MAINTENANCE MANUAL FOR STATION VOICE GUARD™ CHECKOUT PROCEDURE (SIMON)

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DESCRIPTION

The VOICE GUARD (VG) checkout procedure is used to verify proper operation of the station VG shelf, and to assist in troubleshooting. The procedure utilizes a standard ASCII terminal (not supplied) to communicate with a VG station shelf, and a SIMON (SImple MONitor) program to exercise and test the VG station circuitry only. A SIMON PROM replaces logic board PROM U2 so that the terminal can be used to force output lines, test memory, and exercise most of the VG shelf logic.

A complete set-up procedure is contained in this manual (see Table of Contents).

COMMANDS

SIMON uses a star character "*" as a prompt to indicate its readiness to accept commands. Commands consist of three letters followed by up to three data fields as follows:

COM[FIELD 1-] [FIELD 2 =] [FIELD 3] CR

"COM" is the particular three letter command. "FIELD 1" consists of up to four hex characters followed by a minus "-" sign. "FIELD 2" consists of up to four hex characters followed by an equal "=" sign. "FIELD 3" consists of up to four hex characters followed by a "CR" (carriage return). If a command does not depend on a certain field, it will be ignored and need not be entered.

After the first three letters have been entered, spaces may be added to separate the fields. Leading zeros need not be typed. Use "DELETE" or "BACKSPACE" to correct mistakes. Some commands enter a continuous display mode. To get out of the mode and return to the command level of SIMON, press the "ESCAPE" or "CRTL Z" key.

In the following syntax, the letters A, B, and C represent hex data to be entered, and brackets "[]" enclose the optional entries.

- HEL

  Lists part of the command syntaxes and functions.

- MOR

  Lists more command syntaxes and functions.

- RUN AAAA

  Causes execution to begin location AAAA.

- CBY AAAA [-BBBB]

  Displays code BYTE[S] from AAAA [To BBBB] in hex.

- DBY AA[-BB][=CC]

  Displays data BYTE[S] from internal RAM from hex location AA [To hex location BB], or IF = CC is included, changes the bytes in the range to CC in hex.

- XBY AAAA [-BBBB][=DD]

  Displays/changes external memory bytes or memory mapped I/O in the range from AAAA [to BBBB].

- POR A [=BB]

  Displays/changes port A (A = 1, 2, 3 or 4) [To BB in hex].

- CHK AAAA-BBBB

  Computes the checksum of program memory (i.e., uses the MOVC instruction) from hex location AAAA to BBBB.

- WRP AAAA

  Creates a continuous write pulse to external memory location AAAA. Exit this command by pressing escape.

- RDP AAAA

  Creates a continuous read pulse to external memory location AAAA. Exit this command by pressing escape.

- TMX AAAA-BBBB

  Tests external memory by writing pattern 1, checking for pattern 1, writing pattern 2, and checking for pattern 2 for the address range AAAA to BBBB.

- WAT

  Causes pulsing of the watchdog timer to be suspended, allowing it to expire.

- MDS A

  Selects which modem is tested by the BER command below. If A=0, the RF modem (U4) is tested; if A=1, the 9600 baud modem is tested.

- TIM AA

  Sets the time delay from the assertion of request to send to the actual beginning of data for the BER command to AA (hex). Only applies if the 9600 baud modem is selected. Default is 100 msec.

- BER AA-BB=C

  Displays receive error rates and checksum after the modem is selected.

ERROR MESSAGES

The BER command is useful for checking the modem operation and measuring bit error rates on noisy channels. First, the modem is set up with control A register set to AA, and control B register set to BB. Transmit and receive interrupt service routines are initialized. The transmit routine transmits 12 bytes of dotting followed by four SYNC words followed by a fixed pseudorandom bit sequence.

Two pieces of information are updated each time a new byte of data is received; the accumulated number of errors and the receive checksum. 10,000 bits (IF CC = !) or 100,000 bits (IF CC = 10) after the receiver first achieves synchronization. The errors and checksum are displayed and the test is repeated from the beginning. If something unexpected happens, an error is displayed, and the test is repeated from the beginning.

There are six error messages that can be displayed. The error messages and interpretation are as follows:

ERR 01 Tx Underflow Error. Indicates the processor stopped transmitting data. Modem or software error.

ERR 02 Rx Overflow Error. Modem or software error.

ERR 03 Interrupt From Unknown Source. An interrupt has occurred that the modem did not initiate.

ERR 04 Interrupt from Unknown Source. Indicates defective SIMON processor or shorted lines.

ERR 05 First Receive Interrupt After Resync Did Not Have Sync Bit Set. Usually indicates a bad modem.

NOTE

This is the most often occurring error but it usually occurs because of improper setup. Make sure that modem receive and transmit data re connected, and that any inversions are accounted for. Make sure that the command is entered correctly.

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ERR 06 Transmitted Too Many Bits. Modem receiver did not sync up properly.

- Using the BER command to check modem operation:

MODEM MODE:	COMMAND:	RECEIVE ERROR COUNT:	RECEIVE CHECKSUM:
VOICE	BER DE-00=10 (See Note)	0000	00188123

NOTE: Use DE-01 instead of DE-00 if there is an inversion in the system.

- Using the BER command to measure bit errors in a system looped back to itself:

  If the modem transmit data is looped to the modem receive data through a noisy channel, measuring bit error rate is simple. For quick measurements use BER DB-01=1 (or BER DB-01=1 for inverted channels). The error count is the number of errors in 10,000 bits of data. For longer times (100,000 bits) use BER DB-00=10. Note that the receive synchronization algorithm is not completely immune to noise. Error counts that are inconsistently large probably occur because of improper synchronization, and should be discarded.

  If the modem transmit data is looped to the modem receive data through a non-noisy channel, the modem transmit and receive data circuits can be fully checked. The following results can be expected in non-noisy, non-inverted loop backed channels:

SET-UP PROCEDURE

The set-up procedure for SIMON operation includes setting the customer supplied ASCII terminal for the proper operating characteristics, connecting the terminal to the station, replacing VG logic board PROM U2 with the SIMON PROM, and checking the supply voltage and current drain. Also, two jumper connections are made on the VG logic board. The SIMON set-up procedure is as follows:

1. Set the ASCII terminal for the following characteristics.

   - Baud rate..... 2400
   - Parity ..... ODD or NONE
   - Stop bits..... 1
   - Duplex ..... Half
   - All caps..... On

2. As SIMON uses only TX data, RX data and ground only three station connections are required. Connect the terminal to the VG Logic Board on the station shelf as follows:

TERMINAL (RS232)	J-8 ON LOGIC BOARD	FUNCTION
2	2	TX Data (TXD)
3	1	RX Data (RXD)
7	3	Signal Ground (GND)

3. Make the following jumper connections on the VG logic board:

   Jumper P11-1 to -2

   Jumper P12-1 to -2

4. Check for the following supply voltages at connector J2 as measured to J2-3 (GND):

   J2-4 = 5.0 Vdc, ±0.25 Vdc

   J2-1 = 12.0 Vdc, ±0.25 Vdc

   J2-2 = 12.0 Vdc, ±0.25 Vdc

5. After applying power to the VG shelf, verify that the current consumption from the 13.8 V supply does not exceed the following:

1.5 Amperes maximum with 9600 baud modem installed

0.75 Amperes maximum without 9600 baud modem

TEST PROCEDURES

SERIAL LINK TEST

When power is applied, the terminal should respond with the SIMON welcome message. If this does not happen, first of all ensure that the terminal is plugged in and set up correctly, then look for other problems.

EPROM CHECK (U2)

Execute SIMON command "CHK 0000-3FF". The checksum that is displayed will depend on the software version you have. Run the test on a known good board to determine the correct checksum.

RAM TEST (U3)

Test U14 RAM with SIMON command "TMX 000-7FF:. Terminal should respond with:

PATTERN CHECKED OK

PATTERN CHECKED OK

RF MODEM TEST (U4)

RF modem U4 contains the oscillator for the VG logic board, the reset and watchdog timer circuit for the board, a serial data transmitter and a serial data receiver. The different parts are individually tested as follows:

Reference Oscillator Test (Part of U4)

Connect the frequency meter to the U4 pin 14 and check for a frequency of 11, 059.2 kHz, ±500 Hz.

Reset Circuit Test (U17-B)

Lower the +5 volt input to +3 volts. Slowly raise the voltage; somewhere between +4 and +5 volts in, the terminal should respond with the SIMON welcome message. Depressing S4 should also cause a reset, as should connecting J7-3 to ground momentarily.

Watchdog Timer Test (Part of U4)

Execute SIMON command "WAT" and terminal should respond with the SIMON welcome message after 2 seconds.

Transmit and Receive Data Test

Transmit data come out of the U4 pin 21 and passes through data filter U16. Execute SIMON command "XBY B000=10"; this causes switch U15-C to connect transmit data to J7-4. Connect a jumper between J7-4 and J7-2 to connect transmit data to receive data. Receive data passes through limiter U17-a. Execute the SIMON command "MDS 0" to select the RF modem for the BER command. Execute SIMON command "BER DE-00=10"; this command transmits data and simultaneously checks to see that data is being received. The terminal should respond at 10 second intervals with:

Receive Error Count	Receive Checksum
0000	00188123

SWITCH TESTS (S3, U7, S1, U8, S2, U9)

Set S1 to 0101 0101. Two types of switches exist; on the paddle type, a "1" occurs when switch is pushed towards close; on the rocker type, a "1" occurs when the switch is pushed towards open. Execute SIMON command "XBY B000"; the results should be 55. Set S1 to 10101010. Execute SIMON command "XBY B000"; the results should be AA this time.

Set S2 to 0101 0101. Execute SIMON command "XBY B800"; the results should be e 55.

Set S2 to 10101010. Execute SIMON command "XBY B800"; the results should be AA this time.

Set S3 to 0101 0101. Execute SIMON command "XBY B800"; the results should be 55. Set S3 to 10101010. Execute SIMON command "XBY B800"; the results should be AA this time.

FREQUENCY RESPONSE OF GMSK FILTER (U16)

Use U16 pin 3 as the input test point. Use J7-4 as the output test point. Execute the command "XBY B000=10" to connect the filter output to J7-4 through switch U15-C. AC couple a sinewave generator's output to the input test point using a 10 µF or larger capacitor. Connect a distortion analyzer or AC voltmeter to the output test point.

Using an input signal level of about 1.0V rms, vary the input frequency while looking at the output level. Check that the frequency response of the filter is flat (±2 dB) from 10 Hz to 7000 Hz. (Check at least 10 Hz, 1000 Hz, 3000 Hz, and 6000 Hz.) The response should begin to roll off at about 7000 Hz and should be down by at least 5 dB at 10 kHz.

PHONE LINE DRIVER (U18, T1, T2)

Connect a sinewave generator input to J3-31A, and ground J3-32C and J6-8. Connect a load resistor (1K or so) between J6-9 and ground. Apply 100 mV rms and look for a flat frequency response ±2 dB from 300 to 3000 Hz at J6-9.

Connect a sinewave generator input to J6-6 and ground J3-32C and J6-7. Apply 100 mV rms and look for a flat frequency response ±2 dB from 300 to 3000 Hz at J3-32A.

OUTPUT LATCHES AND BUFFERS (U20, U21)

Use the SIMON XBY and POR commands to test the ability of all lines to go to both states. Note that all outputs except those noted below are open collector and must be pulled up with a resistor (10K or so) before they will go high. Also, tie a 10K resistor to ground on J7-14. To achieve conditions "A", "B", "C" and "D" do the following:

"A" XBY A800=52
XBY B000=42
GROUND J7-6

"B" XBY A800=AD
XBY B000=B9
GROUND J7-6

"C" XBY A800=80
XBY B000=0C
OPEN J7-6

"D" XBY A800=80
XBY B000=08
OPEN J7-6

Look for the following results:

	"A"	"B"	"C"	"D"	NOTES:
J6-1	HI	LO	HI	HI	
J6-2	HI	LO			
J6-3	HI	LO			
J6-4	LO	HI			
J6-5	HI	LO			
J6-10	HI	LO			
J6-11	LO	HI			
J6-12	HI	LO			
J6-13	LO	HI			
J6-14	HI	LO			
J6-15	LO	HI			
J6-16	HI	LO			
J7-14	LO	HI			(use 10K to gnd) (HI 1/2 7 V., LO 1/4 .5 V)
J7-15	LO	HI	LO	HI	(HI 1/2 7 V., LO 1/4 .5V) (NO PULLUP NEEDED ON J7-15)
J6-16	LO	HI	HI	HI	
J9-1	HI	LO			(HI 1/2 10V., LO 1/4 -10V)
J3-25A	LO	HI			(HI 1/2 3.5V., LO 1/4 .5V)
J3-13C	HI	LO			
H1	OFF	ON			
H2	ON	OFF			
H3	OFF	ON			
H4	ON	OFF			
H5	ON	OFF			
H6	OFF	ON			
H7	OFF	ON			

INPUT BUFFERS AND PORT PINS TEST

Use the POR command to test that input pins can be detected to go both high and low. To begin with, type "XBY B000=08"; this turns on Q4, thus pulling up J7-14. All other inputs are pulled up by resistor. For condition "A", ground J7-7, J7-9, J7-11, J7-13, and J3-25C. For condition "B", ground J7-6, J7-8, J7-10, J7-12 and J7-14. Type "POR1" and "POR3" to read the inputs. Results should be:

	"A"		"B"		
POR1	1010	1010	0101	0101	
POR3	XX01	XXXX	XX10	XXXX	(X = DON'T CARE)

9600 BAUD PHONE MODEM

NOTE

Un renite aookucatuibsm (i.e. where a phone modem is included in the shelf), the following 2 tests are useful in establishing correct operation of the phone modem. If the 9600 bit/sec phone modem test passes, then U19 and the phone modem must be good, so there is not need to run U19 test. If the phone modem test fails, and further isolation of the problem is desired, one can remove the phone modem and run the U19 test.

As the 9600 phone modem is full duplex, it can be tested by running the BER test with the 9600 baud phone modem in the loop. U19 transmits serial data to the 9600 baud phone modem and receives data from it. Transmit data comes out of the U19 Pin 21 and goes to the 9600 phone baud modem via J3-24C. The 9600 phone baud modem also requires transmit clock, which comes out of U19-27 and goes to J3-22A, and REQUEST-TO-SEND (RTS) which comes from output port U21-2 and goes to J3-25A. When RTS becomes active, the 9600 baud phone modem will send out a 250 msec duration training tone used by the receiving modem to adapt to the conditions of the line.

After the training time, the 9600 baud phone modem will begin to transmit data. (SIMON will activate RTS a period of time before starting data for each bit error count.) Transmit data is coupled to the phone line via U18-B and T2. Receive data comes into the 9600 baud modem through T1 and U18-A. The 9600 baud phone modem converts the complex waveform present on the phone line back to NRZ data, and passes it to U19 via J3-22C.

To loop transmit data to receive data through the 9600 baud modem, install P11 between J11-1 and J11-2, connect a jumper between J6-6 and J6-8, connect a jumper between J6-7 and J6-9. Next, place a 680-ohm resistor between J6-8 and J6-9 (to load the transformer), and adjust R1 and R2 to about mid range. Type "TIM 19" to set the time delay from RTS to beginning of data to 250 milliseconds. Execute the SIMON command "MDS 1" to select the 9600 baud modem for the BER command. Execute SIMON command "BER DE-00=10"; this command transmits data and simultaneously checks to see that data is being received. The terminal should respond with:

Receive Error Count	Receive Checksum
0000	00188123

(Because of modem initialization software, the first count after a reset will probably be wrong; this is OK.)

MODEM U19

NOTE

The 9600 baud phone modem must be removed (if installed) for this test to run.

U19 transmits serial data to the 9600 baud modem and receives data from it. Although U19 (like U4) also contains an oscillator and watchdog circuit, these are not used, and therefore need not be tested.

Transmit data comes out of the U19-pin 21. Connect a jumper between J3-24C and J3-22C to loop transmit data to receive data. Place P11 between J11-1 and J11-2 to complete the loop of data back to the modem. Execute the SIMON command "MDS1" to select the 9600 baud modem for the BER command. Execute SIMON command "BER DE-00=10". This command transmits data, and simultaneously checks to see that data is being received. The terminal should respond with:

Receive Error Count	Receive Checksum
0000	00188123

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