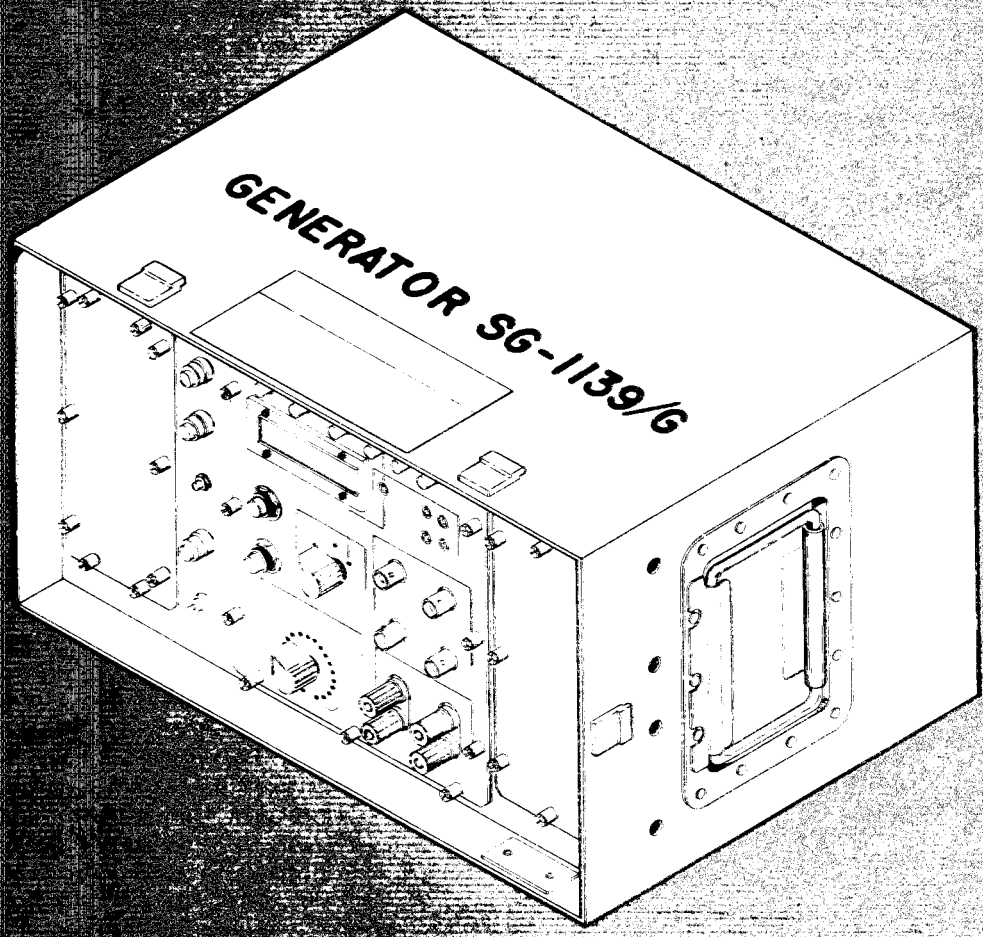
TM 11-6625-3041-12
TO 33A1-8-908-1

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL



DIGITAL DATA GENERATOR SG-1139/G

(NSN 6625-01-136-2048)

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

7 FEBRUARY 1985

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. **DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL**

2. **IF POSSIBLE, TURN OFF THE ELECTRICAL POWER**

3. **IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL**

4. **SEND FOR HELP AS SOON AS POSSIBLE**

5. **AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION**

HIGH VOLTAGE

The high voltage used in this equipment can kill on contact. Observe the following safety precautions:

- **Ground the Equipment** — Before connecting primary power or the signal cables, connect a heavy gage copper wire from the ground lug on the rear panel to earth ground. Do not remove this wire until the signal cables and primary power have been disconnected.
- **Avoid the Power Input** — Be careful not to contact the 115-volt ac input connections when installing or servicing the equipment.
- **Do Not Service Alone** — Never work on the equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who can administer first aid.
- **Use One Hand** — Where possible, use only one hand to service the equipment. Keep the other hand away to reduce the hazard of current flowing through the vital organs of the body.
- **First Aid** — Be thoroughly familiar with the information contained in FM 21-11 First Aid for Soldiers. Apply first aid to anyone who is the victim of electrical shock.

CLEANING SOLVENT

The fumes of trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury. Observe the following safety precautions:

- **Ventilate** — Use only outside or in well ventilated areas and avoid breathing the fumes.
- **No Smoking** — Do not smoke while using and do not use near an open flame or hot surface. Trichlorotrifluoroethane does not burn but heat converts the fumes to a toxic, irritating gas.
- **Use Gloves** — Use gloves that trichlorotrifluoroethane can't penetrate. Because the solvent dissolves the natural oils, avoid long or repeated contact with your skin.
- **Wash** — Wash hands immediately after using.
- **Do Not Take Internally** — Do not drink. If taken internally, see a doctor immediately.

HEAVY EQUIPMENT

This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Observe the following safety precaution:

- **Do Not Lift or Carry Alone** — Do not attempt to lift, carry, or move the equipment by yourself - get help.

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES, DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

DATES OF ISSUE for original and changed pages are:

Original . . . . . 7 February 1985

TOTAL NUMBER OF PAGES in this publication is 144 consisting of the following:

Page No.	Change No.*
Front Cover	0
A-C	0
D Blank	0
i-iii	0
iv Blank	0
1-1 - 1-19	0
1-20 Blank	0
2-1 - 2-36	0
3-1 - 3-48	0
A-1	0
A-2 Blank	0
B-1 - B-8	0
C-1 - C-2	0
D-1	0
D-2 Blank	0
E-1	0
E-2 Blank	0
Gloss-1 - Gloss-2	0
Index-1 - Index-6	0
2028-2 Sample	0
2028-2 Blanks	0

*Zero in this column indicates an original Page.

TECHNICAL MANUAL
TM 11-6625-3041-12
Technical Order
TO 33A1-8-908-1

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

Washington, DC, 7 February 1985

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL
DIGITAL DATA GENERATOR SG-1139/G
(NSN 6625-01-136-2046)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENT

You can help improve this manual. If you find any mistakes or if you know of away to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of the manual direct to: Commander, US Army Communications - Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007.

For Air Force submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, SectionVI, T.O. 00-5-1. Forward direct to prime ALC/MST.

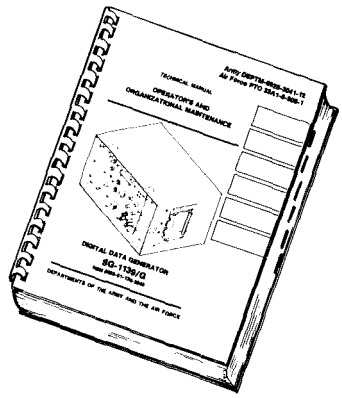
In either case, a reply will be furnished direct to you.

OVERALL CONTENTS Page

HOW TO USE THIS MANUAL

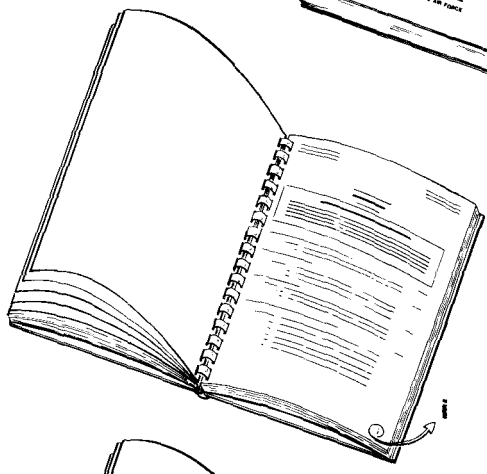
Major Subjects

Major subjects are listed on the right side of the front cover and by pages edgemarked in black.



Chapters and Sections

Chapters and sections within the chapters are listed in the overall contents on page i.

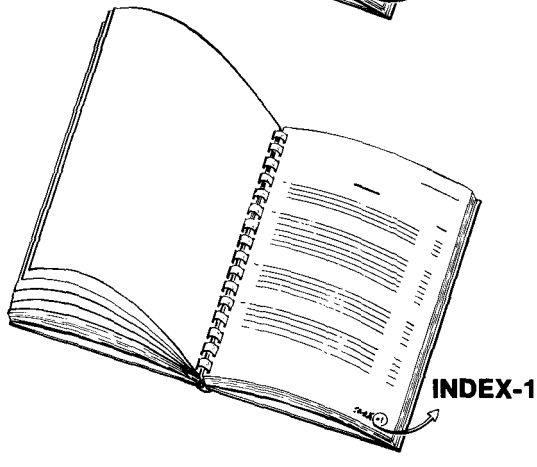


Primary Paragraphs

Primary paragraphs (bold-faced headings) for each chapter are listed in the chapter contents at the start of each chapter. Chapters always start on a right-hand page.

Index

An alphabetical index of all subjects starts on page INDEX-1 in the back of the manual.

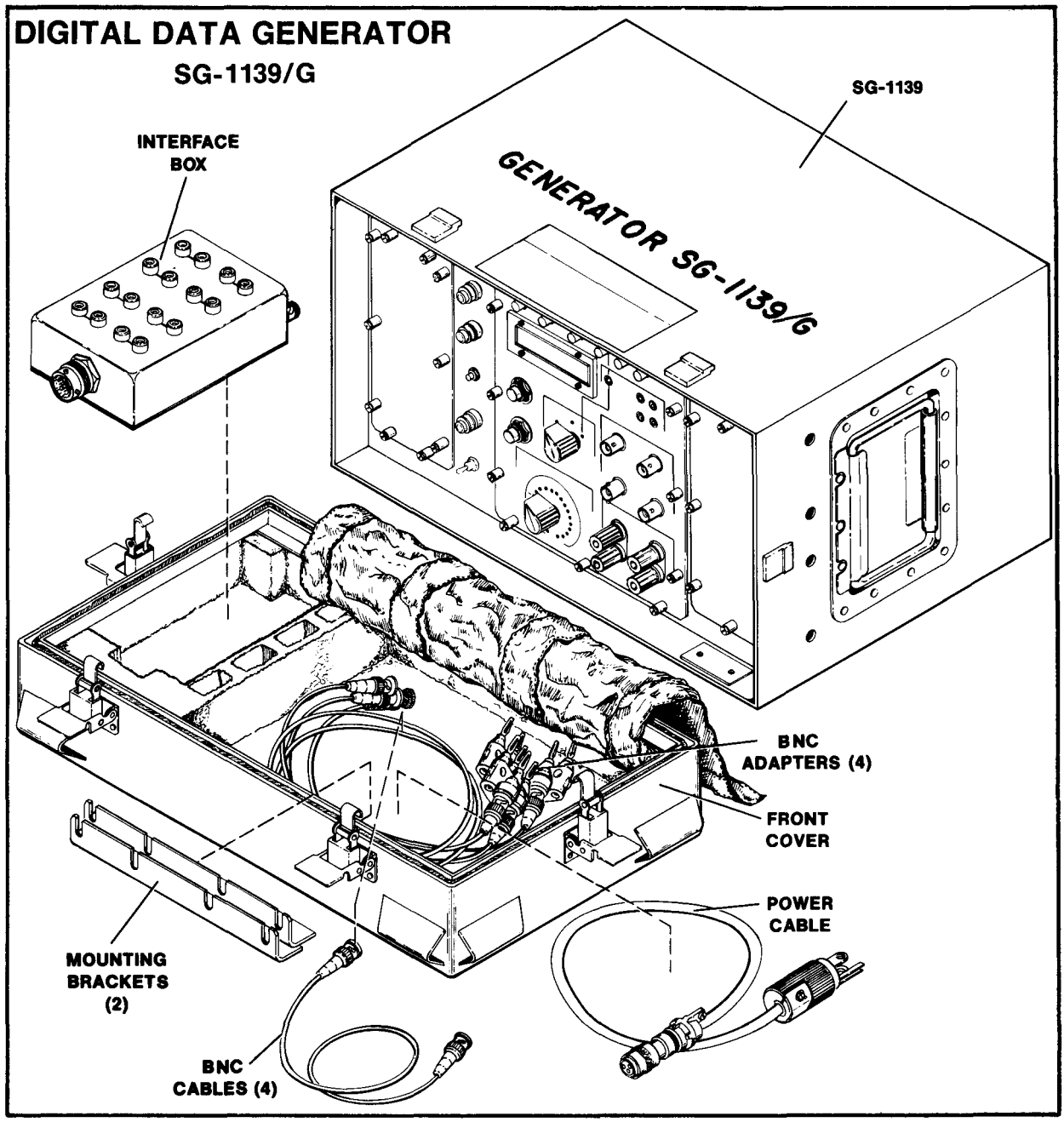


Chapter 1
INTRODUCTION

CHAPTER CONTENTS

Section I

GENERAL INFORMATION



1-1. SCOPE

This manual is for your use in operating and maintaining the Digital Data Generator SG-1139/G (common name SG-1139). It contains detailed descriptive, operation, application, and organizational maintenance information.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Army

Reports of Maintenance and Unsatisfactory Equipment: Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

Report of Packaging and Handling Deficiencies: Fill out and forward SF 364, Report of Discrepancy (ROD), as prescribed in AR 735-11-2.

Discrepancy in Shipment Report (DISREP): Fill out and forward SF 361, Discrepancy in Shipment Report (DISREP), as prescribed in AR 55-38.

Air Force

Reports of Maintenance and Unsatisfactory Equipment: Air Force personnel will use AFR 66-1 for maintenance reporting and TO 00-35D54 for unsatisfactory equipment reporting.

Report of Packaging and Handling Deficiencies: Fill out and forward SF 364, Report of Discrepancy (ROD), as prescribed in AFR 400-54.

Discrepancy in Shipment Report (DISREP): Fill out and forward SF 361, Discrepancy in Shipment Report (DISREP), as prescribed in AFR 75-18.

1-3. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, forms, or additional publications pertaining to the equipment.

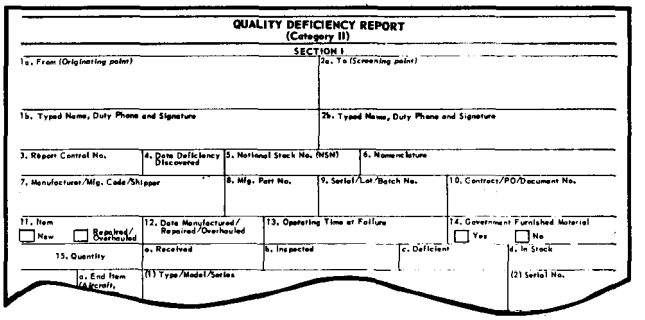
1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2, Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

Army

If your Digital Data Generator SG-1139/G needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368, Quality Deficiency Report. Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.


QUALITY DEFICIENCY REPORT
(Category II)
SECTION I
1a. From (Originating point)
2a. To (Screening point)
1b. Typed Name, Duty Phone and Signature
2b. Typed Name, Duty Phone and Signature
3. Report Control No.
4. Date Deficiency Discovered
5. National Stock No. (NSN)
6. Nomenclature
7. Manufacturer/Mfg. Code/Shipper
8. Mfg. Part No.
9. Serial/Lot/Batch No.
10. Contract/PO/Document No.
11. Item: New / Remfrd/Overhauled
12. Date Manufactured/Repaired/Overhauled
13. Operating Time at Failure
14. Government Furnished Material: Yes / No
15. Quantity
a. Received
b. Inspected
c. Deficient
d. In Stock
a. End Item (Aircraft,
(1) Type/Model/Series
(2) Serial No.

Air Force

Air Force personnel are encouraged to submit EIRs in accordance with AFR 900-4.

1-6. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness.

1-7. PREPARATION FOR STORAGE OR SHIPMENT

For instructions on preparation for storage or shipment refer to paragraph 3-19.

1-8. NOMENCLATURE CROSS REFERENCE LIST

Common Name	Official Nomenclature
SG-1139	Digital Data Generator SG-1139/G
Front cover	Cover assembly, front
Power cable	Cable assembly, power
BNC cable	Cable assembly, coaxial
Mounting bracket	Angle assembly, mounting
BNC adapter	Adapter, BNC-banana
Interface box	Interface assembly
POWER SUPPLY access cover	Cover, front access, power supply
LOGIC access cover	Cover, front access, logic
Multi VDC card	Circuit card assembly, Multi VDC, A1
AC Input card	Circuit card assembly, AC Input, A2
Transmit 1 card	Circuit card assembly, Transmit 1 Board, A3
Transmit 2 card	Circuit card assembly, Transmit 2 Board, A4
Receive 1 card	Circuit card assembly, Receive 1 Board, A5
Receive 2 card	Circuit card assembly, Receive 2 Board, A6
Control filter	Control filter assembly, A8

1-9. LIST OF ABBREVIATIONS

This listing includes special or unique abbreviations, acronyms, or descriptors used in the manual that are not contained in MIL-STD-12.

ATACS . . . . . Army Tactical Communications System

BER . . . . . Bit Error Rate
BII . . . . . Basic Issue Items

CLK . . . . . Clock

Demux . . . . . Demultiplexer
DMWR . . . . . Depot Maintenance Work Requirements

EE . . . . . Electrical equipment

Hz . . . . . Hertz (cycles per second)

kb/s . . . . . Kilo (1000) bits per second

MAC . . . . . Maintenance Allocation Chart
ms . . . . . Milliseconds
MTOE . . . . . Modified Table of Organization and Equipment
mV . . . . . Millivolt

NRZ . . . . . Nonreturn to Zero

P-P . . . . . Peak-to-peak
PCM . . . . . Pulse code modulation
PMCS . . . . . Preventive maintenance checks and services
ppm . . . . . Parts per million
PR . . . . . Pseudorandom

RPSTL . . . . . Repair Parts and Special Tools List
Rqr . . . . . Required

SMR . . . . . Source Maintenance Recoverability
STA . . . . . Station

TAMMS . . . . . The Army Maintenance Management System
TMDE . . . . . Test, Measurement, and Diagnostic Equipment
TMG . . . . . Timing
TRI-TAC . . . . . Tri-Service Tactical Communications System

U/M . . . . . Unit of measurement
µs . . . . . Microsecond

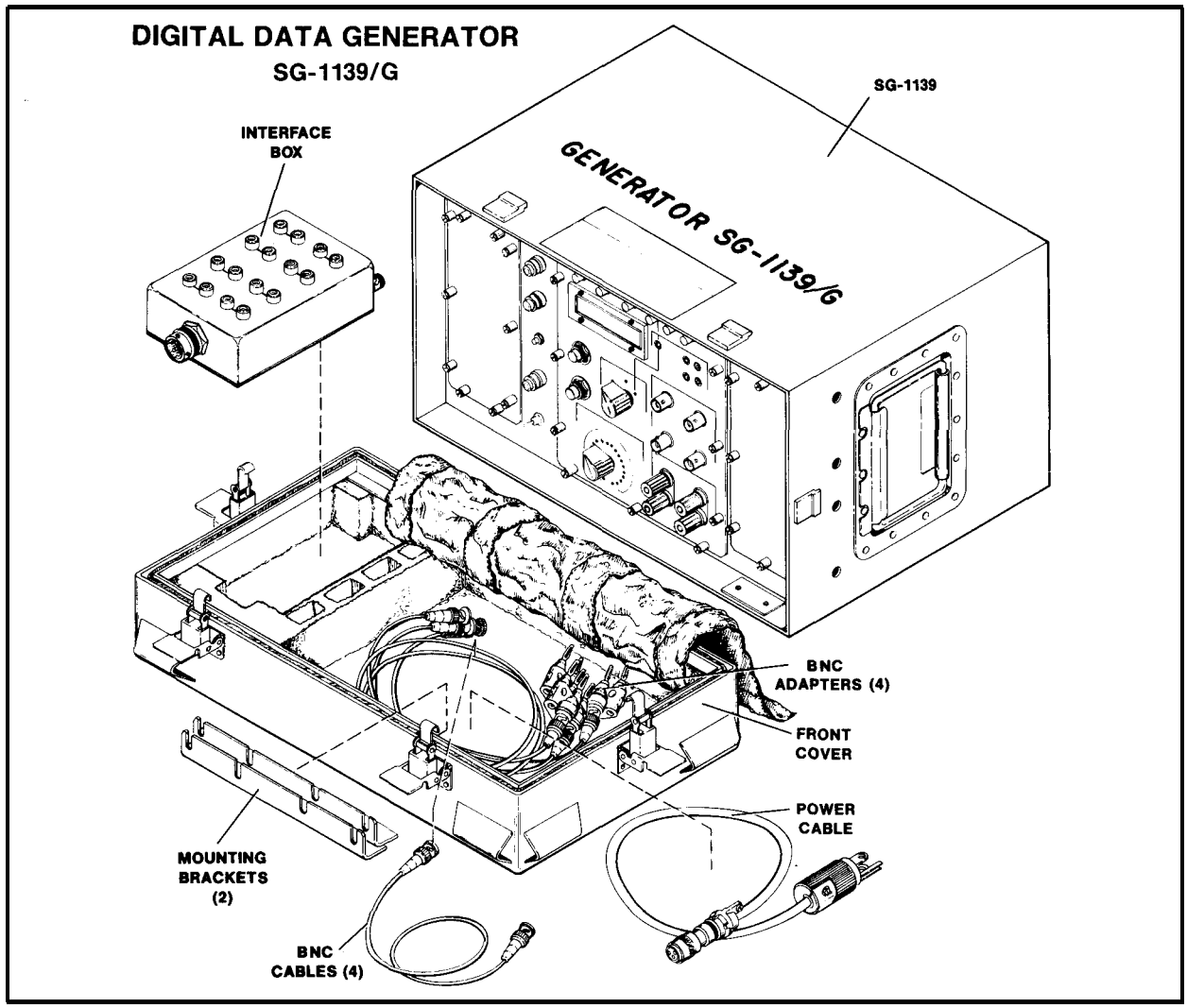
Section II

EQUIPMENT DESCRIPTION

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

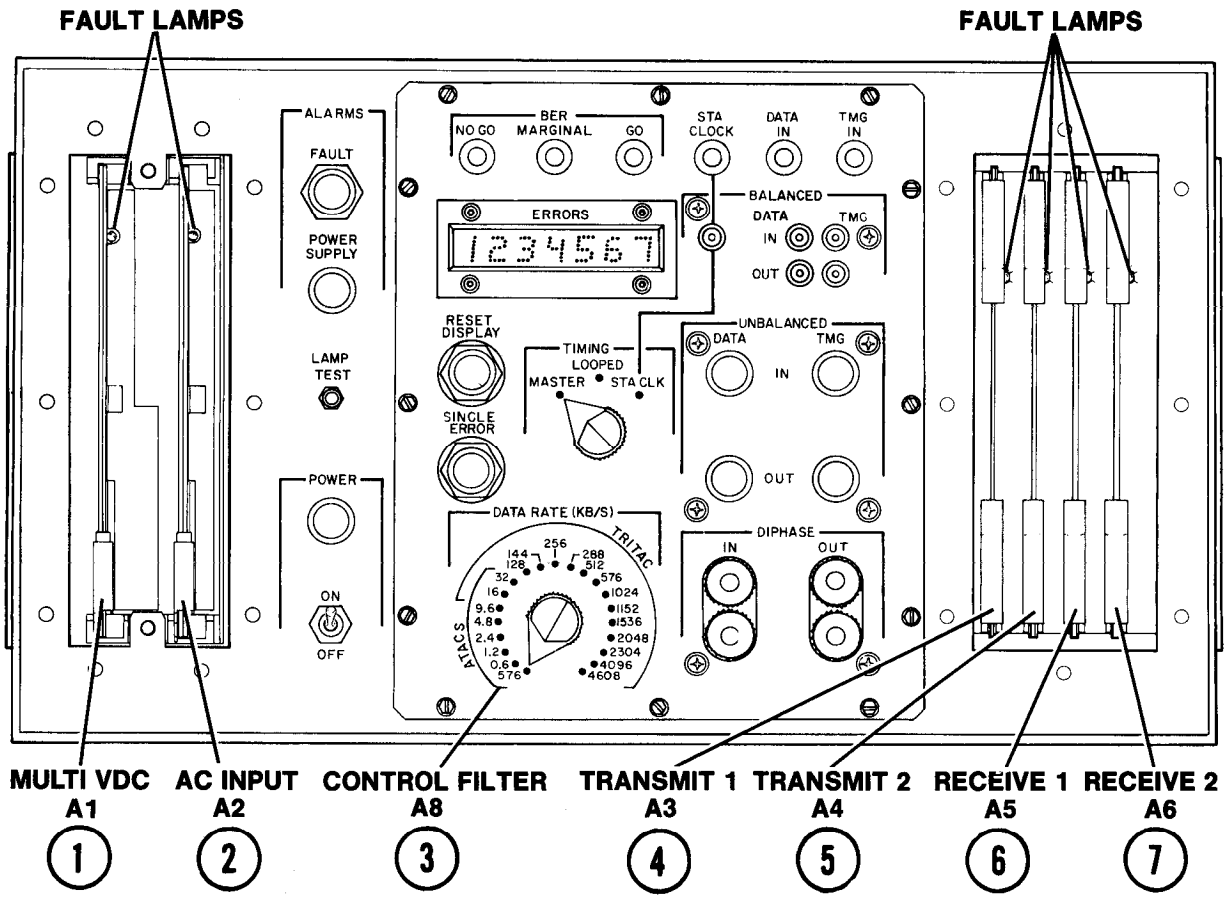
Purpose	• The Digital Data Generator SG-1139/G tests digital paths including separate equipments, cables, transmitters and receivers, and complete systems.
Characteristics	• Compatible with ATACS and TRI-TAC systems. • Includes transmitter and receiver with built-in clock. • Powered from standard 115-volt ac line. • Accessories supplied in cover. • Ruggedized for field use.
Capabilities	• Checks unbalanced NRZ, balanced NRZ, and diphase paths. • Measures total errors and bit error rate. • Checks station clock. • Operates from internal clock, external clock, or clock derived from path under test.
Features	• Automatic, continuous evaluation of bit error rate. • Simple operation with minimal hazard to personnel or equipment. • Built-in test equipment. • Rapid access to assemblies for ease of repair.

1-11. LOCATION AND DESCRIPTION OF MAJOR EXTERNAL COMPONENTS



Item	Name	Description
(1)	SG-1139	Digital data generator excluding front cover and accessories below.
(2)	BNC Adapters	Adapt BNC cables to double banana jacks with 3/4-inch spacing, such as those on SG-1139 DIPHASE inputs and outputs and on interface box; four each.
(3)	Front Cover	Protects front panel during transport and provides storage for accessories.
(4)	Power Cable	Connects SG-1139 to power source.
(5)	BNC Cables	Connect data and timing signals to and from SG-l139; four each.
(6)	Mounting Brackets	Mount SG-1139 to rack; two each.
(7)	Interface BOX	Provides interface between multipin connectors and banana jacks.

1-12. LOCATION AND DESCRIPTION OF MAJOR INTERNAL COMPONENTS



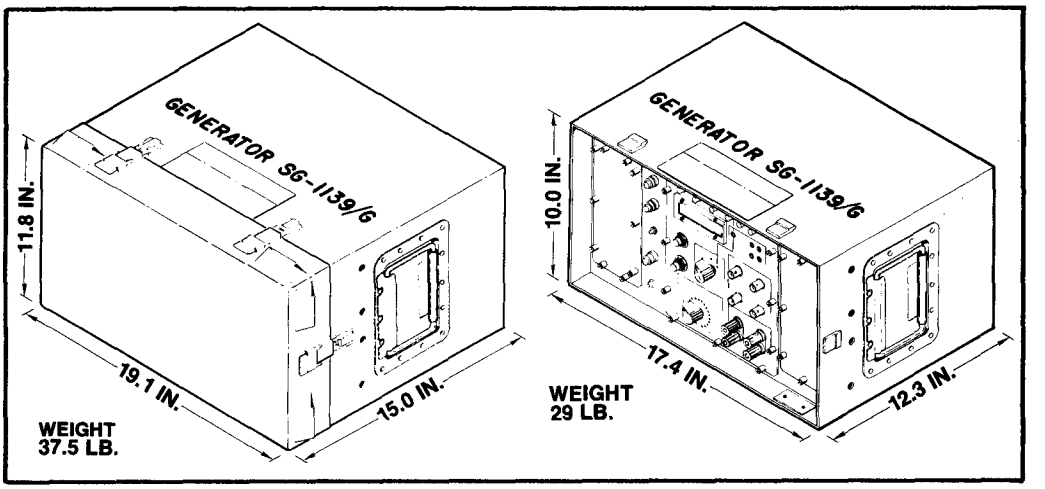
Item	Name	Description
1	Multi VDC CCA A1	Replaceable power supply circuit card assembly provides +5, -5, +12, and -12 dc voltages.
2	AC Input CCA A2	Replaceable power supply circuit card assembly provides ac rectification, system fault summation, indicator-lamp drive, and nuclear shutdown.
3	Control Filter A8	Replaceable assembly provides control and indicator functions, signal input connections, and signal output connections.
4	Transmit 1 CCA A3	Replaceable logic circuit card assembly provides master clock signal, pattern generation, station clock control, balanced and unbalanced data, and timing output signals.
5	Transmit 2 CCA A4	Replaceable logic circuit card assembly provides diphase output signal and error counting.
6	Receive 1 CCA A5	Replaceable logic circuit card assembly provides data and timing input signal processing, diphase-to-binary conversion, clock recovery, and error detection.
	Receive 2 CCA A6	replaceable logic circuit card assembly provides BER measurements.

1-13. DIFFERENCES BETWEEN MODELS

There is only one model of the Digital Data Generator SG-1139/G.

1-14. EQUIPMENT DATA

Physical



Service Conditions	Operating	Storage/Transport
Temperature	-25° to +125°F	-70° to +125°F
Altitude	0 to 15,000 ft.	0 to 40,000 ft.

Power 104 to 127 volts ac, 48 to 420 Hz, single-phase, 50 watts maximum.

Pattern Pseudorandom with length of 2^{15}-1 bits (32,767 bits).

Clock Clock source is set by 3-position TIMING switch:

MASTER Position: Internal oscillator with accuracy of 10 parts per million, over full operating temperature range including aging.

LOOPED Position: Signal derived from input timing or input diphase signals.

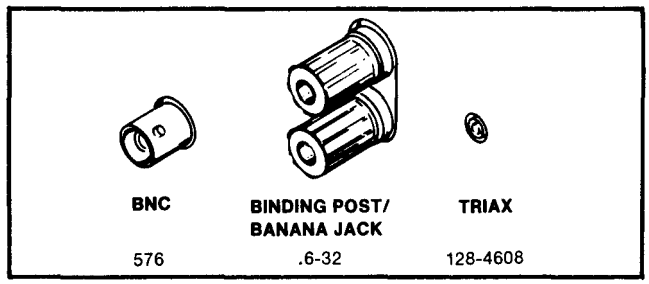
STA CLK Position: External signal (station clock) applied to STA CLOCK Triax connector. Balanced square wave input of 100 mV to 6 V p-p. Logic 0 is -3 V to -50 mV, logic 1 is +50 mV to +3 V. Input impedance is 100 ohms ±10 percent.

Error Injection SINGLE ERROR pushbutton injects one error each time it is pressed.

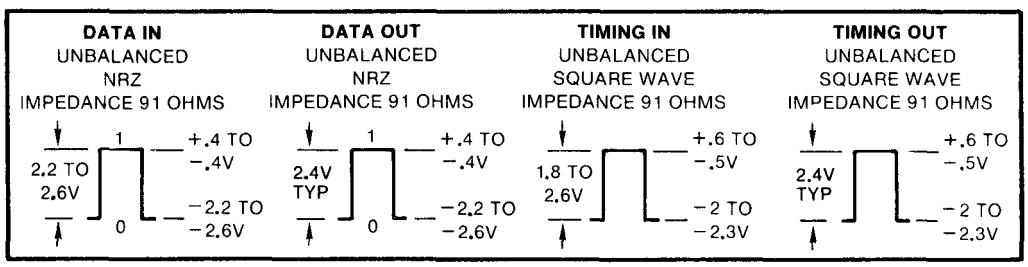
1-14. **EQUIPMENT DATA** (cont)

Internal Data Rate

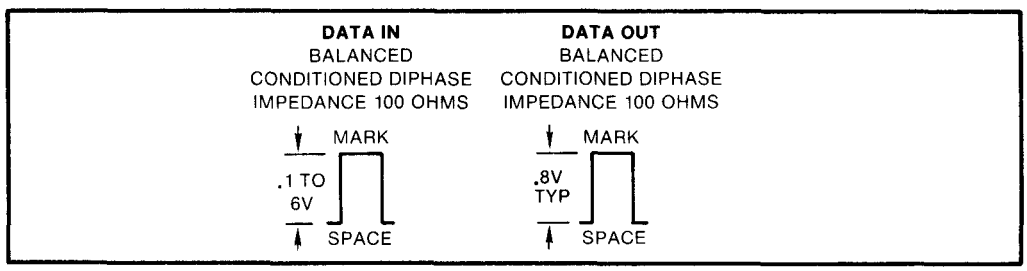
Internal data rate (MASTER position of TIMING switch) is set by the 21-position DATA RATE switch. This switch is grouped into three families (576, .6-32, and 128-4608). Each family uses a different type of connector.



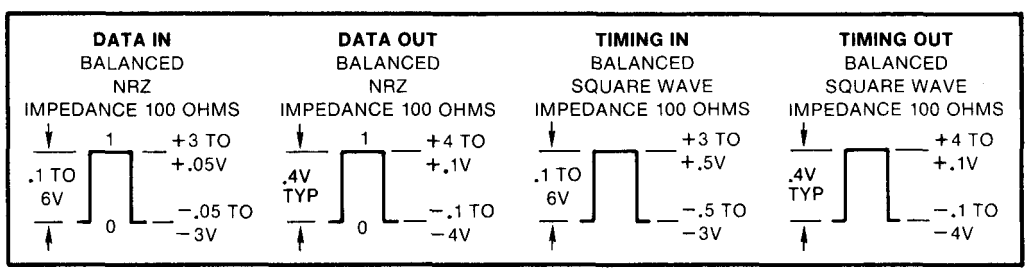
576 Family: Data rate 576 kb/s.



.6-32 Family: Data rate 0.6, 1.2, 2.4, 4.8, 9.6, 16, and 32 kb/s.



128-4608 Family: Data rate 128, 144, 256, 288, 512, 576, 1024, 1152, 1536, 2048, 2304, 4096, and 4608 kb/s.



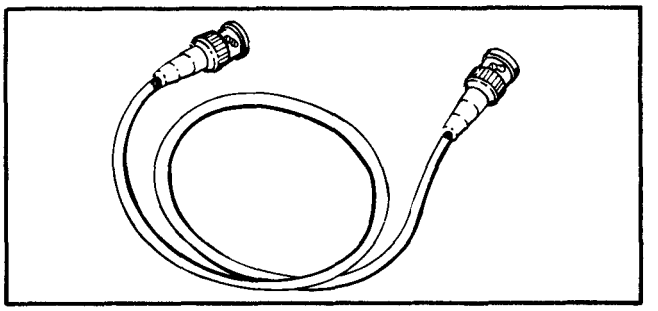
External Data Rate

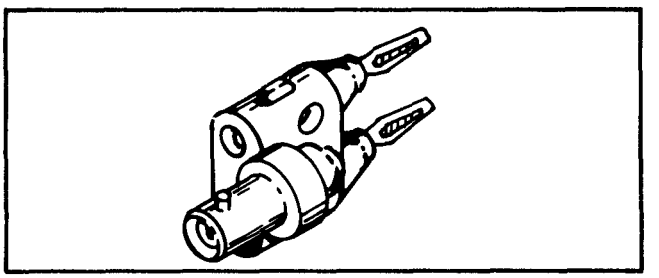
External data rate (LOOPED or STA CLK position of TIMING switch) is set by frequency of external signal. Input and output characteristics are those of the 128-4608 family (balanced NRZ). Any frequency from 2 kHz thru 4915.2 kHz can be applied; in particular 2 kHz, 16 kHz, and 4915.2 kHz.

The 2 kHz and 16 kHz inputs can be applied to either the BALANCED TMG IN connector (TIMING set to LOOPED) or STA CLOCK connector (TIMING set to STA CLK). The 4915.2 kHz input can only be applied to the STA CLOCK connector (TIMING set to STA CLK).

1-14. **EQUIPMENT** DATA (cont)

Input/Output Protection	All inputs and outputs can be connected to one another without damage and are protected against short circuits and open circuits. NRZ inputs and outputs are protected against dc overvoltage of 5 V from line-to-ground. Diphase inputs and outputs are protected against overvoltages of 56 V from line-to-ground, and transients from line-to-ground of +1 kV for 10 µs and +350 V for 2 ms.
Error Indications	Total Errors: 7-digit display indicates total errors detected, can be reset to zero by RESET DISPLAY pushbutton.
	Bit Error Rate (BER): Three indicators:
	NO GO l . . . . BER equal to or greater than 1 error per 1000 bits (10-3).
	MARGINAL . . BER less than 1 error per 1000 (10^{3}) and equal to or greater than 1 error per 100,000 (10^{-5}).
	GO . . . . . BER less than 1 error per 100,000 (10^{-5}).
Alarms	Power Supply: POWER SUPPLY indicator lights when built-in test equipment detects a fault on a power supply card.
	Logic: FAULT indicator lights when built-in test equipment detects a fault on a power supply card or a logic card.
BNC Cables	Four 4-foot cables with BNC connector on each end are supplied in the front cover.
BNC Adapters	Four double-banana plug-to-BNC adapters are supplied in the cover.

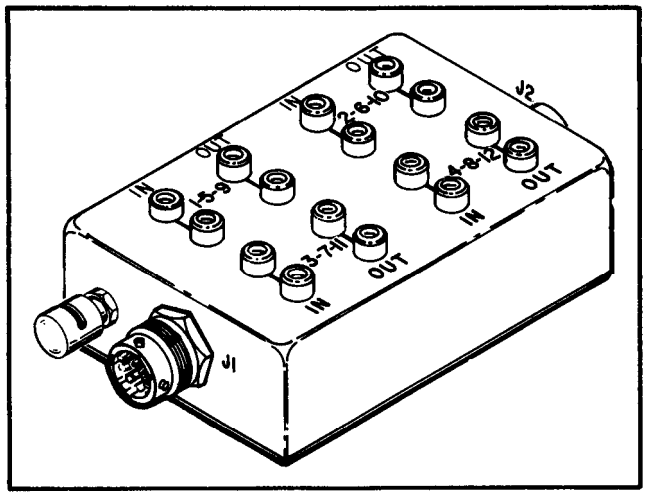




1-14. **EQUIPMENT DATA** (cont)

Interface Box

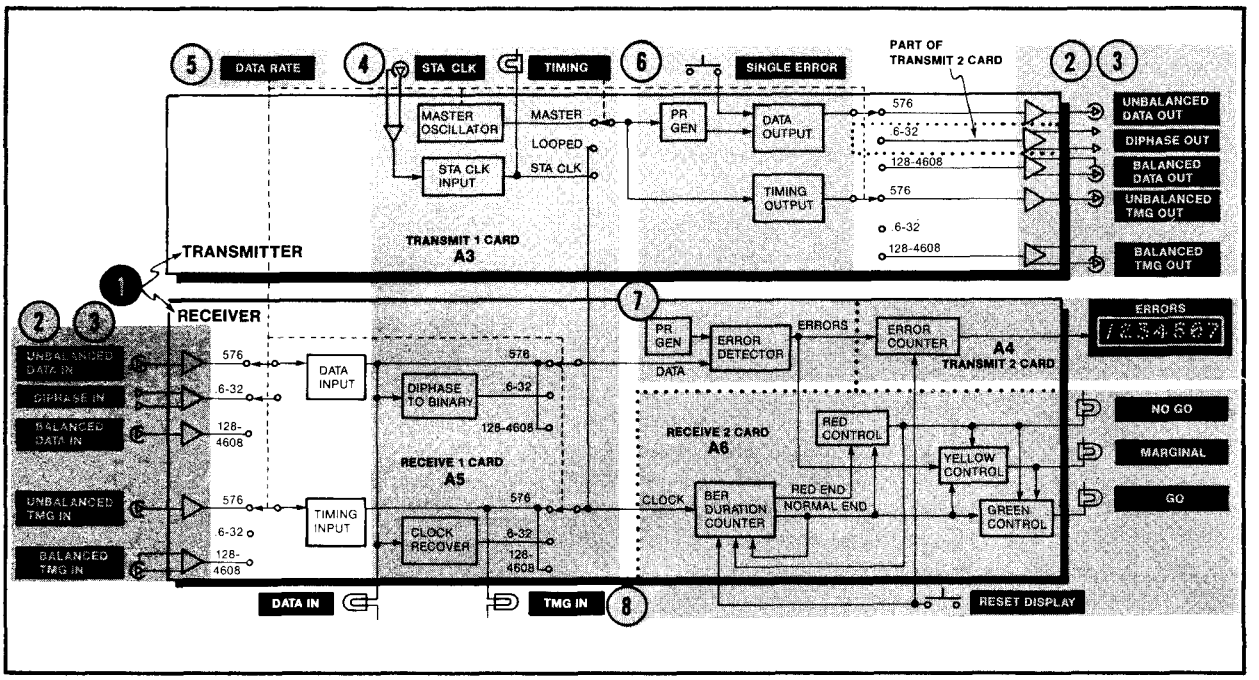
An interface box is supplied in the cover. This box allows access to both sides of the inputs and outputs of four channels wired into multipin connectors. Each side is brought out to a banana jack on the top of the box. These banana jacks are spaced on 3/4-inch centers the same as the combination binding post/ banana jacks used on the front panel and will accept the double-banana-plug-BNC adapters supplied.



Section III

TECHNICAL PRINCIPLES OF OPERATION

1-15. OVERVIEW

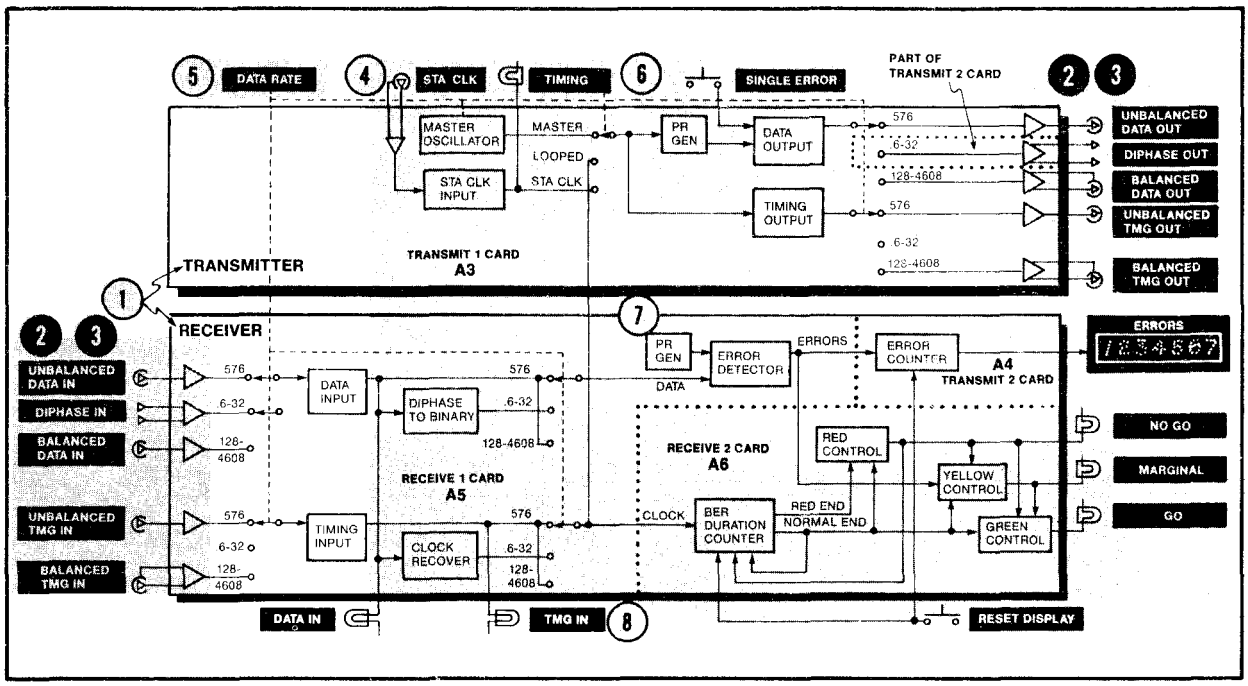


1 **Transmitter/ Receiver** The SG-1139 consists of two functional sections, a transmitter and a receiver. The transmitter generates a test pattern that is applied to the input of the path under test. The receiver accepts the test pattern from the output of the path and detects and counts any errors that may have occurred.

The transmitter and receiver each consist of two replaceable circuit card assemblies (Transmit 1 and 2, Receive 1 and 2).

A power supply is also included and consists of two replaceable circuit card assemblies (Multi VDC which provides +5, -5, +12, and -12 dc voltages and AC Input which provides ac rectification and fault summation).

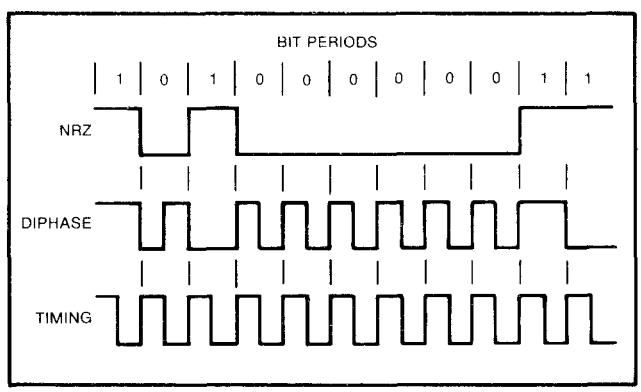
1-16. INPUT/OUTPUT



2 Data and Timing

The SG-1139 transmits and receives data signals with two types of coding (NRZ and diphase) plus a timing signal that is used for synchronization with NRZ coded data signals. The NRZ signals can be balanced or unbalanced. Balanced outputs/inputs use two wires and the signal amplitude is referenced (measured) from one wire to the other. Unbalanced outputs/inputs use one wire and the signal amplitude is referenced from that wire to ground (chassis).

NRZ: A logic 1 is a high level and a logic 0 is a low level.



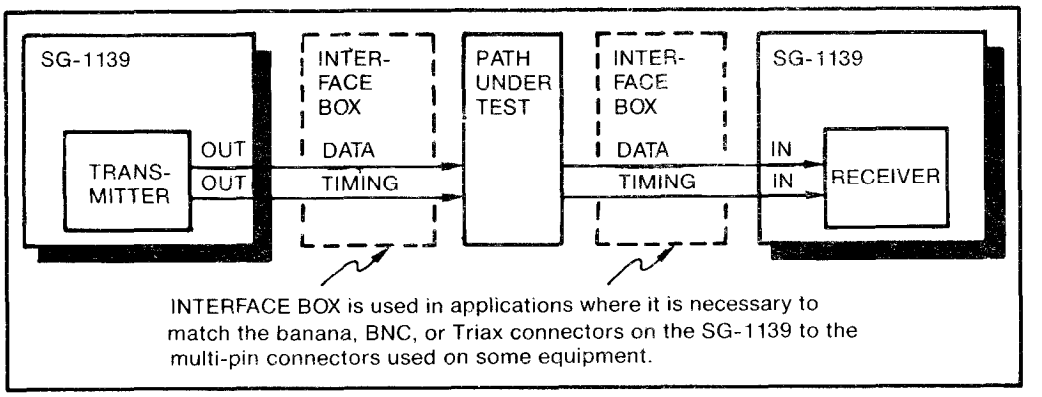
Diphase: A transition occurs at the start of every bit period. A logic 0 is a second transition one-half bit period later.

Timing: A square wave in which the same type of transition (low-to-high as shown) occurs at the start of every bit period.

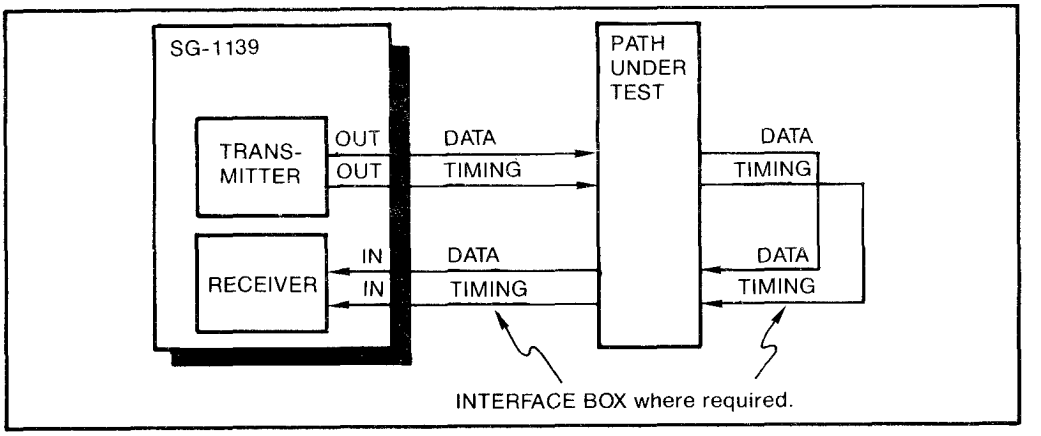
1-16. **INPUT/OUTPUT** (cont)

❸ Connections

The SG-1139 can be connected to the unit under test in one of two basic configurations, end-to-end or loopback.

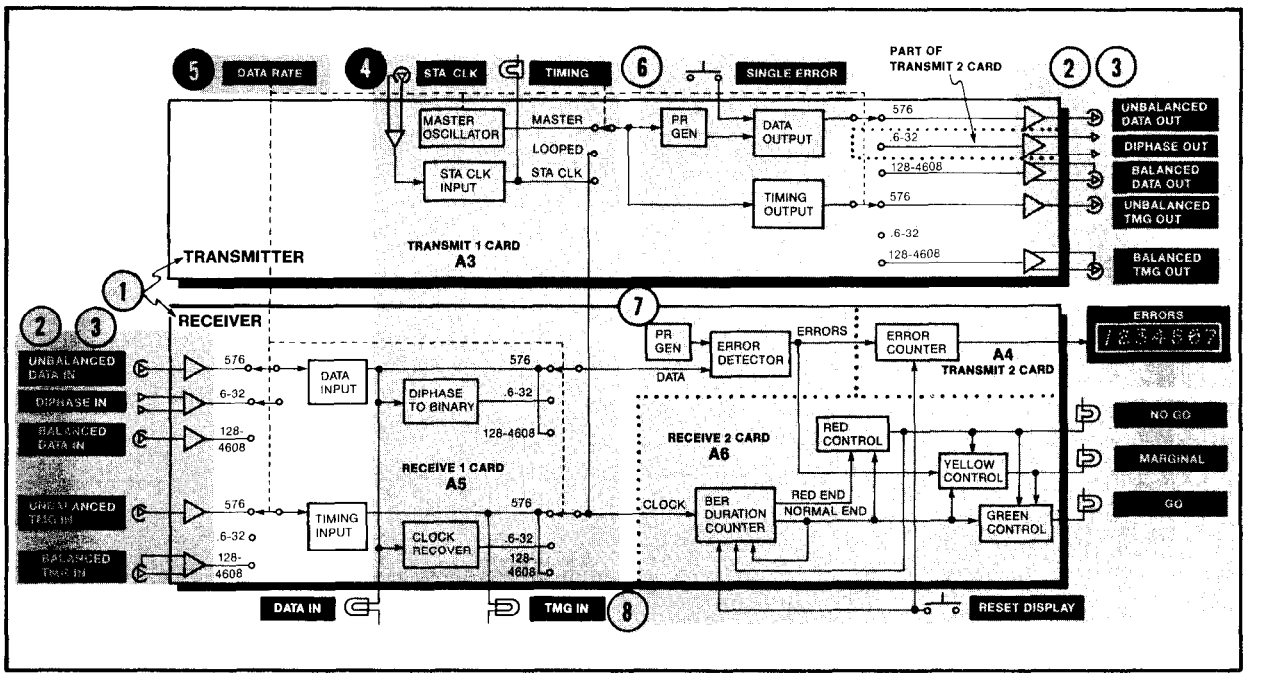


End-to-End: The data output (and timing output if NRZ data signals are used) from the transmitter is connected to the input of the path under test. The output from the path is connected to the input of the receiver.



Loopback: The data output (and timing output if NRZ data signals are used) from the transmitter is connected to the input of one-half of one channel of the path under test. The output from that half is connected to the input of the other half (looped back). The output of the second half is connected to the input of the receiver.

1-16. **INPUT/OUTPUT** (cont)



4 Timing

A TIMING switch allows the action of the SG-1139 to be initiated from one of three sources depending on the setting.

In MASTER, the action is initiated by the internal Master Oscillater whose output rate is set by the DATA RATE switch.

In LOOPED, the action is initiated by the looped clock, which is a signal derived from the signals applied to the receiver input, via the Clock Recover circuit.

In STA CLK, the action is initiated by an external signal (station clock), which is a part of the transmission equip ment and is applied to the SG-1139 STA CLK input.

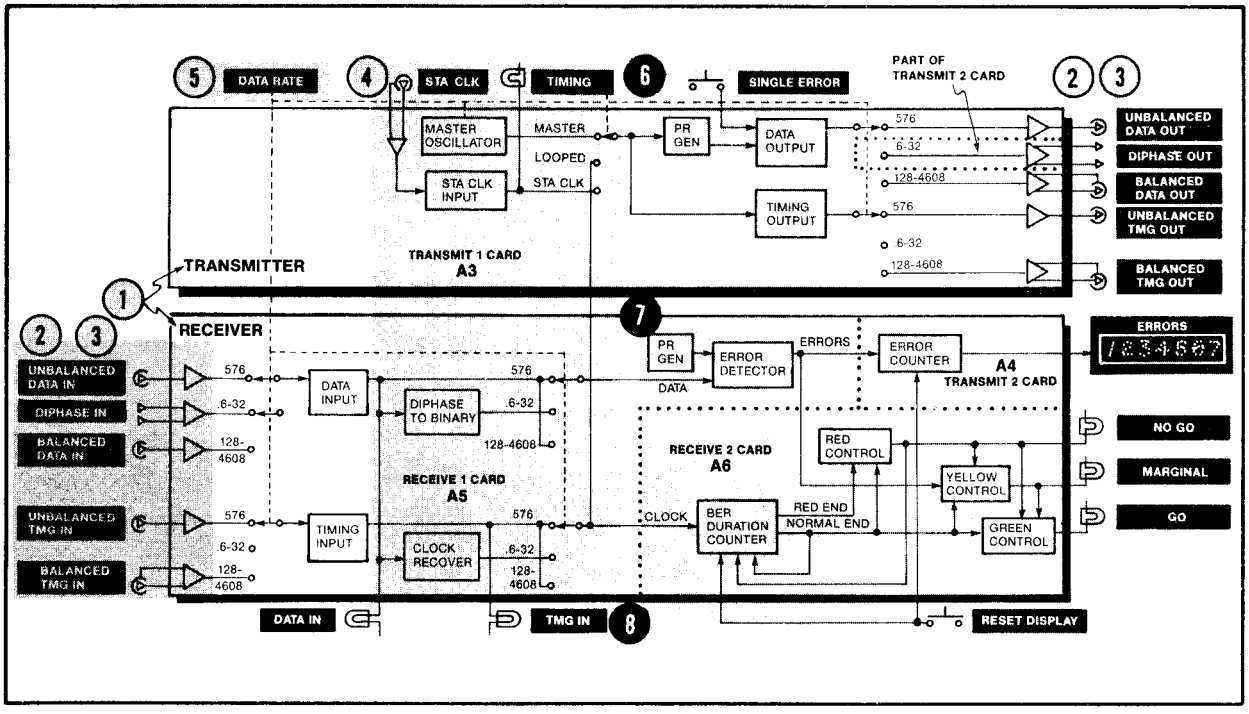
1-16. **INPUT/OUTPUT** (cont)

5 Data Rate

The DATA RATE switch selects the output rate of the Master Oscillator and therefore selects the rate at which both the transmitter and receiver will operate. It also automatically selects type of data and timing inputs/outputs for which the SG-1139 is set. These are grouped by rate into three data rate families (576, .6-32, and 128-4608 kb/s). Unused inputs/outputs are inhibited (not allowed to operate). For example, if the DATA RATE is set to 9.6, it selects the .6-32 family. The DIPHASE IN to the receiver and the DIPHASE OUT from the transmitter are enabled (allowed to operate). All other data and timing inputs/outputs are inhibited.

DATA RATE	DATA IN/OUT	TIMING IN/OUT
576 FAMILY:		
576	Unbalanced NRZ	Unbalanced
.6-32 FAMILY:		
.6	Diphase	not required
1.2	Diphase	not required
2.4	Diphase	not required
4.8	Diphase	not required
9.6	Diphase	not required
16	Diphase	not required
32	Diphase	not required
128-4608 FAMILY:		
128	Balanced NRZ	Balanced
144	Balanced NRZ	Balanced
256	Balanced NRZ	Balanced
288	Balanced NRZ	Balanced
512	Balanced NRZ	Balanced
576	Balanced NRZ	Balanced
1024	Balanced NRZ	Balanced
1152	Balanced NRZ	Balanced
1536	Balanced NRZ	Balanced
2048	Balanced NRZ	Balanced
2304	Balanced NRZ	Balanced
4096	Balanced NRZ	Balanced
4608	Balanced NRZ	Balanced

1-17. PATTERN GENERATION



6 PR Gen and Single Error

The data output from the transmitter is produced by a PR (pseudorandom) Generator. This type of generator produces a signal that is random enough to approximate real data (real data is totally random; that is, it is never known whether the next bit will be a logic 1 or a logic 0) yet repeats itself in such a manner that a test circuit can determine whether the received bit is supposed to be a logic 1 or a logic 0. In the SG-1139 the pattern repeats every 2^{15}-1 bits or 32,768-1 = 32,767 bits.

A SINGLE ERROR pushbutton introduces a single error in the Data Output pattern each time it is pressed.

1-18. ERROR DETECTION

7 Error

A second PR Generator is used in the receiver. It is identical to the one used in the transmitter and its output is applied to one input of the Error Detector. The second input to the detector is the Data Input from the path under test via the receiver input circuits. A circuit in the detector compares the data it is supposed to have (from the second PR Generator) to that which it is actually receiving from the input circuits. Any difference is an error. The errors are counted by the Error Counter and displayed on the 7-digit ERROR display (up to 9,999,999). This counter and the display are reset to zero when power is first applied, when the proper data input (and timing, if required) is first applied, or when the RESET button is pushed.

1-18. ERROR DETECTION (cont)

8 BER Indicators

GO BER: A BER Duration Counter counts the number of clock pulses, which represent the number of data bits received, After it has counted 1,000,000 clock pulses (200,000) for the .6-32 data rate family) it produces a Normal End pulse. This pulse initiates the action of the Green Control circuit which lights the green GO lamp, indicating the bit error rate was less than 10 per million (1 per 100,000). The Normal End pulse also resets to zero the BER Duration Counter and the counters in the the Yellow and Red Control circuits.

NO GO BER: The errors from the Error Detector are also applied to a counter in the Yellow and Red Control circuits. After the BER Duration Counter has counted 100,000 clock pulses (10,000 for the .6-32 data rate family) it produces a Red End pulse. This pulse resets the counter in the Red Control circuit to zero. If, before being reset, the counter reaches a count of 100 (10 for the .6-32 data rate family) the Red Control circuit lights the red NO GO lamp, indicating the bit error rate was equal to or greater than 100 per 100,000. The output from the Red Control circuit also inhibits the operation of the Yellow and Green Control circuits and resets the BER Duration Counter to zero.

MARGINAL BER: If the counter in the Yellow Control circuit reaches a count of 10 (2 for the .6-32 data rate family), the Yellow Control circuit lights the yellow MARGINAL lamp, indicating the bit error rate was equal to or greater than 10 per million (1 per 100,000). The output from the Yellow Control circuit also inhibits (prevents the operation of) the Green Control circuit.

Summary: Although the normal BER duration is fixed at 1 million bits (200,000 for the .6-32 data rate family) the actual time it takes to count these bits depends on the DATA RATE setting.

DATE RATE FAMILY	YELLOW CONTROL			RED CONTROL		
	BITS	TIME	COUNT	BITS	TIME	COUNT
576	1,000,000	1.7s	10	100,000	.17s	100
.6–32	200,000	5.6m to 6.3s	2	10,000	34s to .63s	10
128–4608	1,000,000	7.8s to .2s	10	100,000	.78s to .02s	100

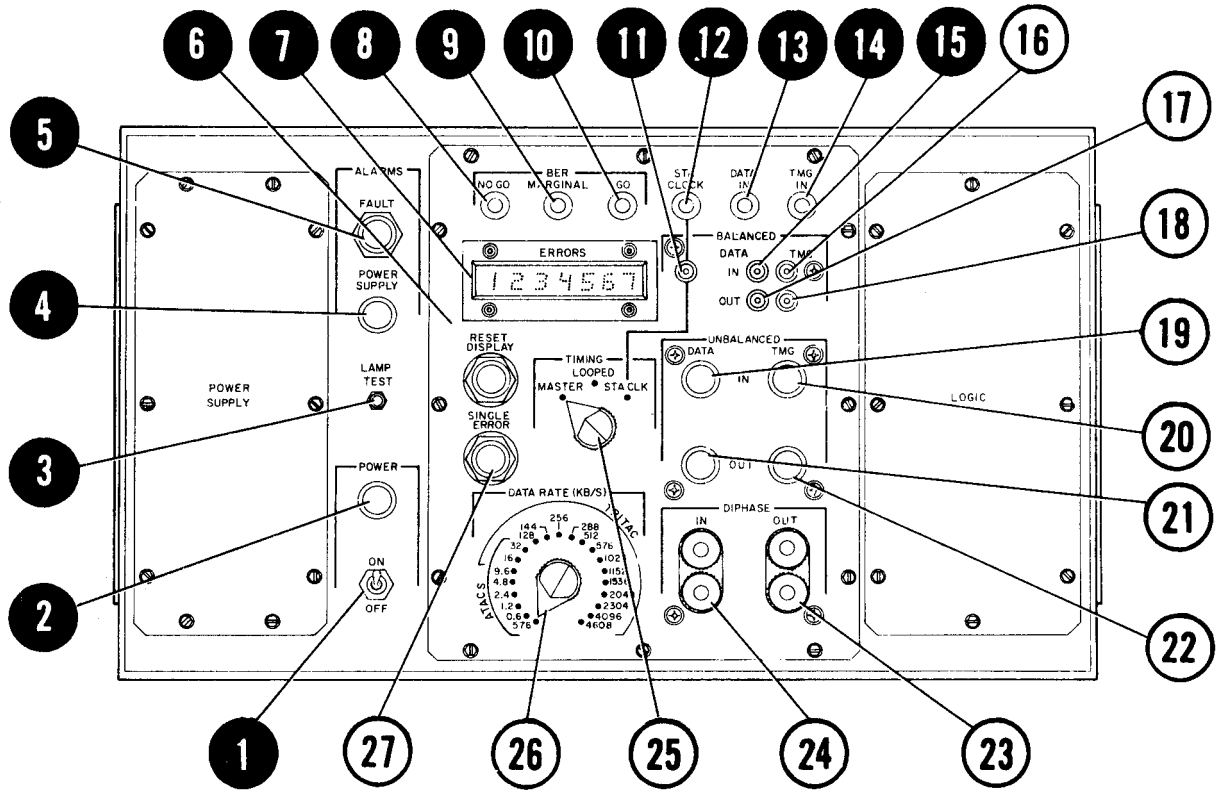
Chapter 2
OPERATING INSTRUCTIONS

CHAPTER CONTENTS Page

Section I

DESCRIPTION OF CONTROLS AND INDICATORS

2-1. FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS

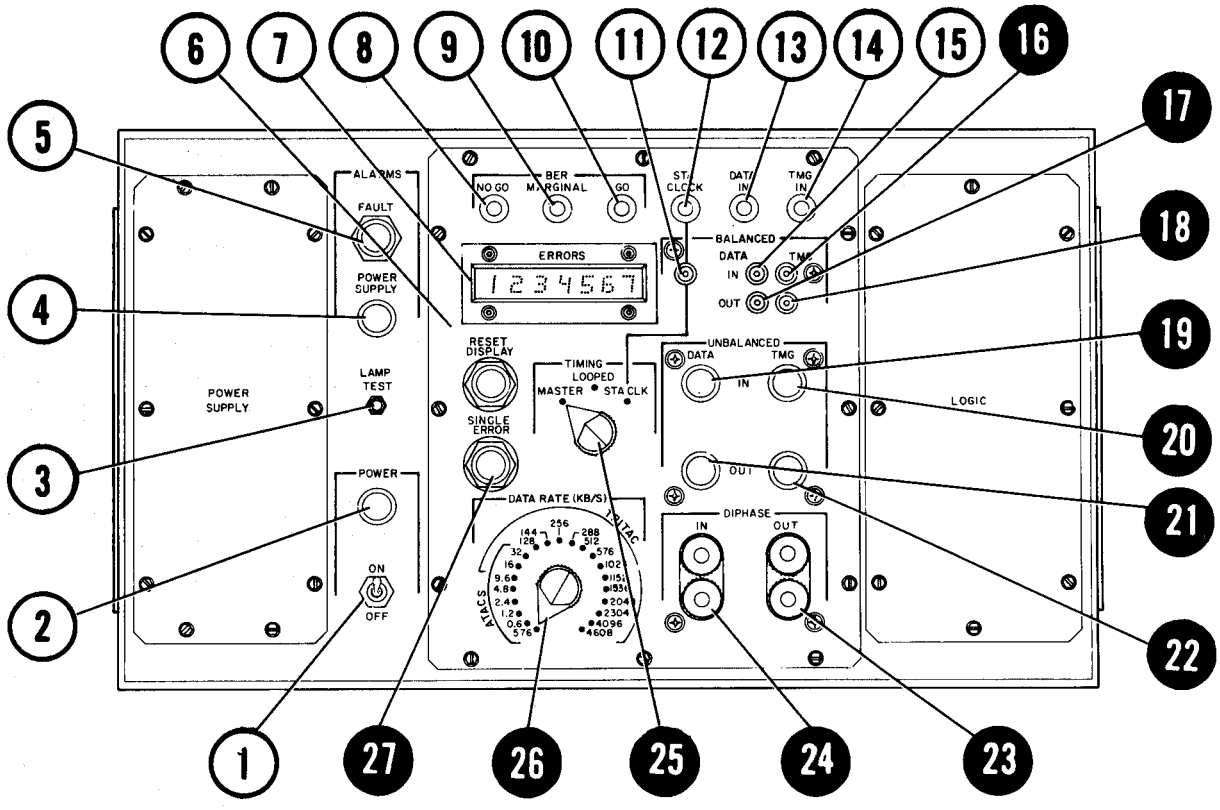


	Name	Type	Function
1	ON-OFF	Toggle switch/ circuit breaker	Turns on SG-1139 and starts error measurement. Trips off automatically if overload occurs.
2	POWER	Green indicator	Lights when ON-OFF switch is set to ON and power is applied to SG-1139.
3	LAMP TEST	Momentary pushbutton switch	When pressed, lights all indicators (except POWER) and sets all seven digits in ERRORS display to 8.
4	POWER SUPPLY	Red indicator	Lights, together with FAULT indicator, if any internal power supply card is defective.
5	FAULT	Red indicator	Lights if any internal power supply or logic card is defective, if timing and data cables are crossed, or if in LOOPED TIMING mode using loopback connections with 128-4608 DATA RATE settings.

2-1. **FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS** (cont)

	Name	Type	Function
6	RESET DISPLAY	Momentary pushbutton switch	When pressed, sets ERRORS display to zero and starts a new total errors measurement and a new bit-error-rate (BER) measurement.
7	ERRORS	7-digit display	Displays total errors detected in received data pattern.
8 9 10	BER	Three indicators	Indicate results of bit-error-rate measurement. Blink when power is first turned on, when input data and timing signals are first applied, or when the RESET DISPLAY button is pressed, to indicate BER measurement is not complete. BER measurement duration varies with DATA RATE setting from 0.02 seconds at highest rate of 4608 kb/s to 5.6 minutes at lowest rate of .6 kb/s.
8	NO GO	Red indicator	Lights when BER is excessive (1 or more errors per 1,000 bits).
9	MARGINAL	Yellow indicator	Lights when BER is marginal (from 1 error per 100,000 bits to just under 1 error per 1,000 bits).
10	GO	Green indicator	Lights when BER is acceptable (less than 1 error per 100,000 bits).
11	STA CLK	Triaxial connector	Provides connection for station clock input.
12	STA CLOCK	Green indicator	Lights when TIMING switch is set to STA CLK and a station clock signal is present at STA CLK input.
13	DATA IN	Green indicator	Lights when data signal, appropriate to the DATA-RATE family selected, is present at the proper DATA IN connector. Will not all light with a diphase signal of all zeros or ones.
14	TMG IN	Green indicator	Lights when timing signal, appropriate to the DATA-RATE family selected, is present at the proper TMG IN connector. A diphase data input will light the TMG IN indicator when the DATA RATE is set for the diphase family (.6-32 kb/s).
15	BALANCED DATA IN	Triaxial connector	Provides connection for balanced NRZ data input signal used with DATA-RATE family of 128-4608 kb/s.

2-1. **FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS** (cont)

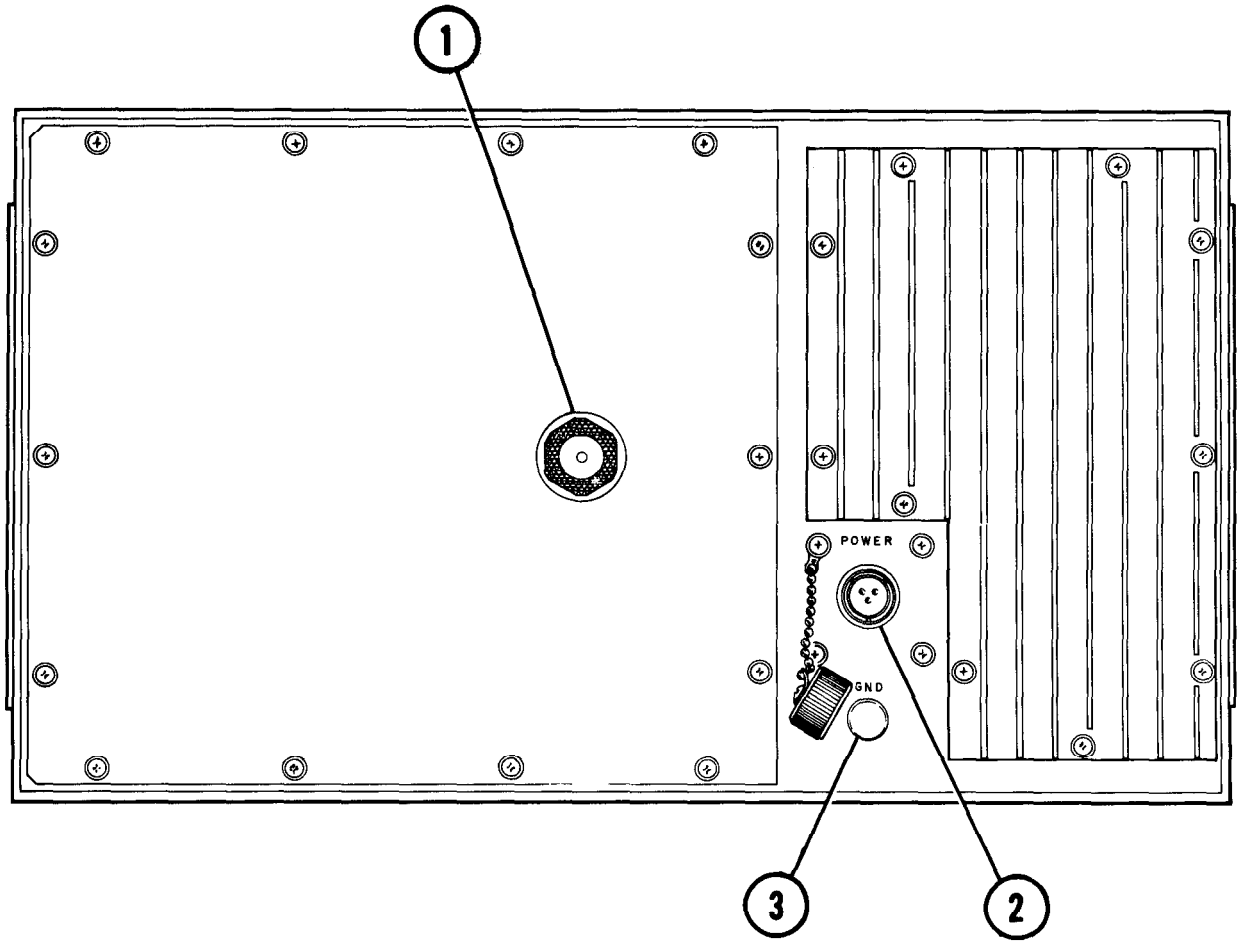


	Name	Type	Function
16	BALANCED TMG IN	Triaxial connector	Provides connection for balanced timing input signal required with BALANCED DATA IN signals.
17	BALANCED DATA OUT	Triaxial connector	Provides connection for balanced NRZ data output signal available with DATA-RATE family of 128-4608 kb/s.
18	BALANCED TMG OUT	Triaxial connector	Provides connection for balanced timing output signal required with BALANCED DATA OUT signals.
19	UNBALANCED DATA IN	BNC connector	Provides connection for unbalanced NRZ data input signal used with DATA-RATE family of 576 kb/s.
20	UNBALANCED TMG IN	BNC connector	Provides connection for unbalanced timing input signal required with UNBALANCED DATA IN signal.
21	UNBALANCED DATA OUT	BNC connector	Provides connection for unbalanced NRZ data output signal available with DATA-RATE family of 576 kb/s.

2-1. **FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS** (cont)

	Name	Type	Function
22	UNBALANCED TMG OUT	BNC connector	Provides connection for unbalanced timing output signal required with UNBALANCED DATA OUT signals.
23	DIPHASE OUT	Double banana jack/binding post	Provides connection for balanced conditioned diphase data output signal available with DATA-RATE family of .6-32 kb/s. Connectors accept banana plugs, field wire, or BNC banana adapters supplied.
24	DIPHASE IN	Double banana jack/binding post	Provides connection for balanced conditioned diphase data input signal used with DATARATE family of .6-32 kb/s. Connectors accept banana plugs, field wire, or BNC banana adapters supplied.
25	TIMING	3-position rotary switch	Selects source of signal that initiates action of the SG-1139 as follows: MASTER Position: Action is initiated by an internal oscillator whose output rate is set by the DATA RATE control. LOOPED Position: Action is initiated by a signal derived from the signals applied to the UNBALANCED TMG IN, DIPHASE IN, or BALANCED TMG IN, depending on the DATA-RATE family selected. STA CLK Position: Action is initiated by an external signal, such as station clock, applied to the STA CLK input.
26	DATA RATE (kb/s)	21-position rotary switch	Selects rate at which both receiver (inputs) and transmitter (outputs) operate. There are 20 different rates, divided into three families (576 kb/s is common to two families). Data and timing inputs and outputs are allowed to operate for only one family at a time, the inputs and outputs for the unused families are not allowed to operate. The data rate also determines the time required for the BER measurements.
27	SINGLE ERROR	Pushbutton switch	When pushed, inserts a single error into data output signal.

2-2. REAR PANEL CONTROLS AND CONNECTORS



	Name	Type	Function
1	Pressure Relief	Air valve	Automatically equalizes air pressure inside the SG-1139 with that outside. May also be manually operated by means of pushbutton in the center. This prevents structural damage to the SG-1139 when changing altitude, such as during air transport.
2	POWER	3-pin connector	Provides connection for 115-Vac primary line power. Accepts power cable assembly supplied.
3	GND	Spring-loaded connector	Provides connection for heavy gage copper ground wire (not supplied).

Section II

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

No operator Preventive Maintenance Checks and Services (PMCS) are authorized. Organizational PMCS is contained in paragraph 3-10.

Section III

OPERATION UNDER USUAL CONDITIONS

2-3. PREPARATION FOR USE

For service upon receipt, including site and shelter requirements, unpacking, front cover removal, checking unpacked equipment, and installation instruction refer to paragraphs 3-4 thru 3-9.

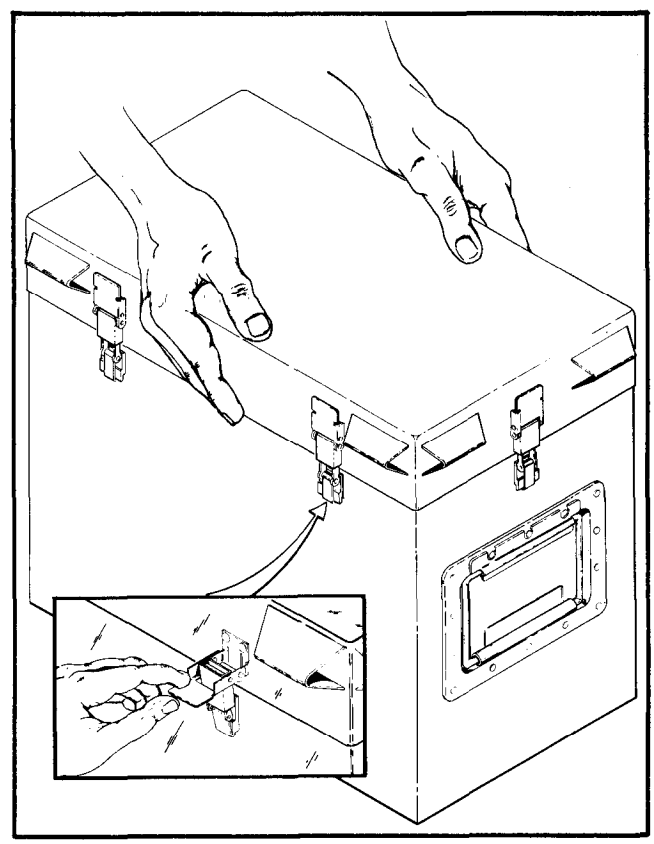
HEAVY EQUIPMENT

This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

To prepare for use, proceed as follows:

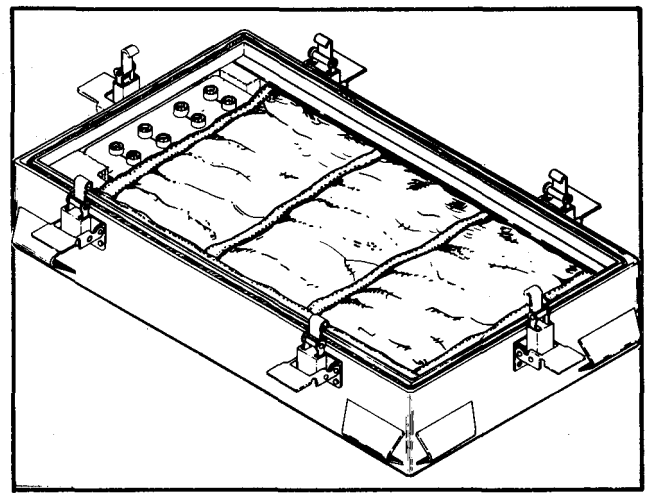
Cover Removal

- Disengage each of the six hasps that secure front cover to the SG-1139.



2-3. **PREPARATION FOR USE** (cont)

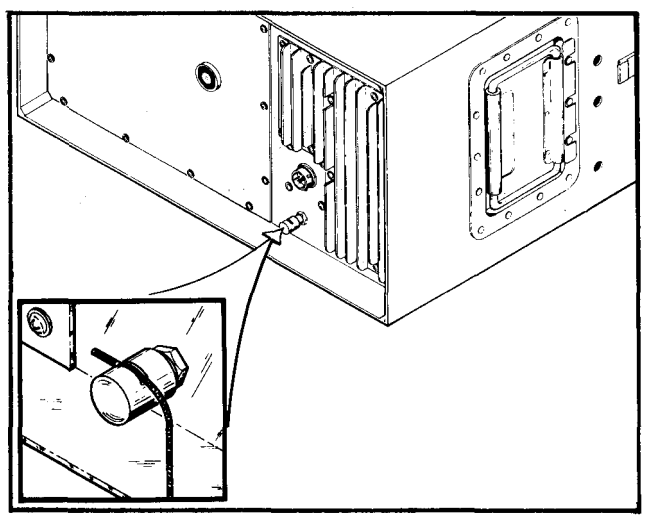
- Remove front cover.



Ground Connection

- Press in cap on GND lug to expose internal slot.
- Place heavy gage ground wire (not supplied) in slot and release pressure on cap.

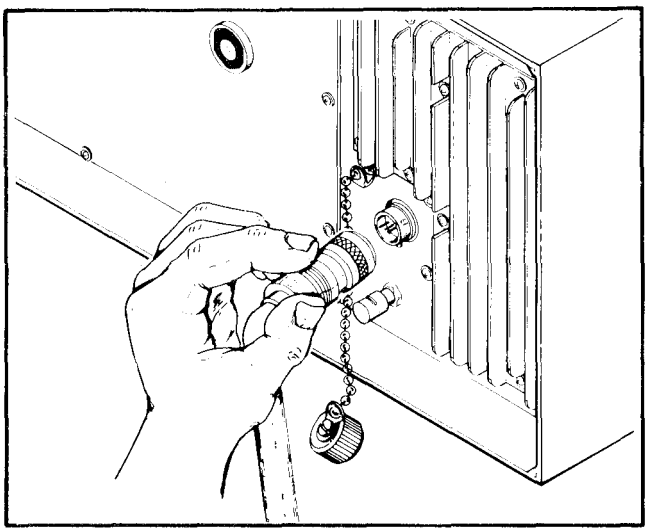
  Connect other end of wire to suitable ground. In the shelter this ground can be an equipment rack. Outside the shelter this ground can be the equipment under test.



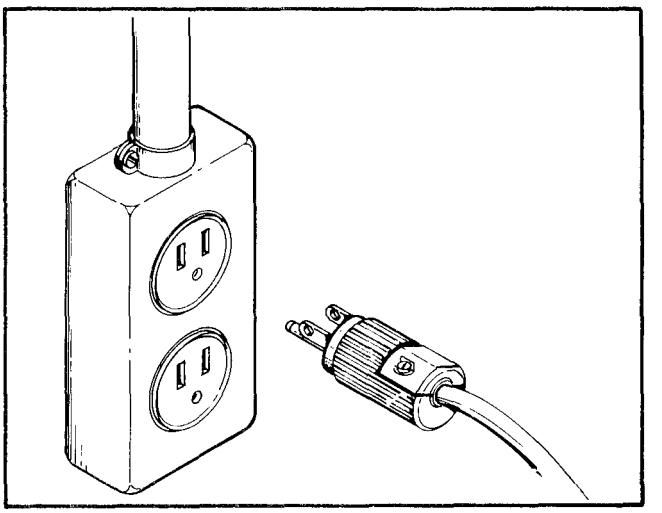
2-3. **PREPARATION FOR USE** (cont)

Power Connection

- Remove power cable from cover.
- Connect power cable to POWER input connector. Turn clockwise to secure.



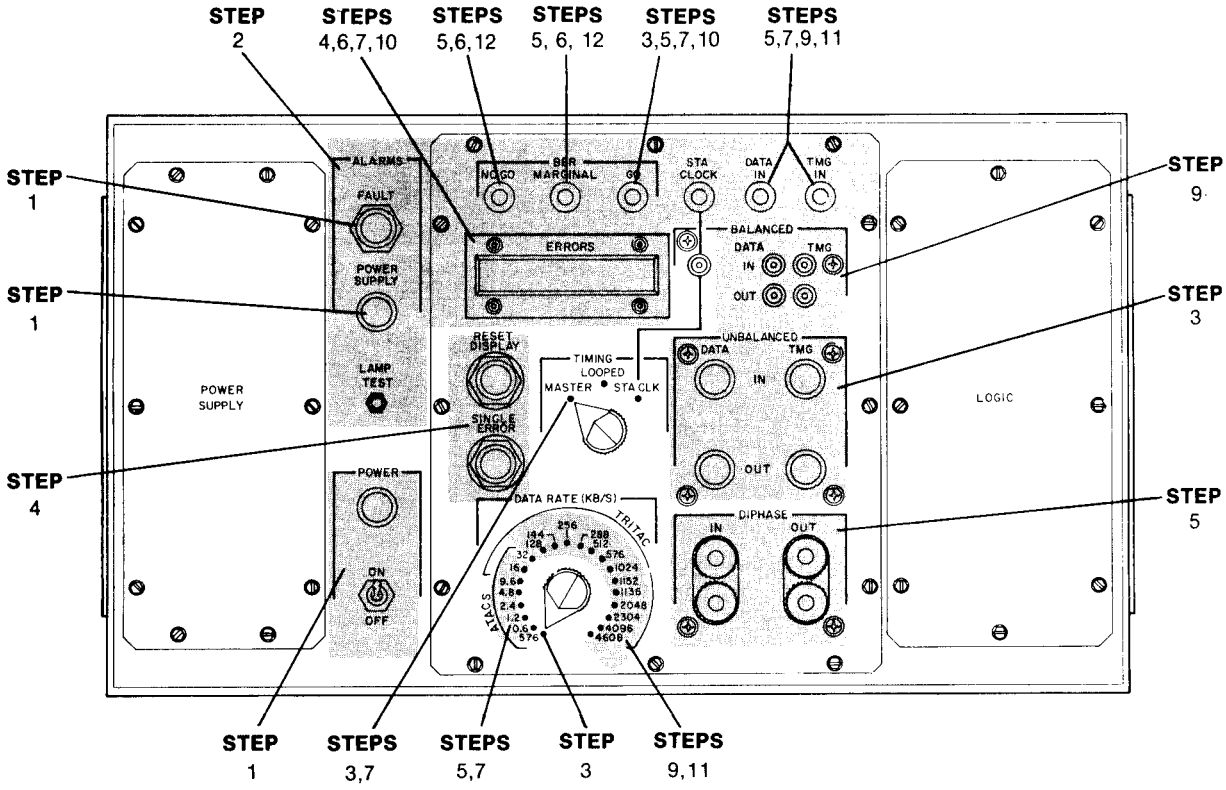
- Connect, other end of power cable to a 115-volt power source.



2-4. SELF-TEST

Purpose — To ensure proper operation of the SG-1139.

Coverage — All circuits are checked except the STA CLK indicator and STA CLK input circuits and the LOOPED and STA CLK positions of the TIMING control.



Failures — If the indications are improper for any step, recheck control settings and connections (especially check that TIMING is set to MASTER and that data and timing cables are not crossed). If indications are still improper, a failure is indicated; refer to paragraph 3-11, Troubleshooting Procedure.

Indicators — Indicators are illustrated as follows:

White (blank) . . . Not lit or can be ignored

Half black . . . . . Blinking

Black . . . . . Lit

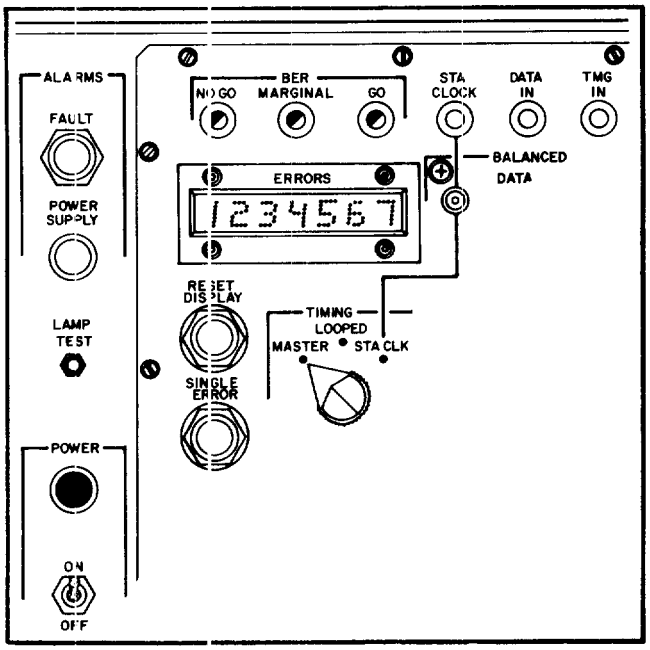
Equipment Required — Cables with triaxial connectors, 2 ea, first item, appendix D.

Cables with BNC connectors, 2 ea, supplied as accessories.

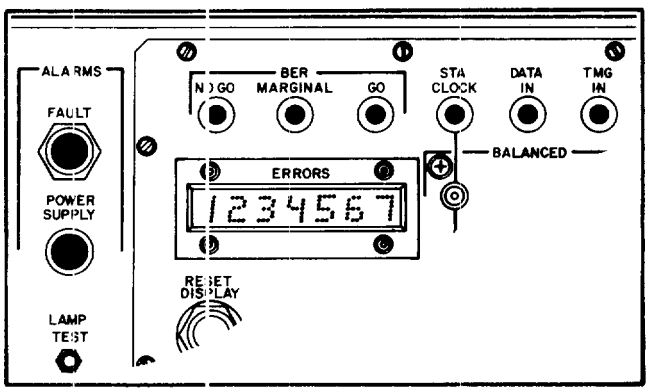
BNC adapters, 2 ea, supplied as accessories.

2-4. **SELF-TEST** (cont)

Step	Power
1	Ž Connect SG-1139 to ac line and set POWER to ON: Green POWER indicator must light. Red POWER SUPPLY and FAULT indicators must not light.

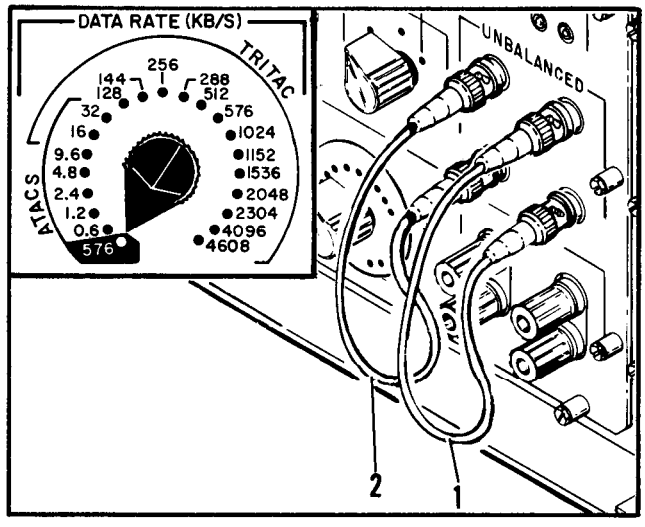


Step	Indicators
2	Ž Press and hold LAMP TEST pushbutton: All eight indicators must light. ERRORS display must read all 8s. Ž Release LAMP TEST pushbutton.

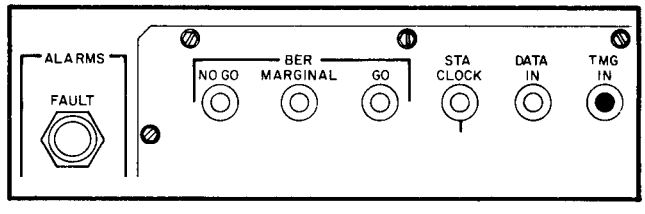


2-4. **SELF-TEST** (cont)

Step		
576 3	Data and Timing	● Set controls as follows: TIMING . . . . MASTER DATA RATE . 576 (ATACS) Use BNC cable (1) to connect UNBALANCED TMG OUT to UNBALANCED TMG IN:

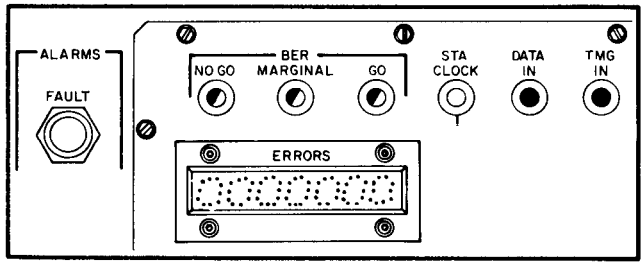


Green TMG IN indicator must light.

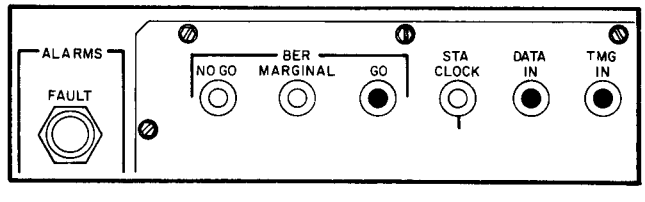


● Use BNC cable (2) to connect UNBALANCED DATA OUT to UNBALANCED DATA IN:

Green DATA IN indicator must light and BER indicators must blink. FAULT indicator must <u>not</u> light.



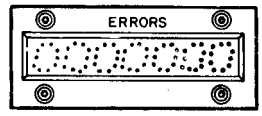
After 1 to 2 seconds, BER indicators must stop blinking and green GO indicator must light.



2-4. SELF-TEST (cont)

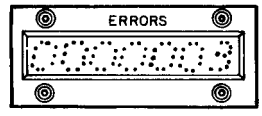
Step 4 — 576 Error Detection

- Press RESET DISPLAY:



ERRORS display must read 0.

- Press SINGLE ERROR several times:



ERRORS display must advance one count each time SINGLE ERROR is pressed.

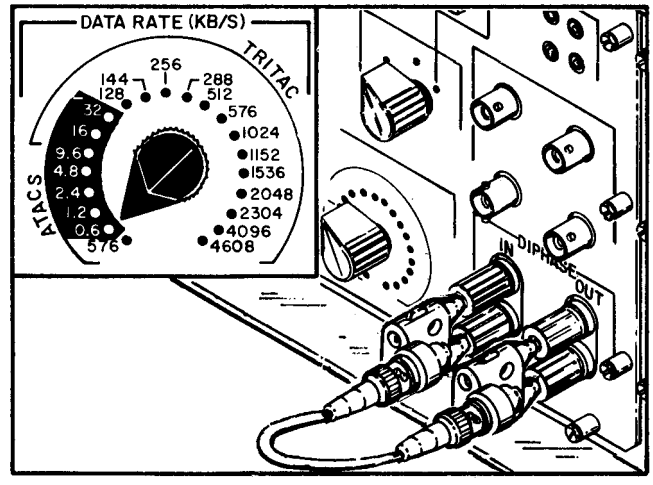
- Disconnect cables from UNBALANCED DATA OUT and DATA IN and TMG OUT and TMG IN.

Step 5 — .6-32 Data and Timing

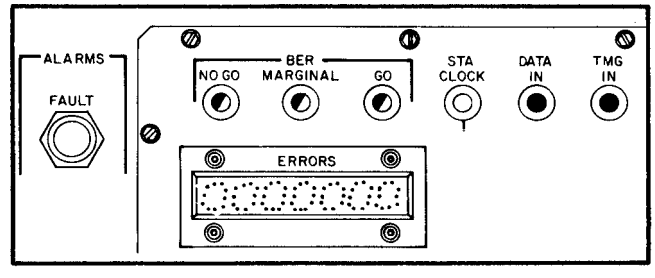
- Set controls as follows:

TIMING . . . . MASTER
DATA RATE . 0.6.

Use two BNC adapters and BNC cable to connect DIPHASE OUT to DIPHASE IN:



Green DATA IN and TMG IN indicators must light and BER indicators must blink. FAULT indicator must not be lit.

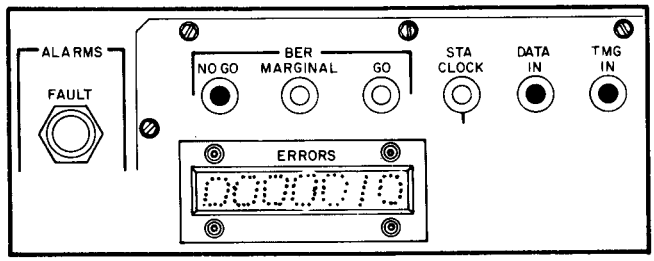


After 5 to 6 minutes, BER indicators will stop blinking and GO indicator will light. You need not wait for this, however, and may proceed immediately to next step.

2-4. **SELF-TEST** (cont)

Step 6 .6-32 No-Go Detection

- Press DISPLAY RESET, then press SINGLE ERROR rapidly 10 times (all presses must be done within 15 seconds).



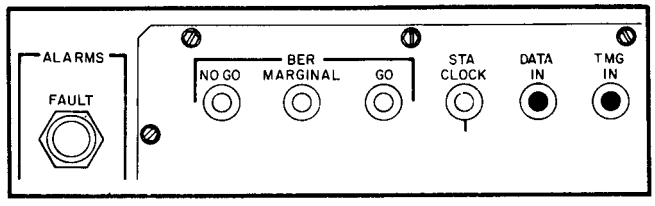
ERRORS display must read 10 and red NO GO indicator must light.

After 5 to 6 minutes, NO GO indicator will extinguish and GO indicator will light. You need not wait for this, however, and may proceed immediately to the next step.

Step 7 .6-32 Remaining Rates

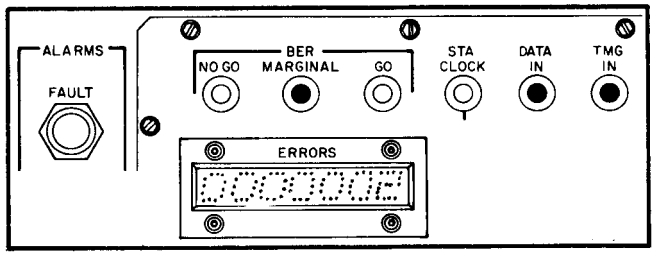
- Set DATA RATE to each of the remaining positions (1.2 thru 32):

At each position, DATA IN and TMG IN indicators must remain lit. FAULT indicator must <u>not</u> be lit.



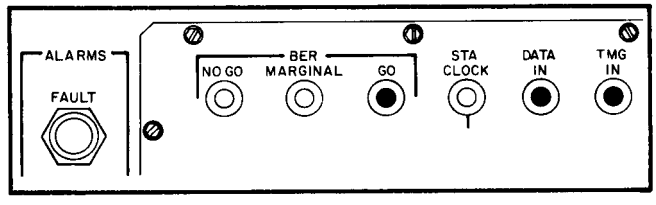
Step 8 .6-32 Marginal and GO Detection

- Keep DATA RATE at 32, press RESET DISPLAY and press SINGLE ERROR two times (all presses must be done within 5 seconds).



ERRORS display must read 2 and yellow MARGINAL indicator must light.

After 6 to 7 seconds, MARGINAL indicator must extinguish and GO indicator must then light.



- Disconnect cable and adapters from DIPHASE IN and DIPHASE OUT.

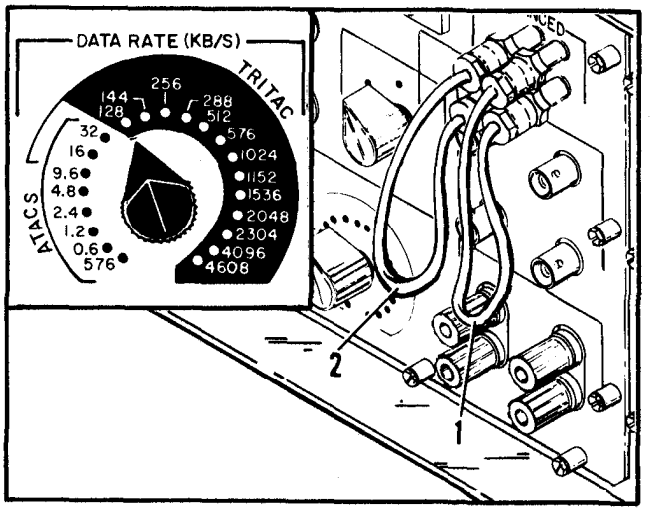
2-4. **SELF-TEST** (cont)

Step 9 — 128-4608 Data and Timing

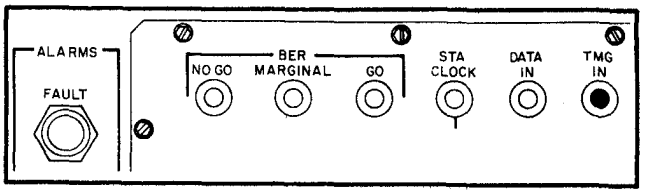
- Set controls as follows:

  TIMING . . . . MASTER
  DATA RATE . 128

  Use triaxial cable (1) to connect BALANCED TMG OUT to BALANCED TMG IN:

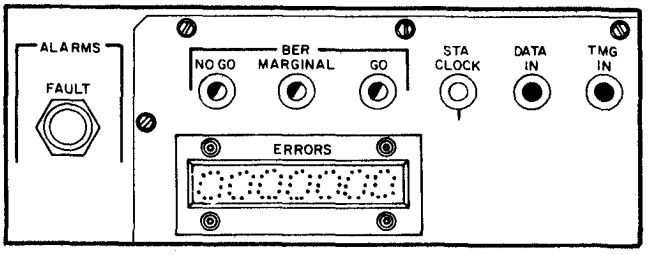


  Green TMG IN indicator must light.

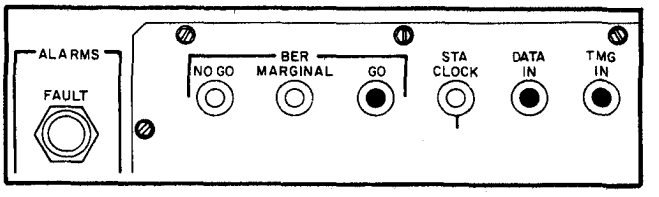


- Use triaxial cable (2) to connect BALANCED DATA OUT to BALANCED DATA IN:

  Green DATA IN indicator must light and BER indicators must blink. FAULT indicator must <u>not</u> light.



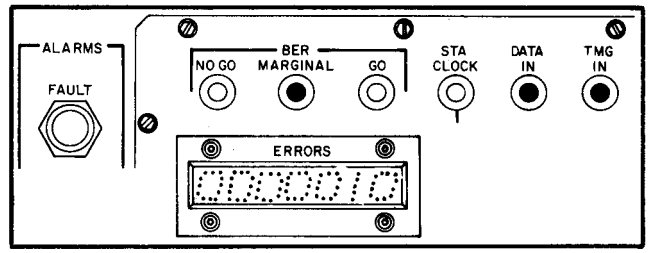
  After 7 to 8 seconds, BER indicators must stop blinking and GO indicator must light.



2-4. **SELF-TEST** (cont)

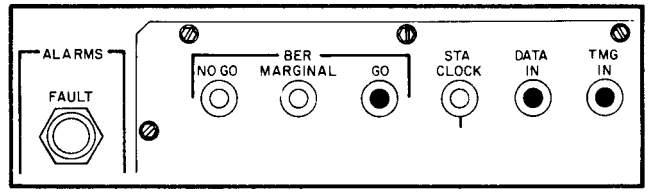
Step 10 128-4608 Marginal and Go Detection

- Press DISPLAY RESET then press SINGLE ERROR rapidly 10 times (all presses must be done within 6 seconds).



ERRORS display must read 10 and yellow MARGINAL indicator must light.

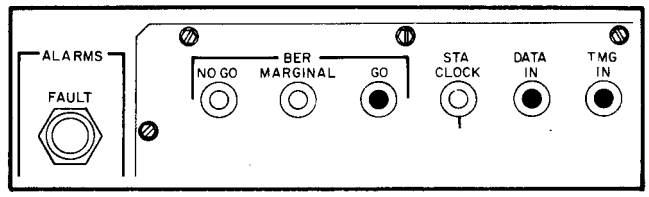
After 7 to 8 seconds, MARGINAL indicator must extinguish and GO indicator must then light.



Step 11 128-4608 Remaining Rates

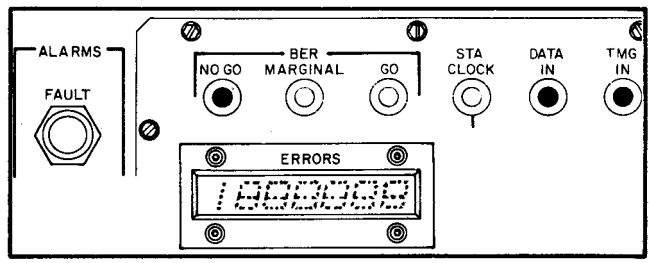
- Set DATA RATE to each of the remaining positions (144 thru 4608) :

At each position, DATA IN and TMG IN indicators must remain lit.



Step 12 128-4608 No-Go Detection

- Keep DATA RATE at 4608 and disconnect cable between BALANCED DATA IN and DATA OUT:



DATA IN indicator must extinguish, ERRORS display must advance count very rapidly, and NO GO indicator must light.

END

- Disconnect cable between BALANCED TMG IN and TMG OUT.

2-5. OVERVIEW OF TESTING

Require-ments

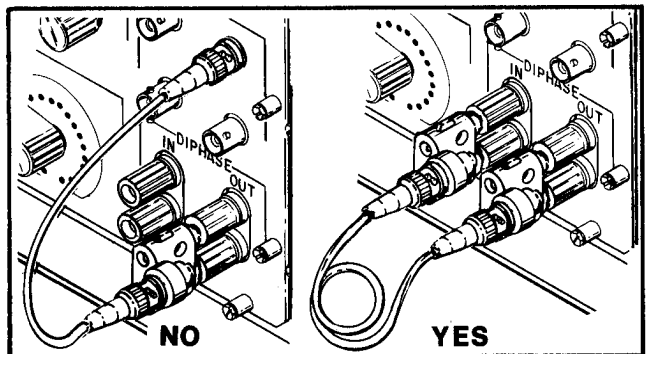
- The input data rate to the SG-1139 receiver must be the same as that from the transmitter.
- The input signal must be unframed. (Must contain only data bits. Must not contain overhead bits such as for synchronization, parity, etc.)
- All testing must be done off-line (the path must be taken out of service).
- A timing signal must be provided when testing with NRZ signals (data-rate families 576 and 128-4608).

SYSTEM	DATA RATE kb/s	DATA TYPE AND (CONNECTOR)	TIMING TYPE AND (CONNECTOR)	BIT ERROR RATE MEASUREMENT TIME NO GO	BIT ERROR RATE MEASUREMENT TIME MARGINAL AND GO
ATACS	**576 FAMILY:**				
	576	Unbalanced NRZ (BNC)	Unbalanced NRZ (BNC)	.2 s	1.7 s
	.6-32 FAMILY:				
	.6	Diphase (binding post/ banana jack)	Not required	16.7 s	5.6 m
	1.2			8.3 s	2.8 m
	2.4			4.2 s	1.4 m
	4.8			2.1 s	41.7 s
	9.6			1.0 s	20.8 s
	16			.6 s	12.5 s
	32			.3 s	6.3 s
TRI-TAC	**128-4608 FAMILY:**				
	2*			50 s	8.3 m
	16*			6.3 s	1.0 m
	128	Balanced NRZ (Triax)	Balanced NRZ (Triax)	.8 s	7.8 s
	144			.7 s	6.9 s
	256			.4 s	3.9 s
	288			.4 s	3.5 s
	512			.2 s	1.9 s
	576			.2 s	1.7 s
	1024			.1 s	1.0 s
	1152			.1 s	.9 s
	1536			.07s	.7 s
	2048			.05s	.5 s
	2304			.04s	.4 s
	4096			.02s	.2 s
	4608			.02s	.2 s
	4915.2*			.02s	.2 m

*External

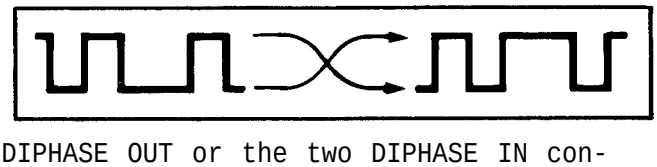
Diphase Connections

Do not connect DIPHASE signals to unbalanced connectors--they will not work properly.



When a BNC cable is connected to the DIPHASE banana jacks by means of a BNC adapter, the other end of the cable must be connected to another BNC adapter. Normally the other adapter is located on the other DIPHASE banana jacks or on the Interface Box. The other end of the cable must not be connected to a panel-mounted BNC connector, including one on the SG-1139. Panel-mounted BNC connectors are always unbalanced (single ended).

Diphase Polarity

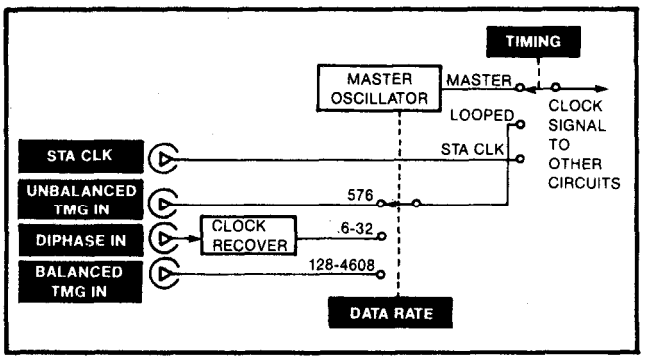


Conditioned diphase signals work properly normal or inverted. It makes no difference how the two DIPHASE OUT or the two DIPHASE IN connectors are connected to the input or output of the path under test as long as they are balanced inputs/outputs. It also makes no difference how the BNC adapters are connected.

2-5. **OVERVIEW OF TESTING** (cont)

Timing

MASTER : Master timing is the normal mode and is used for transmission paths in which the timing is asynchronous (not synchronized) and for which the ±10 ppm accuracy of the SG-1139 internal master oscillator is sufficient.



STA CLK: Station clock timing is used when the accuracy of the master oscillator is not sufficient for the path under test (such as with the AN/TRC-170(V) which requires ±0.1 ppm). This mode can also be used to check the station clock.

LOOPED: Looped timing is used in synchronous (synchronized) systems, such as TRI-TAC, in which the data source must be slaved to system timing. (Individual TRI-TAC equipments, divorced from the system, must use the master mode.)

2-5. OVERVIEW OF TESTING (cont)

Data Rates And Timing

RATE	DATA	SG-1139 CONTROL SETTING	
kb/S	IN/OUT	TIMING	DATA RATE
576 ATACS	Unbal NRZ	MASTER	Same as Rate
ATACS group can be tested.			
0.6 to 32	Diphase	MASTER	Same as Rate
ATACS channels can be tested.			
16 & 32	Diphase	LOOPED	Same as Rate
TRI-TAC channels can be tested.			
2* & 16*	Bal NRZ	LOOPED or STA CLK	128
TRI-TAC digital voice orderwire and digital orderwire channels can be tested.			
128 to 4608	Bal NRZ	Any	Same as Rate
TRI-TAC groups can be tested with equipments including MGM, GM, CDM, RM, and RLGMCD. Use MASTER timing to test data path and STA CLK timing (and input) to test station clock. **TRI-TAC groups** can be tested with equipments including AN/TRC-170(V) and unframed TGM groups. Use LOOPED timing to test TGM groups and AN/TRC-170(V). Use LOOPED or STA CLK timing (and input) to test station clock.			
4915.2*	Bal NRZ	STA CLK	128
Modems carrying ATACS super groups can be tested.			

*Timing at this frequency must be supplied by external input.

2-5. **OVERVIEW OF TESTING** (cont)

Errors

Errors fall into three general categories:

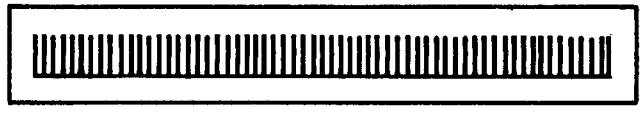
Intermittent: Errors that occur infrequently and at random intervals.

Intermittent errors usually are caused by events external to the equipment such as powerline transients, shock, or vibration. In some cases they may be due to poor connections in or to the equipment.

Burst: Errors that occur in groups.

Burst errors usually are caused by events external to the equipment such as sunspots or overflying aircraft.

Continuous: Errors that occur continuously.

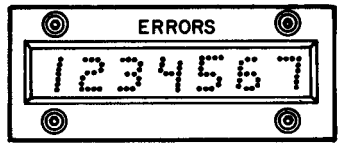


Continuous errors usually are caused by equipment malfunctions including bad or missing connections or improper antenna alinement.

Error Indications

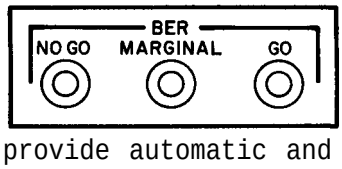
Two types of error indicators are provided:

ERRORS display: The ERRORS display is used primarily for adjustment or alinement procedures because the count advances immediately after an error is detected. The effects of any adjustment can be determined by watching the speed at which the count on the display changes.



The ERRORS display is a good way to detect burst errors and is the only way to detect intermittent errors because these errors never occur frequently enough to light the NO GO or MARGINAL BER indicators.

BER indicators: The BER indicators are used primarily to monitor a transmission path because they provide automatic and nearly continuous indications of the quality of the path.



Continuous errors are determined by a continuously lit NO GO or MARGINAL indicator. Burst errors are determined by indicators that may be NO GO one time, MARGINAL the next, or GO, etc.

2-5. OVERVIEW OF TESTING (cont)

Path Quality

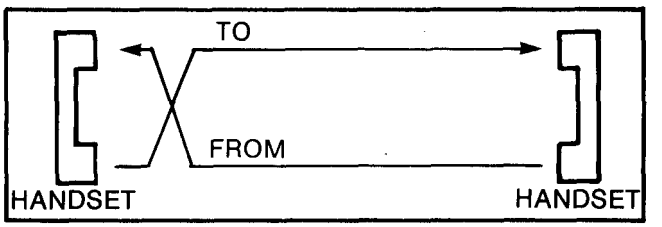
An acceptable path is indicated by a lit green GO BER indicator and by a zero, or near-zero, count on the ERRORS display. Intermittent errors are indicated by the count on the ERRORS display, which increases count by only one or two at infrequent intervals.

A marginal path is indicated by a lit yellow MARGINAL BER indicator and by a low count on the ERRORS display. Burst errors are indicated by the BER indicators, which may change from MARGINAL to NO GO to GO, to MARGINAL, etc. They are also indicated by the ERRORS display which may change at a high rate one moment, and not at all the next, etc.

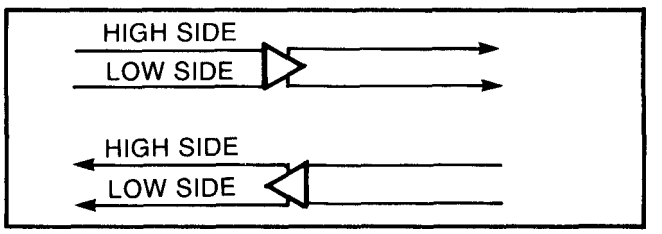
A defective path is indicated by a lit red NO GO BER indicator and by a high count on the ERRORS display. Continuous errors are indicated by a constantly lit NO GO indicator and by the ERRORS display, which increases count very rapidly.

Typical Paths

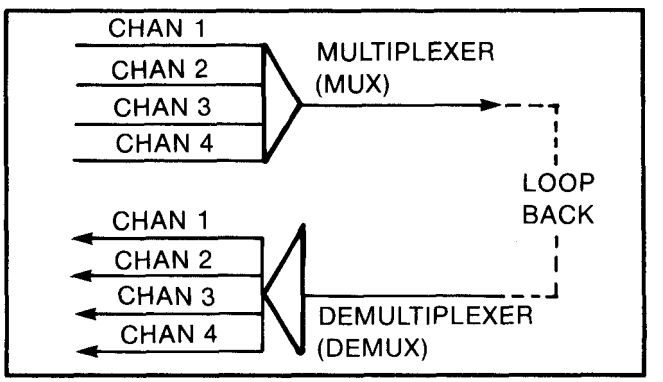
Channel: Channels in the ATACS and TRI-TAC system are full duplex (they can talk and listen or send and receive at the same time).



Balanced: Most channel circuitry uses balanced inputs and outputs (two wires with the signal referenced or measured from one wire or side to the other).



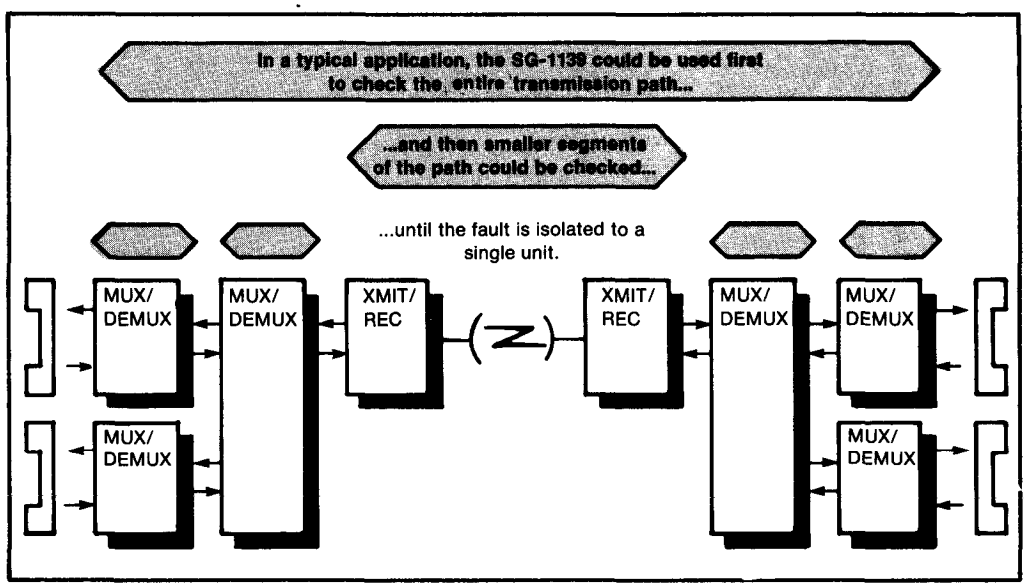
Group: For transmission over longer distances, channels are multiplexed (combined together, usually in groups of 4, 6, or 12, to provide a signal of a higher rate). From the other side, the multiplexed (group) signal is demultiplexed down to the individual channel rate.



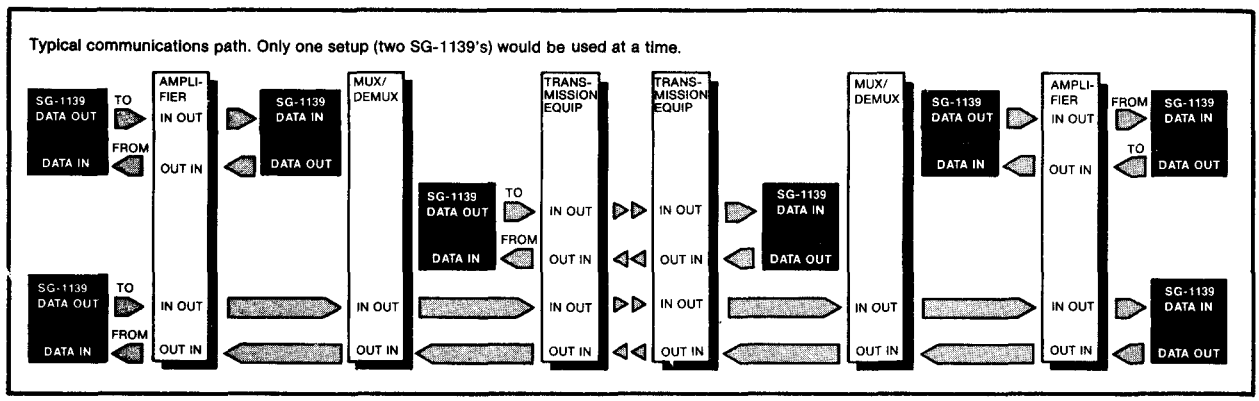
Because the SG-1139 must transmit and receive at the same rate, it cannot check the input (channel rate) and output (group rate) of a multiplexer directly. However, if the output of the multiplexer is connected to the input of the demultiplexer (looped back), the combination of mux/demux can be checked.

2-5. OVERVIEW OF TESTING (cont)

Fault Isolation



2-6. END-TO-END TESTING



Use	Tests each half of a path (to or from) separately.
Advantages	Fault can be isolated to one-half of a path (to or from).
Disadvantage	A single multiplexer/demultiplexer cannot be end-to-end tested because its input/output data rates are different.

Procedure

- Select input and output points of path under test.
- On one end, connect DATA OUT from SG-1139 to data input of path under-test. Use BALANCED, UNBALANCED, or DIPHASE output as required. Use Interface Box if necessary.
- On other end, connect data output from path under test to DATA IN of SG-1139. Use BALANCED, UNBALANCED, or DIPHASE input as required. Use Interface Box if necessary.
- If NRZ data signals are used (BALANCED or UNBALANCED data outputs and inputs) and an external STA CLOCK input is <u>not</u> used:

  On one end, connect TMG OUT from SG-1139 to timing input of path under test. Use BALANCED or UNBALANCED output as required.

  On other end, connect timing output from path under test to TMG IN of SG-1139. Use BALANCED or UNBALANCED input as required.
- If an external STA CLOCK input is used, connect the station clock signal from the path under test to SG-1139 STA CLOCK input.

2-6. **END-TO-END TESTING** (cont)

- Set SG-1139 controls as follows:

  POWER . . . . . ON
  TIMING . . . . MASTER, LOOPED, or STA CLK as required
  DATA RATE . As required

  DATA IN indicator will be lit. TMG IN indicator (or STA CLOCK indicator if external station clock signal is connected to STA CLOCK input) will be lit. FAULT indicator will not be lit. If indications are not proper, connections are improper or path is faulty.

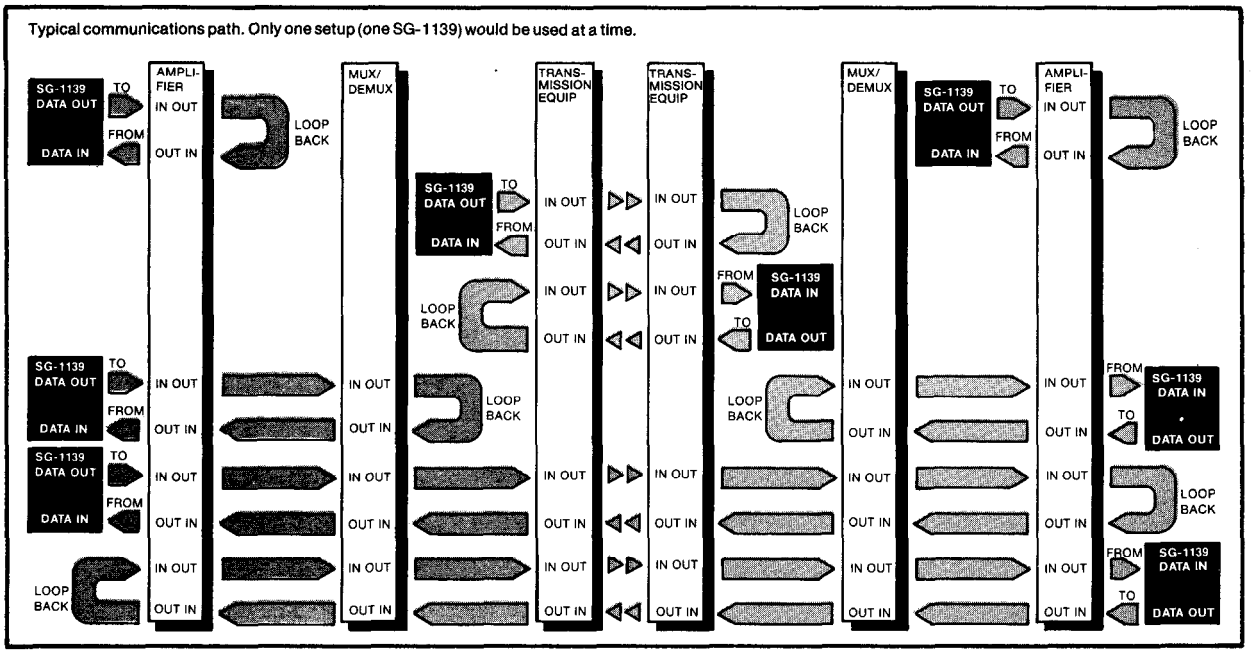
- Press SINGLE ERROR several times:

  ERRORS display will advance one count each time SINGLE ERROR is pressed, which indicates setup is proper.

- Press RESET DISPLAY:

  Display will read 0. Display will remain 0 or will advance count very slowly if path under test is operating properly.

2-7. LOOPBACK TESTING



Use	Tests whole path (to and from).
Advantage	Allows testing of a single multiplexer/demultiplexer.
Disadvantages	Cannot isolate fault to one-half of a path. This can be done by End-to-End testing (para 2-6).
Procedure	● Select input and output points of path under test.

- On one end, connect DATA OUT from SG-1139 to data input of path under-test. Use BALANCED, UNBALANCED, or DIPHASE output as required. Use Interface Box if necessary.
- On same end, connect data output from path under test to DATA IN of SG-1139. Use BALANCED, UNBALANCED, or DIPHASE input as required. Use Interface Box if necessary.
- On other end, connect data output from path under test back to data input (loopback).
- If NRZ data signals are used (BALANCED or UNBALANCED data outputs and inputs) and an external STA CLOCK input is <u>not</u> used:

  On one end, connect TMG OUT from SG-1139 to timing input of path under test. Use BALANCED or UNBALANCED output as required.

  On same end, connect timing output from path under test to TMG IN of SG-1139. Use BALANCED or UNBALANCED input as required.

2-7. LOOPBACK TESTING (cont)

- On other end, connect timing output from path under test back to timing input.

- If an external STA CLOCK input is used, connect the station clock signal from the path under test to SG-1139 STA CLOCK input.

- Set SG-1139 controls as follows:

  POWER . . . . . ON
  TIMING . . . . MASTER, LOOPED, or STA CLK as required
  DATA RATE . As required

  DATA IN indicator will be lit. TMG IN indicator (or STA CLOCK indicator if external station clock signal is connected to STA CLOCK input) will be lit. FAULT indicator will not be lit. If indications are not proper, connections are improper or path is faulty.

- Press SINGLE ERROR several times:

  ERRORS display will advance one count each time SINGLE ERROR is pressed, which indicates setup is proper.

- Press RESET DISPLAY:

  Display will read 0. Display will remain O or will advance count very slowly if path under test is operating properly.

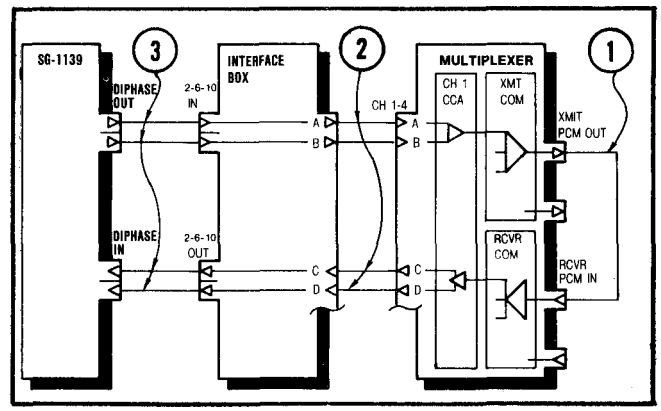
2-8. EXAMPLE OF TESTING

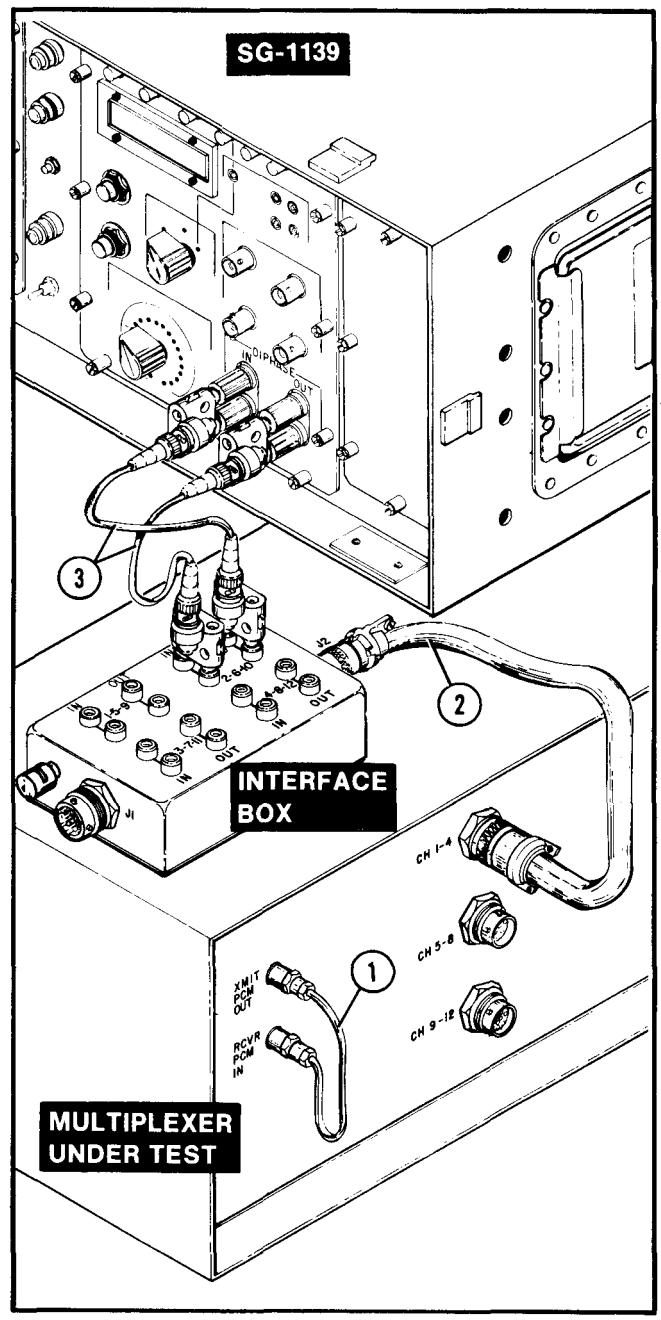
One example of testing is the use of the SG-1139 to test a multiplexer for errors.

Because the input (channel) rate of a multiplexer is different from its output (group or PCM) rate, and because a multiplexer ordinarily adds framing bits, loopback testing must be used.

A typical procedure would be as follows:

(1)	Loopback	● At Multiplexer, connect XMIT PCM OUT to RCVR PCM IN.
(2)	Multiplexer Channel	● Use a cable terminated in multipin connectors to connect to J1 or J2 of Interface Box. ● Connect other end of cable to the connector on the Multiplexer that corresponds to the channel to be tested.
(3)	Interface Box Channel	● Use two BNC adapters and a BNC cable to connect SG-1139 DIPHASE OUT to Interface Box IN connectors (channels 1-5-9, 2-6-10, 3-7-11, or 4-8-12, as required). ● Use two BNC adapters and a BNC cable to connect SG-1139 DIPHASE IN to Interface Box OUT connectors (same channels as above).





2-8. **EXAMPLE OF TESTING** (cont)

SG-1139

- Set controls as follows:

  POWER . . . . . ON
  TIMING . . . . As required
  DATA RATE . As required

  DATA IN and TMG IN indicators will be lit. FAULT indicator will not be lit. If indications are not proper, setup is improper or Multiplexer is faulty.

- Press SINGLE ERROR several times:

  ERRORS display will advance one count each time SINGLE ERROR is pressed, which indicates setup is proper.

- Press RESET DISPLAY:

  Display will read 0. Display will remain O or will advance count very slowly if Multiplexer is operating properly.

  Green BER indicator will be lit if Multiplexer is operating properly.

2-9. PORTABLE INSTALLATIONS PREPARATION FOR MOVEMENT

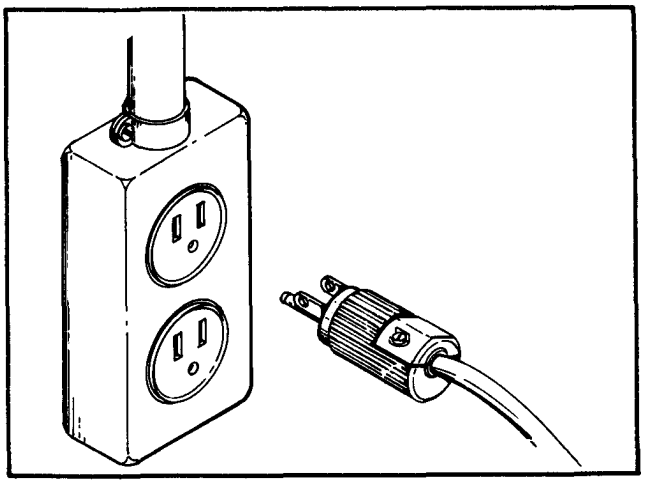
WARNING

HEAVY EQUIPMENT

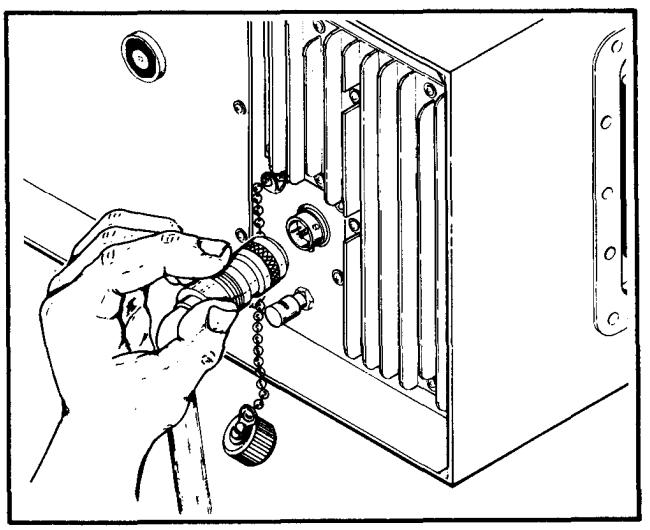
This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

Power Disconnect

- Set POWER to OFF.
- Disconnect power cable from 115-volt ac power source.



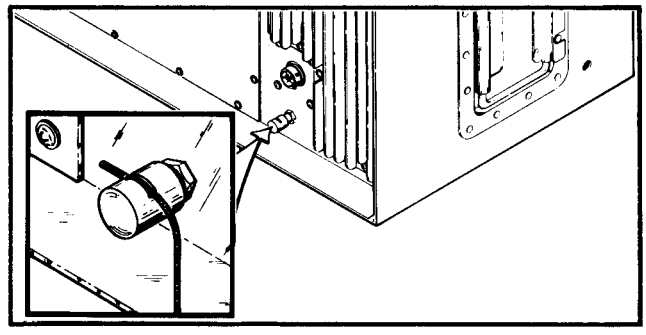
- Turn power cable connector counter-clockwise and disconnect from POWER input connector.
- Place cover on POWER input connector and turn clockwise to secure.



2-9. PORTABLE INSTALLATIONS PREPARATION FOR MOVEMENT (cont)

Ground Disconnect

- Press in cap on GND lug, remove ground wire, and release pressure on cap.



Accessories

- Place power cable and other accessories in front cover. Accessories include:

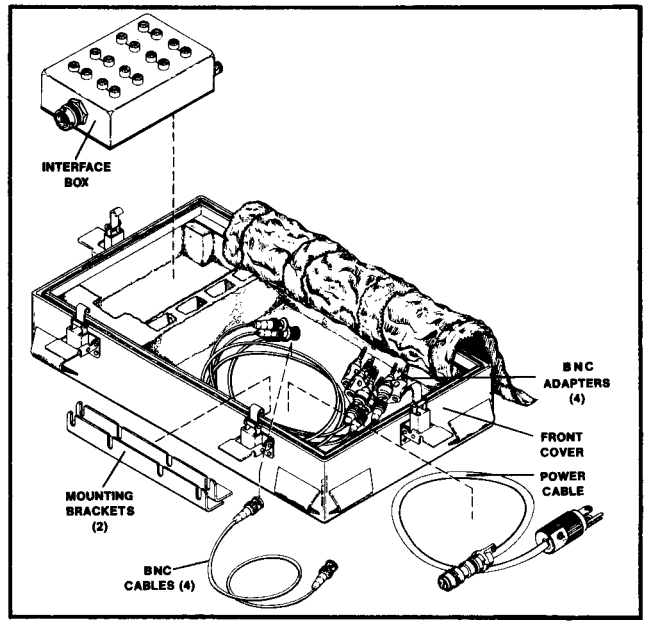
  4 ea BNC adapters

  1 ea Power cable

  4 ea BNC cables

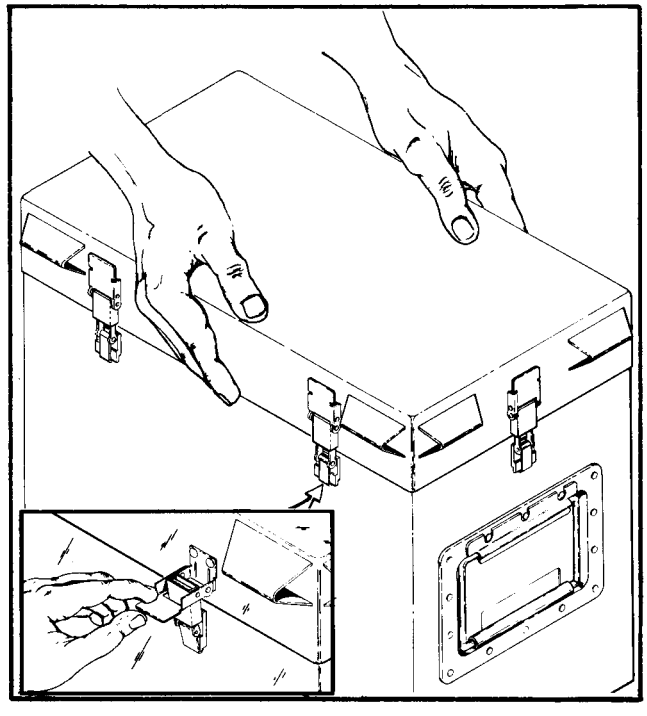
  2 ea Mounting brackets

  1 ea Interface box



Cover Installation

- Place front cover over front of SG-1139.
- Engage each of the six hasps that secure front cover to the SG-1139.



2-10. RACKMOUNT INSTALLATIONS PREPARATION FOR MOVEMENT

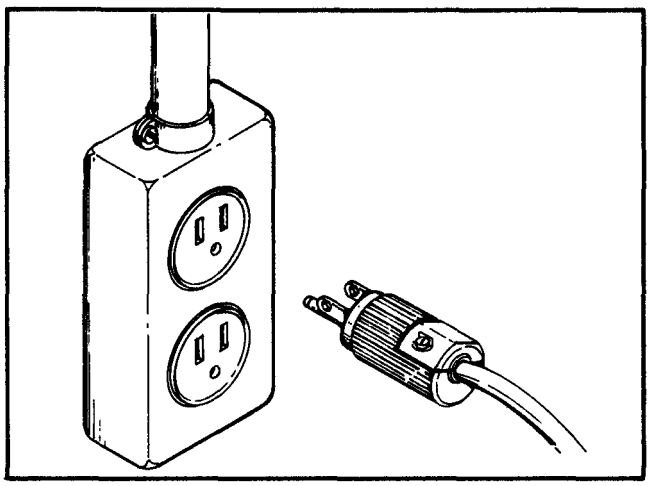
WARNING

HEAVY EQUIPMENT

This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

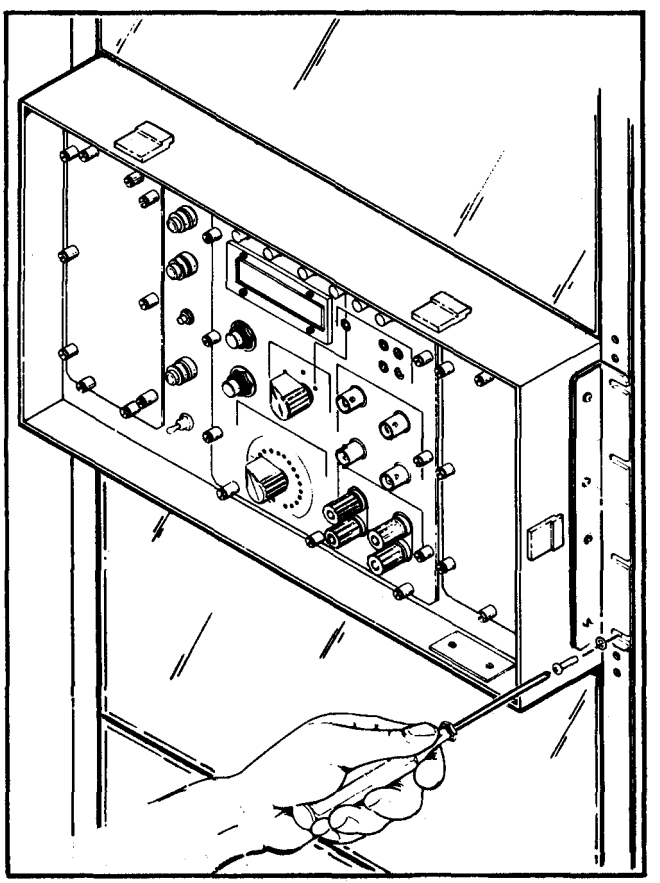
Power

- Turn POWER OFF.
- Disconnect power cable from 115-volt ac power source.



Removal From Rack

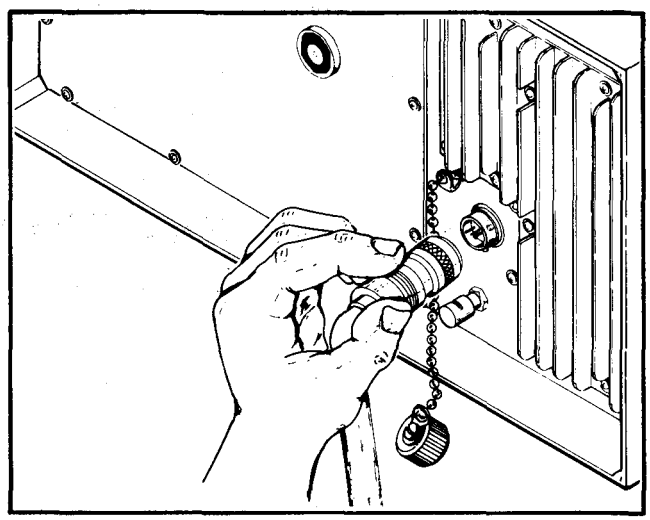
- Remove the eight screws that secure the SG-1139 to the rack.

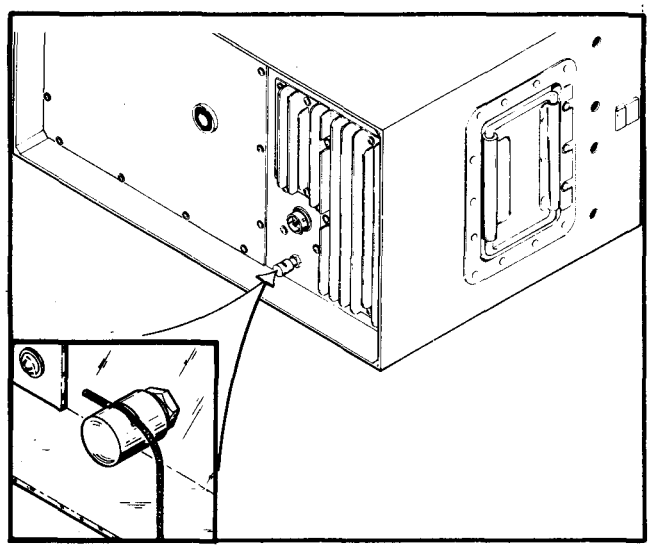


2-10. RACKMOUNT INSTALLATIONS PREPARATION FOR MOVEMENT (cont)

Power and Ground Disconnect

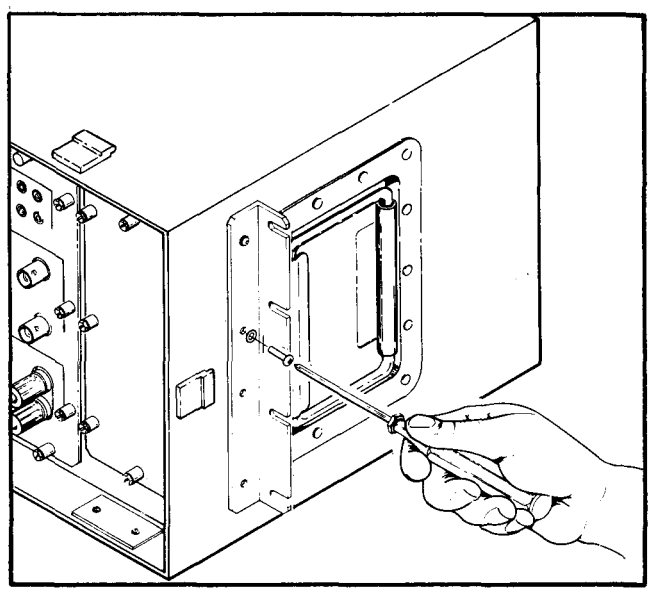
- Support one end of the SG-1139 and swing the other end out.
- Turn power cable connector counter-clockwise and disconnect from POWER input connector.
- Place cover on POWER input connector and turn clockwise to secure.
- Press in cap on GND lug, remove ground wire, and release pressure on cap.





Bracket Removal

- Remove the eight screws that secure the mounting brackets to the SG-1139.



2-10. RACKMOUNT INSTALLATIONS PREPARATION FOR MOVEMENT (cont)

Accessories

- Place power cable, mounting brackets, and other accessories in front cover. Accessories include:

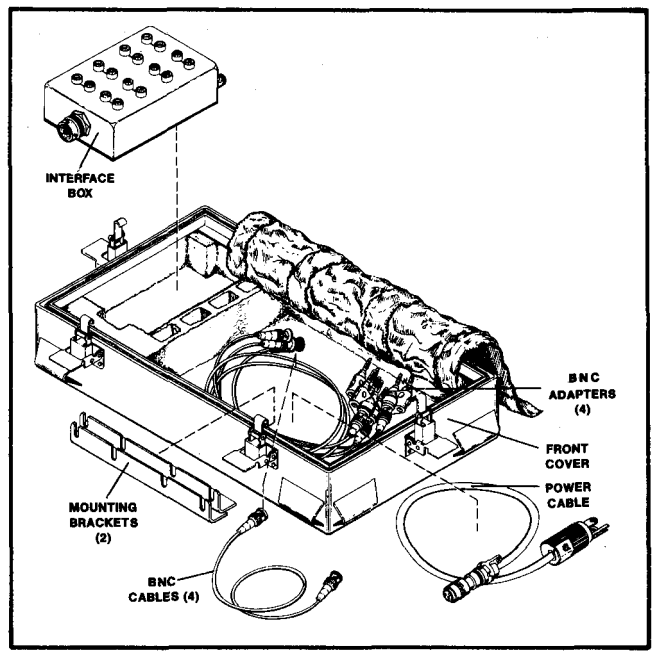
  4 ea BNC adapters

  1 ea Power cable

  4 ea BNC cables

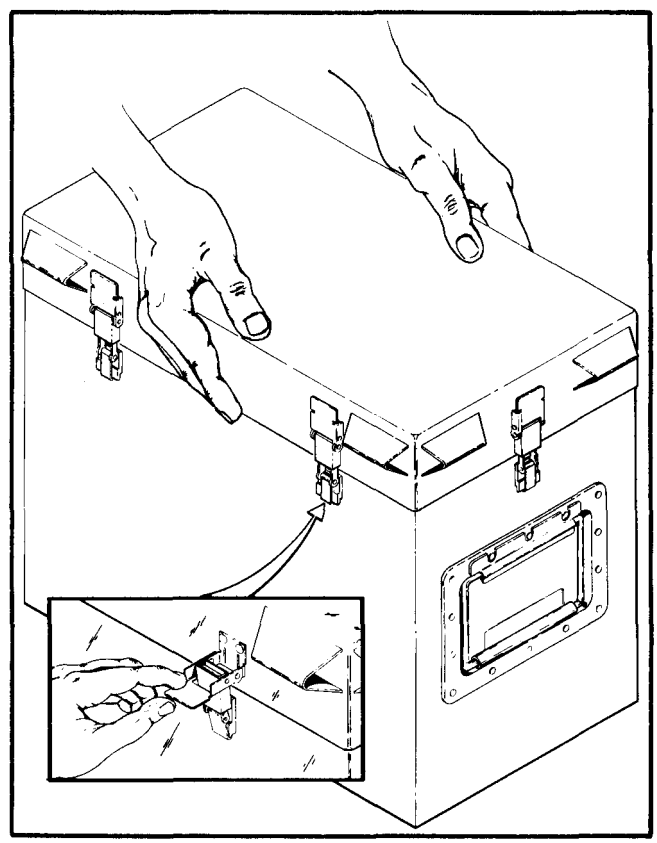
  2 ea Mounting brackets

  1 ea Interface box



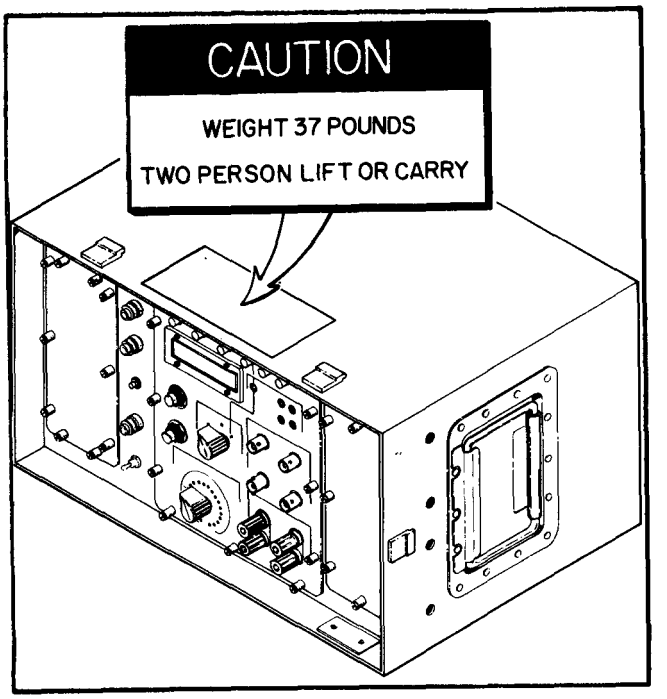
Cover Installation

- Place front cover over front of SG-1139.
- Secure the hasps.



2-11. EQUIPMENT DATA PLATES

Heavy Equipment	"Two-person lift or carry" caution silk screened in yellow and black on top of case.



Section IV

OPERATION UNDER UNUSUAL CONDITIONS

2-12. OPERATION IN UNUSUAL WEATHER

Although intended for use inside a heated/air-conditioned shelter, the SG-1139 is fully ruggedized and will operate under the following environmental extremes.

Arctic Climates

- The SG-1139 can operate at temperatures as low as -25°F and can be stored at temperatures as low as -70°F.
- Extreme cold causes components, especially cables and plastic components, to become brittle. Permanent damage can result from mechanical shock to components. Cables can break if kinked or bent.
- When cold equipment is brought into a warm room, moisture will condense on its surfaces. Before operation, allow equipment to warm to room temperature, then dry thoroughly with cloth.

Tropical Climates

- The SG-1139 can operate and can be stored at temperatures as high as +125°F.
- Extreme heat and humidity cause moisture and fungi, which can cause improper operation. Keep cover on as much as possible and ventilate the equipment as often as possible.

Desert Climate

- The SG-1139 can operate and can be stored at temperatures as high as +125°F.
- Wind-blown sand, dirt, or dust can damage the equipment. Keep cover on as much as possible.

Salt Air

- Salt air can corrode the connectors and controls on the SG-1139. Keep cover on as much as possible and clean surfaces with damp cloth (fresh water).

High Altitudes

- The SG-1139 can operate at altitudes up to 15,000 feet and can be stored at altitudes up to 40,000 feet.
- No special precautions are necessary.

2-13. EMERGENCY PROCEDURES

Loss of Transmitter or Receiver Function

- The SG-1139 consists of two sections, a transmitter and a receiver. Except for the power supplies and the clock circuits, these two sections are independent. One will function without the other.
- If either section malfunctions, it can be used for testing with another SG-1139 in which the opposite section is operating properly (except a transmitter fault will inhibit the BER indicators).

Loss of Data-Rate Family

- The SG-1139 operates at one of three data-rate families:

576	Unbalanced NRZ
.6-32	Diphase
128-4608	Balanced NRZ

- In many cases, a malfunction in one or even two families will not affect the other(s). Testing can proceed normally with the family that is operating properly.

Emergency Turn Off

- Set POWER to OFF on front panel of SG-1139.
- If POWER lamp does not extinguish, either open appropriate shelter circuit breaker or disconnect power cable from 115-volt power source.

Chapter 3

ORGANIZATIONAL MAINTENANCE

CHAPTER CONTENTS

Section I

REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-1. COMMON TOOLS AND EQUIPMENT

There are no common tools and test equipment for the Digital Data Generator SG-1139/G.

3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

For Repair Parts and Special Tools List (RPSTL), refer to TM 11-6625-3041-20P, Organizational Maintenance RPSTL.

Maintenance tools and equipment as authorized by the Maintenance Allocation Chart (refer to appx B) for organizational maintenance are as follows:

TK-101/G Tool Kit, Electronic Equipment

3-3. REPAIR PARTS

Repair parts are listed and illustrated in TM 11-6625-3041-20P, Organizational Maintenance Repair Parts and Special Tools List.

Section II

SERVICE UPON RECEIPT

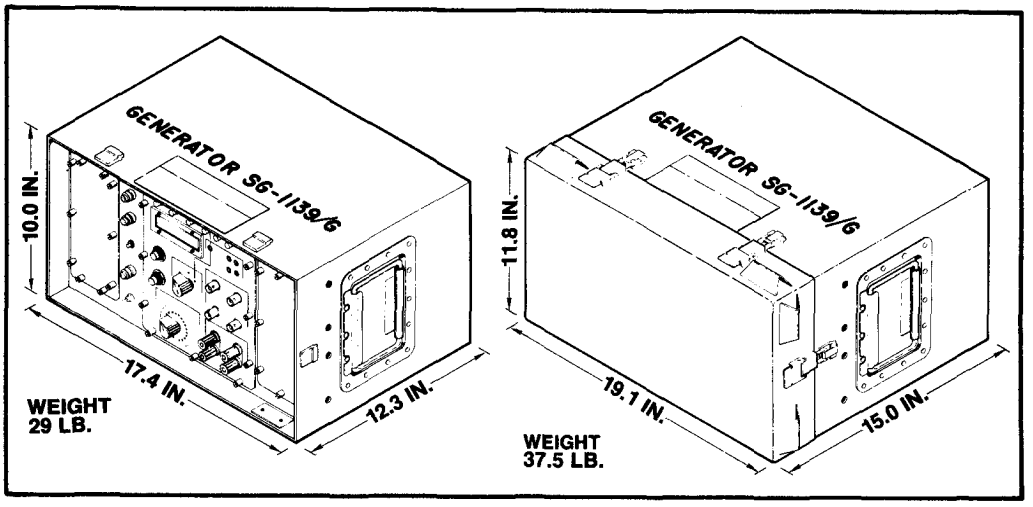
3-4. SITE AND SHELTER REQUIREMENTS

Siting

The SG-1139 is designed as a portable test set for use inside a shelter. It also-may be rackmounted in the shelter, or used outside the shelter in all but extreme weather such as heavy rain or blowing dust.

With its cover installed, it may be transported under any weather conditions.

Physical



Power

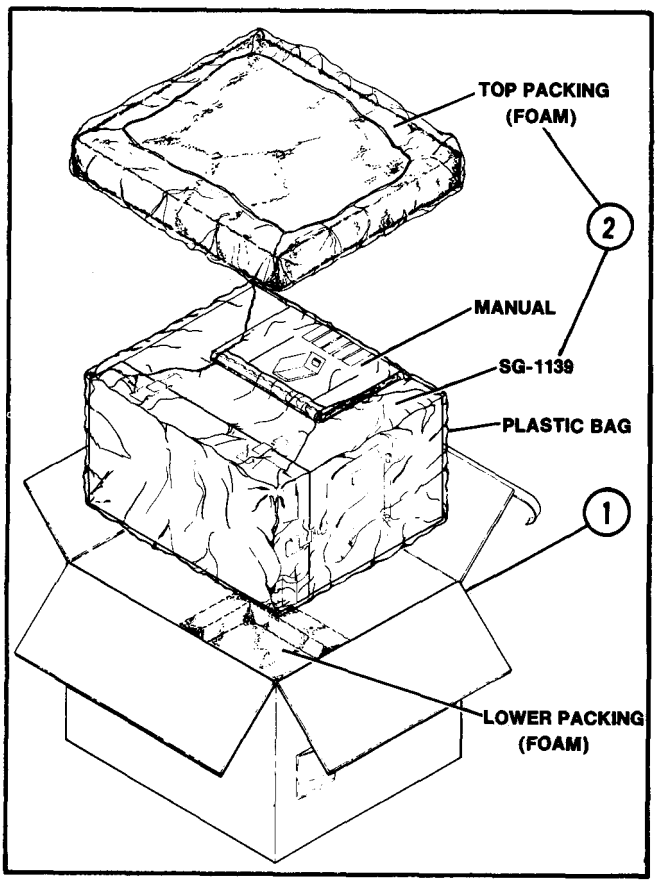
104 to 127 volts ac, 48 to 420 Hz, single-phase, 50 watts maximum.

3-5. UNPACKING

HEAVY EQUIPMENT

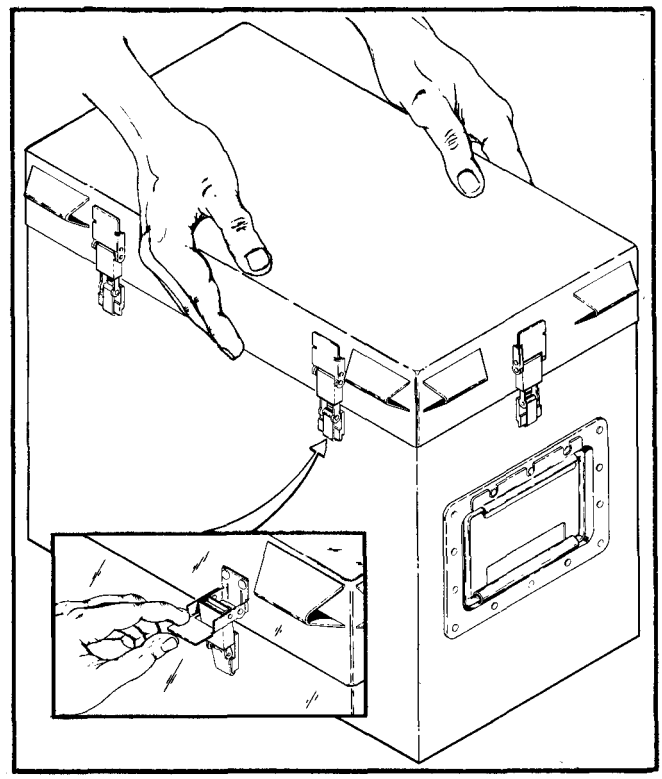
This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

	Tools Required	TK-101/G Tool Kit for: Knife, pocket
(1)	Open	• Use sharp knife to cut reinforcing tape on top of carton. • Open top of box.
(2)	Remove SG-1139	• Lift out top packing. • Lift out SG-1139, including manual. • Use sharp knife to slit plastic bag. • Remove manual and SG-1139.

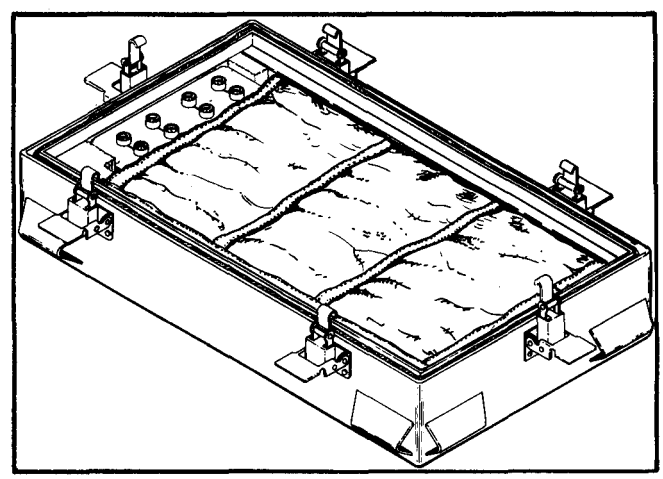


3-6. FRONT COVER REMOVAL

Disengage Hasps	Disengage each of the six hasps that secure front cover to the SG-1139.



Remove Cover	Remove front cover.



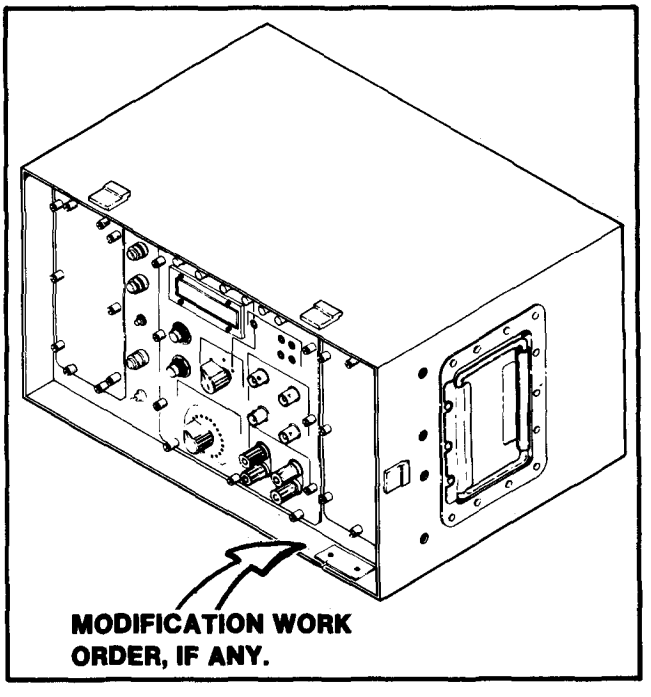
3-7. CHECKING UNPACKED EQUIPMENT

Damage Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on SF 364, Report of Discrepancy (ROD).

Packing Slip Check equipment against the packing slip to see if shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750 as contained in Maintenance Management Update.

Modifications Check to see if equipment has been modified.

If equipment has been modified, a Modification Work Order (MWO) number will be located near the nomenclature plate. Compare this number to the numbers in DA Pam 310-1, Consolidated Index of Army Publications and Blank Forms.



3-8. PORTABLE INSTALLATION INSTRUCTIONS

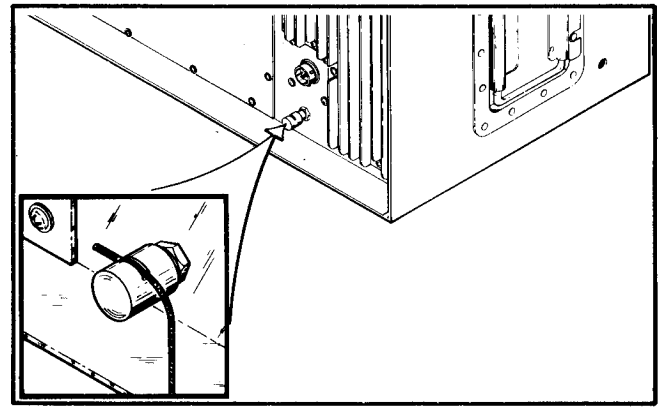
HEAVY EQUIPMENT

This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

The SG-1139 is designed as a portable test set for use inside a shelter. It may also be used outside the shelter in all but extreme weather.

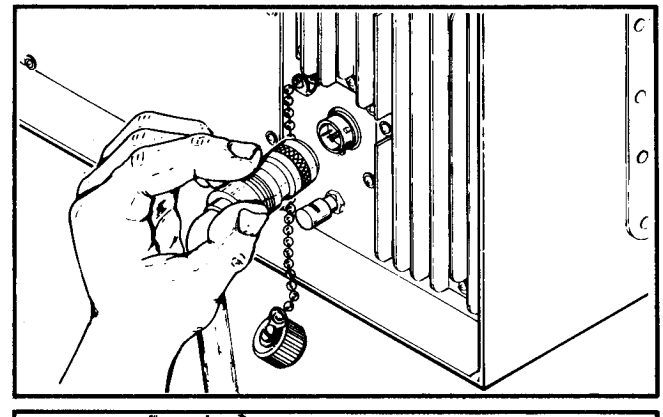
Ground Connection

- Press in cap on GND lug to expose internal slot.
- Place heavy gage wire (not supplied) in slot and release pressure on cap.
- Connect other end of wire to suitable ground. In the shelter, this ground can be an equipment rack. Outside the shelter this ground can be the equipment under test.

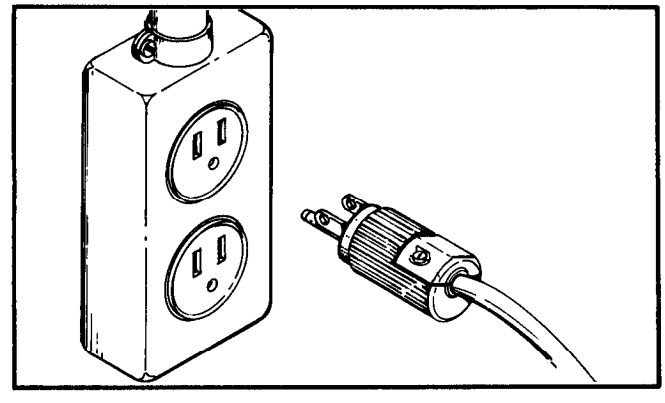


Power Connection

- Remove power cable from cover.
- Connect power cable to POWER input connector. Turn clockwise to secure.



- Connect other end of power cable to a 115-volt ac power source.



3-9. RACKMOUNT INSTALLATION INSTRUCTIONS

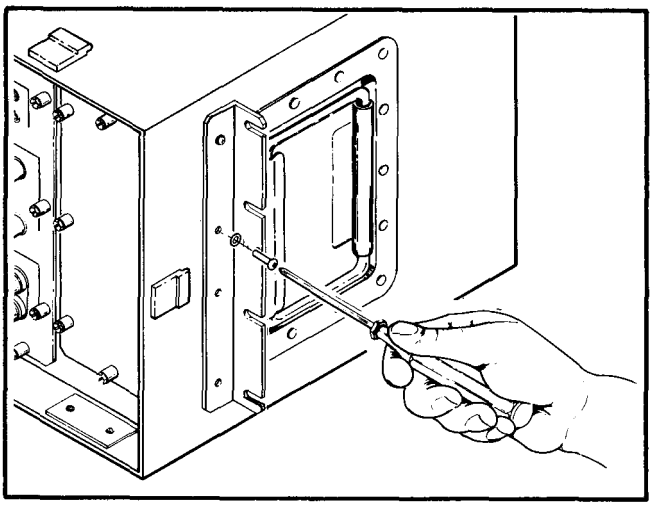
HEAVY EQUIPMENT

This equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Do not attempt to lift, carry, or move the equipment by yourself -- use at least two persons.

The SG-1139 can be mounted in a standard 19-inch rack. It is recommended that two persons be used for the actual mounting.

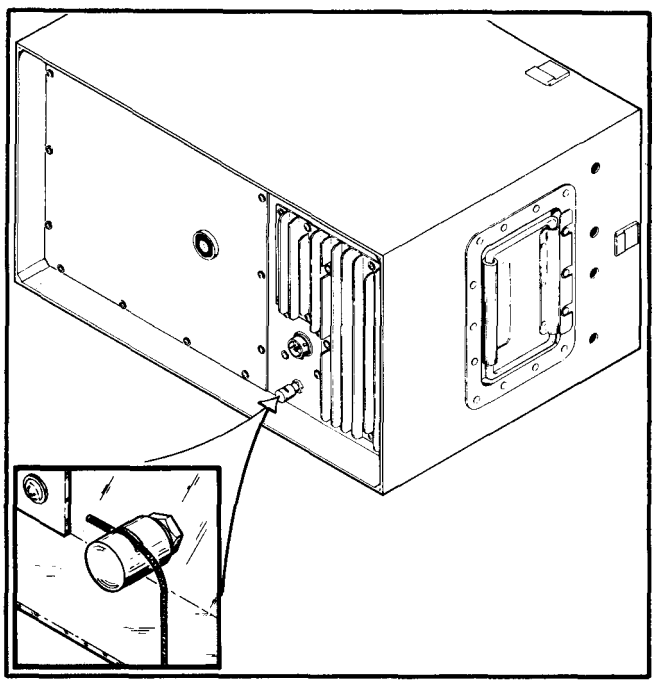
Bracket Installation

- Remove the two mounting brackets from cover.
- Use a cross-tip screwdriver to secure a mounting bracket to each side of SG-1139 with four 10-32 UNF-2Bx3/8 in. screws through No. 10 flat washers (not supplied).



Ground Wire

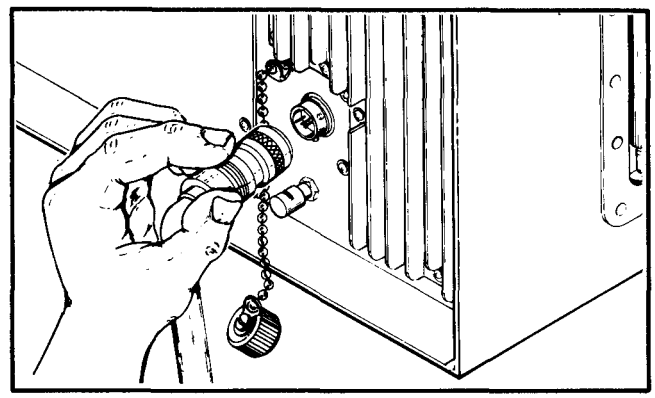
- Support one end of the SG-1139 and swing the other end out.
- Press in cap on GND lug to expose internal slot, place heavy gage wire (not supplied) in slot, and release pressure on cap.



3-9. RACKMOUNT INSTALLATION INSTRUCTIONS (cont)

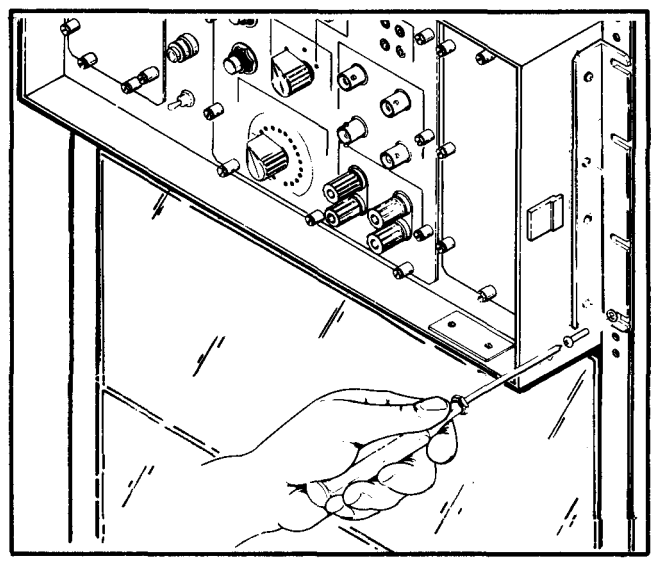
Power Cable

- Remove power cable from cover.
- Connect power cable to POWER input connector. Turn clockwise to secure.



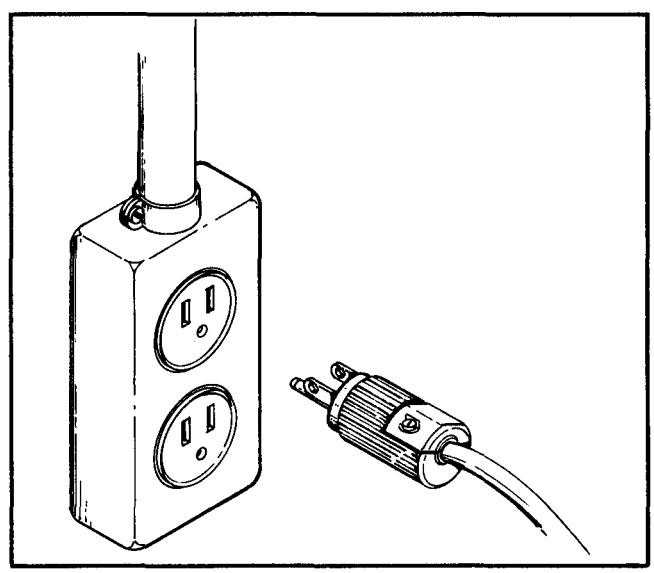
Mounting (two persons)

- Using a cross-tip screwdriver, secure each mounting bracket to rack with four 10-32 UNF-2Bx1/2 in. screws through four No. 10 flat washers (not supplied).



Ground and Power Connections

- Connect ground wire to a suitable ground such as the equipment rack.
- Connect power cable to a 115-volt ac power source.



Section III

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-10. MONTHLY PREVENTIVE MAINTENANCE

Introduction

Item No: Order in which check or service is performed. The number in this column shall also be used as a source of item numbers for the TM Number Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, when recording results of PMCS.

Item To Be Inspected: The portion of the SG-1139 to which the check or service applies.

Procedure: Procedure to be followed for the check or service.

Equipment Required

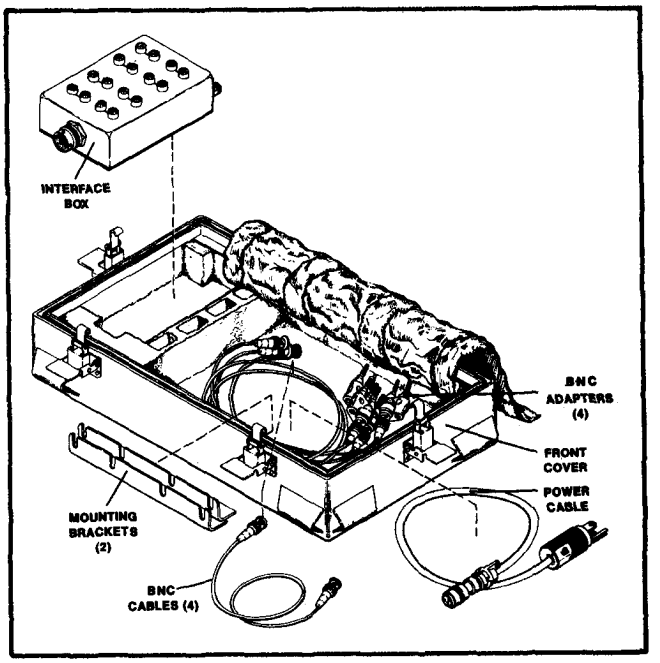
Cleaning compound, trichlorotrifluoroethane (item 1, appx E).

TK-101/G Tool Kit (item 9, sect III, appx B) for:

Cheesecloth (item 2, appx E)

3-10. MONTHLY PREVENTIVE MAINTENANCE (cont)

Item No.	Item to be Inspected	Procedures
1	Accessories	● Check for the following accessories in front cover: BNC adapters, 4 ea Power cable BNC cables, 4 ea Mounting brackets, 2 ea (attached to SG-1139 for rack-mount installations). Interface box If any accessories are missing: Replace or requisition. ● Check that technical manual (TM 11-6625-3041-12) is included. If manual is missing: Replace or requisition. ● Visually inspect power cable and BNC cables for defects such as loose or damaged connectors, open insulation, and frayed wires. If power cable or BNC cables are defective: Replace. ● Visually inspect interface box and adapters for defects such as loose or damaged connectors. If interface box or adapters are defective: Replace.



3-10. MONTHLY PREVENTIVE MAINTENANCE (cont)

Item No.	Item to be Inspected	Procedures
2	Case and Cover	• Visually inspect case for defects such as loose, damaged, inoperable, or missing hasps and handles, damaged rear panel connectors, and missing power input cover. If case or rear panel connectors are defective: Replace. If power input cover is missing. Replace (refer to para 3-18). • Visually inspect front cover for defects such as loose, damaged, inoperable, or missing hasps, improper alinement with case, and damaged or missing flap. If front cover is defective: Replace. • Visually inspect front panel for loose or missing screws, damaged-or missing knobs, and loose or damaged connectors. If front panel is defective: Replace loose or missing screws and damaged or missing knobs.

CLEANING SOLVENT

Trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury. Use in well ventilated areas. Do not breathe the fumes. Do not smoke or use near open flame. Use gloves. Wash hands after use. Do not take internally.

• Use cheesecloth (item 2, appx E) to remove dirt and grease from exterior of cover and case, including front panel. If necessary, use trichlorotrifluoroethane (item 1, appx E).

Section IV

TROUBLESHOOTING

3-11. TROUBLESHOOTING PROCEDURE

a. Quick-Check Troubleshooting

If, during normal operation, the FAULT alarm indicator lights:

Note if the POWER SUPPLY alarm indicator is also lit.

If so, remove POWER SUPPLY access cover (refer to para 3-17) and note which card contains a lit fault indicator. Replace that card (if both cards contain a lit indicator, replace AC Input card A2).

If not, remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card.

If no card fault indicators are lit, proceed with detailed troubleshooting paragraph 3-11b.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

b. Detailed Troubleshooting

Purpose — To localize to a major assembly any problem with the operation of the SG-1139.

Major Assemblies

Major Assembly	Associated Check Step
Case Assembly	1 2 3 10
AC Input card	1 2
Multi VDC card	2 3 4
Transmit 1 card	3 4 5 12 13
Transmit 2 card	4 6 11 12 13
Receive 1 card	7 8 9 10 12
Receive 2 card	13 14 15 16
Control Filter	4 5 6 7 8 9 10 11 12 13

Procedure — Each step in the procedure serves as a foundation for the next. Therefore, each step must be performed in the order given. If they are not, the information given under "This step checks the following:" and the "possible cause" information is invalid.

Fault Lamps — Trouble analysis is aided by fault lamps on the front panel (FAULT and POWER SUPPLY) and on each circuit card. If these are not working, however, this procedure can still be used but it will take longer to perform.

Indications — Any observed front-panel indications that are not specifically called out in the procedure can be ignored.

Indicators — Indicators are illustrated as follows:


White (blank) .. Not lit or can be ignored


Half black . . . . . Blinking


Black . . . . . Lit

Equipment Required

a. TK-101/G Took Kit, Electronic Equipment, for 1/4-in. socket wrench or flat-tip screwdriver.

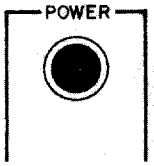
b. Cables terminated in triaxial connectors, 2 ea, appendix D.

c. BNC cables, 2 ea, supplied as accessories.

d. BNC adapters, 2 ea, supplied as accessories.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Power Input	
1		• Disconnect all cables from front panel connectors. • Connect SG-1139 to a source of 115 Vac power and set POWER to ON: Green POWER indicator must light. If it does, proceed to step 2.



This step checks the following:

External	115 Vac power outlet
Accessory	Power cable
AC Input card	12V Ref circuit
Case Assembly	POWER input connector
	POWER circuit breaker
	POWER indicator

If POWER indicator does not light:

Press LAMP TEST pushbutton. If any other indicator lights, possible cause is POWER indicator lamp. Replace (refer to para 3-15), and repeat step 1.

If no indicator lights when LAMP TEST pushbutton is pressed, possible cause is 115 Vac power outlet. Check outlet. If power is missing, connect SG-1139 to an outlet in which power is present and repeat step 1.

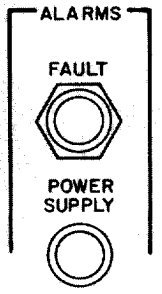
If outlet is functional, possible cause is power cable. Replace or repair (refer to para 2-15), and repeat step 1.

If replacement power cable does not provide proper indication, possible cause is AC Input card A2. Replace (refer to para 3-17), and repeat step 1.

If replacement AC Input card does not provide proper indication, possible cause is POWER input connector or POWER circuit breaker. Evacuate equipment to depot for repair.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

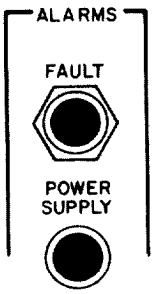
Step	Alarm Indicators	
2		• Set controls as follows: POWER ... ON TIMING .. STA CLK Red FAULT and POWER SUPPLY alarm indicators must <u>not</u> be lit



• Press and hold LAMP TEST pushbutton:

Red FAULT and POWER SUPPLY alarm indicators must light.

If both parts of this step pass, release LAMP TEST pushbutton and proceed to step 3.



This step checks the following:

AC Input card ... 150V supply
Multi VDC card .. All
Case Assembly ... LAMP TEST pushbutton
Alarm indicators

<u>If both indicators are lit before LAMP TEST is pressed:</u>

Remove POWER SUPPLY access cover (refer to para 3-17) and note which card contains a lit fault indicator. Replace that card (if both cards contain a lit indicator, or if no card contains a lit indicator, replace AC Input card A2), and repeat step 2.

<u>If one indicator is lit before LAMP TEST is pressed:</u>

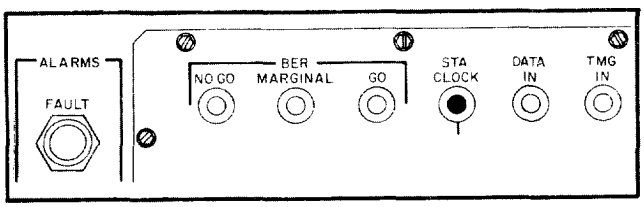
Replace AC Input Card A2 (refer to para 3-17), and repeat step 2.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step 2 cont	<u>If only one indicator lights when LAMP TEST is pressed:</u> Swap that indicator lamp with the POWER indicator lamp. If indicator now lights, cause is lamp. Replace (refer to para 3-15), and repeat step 2. If indicator still does not light, possible cause is AC Input card A2. Replace (refer to para 3-17), and repeat step 2. <u>If neither indicator lights when LAMP TEST is pressed:</u> Swap one indicator lamp with the POWER indicator lamp. If indicator now lights, cause is both FAULT and POWER SUPPLY indicators. Replace (refer to para 3-15), and repeat step 2. If indicator does not light, nor do any other front panel indicators, possible cause is LAMP TEST pushbutton. Evacuate to direct support for repair.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Station	
3	Clock Indicator	● Set controls as follows: POWER ... ON TIMING .. STA CLK Press and hold LAMP TEST pushbutton: Green STA CLOCK indicator must light. If it does, release LAMP TEST pushbutton and proceed to step 5.



This step checks the following:

Multi VDC card .... +5V supply
-5V supply
-12V supply
Transmit 1 card ... STA CLOCK lamp driver
Case Assembly ..... STA CLOCK indicator lamp

<u>If STA CLOCK indicator is lit before LAMP TEST is pressed:</u>

Possible cause is Multi VDC card Al (-12V supply defective). Replace (refer to para 3-17), and repeat step 3.

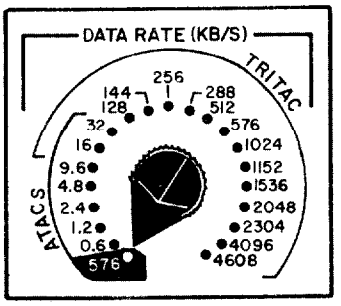
<u>IF STA CLOCK indicator does not light:</u>

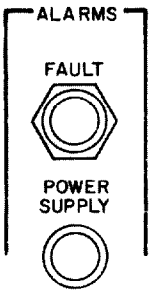
Possible cause is Transmit 1 card A3. Replace (refer to para 3-16), and repeat step 4.

If replacement Multi VDC card Al does not provide proper indication, possible cause is STA CLOCK indicator lamp. Evacuate to direct support for repair.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step		
4	Unbalanced NRZ Out	● Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS Red FAULT alarm indicator must not be lit. If it is not, proceed to step 5.





This step checks the following:

Multi VDC card	+12V supply
Transmit 1 card ...	Master timing select
	576 family data rate decode and select
	Master Osc at 9.216 MHz
	NRZ Clock Gen at 576 kHz
	PR Gen
	Single Error Inject
	UNBALANCED TMG OUT circuits
	UNBALANCED DATA OUT circuits
Transmit 2 card ...	Control Clock Gen
Control Filter	TIMING control MASTER setting
	DATA RATE control 576 family setting

If FAULT alarm indicator is lit:

Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 4.

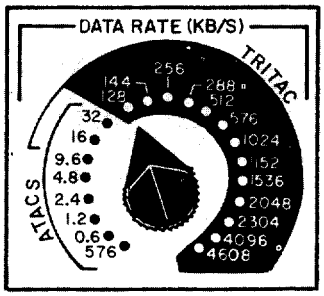
If no logic card contains a lit fault indicator, remove POWER SUPPLY access cover (refer to para 3-17) and note which card contains a lit fault indicator. Replace that card and repeat step 4.

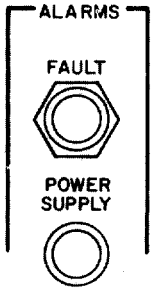
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step 4 cont	If no card contains a lit fault indicator, possible cause is (in order of probability): Transmit 1 card A3, Transmit 2 card A4, and Multi VDC card A1. Replace, one at a time (refer to para 3-16 and 3-17), and repeat step 4. If none of these replacement cards provide the proper indication, refer the SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step		
5	Balanced NRZ Out	• Set controls as follows: POWER ... ON TIMING .. MASTER Set DATA RATE to 128 thru 4096: At each setting, FAULT indicator must not be lit. If it is not, proceed to step 6.





This step checks the following:

Transmit 1 card ... 128-4068 family data rate decode and select
Master Osc at 8.192 MHz
NRZ Clock Gen at 128 thru 4608 kHz
BALANCED TMG OUT circuits
BALANCED DATA OUT circuits

Control Filter .... DATA RATE control 128-4608 family settings

If FAULT indicator is lit at any setting:

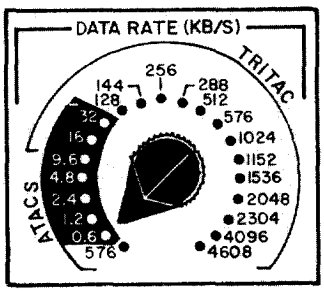
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 5.

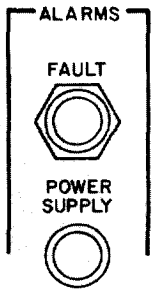
If no card contains a lit fault indicator, possible cause is Transmit 1 card A3. Replace (refer to para 3-16), and repeat step 5.

If replacement card does not provede proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Diphase	
6	Out	• Set controls as follows: POWER .... ON TIMING ... MASTER Set DATA RATE to 0.6 thru 32: At each setting, FAULT indicator must not be lit. If it is not, proceed to step 7.





This step checks the following:

Transmit 2 card ... Diphase Clock Gen/Sel
NRZ to Cond Diphase Conv
DIPHASE OUT circuits
Control Filter .... DATA RATE control .6-32 family settings

If FAULT indicator lights at any setting:

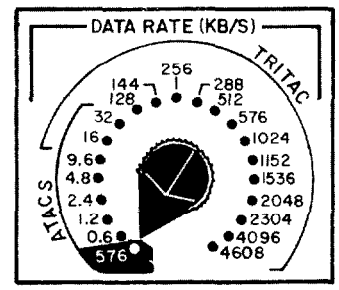
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 6.

If no card contains a lit fault indicator, possible cause is Transmit 2 card A4. Replace (para 3-16), and repeat step 6.

If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

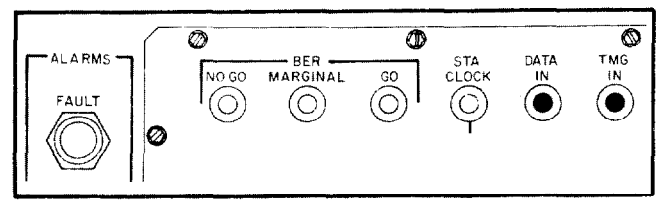
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Input	
7	Indicators	• Set control as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS



Press and hold LAMP TEST pushbutton:

Green DATA IN and TMG IN indicators must light. If they do, release LAMP TEST pushbutton and proceed to step 8.



This step checks the following:

Receive 1 card ... DATA IN lamp driver
TMG IN lamp driver
Control Filter ... DATA IN indicator lamp
TMG IN indicator lamp

If DATA IN or TMG IN indicator does not light:

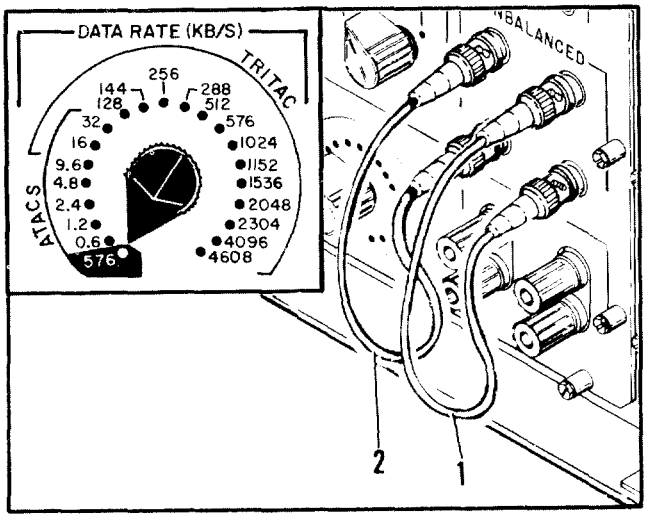
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 7.

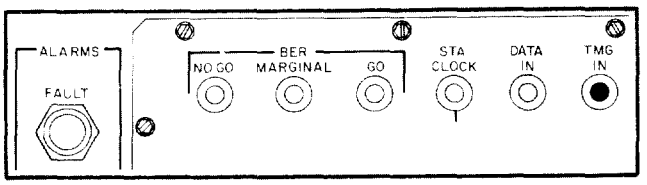
If no card contains a lit fault indicator, possible cause is Receive 1 card A5. Replace (refer to para 3-16), and repeat step 7.

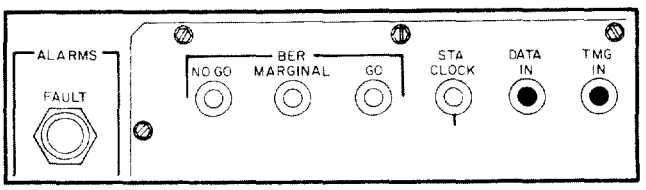
If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step		
8	Unbalanced NRZ In	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS Use a BNC cable (1) to connect UNBALANCED TMG OUT to UNBALANCED TMG IN: Green TMG IN indicator must light. Continue, even if indicator does not light. • Use a BNC cable (2) to connect UNBALANCED DATA OUT to UNBALANCED DATA IN: Green DATA IN indicator must light. Red FAULT indicator must <u>not</u> light. If both parts of this step pass, proceed to step 9. Keep cables connected.







This step checks the following:

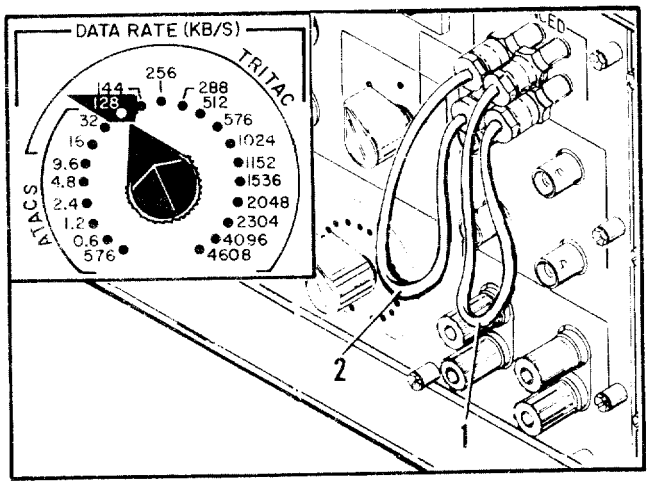
Accessories	BNC cables
Receive J card ...	UNBALANCED TMG IN amplifier
	UNBALANCED TMG IN sensor
	UNBALANCED DATA IN amplifier
	UNBALANCED DATA IN sensor
Control Filter ...	UNBALANCED TMG OUT and IN connectors
	UNBALANCED TMG OUT and IN filters
	UNBALANCED DATA OUT and IN connectors
	UNBALANCED DATA OUT and IN filters

3-11. TROUBLESHOOTING PROCEDURE (cont)

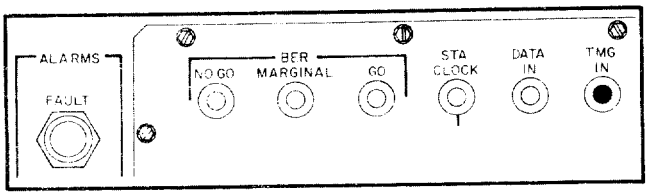
Step 8 cont	<u>If TMG IN or DATA IN indicator does not light or if FAULT indicator lights:</u> Swap unbalanced timing and data cables. If the lit indicator changes (TMG IN is lit instead of DATA IN or DATA IN is lit instead of TMG IN), cause is cable. Replace and repeat step 8. If swapping cables does not change indicator that is lit, remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 8. If replacement card does not provide proper indication, possible cause is Control Filter A8. Replace and repeat step 8. If no logic card contains a lit fault indicator, remove POWER SUPPLY access cover (refer to para 3-17) and note which card contains a lit fault indicator. Replace that card and repeat step 8. If no card contains a lit fault indicator, possible cause is (in order of probability): Receive 1 card A5, Transmit 1 card A3, Transmit 2 card A4, or Multi VDC card A1. Replace, one at a time (refer to para 3-16 and 3-17), and repeat step 8. If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. TROUBLESHOOTING PROCEDURE (cont)

Step		
9	Balanced NRZ In	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 128 Use a triaxial cable (1) to connect BALANCED TMG OUT to BALANCED TMG IN:



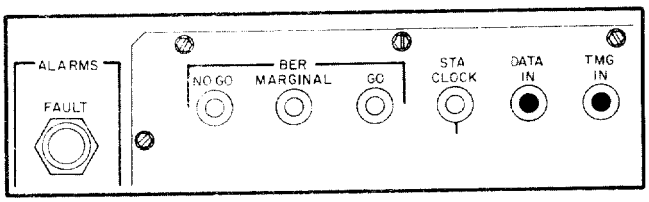
Green TMG IN indicator must light.



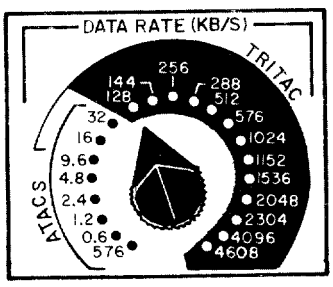
Continue, even if indicator does not light.

- Use a triaxial cable (2) to connect BALANCED DATA OUT to BALANCED DATA IN:

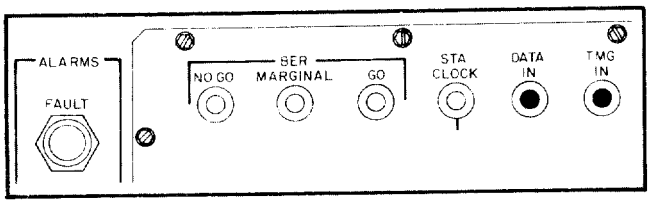
Green DATA IN indicator must light. Red FAULT indicator must not light.



- Set DATA RATE to 128 thru 4608:



At each setting, TMG IN and DATA IN indicators must light.



If all parts of this step pass, proceed to step 10. Keep cables connected.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step 9 cont	This step checks the following: Test Equipment . . . . . Triaxial cables Receive 1 card . . . . . BALANCED TMG IN amplifier BALANCED TMG IN sensor BALANCED DATA IN amplifier BALANCED DATA IN sensor Control Filter . . . . . BALANCED TMG OUT and IN connectors BALANCED DATA OUT and IN connectors

If TMG IN or DATA IN indicator does not light at all settings or if FAULT indicator lights at any setting:

Swap balanced timing and data cables. If the lit indicator changes (TMG IN is lit instead of DATA IN or DATA IN is lit instead of TMG IN), cause is cable. Replace and repeat step 9.

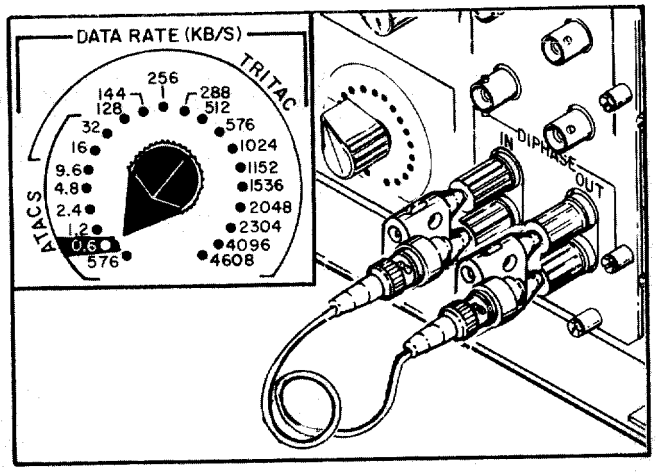
If swapping cables does not change indicator that is lit, remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 9.

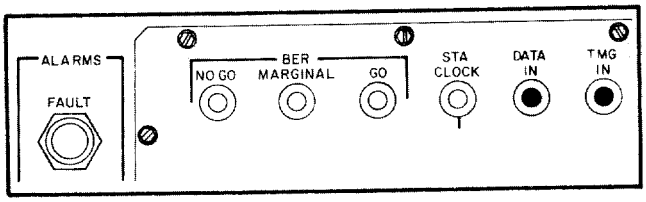
If no card contains a lit fault indicator, possible cause is Receive 1 card A5. Replace (refer to para 3-16), and repeat step 9.

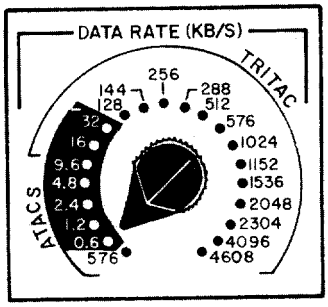
If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

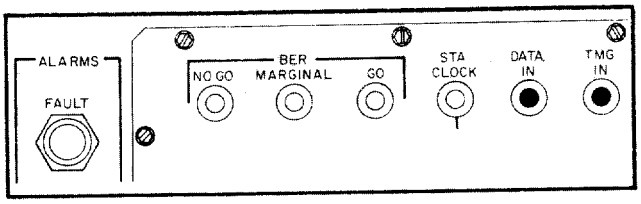
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Diphase	
10	In	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 0.6 Use two BNC adapters and a BNC cable to connect DIPHASE OUT to DIPHASE IN: Green TMG IN and DATA IN indicators must light. Red FAULT indicator must <u>not</u> light. • Set DATA RATE to 0.6 thru 32: At each setting, TMG IN and DATA IN indicators must light. If both parts of this step pass, proceed to step 11. Keep cables connected.









This step checks the following:

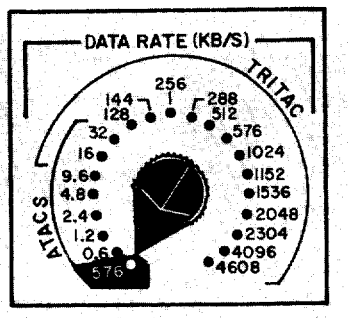
Accessories	BNC adapters BNC cable
Case Assembly	DIPHASE OUT and IN HV protect circuits on transformer card
Receive 1 card ...	DIPHASE IN amplifier DIPHASE IN sensor
Control Filter ...	DIPHASE OUT and IN connector

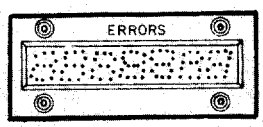
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step 10 cont	<u>If TMG IN or DATA IN indicator does not light at all settings:</u> Replace cable with a known good one (such as one that connects the UNBALANCED TMG or DATA connectors together). If indicators now light, cause is original cable. Replace and repeat step 10. If replacing cable does not provide proper indication, replace one adapter with another one. If indicators now light, cause is first adapter. Replace and repeat step 10. If replacing adapter does not provide proper indication, replace the other one. If indicators now light, cause is second adapter. Replace and repeat step 10. If replacing adapters does not provide proper indication, remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 10. If no card contains a lit fault indicator, possible cause is Receive 1 card A5. Replace (refer to para 3-16), and repeat step 10. If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step	Errors Display	
11		• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS Keep cables connected. Press and hold LAMP TEST pushbutton: ERRORS display must read all 8s. If it does, release LAMP TEST pushbutton and proceed to step 12.





Keep cables connected.

This step checks the following:	
Transmit 2 card	Clock Control Gen Error Counter (all 8s function) Display Mux
Control Filter	ERRORS display (all 8s function)

If ERRORS display does not read all 8s:

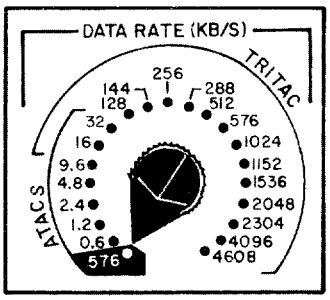
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that. card and repeat step 11.

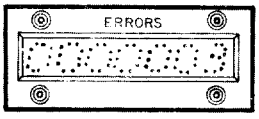
If no card contains a lit fault indicator, possible cause is Transmit 2 card A4. Replace (refer to para 3-16) and repeat step 11.

If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. TROUBLESHOOTING PROCEDURE (cont)

Step	Error	
12	Generation and Detection	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS Keep cables connected. Press SINGLE ERROR pushbutton several times: ERRORS display must increase count by one each time SINGLE ERROR is pressed. If step passes, proceed to step 13. Keep cab connected.





This step checks the following:

Transmit 1 card . . . Single Error Inject
Transmit 2 card . . . Error Couoner (count function)
Receive 1 card . . . . PR GEN
Error Det
Control Filter . . . . SINGLE ERROR pushbutton ERRORS display
(count function)

If ERRORS display does not increase count:

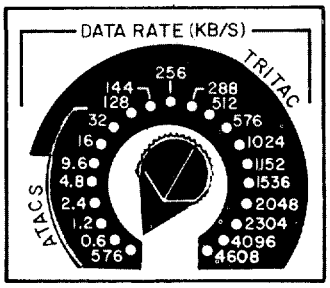
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 12.

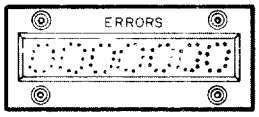
If no card contains a lit fault indicator, possible cause is (in order of probability): Receiver 1 card A5, Transmit 2 card A4, or Transmit 1 card A3. Replace, one at a time (refer to para 3-16), and repeat step 12.

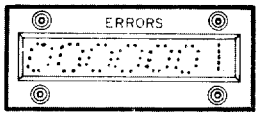
If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step		
13	Reset and Error Count	• Set controls as follows: POWER .... ON TIMING ... MASTER Keep cables connected. Set DATA RATE to 576 ATACS thru 4608 (all settings). At each setting, press RESET DISPLAY then press SINGLE ERROR: Errors display must read zero when RESET is pressed and must increase count by one each time SINGLE ERROR is pressed. If this step passes, proceed to step 14. Keep cables connected.







This step checks the following:

Control Filter . . . . ERRORS display (set 0s function)
Transmit 2 card . . . Error Counter (set 0s function)
Receive 2 card . . . . BER Control (Error Counter set 0s)

If ERRORS display digits do not all change to zero:

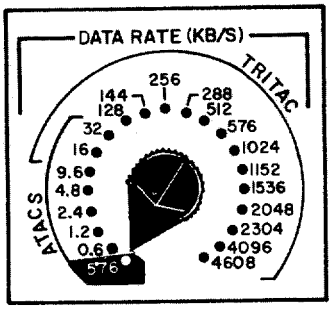
Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 13.

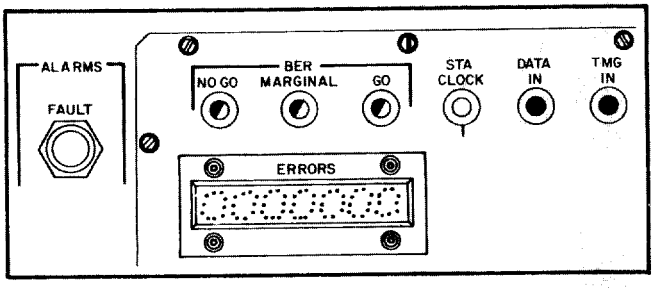
If no card contains a lit fault indicator, possible cause is (in order of probability): Receive 2 card A6 or Transmit 2 card A4. Replace, one at a time (refer to para 3-16), and repeat step 13.

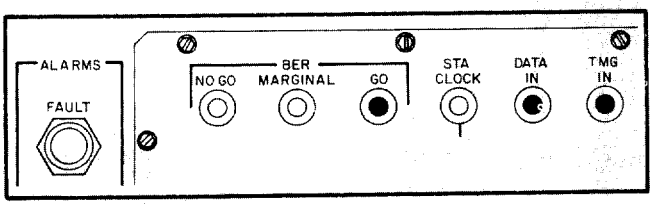
If replacement card does not provide proper indication, refer SG-1139 to Direct Support Maintenance.

3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step		
14	Unbalanced NRZ BER	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 576 ATACS Keep cables connected. Press RESET DISPLAY: Errors display must read zero and BER indicators must be blinking. After 1 to 2 seconds, BER indicators must stop blinking and green GO indicator must light.







If this step passes, proceed to step 15. Keep cables connected.

This step checks the following:

Receive 2 card ... BER Control
BER Duration Counter 10^5 and 10^6 outputs
Red Error Count 100 output
Yellow Error Count 10 output
Green Circuit

<u>If BER indications are improper:</u>

Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 14.

If no card contains a lit fault indicator, possible cause is Receive 2 card A6. Replace (refer to para 3-16), and repeat step 14.

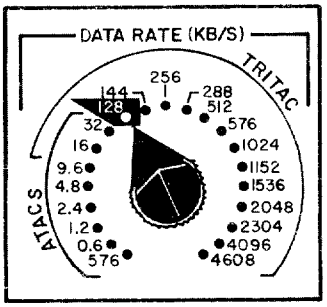
3-11. TROUBLESHOOTING PROCEDURE (cont)

Step 15 Balanced NRZ BER

- Set controls as follows:

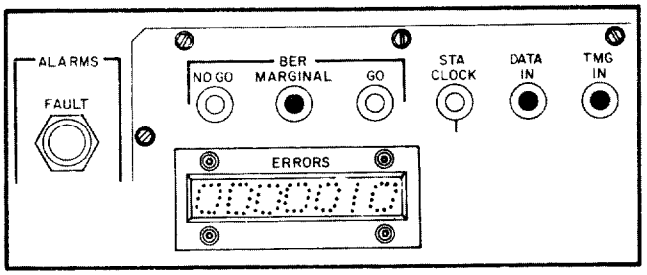
  POWER ..... ON
  TIMING ..... MASTER

  DATA RATE .. 128



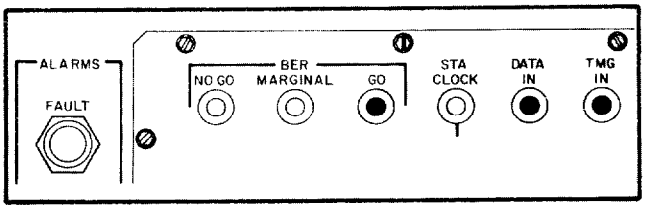
  Keep cables connected. Press RESET DISPLAY, then press SINGLE ERROR rapidly 10 times (all presses must be done within 6 seconds):

  BER indicators must blink. Then, after 7 to 8 seconds, yellow marginal indicator must light.



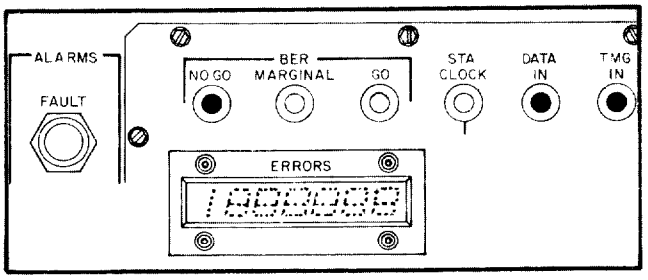
- Wait 7 to 8 seconds

  Green GO indicator must light.



- Disconnect BALANCED DATA IN from BALANCED DATA OUT:

  ERRORS display must increase count rapidly. Red NO GO indicator must light.



  If all parts of this step pass, proceed to step 16. Keep remaining cables connected.

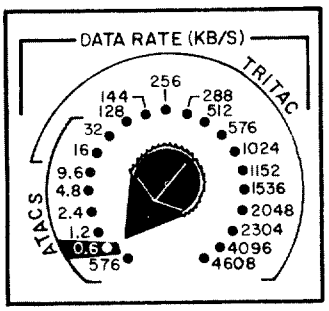
This step checks the following:
Receive 2 card ... Red circuit Yellow circuit

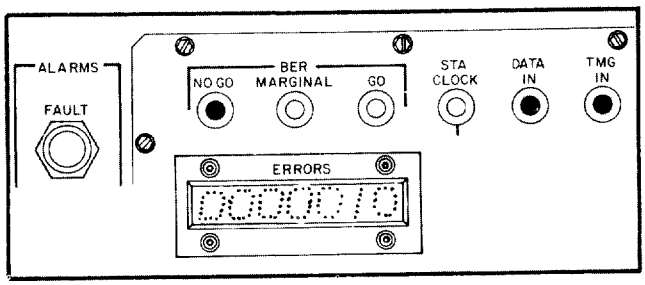
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

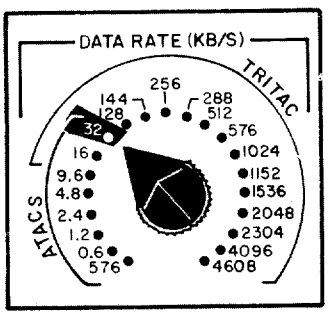
Step 15 cont	If any BER indicator is improper:
	Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 15.
	If no card contains a lit fault indicator, possible cause is Receive 1 card A6. Replace (refer to para 3-16), and repeat step 15.

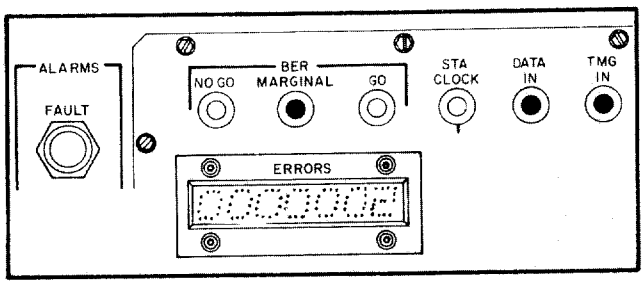
3-11. **TROUBLESHOOTING PROCEDURE** (cont)

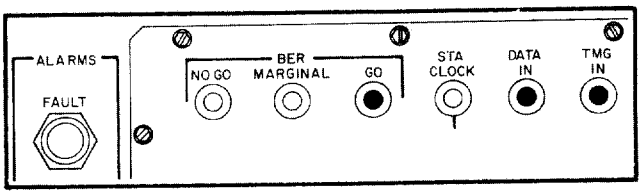
Step	Diphase	
16	BER	• Set controls as follows: POWER ..... ON TIMING ..... MASTER DATA RATE .. 0.6 Keep remaining cables connected. Press RESET DISPLAY, then press SINGLE ERROR rapidly 10 times (all presses must be done within 15 seconds): Red NO GO indicator must light. • Set DATA RATE to 32. Press RESET DISPLAY, then press SINGLE ERROR rapidly two times (all presses must be done within 5 seconds): BER indicators must blink. Then, after 6 to 7 seconds, yellow MARGINAL indicator must light. • Wait 6 to 7 seconds: Green GO indicator must light. If all parts of this step pass, disconnect remaining cables--test complete.











3-11. **TROUBLESHOOTING PROCEDURE** (cont)

Step 16 cont	This step checks the following: Receive 2 card . . . BER Duration Counter 10^4 and 2 x 10^5 outputs Red Error Count 10 output Yellow Error Count 2 output

If any BER indication is improper:

Remove LOGIC access cover (refer to para 3-16) and note which card contains a lit fault indicator. Replace that card and repeat step 16.

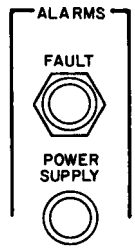
If no card contains a lit fault indicator, possible cause is Receive 2 card A6. Replace (refer to para 3-16), and repeat step 16.

3-12. FAULT INDICATORS

General

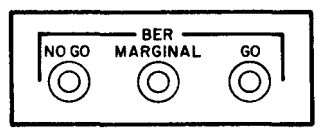
Built-In Test Equipment (BITE) for the SG-1139 consists of two front panel fault indicators and a fault indicator on each of the six circuit card assemblies. In addition, lack of proper input signals can be monitored by the three BER indicators, the ERRORS display, and the three input indicators (STA CLOCK, DATA IN, TMG IN).

Front Panel Indications



POWER SUPPLY: When lit, indicates a fault on a power supply card.

FAULT: When lit, indicates a fault on a power supply or logic card, or under certain improper external conditions such as crossed timing and data cables or when in the LOOPED TIMING mode using loopback connections.

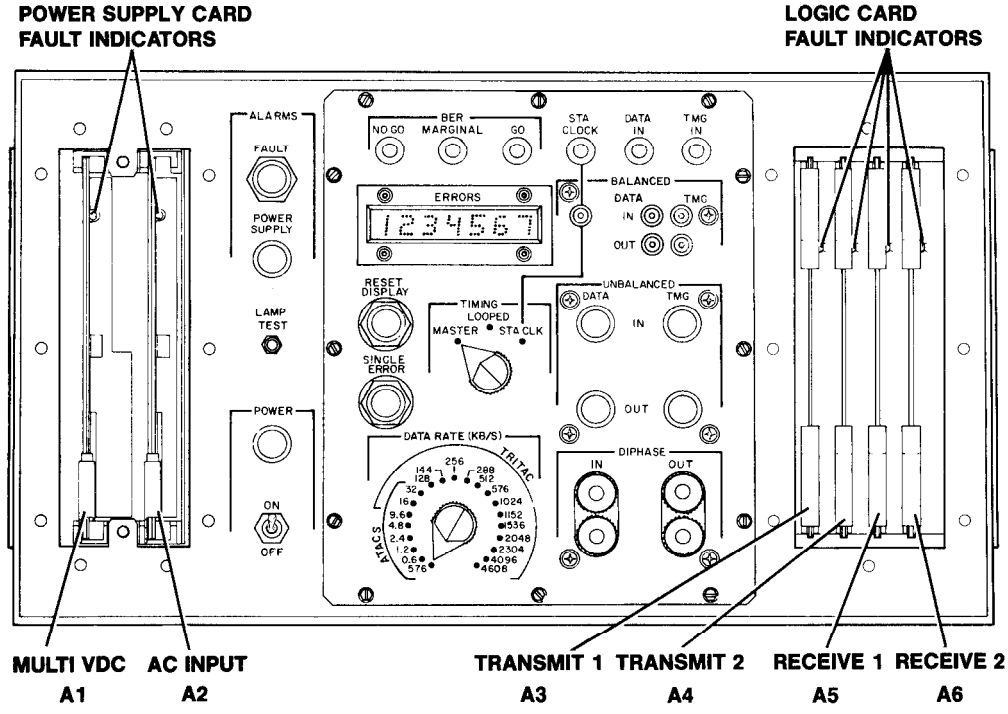


BER Indicators (NO GO, MARGINAL, GO): When not lit or not blinking, indicate a fault (FAULT indicator lit) or lack of an input timing signal (TMG IN not lit).

ERRORS Display: Cleared when a fault is indicated (FAULT indicator lit or input timing signal is not present (TMG IN not lit).

3-12. **FAULT INDICATORS** (cont)

Card Indicators



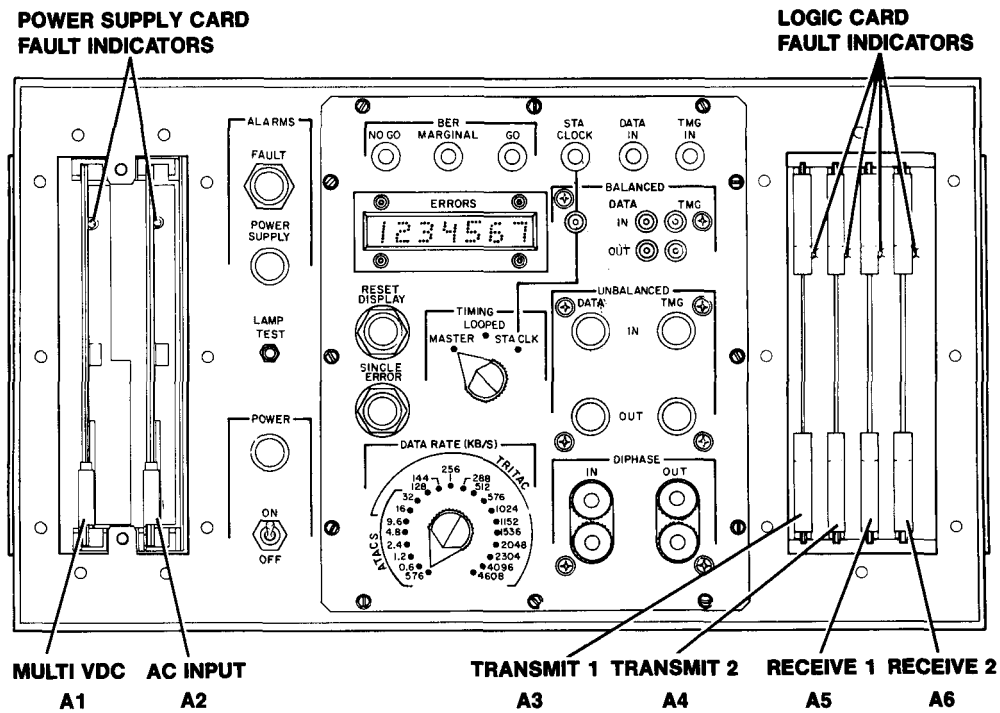
Each circuit card assembly includes a fault indicator that lights whenever one of its fault sensors detects a failure.

Only one logic card fault indicator will light at a time. The priorities are Transmit 1, Transmit 2, Receive 1, and Receive 2. For example, if both Transmit 1 and Receive 1 contain a fault, only the Transmit 1 fault indicator will light. When the fault on Transmit 1 is corrected, the fault indicator on Receive 1 will then light.

The card indicators can be seen by removing the appropriate access cover (left POWER SUPPLY cover for the power supply cards and right LOGIC cover for the logic cards).

3-12. **FAULT INDICATORS** (cont)

Logic Card Sensors



Each logic card contains sensors that monitor important signals on the card (fault sensors). In addition, the Transmit 1 and Receive 1 cards contain sensors that monitor external input signals (input sensors).

Two sensors are peak detectors (.49/.55 Hz and 512/576 kHz clocks) and indicate a fault immediately whenever the monitored signal drops below a preset level. When the signal returns to normal, the indicator immediately returns to a no-fault condition.

The remaining sensors (both fault and input) are digital and are read approximately every half second (2 seconds on the Receive 2 card). Whenever the signal they monitor disappears, it can be one-half or 2 seconds before a fault is indicated. When the signal returns, it can be one-half or 2 seconds before the indication returns to a no-fault condition.

Because of the 2-second read interval on the Receive 2 card, two sensors are inhibited at the lower data rates (red-end sensor at 128 kb/s and below 9.6 kb/s and yellow-end sensor below 576 kb/s).

3-13. FAULT ISOLATION TO A CARD SECTION

General

A fault can often be isolated to a section of a card. Although the cards cannot be repaired at organizational level, knowing which section is faulty (and therefore which sections are not faulty) can allow the SG-1139 to be used in some applications temporarily before repairs are made.

Lit Fault Indicator	Procedure	Indication
Transmit 1 Fault Lit	● Control settings: TIMING . . . . MASTER DATA RATE . Each position	If fault indicator extinguishes at any DATA RATE setting, output for that setting can be used.
	● Control settings: TIMING . . . . STA CLK DATA RATE . Same as station clock Connect STA CLK input (triaxial connector) to station clock.	If fault indicator extinguishes, output for the DATA RATE setting that is the same as the station clock input can be used.
Transmit 2 Fault Lit	● Control settings: TIMING . . . . MASTER DATA RATE . 576, 128 thru 4608	If fault indicator extinguishes at DATA RATE setting of 576 (ATACS, unbalanced NRZ) or 128 thru 4608 (balanced NRZ), outputs for those settings can be used.
Receive 1 Fault Lit	● Control settings: TIMING . . . . MASTER DATA RATE . 576, 128 thru 4608	If fault indicator extinguishes at DATA RATE setting of 576 (ATACS, unbalanced NRZ) or 128 thru 4608 (balanced NRZ), inputs for those settings can be used.
Receive 2 Fault Lit	● Normal measurement setup.	If ERRORS display is advancing count, error detection circuits are operating properly and can be used. BER indicators are inhibited and cannot be used.

Section V

MAINTENANCE PROCEDURES

3-14. TEST PROCEDURES

Test procedures for the Digital Data Generator SG-1139/G and all of its accessories, except the interface box, are contained in paragraph 3-11, Troubleshooting Procedure.

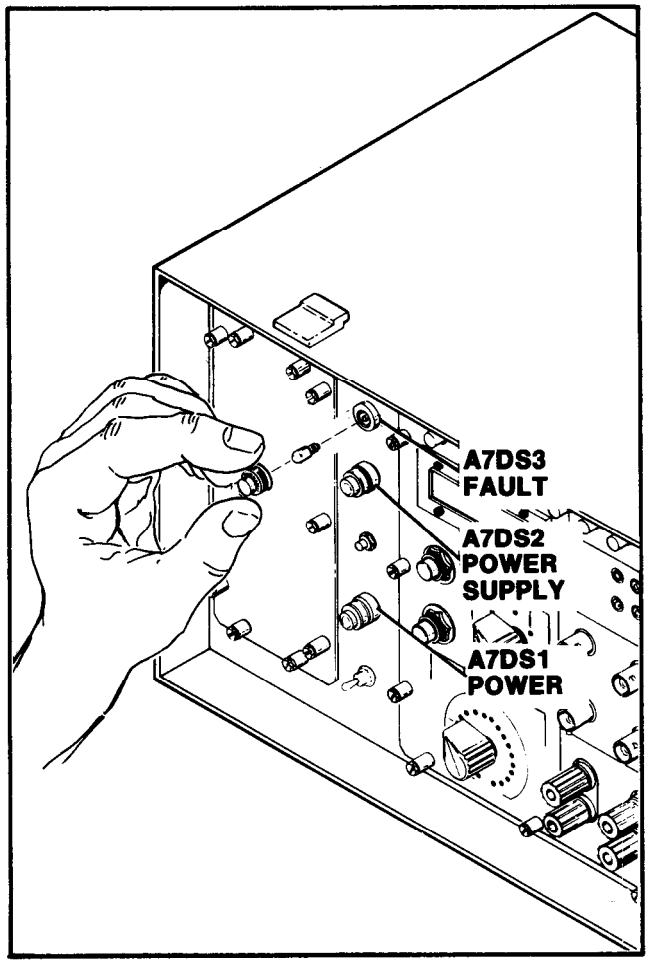
3-15. LAMP REPLACEMENT

Only the lamps for the POWER indicator and POWER SUPPLY and FAULT Alarm indicators are replaceable at Organizational level.

Tools Required
- None.

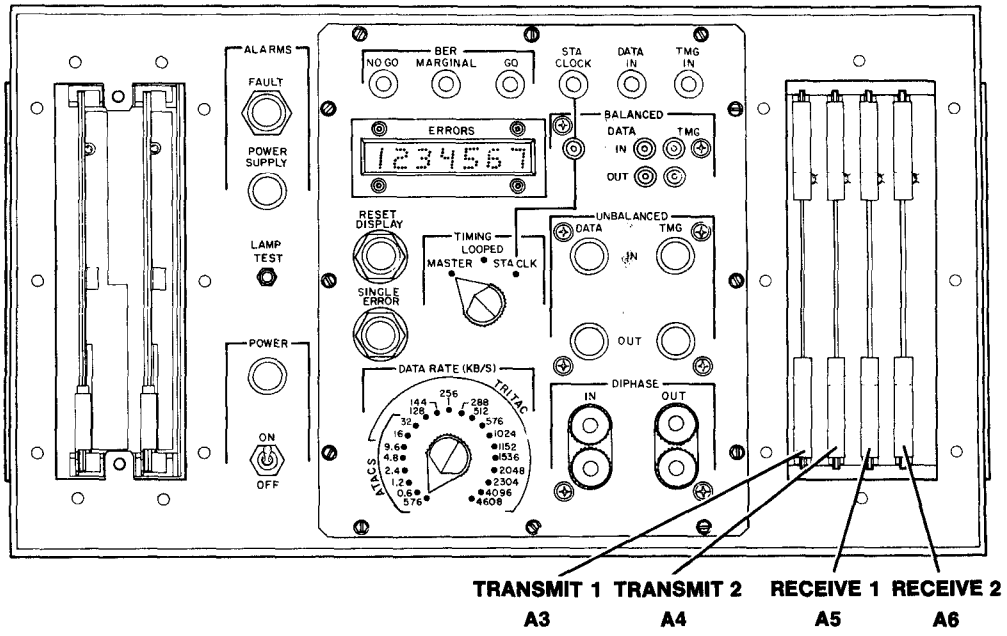
Removal
- Turn lens assembly counterclockwise and remove.
- Pry lamp loose from lens assembly and remove.

Replacement
- Press new lamp into lens assembly (A7DS1 for POWER, A7DS2 for POWER SUPPLY, A7DS3 for FAULT).
- Reinstall lens assembly and turn clockwise to secure.



3-16. LOGIC CARD REPLACEMENT

Location



Tools Required

TK-101/G Tool Kit for:

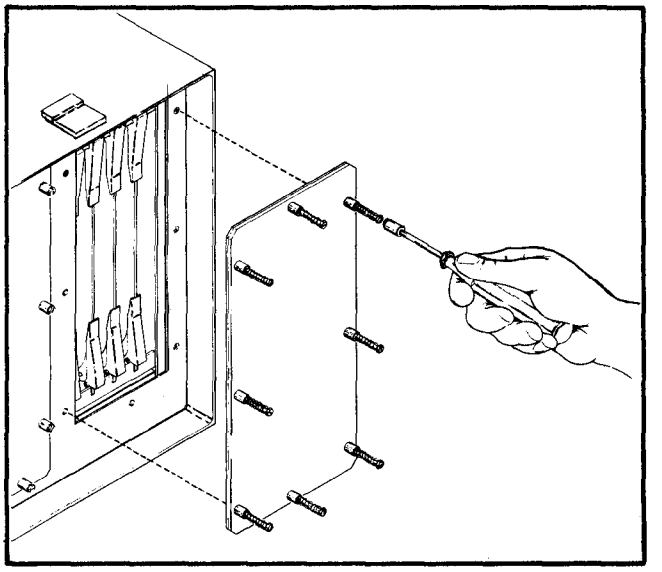
1/4 in. socket wrench

HIGH VOLTAGE

The high voltage used in this equipment can kill on contact. Ground the equipment. Avoid the 115-volt ac input. Do not service alone. Where possible, use one hand to service.

Access

- Set POWER to OFF.
- Use a 1/4-in. socket wrench or flat-tip screwdriver to loosen the eight captive screws on LOGIC access cover.
- Remove cover.

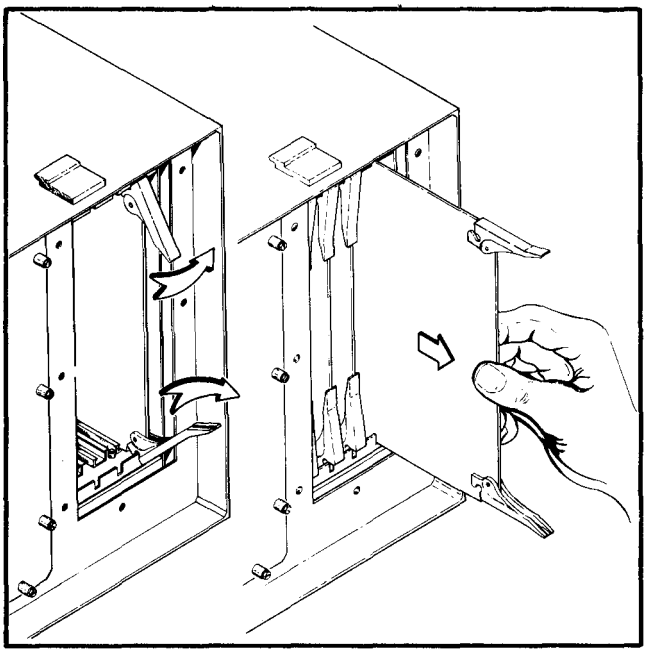


3-16. **LOGIC CARD REPLACEMENT** (cont)

Removal

- Swing out both levers on card at the same time to disengage card from connector.
- Carefully pull out card.

Visually inspect card for defects such as warpage, cracks or broken portions, excessive solder, open or shorted tracks. and loose, missing, or charred components.



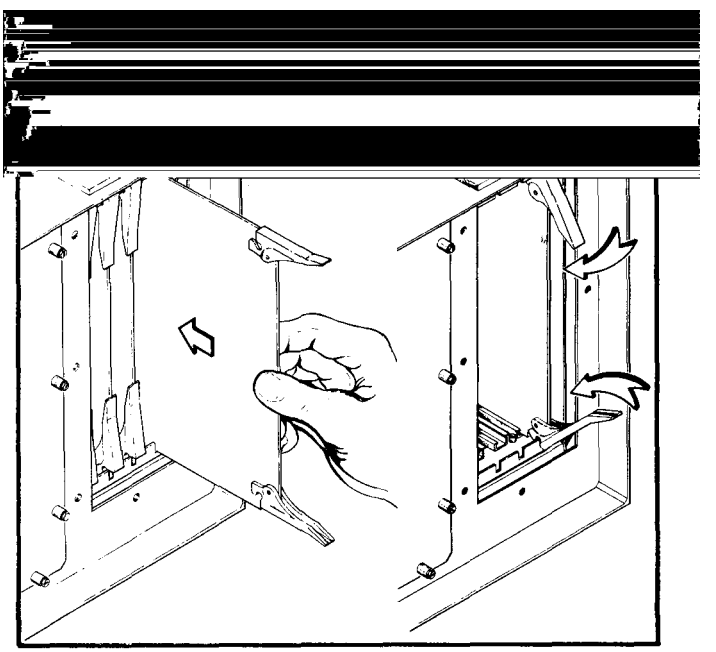
CAUTION

CARD REPLACEMENT

Damage will result if excessive force is used to insert cards. If cards cannot be inserted with reasonable force, ensure card identification on lever matches that on slot. Ensure that levers are straight out before insertion.

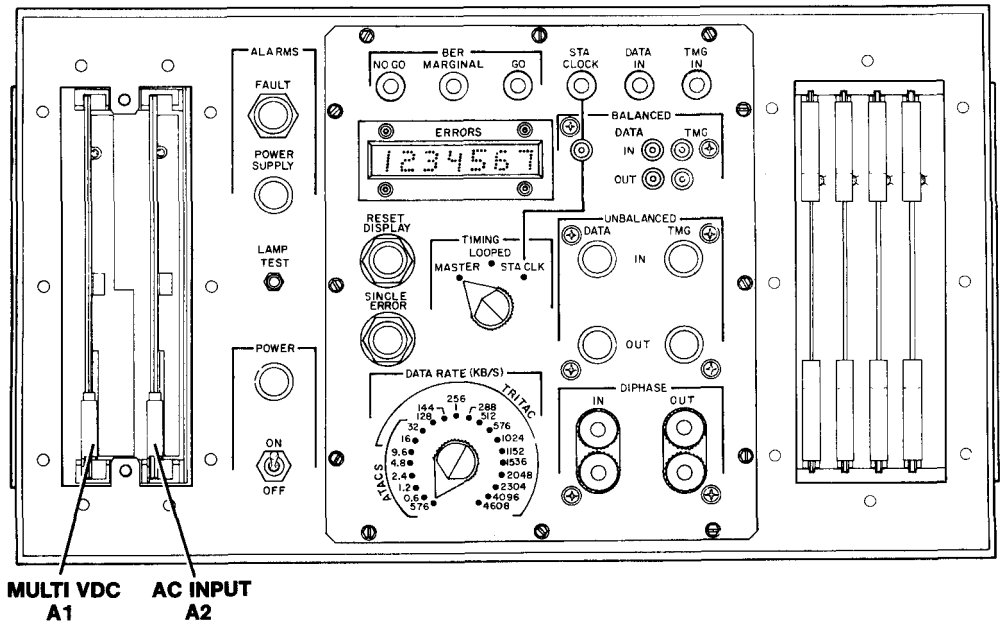
Replacement

- Aline card in slot and carefully push in. As card begins to engage, levers will begin to move in.
- When card is properly in place, swing in both levers at the same time to engage card in connector.



3-17. POWER SUPPLY CARD REPLACEMENT

Location



Tools Required

TK-101/G Tool Kit for:

1/4 in. socket wrench

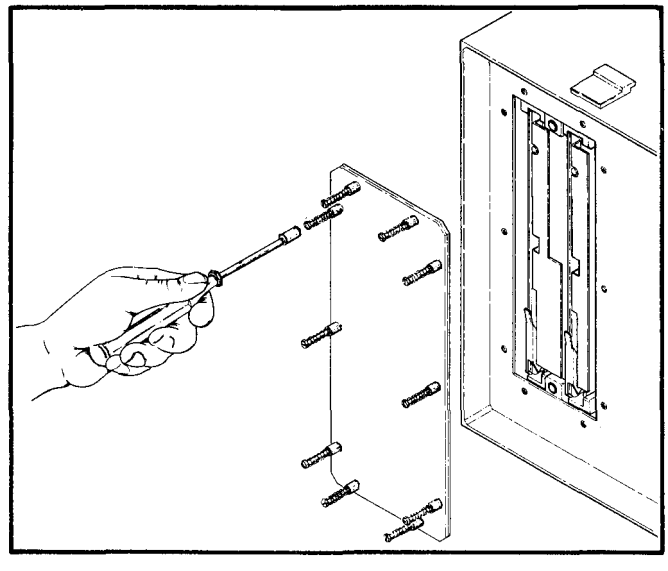
HIGH VOLTAGE

The high voltage used in this equipment can kill on contact. Ground the equipment. Avoid the 115-volt ac input. Do not service alone. Where possible, use one hand to service.

Access

- Turn POWER OFF.
- Use a 1/4-in. socket wrench or flat-tip screwdriver to loosen the 10 captive screws on POWER SUPPLY access cover.

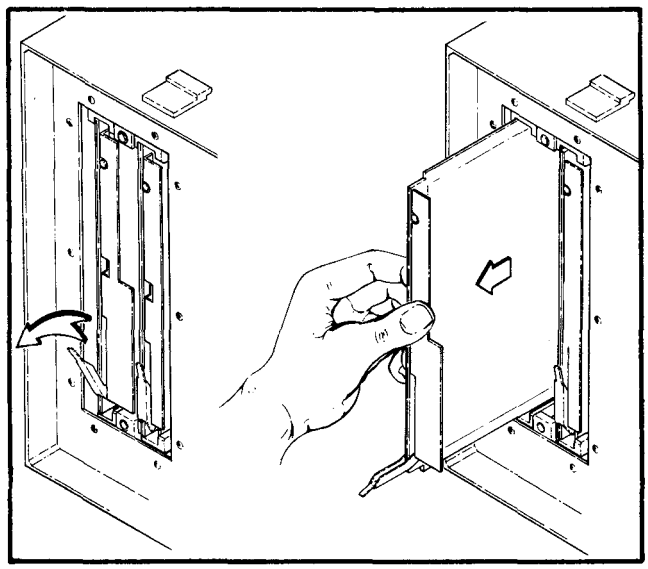
  Remove cover.



3-17. **POWER SUPPLY CARD REPLACEMENT** (cont)

Removal

- Swing out lever on bottom of card to disengage card from connector.
- Carefully pull out card.
- Visually inspect card for defects such as warpage, crackes, or broken portions, excessive solder, open or shorted tracks, and loose, missing, or charred components.



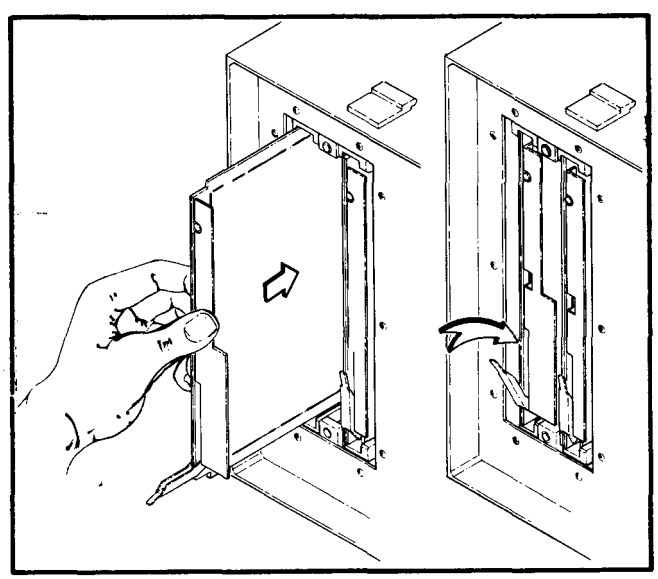
CAUTION

CARD REPLACEMENT

Damage will result if excessive force is used to insert cards. If cards cannot be inserted with reasonable force, ensure card identification on lever matches that on slot. Ensure that levers are straight out before insertion.

Replacement

- Aline card in slot and carefully push in. As card begins to engage, lever will begin to move in.
- When card is properly in place, swing in lever to engage card in connector.



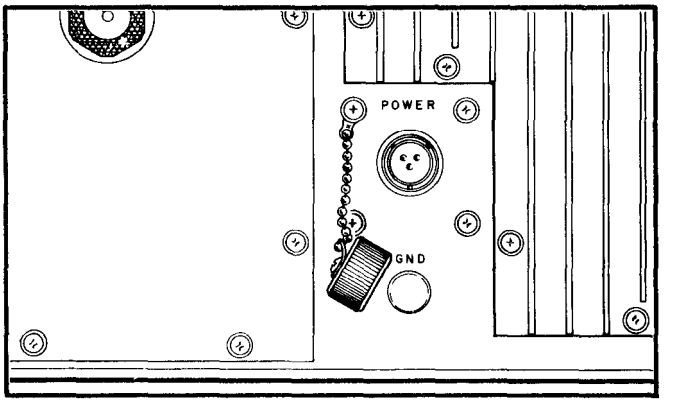
3-18. POWER INPUT COVER REPLACEMENT

Tools Required: TK-101/G Tool Kit for:

Cross-tip screwdriver

Removal

- If necessary, turn cover counterclockwise to remove from POWER input connector.
- Use cross-tip screwdriver to loosen screw that secures chain to rear panel.



- Remove cover, including chain.

Replacement

- Reattach chain to rear panel and use cross-tip screwdriver to tighten screw that secures chain.

Section VI

PREPARATION FOR STORAGE

3-19. SHORT-TERM STORAGE

The SG-1139 may be stored for short periods by simply installing its front cover, including accessories. For detailed procedures refer to paragraph 2-9, Portable Installations Preparation for Movement, or paragraph 2-10, Rackmount Installations Preparation for Movement.

Appendix A

REFERENCES

A-1 Scope

This appendix lists all forms, technical manuals, regulations, and miscellaneous publications used by the Army and referenced in this manual.

A-2 Forms

Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028

Recommended Changes to Equipment Technical Manuals . . . . . DA Form 2028-2

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

Discrepancy in Shipment Report (DISREP) . . . SF 361

Report of Discrepancy (ROD) . . . . . SF 364

Quality Deficiency Report . . . . . SF 368

A-3 Technical Manuals

First Aid for Soldiers . . . . . FM 21-11

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) . . . . . TM 750-244-2

Digital Data Generator SG-1139/G Organizational Maintenance Repair Parts and Special Tools Lists . . . . . TM 11-6625-3041-20P

A-4 Regulations

Reporting of Transportation Discrepancies in Shipments . . . . . AR 55-38

Reporting of Item and Packaging Discrepancies . . . . . AR 735-11-2

A-5 Miscellaneous Publications

Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) . . . . . CTA 50-970

Consolidated Index of Army Publications and Blank Forms . . . . . DA Pam 310-1

The Army Maintenance Management System (TAMMS) . . . . . DA Pam 738-750

Federal Supply Code for Manufacturers (FSCM) . . . . . SB 708-42

Appendix B

MAINTENANCE ALLOCATION CHART

SECTION I. INTRODUCTION

B-1 General

a. This appendix provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2 Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

e. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

SECTION I. INTRODUCTION (cont)

f. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow proper functioning of an equipment or system.

g. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3d position code of the SMR code.

h. Repair. The application of maintenance services including fault location/troubleshooting removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

i. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/ operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

j. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B-3 Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. This column lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00."

b. Column 2, Component/Assembly. This column contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. This column lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

SECTION I. INTRODUCTION (cont)

d. Column 4, Maintenance Category. This column specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C ..... Operator or Crew
O ..... Organizational Maintenance
F ..... Direct Support Maintenance
H ..... General Support Maintenance
D ..... Depot Maintenance

e. Column 5, Tools and Equipment. This column specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4 Explanation of Columns in Tool and Test Equipment Requirements, Section III

a. Column 1, Reference Code. The tool and test equipment code correlates with a code used in the MAC, Section II, column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer’s part number.

SECTION I. INTRODUCTION (cont)

B-5 Explanation of Columns in Remarks, Section IV

a. Column 1, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

SECTION II. MAINTENANCE ALLOCATION CHART FOR SG-1139/G

(1) Group Number	(2) Component Assembly	(3) Maint. Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equip.	(6) Remarks
00	DIGITAL DATA GENERATOR SG-1139/G	Inspect		0.2				9	A
		Test		0.2				9	D
		Install		1.0				9	
		Replace		1.0				9	
		Repair		0.4				9	B
		Test			0.2			9	D
		Repair			1.0			2,9	C
		Test					1.0	2,8,10	
		Overhaul					30.0	1,2,3, 4,5,6, 7,8,10, 11	
01	CIRCUIT CARD ASSEMBLY A1 MULTI VDC	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	1,7	
		Repair					0.5	3,10	
02	CIRCUIT CARD ASSEMBLY A2 AC INPUT	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	1,7	
		Repair					0.5	3,10	
03	CIRCUIT CARD ASSEMBLY A3 TRANSMIT 1 BOARD	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	5,11	
		Repair					0.5	3,8,10	
04	CIRCUIT CARD ASSEMBLY A4 TRANSMIT 2 BOARD	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	5,11	
		Repair					0.5	3,10	
05	CIRCUIT CARD ASSEMBLY A5 RECEIVE 1 BOARD	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	5,11	
		Repair					0.5	3,10	

SECTION II. MAINTENANCE ALLOCATION CHART FOR SG-1139/G (cont)

(1) Group Number	(2) Component Assembly	(3) Maint. Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equip.	(6) Remarks
06	CIRCUIT CARD ASSEMBLY A6 RECEIVE 2 BOARD	Inspect		0.1				9	A
		Test		0.2				9	D
		Replace		0.1				9	
		Test					0.5	5,11	
		Repair					0.5	3,10	
07	ACCESSORY SET								
0701	INTERFACE ASSEMBLY	Inspect		0.1					A
		Replace		0.1					
		Test		0.5				2	
		Repair		1.0				9	
0702	POWER CABLE ASSEMBLY	Inspect		0.1					A
		Replace		0.1					
		Test		0.1				2	E
		Repair		0.5				9	
0703	COAXIAL CABLE ASSEMBLY	Inspect		0.1					A
		Replace		0.1					
		Test		0.1				2	E
		Repair		0.5				9	
08	CASE ASSEMBLY, ELECTRICAL EQUIPMENT	Inspect		0.2					A
		Test					1.0	2	
		Repair					1.0	10	
0801	LOGIC CONNECTOR ASSEMBLY A7A2	Inspect					0.5		A
		Test					1.0	2	E
		Repair					3.0	3,10	
0802	POWER SUPPLY INTERCONNECT CONNECTOR ASSEMBLY A7A1	Inspect					0.5		A
		Test					1.0	2	E
		Repair					3.0	3,10	
09	CONTROL FILTER ASSEMBLY A8	Inspect		0.1					A
		Test		0.2					D
		Replace		0.1				9	
		Repair		0.5				9	F
		Test					1.0	2	E
		Repair					2.0	10	
NFGC	BNC-BANANA ADAPTER	Inspect		0.1					A
		Replace		0.1					A
		Test		0.1				2	

SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR SG-1139/G

Tool or Test Equipment Ref. Code	Maint. Category	Nomenclature	National/Nato Stock Number	Tool Number
1	D	AN/USM-410(XE-3) Test Station, Electronic Equipment	6625-00-614-9535	
2	D,F	AN/PSM-45 Multimeter, Digital	6625-01-139-2512	
3	D	Pace PRC-350C Bench Top Repair Facility	4940-00-403-8176	
4	D	Gardner Denver Wire Wrap Tool, 14xA2 with sleeve, bit, and unwrapping tool for AWG 30 wire	5130-00-465-8785	
5	D	Interconnection Devices for SG-1139/G Digital CCAs		
6	D	Assembly Fixtures		
7	D	Power Supply Adapter for AN/USM-410	6625-01-069-4223	
8	D	TD-1225(V) Electronic Counter	6625-00-498-8946	
9	D,F,O	TK-101/G Tool Kit, Electronic Equipment	5180-00-064-5178	
10	D	TK-105/G Tool Kit, Electronic Equipment	5180-00-610-8177	
11	D	AN/USM-465A Test Set, Digital Card Tester	6625-01-026-2473	

NOTE

The National stock numbers that are missing from this list have been requested and will be added by a change to the list upon receipt.

SECTION IV. REMARKS

Reference Code	Remarks
A	Visual inspection.
B	Repair limited to replacing indicator lamps; inspect for BITE indicators, remove/replace CCAs.
C	Repair limited to continuity and resistance measurements and remove/ replace assemblies.
D	Built-in Test Equipment (BITE) - output loopback test entire unit.
E	Shorts and continuity test.
F	Replace selected front panel components.

Appendix C

COMPONENTS OF END ITEM LIST

SECTION I. INTRODUCTION

C-1 Scope

This appendix lists components of end item and basic issue items for the SG-1139/G to help you inventory items required for safe and efficient operation.

C-2 General

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item that require packaging for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. An illustration is furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. Not applicable.

C-3 Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Column 1, Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

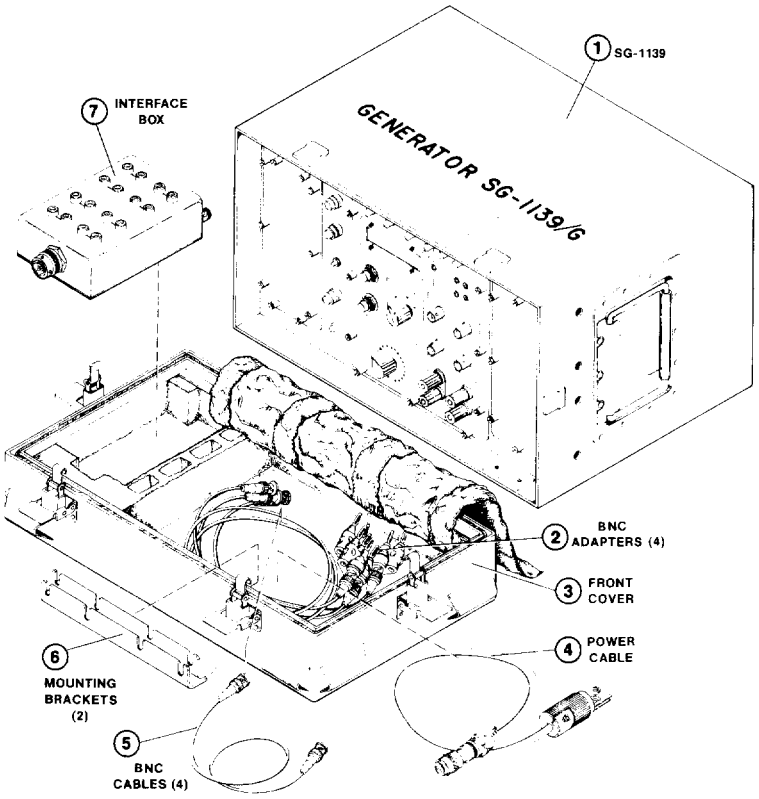
b. Column 2, National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column 3, Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column 4, Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr).

e. Column 5, Quantity Required (Qty Rqd). Indicates the quantity of the item authorized to be used with/on the equipment.

SECTION II. COMPONENTS OF END ITEM



(1) Illus Numbe	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqd
1	6625	DIGITAL DATA GENERATOR SG-1139/G including items 2 thru 7 (80058)	ea	1
2	5935-00-053-9454	ADAPTER, BNC-BANANA (in front cover assembly) (05276) 1269	ea	4
3		COVER ASSEMBLY, FRONT (56996) B4027042	ea	1
4	5995-01-123-4512	CABLE ASSEMBLY, POWER (in front cover assembly) (80063) SM-D-525130	ea	1
5	5995-01-148-6561	CABLE ASSEMBLY, COAXIAL (in front cover assembly) (56996) B4027048	ea	4
6		ANGLE ASSEMBLY, MOUNTING (in front cover assembly) (56996) B4027049	ea	2
7	6625-01-146-3862	INTERFACE ASSEMBLY (in front cover assembly) (56996) B4027047	ea	1

Appendix D

ADDITIONAL AUTHORIZATION LIST

SECTION I. INTRODUCTION

D-1 Scope — This appendix lists additional items you are authorized for the support of the SG-1139/G

D-2 General — This list identifies items that do not have to accompany the SG-1139/G and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3 Explanation of Listing — National stock number, description, and quantity is provided to help you identify and request the additional item you require to support this equipment.

SECTION II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM and Part Number	(3) U/M	(4) Qty
5995-01-122-4832	CABLE, COAXIAL, 78 ohms, terminated in triaxial connectors, 18 in. long (14949) PTWM-18-78	ea	2

Appendix E

EXPENDABLE SUPPLIES AND MATERIALS LIST

SECTION I. INTRODUCTION

E-1 Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the SG-1139/G. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2 Explanation of Columns

a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 1, appx E").

b. Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column 3, National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	6850-00-105-3084	Cleaning compound, trichlorotrifluoroethane (80244) MIL-C-81302	pt
2	O	8305-00-267-3015	Cheesecloth (81348) CCCC440	yd

GLOSSARY

Asynchronous	Independent. Data source (SG-1139) and path under test have independent timing.
Bit error rate (BER)	Number of bits in error per total bits.
Balanced	A path in which two wires are used, each of the same amplitude with respect to ground but of opposite polarity.
Clock	A signal or circuit used to achieve synchronization between various signals and equipments.
Channel	A direct path of electrical communication.
Code	A method of preparing information for electrical transmission (e.g., diphase, NRZ).
Diphase	A code in which a change in level occurs at the start of every bit period and in which a logic 0 is a second change in level one-half bit period later. Logic 1 is no transition at the start of the bit period.
Data	Information.
Data rate	Number of bits per time, usually given in thousands of bits per second (kb/s).
Duplex	A communications path in which information can be both transmitted and received at the same time.
Error	A received bit that is opposite to that transmitted (e.g., 0 when it should have been 1, or 1 when it should have been 0).
End-to-end	From one end of a path to the other.
Family	A class of signal with specific characteristics (e.g., unbalanced NRZ, diphase, balanced NRZ).
Fault	Malfunction, failure.
Group	A path that contains more than one channel.
Inhibit	Prevent an action from taking place.
Inverted	Reversed polarity.
Line-to-ground	Measured from one wire to ground.
Line-to-line	Measured from one wire to the other.
Loopback	From one end of a path to the other, then back again.

GLOSSARY (cont)

Nonreturn to zero . A code in which logic 1 is high level and logic O is low level.

Off line . . . . . Not part of an active transmission path.

Pseudorandom . . . . . Not totally random.

Station clock . . . . . A clock signal that originates in the station or communications system.

Synchronous . . . . . Having a regular time relationship, not independent.

Timing . . . . Process of making synchronous or the signal used to make synchronous.

Triaxial . . . . . A type of connector that contains two contacts for a balanced signal, plus a ground contact.

Transient . . . . . Momentary or a signal with a brief change or surge in amplitude.

Unbalanced . . . . . A path in which a single wire with ground return is used.

ALPHABETICAL INDEX

ALPHABETICAL INDEX (CONT)

ALPHABETICAL INDEX (CONT)

ALPHABETICAL INDEX (CONT)

ALPHABETICAL INDEX (CONT)

ALPHABETICAL INDEX (CONT)

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TM 11-5840-340-12	23 Jan. 1974	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hu[illegible]s, causing strain to the drive train. Hunting [illegible]inimized by adjusting the lag to 2° without [illegible]radat[illegible] of operation.
3-10	3-3		3-1	Item [illegible]ion column. Change "2 dB" to "3 dB." REASON: The ad[illegible]nt procedure the TRANS POWER FAULT indicato[illegible] calls f[illegible] a 3 dB (500 watts) adjustment to light the TRA[illegible] POWER [illegible]LT indicator.
5-6	5-8			Add new step f.1 to read, "[illegible]place cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC" to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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