

TrueTime

Model 560-5179-2 Fault Monitor CPU Manual

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SECTION ONE

1. GENERAL INFORMATION

1.1. PURPOSE OF EQUIPMENT

The 560-5179-2 Fault Monitor CPU card is capable of monitoring the status of the individual cards installed in the chassis, the presence of the three reference frequencies (REFA-C), and the three external fault input signals (P,S,T). It provides a serial port capable of reporting information via either RS 232 or RS 422. There are eight programmable fault output lines which report fault conditions in various forms. Additionally, the CPU controls the selection of primary or secondary input signals on timing switch cards. On frequency switch cards, the CPU can cause a reference frequency to be ignored if it becomes corrupted.

1.1.1. SPECIFICATIONS

1.1.1.1. PHYSICAL

Height:	9.9 cm, (3.9 in)
Width:	2.0 cm, (0.8 in)
Depth:	22.1 cm, (8.7 in)
Weight:	≈0.5 lb

1.1.1.2. ENVIRONMENTAL

Storage Temp:	-40° to +85°C
Operating Temp:	0° to +50°C
Humidity:	Up to 95% Relative, Non-Condensing
Cooling Mode:	Convection

1.1.1.3. POWER

Voltage:	18-72 Vdc
Power:	5 W

1.1.1.4. COMMUNICATION I/O SIGNALS

Use switch SW3-1 to select between RS-232 and RS-422:
SW3-1 off selects RS-232
SW3-1 on selects RS-422

Format:	ASCII, 9600 Baud, 8 Data, No parity, 1 Stop
RXDIN:	RS-232 Input
TXDOUT:	RS-232 Output
RIN+:	+RS-422 Input
RIN-:	-RS-422 Input
TOUT+:	+RS-422 Output
TOUT-:	-RS-422 Output

1.1.1.5. INPUT SIGNALS

Inputs are TTL level signals with 4.7 K Ω pull-up resistors.

PFAULT:	Primary Fault Input (P)
SFAULT:	Secondary Fault Input (S)
TFAULT:	Tertiary Fault Input (T)
AUXIN:	P1-C15

1.1.1.6. OUTPUT SIGNALS

All status outputs are TTL level signals capable of handling 10 mA. OUT1-8 are active-high. BEEP is active-low.

OUT1:	1 PPS Fault (560-5181-2)
OUT2:	IRIG-B Fault (560-5182-1)
OUT3:	Reserved
OUT4:	Reserved
OUT5:	Reserved
OUT6:	Primary External Fault Input Active
OUT7:	Secondary External Fault Input Active
OUT8:	Tertiary External Fault Input Active
BEEP:	Buzzer Control Line

LEDs:

A	No Activity On REFA
B	No Activity On REFB
C	No Activity On REFC
CPU	CPU Fault
P	Solid If Primary Fault Blinking if no Primary Fault, but timing cards are not using primary inputs.
S	Solid If Secondary Fault
T	Solid If Tertiary Fault

1.2. SPECIAL OPTIONS INCLUDED

1.2.1. MANUAL RESET SWITCH

This card has a manual reset switch located on the front panel. Toggling the reset switch will clear any old faults and implement a switch to the primary inputs if the primary inputs are determined to be good.

1.2.2. SPECIAL TIMING FAULT SWITCHING

The 560-5179-2 card performs fault switching differently on certain timing switch cards when compared to the standard 560-5179-1 Fault Monitor CPU. Refer to the note in Section 2.4.2.5 for more information.

1.2.3. SPECIAL ALARM OUTPUT SIGNALS

Two special alarm outputs are available on the 560-5179-2 these outputs are described in Sections 1.1.1.6 and 2.4.2.7.

SECTION TWO

2. INSTALLATION AND OPERATION

2.1. HOT SWAPPING

All cards, input cables and output cables are hot swappable. It is not necessary to remove chassis power during insertion or removal. The system is designed to protect against permanent effects and minimize any temporary effects of hot swapping. The CPU card should be hot swapped when possible to allow the new CPU card to read previous configuration information from the other installed cards.

Adjacent-card hot swapping has a negligible effect on the Fault Monitor CPU.

Hot swapping of the Fault Monitor CPU has some effect on adjacent cards that use REFA, B, and/or C. Hot swapping this card causes a reference-input perturbation that does not result in a reference-source change. The effects of this are discussed in the specific manuals of cards that are sensitive to this type of event.

2.2. REMOVAL AND INSTALLATION

CAUTION: Individual components on this card are sensitive to static discharge. Use proper static discharge procedures during removal and installation.

Refer to CARD COMPATIBILITY section prior to installing new card.

To remove card, loosen the captive retaining hardware at the top and bottom of the assembly, then firmly pull on the handle (or on any connector on rear panel adapter cards) at the bottom of the card. Slide the card free of the frame. Refer to the SETUP section for any required switch settings; or, set them identically to the card being replaced. Reinstall the card in the frame by fitting it into the card guides at the top and bottom of the frame and sliding it in until it mates with the connector. Seat card firmly to avoid contact bounce. Secure the retaining screws at the top and bottom of the card assembly.

2.3. SETUP

The 560-5179-2 Fault Monitor has several switch-selectable features. SW1-1,2,3 control whether the input frequency detectors controlling the front panel LED's and fault detectors are Active or Inactive. Setting the switches to the OFF position will allow the individual detector outputs to pass through to the LED control circuitry and the processor. Setting the switches to ON pulls the output of the corresponding detector circuit high

indicating a valid input signal all of the time. Each of the three detectors may be activated or de-activated independently. SW1-4 selects the input termination of the RS-422 input lines. Silkscreen on the card indicates how to select either 100 Ω or none. SW3-1 selects between RS-232 and RS-422; OFF selects RS-232 and ON selects RS-422. Once the card has been configured, power may be applied and further software configuration may be done as desired. Software configuration is detailed in the software description.

Jumper default settings:

SW1-1,2,3	OFF (Active)
SW1-4	OFF
SW3-1	OFF (RS-232)

2.4. OPERATION

2.4.1. GENERAL INFORMATION

The 560-5179-2 Fault Monitor is designed to monitor the faults from each of the nineteen slots, three reference inputs: REFA, B, C; and three external fault inputs: P, S, and T. It also uses the address and data busses on the backplane to obtain additional information from some of the cards. When timing switch cards are installed in the chassis, the Fault Monitor will evaluate the fault information and control selection of the primary and secondary inputs. The Fault Monitor can send its information serially via RS-232 or RS-422/485 via an I/O Module rear panel card to the user. The Fault Monitor may control an audible beeper as well as the fault relay output lines. Operational parameters are described in Section 2.4.2.9. Command Summary. All parameters entered by the user are retained when the power is off.

2.4.2. FIRMWARE

2.4.2.1. STARTUP

At power up or reset, the Fault Monitor CPU card will hold off fault detection for approximately four seconds. This allows the CPU to determine which cards are installed in the chassis and allows the individual cards to initialize. After the initialization period, the CPU will begin detecting faults and reporting them appropriately.

2.4.2.2. EXTERNAL FAULT INPUTS

The 56000 chassis has three external fault inputs: Primary (P), Secondary (S), and Tertiary (T). The P, S, and T inputs are used to control which of the three reference frequencies are enabled to the frequency option cards, and whether to select the primary or secondary timing sources on the timing option cards. These controls are user configurable and should be setup at installation. See the User Interface Section 2.4.2.6 for configuration details.

2.4.2.3. FREQUENCY OPTION CARDS

Frequency option cards are monitored by the Fault Monitor. Some of the option cards allow the user to configure the outputs via the serial port. Others are configured with switch settings on the option card. Details for option card configuration are given in the specific option card manual. In either case, the Fault Monitor identifies the cards and reports faults over the serial port.

2.4.2.4. FREQUENCY SWITCH OPTION CARDS

Frequency switch option cards utilize the three reference frequency inputs REFA, REFB, and REFC. When REFA is valid, it is used to generate the output frequency. If REFA is invalid, the Fault Monitor will cause all frequency switch cards to disable REFA and use REFB to generate the outputs. Similarly, if REFA is disabled and REFB goes bad, the Fault Monitor will disable REFB on all frequency switch cards and REFC will be used to generate the frequency outputs.

At initialization, all reference inputs are enabled. When one of the external fault status inputs indicates an alarm condition, the corresponding reference will be disabled at each card. The primary status input, "P", will cause REFA to be disabled. Similarly, the secondary and tertiary status, "S" and "T", will disable REFB and REFC. Refer to Section 2.4.2.6.3 to configure the external fault status inputs. An Oscillator Fault on a 560-5147-X card will also cause the used reference to be disabled on the other frequency switch cards.

If all reference frequencies are considered "bad," then the Fault Monitor will leave any active references enabled.

The frequency cards can be commanded to use only a specific reference for test purposes with the commands: "REFA!", "REFB!", and "REFC!". These three test-mode commands disable the two unnamed references and cause the cards to use the specified frequency as its reference. To return to normal operation, send "REF" to the serial port.

2.4.2.5. TIMING SWITCH OPTION CARDS

Timing switch option cards utilize two inputs (selected at installation of each card) from the eight inputs to the chassis (IN1-IN8). The Fault Monitor reads the configuration of the timing cards and provides it to the user in the report outputs as well as in configuration information. When the primary input to a Timing Switch card becomes inactive, this card automatically selects the secondary input. A card will not switch if it has an inactive secondary input.

IMPORTANT NOTE:

560-5181-1 and 560-5181-2 cards that are installed in the same chassis as a 560-5179-2 will fault switch independently from each other. In other words these two timing cards will not "bank switch" together. All 560-5181-1 cards will bank switch together; but 560-5181-2 cards will not bank switch as a result of a fault causing the 560-5181-1 cards to switch. On the other hand, all 560-5181-2 cards will bank switch together; but 560-5181-1 cards will not bank switch as a result of a fault causing the 560-5181-2 cards to switch.

The "PRI" command will first clear any latched fault status bits on the cards and then implement a switch to the primary inputs if the primary inputs are determined to be good. (Refer to the individual card manual for a description of the fault status bits.) "PRI!" allows the user to force the switch cards to their primary inputs regardless of the primary status. Sending "PRI" to the unit after the PRI! command has been used will return the Timing Switch cards to normal operation. "SEC!" can be used to switch the Timing Switch cards to their secondary inputs at any time. "SEC" will cause a switch to the secondary inputs if the secondary inputs are good.

2.4.2.6. USER INTERFACE

2.4.2.6.1. OPERATIONAL MODES

The serial port operates in one of two modes: "VERBOSE" or "MACHINE". Verbose mode is intended for interfacing with a human operator and machine mode designed for interfacing with a computer. In machine mode, the interface does not respond to each command with "OK", as it does in verbose mode. To enter machine mode, type "M." Type V to enter verbose mode or press the ENTER key to send a carriage return, <CR>, three times in a row. This will place the unit in verbose mode. The interface will ignore any line feeds, <LF>, it receives.

2.4.2.6.2. CONFIGURING CARDS

The RS port can be used to send and retrieve configuration information from some option cards. Send C##? to retrieve data on the card in slot ##. Leading zeros may be omitted in the slot number. Send C##=[data]<CR> to configure the card. Refer to the individual card manual for a description of [data]. If a specific card is not configurable, attempts to set or retrieve configuration information from the card will result in an "ERROR 05 NO SUCH FUNCTION" message. "ERROR 02 SYNTAX" will be returned if a command is not entered properly. "OK" is

returned for a valid entry. In some cases, a valid entry will be responded to with a statement affirming the change entered.

2.4.2.6.3. CONFIGURING EXTERNAL FAULT STATUS INPUTS

Each of the three fault status inputs (P, S, and T) have an internal pull-up so that a floating input is pulled high. Syntax to control the active level of these inputs is PSRC=a, SSRC=a, TSRC=a, where a is "H" for HIGH=ALARM, "L" for LOW=ALARM, "O" for OFF, and "D" for DISABLE. For example, to disable the T fault status input, use the TSRC=D command. To set the active level for the S fault status input to LOW=ALARM, use the SSRC=L command.

The status inputs P, S, and T must also be configured to control the operation of any timing switch cards in the chassis. This allows the user to decide which of the three external status inputs will be seen as the primary or secondary input faults for the timing switch cards. TPRI and TSEC can be set to P, S, T, or N for none. For example, the string TPRI=S will cause the secondary status input to be handled as a primary timing signal failure. TSEC=T will use the tertiary external status input as a secondary timing input failure.

2.4.2.6.4. CONFIGURING SITE INFORMATION

The CPU is capable of providing a chassis site number in the range 0 to 99. This function may be useful in systems where more than one chassis is present. To change the site number reported by the unit use the string: SITE=##. To request the site number of a chassis, send: SITE?

2.4.2.6.5. CONFIGURING BOARD ID INFORMATION

The Fault Monitor is capable of reading the card identification of many of the option cards available for the 56000. For cards which the processor is unable to query, the identification may be entered by the user with the C##=XXXX or CR##=XXXX commands. The manual for each option card shows the card identification for that card. When the card ID has been manually entered, the MSB will be set in the machine output report. Also, the Fault Monitor will ignore any card identification information it receives from that slot until the manually entered information is cleared by setting the card ID to 0000.

The card ID for the 560-5179-2 card is 0091.

2.4.2.6.6. FAULT AND STATUS REPORTING

The serial port is able to provide status information about the option cards installed in the chassis. The reports can be generated in three ways: On request, each time a fault condition changes, or at approximate time intervals. To request a report from the unit, send an R. A report will be returned which lists each slot and its current fault information.

To receive a report any time a fault condition changes, send an ARON to the port to turn Automatic Reporting ON. A report will be generated showing the current status of the fault signals. From that time, any change in one of the fault signals or system status will cause a report to be sent. When the chassis configuration is changed, a report will be sent when automatic reports are enabled. To disable the reports, send AROFF.

To receive reports at time intervals send PR##. This will enable Periodic Reports at approximately ## decimal minute intervals. To cancel the periodic reports, send PROFF. The three types of reporting can be used simultaneously.

Sample reports in both verbose and machine modes are shown at the end of this section. If the card is recognized, an identifying string will be displayed in the Verbose Report. If the slot is empty, "Undefined" will be displayed. If the card is unrecognized, "Unknown card" will be displayed.

The Verbose Report will indicate "OK" when the fault input line from a card is inactive and "FAULT xxxx" when the fault line is active. The CPU stores in memory any faults that have occurred on the cards. If faults have occurred on a card and then been automatically cleared, the Verbose Report will display as "OK * xxxx" for that card. Some cards have some of their fault status bits latched and so cannot be automatically cleared. They will continue to display as current faults until operator intervention. To clear any card latched bits and to clear the CPU memory of any old faults, use the CL command. A general description of the faults is shown below, however, the user should refer to the individual card description for specific details. All faults are not present on all cards.

This card also has a manual reset switch. Pressing this switch will clear any latched faults and implement a switch to the primary inputs if the primary inputs are determined to be good.

Bit	Hex	Definition
0	0001	Output A Failure
1	0002	Output B Failure
2	0004	Output C Failure
3	0008	Output D Failure
4	0010	Output E Failure
5	0020	Output F Failure
6	0040	Synthesizer Fault
7	0080	Card Disabled
8	0100	Power Cycle
9	0200	Primary Input Fault
10	0400	Secondary Input Fault
11	0800	Using Primary Timing Source
12	1000	Not Assigned
13	2000	Not Assigned
14	4000	Not Assigned
15	8000	Not Assigned

The Machine Report provides 23 bytes of ASCII coded hex for each card slot. The first byte is the slot number in hexadecimal. The second two bytes are the card identification number read from the card or entered via the serial port. (The composite fault bit read from the card along with the ID is not displayed.) An ID of 00 00 means that the slot is occupied by a passive card or by a part of a card that requires more than one slot, or that the slot is empty. The next two bytes of each line give the fault condition information of the slot. 00 00 indicates that there are no fault conditions present in that slot. FF FF means that a fault exists but the software is unable to provide more detailed information. The remaining bytes are described beneath the Machine Report listing. For a description of the bit definitions, see the appropriate individual card manual.

2.4.2.7. FAULT OUTPUTS

The fault monitor also controls fault lines passing through to the back panel. These lines may be used for different purposes by different rear panel cards. The first line, OUT1, latches any alarm detected on a 560-5181-2 timing card by the fault monitor. The second line, OUT2, latches any alarm detected on a 560-5181-1 timing card by the fault monitor. To reset OUT1 and OUT2, the CL command must be sent to the processor; or the manual reset switch must be toggled. When any fault is present, the line is active. OUT6, OUT7, and OUT8 are used to indicate the status of the primary (P), secondary (S), and tertiary (T) status inputs when present.

2.4.2.8. AUDIBLE ALARM

The fault monitor also drives a line, /BEEP, which may be used to drive an audible alarm which is present on some CPU I/O modules. The

/BEEP line is activated any time a fault occurs in the chassis. The line can be deactivated by sending a Q command to quiet the alarm. It can also be disabled by sending BOFF to turn the buzzer off. The BON command will enable the buzzer.

2.4.2.9. COMMAND SUMMARY

The serial I/O commands are listed in the following summary and syntax is described in the sections that follow. Correct entry of a command will be acknowledged with OK<CR><LF>. In machine mode there will be no acknowledgment. Incorrect or invalid entries will result in one of the following error messages:

ERROR 02 SYNTAX<CR><LF>

ERROR 05 NO SUCH FUNCTION<CR><LF>

The format for data input is:

<COMMAND><CR>

where <COMMAND>

<CR>

is one of the commands listed below.

a carriage return <CR> or a carriage return/line feed combination <CR><LF>. Line feeds are ignored.

COMMAND DESCRIPTION:

<u>Command</u>	<u>Function</u>	<u>Modes</u>
AROFF<CR>	Turn off automatic fault reports.	V / M
ARON<CR>	Turn on automatic fault reports.	V / M
BOFF<CR>	Turn off / disable audible alarm.	V / M
BON<CR>	Turn on / enable audible alarm.	V / M
C##?<CR>	Request configuration on slot ##.	V / M
C## [data]<CR>	Configure slot ## (front card). Refer to manual for [data].	V / M
C##=xxxx<CR>	Enter card ID (xxxx) for slot ## (front card).	V / M
CR##=xxxx<CR>	Enter card ID (xxxx) for slot ## (rear card).	V / M
CL<CR>	Clear previous fault status.	V / M
DEFLT<CR>	Restore default parameters.	V / M
H<CR>	Request HELP!	V / M
M<CR>	Switch to machine mode.	V
PR##<CR>	Turn on periodic reports every ## minutes.	V / M
PROFF<CR>	Turn off periodic reports.	V / M
PRI<CR>	Switch to primary inputs if available.	V / M
PRI!<CR>	Switch to primary inputs regardless of faults.	V / M
PSRC=x<CR>	Set the P external fault status input to active high, active low, or disable when x=H,L,O, or D.	
PSRC?	Request the PSRC setting.	
Q<CR>	Quiet the audible alarm.	V / M
R<CR>	Request a report.	V / M
REF<CR>	Automatic REF selection based on PST status inputs.	V / M
REFA!<CR>	Enable A, Disable REFB and REFC.	V / M
REFB!<CR>	Enable B, Disable REFA and REFC.	V / M
REFC!<CR>	Enable C, Disable REFA and REFB.	V / M
SEC<CR>	Switch to secondary inputs if available.	V / M
SEC!	Switch to secondary inputs regardless of faults.	
SITE=##<CR>	Set the site of the chassis to ## (00-99).	V / M
SITE?<CR>	Request the site of the chassis.	V / M
SSRC=x<CR>	Set the S external fault status input to active high, active low, or disable when x=H,L,O, or D.	V / M
SSRC?	Request the SSRC setting.	V / M
TPRI=x<CR>	Connect the timing switch card primary input fault to an external fault input x=P,S,T, or N for none.	V / M
TPRI?	Request the TPRI setting.	V / M
TSEC=x<CR>	Connect the timing switch card secondary input fault to an external fault input x=P,S,T, or N for none.	V / M
TSEC?	Request the TSEC setting.	V / M
TSRC=x<CR>	Set the source of the T external fault status input to active high, active low, or disable when x=H,L,O, or D.	V / M
TSRC?	Request the TSRC setting.	V / M
V<CR>	Switch to verbose mode.	M
VER?	Request current software and FPGA version.	V / M
<CR><CR><CR>	Switch to verbose mode.	M
<CR><CR><CR>	Request HELP!	V

2.4.2.9.1.

AUTOMATIC FAULT REPORTS ON/OFF

Refer to Section 2.4.2.6.6 for a description of fault and status reporting. Use the ARON/AROFF functions to enable/disable automatic fault and status reporting. To turn automatic fault reporting on (i.e., print a report when a fault condition changes), send the following string:

Sample Entry: ARON<CR>
Response: OK<CR><LF>

To turn automatic fault reporting off, send the following character string:

Sample Entry: AROFF<CR>
Response: OK<CR><LF>

2.4.2.9.2. AUDIBLE BEEPER ON/OFF

Refer to Section 2.4.2.8 for a description of disabling/enabling and deactivating the audible beeper. Use the BON/BOFF functions to enable/disable the audible beeper. Use the Q function to deactivate the beeper. To enable the audible alarm (/BEEP on the backplane), send the following string:

Sample Entry: BON<CR>
Response: OK<CR><LF>

To disable the audible alarm (/BEEP on the backplane), send the following string:

Sample Entry: BOFF<CR>
Response: OK<CR><LF>

To temporarily quiet the beeper, send the following string:

Sample Entry: Q<CR>
Response: OK<CR><LF>

2.4.2.9.3. REQUESTING/SETTING SLOT CONFIGURATION AND ID

Refer to Section 2.4.2.6.2 for a description of setting and retrieving card slot configuration data. Refer to Section 2.4.2.6.5 for a description of setting board ID information. To retrieve data on a card in a particular card slot, send the following string:

Sample Entry: C##?<CR>
Response: Front and back contents of Slot ## are returned

Where ## represents the slot number. Leading zeros may be omitted in the slot number.

To configure the front card of a particular slot, send the following string:

Sample Entry: C## [data]<CR>
Response: OK<CR><LF>

Where ## is the slot number and [data] is the data for the command. Refer to the manual for the appropriate card for [data]. (Rear cards are not currently configurable.)

To configure the card ID for a particular slot, send the following string:

Sample Entry: C##=XXXX<CR> (front card) or
CR##=XXXX<CR> (rear card)
Response: OK<CR><LF>

Where ## is the slot number and XXXX is the configuration ID for the card.

2.4.2.9.4. CLEARING PREVIOUS FAULT STATUS

This command will clear the CPU memory of old faults, clear any card latched fault status bits, clear fault outputs (Section 2.4.2.7), and silence the audible alarm (Section 2.4.2.8). Send the following string:

Sample Entry: CL<CR>
Response: OK<CR><LF>

2.4.2.9.5. RESTORE DEFAULT PARAMETERS

This command will restore the parameters stored in EEPROM to their default values. Send the following string:

Sample Entry: DEFLT<CR>
Response: OK<CR><LF>

Default parameters are:

ARON	Automatic reports on
V	Verbose Mode
PR10	Periodic reporting interval, 10 minutes
PROFF	Periodic reports off
SITE=01	Site number is 01
BON	Audible alarm on
PSRC=D	Disable primary fault status input
SSRC=D	Disable secondary fault status input
TSRC=D	Disable tertiary fault status input
TPRI=N	No connection between primary external fault input and timing card primary input
TSEC=N	No connection between secondary external fault input and timing card secondary input

2.4.2.9.6. REQUESTING HELP

To request help, send the following string:

Sample Entry:	H<CR>	or	<CR><CR><CR>
			(verbose mode only)
Response:	Help will be displayed.		

2.4.2.9.7. SWITCHING BETWEEN VERBOSE AND MACHINE MODES

Refer to Section 2.4.2.6.1 for a description of the operational modes. To go to machine mode, send the following string:

Sample Entry:	M<CR>
Response:	OK<CR><LF>

To go to verbose mode, send the following string:

Sample Entry:	V<CR>	or	<CR><CR><CR>
Response:	OK<CR><LF>		

2.4.2.9.8. ENABLING/DISABLING PERIODIC REPORTING

Refer to Section 2.4.2.6.6 for a description of enabling and disabling periodic reporting. To enable periodic reporting, send the following string:

Sample Entry:	PR##<CR>
Response:	OK<CR><LF>

Where ## is the decimal interval in minutes(0-99).

To cancel periodic reporting, send the following string:

Sample Entry:	PROFF<CR>
Response:	OK<CR><LF>

2.4.2.9.9. SWITCHING TIMING CARD INPUTS

Refer to Section 2.4.2.5 for a description of switching timing card inputs. To switch to primary inputs if there are no input faults, send the following string:

Sample Entry:	PRI<CR>
Response:	OK<CR><LF>

To switch to primary inputs regardless of input faults, send the following string:

Sample Entry:	PRI!<CR>
Response:	OK<CR><LF>

Note: Sending PRI<CR> after PRI!<CR> will return the Timing Switch card to normal operation.

To switch to secondary inputs, if there are no input faults, send the following string:

Sample Entry: SEC<CR>
Response: OK<CR><LF>

To switch to secondary inputs regardless of input faults, send the following string:

Sample Entry: SEC!<CR>
Response: OK<CR><LF>

2.4.2.9.10. SETTING EXTERNAL STATUS INPUT LEVEL

Refer to Section 2.4.2.6.3 for a description of setting the external fault status input level. To set the active level for the primary input, send the following string:

Sample Entry: PSRC=x<CR>
Response: OK<CR><LF>

To set the active level for the secondary input, send the following string:

Sample Entry: SSRC=x<CR>
Response: OK<CR><LF>

To set the active level for the tertiary input, send the following string:

Sample Entry: TSRC=x<CR>
Response: OK<CR><LF>

Where x is "H" for HIGH=ALARM, "L" for LOW=ALARM, "O" for OFF, and "D" for DISABLE. If turning an external status input OFF, this will disable the corresponding reference frequency and any mapped timing input. In effect, this command turns off the entire associated channel. To request PSRC, SSRC, and TSRC command settings send the following strings:

Sample Entry: PSRC<CR>
Response: PSRC=x<CR><LF>

Sample Entry: SSRC<CR>
Response: SSRC=x<CR><LF>

Sample Entry: TSRC<CR>
Response: TSRC=x<CR><LF>

2.4.2.9.11. REQUESTING A REPORT

Refer to Section 2.4.2.6.6 for a description of requesting a report. To request a report from the unit, send the following string:

Sample Entry: R<CR>
Response: A report will be immediately transmitted.

2.4.2.9.12. ENABLING AND DISABLING THE REFERENCE FREQUENCY

Refer to Section 2.4.2.4 for a description of enabling and disabling the Reference Frequency. To exit the reference frequency test mode and return to normal operation, send the following string:

Sample Entry: REF<CR>
Response: OK<CR><LF>

To disable REFB and REFC and enable REFA, send the following string:

Sample Entry: REFA!<CR>
Response: OK<CR><LF>

To disable REFA and REFC, and enable REFB send the following string:

Sample Entry: REFB!<CR>
Response: OK<CR><LF>

To disable REFA and REFB, and enable REFC send the following string:

Sample Entry: REFC!<CR>
Response: OK<CR><LF>

2.4.2.9.13. REQUESTING / SETTING SITE NUMBERS

Refer to Section 2.4.2.6.4 for a description of setting and returning the site number of the chassis. To set the site number of the chassis, send the following string:

Sample Entry: SITE=##<CR>
Response: OK<CR><LF>

Where ## is the decimal number in the range 0 to 99 in which to set the chassis. To request the site number of the chassis, send the following string:

Sample Entry: SITE?<CR>
Response: SITE=##<CR><LF>

2.4.2.9.14. CONNECT THE TIMING CARD INPUT FAULTS TO AN EXTERNAL FAULT INPUT

Refer to Section 2.4.2.6.3 for a description of connecting the timing card input faults. To connect the timing card primary input fault to an external fault input, send the following string:

Sample Entry: TPRI=x<CR>
Response: OK<CR><LF>

To connect the timing card secondary input fault to an external fault input, send the following string:

Sample Entry: TSEC=x<CR>
Response: OK<CR><LF>

Where x = "P" for Primary, "S" for Secondary, "T" for Tertiary, or "N" for None. To request TPRI and TSEC settings, send the following strings:

Sample Entry: TPRI?<CR>
Response: TPRI=x<CR><LF>

Sample Entry: TSEC?<CR>
Response: TSEC=x<CR><LF>

2.4.2.9.15. REQUEST VERSION

To request the current software and FPGA versions (field programmable gate array), send the following string:

Sample Entry: VER?<CR>
Response: 560-3175 1.1 184-054 A

Where 560-3175 is the software number, 1.1 is the software version, 184-054 is the FPGA number, and A is the FPGA version.

SECTION THREE

3. THEORY OF OPERATION

3.1. GENERAL INFORMATION

This section contains a detailed description of the 560-5179-2 Fault Monitor circuitry. Refer to the drawings in part four of this section.

3.2. HARDWARE DESCRIPTION

3.2.1. POWER

The 560-5179-2 Fault Monitor runs on 48 Vdc power from the backplane. A DC to DC converter supplies the on-card circuitry with ± 5 Vdc.

3.2.2. RESET

A reset to the 560-5179-2 can be caused in three ways. A reset is initiated at startup, when the +5 Vdc supply drops below 4.5 Vdc, or when a low going pulse is input via the /RESET line on P1-14. The MC34064 Undervoltage Detector pulls /HC11RST low whenever either of the latter two conditions are met.

3.2.3. CPU FAULT MONITOR

The 560-5179-2 contains an on-card CPU Fault detector. The /NOFAULT line from the processor is AC coupled to an RC at the input of a comparator. While the RC circuit remains charged due to processor activity, the LM339 Comparator output will drive high. This signal is inverted, which provides the INHIBIT signal which enables the write ports. The same signal is input to an Opto-isolator, which controls the front panel LED. The LED is held off by the +15 Vdc power supply and by processor activity.

3.2.4. FREQUENCY MONITORS

The 560-5179-2 monitors reference inputs from the backplane. REFA, REFB, and REFC signals enter the card through the backplane on pins C2, C4, and C6. Each input passes through an identical set of circuitry to provide control of the front panel LED's REFA, REFB, REFC, and the signals /AOK, /BOK, and /COK which are read by the processor. A copy of the frequency is sent buffered to the front panel test points REFA, B, and C. The incoming signal is routed through LT1016 Comparators, U5, 10, 23, which convert the incoming sinusoidal signal into TTL signals. The output of the comparators also charge capacitors at the input of voltage comparators. When the charge on the capacitors is higher than Vref (≈ 1.58 Vdc), the corresponding LM339 Comparator output drops low. The comparator outputs drive the /AOK, /BOK, and /COK lines directly. The comparator outputs are also inverted to control the front

panel LED's. The frequency monitors can be made inactive by setting SW1 appropriately. This pulls the corresponding charge capacitor, C10,19,27, to +5 Vdc which will cause the output of the comparator to remain low.

3.2.5. SERIAL COMMUNICATION

The 560-5179-2 card simultaneously supports both RS-232 and RS-422 protocols at 9600 baud, 8 data bits, no parity, and 1 stop bit.

RXDIN and TXDOUT lines for RS-232 communication are connected via backplane pins B9 and B10. The LT1180A converts the RS-232 levels to TTL levels for the processor.

RIN± and TOUT± signals for RS-422 communication are connected from the backplane pins B13 & B14 and B11 & B12. The LTC491 converts the RS-422 levels into TTL levels for the processor.

3.2.6. PROCESSOR

The 560-5179-2 uses an HC11F1 Microcontroller. The processor runs on a 10 MHz frequency (20 MHz crystal X1 divided by 2). The processor has access to the read ports, /RDPORT0-4, the write ports, /WRPORT0-3, and the /NOFAULT signal. The read and write ports are described following this section. The /NOFAULT signal is toggled by the processor to indicate that the processor is running. If the /NOFAULT signal is not toggled, the CPU Fault Monitor will trigger.

3.2.7. READ PORTS

Many of the backplane signals can be read directly by the processor. The inputs /RDPORT0-4 have 4.7 KΩ pull-ups to +5 Vdc and are used to read the required signals from the data bus via Line Buffers. RDPORT0 (\$2000h) reads the slot identification information, SLOT0-4. The slot information is a 5 bit hex value representing the slot number in the chassis. The signals are controlled by the backplane card itself. /SW2 and /SW1 are used to read the status of switches S1 and S2 when present. The SPARE line is an external input which is connected to J2-23 of the rear panel Alarm Module. /RDPORT1,2,3 (\$3000h,\$4000h, \$5000h) are used to read the /FLTIN1-19 lines from each of the slots on the card. /FLTIN1-18 represent the first 18 slots in the system. /FLTIN19 represents slot 20. /RDPORT4 (\$6000h) reads the three frequency monitor signals, /AOK, /BOK, /COK, and the site information signals, SITE0, and SITE1. These signals have been described previously in the Frequency Monitor and Setup descriptions.

3.2.8. WRITE PORTS

The 560-5179-2 controls multiple signals on the backplane. The signals are controlled via /WRPORT0-3, Octal D Flip-Flops. /WRPORT0 (\$4000h) controls signals /OUT1-8. /OUT1-8 pass directly through to the backplane card via P1-A8, A9, C8, C9, A11, A12, C11, C12. The

INHIBIT line from the processor fault detector enables the write ports when the processor is functioning properly.

3.2.9. SIGNAL GROUND

All GND signals on the 560-5179-2 card are signal ground.

SECTION FOUR

4. DETAILED DRAWINGS

4.1. 560-5179-2 BILL OF MATERIALS