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Model Number: MS462XX

Serial Number: All

---

Prepared By: Stefan Pongratz      Date: 9/11/01

Project Leader: Doug Ramandanes      Date:

Test/Assembly Supervisor: Keely Raymond      Date:

Lab/Manufacturing Manager: Dave Stenfort      Date:

---

UNDER PCO CONTROL   9/01      BY   Dave Stenfort

Date      M.E.

| A | New Release | | 9/01 | SP | DS |
|---|---|---|---|---|---|
| B | Rev. 5.0, 7.2, 7.3, | MI003016 | 4/02 | DS | GE |
| C | Adding Tests | MI003909 | 11/03 | SP | GM |
| D | Adding Tests | MI004114 | 3/1/04 | SP | GM |
| | | | | | |

# /Inritsu

# Test Procedure

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1.0 This test procedure is for the CPU that goes inside the Scorpion Vector Network Measurement System (VNMS). The test can be divided into four categories. They are as followed:

### 1.1 VISUAL INSPECTION

This part of the test will tell us if we have any loose screws, bad pin connections, and/or damaged components.

### 1.2 MEASUREMENTS

The tester will look at the characteristics of the 40 and 50MHz clock signal and make sure that the pulse is within specification. The tester will also make sure the battery is within specification.

### 1.3 SYSTEM SELF TEST

This is a self-test monitor program that tests different controllers on the CPU – board.

### 1.4 SYSTEM TESTING

## 2.0 EQUIPMENT LIST

Analog oscilloscope: Tektronix 2465B, 400MHz

Probe: Tek P6133, 10 MΩ, 10.8 pF, 10X1.3M

Multimeter: Fluke, 70III

Cable from Floppy Drive: P/N 807-3

Cable Backlight Driver: P/N 51920

Ribbon D: P/N 800-489

LCD Connector: P/N D43020-3

Frequency Counter: EIP 548A

## 3.0 REFERENCE DOCUMENTS

Schematic D43014-3

Drawing D43014-3

## 4.0 TEST METHOD

Follow this test procedure sequentially through the tests outlined in Steps 6 and 7.

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5.0 SPECIFICATIONS

BT1 Lithium Battery (Panasonic)

Desired Voltage: 3.1 V

Minimum Spec: 3.1 V

40 MHz Clock Output (tp15)

$V_{IH}$ (Minimum High Level Input Voltage): 2.0 Volts

$V_{IL}$ (Maximum Low Level Input Voltage): 0.8 Volts

$t_r$ (rise time maximum): 5 ns

$t_f$ (fall time maximum): 5 ns

50 MHz Clock Output (tp 20)

$V_{IH}$ (Minimum High Level Input Voltage): 2.0 Volts

$V_{IL}$ (Maximum Low Level Input Voltage): 0.8 Volts

$t_r$ (rise time maximum): 5 ns

$t_f$ (fall time maximum): 5 ns

6.0 PRELIMINARY PROCEDURES

Always follow Anritsu's ESD procedure, ACP-3035.

7.0 TEST PROCEDURE

7.1 VISUAL INSPECTION

1) Inspect the board and look for anything that seems physically damaged (crack in the board, burned components, bent pins, solder issues).

2) Check all the screws and make sure they are tightened all the way.

3) Confirm rework of voltage regulators VR2 and VR1 (54-1368 and 54-LM340T). If the handle is considered to be at the bottom of the board, then these two regulators are located in the upper right corner (it says Linear on top of VR2 and VR1 is right next to it). Make sure that the heat sink isolator below the regulators is flat. If rework has been done, there are two heat sink isolators and they should not overlap each other. Confirm that the spacer (the aluminum piece between chassis and heat sink isolator) has compound on the bottom of its surface. If no compound is present there will be a gap between spacer and chassis. Try to see if there is a gap between spacer and chassis by looking through the back of the board.
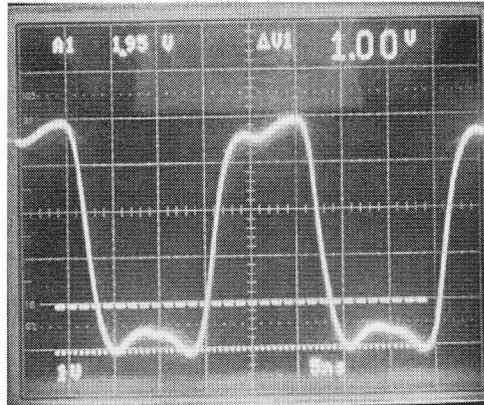
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4) Here, the tester will confirm that R124 and R187 have been modified correctly. Both of them are located on the bottom side. R187 is close to the handle. Using the multimeter, confirm that the resistance is 82.5 Ω.

5) Next, confirm that Capacitors C547-C551 have been removed from the board. These Capacitors used to be on the same side as the resistors. They are located to the left of the handle. Confirm that all of them have been removed.

6) Locate R8 and R9 in the upper half of the other side. Using the multimeter, confirm that the measured resistance is 0Ω.

7) Perform an additional visual inspection of the reworks. First, locate U167. This chip is in the lower right corner. It says Altera Max on it, and there are capacitors and resistors on top of it (capacitors are yellow and resistors are blue).

8) MI002615 was written to modify chassis in a manner such that there would be no need for Contract Manufacturer to bend or sand board to fit it into the chassis. Verify that PCO MI002615 was implemented correctly and inform M.E. if problem is still there.

9) The connector on the back panel used to be a press fit connector. For reliability reasons, this was replaced with a solder type connector (551-1348). Confirm functionality of solder type connector with an ohmmeter. Look at the schematic below. Confirm that pin 6, 8, 12, 18, 20, 24 are all connected to ground. Switch the setting on the multimeter to measure DC-Voltage. Confirm the given voltages on pin 7, 9, 13, 24, 29, 31, 35. Finally, confirm continuity of the remaining pins.
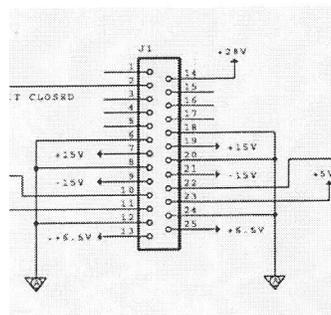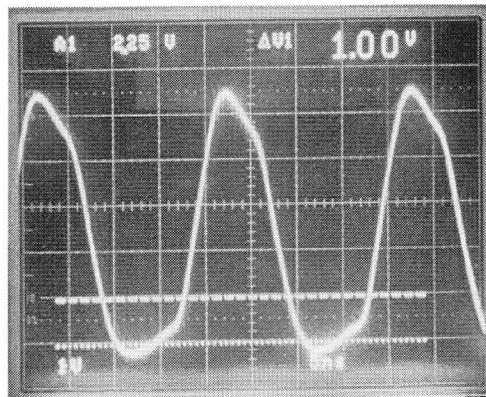


10) Turn the board around and locate RN 54 in the upper right corner. Confirm that pin 8, 9, 10, and 11 are unsoldered and lifted up. (Note that pin1 is in the upper left corner of this chip).

11) Confirm that the Lithium battery is flat. This battery is located in the left bottom of the upper side.

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7.2 MEASUREMENTS

1) Using the multimeter, measure the voltage of the Panasonic 3V Lithium Battery in the lower left corner. Make sure that the voltage is 3.1 V or greater.

2) Turn on the oscilloscope.

3) Connect probe to ch1 of the oscilloscope

4) Set the Volts/Div knob to 1V/div (turn knob until display in the bottom left corner displays 1V).

5) Set the SEC/Div knob to 5ns/div (turn knob until display in the bottom right corner displays 5ns.

6) Set Mode to AutoLVL (buttons are located under MODE).

7) Set source to CH1(buttons are located under SOURCE).

8) Set coupling to DC (buttons are located under COUPLING).

9) Connect the CPU to the system (note that the tester has to connect the cables from the front panel to the CPU).

10) Locate P1 on the rear panel and connect the P1 connector.

11) Connect LCD connector (D43020-3) from front panel to J17 on CPU board.

12) Connect the Cable Backlight Driver (51920) from the front panel to J18 on CPU.

13) Connect the Ribbon cable from the front panel to J19 on the CPU.

14) Connect floppy cable (807-3) from the floppy on the front panel to J11 on CPU.

15) Turn on Unit.

*(pg. 3 of 78 CPU schematics; next to TP20)*

16) Put probe on test point 15 (output of 40 MHz oscillator). Note that it is imperative that the ground (alligator clip) is connected as close to test point as possible. The probe should create a 90-degree angle with the board.

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17) Compare the photo to what you see on the scope. When the signal is low, there is a ripple due to the mismatch in impedance. Make sure that this ripple does not go above 0.8 Volts (in the picture, the max ripple is about 0.4 Volts). Confirm that the rise and fall times are below 5 ns. Looking at the signal as it is rising, the time to get from 0.5 V to 4.5 V should be less than 5ns (it should not exceed one division). The fall time can be measured by looking at the signal as it is falling and measuring the time it takes to get from 4.5 V to 0.5 V. This should also be less than 5 ns.

(pg 3 of 78 - CPU schematics)

18) Now, put the probe on test point 20 (output of 50 MHz oscillator). Find a ground as close to the test point as possible and maintain a 90-degree angle with the board.

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19) Compare the photo to what you see on the scope. The low in the picture is about – 0.2 Volts. If the low in the picture is above 0.8 Volts, the signal is out of spec. Confirm that the rise and fall times are below 5 ns following the procedure outlined in (20).

20) Set the dipswitches for the CPU as shown below to model an MS4623B with option3.

SWITCH SETTINGS, CPU BOARD

FOR SPECIFIC OPTION CONFIGURATION, REFER TO SALES ORDER
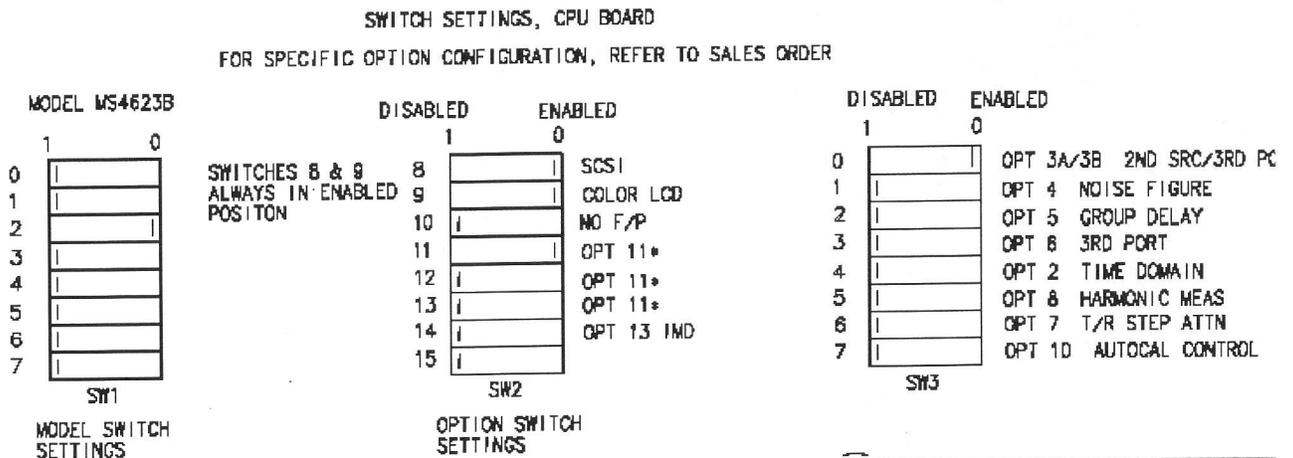


## 7.3 SYSTEM SELF TEST

This test tests the controller of different chips on the board. See description below.

1) Turn off unit.

*(pg. 39 of 78 - CPU schematics)*

2) Replace U75 (EPROM) with the MON EPROM that has been designated for testing.

3) Open the CPU Hyper Terminal Program on the computer.

4) Connect serial Cable SR232 to the back of the CPU.

5) Turn on unit. Note that the screen will remain blank, and that is normal.

6) Type the following commands:

7) Bug>cnfg        [Enter]

Make sure you see this on the screen (Write these numbers down)

CLOCK SPEED = "32"
ETHERNET ADDRESS = "00E0A0000XXX"
DRAM SIZE = "16"  40
SRAM SIZE = "2048"

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**Test Procedure**

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DSP SHARED MEMORY = "0128"

FLASH SIZE = "02"

EXTENDED FLASH SIZE = "02"

8) Bug>sd [Enter]

9) Diag>lanc [Enter]

10) Diag>scc [Enter]

11) Diag>rtc [Enter]

12) Diag>ncr [Enter]

13) Diag>dsp [Enter]

14) Diag>dspsram [Enter]

15) Diag>sram [Enter]

16) Diag>dram [Enter]

17) Diag>sramdisk [Enter]

18) Diag>gvram [Enter]

19) Diag>gdram [Enter]

20) Diag>flash fill [Enter]

21) Diag>flash_ex fill [Enter]

22) Diag>sd [Enter]

23) Bug>cnfg [Enter]

24) Do you see the same thing on the screen?

CLOCK SPEED = "32"

ETHERNET ADDRESS = "00E0A0000XXX"

DRAM SIZE = "16"  40

SRAM SIZE = "2048"

DSP SHARED MEMORY = "0128"

FLASH SIZE = "02"

EXTENDED FLASH SIZE = "02"

Did every test pass? If not, contact supervisor or engineer.

**Directions:** Turn on the power to the CPU test station. Wait for the following message to be displayed on the computer terminal.

```
pSOSystem V2.0.E
Copyright (c) 1992 - 1994, Integrated Systems, Inc.
------------------------------------------------------------
STARTUP MODE:
  Boot into pROBE+ standalone mode
NETWORK INTERFACE PARAMETERS:
  LAN Interface is disabled
  Shared Memory Interface is disabled
MULTIPROCESSING PARAMETERS:
  This board is currently configured as a single processor system
HARDWARE PARAMETERS:
  Serial channels will use a baud rate of 9600
  After board is reset, startup code will wait 60 seconds
------------------------------------------------------------
To change any of this, press any key within 60 seconds

(M)odify any of this or (C)ontinue? [M]
```

At this point, press "**M**" to go into the modify menu and change some of the parameters. Select the following answers to the questions below.

```
How should the board boot?
  1. pROBE+ standalone mode
  2. pROBE+ waiting for host debugger via serial connection
  3. pROBE+ waiting for host debugger via a network connection
  4. Run the TFTP Bootloader

Which one do you want? [3]    --->   select 3 for network connection
NETWORK INTERFACE PARAMETERS:
Do you want a LAN interface? [Y]  --->  select Y
This board's LAN IP address(0.0.0.0 = RARP)? [100.100.100.1]  --->  select 100.100.100.1
Use a subnet mask for the LAN interface? [N]
Do you want a shared memory network interface? [N]
Should there be a default gateway for packet routing? [N]
MULTIPROCESSING PARAMETERS:
Do you want to configure a multiprocessing pSOS+m system? [N]
HARDWARE PARAMETERS:
Baud rate for serial channels [9600]
How long (in seconds) should CPU delay before starting up? [2]   --->   select 2
```

At this point, cycle the power to the CPU test station, and the following message should be displayed.

```
------------------------------------------------------------
STARTUP MODE:
  Boot into pROBE+ and wait for host debugger via a network connection
NETWORK INTERFACE PARAMETERS:
  IP address on LAN is 100.100.100.1
  Shared memory interface is disabled
MULTIPROCESSING PARAMETERS:
  This board is currently configured as a single processor system
HARDWARE PARAMETERS:
  Serial channels will use a baud rate of 9600
  After board is reset, startup code will wait 2 seconds
------------------------------------------------------------
(M)odify any of this or (C)ontinue? [C]  --> select C to continue
```

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25) If test passed, turn unit off and replace MON EPROM with the original EPROM designated for the unit you are working on. *Run PSOS config.*

26) Insert Boot Utilities Software disk

27) Turn unit on

28) Press #1 button at the first beep *Press 1 again (from menu) to load Utility files.*

29) Get the Boot Utilities Software (2300-246) disk out and insert LATEST VERSION of Application Software (2300-244).

30) Press button #2 and wait for the instrument to finish downloading the software.

31) Press "ENTER" to exit

32) Press the DEFAULT key, and then press the #0 button. This will reset instrument to GPIB address #6.

33) Perform step 23-25 of section 7.2 one more time and confirm that everything is in order.

**MONITOR PROGRAM**

Here is a description of the test you just performed.

**LANC test**

The LANC test tests the system's Ethernet controller Intel's CA82596. It includes the controller's self test and DUMP test. The self-test executes the on chip self test. The DUMP executes the CA82596's DUMP command.

**SCC Test**

The SCC test tests the system's serial port controller Zilog's 85230. It runs the device/registers access test.

**RTC test**

The RTC test tests the system's real time clock SGS Thomson's M48T18. It includes three sub-tests: clock test, ram test and address test. The clock test tests the chip's timekeeper functionality. The ram test tests the chip's "Zero Power" RAM functionality. The address test tests the chip's "Zero Power" RAM addressibility.

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### SCSI test

The SCSI test tests the system's hard drive controller NCR 53C710. It consists of five sub-tests. The ACC1 test tests the basic accessibility to the device itself. The ACC2 test tests the accessibility to the registers. The SFIFO test tests the basic ability to write data into the SCSI FIFO and retrieve it in the same order as written. The DFIFO test tests the basic ability to write data into the DMA FIFO and retrieve it in the same order as written. The LPBK (loop back) test checks the input and output data latches and performs a selection, with the 53C710 executing initiator instructions and the 68040 implementing the target role by asserting and polling the appropriate SCSI signals.

### DSP test

The DSP test runs the TMS320C44 on-chip self test code to make sure the functionality. In the troubleshooter mode the user can choose the following monitor program's memory tests, each of these test consists of code that write different patterns to the memory locations and read them back later to verify the memory is working. Some tests also contain code that copy a short execution procedure into the respective memory and run the program and verify with the output of the program.

**DRAM test**
**SRAM test**
**SRAMDISK test**
**GVRAM test**
**GDRAM test**
**FLASH memory test**
**EXTENDED FLASH memory test**

## 7.4    SYSTEM TESTING

### 7.4.1  Recalling ALC Cal From Floppy Disk

1)  Insert Floppy Disk "ALC CAL"

2)  Press "Utility" > "DIAGNOSTICS" > "HARDWARE CAL" > "DISK OPERATIONS" > "RECALL FROM FLOPPY DISK" > HW_CAL ALC".

### 7.4.2  Clearing Service Log

1)  Press "Utility" > "DIAGNOSTICS" > "SERVICE LOG" > "CLEAR LOG"

2) Turn unit off and then turn it back on again.

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### 7.4.3  Self Test

1) Press "Utility" > "DIAGNOSTICS" > "STAR SELF TEST" > "SERVICE LOG"

2) If the battery is low, replace battery and format hard disk ("Utility" -> "GENERAL DISK UTILITIES" -> "FORMAT HARD DISK") and run self test again.

3) Verify that there are no errors in the service log.

### 7.4.4  External Keyboard Test

1) Press "Utility" > "DIAGNOSTICS" > "PERIPHERAL TESTS" > "EXTERNAL KEYBOARD"

2) Verify that ALL keys are working by pressing each key twice (first time should turn the corresponding character green and there should be a beep after the second time).

### 7.4.5  10 MHz Calibration

1) Connect GPIB Cable between EIP counter and Scorpion.

2) Connect cable from Port 1 of Scorpion to BAND 3 (1 GHz – 26.5 GHz) of EIP.

3) Press "Utility" > "DIAGNOSTICS" > "HARDWARE CAL" > "AUTOMATIC" > "START CAL" > "SAVE TO HARD DISK" > HW_CAL TMH".

## 7.5  ENVIRONMENTAL TESTING

### 7.5.1  Configuring the CPU Board

1) Set Dip switches on the CPU board per the diagram below.

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SWITCH SETTINGS, CPU BOARD

FOR SPECIFIC OPTION CONFIGURATION, REFER TO SALES ORDER

MODEL MS4622B

| | 1 | 0 | | | DISABLED | | ENABLED | | | DISABLED | | ENABLED | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | | 0 | | | 1 | | 0 | |
| 0 | I | | SWITCHES 8 & 9 | 8 | | I | SCSI | | 0 | I | | OPT 3A/3B | 2ND SRC |
| 1 | | I | ALWAYS IN ENABLED | 9 | | I | COLOR LCD | | 1 | I | | OPT 4 | NOISE FIGURE |
| 2 | I | | POSITION | 10 | I | | NO F/P | | 2 | I | | OPT 5 | GROUP DELAY |
| 3 | I | | | 11 | | I | OPT 11* | | 3 | I | | OPT 6 | 3RD PORT |
| 4 | I | | | 12 | I | | OPT 11* | | 4 | I | | OPT 2 | TIME DOMAIN |
| 5 | I | | | 13 | I | | OPT 11* | | 5 | I | | OPT 8 | HARMONIC MEAS |
| 8 | I | | | 14 | I | | OPT 13 IMD | | 6 | I | | OPT 7 | T/R STEP ATTN |
| 7 | I | | | 15 | I | | OPT 4B | | 7 | I | | OPT 10 | AUTOCAL CONTROL |

SW1

MODEL SWITCH
SETTINGS

SW2

OPTION SWITCH
SETTINGS

SW3

7.5.2   Installing the CPU Board

1) If front panel has not yet been removed from the MS4622B test instrument, then remove it now.

2) Install the CPU board into the instrument's top shelf.  Before sliding the board all the way into the instrument, connect all 4 cables from the front panel.  Slide the board all the way back until it engages the connector on the backplane.  Monitor this connection through the slots in the back of the unit to ensure the board has been completed seated.

3) Install the front panel and install screws on both sides.

4) Secure CPU to rear of unit with at least 2 screws.

7.5.3   Preparing the MS4622B for Environmental Test

1) Place instrument into Environmental chamber.

2) Connect power cord and GPIB cable (top connector).  Connect external monitor to the VGA connector at rear of instrument.

3) After unit has booted up, set the GPIB address to 7:

a. Press "UTILITY" >  "REMOTE INTERFACE" > "GPIB SETUP".

b. Under "IEEE 488.2", enter 7 followed by the x1 key.

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4) The ALC Cal file should have been applied during board pre-test, however, if "ALC Unleveled" errors are appearing on the instrument screen, load the ALC Cal file per the pre-test instructions. Note: This particular instrument (MS4622B) requires its own specific ALC Cal file.

5) Erase any errors in the Service Log:

Press "UTILITY" > "DIAGNOSTICS" > "SERVICE LOG" > "CLEAR LOG".

6) Verify that the Hard Disk is accessible:

     a. Press "UTILITY" > "GENERAL DISK UTILITIES" > "DISPLAY DIRECTORY". The C:\ drive should appear on the screen.

     b. If the unit beeps and displays an error message (ie, "Hard Disk read error"), then the hard disk needs to be formatted. Press "UTILITY" > "GENERAL DISK UTILITIES" > "FORMAT HARD DISK".

7.5.4   Starting the Environmental Screen AMS Program.

1) On the computer, press Start Programs, Scorpion Environmental Screen.

2) Follow initial instruction screens of program.

3) After completing the initial instructions, the program's main form will take approximately 45 seconds to load.

4) Press "Add Unit to Bus". Enter address 7 when prompted.

5) Verify that "Temperature Profile" box shows 7 hrs.

6) Press "Normalize Units". Verify that the instrument's Clr/Local button is lit indicating that the unit is in Remote. Observe instrument for the next 60 seconds and verify no GPIB errors are displayed on the instrument's screen. If GPIB errors due occur, verify that the hard disk is accessible (as described earlier in procedure).

7.5.5   Starting the Environmental Chamber.

1) Close the door on the chamber.

2) Press the "STOP" button on the chamber's Programmer/Controller.

3) Press "RUN" > "PROG" > "1" > "ENT" > "ENT"

4) The chamber should start up and begin cooling down to -20 deg C.

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7.5.6  Monitoring the AMS Program.

1) As the chamber follows the temperature profile, the AMS program will continually exercise the MS4622B instrument.  In addition, the instrument will be turned ON and OFF throughout the screen.

2) Observe the Service Log Errors box to determine if any errors have been logged into the Service Log.

3) The Communication Status box near the bottom of the AMS form will turn red and show any communication errors should they occur.

4) The chamber will dwell at -20 deg C for approx. 3 hr 10 min, ramp up to +65 deg C over a 50 min period and then dwell at +65 deg C for another 3 hr 10 min. Finally, the chamber will take approx. 10-15 min to ramp back down to 25 deg C where it will continue to run until the "STOP" button is pressed.

5) As the On/Off Interval # box approaches interval 39, the Elapsed Time box should be nearing approx. 7.5 hrs. Once the program has finished interval 39, the test is completed.  The program can be stopped and the instrument and can be removed from the chamber.  Note: the program will continue to exercise the instrument (starting at interval 1 again) until the program is stopped (ie, until pressing the "Quit" button).

6) Any Communication errors displayed by the program should be investigated. Any Service Log errors should be presented to the supervisor of the Scorpion department at Anritsu.