WILTRON

67xx A

OVERALL TROUBLESHOOTING

6C-TROUBLESHOOTING

6C-1 OVERALL TROUBLESHOOTING

The 67XXA Synthesizer contains firmware that generates hidden-key routines and error codes that aid in troubleshooting instrument failures to the replaceable subassembly level. Subsection 6C provides a tabular listing of the hidden-key routines used for troubleshooting and the error codes along with their possible causes. Troubleshooting procedures for faults that do not produce error codes are also provided.

NOTE

It is recommended that you upgrade your instrument's operating firmware to the latest available version. Although the error codes and hidden-key routines cited herein may have been implemented in earlier versions of firmware, newer firmware versions contain upgraded testing and calibration techniques that will maximize the performance of your instrument. Contact WILTRON Customer Service at (408) 778-2000 for further details.

6C-2 HIDDEN-KEY ROUTINES

The <Shift> TRIGGER key in conjunction with a 3 digit code implements the 67XXA's hidden-key routines. These routines are used to in calibration and troubleshooting. Table 6C-1 provides descriptions of the routines useful in troubleshooting. Once a hidden-key routine has been activated, the keys used (except for the DATA ENTRY keypad) have different functions than are indicated by the 67XXA's front panel markings.

Use caution when entering <Shift> TRIGGER codes during calibration or troubleshooting procedures. Entry of an incorrect <Shift> TRIGGER code may damage or erase stored calibration data.

6C-3 ERROR CODES

During normal 67XXA operation, self test runs automatically as part of the instrument turn-on process. If there is a failure during self test, an error code is generated and displayed in the FREQUENCY LCD display area. This alerts the operator to the failure and aids in troubleshooting the failure to a replaceable subassembly.

In addition, self test of specific subsystems or subassemblies may be invoked at anytime by using the appropriate hidden-key routine as described in paragraph 6C-2 and Table 6C-1.

Table 6C-3 provides a summary listing of the error codes along with descriptions and probable causes. This table makes reference to additional procedures located in the various subsystem sections of the manual. These additional procedures provide more detailed trouble isolation techniques.

6C-4 MASTER RESET FUNCTION

This function causes the non-volatile ram on the A23 PCB to be erased. In addition to being used to overwrite the non-volatile RAM and to cancel the <Shift> TRIGGER 004 function, it is used as a trouble shooting diagnostic aid. To perform a master reset, proceed as follows:

1. With the 67XXA in STANDBY, press and hold the RF ON/RF OFF key.
2. Press the STANDBY/ON key to turn the instrument on. After the displays blank and the self test has started, release the RF ON/RF OFF key.

NOTE:

This procedure overwrites all information stored in the non-volatile RAM, including the 9 stored front panel setups with their default values. Whenever a master reset is performed, an E8-10 error will occur.

6C-5 TROUBLESHOOTING FAULTS THAT DO NOT PRODUCE ERROR CODES

Since the 67XXA Synthesizer must run self test to generate error codes, faults that cause the instrument to be non-operational do not produce error codes. These faults generally are: failure to power up properly, unexpected shutdown, and front panel lock up. Table 6C-2 provides troubleshooting procedures for these types of failures along with their most probable causes.

Table 6C-1.   Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (1 of 6)

<Shift> TRIGGER Code	Function
000	Enables the security function that turns off the FREQUENCY and MODULATION displays. It is disabled by a reset.
001	Enables the security function that turns off all of the front panel displays. It is disabled with a reset.
002	Enables the external high-resolution mode. It is turned off by a reset or <Shift> TRIGGER 003.
003	Disables the external high-resolution mode.
004	Makes the non-volatile RAM act like standard RAM on POWER OFF/ON. This function is disabled with a master reset (para 6C-4).
008	Enables the entry or display of the instrument serial number in the FREQUENCY display window.
009	Enables the display of the current firmware version number in the FREQUENCYdisplay window. <Shift> exits this function.
010	Enables the display of the Reference Loop frequency in the FREQUENCY display window and the tuning voltage in the LEVEL display window.
011	Enables direct control of the Fine Loop. The frequency is displayed in the FREQUENCY display window and the tuning voltage is displayed in the LEVEL display window. Changes to the Fine Loop frequency are made with DATA ENTRY keypad inputs.
012	Enables direct control of the Coarse Loop. The frequency is displayed in the FREQUENCY display window and the tuning voltage is displayed in the LEVEL display window. Changes to the Coarse Loop frequency are made with DATA ENTRY keypad inputs.
019	Executes the display test that is part of self test. The test turns on all the LEDs and all segments of the LCD displays continuously. Unit must be turned off to terminate this test.
020	Executes the Microprocessor test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
021	Executes the A17 DVM test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
022	Executes the power supply and A22 voltage regulator test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
023	Executes the A8 serial I/O test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
024	Executes the A17 ramp generator test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
025	Executes the A13 pulse generator test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
026	Executes the A16 FM PCB test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
027	Executes the A17 Analog Instruction PCB test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
028	Executes the A15 ALC PCB test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
029	Executes the A15 leveling loop test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
030	Executes the A15 ALC test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.

Table 6C-1.   Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (2 of 6)

<Shift> TRIGGER Code	Function
031	Executes the A5 reference oscillator test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
032	Executes the A9, A11 Fine Loop test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
033	Executes the A3, A4, A6 Coarse Loop test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
034	Executes the A12, A16 YIG Loop test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
035	Executes the A24 GPIB test that is part of self test. Displays any failures as error codes in the FREQUENCY display window and outputs a pass/fail message thru the GPIB.
080	Unlocks the 67XXA. Mainly used for unlocked FM mode where it is possible to get up to a 25 MHz deviation. It is disabled by reset or <Shift> TRIGGER 081.
081	Disables hidden-key routine 080. Resets the 67XXA to normal locking.
089	Enables access to hidden-key routines that have <Shift> TRIGGER codes from 300 to 599. These routines are used for calibration or to check out the DACs to be calibrated. (Refer to Section 3, Table 3-3 for a listing these hidden-key routines.)
599	Enables access to hidden-key routines that have <Shift> TRIGGER codes above 600. These routines are used for troubleshooting.
600	Tests the front panel LEDs.
603	Sets the A17 ramp generator to the end of the ramp (10 Volts).
604	Sets the A17 ramp generator to the beginning of the ramp (0 Volts)
612	Sets the A17 DVM scale to 2. This makes the voltage range -20 to +20 Volts.
613	Disables hidden-key routine 612.
614	Sets the A17 DVM scale to 10. This makes the voltage range -100 to +100 Volts.
615	Disables hidden-key routine 614.
616	Sets A17 power meter switch 1 to closed.
617	Sets A17 power meter switch 1 to open.
618	Sets A17 power meter switch 2 to closed.
619	Sets A17 power meter switch 2 to open.
620	Sets all A17 power meter gain switches to open.
621	Sets A17 power meter gain = 1.
622	Sets A17 power meter gain = 10.
623	Sets A17 power meter gain = 100.
624	Sets A17 power meter gain = 1000.
625	Sets A17 power meter gain = 10000.
626	Switches on the A16 fast loop enable.
626	Switches off the A16 fast loop enable.

Table 6C-1.   Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (3 of 6)

<Shift> TRIGGER Code	Function
628	Sets FM to DC coupled on the A16 PCB.
629	Sets FM to AC coupled on the A16 PCB.
630	Switches on the FM 30 Hz high-pass filter on the A16 PCB.
631	Switches off the FM 30 Hz high-pass filter on the A16 PCB.
632	Switches on the FM ATTEN B X10 on the A16 PCB.
633	Switches off the FM ATTEN B X10 on the A16 PCB.
634	Switches on the FM ATTEN A X10 on the A16 PCB.
635	Switches off the FM ATTEN A X10 on the A16 PCB.
636	Switches on FM enable on the A16 PCB.
637	Switches off FM enable on the A16 PCB.
638	Switches on FM sweep enable on the A16 PCB.
639	Switches off FM sweep enable on the A16 PCB.
640	Switches on YIG loop enable on the A16 PCB.
641	Switches off YIG loop enable on the A16 PCB.
642	Selects +10 V reference for the A17 Tuning DAC.
643	Selects -10 V reference for the A17 Tuning DAC.
644	Set A17 Tuning gain to 4.
645	Set A17 Tuning gain to 1.
646	Set A17 gain 0 width path.
647	Set A17 gain 1 width path.
648	Set A17 gain 4 width path.
649	Disables the A17 ramp integrator.
650	Enables the A17 ramp integrator.
651	Selects A17 sweep ramp of <1 sec.
652	Selects A17 sweep ramp of >1 sec.
656	Clears the A17 dwell strobe.
657	Enables the A17 dwell strobe.
658	Disables the A17 dwell strobe.
659	Disable all the YIG-tuned oscillators.
660	Enable the CS band YIG-tuned oscillator.
661	Enable the X band YIG-tuned oscillator.
662	Enable the Ku band YIG-tuned oscillator.
663	Enable the K band YIG-tuned oscillator.

Table 6C-1.   Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (4 of 6)

<Shift> TRIGGER Code	Function
670	Sets A17 power meter amplifier A to gain of 1.
671	Sets A17 power meter amplifier A to gain of 10.
672	Sets A17 power meter amplifier A to gain of 100.
673	Sets A17 power meter amplifier B to gain of 1.
674	Sets A17 power meter amplifier B to gain of 10.
675	Sets A17 power meter amplifier B to gain of 100.
681	FM input path test.
682	AM input path test.
686	Test the Digital Horizontal Output DAC.
687	Display the rear panel switch settings in the FREQUENCY display window.
689	Enable access to and display of the Memory RAM.
690	Enable the 20 Volt scale in the external DVM.
691	Enable the 100 Volt scale in the external DVM.
692	Test EEPROM U27.
693	Test EEPROM U28.
694	Enable access to and display of EEPROM data.
695	Copy EEPROM U27 to U28.
697	Display number of errors in EEPROM test.
699	Copy EEPROM U28 to U27.
703	Enable control of the A17 analog ramp and set it to the end.
704	Enable control of the A17 analog ramp and set it to the beginning.
710	Displays the tuning range of the Fine Loop.
711	Finds the locking time for the Fine Loop.
712	Checks the Fine Loop linearity.
720	Displays the tuning range of the Coarse Loop.
721	Finds the locking time for the Coarse Loop.
722	Checks the Coarse Loop linearity.
730	Displays the tuning range of the Reference oscillator.
732	Display the tuning range of the YIG Loop for the current band.
733	Finds the locking time for the YIG Loop for the current band.
734	Checks the YIG Loop linearity for the current band.
760	Checks the A17 DVM linearity.
761	Turns on the external DVM.

Table 6C-1. Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (5 of 6)

<Shift> TRIGGER Code	Function
762	Turns on the internal DVM.
764	Activates power meter test with fixed gain.
765	Deactivates the power meter test with fixed gain.
766	Disables power meter temperature compensation.
767	Enables power meter temperature compensation.
768	Disables power meter offset compensation.
769	Enables power meter offset compensation.
770	Disable zero FM autocalibration.
771	Enable zero FM autocalibration.
772	Remove the CW filter from the YIG Loop.
773	Place the CW filter in the YIG Loop.
776	Execute the zero FM routine. Reduce the FM error.
778	Zero out the frequency dynamic calibration.
791	This routine will sweep the A17 Tuning DAC in 100 step increments.
792	This routine will sweep the A17 Sweep Width DAC in 100 step increments.
793	This routine will sweep the A17 Tuning and Sweep Width DACs at the same time.
794	This routine will sweep the A17 Linearizer DAC.
795	This routine will sweep the A17 Breakpoint DAC.
796	This roiutine will sweep the A17 Sweep Time DAC.
797	This routine will sweep the A17 Switchpoint DAC.
798	Exercise the analog ramp in the open loop.
820	Causes a pause the external leveling calibration.
821	This routine is used to stop the analog sweep at each dwell point. The microprocessor will stop the sweep just before it locks. Pressing <Shift> allows the sweep to continue to the next dwell point.
904	Disables the line/external trigger interrupt.
905	Enables the line/external trigger interrupt.
906	Disables the dwell interrupt.
907	Enables the dwell interrupt.
908	Disables the timer 2 interrupt.
909	Enables the timer 2 interrupt.
910	Disables the timer 1 interrupt.
911	Enables the timer 1 interrupt.
912	Disable the GPIB interrupt.
913	Enable the GPIB interrupt.

Table 6C-1.   Descriptions of Hidden-Key Routines Useful in Maintenance/Troubleshooting (6 of 6)

<Shift> TRIGGER Code	Function
914	Disable the fast frequency change interrupt.
915	Enable the fast frequency change interrupt.
916	Disable the front panel interrupt.
917	Enable the front panel interrupt.
918	Disable the housekeeping interrupt.
919	Enable the housekeeping interrupt.

Table 6C-2.   Troubleshooting Turn On, Unusual Shutdown, and Locked Up Front Panel Problems (1 of 2)

Trouble Indication	Troubleshooting Procedure
Synthesizer does not-power up, **STANDBY** lite OFF.	Check both line fuses on rear panel. • If the line fuses are good, check A22TP11 for +24V. • If the +24V is present, check the A28J1 connection to the front panel casting. If this connection is good, then there is an open in the cabling between the front panel casting and the A1 and A2 PCBs. • If there is no +24V present at A22TP11, disconnect A28J3 and A28J1. If the +24V appears, there is a short circuit in either the front panel casting PCBs or the 10 MHz crystal oscillator. • If the +24V does not appear, the problem is with A22VR1, A52T1, or A28CR6-9.
Synthesizer does not power up, **STANDBY** lite ON.	When the **LINE** key is pressed, the **STANDBY** lite should go off and the **ON** lite should illuminate. • If **STANDBY** goes off and the **ON** lite remains off, it indicates either that the **LINE** switch is defective or that there is a short circuit on the +24V line following the **LINE** switch. • If the **STANDBY** lite goes off and the **ON** lite illuminates as normal, you should hear a click. This click means the A28K1 relay has energized. If A28K1 does not energize, but the fan operates, then A28K1 is defective. If the fan does not operate, the cabling from the front panel casting via A28J2 is most likely open.
Front panel LCDs and LEDs flash on and off when **LINE** is switched to ON.	Indicates one of the A25 outputs is shorted to ground. • Perform master reset (para 6C-4). • Refer to paragraph 6N-7 for additional power supply assemblies troubleshooting procedures.

Table 6C-2. Troubleshooting Turn On, Unusual Shutdown, and Locked Up Front Panel Problems (2 of 2)

Trouble Indication	Troubleshooting Procedure
Synthesizer operates for some time, then shuts down (ON indicator is on). After a short time, synthesizer resumes normal operation.	Indicates the 67XXA synthesizer has reached an excessive operating temperature. • If fan is still operating, clean air filter. • If fan is not operating, the trouble could be A22VR1, the fan, or the fan circuitry. Refer to paragraph 6N-7 for additional troubleshooting procedures.
Front Panel Hangs Up	During normal operation when the synthesizer is turned on, the front panel LCD displays and LEDs will light in a random pattern for a few seconds and then blank while self test is being performed. Upon completion of self test, the front panel will display the set-up that the synthesizer had when last powered down. If the LCD numeric displays and the indicator LEDs never change from their initial random pattern and/or if front panel control is lost, a problem in either the Digital Control subsystem or the Operator I/O subsystem is indicated. Troubleshoot as follows: During power up, monitor A28J1-3 and A28J1-4 (Mother board connector that connects to the front panel casting) with an oscilloscope. You should observe a TTL serial data signal on pin 3 and a TTL 400 kHz clock signal on pin 4 at intervals indicating that the front panel is being written to by the A8 Serial I/O. • Perform master reset (para 6C-4). • If the data and clock signals are observed at A28J1 pins 3 and 4, then the malfunction is most likely in the Front Panel A1 and A2 PCBs. Refer to paragraph 6D-7 for front panel assemblies troubleshooting procedures. • If the data and clock signal are *not* observed at A28J1 pins 3 and 4, the problem lies within the Digital Control Subsystem. Refer to paragraph 6E-7 for digital control assemblies troubleshooting procedures.

Table 6C-3. Summary of Error Codes with Probable Causes (1 of 9)

Error Code	Description	Remarks/Possible Problem Area
E0-0	The microprocessor is unable to perform a self-test. This can be caused by either the DVM or the ±15V(G) supplies. This is a fatal error, which means that normal operation is curtailed until the error is corrected.	Refer to Section 6N Power Supply Assemblies for troubleshooting procedures.
E0-1	The A17 Board is missing, or +10V Reference in A17 or A15 failed.	
	Coarse Loop Tests	Refer to paragraph 6H-6 for detailed Coarse Loop troubleshooting procedures.
	NOTE The Reference Loop must be operating.	
E4-10	Phase-Lock Error — This test checks the A6 PCB for phase detector output. If this test passes, then the E4-13 test is run. If this test fails, then the E4-11 and E4-12 tests are used to narrow the problem area.	A3, A4, or A6 PCBs.
E4-11	Phase-Lock Negative Error — The 10 MHz reference for the Coarse Loop Subsystem is missing.	A6 PCB Input Buffer or A10 PCB Reference Buffer.
E4-12	Phase-Lock Positive Error — The A6 Coarse Loop Divider PCB is not receiving a signal from the A3 Coarse Loop Mixer PCB.	A3 and A4 PCBs.
E4-13	VCO Tuning Voltage Error — The VCO tuning voltage is out of range. The instrument may operate normally; however, it needs to be recalibrated.	If the voltage value reveals that the sweep is at the end of its range opposite from where it should be, the probable cause is the A4 PCB Tuning Amplifier.
	Reference Loop Tests	Refer to paragraph 6G-6 for detailed Reference Loop troubleshooting procedures.
	NOTE The E5-series tests take precedence over the E4-, E9-, and E12-series tests. If there is no output from the A5 PCB (via the A10 PCB) the E4-, E9-, and E12-series tests are bypassed until the A5 PCB error is corrected.	
E5-10	Phase-Lock Error — Test checks whether the A5 Reference Oscillator is locked. If unlocked, the E5-11 and E5-12 tests are run. If locked, they are bypassed.	

Table 6C-3. Summary of Error Codes with Probable Causes (2 of 9)

Error Code	Description	Remarks/Possible Problem Area
E5-11	Phase-Lock Negative Error	The A7 Reference Divider PCB.
E5-12	Phase-Lock Positive Error	The A7 Reference Divider PCB is not receiving the 500 MHz signal from the A5 PCB.
E5-13	VCO Tuning Voltage Error	The alignment of the VCO tuning voltage is marginal and requires recalibration.
	A8 Serial I/O Test	
E8-10	Serial I/O Not Responding — Failure indicates that the A8 Serial I/O PCB is not receiving information from the front panel.	Refer to paragraph 6E-7 for detailed Serial I/O troubleshooting procedures.
	Fine Loop Tests **NOTE** The Reference Loop must be operating but not locked for the following tests. If there is an E5 error code, then the E9-series tests are run. If the E9-series tests fail, only the E5 error code will be displayed.	Refer to paragraph 6I-7 for detailed Fine Loop troubleshooting procedures.
E9-10	Phase-Lock Error — Tests whether the A9 Fine Loop Oscillator is locked. If unlocked, the E9-11 and E9-12 tests are run. If locked, they are bypassed.	
E9-11	Phase-Lock Negative Error	The A11 Reference Divider PCB is not receiving the Fine Loop signal from the A9 PCB.
E9-12	Phase-Lock Positive Error	The 10 MHz reference signal is not being received by the A11 Reference Divider PCB.
E9-13	VCO Tuning Voltage Error — The VCO tuning voltage is out of range. The instrument may operate properly; however, it should be calibrated.	If the voltage value reveals that the sweep is at the end of its range opposite from where it should be, the probable cause is the A9 PCB Tuning Amplifier.

Table 6C-3.   Summary of Error Codes and Probable Causes (3 0f 9)

Error Code	Description	Remarks/Possible Problem Area
	A12 YIG Loop Tests	Refer to paragraph 6J-7 for detailed YIG Loop troubleshooting procedures.
	NOTE	
	The E4-, E5-, and E9-series tests must have been successfully completed before these tests will be run. If any of the E4-, E5-, or E9-series tests fail, the E12-series tests are bypassed.	
E12-10	Phase Lock Error — The YIG Loop will not phase lock in any band. If completed successfully, the E12-11 and E12-12 tests are bypassed. If only one oscillator is not locking, the FM-path error code for that oscillator is displayed.	A12, A16, A30 and/or A31 PCBs
E12-11	Phase-Lock Negative Error	The reference signal from the A9 PCB is not being received.
E12-12	Phase-Lock Positive Error	No RF is being received from the A30 Sampler/IF PCB.
	A13 Pulse Generator test	Refer to paragraph 6M-3 for detailed Pulse Generator troubleshooting procedures.
E13-10	Pulse Generator Error	A13 Pulse Generator PCB.
	A15 ALC tests	Refer to paragraph 6M-3 for detailed ALC troubleshooting procedures.
E15-10	UNLEVELED-Indicator-On Error — The front panel UNLEVELED indicator is always on.	A15U42-44
E15-11	UNLEVELED-Indicator-Off Error — The front panel UNLEVELED indicator will not come on.	A15U12, U40, or U42-44
E15-13	Phase Error, AM Peak Detector — The AM Peak Detector is inoperative.	A15U11, U13, or U15
E15-14	Phase Error, AM Trough Detector — Failure indicates that the AM Trough Detector is inoperative.	A15U11, U13, or U15
E15-15	–10V Reference Error	The A15 PCB –10V reference supply is inoperative: A15VR1, A15U14

Table 6C-3. Summary of Error Codes with Probable Causes (4 of 9)

Error Code	Description	Remarks/Possible Problem Area
E15-16	+10V Ref Error	The A15 PCB +10V reference supply is inoperative: A15VR1, A15U14
E15-20	Unleveled Error, Full Band — The RF output is unleveled (maximum output) across the entire frequency range. (If only one band were unleveled, one of the E18- thru E21-series error codes would be shown.)	
E15-21	No RF Error, Full Band — No RF output is present across the entire frequency range. (If only one band were unleveled, one of the E18- thru E21-series error codes would be shown.)	
E15-22	Slope DAC Error	Slope DAC is inoperative: A15U8, A15U9
E15-23	Detector Path Error, Band 0 CW	Either the Downconverter or the band 0 Preamplifier on the A15 PCB is defective.
E15-24	Detector Path Error, Band 1-4 CW	Either the Band 1-4 Level Detector or Band 1-4 Preamplifier on the A15 PCB is defective.
E15-25	Detector Path Error, Band 0 Sample/Hold — This test is bypassed if the E15-23 test passes.	This detector path, which is used during pulse operations, is defective.
E15-26	Detector Path Error, Band 1-4 Sample/Hold — This test is bypassed if the E15-24 test passes.	This detector path, which is used during pulse operations, is defective.
E15-30	Band 0 Pulse Error — This test is bypassed if the E13-10 test passes.	Indicates that the A13 PCB pulse driver for Band 1, Band 1 Control Modulator, or A15 Sample/Hold circuit is defective.
E15-31	Band 1-4 Pulse Error — This test is bypassed if the E13-10 test passes.	The A13 PCB pulse drivers, or the A15 PCB Sample/Hold circuit is defective.
E15-40	Voltage Level reference error.	
	A16 FM tests	Refer to paragraph 6J-7 for detailed FM troubleshooting procedures.
E16-10	FM Ø Error	The FM peak detector on A16 is inoperative: A16U28
E16-11	Phase Mod Ø Error	The Phase Modulation Peak Detector on the A16 PCB is inoperative: A16U30

Table 6C-3. Summary of Error Codes with Probable Causes (5 of 9)

Error Code	Description	Remarks/Possible Problem Area
E16-12	YIG Loop Ø Error	The loop amplifier for the YIG loop is inoperative.
E16-13	Sweep Path Error, YIG FM	The 50 MHz sweep path is inoperative.
	A17 Analog Instruction Tests	Refer to paragraph 6K-15 for detailed Analog Instruction troubleshooting procedures.
E17-10	DVM Measurement Error, 0 Volts — The DVM is inoperative. All other tests are bypassed. This is a fatal error; the instrument is inoperative.	
E17-11	DVM Measurement Error, +10 Volt Reference	The 10V reference for the A17 PCB is defective.
E17-12	DVM Measurement Error, +20 Volt Range	The 20V range of the DVM is inoperative.
E17-13	DVM Measurement Error, 100 Volt Range	The 100V range of the DVM is inoperative.
E17-20	Tune DAC 0V	The Tune DAC is not operating properly.
E17-21	Tune DAC +10V	The Tune DAC −10V reference supply or the Tune DAC itself is defective.
E17-22	DVM Error, Tune DAC −10V	The Tune DAC +10V reference supply or Tune DAC is defective.
E17-23	DVM Error, Tune DAC Sweep	Linearity problem in the Tune DAC.
E17-24	DVM Error, Tune DAC Gain= 4	The switch for gain=4 is defective: A17U41A.
E17-30	Ramp Generator Error	The integrator for the ramp generator and its associated circuitry is not operating properly.
E17-31	Sweep Time Error, Sweep Time DAC	The DAC that controls the sweep time is out of its specified limits.
E17-32	Retrace Time Error, Sweep Time DAC	Error in retrace timing of the ramp.
E17-33	Range Error, Sweep Time Circuit	Error in the >1 second sweep-time circuitry.
E17-40	Sweep Width DAC Error, 0V	Sweep Width DAC error at maximum attenuation.
E17-41	Sweep Width DAC Error, Full-Scale, +10V	Sweep Width DAC error at full scale.

Table 6C-3. Summary of Error Codes with Probable Causes (6 of 9)

Error Code	Description	Remarks/Possible Problem Area
E17-42	Sweep Width DAC Error. −10V	
E17-43	Sweep Width DAC Error, 1% Steps	Sweep Width DAC linearity error.
E17-44	Sweep Width DAC Error, Gain 4	The Gain=4 switch is defective: A17U36.
E17-50	Linearizer Slope DAC Ø Error	Linearizer DAC is defective.
E17-51	Linearizer Slope DAC 100 % Error	Linearizer DAC is defective.
E17-52	Linearizer Slope DAC 0 % Error	Linearizer DAC is defective.
E17-53	Linearizer Breakpoint DAC 50% Error	Breakpoint DAC is defective.
E17-60	Power Meter Error	Power meter circuit is defective.
	RF tests **NOTE** The following error codes indicate a problem on the RF microwave deck. They may not be applicable to all 67XXA models because of different RF microwave deck configurations. Refer to Table 6Q-2 for the RF microwave deck configuration by model number. The first two digits of the error code indicate the number of the YIG Driver PCB (A18 thru A21) associated with the frequency band. The third digit is the frequency band number. The fourth digit is the type of test.	Refer to paragraph 6Q-6 for detailed RF troubleshooting procedures.
E18-01	Unleveled Error, Band 0	The downconverter output is unleveled. The Band 1 Control Modulator or modulator drive is the most probable cause.
E18-02	No RF Error, Band 0	Either the Downconverter is defective or there is no output from the A5 Reference Oscillator PCB to the Downconverter.
E18-03	FM Path Error, Band 0	The FM driver on A18 is defective.

Table 6C-3. Summary of Error Codes with Probable Cause (7 of 9)

Error Code	Description	Remarks/Possible Problem Area
E18-11	Unleveled Error, Band 1	The Band 1 Control Modulator or driver is defective.
E18-12	No RF Error, Band 1	The Band 1 Control Modulator or YIG-tuned oscillator is defective.
E18-13	FM Path Error, Band 1	The FM driver on A18 is defective.
E19-21	Unleveled Error, Band 2	The Band 2 Control Modulator or driver is defective.
E19-22	No RF Error, Band 2	The Band 2 Control Modulator or YIG-tuned oscillator is defective.
E19-23	FM Path Error, Band 2	The FM driver on A19 is defective.
E20-31	Unleveled Error, Band 3	The Band 3 Control Modulator or driver is defective.
E20-32	No RF Error, Band 3	The Band 3 Control Modulator or YIG-tuned oscillator is defective.
E20-33	FM Path Error, Band 3	The FM driver on A20 is defective.
E21-41	Unleveled Error, Band 4	The Band 4 Control Modulator or driver is defective.
E21-42	No RF Error, Band 4	The Band 4 Control Modulator or YIG-tuned oscillator is defective.
E21-43	FM Path Error, Band 4	The FM driver on A21 is defective.
E21-51	Unleveled Error, Band 5	The Band 3 Control Modulator or driver is defective.
E21-52	No RF Error, Band 5	The Band 3 Control Modulator, YIG-tuned oscillator, or ffrequency doubler/ amplifier is defective.
E21-53	FM Path Error, Band 5	The FM driver on A20 is defective.
	Power Supply/Regulator Tests	Refer to paragraph 6N-7 for detailed Power Supply and Regulator troubleshooting procedures.
E22-10	PS1 Error	A PS1 monitor problem which cannot be determined from the E22-21 thru -29 tests.
E22-11	PS2 Error	A PS2 monitor problem which cannot be determined from the E22-21 thru -29 tests.

Table 6C-3. Summary of Error Codes with Probable Causes (8 of 9)

Error Code	Description	Remarks/Possible Problem Area
E22-20	+9V LP Error	The 9V supply has no output to the 5V regulators in the phase lock circuitry.
E22-21	+24V Error	The supply is unregulated. If there is no output from this supply, the STANDBY lite will not illuminate and the instrument will not power up.
E22-22	+15V (G) Error	There is no output from this supply located on the A22 PCB.
E22-23	−18V Tuning Error	There is no output from this supply located on the A22 PCB.
E22-24	−43V Tuning Error	There is no output from this supply located on the A22 PCB.
E22-25	−15V LP Error	There is no output from this supply located on the A22 PCB.
E22-26	+15V LP Error	There is no output from this supply located on the A22 PCB.
E22-27	+15V FM Error	There is no output from this supply located on the A22 PCB.
E22-28	+15V (A) Error	There is no output from this supply located on the A22 PCB.
E22-29	−15V FM Error	There is no output from this supply located on the A22 PCB.
E22-30	−15V (A) Error	There is no output from this supply located on the A22 PCB.
E22-31	−15V (G) Error	There e is no output from this supply located on the A22 PCB.
	Microprocessor Tests	Refer to paragraph 6E-7 for detailed Microprocessor troubleshooting procedures.
E23-10	Non-volatile RAM for storing front panel setups has failed read-write testing.	Replace A23U25.
E23-11	Volatile RAM #1 has failed read-write test	Replace A23U26.
E23-12	Volatile RAM #2 has failed read-write test	Replace A23U29.
E23-14	Personality PROM Check-Sum Error	Replace A23U24.
E23-15	EPROM #1 Check-Sum Error	Replace A23U22 .

Table 6C-3. Summary of Error Codes with Probable Causes (9 0f 9)

Error Code	Description	Remarks/Possible Problem Area
E23-16	EPROM #2 Check-Sum Error	Replace A23U23.
E23-17	EEPROM Check-Sum Error	Error in the Band 0 level detector calibration table.
E23-18	EEPROM Check-Sum Error	Error in the Band 1-4 level detector calibration table.
E23-19	EEPROM Check-Sum Error	Error in the attenuator insertion loss table.
E23-20	Stored Setups Check-Sum Error	Perform master reset (para 6C-4).
E23-21	I/O Error — Indicates the I/O interrupt is inoperative.	Replace A23U8.
	A24 GPIB Tests	Refer to paragraph 6E-7 for detailed GPIB troubleshooting procedures.
E24-0	GPIB no response or A24 not installed	
E24-10	Check-Sum Error in the GPIB RAM	Replace A24U11.
E24-11	Check-Sum error in the PROM	Replace A24U10.
E24-12	GPIB Interface Error	The interface processor is inoperative. Replace A24U7.
	A29 Rear Panel Interface Tests	Refer to paragraph 6F-7 for detailed Rear Panel Interface troubleshooting procedures.
E29-10	V/GHz Offset DAC Error	The U15 V/GHz Offset DAC or Data Latches U8 or U9.
E29-11	V/GHz Slope Error	The U13 V/GHz Slope DAC or Data Latches U8 or U9.