This event signals that the CPU has determined that it is unable to properly read from the bus. This typically means that a module is disrupting the data on the bus.
56	Equipment, Event, Restored	System Bus Restored	This event signals that the CPU has regained use of the bus and is reading valid data from the modules.
57	Equipment, Minor, Intifcfail	One PPS Failed	This event signals that the CPU has failed the 1 PPS signal from a Clock module. This typically occurs when the 1 PPS signal is off frequency or is not at the proper level.
58	Equipment, Event, Restored	One PPS Restored	This event signals that the CPU has regained the 1 PPS signal from a Clock module.
59	Message, Event, Oper	User Set Osc Time Constant	This event signals that the operator has set the time constant (tc) for the given Clock module.
60	Message, Event, Oper	Module Disabled	This event signals that the operator has disabled a clock or Frame Generator module. This module is not available for use as a master and will not provide timing for the unit.
61	Message, Event, Oper	Module Enabled	This event signals that the operator has enabled a clock or Frame Generator module. This event also occurs when the operator enables a failed module. This module now begins normal operation.
62	Input, Minor, Mtie	Mtie Limit 1 Exceeded	This event occurs when the given inputs Mtie has exceeded limit 1.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
63	Input, Minor, Mtie	Mtie Limit 2 Exceeded	This event occurs when the given inputs Mtie has exceeded limit 2.
64	Input, Event, Mtie	Mtie Limit 1 Cleared	This event signals that the Mtie for the given input is less than the limit 1.
65	Input, Event, Mtie	Mtie Limit 1 Exceeded	This event occurs when the given inputs Mtie has exceeded limit 1.
66	Message, Event, Oper	Mtie Limit 2 Exceeded	This event occurs when the given inputs Mtie has exceeded limit 2.
67	Message, Event, Oper	Mtie Limit 1 Cleared	This event signals that the Mtie for the given input is less than the limit 1.
68	Message, Event, Oper	Mtie Limit 1 Exceeded	This event occurs when the given inputs Mtie has exceeded limit 1.
69	Message, Event, Oper	User Set Mtie Mode 2	This event signals that the operator has changed the Mtie limit 2 alarm mode for the given Input module.
70	Input, Minor, Freq	Frequency Limit 1 Exceeded	This event occurs when the given inputs frequency has exceeded limit 1.
71	Input, Minor, Freq	Frequency Limit 2 Exceeded	This event occurs when the given inputs frequency has exceeded limit 2.
72	Input, Event, Freq	Frequency Limit 1 Cleared	This event signals that the frequency for the given input is less than the limit 1.
73	Input, Event, Freq	Frequency Limit 2 Cleared	This event signals that the frequency for the given input is less than the limit 2.
74	Message, Event, Oper	User Set Frequency Limit 1	This event signals that the operator has changed the frequency limit 1 for the given Input module.
75	Message, Event, Oper	User Set Frequency Limit 2	This event signals that the operator has changed the frequency limit 2 for the given Input module.
76	Message, Event, Oper	User Set Frequency Mode 1	This event signals that the operator has changed the frequency limit 1 alarm mode for the given Input module.
77	Message, Event, Oper	User Set Frequency Mode 2	This event signals that the operator has changed the frequency limit 2 alarm mode for the given Input module.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
78	Message, Minor, Msg	Control Value Approaching End Of Range	This event signals that the Clock modules control value is nearing the end of range. This does not fail the module since this may be necessary to lock to the input signal.
79	Message, Event, Msg	Control Value End Of Range Cleared	This event signals that the Clock modules control value has moved away from the end of range error limit.
80	Message, Event, Oper	User Set Input AutoSwitch	This event signals that the operator has turned the input autoswitch flag on or off.
81	Message, Event, Oper	User Set Input AutoReturn	This event signals that the operator has turned the input autoreturn flag on or off.
82	Message, Event, Msg	Clock Type Changed	This event signals that the Clock module that was just installed is not the same type that was previously removed.
83	Message, Event, Oper	Operator Logged In	This event signals that the operator has logged in at the given level.
84	Message, Event, Oper	Operator Logged Out	This event signals that the operator has logged out.
85	Message, Event, Oper	Operator Failed Login	This event signals that the operator has attempted to login three time and failed each attempt because of incorrect username.
86	Message, Event, Oper	Automatically Logged Operator Out	This event signals that the unit has automatically logged the operator off because the port has been inactive for the time-out period.
87	Message, Event, Oper	Operator Inhibit Alarms	This event signals that the operator has inhibited or disabled Mtie or frequency alarms for the given input.
88	Message, Event, Oper	Operator Set Default Configuration	This event signals that the operator has restored the user defaults.
89	Message, Event, Oper	Operator Set Factory Configuration	This event signals that the operator has restored the factory defined default values stored in eprom.
90	Equipment, Event, Intifcfail	Bad User Defined Defaults Section	This event occurs on bootup and signals that the user defined defaults section is bad, has not been loaded, or has been corrupted.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
91	Equipment, Event, Msg	PLL Fault Cleared	This event occurs when the Clock modules hardware phase-locked loop has re-established lock.
92	Equipment, Major, Msg	PLL Fault	This event occurs when the Clock modules hardware phase-locked loop loses lock.
93	Input, Minor, Msg	Input Signal Invalid due to an Input Fault	This event signals that the given Input module has failed because of an input fault (LOS, AIS, BPV, OOF, or CRC).
94	Message, Event, Oper	User Saved Configuration	This event signals that the user has saved the current configuration to nonvolatile memory.
95	Equipment, Major, Alarm	Clock Module Failed - Internal Alarm	This event signals that the given Clock module has failed because of an oscillator fault. The module must be returned to the factory for service.
96	Equipment, Event, Restored	Clock Module Restored - Internal Alarm	This event signals that the given Input module has been restored from an oscillator fault.
97	Message, Event, Oper	User Set ERF Mode	This event signals that the operator has set the external reference fault mode for the external reference module (3860 only).
98	Message, Event, Oper	User Failed Login	This event signals that the operator has failed to login properly after 3 attempts.
99	Message, Event, Oper	User Set Sync Status Message	This event signals that the operator has set the provisioned input SSM for the given port.
100	Message, Event, Oper	User Set Input Port Configuration	This event signals that the operator has set the given input ports MTIE and Frequency setup.
101	Equipment, Event, Intifcfail	Ethernet Initialization Failed	This event occurs while the CPU is booting up. It signals that the ethernet port has not been initialized and is not responding normally but is installed.
102	Equipment, Event, Intifcfail	Telnet Command Shell Initialization Failed	This event occurs while the CPU is booting up. It signals that the CPU could not start the telnet command server.
103	Equipment, Event, Intifcfail	Telnet Server Startup Failed	This event occurs while the CPU is booting up. It signals that the CPU could not initialize the telnet server.
104	Output, Event, Msg	Broadcast Message	This event signals that a user has sent a broadcast message to be displayed on all communication ports.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
105	Output, Event, Msg	Restart Warning Message	This event counts down to the system restarting.
106	Message, Event, Msg	Restart Message	This event occurs when the Operator enters the restart command.
107	Output, Event, Msg	Automatic Logoff Warning Message	This event occurs before the software automatically logs the user out on this port. This is only displayed on the port that the operator will be logged out on.
108	Equipment, Major, Ref	External Reference LOS Failed	This event occurs when the external reference module signals an LOS. (3860 only)
109	Equipment, Event, Ref	External Reference LOS Restored	This event occurs when the external reference module recovers from an LOS. (3860 only)
110	Equipment, Major, Bus	Module Bus Failed	This event occurs when a module fails its bus test.
111	Equipment, Event, Restored	Module Bus Restored	This event occurs when a module recovers from failing its bus test.
112	Equipment, Event, Intifcfail	Not Enough Memory	This event occurs when the CPU can not allocate enough memory for a given task.
113	Message, Event, Msg	Binary Server Session Failed	This event occurs when a binary session fails and disconnects.
114	Equipment, Event, Msg	Binary Server Failed	This event occurs when the binary server fails and shuts down.
115	Equipment, Major, Alarm	Clock Failed Due To Stability Problem	This event occurs when the clock output becomes unstable.
116	Equipment, Event, Restored	Clock Stability Restored	This event occurs when the clock output stability recovers.
117	Message, Event, CRC	Began CRC	This event occurs when the input port signals a CRC.
118	Message, Event, CRC	Ended CRC	This event occurs when the input port signals that the CRC error condition has ended.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
119	Input, Minor, CRC	CRC Fault	This event occurs when the input port fails due to CRC errors.
120	Input, Event, CRC	CRC Fault Cleared	This event occurs when the input port is restored from a CRC failure.
121	Equipment, Minor, Alarm	Input Module Halted	Description: This event occurs when the Input module is halted due to a problem on the module. This is generated by the 3 port and new 1port modules only.
122	Input, Event, Pha	Started Phase Build out	This event occurs when the input port starts building out the phase error.
123	Input, Event, Pha	Ended Phase Build out	This event occurs when the input port stops building out the phase error.
124	Input, Event, SQL	Input Sync Quality Level Degraded	This event occurs when the received SSM is lower Sync Quality Level than provisioned SSM and SSM alarm mode is set to report or alarm.
125	Input, Event, SQL	Input Sync Quality Level Restored	This event occurs when the received SSM has returned to better than or equal to the provisioned SSM and SSM alarm mode is set to report or alarm.
126	Input, Minor, SQL	Input Sync Quality Level Fault	This event occurs when the received SSM is lower Sync Quality Level than provisioned SSM and SSM alarm mode is set to fail.
127	Input, Event, SQL	Input Sync Quality Level Fault Cleared	This event occurs when the received SSM has returned to better than or equal to the provisioned SSM and SSM alarm mode is set to fail.
128	Message, Event, Oper	User Set Input Reference Selection Mode	This event occurs when the operator changes the input selection mode.
129	Message, Event, Oper	User Set SSM Output Mode	This event occurs when the operator changes the SSM output mode.
130	Message, Event, Oper	User Set SSM Input Mode	This event occurs when the operator changes the SSM input mode.
131	Message, Event, Oper	Administrator Logged User Out	This event occurs when the administrator logs a user out.
132	Input, Minor, Freq	Input Range Fault	This event occurs when the input signals frequency offset is greater than the maximum offset frequency for the given Clock module.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
133	Input, Event, Freq	Input Range Fault Cleared	This event occurs when the input signals frequency offset becomes less than the maximum offset frequency for the given Clock module.
134	Input, Event, Msg	Input Port Sync Quality Level Changed	This event occurs when the input ports received SSM changes.
136	Equipment, Event, Alarm	Critical Alarm Cleared	This event signals that the CPU has turned off the major alarm LED and relays and is not reporting a critical alarm.
137	Message, Event, Oper	User Set Clock AutoReturn	This event signals that the operator has turned the clock autoreturn flag on or off.
138	Message, Event, Oper	User Set E1 Input SSM Bit	This event signals that the operator has changed the E1 SSM bit setting for reading the input ssm.
139	Input, Event, SQL	Input Sync Quality Level is Better than the Clock Sync Quality Level	This event signals that the read input ssm is better than the clock holdover ssm.
140	Input, Event, Msg	Lost Clock Reference Signal	This event signals that the Input module has lost the reference signal from the specified Clock module. It may signify an error on either module.
141	Input, Event, Msg	Clock Reference Signal Restored	This event signals that the Input module has regained the reference signal from the specified Clock module.
142	Input, Event, Msg	Input Signal Fault Cleared	This event signals that the input port has been restored from the signal error that created a failure. This event is generated only when the ports corresponding alarm mode flag is set to fail.
143	Input, Event, Alarm	Input Module Halt Cleared	This event signals that the Input module has started normal operation after signalling that the halt condition has been reached. Currently this event can never happen but was added for TL1 purposes.
144	Input, Minor, Msg	Input Port 3 Sigma Fault	This event signals that the input port phase error change has crossed the 3 sigma threshold for that input. The 3 sigma limit is calculated on the read phase and is used to determine possible noise bursts.

Table B-5. Event Listing (Continued)

Event No.	Type	Description	Comment
145	Input, Event, Msg	Input Port 3 Sigma Fault Cleared	This event signals that the input port phase error change is under the 3 sigma threshold for that input. The 3 sigma limit is calculated on the read phase and is used to determine possible noise bursts.
146	Input, Minor, Oper	User Changed FG Output SSM	This event signals that the user has manually entered an output SSM for the given frame generator.
147	Equipment, Major, Clear, Msg	Unit Entered Bypass Mode	This event signals that the CPU has determined that none of the Clock modules are suitable for use with it’s peer frame generator. This typically means that the Clock modules are in warmup, do not exist, or have a fault.
148	Equipment, Major, Clear, Msg	Unit Exit Bypass Mode	This events indicates that the unit has entered normal operation and is no longer in Bypass mode.
149	Input, None, Clear, Msg	Input module has received an Unrecognized SSM	This events indicates that an input has received a SSM that is not defined in the units SSM(SQL) table.
150	Input, Minor, Clear, LMHO	Input Failed due to LMHO against Clock A	This events indicates that an input is unable to make stable phase measurements on a input signal versus clock A.
151	Input, Minor, Clear, LMHO	Input Cleared LMHO against Clock A	This events indicates that an input cleared the LHMO fault versus clock A.
152	Input, Minor, Clear, LMHO	Input Failed due to LMHO against Clock B	This events indicates that an input is unable to make stable phase measurements on a input signal versus clock B.
153	Input, Minor, Clear, LMHO	Input Cleared LMHO against Clock B	This events indicates that an input cleared the LHMO fault versus clock B.
154	Input, Minor, Clear, Alarm	Input Port Fault	This events indicates that an input port is faulted.
155	Input, Minor, Clear, Alarm	Input Port Fault Cleared	This events indicates that an input has cleared the port fault.

Appendix C TL1 Reference

This appendix provides information to familiarize you with the formal TL1 syntax and how it is implemented in the TSG-3800. Refer to Bellcore's Technical Reference TR-NWT-00831 for a complete description. It also includes specific information on the TL1 commands implemented in the TSG-3800.

Note: Bellcore, or Bell Communications Research, is now Telcordia Technologies, Inc. The reference documents described in this section were originally published by Bellcore, but are now available from Telcordia Technologies, Inc.

In This Appendix:

- Connecting to the TL1 Port
- Input Command Message Structure
- Response Message Structure
- Autonomous Reports
- Set Commands
- Retrieve Commands
- Other Commands
- TL1 Event Messages

Connecting to the TL1 Port

You can connect to the TSG-3800 and use the TL1 syntax with either COMM A, COMM B, or the Ethernet port. If you use either COMM port, you must first log in as a supervisor (level 3) or administrator (level 4) and change the port to the TL1 mode. See Setting the Operating Mode, on page 299 for the command syntax. The COMM A port remains in TL1 mode until you send the EXIT command or when you send three consecutive ESC characters. The COMM B port stays in TL1 mode until you change the mode again.

To connect to the TSG-3800 through the Ethernet port, use a terminal emulation program. Enter the unit's IP address and specify port 4000. The port opens in TL1 mode and remains until you send the EXIT command (see Exit, on page 414) or you terminate the session in the terminal emulation program. You can have one or two Ethernet connections open at a time.

After you connect to the TSG-3800 in TL1 mode, log in using the ACT-USER command, as described in Activate User, on page 413. The automatic time-out function is disabled in the TL1 mode. To log off without closing the connection, use the CANC-USER command described in Cancel User, on page 413.

Input Command Message Structure

The TL1 input command message structure is as follows:

```
cmd:<tid>:<aid>:<ctag>:<gb>:<pl>;
```

The colon (:) must be included in the command string, and the string is always terminated with a semicolon (;). Unused fields are indicated by adjacent colons; if an unused field is the last parameter in the parameter list (for example the General Block or the Payload), the colon can be omitted. Descriptions of TL1 command structure elements are shown in Table C-1.

All commands must contain the CMD, TID, and CTAG fields; the AID field is optional. The GB field is not used; you must use double colons (::) immediately after the CTAG field. You must terminate the command with a semicolon (;).

Table C-1. Structure of TL1 Input Command Messages

Command	Description
CMD	Command verb with modifier
<TID> <target identifier>	Optional – up to 32-character name field

Table C-1. Structure of TL1 Input Command Messages (Continued)

Command	Description
<AID> <access identifier>	SxAy-z, where x is the shelf, y is the slot, and z is the port ALL, which includes all relevant modules and ports CLK-w, where w is A or B SxBUF-w, where x is the shelf and w is A or B You can specify multiple <AIDs> by using an ampersand (&). A single ampersand (&) indicates AID1 and AID2. A double ampersand (&&) indicates a range from AIDx to AIDy
<CTAG> <correlation tag>	Decimal number or alpha-numeric up to six characters supplied by remote OS; to be returned in response message
<GB> <general block>	Optional – not used by the TSG-3800
<PL> <payload>	Optional – not used by the TSG-3800

Response Message Structure

The output response message structure that corresponds to the TL1 input command response is as follows (the ^ character indicates a space in the output):

```
<header><response identification>[<text block>] <terminator>
```

The <header> response takes the following form, where <sid> is the TID assigned to the unit:

```
<cr><lf><lf>^^^<sid>^<year>-<month>-<day>^<hrs>:<min>:<sec>
```

The <response identification> entry takes one of the forms below, with example responses given in quotes.

The TL1 response message that corresponds to the TL1 input command is either a “command-completed response” or a “command-denied response”. For a successfully completed input command (command-completed response), the format of the response is:

```
M^<CTAG>^COMPLD
```

An example of an optional text block response is:

```
“<blank line>”
“   TSG 02-09-09 15:03:48”
“M 1032 COMPLD”
“A ,00,00,00,00,00”
“;”
```

For an unsuccessfully completed input command (command-denied response), the format of the response is:

```
M^<CTAG>^DENY
```

Autonomous Reports

Autonomous reports are generated when the TSG-3800 detects an alarm condition or a status change. The alarm status is updated whenever the alarm status changes, including whenever a user sets or clears an alarm. The message appears on the Comm port configured for TL1.

The response message line has the following format:

```
<cr><lf><lf>
^^^"[aid]:ntfcncde,condtype,srveff,ocrdat,octrm[:condscr]"<cr
><lf>
;
```

The alarm status report has the following format:

```
<cr><lf><lf>
^^^"[aid]:ntfcncde,condtype,condscr"<cr><lf>
^^^sid^ocrdat^ocrtim<cr><lf>
almcde^atag^REPT^mod1[^mod2]<cr><lf>
;
```

where:

<ntfcncde> is a two-letter code as described in Table C-2.

Table C-2. Notification Codes

Alarm Code	Type of Alarm
CR	Critical Alarm
MJ	Major Alarm
MN	Minor Alarm
CL	Cleared Alarm
NA	Non-alarm event

<condtype> is the event number correlating to the event. Alarm events use number 1 through 32; all others are non-alarm events. Table C-3 describes the condition types for alarms and events.

Table C-3. Condition Types

Condition Type	Description
AIS, BPV, CRC, LOS, OOF, SQL	Input signal faults
MTIE, TDEV, FREQ, PHA, REF	Input signal limits
INTIFCFAIL	Equipment faults
For the SBC firmware build:	
INTIFCFAIL = CLK, FG, T1, OTP	
OPER, MSG	Operator responses
ADDED, RESTORED, REMOVED	Module operations
ALARM, PWR, BUS	CPU Alarm operation
NA	Non-alarm event

<condtype> has one or more optional descriptors called <condscr>, which is a text string that describes the alarm or event, as listed in Table C-4.

Table C-4. Condition Descriptors

Condition Descriptor	Text	Description
srveff	SA, NSA	Service Affecting or Not Service Affecting
montype	PHA, FREQ, MTIE, TDEV	Type of monitor data
tmper	xHR or ySEC	Time period in hours or seconds
ocrdat	YY-MM-DD	Date of occurrence
ocrtm	HH-MM-SS	Time of occurrence
start	MM-DD-YY,HH-MM-SS	Start time
stop	MM-DD-YY,HH-MM-SS	Stop time

If the date is null but is followed by a time, the date is the current date. If the start or stop time is null but is preceded by a date, the time is the current time. If the start date and time is null, then the start date and time is the start of data. If the stop date and time is null, then the stop date and time is the end of data. The comma must be present to indicate a null start.

<almcde> reports the level of the alarm, as described in Table C-5.

Table C-5. Alarm Codes

Alarm Code	Type of Alarm
*C	Critical
**	Major
*^	Minor
A^	Non-alarm event

<atag> is a six-digit correlation tag that increments with every message the TSG-3800 sends.

<mod1> is either ALRM or EVNT

<mod2> is INP (T1 for the SBC software) for input signal faults, OPT for output signal faults, or EQPT for other faults.

Set Commands

Each Set command you submit causes the TSG-3800 to respond with the Complied message.

Valid <tid> code: the assigned tid (see SET-TID; the default TID is TSG) or null. If null, the TSG-3800 requires the <aid>.

Valid <aid> code:

- Null (no characters). If null, the TSG-3800 requires the <tid>
- ID00000

Set Clock

The Set Clock command changes the current output clock to the clock specified by the aid. If the aid is invalid, if the clock is not available, or if the AutoReturn is set to On, the TSG-3800 returns the DENY message.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-CLK:[tid]:[aid]:ctag;`
Valid aid	`CLK A, CLK B`
Minimum User Level	
Example Command	`SET-CLK:TSG:CLK A;`
Example Response	

```
   TSG 02-09-06 11:26:20
M 1 COMPLD
;
```

Set Date

The Set Date command sets the date stored in the TSG-3800.

When the TSG-3800 successfully receives the command, it returns the COMPLD message with the new date and time in the header. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-DAT:[tid]::ctag::date^time;`
Valid aid	must be null date^time = YY-MM-DD^HH:MM:SS, where ^ can be a space or a comma and the time separator can be colons or dashes
Minimum User Level	2
Example Command	`SET-DAT::ctag:08-28-02,15:25:00;`
Example Response	

```
   TSG 02-08-28 15:25:00
M 13 COMPLD
;
```

Set Disable

The Set Disable command disables the specified Clock module, Frame Generator module, Input module, or input port. The aid TL1_SECU disables the need to use a valid user name and password to log in to a TL1 connection.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-DIS:[tid]:[aid]:ctag;`
Valid aid	`CLKx, FGx, INPx, INPx[-y], TL1_SECU`

Minimum User Level	2
Example Command	`SET-DIS:TSG:CLKA:ctag;`

Example Response	`TSG 02-05-16 15:02:19`
	`M 11 COMPLD`
	`;`

Related Command	`SET-EN`

Set Enable

The Set Enable command enables the specified Clock module, Frame Generator module, Input module, or input port. The TL1_SECU aid sets the security mode for TL1 connections; users must use a valid user name and password to log in.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-ENA:[tid]:[aid]:ctag::;`
Valid aid	`CLKx, FGx, INPx, INPx[-y], TL1_SECU`
Minimum User Level	2 4 to set TL1-SECU
Example Command	`SET-ENA:TSG:INP3-1:ctag;`

Example Response	`TSG 02-05-16 13:46:16`
	`M 1 COMPLD`
	`;`

Set Event

The Set Event command sets the event-reporting mode

When the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-EVNT:[tid]::ctag::mode;`
Valid aid	`none` `mode = NONE, INP, EQPT, ALRM, ALL`
Minimum User Level	

Example Command	`SET-EVNT:TSG:ALL:ctag;`

Example Response	`TSG 02-05-16 14:36:46`
	`M 14 COMPLD`
	`;`

Set Name

The Set Name command applies the specified name to the TSG-3800. You can use up to 10 characters for the name.

When the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-NAME:[tid]::ctag::name;`
Valid aid	`none` `name: up to 10 characters or null`
Minimum User Level	3
Example Command	`SET-NAME:TSG::ctag::TSG3800;`

Example Response	`TSG3800 02-05-16 14:45:49`
	`M 15 COMPLD`
	`;`

Set Reference

The Set Reference command sets the current input source to the specified input port.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-REF:[tid]:[aid]:ctag;`
Valid aid	`INPx[-y]` For single-port Input modules x is 1–4 and y is always 1. For three-port Input modules x is 1-4 and y is 1-3.
Minimum User Level	3
Example Command	`SET-REF:TSG:INP3-3:ctag;`

Example Response	`TSG3800 02-05-16 14:51:32`
	`M 15 COMPLD`
	`;`

Set Phase Zero

The Set Phase Zero command sets the input phase to zero for the specified input, or for all inputs if the aid is null or All. If no clksrc is specified, both clocks are set to zero, otherwise the specified clock is set to zero.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PHASE-ZERO:[tid]:[aid]:ctag[::clksrc];`
Valid aid	`none or INPx[-y]` `clksrc = CLKA or CLKB`
Minimum User Level	
Example Command	`SET-PHASE-ZERO:TSG3800:INP4-2:CLKA;`
Example Response	

```
   TSG3800 02-05-16 16:21:05
M 15 COMPLD
;
```

Set AutoReturn

The Set AR Parameter command turns the input reference AutoReturn (revertive) parameter on or off.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-AR:tid::ctag::mode;`
Valid aid	`none required` `mode = On or Off`
Minimum User Level	2
Example Command	`SET-PRMTR-AR:TSG3800::ctag::ON;`
Example Response	

```
   TSG3800 02-09-11 09:45:00
M 623 COMPLD
;
```

Set AutoSwitch

The AutoSwitch Parameter command turns the input reference AutoSwitch parameter on or off.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-AS:tid::ctag::mode;`
Valid aid	`none required` `mode = On or Off`
Minimum User Level	2
Example Command	`SET-PRMTR-AS:TSG3800::ctag::ON;`
Example Response	

```
   TSG3800 02-09-11 09:45:45
M 623 COMPLD
;
```

Set Error

The Error Parameter command sets the specified error parameter (AIS, BPV, CRC, LOS, or OOF) for the specified input. The specified error condition (Fail, Alarm, Report, or Ignore) is reported when the condition is present for the specified time period (ercnt); the condition clears when the condition has no longer been present for the specified time period (clcnt).

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-AIS:tid:[aid]:ctag:ercnt,clcnt:mode;`
	`SET-PRMTR-BPV:tid:[aid]:ctag:ercnt,clcnt:mode;`
	`SET-PRMTR-CRC:tid:[aid]:ctag:ercnt,clcnt:mode;`
	`SET-PRMTR-LOS:tid:[aid]:ctag:ercnt,clcnt:mode;`
	`SET-PRMTR-OOF:tid:[aid]:ctag:ercnt,clcnt:mode;`

Valid aid	`INP, INPx, INPx[-y], ALL, null`
	`ercnt, clcnt = 0-100000 (seconds)`
	`mode = Fail, Alrm, Rept, Ignr`

Minimum User Level	2
Example Command	`SET-PRMTR-AIS:TSG3800::ctag:25:15:Alrm;`
Example Response	

```
   TSG3800 02-09-11 09:47:33
M 626 COMPLD
;
```

Set Clock

The Clock Parameter command sets the operating mode of the specified Clock module, as well as the tau (time constant), AutoReturn mode, and the Control Value. The mode must be set to Hold in order to set the CV. Null values leave the settings for parameters unchanged.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	SET-PRMTR-CLK:[tid]:[aid]:ctag::mode[,tau [,ar[,cv]]];
Valid aid	CLKA, CLKB mode = Warm, Hold, Acq, Lock, <null> tau = Min, Max, <number>, or <null> AR = On, Off, or <null> CV = <number> or <null>
Minimum User Level	2
Example Command	SET-PRMTR-CLK:TSG3800::ctag:Lock;
Example Response	TSG3800 02-09-11 09:48:11 M 627 COMPLD ;

Set Delay

The Set Delay Parameter command defines the length of time (in seconds) before a change in the SSM appears on the outputs. The delay can be from 1 to 30 seconds.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	SET-PRMTR-DELAY:[tid]::ctag::delay;
Valid aid	none delay = 1 to 30
Minimum User Level	2
Example Command	SET-PRMTR-DELAY:TSG3800::ctag:5;
Example Response	TSG3800 02-09-11 09:48:37 M 628 COMPLD ;

Set Frequency

The Set Frequency Parameter command sets the frequency stability thresholds for the specified input. The threshold settings lim1 and lim2 are values in ps/s. The error mode mod1 and mod2 determine what happens when lim1 and lim2 are exceeded, respectively. The tmper determines which time period the thresholds and error conditions apply to. Use aid ALL or <null> to specify all inputs.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-FREQ:[tid]:[aid]:ctag::lim1,mod1,` `lim2,mod2, tmper;`

Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
	`lim1, lim2 = <number>`
	`mod1, mod2 = Fail, Alrm, Rept, Ignr`
	`tmper = 100, 1000, 10000`

Minimum User Level	2
Example Command	`SET-PRMTR-FREQ:TSG3800:INP1:ctag:175,Alrm,200` `,Fail,1000;`

Example Response	`   TSG3800 02-09-11 09:49:07`
	`M 630 COMPLD`
	`;`

Set Input

The Set Input Parameter command provisions the selected T1/E1 Input module. Use aid ALL or <null> to specify all inputs.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-INPT:[tid]:[aid]:ctag:mode,zs,crc,` `freq,term;`

Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
	`mode: T1 modules: D4, ESF, CLK`
	`      E1 modules: CAS, CCS, CLK`
	`zs = On or Off`
	`crc = On or Off`
	`Freq = 1, 1.544, 2.048, 5, 10`
	`term = 50, 75, 100, 120, 3300`

Minimum User Level	2

Example Command	`SET-PRMTR-INPT:TSG3800:INP3-3:ctag:D4,On,On,2.048,75;`
Example Response	``` TSG3800 02-09-11 09:49:29 M 631 COMPLD ;```

Set MTIE

The Set MTIE Parameter command sets the input MTIE stability thresholds for the specified input. The threshold settings lim1 and lim2 are values in ps/s. The error mode mod1 and mod2 determine what happens when lim1 and lim2 are exceeded, respectively. The tmper determines which time period the thresholds and error conditions apply to. Use aid ALL or <null> to specify all inputs.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-MTIE:[tid]:[aid]:ctag::lim1,mod1,lim2,mod2, tmper;`

Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
	`lim1, lim2 = <number>`
	`mod1, mod2 = Fail, Alrm, Rept, Ignr`
	`tmper = 100, 1000, 10000`

Minimum User Level	2
Example Command	`SET-PRMTR-MTIE:TSG3800:INP1:ctag:175,Alrm,200,Fail,1000;`

Example Response	`   TSG3800 02-09-11 09:56:01`
	`M 655 COMPLD`
	`;`

Set Priority

The Set Priority Parameter command provisions the specified input port at the selected priority level. Use aid ALL to specify all inputs.

When the TSG-3800 successfully receives the command and the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-PRI:[tid]:[aid]:ctag:priority;`
Valid aid	`INPx, INPx[-y], ALL` `priority = 0, 1, 2, 3, 4`

Minimum User Level	2
Example Command	`SET-PRMTR-PRI:TSG3800:INP1:ctag:1;`
Example Response	

```
   TSG3800 02-09-11 09:56:42
M 657 COMPLD
;
```

Set Reference

The Set Reference command provisions the input reference selection mode.

When the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-REF:[tid]::ctag::mode;`
Valid aid	`none` `mode = PRI, BEST, SQL`
Minimum User Level	2
Example Command	`SET-PRMTR-REF:TSG3800::ctag::BEST;`
Example Response	

```
   TSG3800 02-09-11 09:57:12
M 658 COMPLD
;
```

Set SQL

The Set SQL command provisions the Synchronization Quality Level (SQL), the mode of operation, and selects the bit position (E1 operation only) of the Time Slot 0 word for the SSM input. The Auto mode of operation uses the SQL from the input, if available; the Prov mode always uses the provisioned level. Use aid ALL or <null> to specify all inputs.

When the TSG-3800 successfully receives the command and if the aid is valid, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-PRMTR-SQL:[tid]:[aid]:ctag::level, mode[,bit];`

Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
	`level = PRS, ST2, ST3 DUS, STU`
	`mode = Auto, On, Prov, Off`
	bit = 4, 5, 6, 7, 8

Minimum User Level	2

Example Command	`SET-PRMTR-REF:TSG3800::ctag::BEST;`

Example Response	`TSG3800 02-09-11 09:57:12`
	`M 658 COMPLD`
	`;`

Set User

The Set User command allows an administrative-level user to add, modify, and delete user accounts. To add a user, you must specify username, password, and level (default level is 1). To delete a user, you need only specify a username. To erase the entire list of users except Guest- and Administrator-level users, specify Init.

When the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`SET-USER:tid::ctag::mode[,username][,password][,level];`

Valid aid	`none`
	`mode = Add, Del, Init`
	`username = up to 20 characters, required for Add, Del`
	password = up to 20 characters, required for Add
	level = 0 (guest), 1 (user), 2 (craft), 3 (supervisor), 4 (administrator) Default =1

Minimum User Level	4
Example Command	`SET-USER:TSG3800::ctag::ADD,DSTREBE,ADMIN,4;`

Example Response	`TSG3800 02-09-11 10:01:17`
	`M 660 COMPLD`
	`;`

Retrieve Commands

Each Retrieve command submitted by the user causes the TSG-3800 to respond with the Complied message and a response message that contains the requested data.

Valid <tid> code: the assigned tid (see SET-TID; the default TID is TSG) or null. If null, the TSG-3800 requires the <aid>.

Valid <aid> code:

- Null (no characters). If null, the TSG-3800 requires the <tid>
- ID00000

Retrieve Alarms

The Retrieve Alarms command reports all active alarms from the TSG-3800 or from the selected module. The text_block contains the highest-severity alarm level of all alarms in the list, and contains the most recent alarms.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If it does not successfully receive the command, it returns the DENY message.

Command Syntax	RTRV-ALMS:[tid]:[aid]:ctag;
Response Format	^^^“aid:ntfcncde,condtype,srveff,\“condscr\”” <cr><lf>
Valid aid	CPU, INPx[-y], CLKA, CLKB, FGA, FGB
Minimum User Level	1
Example Command	RTRV-ALMS:TSG:CLKA:ctag;
Example Response	

```
   TSG 02-09-25 03:01:36
M 1 COMPLD”
“A ,00,00,00,00,00”
or
   TSG 02-09-15 09:57:25
M 1 COMPLD”
“*C,03,18,”
;
```

Retrieve Current Alarms

The Retrieve Current Alarms command reports all active alarms from the TSG-3800 or from the selected module. There is no report message for modules or inputs that are not in alarm. The condscr contains the event identification number as described in Table C-6.

If the TSG-3800 successfully receives the command, it returns the COMPLD message followed by the alarm message report. If it does not successfully receive the command, it returns the DENY message.

Command Syntax	RTRV-ALMS:[tid]:[aid]:ctag;
Response Format	^^^“aid:ntfcncde,condtype,srveff,\“condscr\””
Valid aid	CPU, INPx[-y], CLKA, CLKB, FGA, FGB
Minimum User Level	1
Example Command	RTRV-ALMS:TSG:CLKA:ctag;
Example Response	TSG 02-09-25 03:01:36 M 1 COMPLD” “A ,00,00,00,00,00” or TSG 02-09-15 09:57:25 M 1 COMPLD” “*C,03,18,” ;

Retrieve Equipment Condition

The Retrieve Equipment Condition command reports the mode status of the TSG-3800 or of the selected module or input.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG0-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	RTRV-COND-EQPT:[tid]:[aid]:ctag;
Response Format	^^^aid:mode,status<cr><lf> where Mode for: CPU is Run|Halt Clocks is Warm|Hold|ACQ|Lock FGs is Man|Auto|Bypass and Status for: CPU is OK|Pwrfail Clocks and FGS is Ref|OK|Fail|Dis
Valid aid	CPU, CLK, CLKA, CLKB, FG, FGA, FGB, ALL, <null>

Minimum User Level	2
Example Command	`RTRV-COND-EQPT:TSG:ALL;`

Example Response

```
   TSG 10-05-15 13:17:40
M 1 COMPLD
   “CPU:Run,OK”
   “ClkA:Lock,OK”
   “ClkB:Lock,Ref”
   “FGA:Auto,OK”
   “FGB:Auto,Ref”
;
```

Retrieve Input Condition

The Retrieve Input Condition command displays the current operating mode and status of the selected input ports.

If the TSG-3800successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-COND-INP:[tid]:[aid]:ctag;`

Response Format	`^^^aid:mode,status<cr><lf>`
	`where Mode is Ref|OK|Mon|Dis`
	`and Status is OK|Alrm|Fail`

Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	2
Example Command	`RTRV-COND-INP:TSG:INP3;`

Example Response

```
   TSG 10-05-15 13:17:40
M 1 COMPLD
   “INP3-1:Ref,OK”
   “INP3-2:OK,OK”
   “INP3-3:Mon,OK”
;
```

Retrieve Configuration

The Retrieve Configuration command reports configuration (inventory management) information for the specified module.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

<table>
<tr><td>Command Syntax</td><td><code>RTRV-CONF:[tid]:[aid]:ctag;</code></td></tr>
<tr><td>Response Format</td><td><code><cr><lf><lf></code>
<code>M^ctag^COMPLD<cr><lf></code>
followed by module-specific lines:
CPU module:
<code>^^^”aid:mode,status,tl1_security”<cr><lf></code>
where:
mode is [Run|Halt]
status is [OK|Failed]
Clock module:
<code>^^^”aid:module type,config”<cr><lf></code>
where:
module type is [ST2RUB|ST2|ST3E]
config is “Config Not Available”
FG module:
<code>^^^”aid:module type,CLK1 Frame Type,CLK1 Signal Type,CLK1 CRC,CLK1 ZS,CLK1 SSM,CLK2 Frame Type,CLK2 Signal Type,CLK2 CRC,CLK2 ZS,CLK2 SSM”<cr><lf></code>
where:
module type is [T1/E1(SSM)|T1/E1|T1|E1]
If type is T1 or E1, then “Config Not Available” is displayed.
If type is T1/E1(SSM) or T1/E1, then the following is displayed:
CLK{1|2} Frame Type is [T1|E1|CC|1.544|8K]
CLK{1|2} Signal Type is [D4|ESF|CAS|CCS|50/50|63/37]
CLK{1|2} CRC is [On|Off]
CLK{1|2} ZS is [HDB3|AMI]
CLK{1|2} SSM is [On|Off]

Input module:
<code>^^^”aid:module type,frame type,signal frequency, termination,signal type,ZS,CRC,SSM,E1 SSM bit”<cr><lf></code>
where:
module type is [DS1|G.703|Sine|CC|1PortT1|3PortT1|1PortE1| frame type is [T1|E1|Clk|”Config not Available”]
If frame type is T1, E1, or Clk, then the following is displayed:
Signal Type is [D4|ESF|CAS|CCS]
ZS is [On|Off]
CRC is [On|Off]
SSM is [On|Off]
If frame type is E1, then the following is displayed:
E1 SSM Bit is [4|5|6|7|8]</td></tr>
<tr><td>Valid aid</td><td><code>CPU, INPx[-y], CLKA, CLKB, FGA, FGB</code></td></tr>
</table>

Minimum User Level: 2

Example Command:

```
RTRV-CONF:TSG:CLKA:ctag;
```

Example Response:

```
   TSG 02-09-10 19:00:19
M 1 COMPLD
   “CLKA:ST2RUB,Config Not Available”<cr><lf>
```

Retrieve Alarm Data

The Retrieve Alarm Data command reports the error and clear counts for the specified error and aid.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax:

```
RTRV-DATA-AIS:[tid]:[aid]:ctag;
RTRV-DATA-BPV:[tid]:[aid]:ctag;
RTRV-DATA-CRC:[tid]:[aid]:ctag;
RTRV-DATA-LOS:[tid]:[aid]:ctag;
RTRV-DATA-OOF:[tid]:[aid]:ctag;
```

Valid aid:

```
INP, INPx, INPx[-y], ALL, <null>
```

Minimum User Level: 1

Response Format:

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^aid:prmtr,ercnt,clcnt<cr><lf>
```

Example Command:

```
RTRV-DATA-AIS:TSG:INP2:ctag;
```

Example Response:

```
   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^TSG:AIS,1,5
```

Retrieve Clock Data

The Retrieve Clock Data command reports the current 1-s and 100-s control values and tau for the A and B clocks.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax:

```
RTRV-DATA-CLK:[tid]:[aid]:ctag;
```

Valid aid:

```
CLK, CLKA, CLKB, ALL, <null>
```

Minimum User Level: 2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^"aid:(cv1),(cv100),tau"<cr><lf>`

Example Command	`RTRV-DATA-CLK:TSG:CLKA:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^TSG:0,5,3000`

Retrieve Frequency Data

The Retrieve Frequency Data command reports the current 100, 1000, and 10000 second averages for the specified input. The frequency values are in ps/s. If you specify more than one input (aid = All or <null>), the data for each input port is on a separate line.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-DATA-FREQ:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^"aid:FREQ,(f100),(f1000),(f10000)"<cr><lf>`

Example Command	`RTRV-DATA-FREQ:TSG:INP2:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^INP2:FREQ,158,204,212`

Retrieve MTIE Data

The Retrieve MTIE Data command reports the current 100, 1000, and 10000 second MTIE measurements for the specified input, if they are available. The frequency values are in nanoseconds. If you specify more than one input (aid = All or <null>), the data for each input port is on a separate line.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-DATA-MTIE:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`

Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:MTIE,m100,m1000,m10000)”<cr><lf>`

Example Command	`RTRV-DATA-MTIE:TSG:INP3-3:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^INP3-3:MTIE,158,204,212`

Retrieve Phase Data

The Retrieve Phase Data command reports the current 1 and 100 second average phase readings for the specified input vs. the A and B clocks. The phase values are in nanoseconds. If you specify more than one input (aid = All or <null>), the data for each input port is on a separate line.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-DATA-PHA:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:PHA,(a1),(b1),(a100),(b100)”<cr><lf>`

Example Command	`RTRV-DATA-PHA:TSG:INP1:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^INP1:PHA,0,0,0,0`

Retrieve SQL Data

The Retrieve SQL Data command reports the current Sync Quality Level (SQL) for the specified inputs. This value comes from the SSM, if available; if not, then it comes from the provisioned value. See Set SQL, on page 387, for information on the SQL definitions. If you specify more than one input (aid = All or <null>), the data for each input port is on a separate line.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-DATA-SQL:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:level”<cr><lf>`

Example Command	`RTRV-DATA-SQL:TSG:ALL:ctag;`
Example Response	

```
   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^INP1:ST2
^^^INP2:STU
^^^INP3-1:ST1
^^^INP3-2:ST1
^^^INP3-3:ST1
;
```

Retrieve Day of Year

The Retrieve DOY command returns the current day of year and year for the TSG-3800.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-DOY:tid::ctag;`
Valid aid	`none`
Minimum User Level	0

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”doy,year”<cr><lf>`

Example Command	`RTRV-DOY:TSG::ctag;`
Example Response	

```
   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^308,2002
;
```

Retrieve Events

The Retrieve Event command reports the current data for the specified event type. You can specify an optional time frame (date and time) for the report. Each event appears on a separate line in the response. All events are displayed if the aid is All or <null>.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-EVNT-MSG:tid:[aid]:ctag[::start[:stop]];`
	`RTRV-EVNT-EQPT:tid:[aid]:ctag[::start[:stop]];`
	`RTRV-EVNT-INP:tid:[aid]:ctag[::start[:stop]];`
	`RTRV-EVNT-ALL:tid:[aid]:ctag[::start[:stop]];`

Valid aid	`INP, INPx, INPx[-y], CLK, CLKA, CLKB, FG, FGA, FGB, OTP, CPU, ALL, <null>`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^"[aid]:ntfcncde,condtype,srveff,ocrdat,ocrtm [:condscr]"<cr><lf>`

Example Command	`RTRV-EVNT-MSG:CLK::ctag;`
Example Response	

```
   TSG 02-11-04 19:00:19
M 13 COMPLD
^^^04NOV2002 14:40:03.020 Telnet User A,
DSTREBE, Logged In At Administrator Level
;
```

Retrieve Header

The Retrieve Header command verifies that the TSG-3800 is responding to messages.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-HDR:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	0
Response Format	`<cr><lf><lf>` `M^ctag^COMPLD<cr><lf>`
Example Command	`RTRV-DOY:TSG::ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`;`

Retrieve Network Element Type

The Retrieve NE Type command verifies that the TSG-3800 is responding to messages; the response includes the element type message.

If the unit successfully receives the command, it returns the COMPLD message. If the unit does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-NETYPE:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	0

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”AUSTIN TSG”`

Example Command	`RTRV-NETYPE:TSG::ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^AUSTIN TSG`
	`;`

Retrieve MTIE

The Retrieve MTIE command reports the true MTIE data from the specified port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PD-MTIE:[tid]:[aid]:ctag[::start][:stop];`
Valid aid	`INPx[-y]`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^"aid:ocrdat,ocrtim,MTIE"<cr><lf>`
	`^^^tmper,monval[<cr><lf>`
	`^^^tmper,monval...]"`
	`;`
	■ where:
	ocrdat and ocrtime are the actual date and time the data were collected
	■ MTIE describes the data that follows
	■ tmper is the data measurement time period in seconds.
	■ Maximum values are 0.05, 0.1, 1.0, 10.0, 100.0, 1000.0 and 10000.0. Only values available in the interval between the start and stop time are reported.
	■ monval is the data value for the tmper in nanoseconds

Example Command	`RTRV-PD-MTIE:TSG:INP2-3:ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^`
	`;`

Retrieve MTIE 2

The Retrieve MTIE 2 command reports the true MTIE data from the specified port; it uses a different output format from the Retrieve MTIE command.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax

```
RTRV-PD-MTIE2:[tid]:[aid]:ctag[::start][:stop];
```

Valid aid

```
INPx[-y]
```

Minimum User Level

1

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^"aid:ocrdat,ocrtim,MTIE,tmper,monval[<cr><
lf>
^^^"aid:ocrdat,ocrtim,MTIE,tmper,monval[<cr><
lf>
...
;
```

- where:
  ocrdat and ocrtime are the actual date and time the data were collected
- MTIE describes the data that follows
- tmper is the data measurement time period in seconds.
- Maximum values are 0.05, 0.1, 1.0, 10.0, 100.0, 1000.0 and 10000.0. Only values available in the interval between the start and stop time are reported.
- monval is the data value for the tmper in nanoseconds

Example Command

```
RTRV-PD-MTIE2:TSG:INP2-3:ctag;
```

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^
;
```

Retrieve TDEV

The Retrieve TDEV command reports the TDEV data from the specified port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PD-TDEV:[tid]:[aid]:ctag[::start][:stop];`
Valid aid	`INPx[-y]`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:ocrdat,ocrtim,TDEV”<cr><lf>`
	`^^^tmper,monval[<cr><lf>`
	`^^^tmper,monval...]”`
	`;`
	■ where:
	ocrdat and ocrtime are the actual date and time the data were collected
	■ TDEV describes the data that follows
	■ tmper is the data measurement time period in seconds. Maximum values are 0.05, 0.1, 0.25, 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, 32.0, 64.0, 128.0, 256.0, 512.0, 1024.0. Only values available in the interval between the start and stop time are reported.
	■ monval is the data value for the tmper in nanoseconds

Example Command	`RTRV-PD-TDEV:TSG:INP1:ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^`
	`;`

Retrieve TDEV 2

The Retrieve TDEV 2 command reports the true TDEV data from the specified port; it uses a different output format from the Retrieve TDEV command.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PD-TDEV2:[tid]:[aid]:ctag[::start][:stop];`
Valid aid	`INPx[-y]`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^"aid:ocrdat,ocrtim,TDEV,tmper,monval[<cr><lf>`
	`^^^"aid:ocrdat,ocrtim,TDEV,tmper,monval[<cr><lf>`
	`...`
	`;`
	■ where:
	ocrdat and ocrtime are the actual date and time the data were collected
	■ TDEV describes the data that follows
	■ tmper is the data measurement time period in seconds. Maximum values are 0.05, 0.1, 1.0, 10.0, 100.0, 1000.0 and 10000.0. Only values available in the interval between the start and stop time are reported.
	■ monval is the data value for the tmper in nanoseconds

Example Command	`RTRV-PD-TDEV2:TSG:INP1:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^`
	`;`

Retrieve PM Phase

The Retrieve PM Phase command reports the phase data stored in the 1-s or 100-s phase history buffers for the specified port. You can also specify the number of data points to display.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax

```
RTRV-PM-PHA:[tid]:[aid]:ctag[::tmper][:points
]];
```

where:

- tmper is 1 or 100
- points is 1–100 for tmper = 1 and 1–1000 for tmper = 100. Default is 1

Valid aid

```
INPx[-y]
```

Minimum User Level: 1

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^"aid:ocrdat,ocrtim,PHA,tmper,(monval1),
(monval2)[<cr><lf>
;
```

where:

- ocrdat and ocrtime are the actual date and time the data were collected
- PHA describes the data that follows
- tmper is the data measurement time period in seconds
- monval1 and monval2 are the phase values for the specified input port in nanoseconds

Example Command

```
RTRV-PM-PHA:TSG:INP1:ctag;
```

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^
;
```

Retrieve PM Frequency

The Retrieve PM Frequency command reports the frequency data stored in the 1-s, 100-s, or 1000-s frequency history buffers for the specified port. You can specify the number of data points to display; the TSG-3800 stores up to 50 data points.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PM-FREQ:[tid]:[aid]:ctag[::tmper][:points]];` where: ■ tmper is 1, 100, or 1000 ■ points is 1–50. Default is 1
Valid aid	`INPx[-y]`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:ocrdat,ocrtim,FREQ,tmper,monval[<cr><lf>;`
	where:
	■ ocrdat and ocrtime are the actual date and time the data were collected
	■ FREQ describes the data that follows
	■ tmper is the data measurement time period in seconds
	■ monval is the frequency value for the specified input port in ps/s with commas separating the values

Example Command	`RTRV-PM-FREQ:TSG:INP3-3:ctag;`
Example Response	

```
   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^
;
```

Retrieve PM MTIE

The Retrieve PM MTIE command reports the MTIE data stored in the 100-s, 1000-s, or 10000-s MTIE history buffers for the specified port. You can specify the number of data points to display; the TSG-3800 stores up to 50 data points.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PM-MTIE:[tid]:[aid]:ctag[::tmper][:points]];` where: ■ tmper is 100, 1000, or 10000 ■ points is 1–50. Default is 1
Valid aid	`INPx[-y]`
Minimum User Level	1

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”aid:ocrdat,ocrtim,MTIE,tmper,monval[<cr><lf>`
	`;`
	where:
	■ ocrdat and ocrtime are the actual date and time the data were collected
	■ MTIE describes the data that follows
	■ tmper is the data measurement time period in seconds
	■ monval is the frequency value for the specified input port in ps/s with commas separating the values

Example Command	`RTRV-PM-MTIE:TSG:INP3-3:ctag;`

Example Response	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^`
	`;`

Retrieve Alarm Parameters

The Retrieve Alarm Parameters command reports the error and clear counts as well as the current mode for the specified error and input port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	RTRV-PRMTR-AIS:[tid]:[aid]:ctag; RTRV-PRMTR-BPV:[tid]:[aid]:ctag; RTRV-PRMTR-CRC:[tid]:[aid]:ctag; RTRV-PRMTR-LOS:[tid]:[aid]:ctag; RTRV-PRMTR-OOF:[tid]:[aid]:ctag;
Valid aid	INP, INPx, INPx[-y], ALL, <null>
Minimum User Level	2
Response Format	<cr><lf><lf> M^ctag^COMPLD<cr><lf> ^^^aid:prmtr,ercnt,clcnt,mode<cr><lf> where: ■ ercnt is the error count ■ clrcnt is the clear count ■ mode is Fail|Alrm|Rept|Ignr
Example Command	RTRV-PRMTR-AIS:TSG:INP2:ctag;
Example Response	 TSG 02-09-10 19:00:19 M 13 COMPLD ^^^TSG:AIS,1,5 ALRM

Retrieve Clock Parameters

The Retrieve Clock Parameters command reports the settings of the specified Clock module.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	RTRV-PRMTR-CLK:[tid]:[aid]:ctag;
Valid aid	CLK, CLKA, CLKB, ALL, <null>
Minimum User Level	2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^aid:mode,tau,ar,sel,clktype<cr><lf>`
	where:
	■ mode is Warm|Hold|Acq|Lock
	■ tau is a number indicating the final time constant value in seconds
	■ ar indicates whether AutoReturn is on or off
	■ sel is {sel} for the selected clock
	■ clktype is ST2Rub|ST2DDS|ST2|ST2.1|ST2.1DDS|ST3EDDS|Ext.Ref

Example Command	`RTRV-PRMTR-CLK:TSG:CLKB:ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^TSG:Lock,0,Off,Sel,ST2Rub`
	`;`

Retrieve Delay Parameter

The Retrieve Delay Parameter command reports the delay time for SSM messages.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PRMTR-DELAY:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^delay<cr><lf>`
	where:
	■ delay is the time in seconds before a new incoming SSM appears on the output

Example Command	`RTRV-PRMTR-DELAY:TSG::ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^TSG:5`
	`;`

Retrieve Frequency Parameter

The Retrieve Frequency Parameter command reports the frequency threshold settings for the specified input port. The settings for each time period (100, 1000, and 10000 seconds) are reported on three separate lines for each input port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PRMTR-FREQ:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^aid:FREQ,lim1,mod1,lim2,mod2,tmper<cr><lf>`
	where:
	■ lim1 and lim2 are the threshold values
	■ mod1 and mod2 are the alarm mode settings [Fail|Alarm|Rept| Ignr]
	■ tmper is 100|1000|10000

Example Command	`RTRV-PRMTR-FREQ:TSG::ctag;`

Example Response	`TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^TSG:`
	`;`

Retrieve MTIE Parameter

The Retrieve MTIE Parameter command reports the MTIE threshold settings for the specified input port. The settings for each time period (100, 1000, and 10000 seconds) are reported on three separate lines for each input port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PRMTR-MTIE:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	2

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^aid:MTIE,lim1,mod1,lim2,mod2,tmper<cr><lf>
```

where:

- lim1 and lim2 are the threshold values
- mod1 and mod2 are the alarm mode settings [Fail|Alarm|Rept| Ignr]
- tmper is 100|1000|10000

Example Command

```
RTRV-PRMTR-MTIE:TSG::ctag;
```

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^TSG:
;
```

Retrieve Priority Parameter

The Retrieve Priority Parameter command reports the priority level for the specified input port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax

```
RTRV-PRMTR-PRI:[tid]:[aid]:ctag;
```

Valid aid

```
INP, INPx, INPx[-y], ALL, <null>
```

Minimum User Level: 2

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^aid:level<cr><lf>
```

where:

- level is 1 (highest) through 4 (lowest), Mon (for Monitor mode) or Dis (for disabled)

Example Command

```
RTRV-PRMTR-PRI:TSG::ctag;
```

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^INP2:Mon
;
```

Retrieve Reference Parameter

The Retrieve Reference Parameter command reports which input port is the current reference input.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PRMTR-REF:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	2

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^aid:mode,as,ar<cr><lf>`
	where:
	■ mode is PRI|SSM|Best
	■ as and ar indicate if AutoSwitch and AutoReturn are On or Off, respectively

Example Command	`RTRV-PRMTR-REF:TSG::ctag;`

Example Response	
	`   TSG 02-09-10 19:00:19`
	`M 13 COMPLD`
	`^^^INP2:PRI,On,Off`
	`;`

Retrieve SQL Parameter

The Retrieve SQL Parameter command reports the Synchronization Quality Level (SQL) and the mode of operation for the specified input port.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-PRMTR-REF:[tid]:[aid]:ctag;`
Valid aid	`INP, INPx, INPx[-y], ALL, <null>`
Minimum User Level	2

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^aid:level,mode,bit<cr><lf>
```

where:

- level is PRS|ST2|ST3|DUS|STU
- mode is Auto or Provisioned
- bit is the location of the bit (4–8) in Time Slot 0 word that contains the E1 sync status message.

Example Command `RTRV-PRMTR-REF:TSG::ctag;`

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^INP2:PRI,On,Off
;
```

Retrieve User

The Retrieve User command reports the user name and access level for the user list stored in the TSG-3800.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax `RTRV-USER:[tid]::ctag;`

Valid aid `none`

Minimum User Level 3

Response Format

```
<cr><lf><lf>
M^ctag^COMPLD<cr><lf>
^^^"user name,access level<cr><lf>
```

where:

- user name is a 10-character user name
- access level is 1, 2, 3, 4, where 4 is the administrator level

Example Command `RTRV-USER:TSG::ctag;`

Example Response

```

   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^User,1
^^^Craft,2
^^^Supervisor,3
^^^Administrator,4
;
```

Retrieve Version

The Retrieve User command reports the version of the firmware and boot code in the CPU module.

If the TSG-3800 successfully receives the command, it returns the COMPLD message. If the TSG-3800 does not successfully receive the command, it returns the DENY message.

Command Syntax	`RTRV-VER:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	0

Response Format	`<cr><lf><lf>`
	`M^ctag^COMPLD<cr><lf>`
	`^^^”firmware version,bootcode version<cr><lf>`

Example Command	`RTRV-VER:TSG::ctag;`
Example Response	

```
   TSG 02-09-10 19:00:19
M 13 COMPLD
^^^
;
```

Other Commands

Each command submitted by the user causes the TSG-3800 to respond with the Complied message and a response message that contains the requested data.

Valid <tid> code: the assigned tid (see SET-TID; the default TID is TSG) or null. If null, the TSG-3800 requires the <aid>.

Valid <aid> code:

- Null (no characters). If null, the TSG-3800 requires the <tid>
- ID00000

Activate User

The Activate User command logs in the user with the specified username and password.

Command Syntax	`ACT-USER:[tid]:uid:ctag::pwd;`
Valid aid	`none`
Minimum User Level	0
Response Format	`tsg->`
Example Command	`ACT-USER:CRAFT:ctag:CRAFT;`
Example Response	`tsg->`

Cancel User

The Cancel User command logs off the current user and returns the TSG-3800 to security level 0. port to ASCII mode, or disconnects an Ethernet session to end TL1 communication.

Command Syntax	`CANC-USER:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	all
Response Format	`N/A`
Example Command	`CANC-USER:ctag;`
Example Response	`N/A`

Exit

The Exit command logs off the current user and returns the port to ASCII mode, or disconnects an Ethernet session to end TL1 communication.

Command Syntax	`EXIT:[tid]::ctag;`
Valid aid	`none`
Minimum User Level	all
Response Format	`N/A`
Example Command	`EXIT:ctag;`
Example Response	`N/A`

TL1 Event Messages

This section describes the event messages that the TSG-3800 logs when you are in the TL1 access mode.

Table C-6. TL1 Event Listing

Event No.	Type	Condscr	Related Event
1	Equipment, Minor, Minor Initfcfail	<001,\”LOCAL_1PPS_FAILED\”>	2
2	Event, Minor, Cleared, Initfcfail	<002,\”LOCAL_1PPS_RESTORED\”>	1
3	Message, Minor, Cleared, Removed	<003,\”MODULE_ADDED\”>	4
4	Message, Minor, Minor, Removed	<004,\”MODULE_REMOVED”\>	3
5	Message, Event, Event, Oper	<005,\”USER_SETPRIORITY, priority %d,comport %d, username %s\”>	None
6	Message, Event, Event, Oper	<006,\”ISER_SET_SSM_ALARM, mode %s,comport %d,username %s”\>	None
7	Message, Event, Event, Oper	<007,\”USER_SET_INP_SSM_SEL, AUTO/PROV,comport %d,username %s\”>	None
8	Input, Minor, Minor, SQL	<008,\”CLK_SQL_BETTER,clock sql %s,input sql %s\”>	139
9	Equipment, Event, Event, Msg	<009,\”NVCLK_INITIALIZED\”>	None
10	Equipment, Event, Event, Msg	<010,\”NVRAM_INITIALIZED\”>	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
11	Message, Event, Event, Msg	<011,\”CLK_ENTERED_LOOP_MODE,mode%s\”>	None
12	Message, Event, Event, Msg	<012,\”CHANGED_CLK_MASTERS\”>	None
13	Equipment, Minor, Minor, Power	<013,\”POWER_FAILED\”>	14
14	Equipment, Minor, Cleared, Power	<014,\”POWER_RESTORED\”>	13
15	Message, Event, Event, Alarm	<015,\”AUDIO_ALARM_CLEARED\”>	None
16	Message, Event, Event, Alarm	<016,\”CHOSEN_CPU_CLK\”>	None
25	Input, Minor, Minor, OOF	<025,\”OOF_FLT\”>	29
26	Input, Minor, Minor, BPV	<026,\”BPV_FLT\”>	32
27	Input, Minor, Minor, LOS	<027,\”LOS_FLT\”>	31
28	Input, Minor, Minor, AIS	<028,\”AIS_FLT\”>	30
29	Input, Minor, Cleared, OOF	<029,\”OOF_FLT_CLEARED\”>	25
30	Input, Minor, Cleared AIS	<030,\”AIS_FLT_CLEARED\”>	28
31	Input, Minor, Cleared, LOS	<031,\”LOS_FLT_CLEARED\”>	27
32	Input, Minor, Cleared BPV	<032,\”BPV_FLT_CLEARED\”>	26
33	Equipment, Major, Cleared, Initfcfail	<033,\”MODULE_RESTORED\”>	34
34	Equipment, Major, Major, Initfcfail	<034,\<MODULE_FAILED,failed code %x\”>	33
35	Message, Event, Event, Ref	<035,\”REF_SELECTED\”>	None
37	Equipment, Minor, Cleared, Alarm	<037,\”MINOR_ALARM_CLEARED\”>	36
39	Equipment, Major, Cleared, Alarm	<039,\”MAJOR_ALARM_CLEARED\”>	38
40	Input, Major, Major, Ref	<040,\”NO_VALID_REF_FOUND\”>	41
41	Input, Major, Cleared, Ref	<041,\”VALID_REF_FOUND\”>	40
42	Equipment, Critical, Critical, Intifcfail	<042,\”OTP_REF_INVALID\”>	43
43	Equipment, Critical, Cleared, Intificfail	<043,\”OTP_REF_VALID\”>	42
44	Equipment, Major, Major, Alarm	<044,\”DIST_OTP_FLT\”>	45
45	Equipment, Major, Cleared, Alarm	<045,\”DIST_OTP_FLT_CLEARED\”>	44
46	Equipment, Minor, Minor, Alarm	<046,\”DIST_INP_FLT\”>	47
47	Equipment, Minor, Cleared, Alarm	<047,\”DIST_INP_FLT_CLEARED\”>	46
48	Equipment, Event, Event, Msg	<048,\”CONFIG_LOADED\”>	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
49	Equipment, Event, Event, Msg	<049,\”DFT_CONFIG_LOADED\”>	None
50	Message, Event, Event, Oper	<050,\”USER_SET_REF,comport %d, username %s\”>	None
51	Message, Event, Event, Oper	<051,\”USER_SET_LOOP_MODE, mode %s,comport %d,username %s\”>	None
52	Message, Event, Event, Oper	<052,\”USER_SET_ALARM_PARM, limit type %s, limit %d, comport %d,username %s\”>	None
53	Message, Event, Event, Oper	<053,\”USER_ZERO_ALARM_PARM , counter type %s, comport %d,username %s\”>	None
54	Message, Event, Event, Oper	<054.\”USER_SET_ALARM_MODE, limit type %s,mode %s,comport %d, username %s\”>	None
55	Equipment, Major, Major, Intifcfail	<055,\”SYS_BUS_FAILED\”>	56
56	Equipment, Major, Cleared, Intificfail	<056,\”SYS_BUS_RESTORED\”>	55
57	Equipment, Minor, Minor, Intifcfail	<057,\"ONE_PPS_FAILED\">	58
58	Equipment, Minor, Cleared, Intifcfail	<058,\"ONE_PPS_RESTORED\">	59
59	Message, Event, Event, Oper	<059,\"USER_SET_CLK_TIME_CON STANT, tc %d, comport %d, username %s\">	None
60	Message, Event, Event, Oper	<060,\"MODULE_DISABLED, comport %d, username %s\">	61
61	Message, Event, Cleared, Oper	<061,\"MODULE_ENABLED, comport %d, username %s\">	60
62	Input, Minor, Minor, MTIE	<062,\"MTIE_LIMIT1_EXCEEDED, time scale %d, value %d, limit %d\">	64
63	Input, Minor, Minor, MTIE	<063,\"MTIE_LIMIT2_EXCEEDED, time scale %d, value %d, limit %d\">	65
64	Input, Minor, Cleared, MTIE	<064,\"MTIE_LIMIT1_CLEARED, time scale %d\">	62
65	Input, Minor, Cleared, MTIE	<065,\"MTIE_LIMIT2_CLEARED, time scale %d\">	63
66	Message, Event, Event, Oper	<066,\"USER_SET_MTIE_LIMIT1, time scale %d, limit %d, comport %d, username %s\">	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
67	Message, Event, Event, Oper	<067,\"USER_SET_MTIE_LIMIT2, time scale %d, limit %d, comport %d, username %s\">	None
68	Message, Event, Event, Oper	<068,\"USER_SET_MTIE_MODE1, mode %s, comport %d, username %s\">	None
69	Message, Event, Event, Oper	<069,\"USER_SET_MTIE_MODE2, mode %s, comport %d, username %s\">	None
70	Input, Minor, Minor, Freq	<070,\"FREQ_LIMIT1_EXCEEDED, time scale %d, value %d, limit %d\">	73
71	Input, Minor, Minor, Freq	<071,\"FREQ_LIMIT2_EXCEEDED, time scale %d, value %d, limit %d\">	73
72	Input, Minor, Cleared, Freq	<072,\"FREQ_LIMIT1_CLEARED, time scale %d\">	70
73	Input, Minor, Cleared, Freq	<073,\"FREQ_LIMIT2_CLEARED, time scale %d\">	71
74	Message, Event, Event, Oper	<074,\"USER_SET_FREQ_LIMIT1, time scale %d, limit %d, comport %d, username %s\">	None
75	Message, Event, Event, Oper	<075,\"USER_SET_FREQ_LIMIT2, time scale %d, limit %d, comport %d, username %s\">	None
76	Message, Event, Event, Oper	<076,\"USER_SET_FREQ_MODE1, mode %s, comport %d, username %s\">	None
77	Message, Event, Event, Oper	<077,\"USER_SET_FREQ_MODE2, mode %s, comport %d, username %s\">	None
78	Message, Minor, Minor, Msg	<078,\"CV_END_OF_RANGE, percent range %d\">	79
79	Message, Minor, Cleared, Msg	<079,\"CV_END_OF_RANGE_CLEARED\">	78
80	Message, Event, Event, Oper	<080,\"USER_SET_INP_AUTOSWITCH, ON/OFF\">	None
81	Message, Event, Event, Oper	<081,\"USER_SET_INP_AUTORETURN, ON/OFF\">	None
82	Message, Event, Event, Oper	<082,\"CLK_TYPE_CHANGED\">	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
83	Message, Event, Event, Oper	<083,\"LOGGED_IN, comport %d, username %s, access level %d\">	None
84	Message, Event, Event, Oper	<084,\"LOGGED_OUT, comport %d, username %s\">	None
85	Message, Event, Event, Oper	<085,\"PORT_FAILED_LOGIN, comport %d\">	None
86	Message, Event, Event, Oper	<086,\"AUTO_LOGOUT, comport %d, username %s\">	None
87	Message, Event, Event, Oper	<087,\"USER_INHIBIT, FREQ/MTIE, comport %d, username %s\">	None
88	Message, Event, Event, Oper	<088,\"USER_SET_DFT_CONFIG\">	None
89	Message, Event, Event, Oper	<089,\"USER_SET_FACTORY_CON FIG\">	None
90	Equipment, Event, Event, Intifcfail	<090,\"BAD_USER_DFT\">	None
91	Equipment, Major, Cleared, Msg	<091,\"PLL_FLT_CLEARED\">	92
92	Equipment, Major, Major, Msg	<092,\"PLL_FLT\">	91
93	Input, Minor, Minor, Msg	<093,\"INP_SIGNAL_INVALID, AIS/BPV/LOS/OOF/CRC\">	142
94	Message, Event, Event, Oper	<094,\"USER_SAVED_CONFIG, comport, username %s\">	None
95	Equipment, Major, Major, Alarm	<095,\"CLK_MODULE_FAILED\">	96
96	Equipment, Major, Cleared, Alarm	<096,\"CLK_MODULE)RESTORED\">	95
97	Message, Event, Event, Oper	<097,\"USER_SET_ERF\">	None
98	Message, Event, Event, Oper	<098,\"FAILED_LOGIN, comport %d, username %s\">	None
99	Message, Event, Event, Oper	<099,\"USER_SET_SSM, ssm %d, comport %d, username %s\">	None
100	Message, Event, Event, Oper	<100,\"USER_SET_PORT_CONFIG, PRS/OCN/MCD, comport %d, username %s\">	None
101	Equipment, Event, Event, Intifcfail	<101,\"ETHERNET_FAILED\">	None
102	Equipment, Event, Event, Intifcfail	<102,\"TELNET_SHELL_FAILED\">	None
103	Equipment, Event, Event, Intifcfail	<103,\"TELENT_SERVER_FAILED\">	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
104	Output, Event, Event, Message	<104,\"BROADCAST, message %s, comport %d, username %s\">	None
105	Output, Event, Event, Message	<105,\"RESTART_WARNING, seconds to restart %d\">	None
106	Message, Event, Event, Msg	<106,\"RESTART, seconds to restart %d, comport %d, username %s\">	None
107	Output, Event, Event, Message	<107,\"AUTO_LOGOFF, comport %d, username %s\">	None
108	Equipment, Major, Major, Ref	<108,\"EXT_REF_LOS_FAILED\">	109
109	Equipment, Major, Cleared, Ref	<109,\"EXT_REF_LOS_RESTORED\">	108
110	Equipment, Major, Major, Bus	<110,\"MODULE_BUS_FAILED\"	111
111	Equipment, Major, Cleared, Bus	<111,\"MODULE_BUS_RESTORED\">	110
112	Equipment, Event, Event, Intifcfail	<112,\"NOT_ENOUGH_MEMORY, bytes unabled to allocated %d\">	None
113	Message, Event, Event, Msg	<113,\"BINARY_SESS_FAILED\">	None
114	Equipment, Event, Event, Msg	<114,\"BINARY_SERVER_FAILED\">	None
115	Equipment, Major, Major, Alarm	<115,\"CLK_STABILITY_FAILED\">	116
116	Equipment, Major, Cleared, Alarm	<116,\"CLK_STABILITY_RESTORED\">	115
117	Message, Event, Event, CRC	<117,\"BEGAN_CRC\">	118
118	Message, Event, Cleared, CRC	<118,\"ENDED_CRC\">	117
119	Input, Minor, Minor, CRC	<119,\"CRC_FLT\">	120
120	Input, Minor, Cleared, CRC	<120,\"CRC_FLT_CLEARED\">	119
121	Equipment, Minor, Minor, Alarm	<121,\"MODULE_HALTED, failed code %X\">	143
122	Input, Event, Event, Pha	<122,\"BEGAN_PHA_BUILDOUT\">	123
123	Input, Event, Cleared, Pha	<123,\"ENDED_PHA_BUILDOUT\">	122
124	Input, Event, Event, SQL	<124,\"INP_SQL_DEGRADED\">	125
125	Input, Event, Cleared, SQL	<125,\"INP_SQL_RESTORED\">	124
126	Input, Minor, Minor, SQL	<126,\"INP_SQL_FLT\">	127
127	Input, Minor, Cleared, SQL	<127,\"INP_SQL_FLT_CLEARED\">	126

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
128	Message, Event, Event, Oper	<128,\"USER_SET_REF_SEL_MODE, mode %s, comport %d, username %s\">	None
129	Message, Event, Event, Oper	<129,\"USER_SET_SSM_OTP_MODE, AUTO/MAN, comport %d, username %s\">	None
130	Message, Event, Event, Oper	<130,\"USER_SET_SSM_INP_MODE, mode %s, comport %d, username %s\">	None
131	Message, Event, Event, Oper	<131,\"LOGGED_USER_OUT, comport being logout %d, username %s, admin comport %d\">	None
132	Input, Minor, Minor, Freq	<132,\"INP-_RANGE_FLT, CLKA/CLKB\">	133
133	Input, Minor, Cleared, Freq	<133,\"INP_RANGE_FLT_CLEARED, CLKA/CLKB\">	132
134	Input, Event, Event, Msg	<134,\"INP_SSM_CHANGED, ssm %s\">	None
136	Equipment, Critical, Cleared, Alarm	<136,\"CRITICAL_ALARM_CLEARED\">	135
137	Message, Event, Event, Oper	<137,\"USER_SET_CLK_AUTORETURN, ON/OFF, comport %d, username %s\">	None
138	Message, Event, Event, Oper	<138,\"USER_SET_INP_SSM_BIT, ssm bit "4-8" %d, comport %d, username %s\">	None
139	Input, Minor, Cleared, SQL	<139,\"INP_SQL_BETTER, ref sync quality level %s, clk sync quality level %s\">	
140	Input, Event, Event, Msg	<140,\"BEGAN_LOC\">	141
141	Input, Event, Cleared, Msg	<141,\"ENDED_LOC\">	140
142	Input, Minor, Cleared, Msg	<142,\"INP_SIGNAL_INVALID_CLEARED \">	93
143	Equipment, Minor, Cleared, Alarm	<143,\"MODULE_HALT_CLEARED\">	121
144	Input, Minor, Minor, Msg	<144,\"INP_SIGMA_FLT\">	145
145	Input, Minor, Cleared, Msg	<145,\"INP_SIGMA_FLT_CLEARED\">	144
146	Message, Event, Event, Oper	<146,\"USER_SET_SSM_FG, ssm %x, comport %d, username %s\">	None

Table C-6. TL1 Event Listing (Continued)

Event No.	Type	Condscr	Related Event
147	Equipment, Major, Cleared, Msg	<147,\"UNIT_ENTERED_BYPASS_MODE\">	148
148	Equipment, Major, Cleared, Msg	<148,\"UNIT_LEFT_BYPASS_MODE\">	147
149	Input, None, Cleared, Msg	<149,\"RECEIVED_UNRECOGNIZED_SSM\">	None
150	Input, Minor, Minor, LMHO	<150,\"INP_FAILED_LMHO,CLKA\">	151
151	Input, Minor, Cleared, LMHO	<151,\"INP_CLEARED_LMHO,CLKA\">	150
152	Input, Minor, Minor, LMHO	<152,\"INP_FAILED_LMHO,CLKB\">	153
153	Input, Minor, Cleared, LMHO	<153,\"INP_CLEARED_LMHO,CLKB\">	152
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