INSTALLATION AND OPERATION MANUAL

FOR THE

AGILENT TECHNOLOGIES

E2730A VXI RF TUNER

P/N 181629-003 Revision C

JUNE 2002

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E2730A VXI RF TUNER

INSTALLATION AND OPERATION MANUAL

REVISION RECORD

Revision	Description	Date
C	Production Release.	6/2002

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GENERAL DESCRIPTION

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SECTION 1 GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The E2730A VXI RF Tuner is a general purpose, microprocessor-controlled, synthesized tuner used for surveillance and monitoring operations within the 20 to 2700 MHz frequency range. The E2730A is packaged in a single slot "size C" VXI (VMEbus Extension for Instrumentation) module making it ideal for applications where high density and a high degree of integration is required. See **Figure 1-1** for a front, side, and rear view of the tuner.

The E2730A features low phase noise frequency synthesizers and high dynamic range. The unit achieves a third-order input intercept point of +5 dBm while maintaining a typical noise figure of 12 dB in the 1200 to 2700 MHz range and 11 dB in the 20 to 1200 MHz range. See **Table 1-1** for a list of general specifications.

The E2730A has a frequency tuning range of 20 to 2700 MHz, in 1-kHz steps, and provides up to 56 dB of manual gain control.

The E2730A monitors and reports any hardware failures within the unit. This includes the lock status of the Local Oscillator loops (LOs) contained in the tuner module.

The E2730A is operated remotely via a VXI interface or an RS-232 port located on the front panel. By placing the tuner directly on a standard instrumentation and computing bus, system integration is simplified and enhanced. All functions are accessible via the VXI interface, except for power on/off control. All data is passed to and from the E2730A using VXI standard word serial protocol with a command format based on the IEEE-488.2 standard.

The E2730A provides a wideband 70 MHz IF output signal with a 36 MHz bandwidth. Other outputs include samples of the 1st LO and 2nd LO synthesizers that may be used in another E2730A to form a two-channel, phase-coherent tuner.

1.2 MECHANICAL CHARACTERISTICS

The E2730A VXI RF Tuner is packaged in a single-slot, C-size, VXI module (9.2 inches high x 13.6 inches deep x 1.2 inches wide). The mechanical packaging design uses modern surface-mount technology. RF isolation is provided by fastening multilayer PC boards into a milled aluminum chassis.

Five SMA-type connectors (RF IN, 70 MHz IF OUT, 10 MHz EXT REF, 1st LO IN/OUT, and 2nd LO IN/OUT are provided on the E2730A front panel to pass RF/analog signals in and out of the unit. The front panel also

contains a microminiature D-type connector (AUX) which provides the RS-232 interface port (for externally controlling the unit). The VXI P1 and P2 multipin connectors for the VXI interface are mounted on the rear panel of the unit. Refer to **Section 2** for further details on the unit's input/outputs.

Two LEDs (ERR and RUN) on the E2730A front panel monitors tuner operations and provide indications for operator information and control. Refer to **Section 3** for more information on these indicators.

The E2730A tuner contains seven modules. Six of the modules are PC boards which contain surface-mounted components and plug-in, metal-cased components. The seventh module is a plug-in YIG Assembly. The modules are attached to a milled-out aluminum housing that makes up the main chassis.

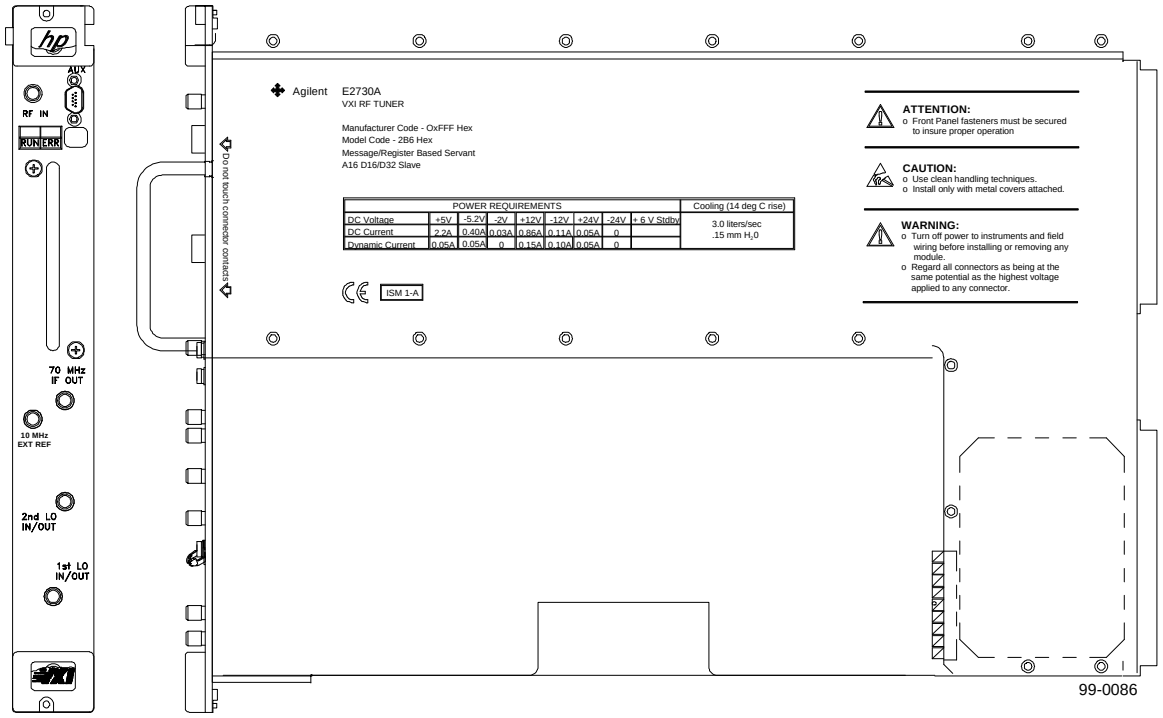

Figure 1-1. E2730A VXI RF Tuner

Table 1-1. E2730A VXI RF Tuner Specifications

Frequency Range	20-2700 MHz
Tuning Resolution	1 kHz
Internal Reference Accuracy	±1.0 ppm maximum (0 to 40° C)
External Reference Input	10 MHz (across VXI backplane or front panel)
RF Input	50 ohm, 1.5:1 VSWR typical 2.2:1 VSWR maximum at tuned frequency
Noise Figure (Pre-amplifier on)	12 dB maximum, 11 dB typical (20 to 1200 MHz) 13 dB maximum, 12 dB typical (1200 to 2400 MHz) 14 dB maximum, 12 dB typical (2400 to 2700 MHz)
Input 3rd-Order Intercept (Pre-amplifier on)	+5 dBm minimum at 70 MHz IF output with -20 dBm signals
Input 2nd Order Intercept (Pre-amplifier on)	+23 dBm minimum at 70 MHz IF Output with -20 dBm signals
Gain to 70 MHz IF Output	+17 dB minimum, +23 dB maximum
IF Bandwidth Flatness Variation over 36 MHz	1 dB maximum
Differential Group Delay across 36 MHz BW	20 nsec maximum
Gain Control Modes	Manual, 56-dB range with 2-dB steps, typical
Image Rejection	90 dB
IF Rejection	90 dB
Phase Noise	Better than -97 dBc/Hz @ 20 kHz offset Typically -115 dBc/Hz @ 100 kHz offset
F1 to F2 Sweep Time (36 MHz step)	5.0 msec, max. per sweep point (with 1-kHz resolution)
LO Level at RF Input	-90 dBm maximum
Internally Generated Spurious	-110 dBm equivalent RF input, maximum
VXI Interface	
Device Type	Message-based device, VXI servant
Module Size	VXIbus C-size module, 1-slot wide
Data Transfer Handshake	Normal Transfer Mode
Data Transfer Capability	A24, D16 circuitry provided
EMI Shielding	Completely Enclosed Module
Power Consumption	Less than 26 Watts

Environmental Specifications

Temperature:	
Operating Temperature Range	0 to +50°C ambient
Non-Operating Temperature Range	-40°C to +70°C ambient
Full Specification Compliance	20 to 30°C ambient
Altitude	0 to 12,000 feet (3658 meters) above mean sea level
Humidity	10% to 90% non-condensing

Weight & Dimensions

Height	Width	Depth	Weight
9.2 inches (23.37 cm)	1.2 inches (3.05 cm)	13.6 inches (34.03 cm)	<7 pounds (<3.2 kg)

1.3 EQUIPMENT SUPPLIED

Equipment supplied consists of the tuner, an accessory kit and an Installation and Operation Manual (P/N 181629-003).

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To fully utilize the tuner, equipment from the following list should be selected:

1. VXI vertical (C-size) mainframe.
2. VXI slot 0 controller.

1.5 SOFTWARE RELEASE HISTORY

The initial version of the tuner software is version 00.01.00, released May 4, 1999.

Version 01.00.00 was released on October 27, 1999. It added the Board Not Installed bit into the CDE and DDE registers and a test query to tell which board is not installed. This was added to help the test technicians debug problems because the code ignores LO unlocks from what it considers uninstalled boards. It changed identity information to Agilent Technologies E2730A. In addition, the #CDT and #CSN commands also changed format, to comply with customer requests. The YIG calibration routine has been enhanced to help the test technicians calibrate more units on the first try. The code no longer allows access to the low level attenuators (ATR and ATI) via the binary command interface. The reason for this is that they interfered with ATN processing. It fixed a problem with the changing of the preselector band. When in kHz tuning, it should have changed at 981.9995 MHz (because the actual 100 Hz resolution tuned frequency value is rounded to the closest kHz), but it did not change until 982.0000 MHz. It fixed the 100 Hz resolution lock times. This eliminated a problem intercepting signals while in the100 Hz tuning mode because the LO lock times for the 2nd LO were insufficient. Version 01.00.00 code was compiled on a new version of the compiler.

SECTION 2

INSTALLATION

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SECTION 2 INSTALLATION

2.1 UNPACKING AND INSPECTION

The E2730A and its accessories are shipped cushioned between molded-in-place expanded plastic pads in a double-walled carton. After unpacking the equipment, retain the shipping container and packing material until the equipment has been thoroughly inspected and it is ensured that reshipment is not necessary. Perform the following initial inspection:

1. Carefully inspect the outside of the shipping container for discoloring, stains, charring, or other signs of exposure to excessive heat, moisture or liquid chemicals. Check for any physical damage to the shipping container such as dents, snags, rips, crushed areas, or similar signs of excessive shock or careless handling.

2. Remove all equipment and accessories from the shipping container. If any items are missing, contact your Agilent Technologies Customer Engineer.

3. Carefully inspect the equipment looking for dents, scratches, damaged or loose controls, indicators, or connectors, or any other signs of physical abuse or careless handling.

If damage is found, forward an immediate request to the delivering carrier to perform an inspection and prepare a concealed-damage report. Do not destroy any packing material until it has been examined by an agent of the carrier. Concurrently, report the nature and extent of damage to your Customer Engineeer through your local Agilent Technologies Service Center. Under U.S. shipping regulations, damage for claims must be collected by the consignee; do not return the equipment to Agilent Technologies until a claim for damages has been established.

2.2 CONNECTOR SIGNALS

The following paragraphs describe the input and output signals provided at the tuner's front panel connectors. The signals at the rear panel VXIbus P1/P2 connectors are described in the VXIbus System Specification. For convenience, their pin assignments are included here. **Table 2-1** lists all of the E2730A's external connectors, their reference designations and basic functions. **Table 2-2** lists the mating connector types, the associated part numbers and the manufacturer's CAGE Code (if applicable). **Figure 2-1** shows the location of the connectors.

Table 2-1. List of Connectors

Connector	Ref Des	Function
VXI P1	A1P1	(Multipin) Standard VXIbus P1 connector
VXI P2	A1P2	(Multipin) Standard VXIbus P2 connector
AUX	A5J2	(Multipin) Auxiliary RS-232 Control
RF IN	J2	(SMA) Antenna Input
10 MHz EXT REF	J8	(SMA) 10 MHz Reference Input
70 MHz IF OUT	W4J4	(SMA) 70 MHz IF Output
2nd LO IN/OUT	W3J3	(SMA) 2nd Local Oscillator Bi-directional Input/Output
1st LO IN/OUT	W1J1	(SMA) 1st Local Oscillator Bi-directional Input/Output

Table 2-2. List of Mating Connectors

Connector (Type)	Ref Des	Mating Connector (CAGE Code)	Comment
VXI P1	A1P1	VXI Interface Frame	Not Supplied
VXI P2	A1P2	VXI Interface Frame	Not Supplied
AUX (9-pin Micro D)	A5J2	MDSM-9SC-Z11 (71468)	P/O Accessory Kit
RF IN (SMA female)	J2	SMA male 9001-9023-005 (19505)	Not Supplied
10 MHz EXT REF (SMA female)	J8	SMA male 9001-9023-005 (19505)	Not Supplied
70 MHz IF OUT (SMA female)	W4J4	SMA male 9001-9023-005 (19505)	Not supplied
2nd LO IN/OUT (SMA female)	W3J3	SMA male 9001-9023-005 (19505)	Not Supplied
1st LO IN/OUT (SMA female)	W1J1	SMA male 9001-9023-005 (19505)	Not Supplied

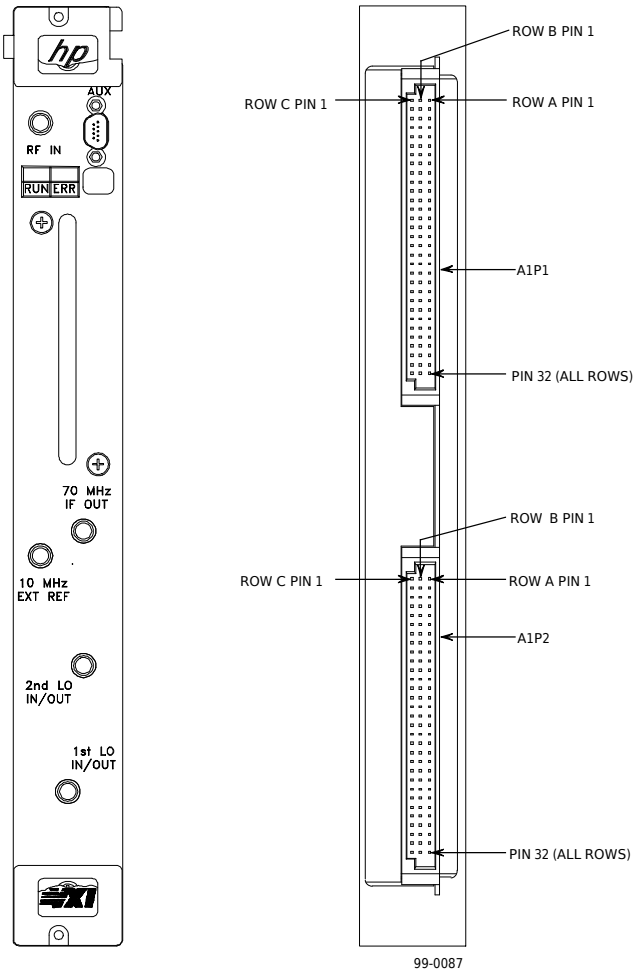


Figure 2-1. Location of External Connectors and Indicators

2.2.1 VXI P1, STANDARD VXIbus P1 (A1P1)

This multipin connector is the standard multipin, VXIbus P1 connector. Refer to Section B of the VXIbus System Specification for details on the signals resident at this connector. For convenience, the pin assignments of this connector are defined in **Table 2-3**.

Table 2-3. Pin Assignments of the Standard VXIbus P1 Connector

Pin	Row A Signals	Row B Signals	Row C Signals
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BG0IN*	D11
5	D04	BG0OUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D13
8	D07	BG2IN*	D15
9	GND	BG2OUT*	GND
10	SYSCLK	BG3IN*	SYSFAIL*
11	GND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	IACKIN*	not connected	A17
22	IACKOUT*	not connected	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*	A11
28	A03	IRQ3*	A10
29	A02	IRQ2*	A09
30	A01	IRQ1*	A08
31	-12V	+5V STBY	+12V
32	+5V	+5V	+5V

*Indicates active low signal.

2.2.2 VXI P2, STANDARD VXIbus P2 (A1P2)

This multipin connector is the standard multipin, VXIbus P2 connector. Refer to Section B of the VXIbus System Specification for details on the signals resident at this connector. For convenience, the pin assignments of this connector are defined in **Table 2-4**.

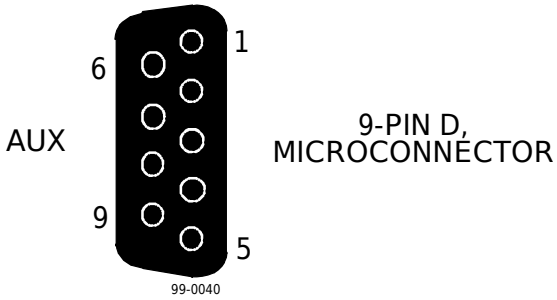
Table 2-4. Pin Assignments of the Standard VXIbus P2 Connector

Pin	Row A Signals	Row B Signals	Row C Signals
1	ECLTRG0	+5V	CLK10+
2	-2V	GND	CLK10-
3	ECLTRG1	RSV1	GND
4	GND	A24	-5.2V
5	LBUSA00	A25	LBUSC00
6	LBUSA01	A26	LBUSC01
7	-5.2V	A27	GND
8	LBUSA02	A28	LBUSC02
9	LBUSA03	A29	LBUSC03
10	GND	A30	GND
11	LBUSA04	A31	LBUSC04
12	LBUSA05	GND	LBUSC05
13	-5.2V	+5V	-2V
14	LBUSA06	D16	LBUSC06
15	LBUSA07	D17	LBUSC07
16	GND	D18	GND
17	LBUSA08	D19	LBUSC08
18	LBUSA09	D20	LBUSC09
19	-5.2V	D21	-5.2V
20	LBUSA10	D22	LBUSC10
21	LBUSA11	D23	LBUSC11
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	RSV2	D30	RSV3
30	MODID	D31	GND
31	GND	GND	+24V
32	SUMBUS	+5V	-24V

*Indicates active low signal.

2.2.3 AUX, AUXILIARY RS-232 CONTROL CONNECTOR (A5J2)

The AUX connector is a 9-pin D-type microconnector. Pin 1 (TX) and pin 2 (RX) provide an RS-232C port which may be used to control the tuner. The default baud rate is 19200. However, baud rates of 1200 to 38400 are supported via the #CBR command as described in **Section 3** of this manual. The interface supports 8 bit, no parity operation with one stop bit.



1.	TX	6.	GND
2.	RX	7.	SPARE
3.	SPARE	8.	GND
4.	GND	9.	SPARE
5.	SPARE		

Figure 2-2. AUX Connector Pin Assignments

2.2.4 RF IN (J2)

The RF IN SMA connector accepts 20 to 2700 MHz RF input signals from the antenna. Nominal input impedance is 50 ohms. Maximum RF input without incurring damage is a maximum of 100 milliwatts.

2.2.5 10 MHz EXT REF (J8)

The 10 MHz EXT REF SMA connector accepts an input from an external reference source for use as the tuner's time base. It accepts an input signal frequency of 10 MHz, at a minimum level of zero dBm from a 50 ohm source. To utilize the external reference signal, the tuner must be remotely set to the "external reference" mode of operation via the REF command. Refer to **Section 3** for details on the REF command. This connector is equipped with an open circuit dust cap (MP1) for use when an external reference is not connected to J8.

2.2.6 70 MHz IF OUT (W4J4)

The 70 MHz IF OUT SMA connector provides a 70 MHz center frequency output with a 36 MHz bandwidth. The output signal frequency spectrum is inverted and the output signal level is 20 dB nominal above the RF input level with the RF attenuator set to zero dB and the RF preamplifier turned on. The output impedance is 50 ohms.

2.2.7 2nd LO IN/OUT (W3J3)

The 2nd LO IN/OUT SMA bi-directional connector provides a sample of the 2nd LO synthesizer frequency. The 2nd LO frequency ranges from 3710.001 MHz to 3712.5 MHz in 1-kHz steps. The +7 dBm (minimum) output level may be used in another E2730A tuner to form a two-channel, phase-coherent tuner. This connector, via internal switching, may also be used to input a 2nd LO frequency from another E2730A tuner to form a Master/Slave relationship. The appropriate operating mode (independent, master or slave) must be remotely selected via the LOM command which is described in **Section 3** of this manual. The impedance of this connector is 50 ohms.

NOTE: Master/slave connections require the use of short semi-rigid RF cables between the LO inputs and outputs. When the tuner is not used in master/slave mode, these cables must be disconnected to prevent spurious signals from appearing in both tuners. Also, an unused LO IN/OUT connector should be terminated with mating termination dust cap, MP2 .

2.2.8 1st LO IN/OUT (W1J1)

The 1st LO IN/OUT SMA bi-directional connector provides a sample of the 1st LO synthesizer frequency. The 1st LO frequency ranges from 3802.5 MHz to 6482.5 MHz in 2.5-MHz steps. The +7 dBm (minimum) output level may be used in another E2730A tuner to form a two-channel, phase-coherent receiving system. This connector, via internal switching, may also be used to input a 1st LO frequency from another E2730A tuner to form a Master/Slave relationship. The appropriate operating mode (independent, master or slave) must be remotely selected via the LOM command which is described in **Section 3** of this manual. The impedance of this connector is 50 ohms.

NOTE: Master/slave connections require the use of short semi-rigid RF cables between the LO inputs and outputs. When the tuner is not used in master/slave mode, these cables must be disconnected to prevent spurious signals from appearing in both tuners. Also, an unused LO IN/OUT connector should be terminated with mating termination dust cap, MP3.

2.3 POWER AND COOLING REQUIREMENTS VERSUS MAINFRAME SELECTION

Three major factors must be considered when selecting a mainframe for a VXI system: module size, power requirements, and cooling requirements. The E2730A is mechanically designed as a C-size VXI module. Therefore, a mainframe capable of housing C-size modules is required for use with the E2730A .

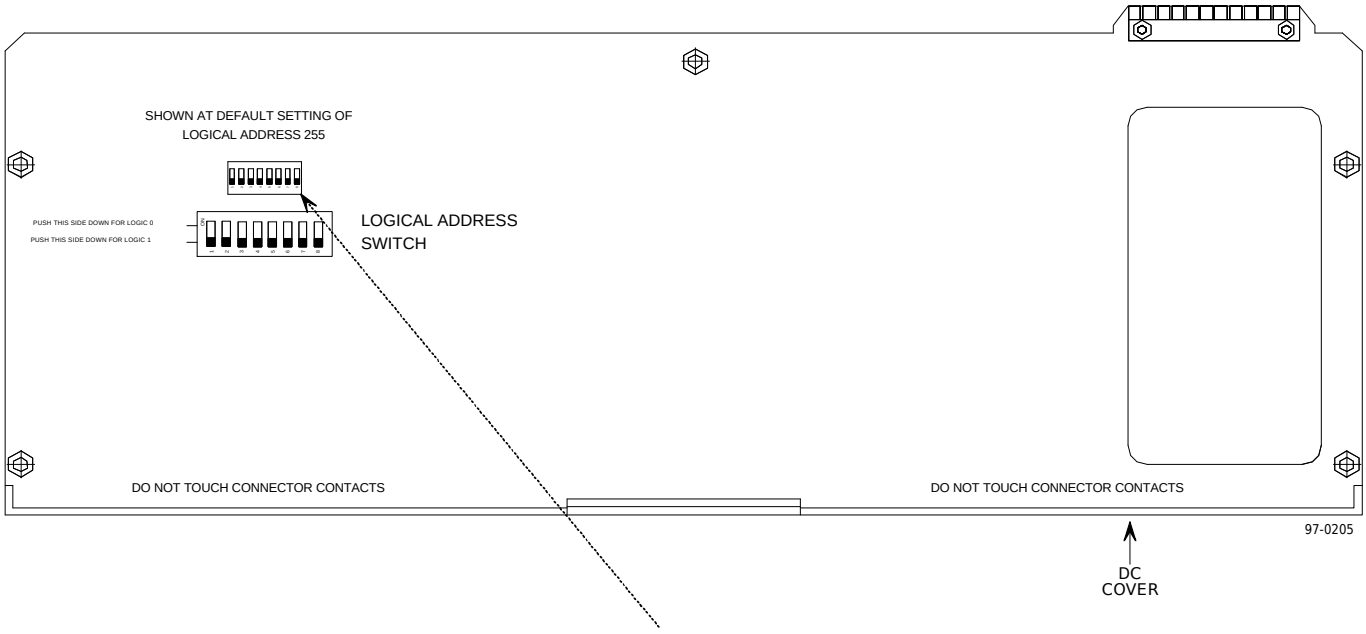
The power and cooling requirements of a mainframe are driven by the type and number of modules installed in it. Each module has its own specific power and cooling requirements. Thus the combination of all modules identifies the mainframe requirement. The user should refer to the VXIbus Specification paragraph B.7 and B.8 for information on VXI environmental considerations and power requirements. The following are the specific power and cooling requirements for the E2730A :

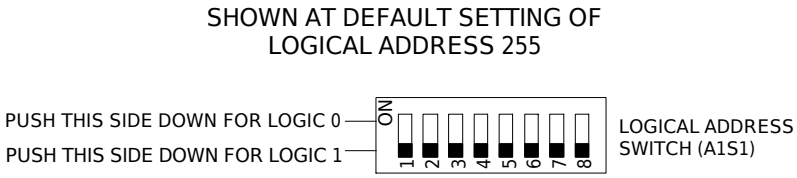
DC Volts	DC Current	Dynamic Current	Cooling
+5 V	2.2 A	50 mA	0°C to 50°C Operating Ambient Temperature
+12 V	860 mA	150 mA	
-12 V	110 mA	100 mA	1.6 mm H_2O Backpressure
-5.2 V	400 mA	60 mA	
+24 V	50 mA	50 mA	3.0 L/S Air Flow
-24 V	0 A	0 A	
-2 V	30 mA	0 A	

2.4 SETTING THE E2730A 's LOGICAL ADDRESS

All modules in a VXI system must be assigned a logical address to allow controller to device communications. The E2730A is assigned a logical address via either of two methods: Dynamic Configuration (DC) or Static Configuration (SC). Refer to Section F in the VXIbus specification for details on these configurations.

The tuner is set to either DC or SC configurations by a DIP switch located on the Digital Control Assembly (A1). The DIP switch is accessible through a hole in the Digital Control (DC) cover on the left side of the tuner as shown in **Figure 2-3.** The DC configuration is selected by setting all switch positions of the switch to OFF for a value of 255. This is the default switch setting of the E2730A when shipped. Any other combination of switch settings places the tuner in the SC configuration, with its address being the decimal equivalent of the binary value of the switch positions (ON = logic 0, OFF = logic 1). **Figure 2-3** provides the combination of switch position settings required for various addresses. When the E2730A is configured as a DC device, the Resource Manager assigns a logical address to it during the power-on sequence. When the tuner is in the SC configuration, it responds to controller commands only after receiving the address as identified by the DIP switch.





ADDRESS EXAMPLES								
SWITCH POSITION								ADDRESS
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	SC 0*
0	0	0	0	0	0	0	1	SC 1
0	0	0	0	0	0	1	0	SC 2
0	0	0	0	0	1	0	0	SC 4
0	0	0	0	1	0	0	0	SC 8
1	1	1	1	1	1	1	1	DC 255

* This address is not a Slot 0 Controller recognized servant address. Do Not configure the switch to provide this address.

Figure 2-3. Setting the E2730A Logical Address

2.5 INSTALLING THE E2730A IN THE MAINFRAME

CAUTION **Damage to the tuner may result if it is installed in a mainframe with power applied. Ensure that power is removed before installing or removing the tuner.**

CAUTION **Damage to the tuner may result if power is applied while it is improperly seated in a VXI module slot of the mainframe. Ensure the E2730A is firmly seated and VXI mounting screws are fully tightened before applying power. See Figure 2-4.**

NOTE: Before installing the tuner, ensure its logical address is set to the proper setting (refer to **paragraph 2.4**).

The E2730A should be installed vertically in a C-size mainframe. Refer to the equipment manual provided with the mainframe being used for proper module installation instructions. Refer also to the VXIbus Specification for proper module installation procedures and details on configuring the interrupt daisy chain on the mainframe backplane to bypass empty slots, if required.

When installing the tuner in a vertical mainframe, slide it in the appropriate module slot (any slot except 0) with the RF IN SMA connector towards the top and the 3rd LO IN/OUT connector towards the bottom. **Figure 2-4** shows the E2730A properly installed in a vertical mainframe.

2.6 VXI COMPLIANCE D16/D32

The E2730A Tuner supports 16-bit or 32-bit VXI data bus access.

2.7 VXI SIGNAL LIST

The E2730A utilizes the standard multipin VXIbus P1 and P2 connectors. The signals associated with these connectors are fully defined in Section B of the VXIbus System Specification and, for convenience, are also provided in **paragraphs 2.2.1** and **2.2.2**. The VXI 10 MHz reference signal is further described in the following paragraph.

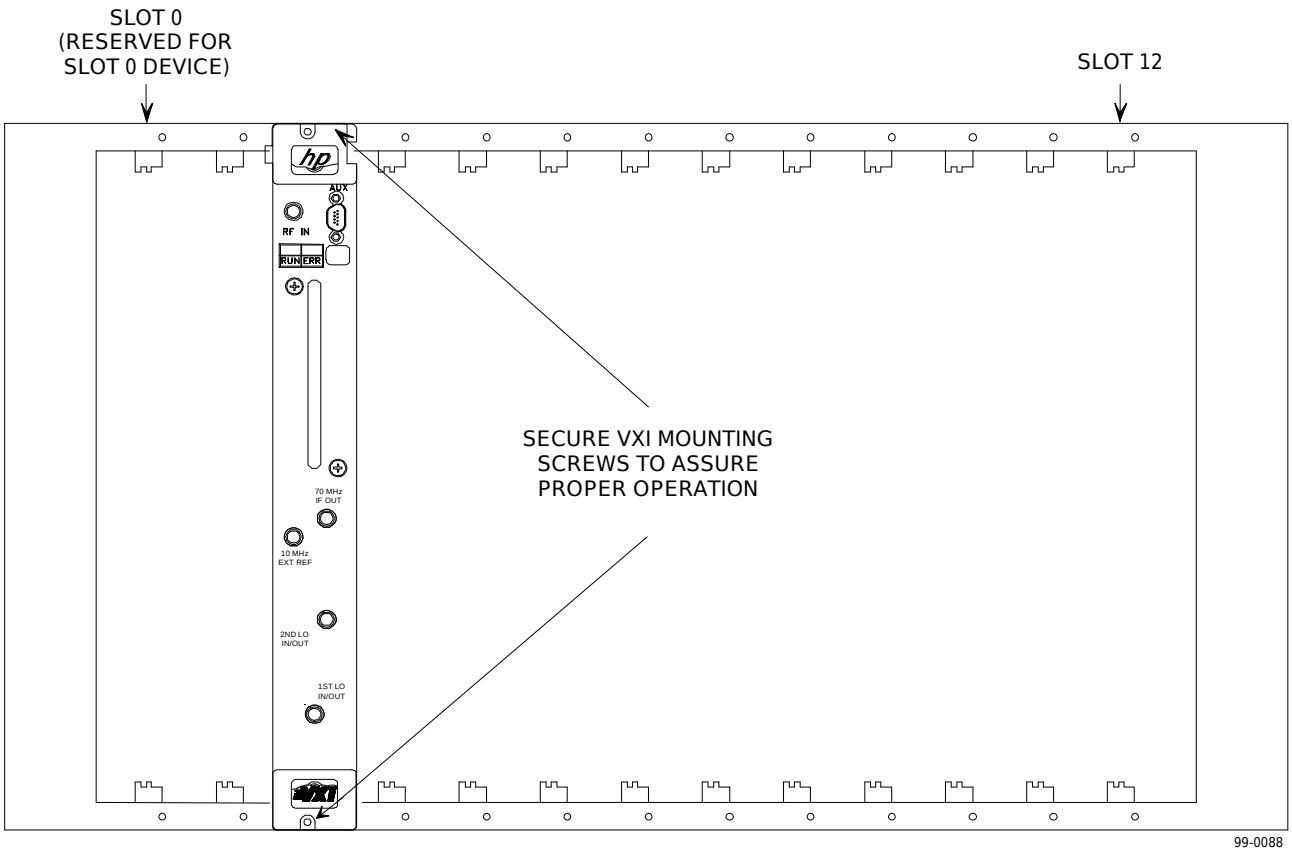


Figure 2-4. E2730A Properly Installed in a Vertical Mainframe

2.7.1 VXI 10 MHz REFERENCE

A VXI 10 MHz reference signal is generated within the slot zero controller and distributed to each tuner via the VXI bus. The VXI 10 MHz reference is a differential ECL signal, which is available on the CLK10+ and CLK10- lines. To utilize the VXI 10 MHz reference, each tuner must be remotely set to the "VXI Bus Reference" mode of operation via the REF command as explained in **Section 3**. Optionally, an external 10 MHz reference signal may be applied to the Slot 0 Controller and then distributed to each tuner via the VXI bus.

NOTE: The 10 MHz reference generated within the slot zero controller generally does not provide sufficient accuracy to meet system tuning requirements. In most cases the user is advised to apply an external 10 MHz reference signal to the controller which may then be distributed to the tuners through the VXI bus.

2.8 SERVICE AND SUPPORT

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center.

AGILENT ON THE WEB

You can find information about technical and professional services, product support, and equipment repair and service on the Web:

http://www.agilent.com/contacts/English/noscript.html

Double-click the link to Test & Measurement. Select your country from the drop-down menus. The Web page that appears next has contact information specific for your country.

AGILENT BY PHONE

If you do not have access to the Internet, call one of the numbers below:

Agilent Call Centers and Regional Headquarters

United States and Canada: Test and Measurement Call Center, (800) 452 4844 (toll-free in US)

Europe: (41 22) 780 8111

Japan: Measurement Assistance Center (81) 0426 56 7832

Latin America: 305 269 7548

Asia-Pacific: (85 22) 599 7777

2.9 PREPARATION FOR RESHIPMENT OR STORAGE

If the unit must be prepared for reshipment, the packaging method should follow the pattern established in the original shipment. Use the best packaging materials available to protect the unit during reshipment or storage. When possible, use the original packing container and cushioning materials. If the original packing materials are not available, use the following procedure:

1. Wrap the unit in sturdy paper or plastic.
2. Place the wrapped unit in a strong shipping container and place a layer of shock-absorbing material (3/4-inch minimum thickness) around all sides of the unit to provide a firm cushion and to prevent movement inside the container.
3. Thoroughly seal the shipping container and mark it FRAGILE.

SECTION 3

OPERATION

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SECTION 3 OPERATION

3.1 INTRODUCTION

The E2730A VXI RF Tuner is controlled using either word serial commands or binary commands via the VXI Interface. In addition, the RS-232 port (AUX, located on the front panel) also accepts the same mnemonics that are used with the word serial VXI commands. The following paragraphs provide the details required for the system integrator to access, control, and monitor the tuner's operation. The following discussions assume that the system integrator is familiar with the rules and guidelines contained in the VXIbus Specification and RS-232 interface specifications. A copy of the VXIbus Specification can be requested by writing to:

VXIbus Consortium, Inc.
P.O. Box 1736
Vancouver, WA 98668 U.S.A.

3.2 INDICATORS

All tuner indicators are located on the front panel. Two LEDs are provided for monitoring the operating status of the unit. The following paragraphs further explain the function of each LED. The E2730A has no front panel controls.

3.2.1 RUN INDICATOR, GREEN LED

This green LED illuminates approximately one second after power is applied to the tuner, indicating that the tuner’s microcontroller is active and running properly.

3.2.2 ERR INDICATOR, RED LED

This red LED illuminates when internal diagnostic circuitry detects any of the following tuner errors:

- Any Unlocked LO
- EEPROM Defaulted (illuminate for three seconds only)

Note that the ERR indicator does not indicate the receipt of invalid remote messages.

3.3 TUNER CONTROL USING THE VXI INTERFACE

The E2730A is configured as a Message-Based and Memory-Based Servant Device; that is, a device that has communications registers accessible by other devices. The tuner is controlled by using Word Serial Commands and IEEE-488.2 Protocol. Binary registers may also be used for some of the most common functions. The following paragraphs provide further details on how the E2730A is controlled in the VXI architecture using either command method.

3.3.1 VXIBus/E2730A INTERFACE

All tuner operations are directed by commands received over the VXIbus. VXIbus word serial commands are processed by the VXI Interface to control and configure the E2730A as a message-based VXIbus module. IEEE 488.2 ASCII commands/queries are then transmitted to the E2730A via Word Serial Byte Available commands. Refer to **Table 3-1** for a listing of Word Serial Commands.

Responses to IEEE 488.2 ASCII queries are transferred to the VXIbus in response to the Word Serial Byte commands.

Table 3-1. Word Serial Commands

Command	Description
Abort Normal Operation	Causes device to cease normal operation. Device returns to its default configuration, aborting all operations.
Begin Normal Operation	Notifies device that it can begin normal operation
Byte Available	Used to send a byte of data from a Commander to a Servant.
Byte Request	Used to request a byte of data from a Servant by a Commander.
Clear	Clears the VXIbus interface and any pending operations.
End Normal Operation	Causes device to cease normal operation in an orderly manner.
Read Protocol	Determines which protocols in addition to the Word Serial protocol that the Servant supports.
Read Protocol Error	Requests the most recent error code from the Servant.
Read STB	Requests the status byte from the Servant.
Assign Interrupter Line	Assigns VXIbus IRQ line to an Interrupter.
Read Interrupter Line	Used to determine which VXIbus IRQ line that a particular Interrupter in the Servant device is connected to.
Read Interrupters	Used to determine the number of Interrupters within a Servant device.

3.3.2 E2730A ADDRESSING

The E2730A has registers located within 64-byte blocks in the A16 address space. The base address of the E2730A registers is determined by the unique logical address. This address is set via an eight-position DIP switch located on the left side panel. Refer to **Section 2** for details on setting the logical address with this switch.

If the switch is set for dynamic configuration (255), the address of the E2730A is determined by the Resource Manager by reading the tuner's MODID (module identification) line during the power-up and initialization routine. The E2730A contains an offset register that can be written to by the resource manager to define its address. Refer to Section F in the VXIbus Specification for further details on dynamic configurations.

If the switch is set for static configuration (1-254), the Resource Manager reads and acknowledges the set address.

3.3.3 E2730A CONFIGURATION REGISTERS

At startup, it is the responsibility of the Resource Manager to read the configuration register of the E2730A (refer to the VXIbus Specification). The E2730A returns the following data from its configuration register:

ID Register

Bits:	Contents:	Value:
0-11	Manufacturer ID	$0xFFF_{16}$
12,13	Address Space	00 (A16/A24)
14,15	Device Class	$0x2_{16}$ (Message Based)

Device Type Register

Bits:	Contents:	Value:
0-11	Model Code	0x2B6
12,15	Required Memory	64k (bytes)

3.3.4 E2730A COMMUNICATION PROTOCOL

The operation of the E2730A is normally controlled using word serial commands (refer to the VXIbus Specification, paragraph C.3.3.1) and IEEE-488.2 modeled ASCII mnemonics. The Tuner also supports register based VXI operations. Each communication method is discussed in the following paragraphs.

WORD SERIAL IEEE-488.2 COMMANDS

COMMAND MESSAGE FORMAT

The word serial command messages used with the E2730A consist exclusively of ASCII-encoded data. Command headers consist of three-character mnemonics, which are defined in the command tables provided in this section. Headers are case independent and may be entered in upper or lower case letters. IEEE 488.2 Communication commands must be prefixed with an "*" character as shown in the Communication Message Command Table. All queries must be suffixed with the "?" character. The command parser ignores all "white space" (ASCII 0 through 20 hex, with exceptions being communication protocol characters). The parser accepts numeric arguments in the forgiving numeric representation form (described below). Multiple commands must be separated by the ";" character. Multiple arguments of a single command must be delimited with "," character(s). Message strings sent to the tuner must be terminated with a linefeed (0A hex) character or VXI (END).

COMMAND MESSAGE PROCESSING

All command message data is stored in the input buffer until a valid message termination is received. The message is then parsed and executed. Additional command message data may be sent to the unit within the boundaries of the input buffer.

The command message format is checked for validity as the message is parsed and executed. If the command message fails to meet the restrictions of the command message format, then an error is generated in an Event Status Register, and the rest of the message is processed normally.

QUERY RESPONSE FORMAT

Query responses maintain a fixed field format. Query responses begin with the mnemonic in upper case letters. Responses containing numeric arguments separate the first argument and the mnemonic with a space

character. Numeric arguments are represented by the least number of digits necessary to represent the entire range of the argument. If the argument can be negative then a sign character ("+" or "-") is always given. Multiple arguments are delimited by "," character(s). Responses to concatenated queries are concatenated in the output buffer, delimited by "," characters. The tuner terminates all query responses with a carriage return (0D hex) character followed by a linefeed (0A hex).

NUMERIC DATA REPRESENTATION

Numeric arguments that are used with commands are accepted in a forgiving numeric representation. Numeric arguments that appear in query responses are in a fixed field format. Specific details on numeric representation used in this document are given below.

nrf - forgiving numeric representation

The nrf data element is composed of the sequential fields listed below. All fields are optional with one restriction: at least one digit must be present within the active data element.

1. Plus (+) or minus (-) sign.
2. Any number of digits, up to eight.
3. Decimal point.
4. Any number of digits, up to eight.
5. Uppercase or lower case "E,e" followed by an optional sign and at least one digit but no more than three digits.

This format specifies all numeric input data. If the unit receives an nrf argument of a precision greater than it can handle, rounding is used.

nr1 - numeric response data - integers

This numeric response data format is composed of an optional sign, followed by any number of digits. The decimal point is implicitly defined to follow the last digit and is not present in the data element.

nr2 - nr2 numeric response data - real

This numeric response data format is composed of an optional sign field, followed by any number of digits, a decimal point, and any number of digits. As implied, there must be at least one digit on either side of the decimal point. The resolution of this numeric data for frequency responses may be selected with the #FFE User Configuration message. Refer to **Table 3-15** for details on the #FFE command.

REGISTER BASED VXI OPERATIONS

The E2730A supports control of base hardware functions with optimized binary register based commands. These commands are optimized for tightly integrated VXI systems. The register based commands save VXI I/O time and internal tuner firmware processing time. In order to minimize the processing time required for these commands error checking is minimal. It is the responsibility of the user application to only send valid commands and data. The E2730A will accept a combination of binary register operations and word serial operations with the last operation executed taking precedence. The available VXI binary commands are discussed in the following paragraphs.

BINARY COMMANDS

The E2730A may be controlled by writing commands to either the VXI Device Dependent Registers or through the lower portion of "Upper Memory" as assigned by the Resource Manager. Binary commands allow control of frequency and attenuation. The binary commands allow higher speed operation than the word serial operations. They require less data transfer time and parsing than the word serial commands. To optimize performance there is a minimum of error checking with the binary commands and it is the responsibility of the user's application to not send invalid binary commands to the tuner.

The E2730A has the ability to accept VXI commands via the Command RAM which acts as a bank of registers for Binary Communications. Also, the same data may be written to the "Upper Memory" area of the VXI memory. A memory map of the available binary commands is shown in **Table 3-2**. Note that the various parameters associated with the binary commands have the same value ranges and settings as the word serial commands, with the exception of the frequency and attenuator commands. The frequency is entered in units of 10s of hertz. For example, to tune to 214.34560 MHz (0d21434560 = 0x14710c0), the value 0x014710c0 needs to be written to the frequency data registers (0x0147 to the High Word and 0x10c0 to the Low Word). The attenuator data range is from zero to 30, in 1-dB steps, representing the word serial range of 0 through 60 in 2-dB steps.

Table 3-2. VXI Memory/Register Based Commands

Address Base + 0x00xx	Description
20	Fast Command 1 - Not Used At This Time
22	Fast Command 2 - Not Used At This Time
24	Fast Command 3 - Not Used At This Time
26	Fast Command 4 - Not Used At This Time
28	Fast Command 5 - Not Used At This Time
2A	Binary Command - Bit-Mapped register that indicates what commands to execute. Bit 15-11 - Not Used Bit 10 - Not Used Bit 9 - Not Used Bit 8 - Not Used Bit 7 - Not Used Bit 6 - Not Used Bit 5 - Not Used Bit 4 - Manual ATN Command 1 Bit (ATN, PAM) Bit 3 - Not Used Bit 2 - Not Used Bit 1 - Not Used Bit 0 - FRQ Command Bit
2C	FRQ_HI_DATA - High Word of Frequency long word (10 Hz resolution)
2E	FRQ_LO_DATA - Low Word of Frequency long word (10 Hz resolution)
30	Not Used
32	MAN_ATTN_DATA_1 - Manual Attenuation Data Word 1 Bit 15-9 - ATN Value : Range = 0 - 120 (dB) Bit 8 - PAM Mode : 0 = OFF ; 1 = ON Bit 7-0 - Not Used
34	Not Used
36	Not Used
38	Not Used
3A	Not Used
3C	Binary Status Word - This register is reserved to supply status to the user of various tuner functions. Bit 15-3 – Unused Bit 2 - Binary Command Status : 0 = No Error ; 1 = Error Bit 1 - IF_VALID - Set at the end of a tune word when the IF is valid Bit 0 - LO_LOCK - Set at the end of a tune word when the LOs are Locked
3E	Not Used

BINARY COMMAND PROTOCOL

A specific protocol is required when implementing binary commands. The control application must first check to see that any previous binary commands have been completed. This is done by reading the binary command register to see that it is clear. If it is not clear, then the application must wait until it is. Then a new binary command may be entered. First, the application must update the desired data in the data registers (2C-34) and then set the bits in the binary command register for each data parameter that is to be updated. When the binary command register is written, the E2730A will start processing the new binary command data. The data registers must not be rewritten until the binary command register has been cleared by the tuner. In the event multiple bits are set in the command register, processing will be in sequence indicated below:

1. FRQ
2. Manual Attenuation
   - 2.1 ATN
   - 2.2 PAM

The frequency command is processed first because it takes the longest to complete.

After the tuner has processed one of the commands, the corresponding bit in the binary command register is cleared. The application must wait until all the bits in the binary command have been cleared before issuing another set of commands. However, the application may take advantage of polling the binary command register and updating the data registers before the tuner has processed the last piece of data; i.e., while the tuner is processing attenuation data, the user can update the frequency data.

3.3.5 INTERRUPTERS

The E2730A tuner is a message-based VXI device with interrupter capability. The tuner requires one VXIbus interrupt line for operation. The interrupt line is used when the E2730A tuner has asserted a service request (SRQ). The "*assign interrupt line*" word serial command (see **paragraph 3.3.1**) is used to assign interrupt lines to a VXIbus device.

The tuner asserts an SRQ from error status conditions. The details of SRQ generation are presented in **paragraph 3.4.4**.

3.4 TUNER OPERATIONS

The following paragraphs describe the word serial commands which are used to control and query the operational parameters of the E2730A VXI VHF/UHF Tuner. All commands use IEEE-488.2 ASCII mnemonics and the command messages consist exclusively of ASCII-encoded data. Refer to **paragraph 3.3.4** for specific details on communication protocol. The word serial commands are divided into the following operational subcategories:

- Setup Operations
- Manual Control
- Memory Operation
- Communication
- Error Messages
- Master/Slave LO's
- Compatibility
- User Configuration
- Factory Configuration
- Maintenance

3.4.1 SETUP OPERATIONS

Tuner Setup Operations are global commands that affect the E2730A regardless of the current operational mode. These commands include external reference selection, the tuner reset operation, and the clear storage memory operation. The commands in this message category are described in the following paragraphs.

REFERENCE SELECTION

The E2730A can have its frequency referenced to one of three sources: an internal reference oscillator, an external 10 MHz input on the front panel of the tuner or the VXI 10 MHz bus reference. The tuner always powers up using the internal reference oscillator. If an external reference is selected, it must be present (otherwise the tuner LOs will become unlocked). The commands in this message category are listed in **Table 3-4**.

Table 3-3. Reference Selection

Command	Response	Description
REF nrf		Set Reference to Internal or External 0 = Internal Reference 1= VXI Bus Reference 2 = External Reference
REF?	REF nr1	Request Reference Setting Reset: REF 0 Example: REF 1

RESET

The *RST command returns all tuner parameters to their reset values (the same values which occur at power up). The reset command does not affect the contents of channel memory or SRQ registers. The commands in this message category are listed in **Table 3-4.**

Table 3-4. Reset

Command	Response	Description
*RST		Set all tuner device messages to the reset values.

MEMORY CLEAR

The memory clear (CLM) command allows clearing of channel storage memory. If the CLM 1 command is sent, storage memory will be cleared. The command in this message category is listed in **Table 3-5**.

Table 3-5. Memory Clear

Command	Response	Description
CLM nrf		Clear channel storage memory. nrf Description 1 Clear channel storage memory

3.4.2 MANUAL CONTROL

When the tuner is in the manual operating mode, the operating frequency and tuner attenuation parameters may be controlled. Frequency and tuner attenuation operations are described in the following paragraphs.

FREQUENCY OPERATIONS

The E2730A supports a frequency range query (FRG?) that returns the upper and lower frequency limits of the tuner. This query allows an application to configure itself based on the current frequency limits. While all of the E2730A tuners currently respond with the same limits, future units could potentially have extended capabilities. The frequency range query will respond with a lower frequency limit of 2 MHz and an upper frequency limit of 2700 MHz. The specified RF performance of the E2730A is however guaranteed between 20 MHz and 2700 MHz.

A frequency command (FRQ) is available for setting the tuner's tuned frequency. The limit of the command is 0 MHz to 2700 MHz. The frequency query (FRQ?) is always valid and will return the current tuner frequency.

The E2730A supports two combinations of tuning speed and tuning resolution. These tuning modes are selected by the tuning speed command (TSP). This allows the tuner tuning to be optimized for either speed or resolution. Tuning speed one (TSP 1) offers 100 Hz resolution and a worst case tuning time of less than 8 ms. Tuning speed two (TSP 2) offers 1 kHz resolution and a typical tuning time of less than 3 ms for 25 kHz steps. The worst case tuning time for TSP 2 is less than 6 ms. When TSP 2 is active, the tuner always accepts the frequency inputs with a resolution of 100 Hz and then internally rounds the value to the nearest 1 kHz before tuning the second LO. A query response will retain the originally input 100 Hz value. The default tuning speed setting is TSP 2 (1 kHz).

The frequency operations commands (frequency range query, frequency and tuning resolution commands) are listed in **Table 3-6**.

Table 3-6. Frequency Operations

Command	Response	Description
FRG?	FRG nr2, nr2	Request the lower and upper frequency limits of the tuner. Reset: n/c Example: FRG 0002.0000,2700.0000
FRQ nrf		Set tuned frequency of tuner. Range: 0 - 2700 MHz, resolution is 100 Hz.
FRQ?	FRQ nr2	Request current tuned frequency. Reset: FRQ 0020.0000 Example: FRQ 2699.9999
TSP nrf		Selects tuning resolution 1 = 100 Hz, 2 = 1 kHz
TSP?	TSP nr1	Request current tuning resolution Reset = TSP 2 Example = TSP 1

TUNER ATTENUATION OPERATIONS

Gain control of the E2730A is via the ATN command. The ATN command allows the reduction of gain from maximum (ATN 0) in approximately 2-dB increments to gain minimum (ATN 56). The commands in this message category are listed in **Table 3-7**.

Table 3-7. Tuner Attenuation

Command	Response	Description
ATN nrf		Set the tuner attenuation. Range 0-56 dB, resolution is 2-dB.
ATN?	FRQ nr2	Request current tuner attenuation. Reset: ATN 000 Example: ATN 030

3.4.3 MEMORY OPERATION

A memory channel contains an entire setup for a single frequency. A total of 200 memory channels are provided. Memory channels may be accessed directly via the Store Memory Direct (SMD) and Read Memory Direct (RMD) commands. However, the memory channels may also be accessed by setting up the single frequency parameters and then storing them with the Store Channel (STO) command or by recalling a specified channel with the Recall and Execute (RCE) command and then reading the channel data with the individual queries.

DIRECT MEMORY COMMANDS

The direct memory commands allow access to memory channels without impacting the current tuner operation. The first argument after the SMD or RMD command identifies the channel number (which can be zero to indicate current tuner operations or one to 200 to specify a memory channel). The remaining fields are the data values associated with the mnemonic parameters as indicated in the **Table 3-8**.

The SMD command may be sent in abbreviated forms. The command may end after any completed field. The remaining fields in the channel will be unchanged. Fields that are not to be altered may be skipped by concatenation of the commas. The skipped field will be unchanged.

The commands in this message category are listed in **Table 3-8**.

Table 3-8. Direct Memory Commands

Command	Response	Description
RMD nrf?	SMD nr1, nr1, nr2,nr1,nr1,nr1, nr1,nr1,nr1,nr1, nr1,nr1,nr2,nr2, nr2,nr1,nr2,nr2	Recall current tuner parameters from specified memory channel. Reset: SMD 001,0,0020.000,01,+00,1,0, 000,0,+000,-001,+00,0020.0000,2700.0000, 0000.1000,1,+0.00,+0000.0000 Example: SMD 001,0,1234.5678,01,+00,1,0, 024,0,+000,+005,+00,0002.0000,2700.0000, 0000.1000,0,+0.00,+0000.0000
SMD nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf		Store directly to the specified memory channel the following data list. Field — Parameter — Range 1 Memory Channel Number 0,200 2 Idle Mode Status (IDM) Ignored 3 Tuned Frequency (FRQ) See FRQ 4 Bandwidth Slot (BWS) Ignored 5 COR (COR) Ignored 6 Detection Mode (DET) Ignored 7 AGC Mode (AGC) Ignored 8 Attenuation Setting (ATN) 0 to 60 9 AFC Mode (AFC) Ignored 10 Pre Dwell (PDW) Ignored 11 Signal Dwell (SDW) Ignored 12 Loss Dwell (LDW) Ignored 13 Sweep Start Freq. (FRA) Ignored 14 Sweep Stop Freq. (FRB) Ignored 15 Sweep Increment Freq. (INC) Ignored 16 Sweep Direction (SWD) Ignored 17 BFO Frequency (BFO) Ignored 18 IFO Frequency (IFO) Ignored

STORE AND RECALL OPERATIONS

The Store and Recall memory operations allow the current tuner operating parameters to be stored in a memory channel and allow the parameters associated with a memory channel to be recalled as the current operating parameters.

The Store (STO) command causes the current tuner parameters to be stored in the memory channel specified. The Recall (RCE) command causes the tuner to use the parameters of the specified memory channel for current operations. The commands in this message category are listed in **Table 3-9**.

Table 3-9. Store and Recall Operations

Command	Response	Description
RCE nrf		Recall and execute the specified memory channel. Range: 1 to 200 (valid memory channels)
STO nrf		Store current parameters to the memory channel specified. Range: 1 to 200 (valid memory channels)

3.4.4 COMMUNICATION MESSAGES AND SRQ OPERATIONS

The mnemonics in this message category are always valid. These commands establish communications and control the event interrupts between the E2730A and the controller and do not alter the hardware functions of the tuner. The commands associated with this message category are described in the following paragraphs.

Most of the messages in this category are used to control and monitor the SRQ operation of the tuner. The exceptions are the Identity query (*IDN) which responds with the tuner's identity, a future Option query (*OPT?), and the Request Token (RTK) command. The RTK command allows the tuner to indicate (with a numeric argument) who is in control. This command can be used to arbitrate control between the VXI interface and the RS-232 interface of the tuner.

The E2730A supports the IEEE 488.2 SRQ capability. This capability is implemented through a series of layered enable and status registers. The tuner is capable of generating SRQ interrupts for numerous events. These include communication errors and hardware errors. The SRQ Structure Diagram is shown in **Figure 3-1**. This diagram shows the layers of enable and status registers that support the SRQ operation.

The highest level registers are the Service Request Enable (*SRE) and Status Byte (*STB) registers. The *STB register contains the Message Available (MAV) bit, Event Status Bit (ESB) and Request for Service Bit (RQS). Each of these event bits (except the RQS) may be enabled via the *SRE register. SRQ generation occurs when the event bit and its corresponding enable bit are both true. The event bits are set regardless of the status of the corresponding enable bit. The user's application is responsible for "anding" the status register with the enable register to determine the cause of the SRQ. Both registers may be read non-destructively. The event bits are cleared when their corresponding registers are read. The RQS bit indicates that an enabled event has set SRQ in this tuner. This bit is cleared by the VXI Spool Read STB operation.

The ESB bit indicates an enabled event in the Event Status Register (*ESR) occurred. The *ESR contains bits to indicate Operation Complete (OPC), Query Error (QYE), Device Dependent Error (DDE), Execution Error (EXE), Command Error (CME) and Power On (PON). The Event Status Enable Register (*ESE) contains a corresponding enable bit for each event. The OPC event is set upon completion of the parsing of a command string which includes the *OPC command. A QYE event is generated when previously queried data is discarded without having been read. The DDE event occurs when the tuner detects a failure of one or more of the monitored hardware subsystems and the enable DDE bit in the *ESR is set. Reading the DDE register will indicate the cause for the failure event. The EXE bit is set to indicate that the tuner has received a valid command with an out-of-bounds argument. The CME bit indicates the tuner has received an unknown or invalid command mnemonic. The PON bit is set whenever the unit power is cycled. Anytime the control software restarts, the PON bit will be set.

The mnemonics associated with this message category are listed in **Table 3-10**.

Table 3-10. Communications Messages and SRQ Operations

Command	Response	Description
*CLS		Clear all communication status registers.
*ESE nrf		Set up the Event Status Enable Register. Bit definitions are same as Error Status Register (*ESR).
*ESE?	*ESE nr1	Read the current value of the Event Status Enable Register. Reset: n/c Example: *ESE 000
*ESR?	*ESR nr1	Return the current setting of the Event Status Register. Bit Description 0 OPC operation 1 Not Used 2 QYE (query error) 3 DDE (device-dependent error) 4 EXE (execution error) 5 CME (command error) 6 Not Used 7 PON (power on) Reset: n/c Example: *ESR 128

Table 3-10. Communications Messages and SRQ Operations (Continued)

Command	Response	Description
*IDN?	*IDN str	Request the tuner's identity. Response is manufacture, model, serial number, and firmware version number. Reset: n/c Example: *IDN Agilent Technologies, US39440101, 01.00.00
*OPC		Operation complete switch. Causes SRQ upon event processing if enabled.
*OPC?	*OPC 1	Respond with OPC string when the operation is complete.
*OPT?	*OPT nr1	Request a bit-mapped value of the installed options. No options are currently defined for the E2730A tuner (always returns 000). Reset: n/c Example: *OPT 000
RTK nrf?	RTK nr1	Request Token. Returned value will either be the number entered or another controller's token value if the token was not zero when the request was received. The valid arguments are 0 to 99. Reset: n/c Power up: RTK 00 Example: RTK 01
RTK 0		Return token to tuner allowing it to be requested by another controller. Sets tuner token to 0.
*SRE nrf		Set up the Service Request Enable Register. Bit definitions are same as Status Byte Register (*STB) except that bit 6 is not used in this register.
*SRE?	*SRE nr1	Read Service Request Enable Register. Reset: n/c Example: *SRE 000
*STB?	*STB nr1	Request the Status Byte Register. Bit Description 0 Not Used 1 Not Used 2 Not Used 3 Not Used 4 MAV, Message Available bit 5 ESB, Event Summary bit 6 RQS, Request Service bit 7 Not Used Reset: n/c Example: *STB 064

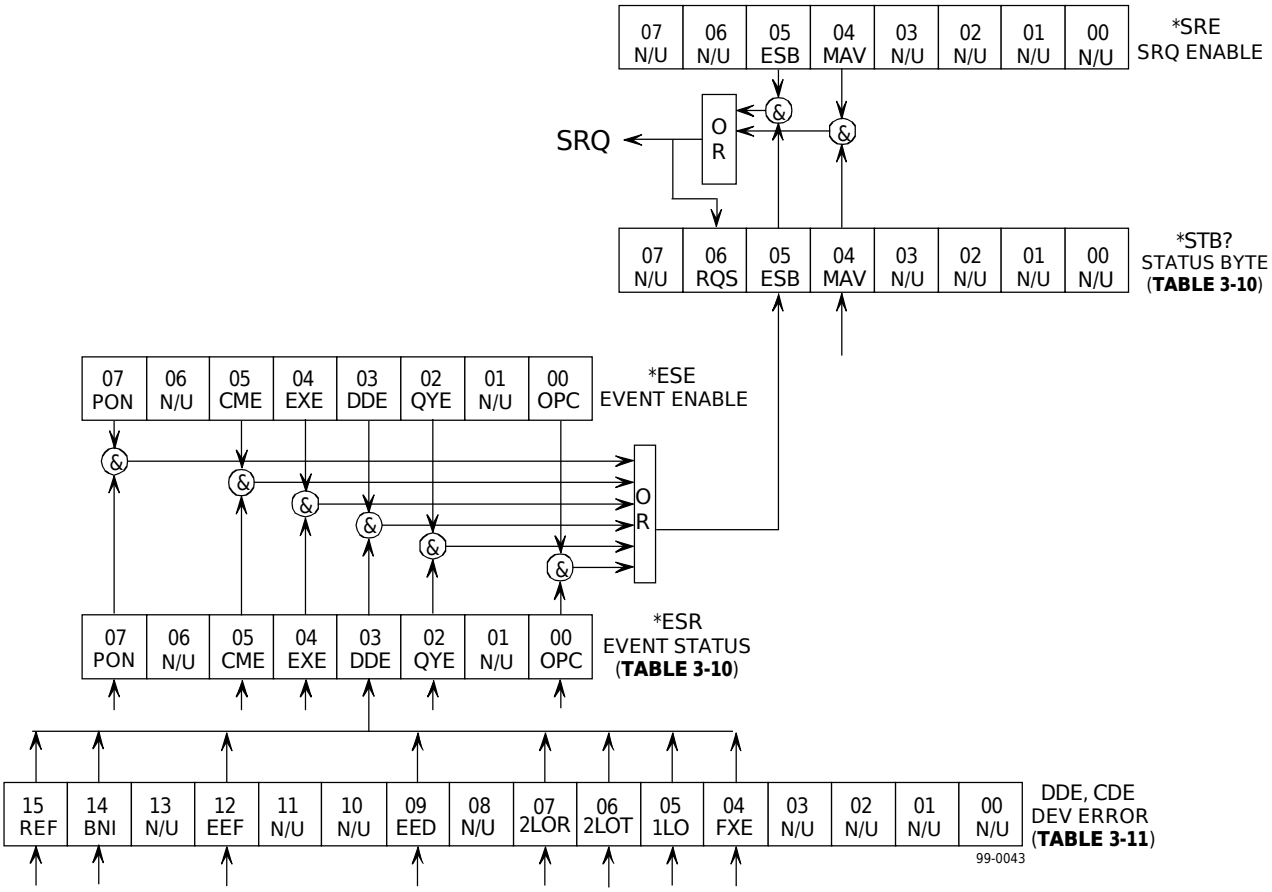

Figure 3-1. E2730A SRQ Structure Diagram

3.4.5 HARDWARE ERROR MESSAGES

The E2730A performs both startup built-in internal tests and continuous monitoring of key tuner sections. The tuner responds to a command which reruns the startup test and also queries to determine the current status of these operations along with the history since the last status request. The errors indicated in these messages are all hardware errors and should not occur as a result of normal operation. When the tuner detects one of these errors the ERR LED on the front panel illuminates indicating the error condition.

At startup the tuner verifies proper logic download and LO lock status. The error status bits are set to indicate the results of startup tests.

During normal operation the tuner LO status is continually monitored. The error status bits are set to indicate the results of the monitoring operations.

The tuner includes three command queries for determining hardware error status. Each of the commands returns a bit mapped value between 0 and 65535, where each bit indicates the hardware status of a particular subsystem of the tuner.

The Current Device Error (CDE) status query returns the current status of the LO subsystems. This is not a latched register. If an LO went unlocked and then re-locked prior to the CDE? query, there would be no evidence of this error in the response.

The Device Dependent Error (DDE) status query returns a latched history of any errors that have occurred since the last read of this register. Reading the DDE clears any latched errors. If the error condition still exists, the bit will be immediately reactivated.

The *TST command responds with same data as the DDE? query. However, the *TST status query does not clear the latched device dependent error status register.

The mnemonics associated with this message category are listed in **Table 3-11**.

Table 3-11. Hardware Error Messages

<table>
<tr><th>Command</th><th>Response</th><th>Description</th></tr>
<tr><td>CDE?</td><td>CDE nr1</td><td>Request the current device Error Register contents. Reading this register does not affect its contents. This is a bit mapped response where 0 = (Okay) and 1 = (Fault).

<table>
<tr><th>Bit</th><th>Value</th><th>Description</th></tr>
<tr><td>0</td><td>1</td><td>Not Used</td></tr>
<tr><td>1</td><td>2</td><td>Not Used</td></tr>
<tr><td>2</td><td>4</td><td>Not Used</td></tr>
<tr><td>3</td><td>8</td><td>Not Used</td></tr>
<tr><td>4</td><td>16</td><td>FXE, FLEX Bootload failure</td></tr>
<tr><td>5</td><td>32</td><td>1LO, 1st LO unlocked</td></tr>
<tr><td>6</td><td>64</td><td>2LOT, 2nd LO Translation Loop unlocked</td></tr>
<tr><td>7</td><td>128</td><td>2LOR, 2nd LO Resolution Loop unlocked</td></tr>
</table>
</td></tr>
</table>

Table 3-11. Hardware Error Messages (Continued)

Command	Response	Description
CDE? (Cont'd)		8 256 Not Used 9 512 EED, EEPROM has been defaulted 10 1024 Not Used 11 2048 Not Used 12 4096 EEF, EEPROM failure to be written 13 8192 Not Used 14 16384 BNI, Board Not Installed 15 32768 REF, Reference Generator unlocked Reset: n/c Example: CDE 00016
DDE?	DDE nr1	Request the latched error status. Reading this register clears it until the fault reoccurs. This is a bit mapped response where 0 = (Okay) and 1 = (Fault). Bit Value Description 0 1 Not Used 1 2 Not Used 2 4 Not Used 3 8 Not Used 4 16 FXE, FLEX Bootload failure 5 32 1LO, 1st LO unlocked 6 64 2LOT, 2nd LO Translation Loop unlocked 7 128 2LOR, 2nd LO Resolution Loop unlocked 8 256 Not Used 9 512 EED, EEPROM has been defaulted 10 1024 Not Used 11 2048 Not Used 12 4096 EEF, EEPROM failure to be written 13 8192 Not Used 14 16384 BNI, Board Not Installed 15 32768 REF, Reference Generator unlocked Reset: n/c Example: DDE 00000

Table 3-11. Hardware Error Messages (Continued)

Command	Response	Description
*TST?	*TST nr1	Returns same value as DDE? query. This query does not clear the latched error register. Reset: n/c Example: *TST 00000

3.4.6 MASTER/SLAVE MESSAGES

The commands in this message category control the master/slave LO operations. These commands are used when tuners are connected in multiple configurations and phase coherence is required.

The commands that are used to control the master/slave LO operation are listed in **Table 3-12**.

Table 3-12. Master/Slave Messages

Command	Response	Description
LOM nrf		Set the LO Mode. 0 – Independent 1 – Master 2 – Slave
LOM?	LOM nr1	Request current LO Mode. Reset: LOM 0 Example: LOM 1

3.4.7 COMPATIBILITY MESSAGES

The commands in this message category are only implemented to provide compatibility with other receivers. Many of the commands have no meaning with respect to the E2730A, but are provided to obtain interface backward compatibility. The mnemonics associated with this message category are listed in **Table 3-13.**

Table 3-13. Compatibility Messages

Command	Response	Description
ADV		Advance to the next frequency if the current state is active.
AFC nrf		Select AFC mode.
AFC?	AFC 0	Request AFC mode.
AGC nrf		Select the gain control mode.
AGC?	AGC 0	Request the gain control mode.
AGP nrf		Set Analog to digital Gain Protection function on/off – *IGNORED*
AGP nrf		Turn ADC Gain Protection OFF or ON
AGP?	AGP 0	Request setting of the AGP - always returns 0
AGP?	AGP 0	Request ADC Gain Protection Setting
AMD?	AMD ***	Query AM Average Detector Value
AMP?	AMP ***	Query AM Peak Detector Value
ATD		Attenuation Dump.
ATE nrf		Set ATE Attenuator – *IGNORED*
ATE?	ATE 0	Query value of ATE Attenuator
ATF nrf		Set Final Attenuator
ATF?	ATF 0	Query value of Final Attenuator
ATS nrf		Set Second IF Attenuator
ATS?	ATS 0	Request current value of Second IF Attenuator
BFO nrf		Set BFO frequency.
BFO?	BFO +0.00	Request current BFO frequency.
BUP nrf		Sets the sample Bin Update option.
BUP?	BUP 0	Request the status of the Bin Update parameter.
BWA?	BWA 1	Request actual active IF bandwidth number.
BWC nrf		Select IF bandwidth by size (in MHz)
BWC?	BWC 0000.00000	Request selected IF bandwidth size
BWL?	BWL 0000.00000,0000.00000,…,0000.00000	Request IF bandwidth list.
BWS nrf		Select IF bandwidth by bandwidth number.
BWS?	BWS 1	Request selected IF bandwidth number.
BYP nrf		Set the Preselector Bypass mode.
BYP?	BYP 0	Request the Preselector Bypass Mode Status.

Table 3-13. Compatibility Messages (Continued)

Command	Response	Description
#CBW nrf,nrf,...nrf	CHN 0	Set IF Bandwidth Data
CHN?	CLG nr1,nr1,...nr1	Request current memory channel accessed for sweep or step operation.
#CLG?		Request dBm Table. Always returns 0.
CLT nrf		Set COR loss timer.
CLT?	CLT 0000	Request current COR loss timer value.
CMP nrf,nrf		Set the sweep data compression ratio.
CMP?	CMP 001,1	Request the status of the sweep compression ratio selection.
COD nrf		Set COR Output Delay Timer - *IGNORED*
COD?	COD 0	Query COR Output Delay Timer Setting – always returns 0
COR nrf		Set COR level.
COR?	COR 00	Request current COR level.
CQU		Clear the signal queue.
CST?	CST 1	Request current COR status
#CVB nrf,nrf,...nrf		Set Video Bandwidth Data – *IGNORED*
DBM nrf		Set data representation in SSD buffer
DBM?	DBM 0	Request current SSD data representation.
DBT nrf		Set data width (number of bits) in Digital Scan Output
DBT?	DBT 8	Request Digital Scan Output data width
DCM nrf		Set DSP Clock Mode
DCM?	DCM 0	Request Current DSP Clock Mode
DCR nrf		Sets the value of the Delta COR parameter.
DCR?	DCR 0	Request the value of the Delta COR parameter.
DDF nrf		Sets the value of the Decaying factor parameter.
DDF?	DDF 0	Request the value of the Decaying factor parameter.
DET nrf		Select detection mode.
DET?	DET 1	Request current detection mode.
DIM nrf		Set DSP Idle Mode
DIM?	DIM 0	Request DSP Idle Mode Status
DIS nrf		Setup Digital Interface
DIS?	DIS 0	Request current digital interface setup.
DRF nrf		Sets the value of the Rising factor parameter.
DRF?	DRF 0	Request the value of the Rising factor parameter.
DSO nr1		Turns Digital Scan Output ON and OFF – *IGNORED*

Table 3-13. Compatibility Messages (Continued)

Command	Response	Description
DSO?	DSO 0	Returns status of Digital Scan Output – always returns 0
DWS?	DWS 0	Request the current dwell state.
ENA		Restore to active a suspended sweep or step operation.
FMO?	FMO ****	Request FM offset percentage of selected IF bandwidth.
FNO nrf		Enable or disable frequency normalization.
FNO?	FNO 0	Request status of frequency normalization enable.
FRA nrf		Select the start frequency for F1-F2 sweep operation.
FRA?	FRA 0020.0000	Request current start frequency for F1-F2 scan.
FRB nrf		Select the stop frequency for F1-F2 sweep operation.
FRB?	FRB 2700.0000	Request current stop frequency F1-F2 scan.
GTA nrf		Set AGC Gate Timer for AM and FM detection modes
GTA?	GTA 4	Request setting of AGC Gait Timer for AM and FM
GTC nrf		Set AGC Gate Timer for CW, SSB, and IFT detection mode
GTC?	GTC 4	Request setting of AGC Gait Timer for CW, SSB, and IFT detection modes
GTP nrf		Set AGC Gate Timer for AM Pulse detection mode
GTP?	GTP 4	Request setting of AGC Gait Timer for AM Pulse detection mode
HAD nrf		Set Handoff Address
HAD?	HAD 0	Request Handoff Address
IDM nrf		Set tuner manual idle mode.
IDM?	IDM 0	Request idle mode status.
IFO nrf		Set IF Offset Frequency
IFO?	IFO 0000.00000	Request IF Offset Frequency
IGB		While stopped or suspended on a signal, ignore the sample bin update.
INC nrf		Select frequency-to-frequency scan step increment.
INC?	INC 0000.1000	Request current F1-F2 scan step increment.

Table 3-13. Compatibility Messages (Continued)

Command	Response	Description
LCK nrf,nrf,nrf		Enter a lockout channel to be used in Sweep operation.
LDG		Load tuner attenuation (ATN) to reflect current AGC attenuation value.
LDW nrf		Set scan post (loss) dwell timer.
LDW?	LDW +00	Request current scan post (loss) dwell timer
LGD?	LGD **	Request Log Display Detector Value
LGE nrf		Enable or disable log range extension for SSD buffer operation.
LGE?	LGE 0	Request status of log range extension enable.
#LOD nrf,nrf,...nrf		Set the LO Delay times.
#LOD?	#LOD 0,0000.00000,0, 0000.00000,...,0,00 00.00000	Read current LO delay settings.
LPG		Load AGP Attenuation settings to ATR and ATI
LSP nrf		Sets the number of learning sweep passes.
LSP?	LSP 0	Request the number of learning sweep passes.
MST?	MST 0	Request Manual operation status.
OPR nrf		Set the tuner operating mode.
OPR?	OPR 1	Request current operating mode.
PDW nrf		Set scan pre dwell timer.
PDW?	PDW +000	Request current scan pre dwell timer
PRE nrf		Set Preselector Tuning Voltage
PRE?	PRE 000	Request Current Preselector Tuning Voltage
QUE?	QUE	Return the signal queue.
RAC nrf		Set the Report Action Control register
RAC?	RAC 000	Request Report Action Control register setting.
#RAM nrf		Set memory to default RAM at power up or not
#RAM?	#RAM 1	Request Reset RAM
#RCB nrf?	#CBW nr1,0000.00000,01, 01,01,01,00,+0, -172,00000	Request IF Bandwidth Settings by Bandwidth Slot
RES		Restart the sweep or step operation.
RSE nrf		Setup the Receiver Status Enable Register.
RSE?	RSE 00000	Read the current value of the Receiver Status Enable Register.

Table 3-13. Compatibility Messages (Continued)

Command	Response	Description
RSR?	RSR 00000	Read the Receiver Status Register.
RLK nrf ?	LCK nr1,0000.0000, 0000.0000	Recall the specified lockout channel.
#RVB nrf?	#RVB nr1,0000.00000	Request Video Bandwidth Settings by Bandwidth Slot
SAC nrf		Suspend Action Control register.
SAC?	SAC 0	Request Suspend Action Control register setting.
SAO nrf		Set the selected audio output on or off.
SAO?	SAO 0	Return the current SAO condition.
SDW nrf		Set the signal dwell time for sweep or step.
SDW?	SDW 001	Request the current signal dwell time.
SGS?	SGS ****	Request Signal Strength
SGV?	SGV 1,1,****,****	Request list of SPI, CST, SGS, and FMO signal values.
SLM?	SLM 200	Request the available space in lockout memory in unused channels.
SLP nrf		Put radio into Sleep mode
SMC		Shared Memory Clear
SME nrf		Set Shared Memory Enable Register
SME?	SME 000	Request current value of Shared Memory Enable Register
SMM nrf		Shared Memory Data Type
SMM?	SMM 0	Request Shared Memory Data Type
SMR?	SMR 000	Request current value of Shared Memory Status Register
SMS nrf,nrf		Set Shared Memory FIFO Programmable Levels
SMS?	SMS 0000,0000	Request the current Programmable Empty and Full levels, respectively.
SMT		Issue Shared Memory Trigger
SPI?	SPI 1	Request the status if the IF spectrum.
SQL?	SQL 000	Request squelch level in negative dBM
SQL nrf		Set squelch level in negative dBm
SSD?	SSD	Request the Sweep/Step LOG display data collected during the sweep or step operation.
SSO nrf		Disable or setup and enable the sweep/step data output function (SSD).
SSO?	SSO -1	Request the setup status of the sweep/step data output function (SSD).

Table 3-13. Compatibility Messages (Continued)

Command	Response	Description
SST?	SST 0	Request Step operation status.
STL?	STL	Request the step channel list.
STL nrf,... nrf or (nrf:nrf),...(nrf:nrf)		Enter a step channel list.
SUS		Suspend the sweep or step operation.
SWD nrf		Select sweep direction for sweep immediate.
SWD?	SWD 1	Request current sweep direction.
SWL nrf,nrf,nrf, nrf, nrf, nrf, nrf, nrf, nrf, nrf		Set the sector sweep list.
SWL?	SWL	Returns the current sector sweep list.
SWO nrf		Select the type of sweep operation.
SWO?	SWO 0	Request the current sweep operation.
SWS?	SWS 0	Request Sweep operation status.
SYN		Issue Sync Pulse to Master radio of a DF set
TLM nrf		Set the Third LO Mode.
TLM?	TLM 0	Request the current Third LO Mode.
TPE nrf		Set trigger pair enable.
TPE?	TPE 0	Trigger pair enabled status.
TPS nrf,nrf		Selects the two VXI trigger lines for the Shared Memory Trigger and the F-Sync Pulse, respectively.
TPS?	TPS 0,1	Requests the VXI trigger line setting.
ULC nrf		Unlock the channel.
UPB		While stopped or suspended on a signal, update the sample bin.
VBC nrf		Set Video Bandwidth by bandwidth size. (in MHz)
VBC?	VBC 0000.00000	Request Video Bandwidth Size
VBL?	VBL 0000.00000,0000.00000,...0000.00000	Request List of Video Bandwidths in unit.
VBM nrf		Set Video Bandwidth Mode
VBM?	VBM 1	Request Video Bandwidth Mode
VBS nrf		Set Video Bandwidth by Slot Number
VBS?	VBS 01	Request Current Video Bandwidth Slot
VOL nrf		Set Headphone Jack Volume
VOL?	VOL 0	Request Current Headphone Volume

3.4.8 USER CONFIGURATION MESSAGES

The commands in this message category, which begin with the pound sign (#), are valid only when the tuner is in configuration mode. These commands are used to configure the tuner's EEPROM. The parameters associated with these commands are retained by the tuner and are not reset on power up. To use these commands the tuner must first be placed in the configuration mode by sending the CFG 1 command. After setting the configuration parameters, the tuner must be removed from the configuration mode by sending CFG 0. The mnemonics associated with this message category are listed in **Table 3-14**.

Table 3-14. User Configuration Messages

Command	Response	Description
#CBR nrf		Set User BAUD Rate for RS-232 port. Valid Values: 1200, 2400, 4800, 9600, 19200, 38400
#CBR?	#CBR nr1	Request current user BAUD Rate Default: #CBR 19200 Example: #CBR 09600
CFG nrf		Set configuration status on or off. Normal operation is with configuration off (0). When configuration is on (1) EEPROM data in the tuner may be written.
CFG?	CFG nr1	Request status of the configuration mode. 0 = Unit is set to operation mode 1 = Unit is set to configuration mode Reset: n/c Example: CFG 0
#FFE nrf		Set nr2 output format. 0 nr2 output format = xxxx.xxxx 1 nr2 output format = xxxx.xxxxx 2 nr2 output format = xxxxx.xxxx 3 nr2 output format = xxxxx.xxxxx
#FFE?	#FFE nr1	Return current nr2 output format. Example: #FFE 0

3.4.9 FACTORY CONFIGURATION MESSAGES

The commands in this message category, which begin with the pound sign (#), are valid only when the tuner is in configuration mode. These commands are used to configure the tuner's EEPROM with parameters required for proper operation. These parameters should not be altered without factory direction. To use these commands the tuner must first be placed in the configuration mode by sending the CFG 1 User Configuration command (refer to **Table 3-14**). After setting the configuration parameters, the tuner must be removed from the configuration mode by sending CFG 0. The mnemonics associated with this message category are listed in **Table 3-15**.

> **NOTE:** Many of these parameters are unique to the particular tuner serial number and should not be changed.

Table 3-15. Factory Configuration Messages

Command	Response	Description
#CDT nrf,nrf,nrf		Set the date of configuration. Field — Parameter — Range 1 — Month — 1 to 12 2 — Day — 1 to 31 3 — Year — 0000 to 9999
#CDT?	#CDT nr1,nr1,nr1	Request the configuration date. Default: #CDT 01,01,2000 Example: #CDT 06,25,1997
#COP		Set the options configured in the unit. Bit — Options 0 — TBD 1 — TBD 2 — TBD 3 — TBD 4 — TBD 5 — TBD 6 — TBD 7 — TBD
#COP?	#COP nr1	Request the options configured in the unit. Default: #COP 00000 Example: #COP 00000

Table 3-15. Factory Configuration Messages (Continued)

Command	Response	Description
#CSN?	#CSN nr1	Request the unit's serial number. Default: #CSN US00000000 Example: #CSN US39440722
#EED 0		Load default configuration data to EEPROM.
#EED?	#EED nr1	Return current value in EEPROM. Example: #EED 43690
#MDL str		Set the unit's model number. The unit's model number is used to determine its VXI hexadecimal model code. The change in model code affects the VXI model code register when the unit is power cycled. Example: #MDL 'E2730A '
#MDL?	#MDL str, nr3	Request the unit's model number and VXI hexidecimal model code. Default: #MDL 'E2730A ',2B6 Example: #MDL 'E2730A ' ,2B6 **Note:** The first six (E2730A) of the seven characters must never change. If they do, then the EEPROM will be reset upon the next power-up of the unit.
#YCL		Initiates a Calibration of the YIG DAC. This command should only be issued by qualified personnel and only after the tuner is at normal operational temperature.
#YCL?	#YCL nr1	This returns the status of the most recent YIG DAC calibration. Results: -1 - Complete and Uncalibrated +0 - Complete and Calibrated +1 - Calibration In Progress Example: #YCL +0
#YIG nrf,nrf		Set the YIG DAC tuning voltage values at 0 MHz and 2700 MHz respectively. This command should only be used by qualified personnel.
#YIG?	#YIG nr1,nr1	Request Current YIG DAC Settings. Example: #YIG +00000,+00000

3.4.10 MAINTENANCE MESSAGES

The commands in this message category are for maintenance operations only. These commands are not intended for normal applications and may interact with normal operations of the tuner. Powering the tuner down and back up will eliminate any of those interactions and return the tuner to normal operation. The mnemonics associated with this message category are listed in **Table 3-16**.

Table 3-16. Maintenance Messages

Command	Response	Description
ADC?	ADC nr1,nr1,...nr1	Request ADC Reads for all eight inputs to the ADC.
ATI nrf		Set IF attenuators. Range: 0 to 30, 2-dB steps
ATI?	ATI nr1	Request current IF attenuator setting. Reset : ATI 00 Example: ATI 14
ATR nrf		Set RF attenuators. Range: 0 to 30 - 2 dB steps
ATR	ATR nr1	Request current RF attenuator setting. Reset: ATR 00 Example: ATR 22
BND nrf		Sets the preselector band. Range: 1-2 Where: 1 – Selects the lower preselector band. (0-982 MHz) 2 – Selects the upper preselector band. (982 MHz +)
BND?	BND nrl	Returns the active preselector band. Reset: BND 1 Default: BND 1
#MEM nrf,nrf,nrf		Write to receiver memory location. This command is unprotected. Any writes to incorrect locations can cause the tuner firmware to crash. Powering down and back up will restore normal operations. Field Parameter Range 1 Memory Size 0 - byte; 1 – word; 2 - long word 2 Memory Address 0 to 4294967295 3 Data Value 0 to 255 (byte range), 0 to 65535 (word range),0 to 4294967295 (long word range)

Table 3-16. Maintenance Messages (Continued)

Command	Response	Description
#MEM?	#MEM nr1,nr1,nr1	Read a memory location. Field Parameter Range 1 Memory Size 0 – byte; 1 – word; 2 – long word 2 Memory Address 0 to 4294967295 3 Data Value 0 to 255, 0 to 65535, 0 to 4294967295 Reset: N/A Example: MEM 0,0000100000,200
PAM nrf		Turn Pre-Amplifier OFF and ON. 0 = OFF - 1 = ON Reset: 1 ; Default: 1
PAM?	PAM nr1	Request Pre-Amp Setting.

SECTION 4

REPLACEMENT PARTS LIST

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SECTION 4 REPLACEMENT PARTS LIST

4.1 UNIT NUMBERING METHOD

The method of numbering used throughout the unit includes the assignment of reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within an assembly, and discrete components. An example of the unit numbering method is as follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

4.2 REFERENCE DESIGNATION PREFIX

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

4.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
14632	BAE SYSTEMS Advanced Systems 700 Quince Orchard Rd. Gaithersburg, MD 20878-1794 (301) 948-7550	7W263	Huber & Suhner, Ltd. Tumbleinstrauss 20 CH-8330 Pfaffikon Switzerland
16179	M/A-COM Inc. Merrimack, NH 03054-4303	7Y213	Mica Microwave Group 7017 Realm Drive San Jose, CA 95119 (408) 363-9200
71468	ITT Corp 666 E. Dyer Road Santa Ana, CA 92702	82316	Gilbert Engineering Co. Inc. 5310 W. Camelback Road Glendale, AZ 85301-7597

4.4 PARTS LIST

The following parts list contains all the major electrical components used in the unit, along with any mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts, specify the unit type and the serial number. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph 4.3** and the manufacturer's part number, provided in **paragraph 4.5** are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. However, the parts listed in **paragraph 4.5** will provide satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE: Some transistors, diodes and integrated circuits installed in the equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

4.5 TYPE E2730A VXI RF TUNER — MAIN CHASSIS

	Revision 51				
A1	Digital Control PC Assembly	1	483136-001	14632	
A1U18	EPROM, Programmed	1	181665-001	14632	
A1U19	Same as A1U18				
A2	1st LO PC Assembly	1	483134-001	14632	
A3	1st Converter PC Assembly	1	484323-001	14632	
A3U7	Upconversion Mixer, 3.7 GHz	1	092863-001	14632	
A4	2nd Converter PC Assembly	1	484337-001	14632	
A4T1	3.6-4.2 GHz Isolator, 18 dB	2	SMF950-F0310	7Y213	
A4T2	Same as A4T1				
A5	Front Panel Interface PC Assembly	1	483534-002	14632	
A5J2	Connector, D-Micro, 9-pin, Right Angle	1	MDSM-9PE-210	71468	
A6	Digital Interconnect PC Assembly	1	483532-001	14632	
A7	Not Used				
A8	YIG Assembly	1	384286-001	14632	
FL1	3.7 GHz Filter Assembly	1	384767-001	14632	
J2	Connector, Modified	2	384205-001	14632	
J8	Same as J2				
W1	Cable Assembly	1	17300-530-001	14632	
W1J1	Connector, Modified	3	384206-001	14632	
W1P1	Connector, RF Misc., Plug, Straight, Male, MMCX for RG-405, .085 S	4	11MMCX50-2-1C	7W263	
W2	Cable Assembly	1	17300-530-002	14632	
W2P1	Connector, Plug, GPO, Right Angle, Semi-Rigid, .086 Diameter, Female	1	0119-815-1	82316	
W2P2	Same as W1P1				
W3	Cable Assembly	1	17300-530-003	14632	
W3J3	Same as W1J1				
W3P1	Same as W1P1				
W4	Cable Assembly	1	17300-530-004	14632	
W4J4	Same as W1J1				
W4P1	Same as W1P1				
MP1	Connector Cap, Open Circuit, Dust Cap	1	2021-1310-02	16179	
MP2	Connector Cap, Open Circuit, Dust Cap	2	2021-1311-02	16179	
MP3	Same as MP2				
	Accessory Items				
AI-1	Cable Assembly, 9-pin Micro-D Connector	1	384425-001	14632	
AI-2	Cable Assembly, Serial, 9-pin D Connector	1	383255-001	14632	

NOTES

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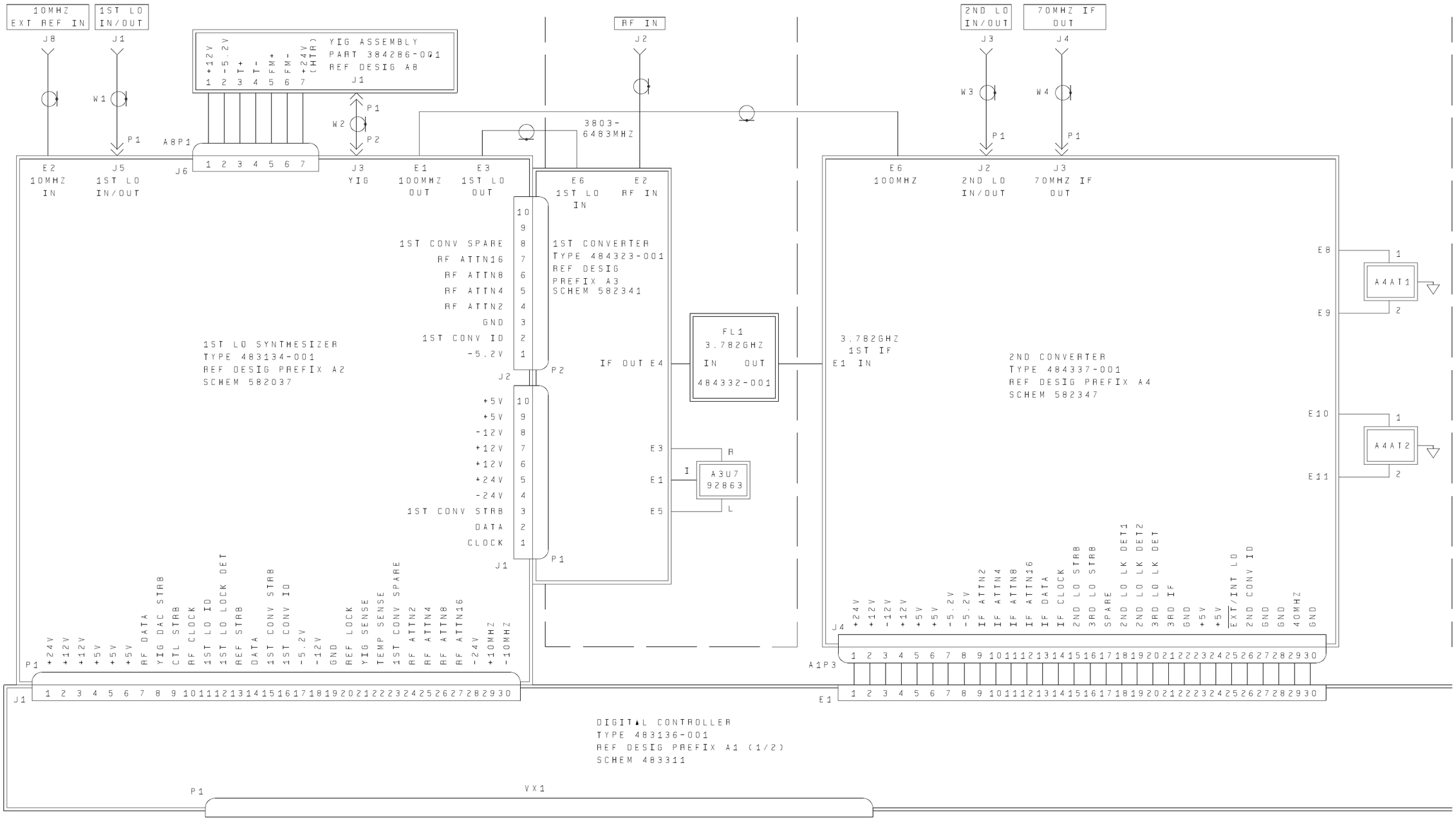
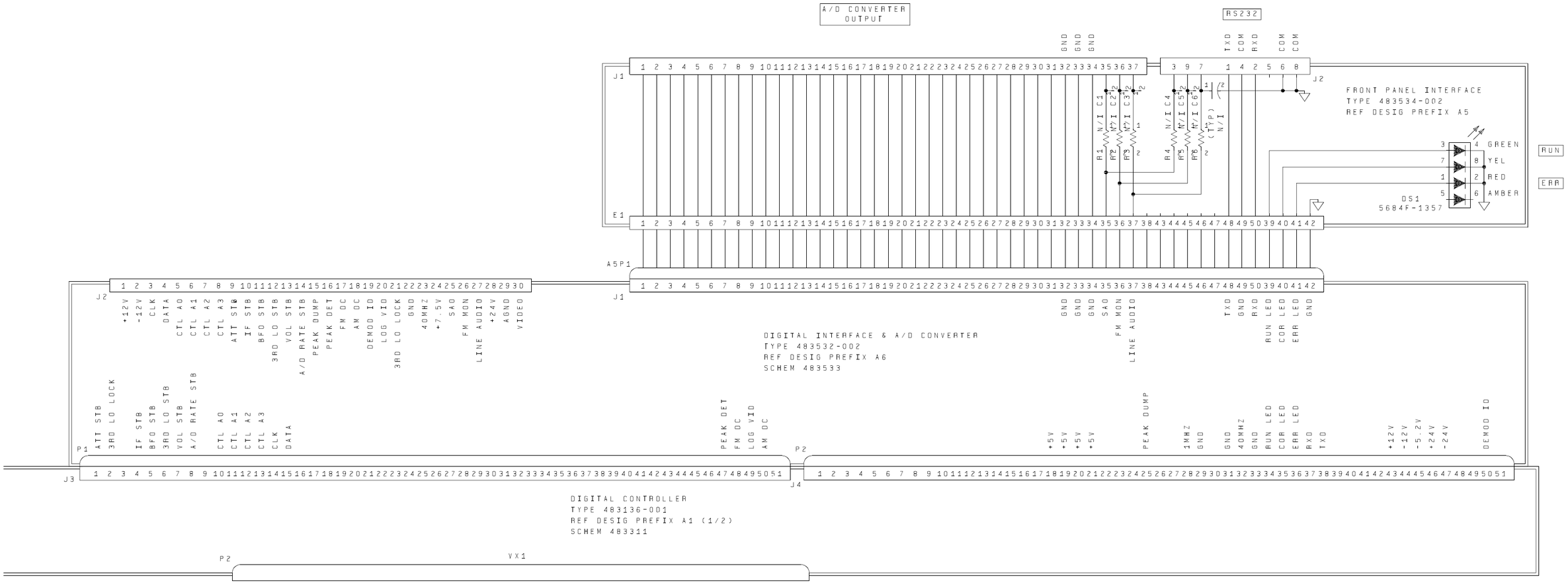


FO-1. Type E2730A VXI RF Tuner, Main Chassis Schematic Diagram 484331 (Sheet 1 of 2) (B)



FO-1. Type E2730A VXI RF Tuner, Main Chassis
Schematic Diagram 484331 (Sheet 2 of 2) (B)