TEK INSTRUCTION MANUAL

Part No. 070-2759-00
Product Group 20

1410
NTSC GENERATOR with Options
(SN B010135 AND UP)

Please Check for CHANGE INFORMATION at the Rear of This Manual

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual


This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment


DANGER — High voltage.


Protective ground (earth) terminal.


ATTENTION — refer to manual.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.
Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see Page 1-2, Fig. 1-3.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

Do Not Operate Without Covers (for TM 500 plug-ins only)

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

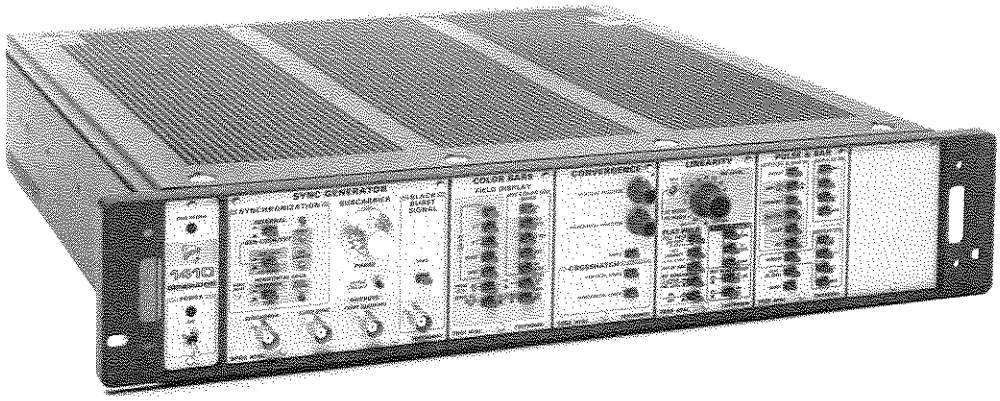
Use Care When Servicing With Power On

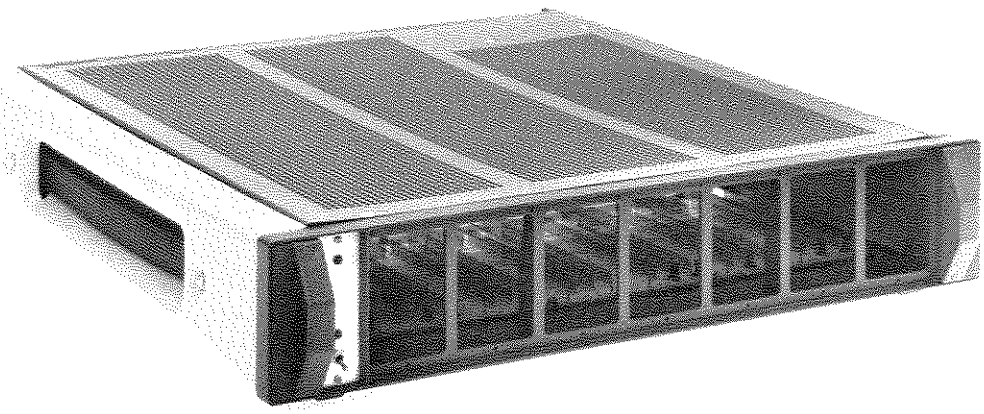
Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.





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1410 rackmount model. 1410 cabinet model with SPG and TSG modules installed.

PART I
OPERATORS INFORMATION

OPERATING INSTRUCTIONS

DESCRIPTION

The 1410 is an NTSC Generator and, as such, is both a system (when it contains a Sync Pulse Generator, SPG, module and Test Signal Generator, TSG, module) and an individual instrument. The 1410 Generator, excluding SPG and TSG modules, contains the system power supplies and an accurate subcarrier-frequency reference oscillator. The subcarrier oscillator in the standard 1410 is accurate to within 10 Hz; with Option 1, it is accurate to within 1 Hz.

The heart of the system concept is the 1410 Interface circuit board. It provides the flexibility required to allow for the loading of a wide range of TSG modules, plus the choice of one of several available SPG modules. The board contains 22 rows of interconnect pins for mounting sync and test signal modules, identified as plugs. Four rows of these pins are always dedicated to SPG modules. When a dual-wide SPG (such as the SPG1 or SPG2) is employed, the next (adjacent) three rows of pins are also used by the SPG.

Figure 1-1 shows a front view of the 1410 with no SPG or TSG modules installed. This illustration identifies the module locations. Location 0 is always used by the SPG module, with the possible addition of location 1 if the SPG is dual width. Locations 1 through 6 are the TSG module locations. Each of the six locations (1 through 6) has a rear-panel output connector assigned to it to be used as an output for the standard signal of the installed module. For example, if location 2 contains a TSG1 (Color Bars module), J2 on the rear panel should provide a Color Bars Composite Video signal. The rear-panel J numbers, 1 through 6, are intended to be used with the location of the same number.

A 36-pin REMOTE connector, on the 1410 rear panel, allows remote access to a number of SPG and TSG functions. Three interface lines per module location (1 through 6) are wired directly to the REMOTE connector. In addition, six control lines, common to all locations, are brought out to the connector. Seven of the remaining twelve lines are used with the SPG module, either to drive status indicators or to switch operating modes. Four pins of the REMOTE connector are unused, and one pin is connected to chassis ground.

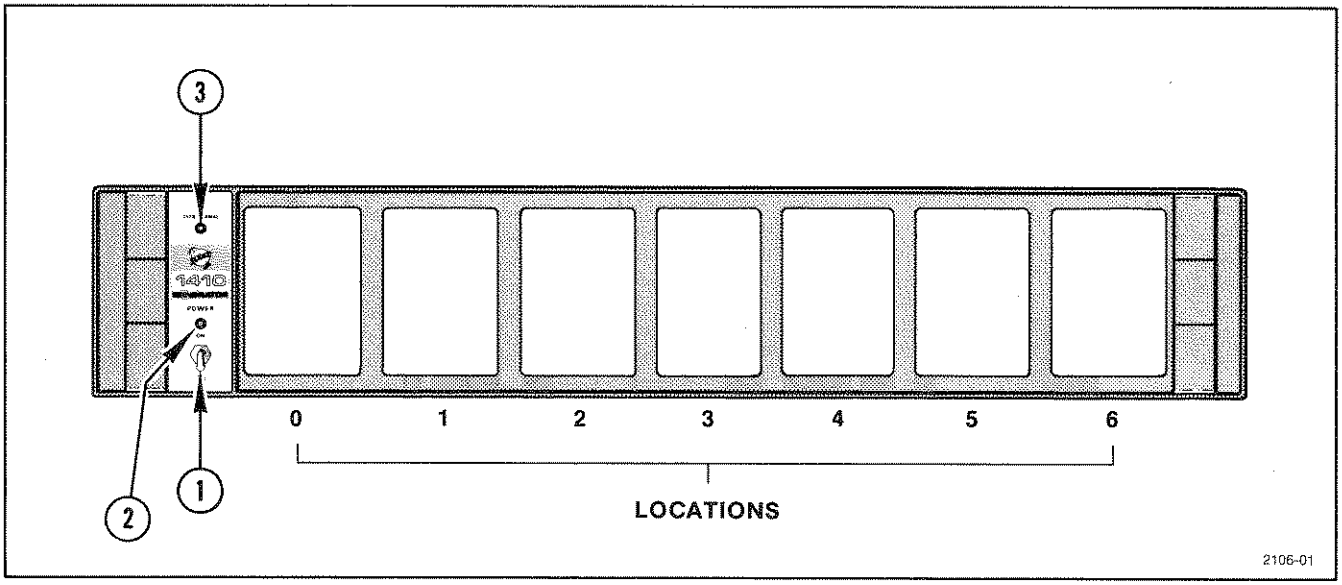


Fig. 1-1. Front-panel details.

Additional information on the interfacing and remote connection is located in Section 4, System Configuration.

FRONT-PANEL SWITCH AND INDICATORS (Refer to Fig. 1-1)

Switch

(1) POWER Switch

Connects or interrupts mains voltage to the transformer primary circuit.

Indicators

(2) POWER

Illuminates when mains voltage is applied to the transformer primary circuit.

(3) OVEN TEMP

Illuminates to indicate that the crystal oscillator oven is at operating temperature.

REAR-PANEL CONNECTORS (Refer to Fig. 1-2)

(1) J42 POWER Connector-Fuse Holder

Contains the power cord receptacle, the fuse holder, and the mains voltage selector. Mains voltage selection is done via a plug-in circuit board (see Fig. 1-3 for details). Selects 100, 120, 220, or 240 V ac as center-value input line voltage.

(2) J41 REMOTE

This 36-pin connector provides access to switching functions. (Refer operation through the REMOTE connector to qualified service technicians.) Instructions on the use of the REMOTE input are located in Section 3, Installation, and Section 4, System Configuration.

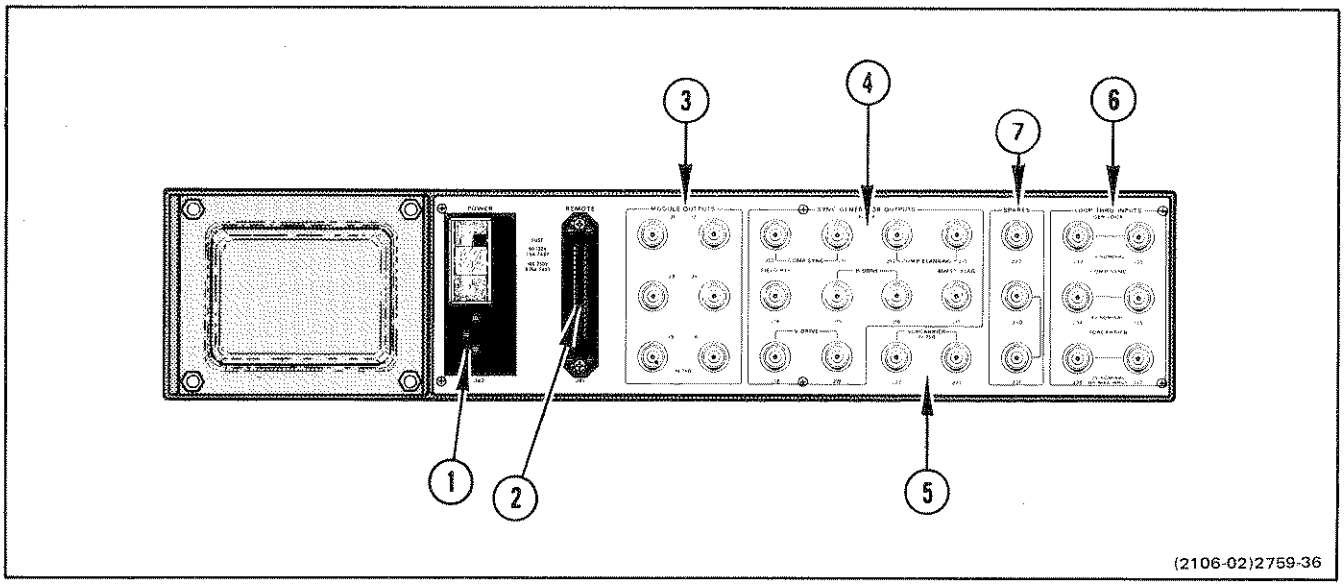


Fig. 1-2. Rear-panel details.

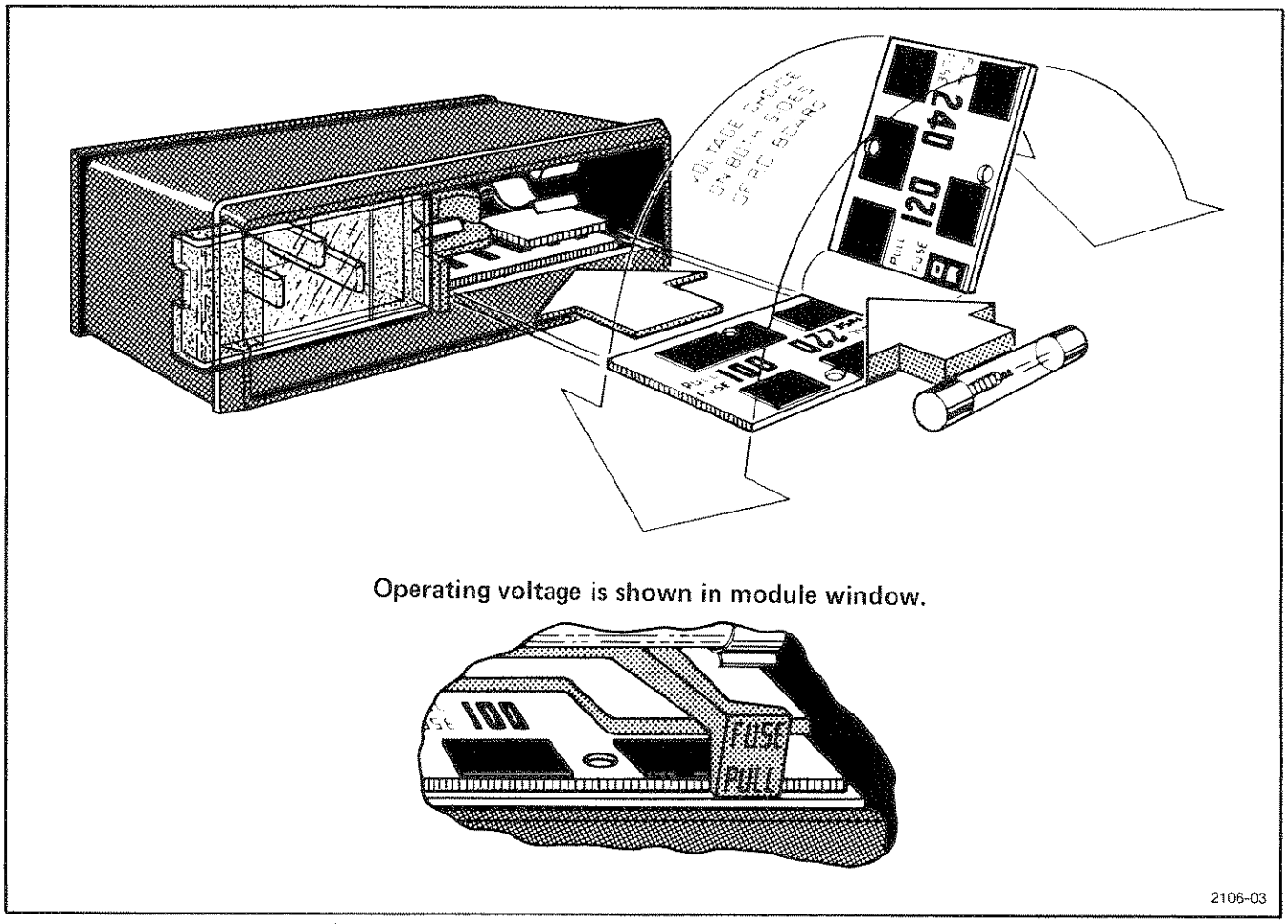


Fig. 1-3. Changing mains voltage.

(3) J1—J6 MODULE OUTPUTS

The signal from any of the MODULE OUTPUT connectors depends on which test signal module is installed in a given mainframe location (see Fig. 1-4 for location identification). With an SPG1 or SPG2 mounted in locations 0 and 1, the output from J1 is always the VIRS/Black Burst signal. With an SPG3 in location 0, any of the test signal modules can be installed in location 1. The signal at J1 is determined by the module in location 1. The other MODULE OUTPUT numbers relate directly to the mainframe location number. If all Module locations are not used, the extra connectors may be connected to other modules for dual output.

(4) J10—J19 SYNC GENERATOR OUTPUTS

The SYNC GENERATOR OUTPUTS include drive, sync, and blanking signals generated by the SPG1 or SPG2. If an SPG3 is installed, no signals are present at these connectors (see the SPG1/SPG2 manual for signal details).

(5) J20 and J21 SUBCARRIER

These connectors provide a 2 V peak-to-peak of 3.579545 MHz subcarrier signal from the sync generator module. If an SPG1 or SPG2 is installed, the phase of the subcarrier at J20 and J21 is variable with the sync generator Subcarrier Phase control. With an SPG3 installed, there is no subcarrier signal at these connectors.

(6) J32—J37 LOOP-THRU INPUTS

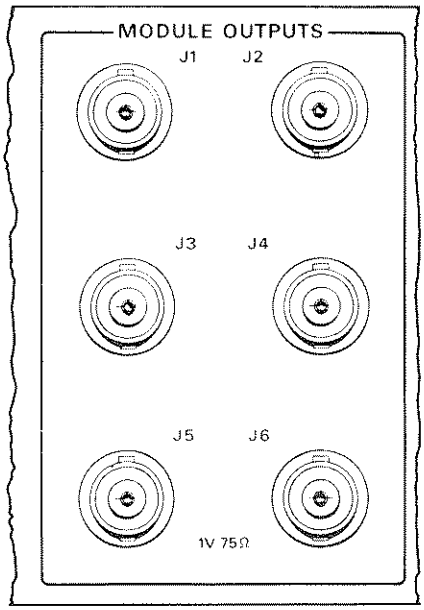
The loop-thru inputs are high-impedance inputs, compensated for 75 ohms, but not internally terminated. They permit locking the sync generator to external sources. The SPG1 may be locked to external sync and subcarrier. The SPG2 accepts sync and subcarrier, and can be gen-locked to external composite video. The SPG3 can be locked to external subcarrier only.

(7) Spare Connectors

J22 is connected so that it can be used as an input or an output by adding a cable from the desired point.

J30 and J31 are connected as loop-thru inputs, with a 15-kΩ resistor connected off the center of the loop.

LOCATION	OUTPUT JACK	PREFERRED MODULE	MODULE FUNCTION
0	Front or Rear Panel	SPG3 or	Timing or
		SPG1, SPG2	Sync
1	J1	SPG1 or SPG2	Sync or
		TSG4	Black Burst
2	J2	TSG1	Color Bars
3	J3	TSP1 or	Switcher/Conv.
		TSG2	or Convergence
4	J4	TSG3	Linearity
5	J5	TSG5	Pulse & Bar
6	J6	TSG6	Multiburst



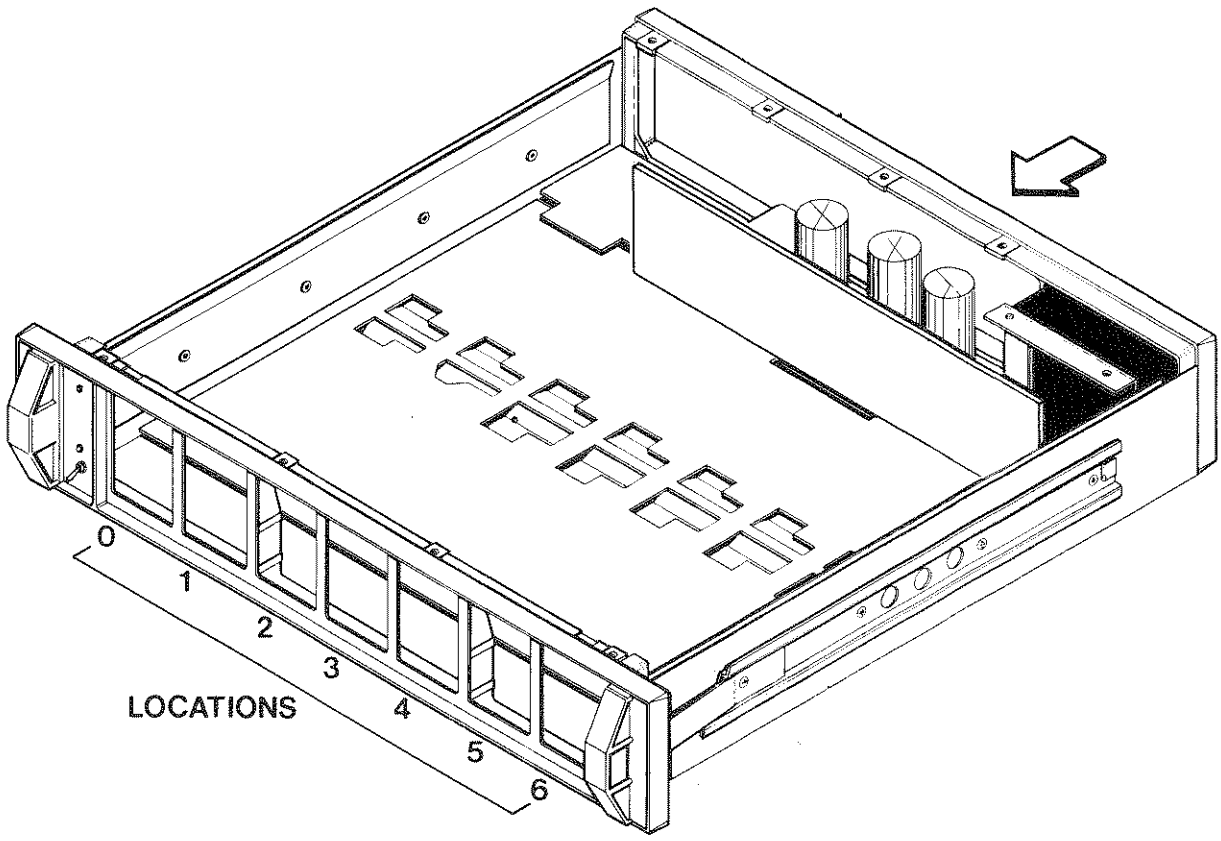


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Fig. 1-4. Module locations and outputs.

SPECIFICATION & OPERATIONAL CHECK

This section contains the operating characteristics and performance requirements for the 1410 mainframe circuits and a procedure to check that the instrument is functioning properly. A complete procedure for checking items listed in the Performance Requirement column of Table 2-1, Electrical Specification, is located in Section 5, Performance Check/Calibration.

SPECIFICATION

The performance requirements listed here apply over an ambient temperature range of 0° C to +50° C. The rated accuracies are achieved when the instrument has been calibrated at +20° C to +30° C, after a minimum warm-up time of ten minutes. A twenty-minute warm-up time is required for operation within stated accuracies at 0° C.

Table 2-1

ELECTRICAL SPECIFICATION

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
Frequency (F_{sc})			
Standard 1410	3.579545 MHz ±10 Hz		2
Option 1 1410	3.579545 MHz ±1 Hz		
Pull-In Range			
Standard 1410	F_{sc} ±50 Hz		6 (In Calibration Procedure)
Option 1 1410	F_{sc} ±20 Hz		
Input Requirements			
SUBCARRIER INPUT			
Amplitude	1.0 V to 4.0 V peak-to-peak		4 (In Calibration Procedure)
Frequency	3.579545 MHz to ±10 Hz		5 (In Calibration Procedure)
Return Loss	−46 dB to 3.579545 MHz		9 (In Calibration Procedure)

Table 2-1 (cont)

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
POWER SUPPLY			
Supply Accuracy			
+15 V	15 V ±50 mV		3 (In Calibration Procedure)
+5 V Analog	5 V ±50 mV		
+5 V Digital	5 V ±50 mV		
−15 V	−15 V ±25 mV		2 & 3 (In Calibration Procedure)
Current Limit			
+15 V		1 ampere	
+5 V Analog		1 ampere	
+5 V Digital		3 amperes	
−15 V		1.5 amperes	
Supply Ripple		Typical	
+15 V		1 mV	
+5 V Analog		1 mV	
+5 V Digital		1 mV	
−15 V		1 mV	
Power Mains			
Voltage Range			
100 V ac		90—112 V ac	
120 V ac		106—132 V ac	
220 V ac		196—244 V ac	
240 V ac		214—250 V ac	
Mains Crest Factor		At least 1.35	
Maximum Power Consumption		130 watts	
Maximum current at 120 V ac, 60 Hz		1.2 amperes	
Mains Frequency		47—63 Hz	

Table 2-2

MECHANICAL SPECIFICATION

Characteristic	Supplemental Information	
Length	19.2 inches	(48.77 centimeters)
Width	19.0 inches	(48.26 centimeters)
Height	3.47 inches	(8.81 centimeters)
Weight (Rackmount)	21 lbs. 9 ounces	(9.78 kilograms)
Weight (Cabinet Model)	23 lbs. 13 ounces	(10.8 kilograms)

Table 2-3

ENVIRONMENTAL CHARACTERISTICS

Characteristic	Performance Requirement
Temperature	
Operating	0°C to +50°C
Storage	−40°C to +65°C
Altitude	
Operating	To 15,000 feet
Storage	To 50,000 feet

OPERATIONAL CHECK

This procedure is to be used to check the 1410 for proper operation, and may be used for incoming inspection to verify normal operation. Leave the instrument covers in place while performing this procedure to avoid electrical shock. If any faults are noted in the instrument, refer troubleshooting to qualified service personnel.

Control and connector names on the 1410 under test are capitalized in this procedure; for example, POWER. Controls and connectors on test equipment or any of the modules installed in the 1410 mainframe have only the first letter capitalized; for example, test oscilloscope Volts/Div, or sync generator Horizontal Lock.

TEST EQUIPMENT

The test equipment listed here was used in preparing this procedure. The measurement capabilities described are the minimum required to verify normal operation of the instrument. Each piece of test equipment is assumed to be operating within its stated specification. If alternative test equipment is used, it must meet or exceed these requirements. Detailed operating instructions for test equipment are omitted in this procedure (see the test equipment instruction manuals if more information is needed).

1. Test Oscilloscope

Time Base. Sweep range from 100 ns/div to 5 ms/div, with provisions for internal and external television triggering.

Amplifier. Bandwidth, dc to 30 MHz; minimum deflection factor, 0.5 V/div.

For example, a TEKTRONIX 7603 Oscilloscope with 7B53A Dual Time Base and 7A26 Dual Trace Amplifier.

2. Frequency Counter

Capable of resolving 1/4 Hz out of 3 MHz.

For example, a TEKTRONIX DC 508 Option 1 Counter installed in a TEKTRONIX TM 500-Series Power Module, or a Hewlett-Packard 5326A Option 011.

3. 75-ohm Cable (4 required)

Length, 42 inches; connectors, bnc; impedance, 75 ohms. Tektronix Part Number 012-0074-00.

4. 75-ohm Feedthrough Termination (3 required)

Connectors, bnc; impedance, 75 ohms. Tektronix Part Number 011-0103-02.

5. Video Signal Source

Capable of producing 2 volts peak-to-peak of 3.579545 MHz subcarrier output signal and NTSC composite sync output of negative-going, 4-volt (peak-to-peak) amplitude. For example, another 1410 with SPG1 or SPG2, or equivalent.

PROCEDURE

1. Check OVEN TEMP LED Operation

a. Connect the 1410 (under test) to an appropriate source of ac power.

b. Set the POWER switch to ON.

c. CHECK—that the OVEN TEMP indicator lights within two minutes for the standard 1410, or within six minutes for the 1410 Option 1.

2. Check Subcarrier Frequency

NOTE

For first-time operation or after prolonged periods of inoperation, the 1410 should be left on for at least two hours prior to checking Subcarrier Frequency. This will re-age the oscillator crystal.

a. Connect the Sync Generator (in the 1410 under test) Subcarrier output through a 75-ohm cable and 75-ohm termination to the frequency counter input.

b. CHECK—that the subcarrier frequency is 3.579545 MHz ±10 Hz for the standard 1410, or 3.579545 MHz ±1 Hz for the 1410 Option 1.

3. Check Subcarrier Amplitude

a. Disconnect the cable and termination from the frequency counter and connect it to the test oscilloscope vertical input.

b. Set the test oscilloscope sweep rate to 200 ns/div and the deflection factor to .5 V/div (500 mV/div).

c. CHECK—that the subcarrier amplitude is between 1.8 and 2.2 volts peak-to-peak (3.6 to 4.4 divisions).

4. Check Internal/External Switching (SPG1 or SPG2)

a. Connect the video signal source Comp Sync output through a 75-ohm cable to the 1410 COMP SYNC LOOP THRU INPUT. Connect the other COMP SYNC LOOP THRU connector to the test oscilloscope external trigger input via a 75-ohm cable and a 75-ohm termination. Set the test oscilloscope for external triggering.

b. Connect the video signal source Subcarrier output through a 75-ohm cable to the 1410 SUBCARRIER LOOP THRU INPUT. Terminate the other SUBCARRIER LOOP THRU INPUT connector in 75 ohms.

c. Set the SPG1 or SPG2 (in the 1410 under test) for External Synchronization and Subcarrier Horizontal Lock.

d. CHECK—that the test oscilloscope display is locked.

e. Set the Sync Generator (in the 1410 under test) for Internal Synchronization.

f. CHECK—that the test oscilloscope display is not locked.

This completes the Operational Check for the 1410.

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

PART II
SERVICE INFORMATION

INSTALLATION

PACKAGING

At installation time, save the shipping carton and packing materials for repackaging in case shipment becomes necessary. See Fig. 7-10 in Section 7, Maintenance, in this manual for detailed repackaging instructions.

ELECTRICAL INSTALLATION

Power Source

This instrument is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation. Only the Line conductor is fused for overcurrent protection.

Mains Frequency and Voltage Ranges

The 1410 operates over a frequency range of 47 Hz to 63 Hz and at mains voltages of 100 V ac, 120 V ac, 220 V ac, and 240 V ac. The dc power supplies are regulated to operate over a range of approximately ±10% from the nominal center mains voltage (see Section 2 under Electrical Specification for range limits). A rear-panel voltage selector makes selection of any of these nominal voltages easy.

Mains Conversion

Mains voltage selection is accomplished by means of a small circuit board in the power connector-fuse holder assembly A6 on the 1410 rear panel (see Fig. 3-1).

To change mains voltage ranges, remove the power cord, open the cover, and pull the fuse lever down.

Insert a pointed tool in the hole at the edge of the Voltage-Selector board and pull gently out of the holder.

Orient the Voltage-Selector circuit board so that the desired mains voltage will appear in the notch in the holder, and insert the board.

Set the fuse-pull lever back to its normal position and insert the correct fuse in the fuse holder. See Section 9, Replaceable Electrical Parts, for correct fuse values.

Remote Switching

J41 on the 1410 rear panel provides access to the modules for remote functions. See Fig. 3-2 for pin locations. See Section 4, System Configuration, for a detailed discussion of remote operation.

The mating male plug for the REMOTE connector can be obtained by ordering Tektronix Part Number 131-0293-00.

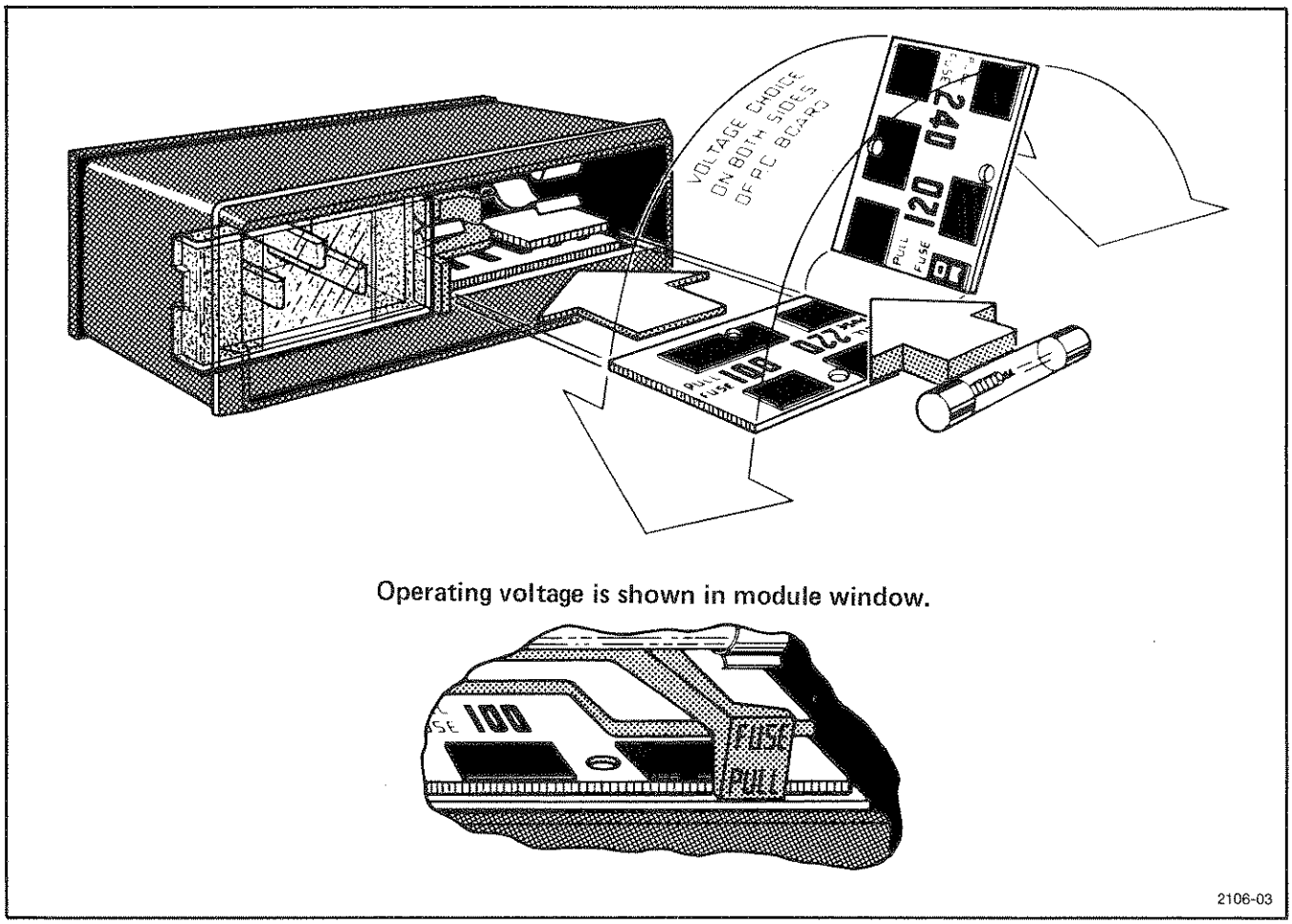

Fig. 3-1. Changing mains voltage.

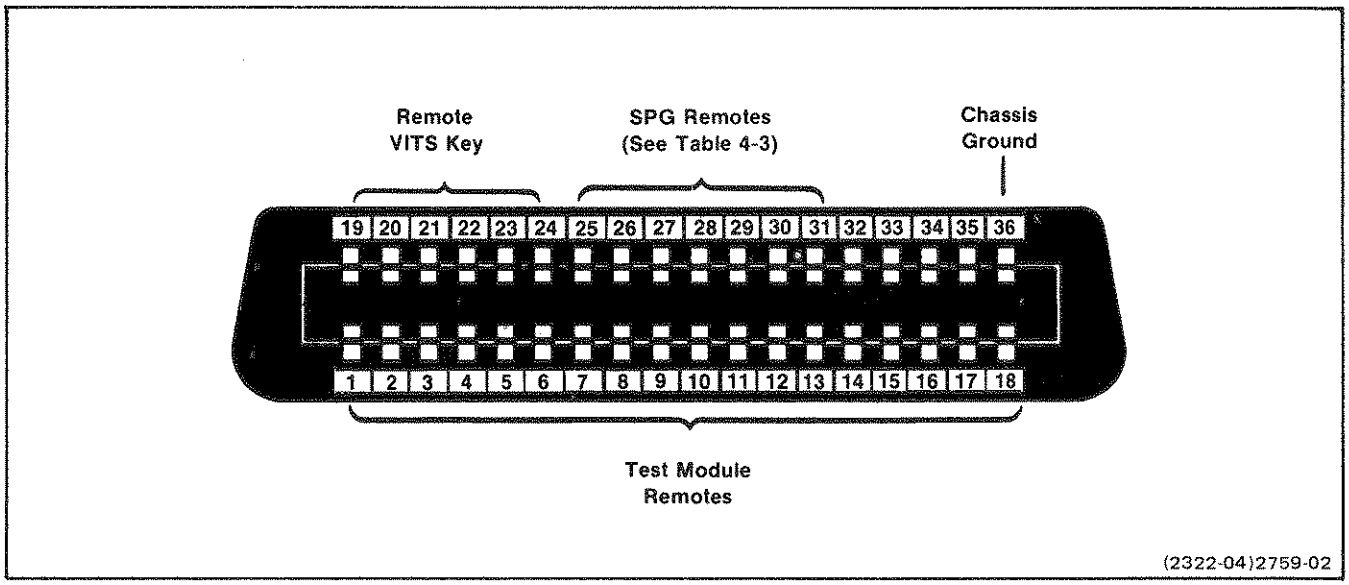

Fig. 3-2. J41 REMOTE connector (located on the 1410 rear panel).

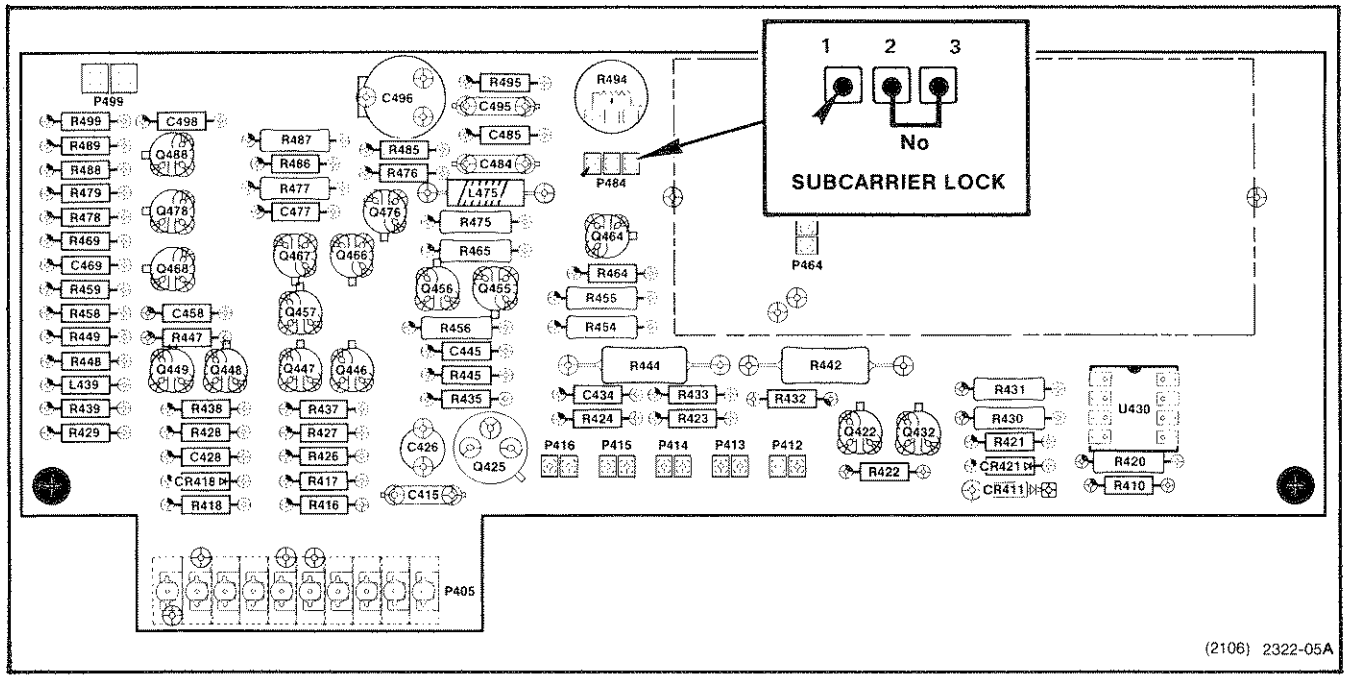

Fig. 3-3. Subcarrier operating mode (P484).

Operating Mode Selection

Subcarrier Input board A13 has a three-pin plug-jumper, P484, that must be positioned correctly for the installed Sync Pulse Generator.

When an SPG with subcarrier lock (SPG2) is used, adjustment of the subcarrier frequency is made in the SPG2. The plug-jumper for P484 on the Subcarrier Input circuit board is removed (see Fig. 3-3).

For Sync Pulse Generators without subcarrier lock (SPG1 or SPG3), the plug-jumper on P484 is installed in the 2-3 position (see Fig. 3-3).

Circuit Board Extender

The 1410 is provided with a reversible Circuit Board Extender. By changing the removable pins to the other side of the extender board, it can be configured to accommodate either left- or right-facing circuit boards. The extender board facilitates access to circuit-board connections and components when troubleshooting the instrument.

CAUTION

Do not attempt to use the Circuit Board Extender for the Power Supply board. For troubleshooting, components and test points are accessible from the top of the board.

The Circuit Board Extender is shipped from the factory in a pocket located in the inside cover of the systems Instruction Manual. If there are unused test-signal module locations in your 1410, you may want to mount the extender board in the left row of pins of an empty test-signal module for storage. Figure 3-4 shows an extender board stored in an unused module location. Figure 3-5 shows the Circuit Board Extender with the pins in the stored position. More details on the use of the extender board are included in Section 7, Maintenance.

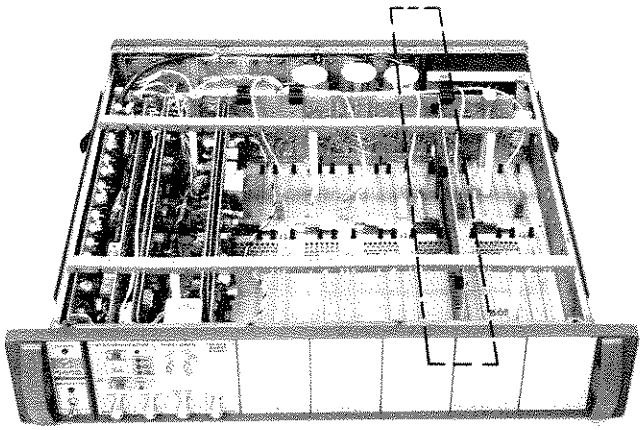

Fig. 3-4. Circuit Board Extender, stored in an empty test signal module.

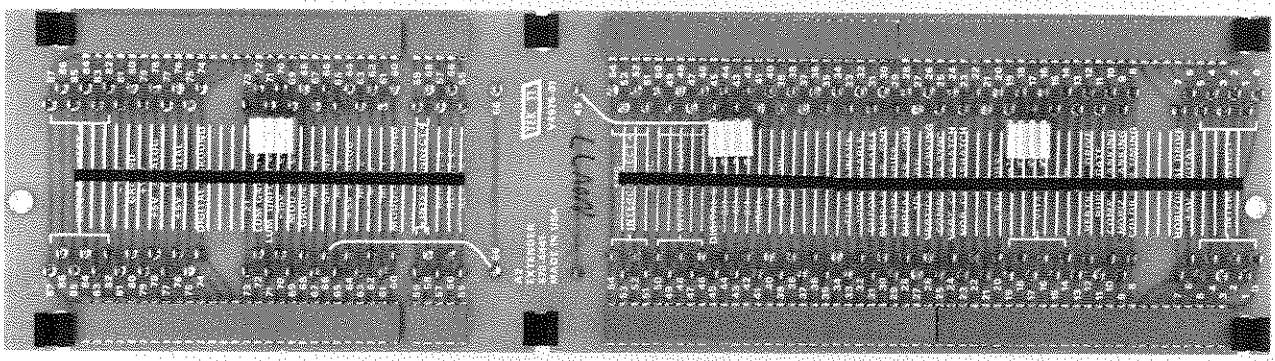

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Fig. 3-5. Circuit Board Extender, with mating pins in the stored position.

MECHANICAL INSTALLATION

Rackmounts

Latching. The 1410 incorporates a new spring-latch design built into the rack-handle system. To release, grasp the handles, press the latch knobs toward the center of the instrument, and pull the 1410 forward. To re-latch, push the 1410 in until the spring-latches catch.

Thumbscrews. For those applications where additional racking security is needed, the front castings have mounting holes for thumbscrew hold-downs (not supplied with the 1410). To gain access to these mounting holes, remove the cover plates under each handle by removing the two screws holding each assembly on. Re-mount the handles with these same screws. See Fig. 3-6 for mounting-hole details. The spring latches need not be removed when thumbscrews are used.

NOTE

Because of the spring-latch feature, the 1410 cannot be racked in already installed stationary slide sections unless thumbscrew hold-downs are used. The slide tracks supplied with the 1410 are required to accommodate the spring latches. The new slides provide a cut-out in the stationary section to catch the shoulder of the spring latch (see Fig. 3-7).

Rackmounting. The 1410 will fit most commercial consoles and 19-inch wide racks whose rail holes conform to universal spacing (EIA RS-310-B or RETMA) or Western Electric (MIL STD189) spacing. See Fig. 3-6 for hole-spacing details.

Allow at least 2 inches of clearance between the 1410 rear panel and the rack enclosure to ensure an adequate supply of cooling air.

The slide-out tracks mount easily to the rack front and rear vertical mounting rails if the inside distance between the rails is within 10 1/2 to 24 1/2 inches.

Some means of support (for example, extensions to the rear mounting brackets) is needed for the rear ends of the slide-out tracks if the tracks are going to be installed in a rack whose inside dimension is not within 10 1/2 and 24 1/2 inches (see Fig. 3-8).

The 1410 is 3.5 inches high, a multiple of 1.75 inches, the standard rack spacing. As long as the 1410 is positioned in the rack some multiple of 1.75 inches from the bottom or top, all the holes should line up and no drilling will be necessary.

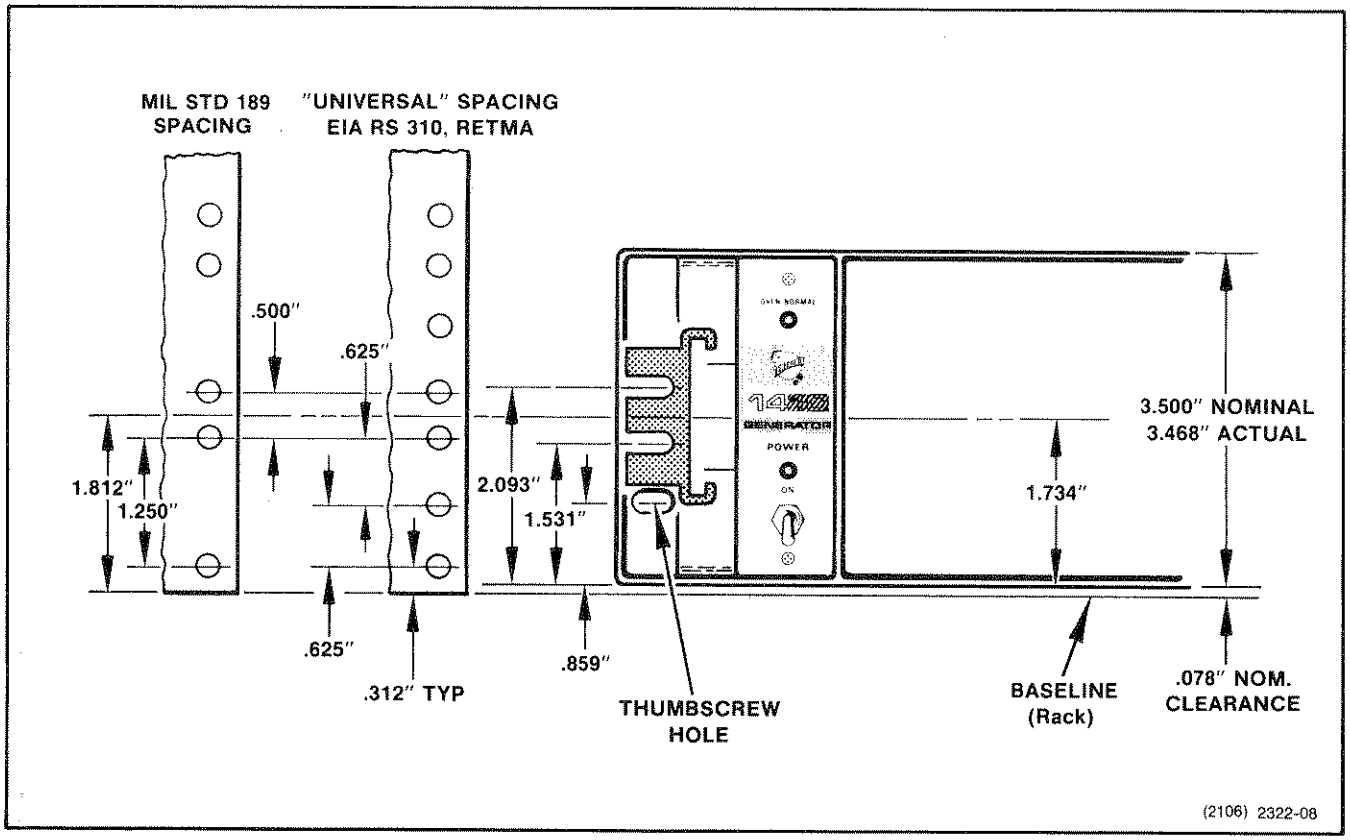


Fig. 3-6. Rackmount hole spacing.

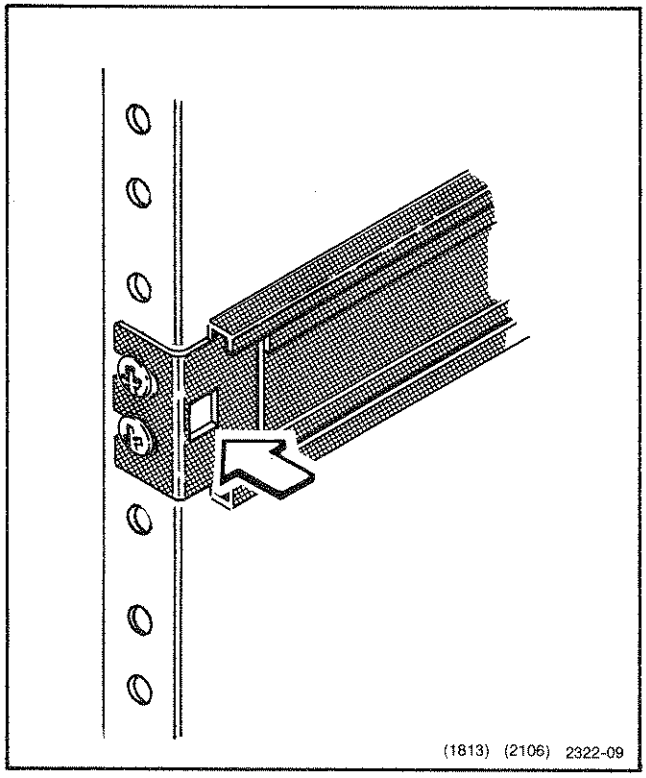


Fig. 3-7. Spring latch catch.

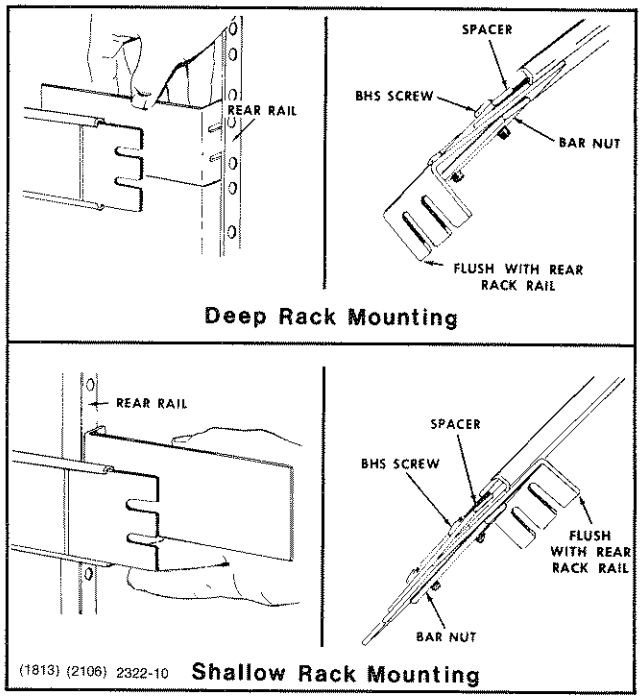


Fig. 3-8. Mounting slide tracks to accommodate various rack depths.

The dimensions of the opening between front rack rails must be at least 17 5/8 inches. The front lip of the stationary track section mounts in front of the rail. Use bar nuts behind untapped front rails. The front lip of the stationary track section must mount in front of the front rail to allow the 1410 spring latch to function properly.

The slide-out tracks consist of two assemblies, one for each side of the instrument. Each assembly consists of three sections (see Fig. 3-9). The stationary section of each track attaches to rack rails as illustrated in Fig. 3-10. The chassis section mounts on the instrument and is installed at the factory. The intermediate section fits between the other two sections, allowing the instrument to be fully extended out of the rack.

The stationary and intermediate sections for both sides are shipped as a matched set and should not be separated. The package includes matched sets for both sides and mounting hardware. To identify the assemblies, note that the automatic latch and intermediate section stop are located near the top of the matched sets when properly mated to the chassis sections.

To mount the instrument in a rack, select the appropriate holes in the rack rail using Fig. 3-6 as a guide.

Mount the stationary track sections to the front rack rails with pan head screws (and bar nuts) if the rails are not counter-sunk. Use flat head screws (and bar nuts) if the rails are counter-sunk.

Mount the stationary track sections to the rear rails, using one of the methods in Fig. 3-10. Note that the rear mounting bracket can be installed to fit either a deep or shallow cabinet rack.

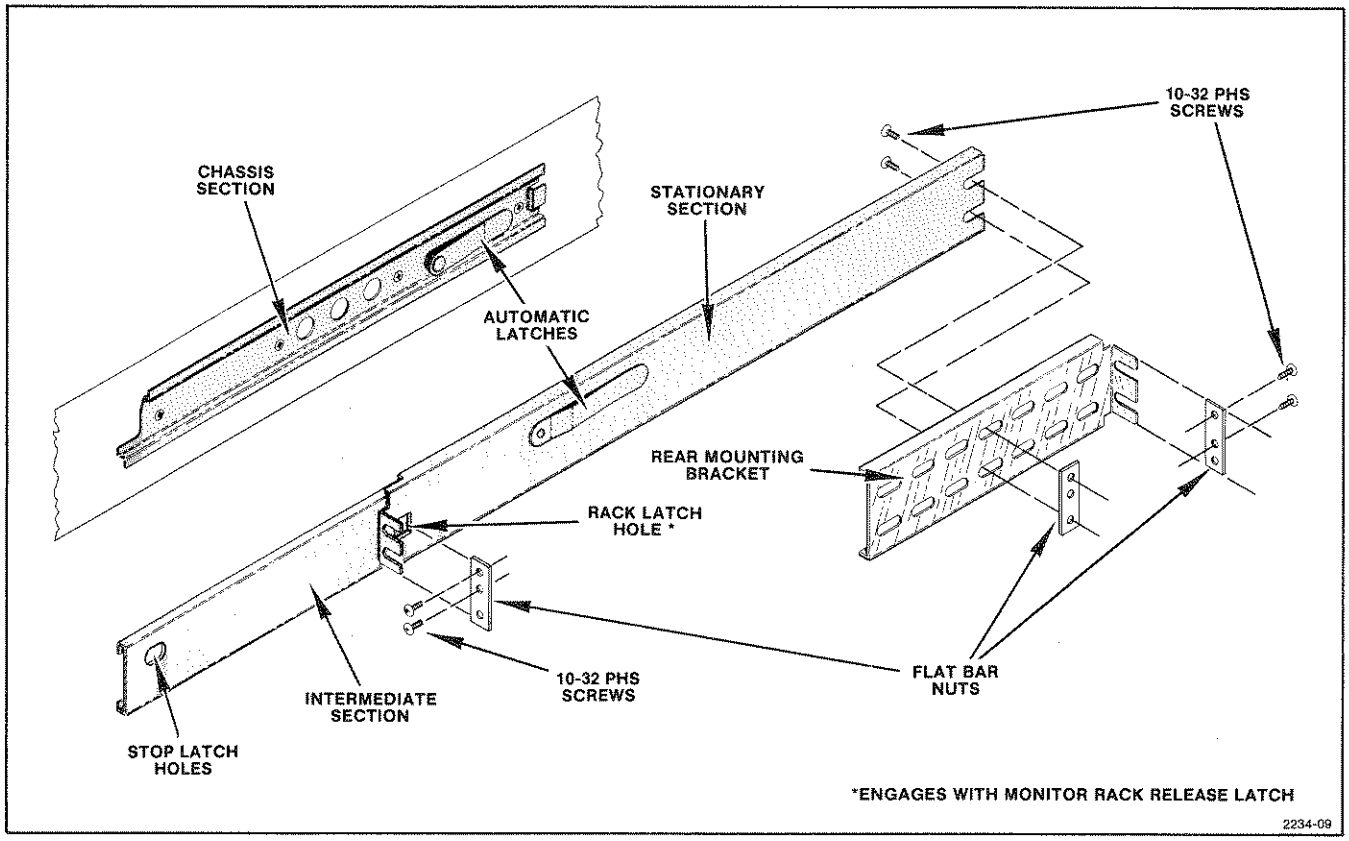


Fig. 3-9. Rackmounting hardware.

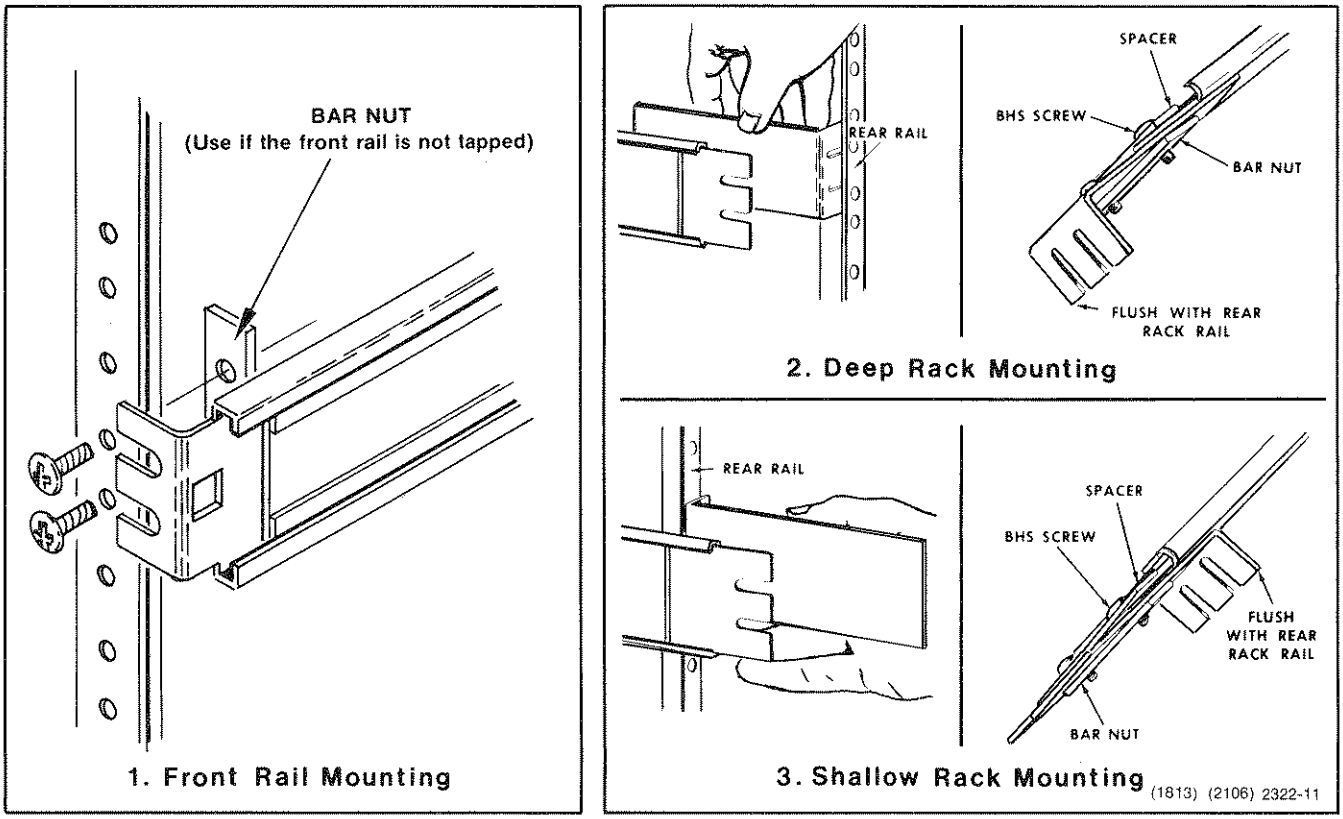


Fig. 3-10. Mounting stationary sections.

After mounting the instrument in the slide-out tracks, adjust for proper width by loosening the front screws and allowing the slides to seek the proper width. Be sure that the instrument is centered, then re-tighten the screws.

When the instrument is pushed into the rack, an automatic spring latch engages the back of the front rack rail to hold the instrument in place. To extend the instrument out of the rack, just press in the spring latch on each handle and pull the instrument out.

See Fig. 3-11a for a dimensional drawing of 1410 rackmount.

Cabinet Models

1410 cabinet models use the same chassis as the rackmount, the differences being that the rackmount chassis slide section is removed and plastic sides are installed. The left side includes a carrying handle. See Fig. 3-11b for a dimensional drawing of a 1410 cabinet model.

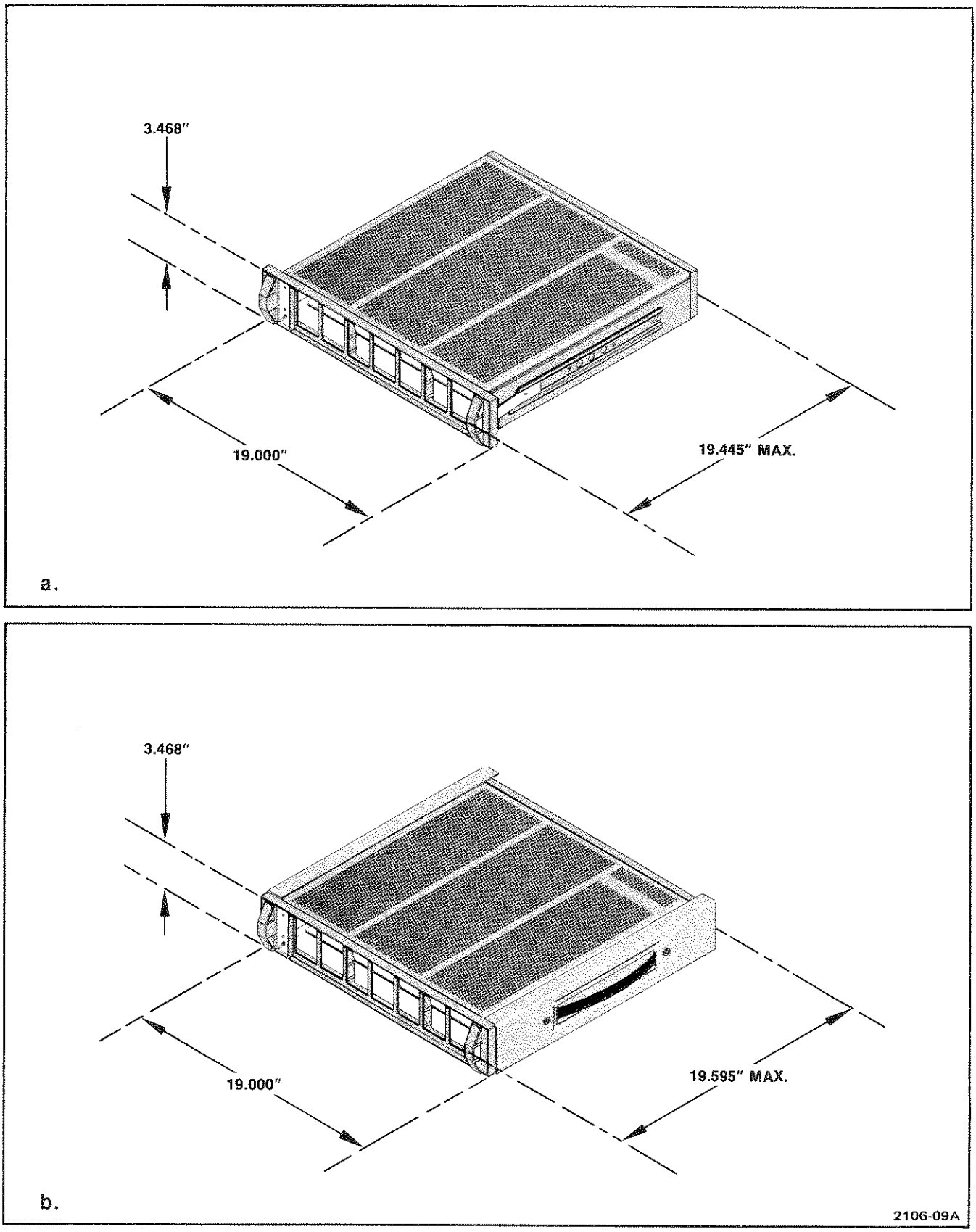


Fig. 3-11. a. 1410 Rackmount dimensions. b. 1410 Cabinet model dimensions.

SYSTEM CONFIGURATION

This section details the operation of the 1410 as a signal generating system that is capable of generating accurate video sync and timing signals and a wide range of test signals.

Sync Pulse Generator and Test Module Interface

The 1410, when it contains signal modules (SPG or TSG), is a system. As a system, its central element is the Interface etched-circuit board. The Interface board consists of 22 full-length plugs numbered from P51 through P72. In addition, three plugs (P51A, B, and C) are used to connect to the Sync Pulse Generator location (location 0, P51—P54).

P73 connects the Power Supply circuit board to the Interface board, taking care of the interconnections of system grounds and power supplies.

P74 connects the Subcarrier Input circuit board, including the crystal oven, to the remainder of the 1410 circuits.

Interface board pins 0—5, 46—50, 58—59, and 82—87, plus 61, 63, 65, 67, 69, 71, 73, 75, and 77 are used to connect the circuit boards that make up an individual module. Pins 7 through 12 and 20 through 44 connect SPG timing and control signals between the SPG and all TSG locations.

Power-supply assignments are listed in Table 4-1.

Table 4-1

POWER SUPPLY INTERFACE

Supply	Pin Numbers
−15 V	70 & 81
+15 V	62 & 79
+5 V Analog	64 & 78
+5 V Digital	6 & 76
Gnd Digital	45 & 74
Gnd Analog	66, 68, & 80

Interface board pins 7 through 12 and 20 through 44 are used to connect SPG timing and control signals to the TSG modules so that each pin is connected to the same signal at any row of the Interface board. A listing of the signals on these pins is included in Fig. 4-1A. Typical waveforms on these pins are shown in Fig. 4-2.

Module Locations

Because of the flexibility of a system like the 1410, it is necessary to refer to sets of pin connectors or plugs (P51 through P72) as module locations. The module locations are numbered 0 through 6. Figure 4-3 shows the 1410 mainframe with location numbers.

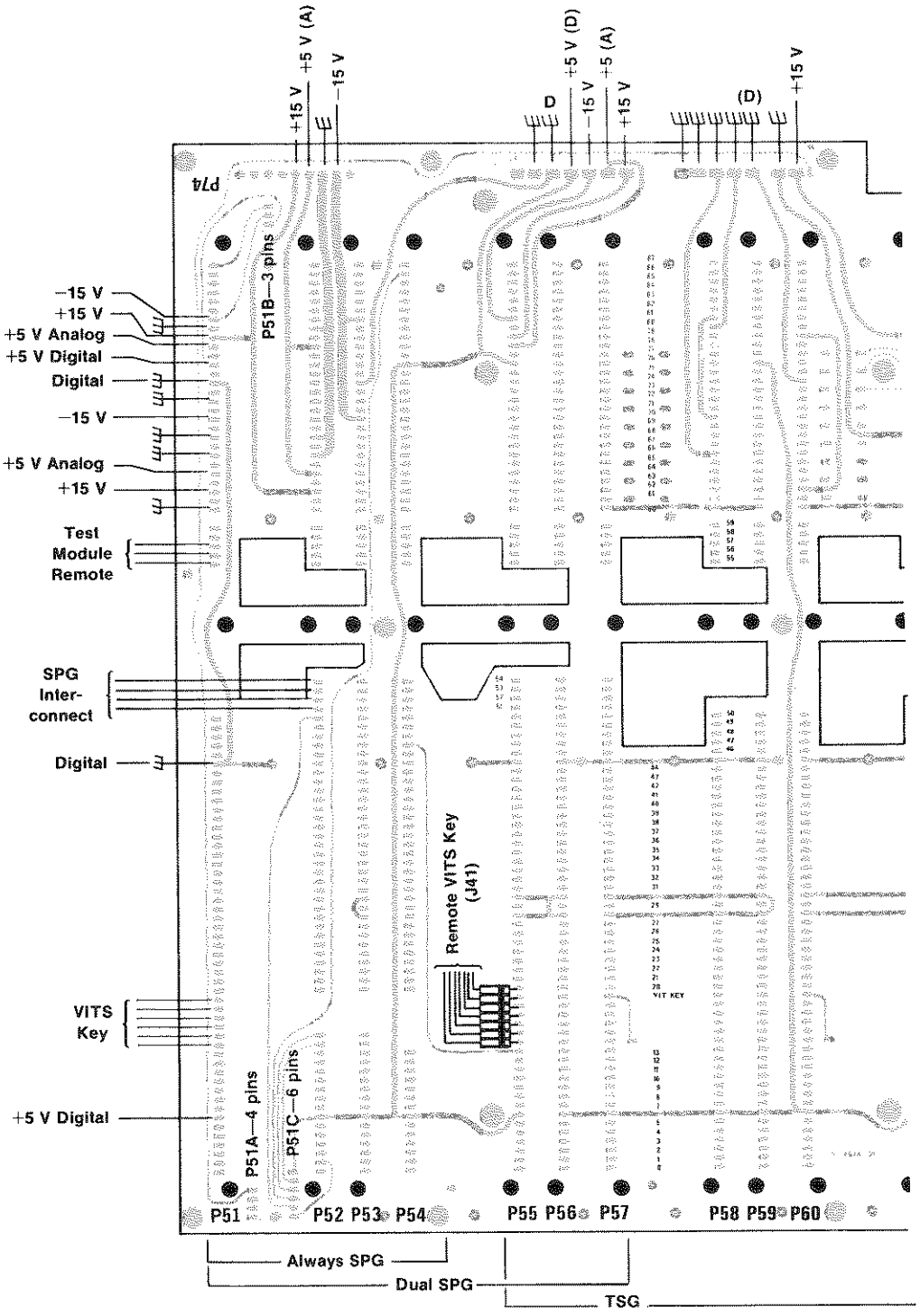
Location 0 must always contain a Sync Pulse Generator (SPG) module. When a dual-width SPG is used (SPG1 or SPG2), location 1 is also occupied by that SPG. The use of location 1 is thus optional, depending on the SPG that is used.

Locations 2 through 6 always contain Test Signal Generator (TSG) modules or remain blank, depending on the selection of modules for an individual 1410 system. The system Instruction Manual, shipped with that individual system, will always reflect the modules that make up that system.

Module locations 1 through 6 have the timing and power supply voltages for any of the TSG modules. Although preferred module locations have been assigned, test signal modules may be moved to a different module location for servicing or special instrument configurations.

Only one Color Bars module (TSG1) should be used per mainframe. The TSG1 sends an EIA color-bar timing signal to the color-bar timing stage in the SPG module. Erratic color bar operation would result from the presence of timing signals from more than one source. Also, only one Multiburst module (TSG6) should be used per mainframe, due to the increased power requirements of this unit.

For optimum system operation, installation of the individual TSG modules should be made in accordance with the preferred module locations as shown in Fig. 4-3.



SIGNAL INTERCONNECT (from SPG)

SIGNAL	PIN
H Drive	7
Color Bar Timing	8
H Blanking	9
Composite Blanking	10
Burst Gate	11
V Drive	12
Pal Pulse	20
H/4	21
H/2	22
H Convergence	23
V Convergence	24
Composite Sync	25
V Blanking	26
1/2 - 3/4 V Split	27
Ground (Subcarrier)	28
Subcarrier	29
Ground (Subcarrier)	30
Chroma Disable	31
Video Disable	32
Field Squarewave	33
H*	34
H	35
V/2	36
V/4 NTSC-FIELD 1 Ref	37
16H	38
Window	39
5 MHz	40
1 MHz	41
2H	42
4H	43
8H	44

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Fig. 4-1A. 1410 Interface circuit board.

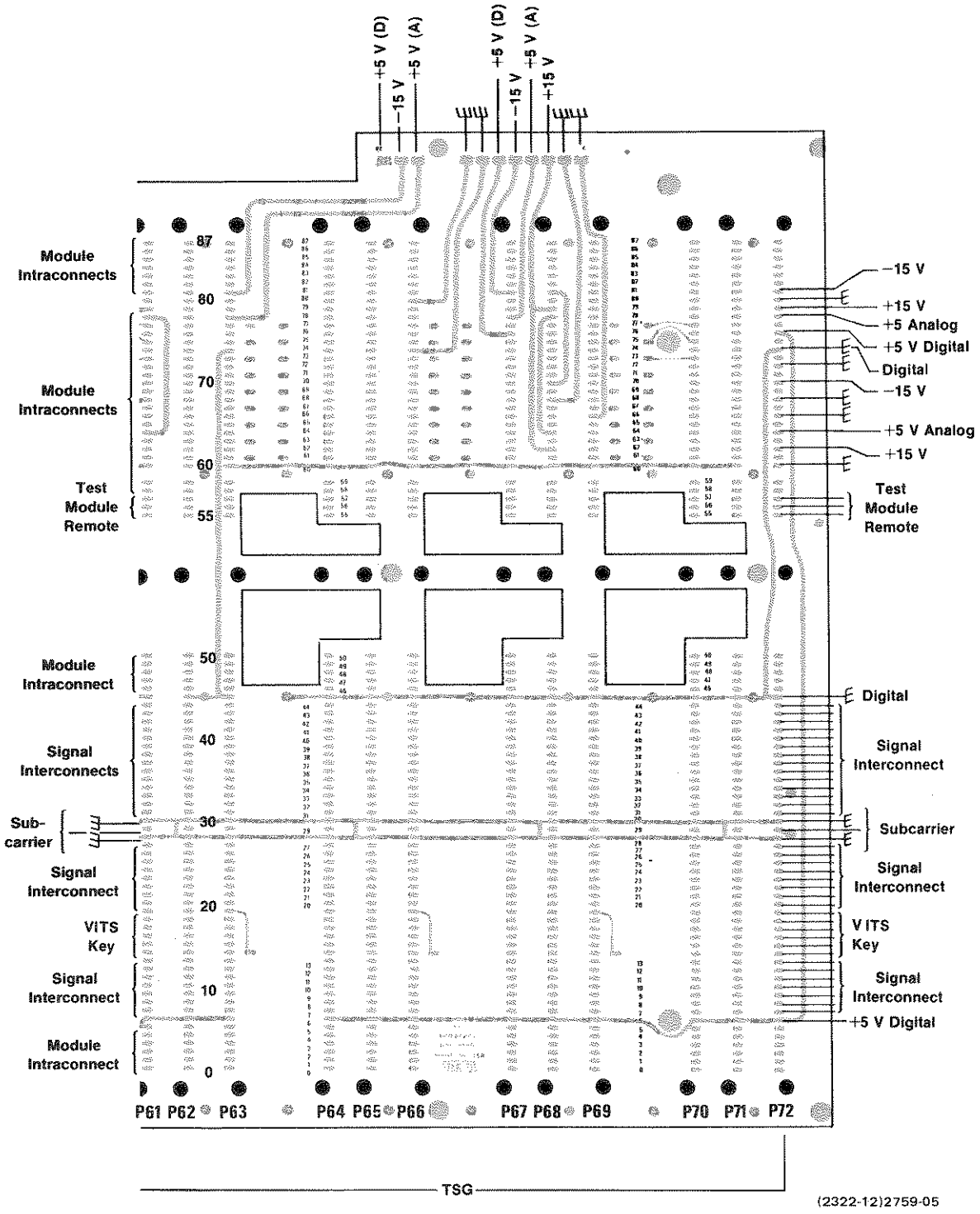
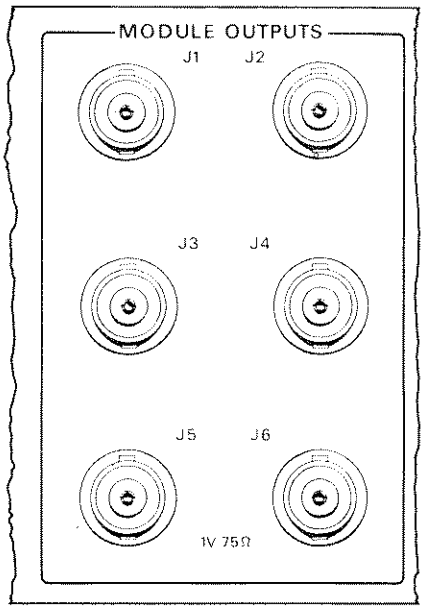


Fig. 4-1B. 1410 Interface circuit board (cont'd).

LOCATION	OUTPUT JACK	PREFERRED MODULE	MODULE FUNCTION
0	Front or Rear Panel	SPG3 or	Timing or
		SPG1, SPG2	Sync
1	J1	SPG1 or SPG2	Sync or
		TSG4	Black Burst
2	J2	TSG1	Color Bars
3	J3	TSP1 or	Switcher/Conv.
		TSG2	or Convergence
4	J4	TSG3	Linearity
5	J5	TSG5	Pulse & Bar
6	J6	TSG6	Multiburst



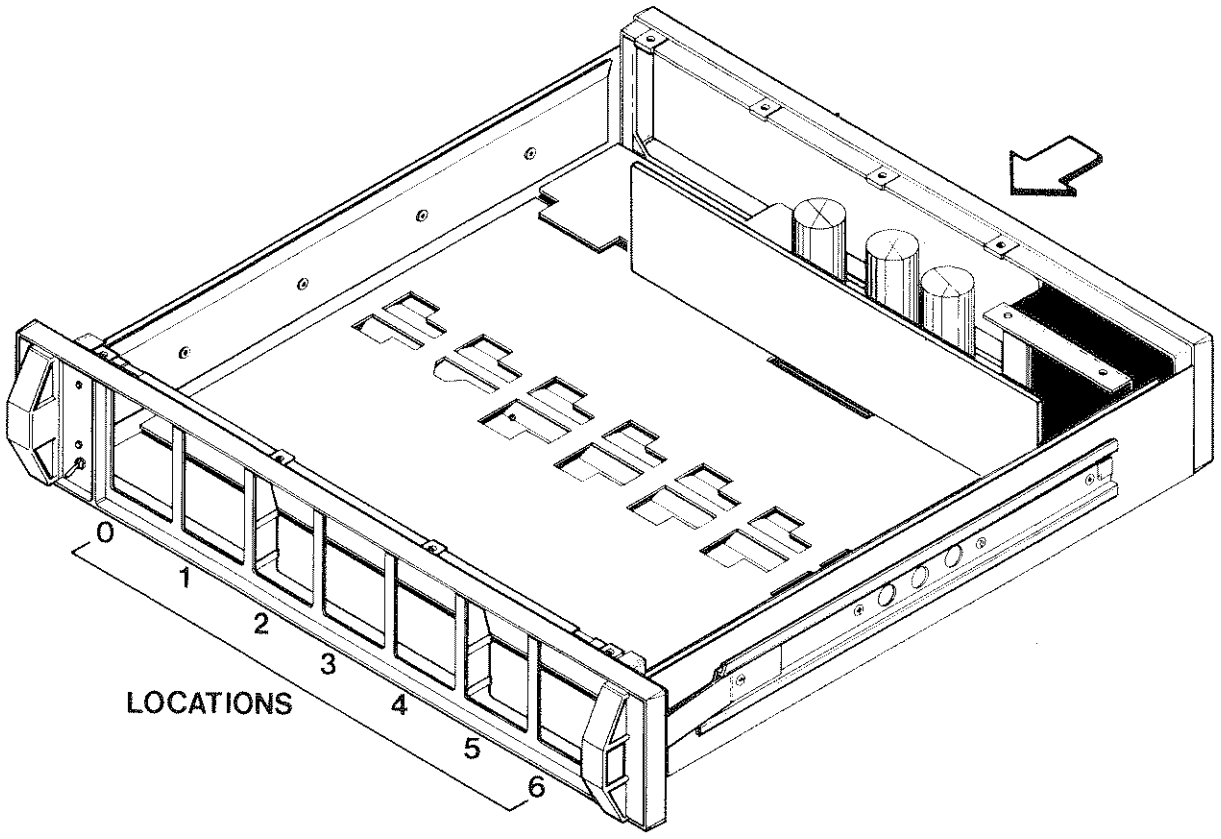


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Fig. 4-2. 1410 module locations.

Adding Additional Modules

As test signal needs change, the 1410 can be updated to include new test signal modules. New or replacement modules can be installed with relative ease. Remove front-panel knobs and the existing front-panel segment. Remove the etched-circuit boards that make up the old module (if one was previously installed) and put in the new circuit boards, according to the directions in the module's Instruction Manual. Perform the brief Installation Calibration Procedure for the new module, if this procedure is included in the Instruction Manual for the module.

Module Outputs

Rear-panel jacks J1 through J6 are intended for the output of the test module occupying the corresponding location. Cables and plugs that connect to the modules are color coded (EIA code: brown = 1, red = 2, etc.) to ensure correct connection to the individual test modules. Sticky-back labels (Tektronix Part No. 334-3303-00) may be used to mark the test signal outputs on the rear panel. A set of labels is supplied with the standard accessories of the 1410.

Unused test signal output coaxial cables should be stored by connecting their plugs to any unused module location pin 59 on the Interface board.

When the dual-width SPGs are used, J1 will contain a signal from the SPG. With a single-width SPG (SPG3), location 1 is a test signal generator (TSG) module location, and will have the output signal of that module on J1. See Fig. 4-3.

Sync Generator Outputs

SPGs are available that provide rear-panel synchronizing signals. All of the SPG modules supply the sync and timing signals required by the test signal modules. Single-width SPGs may not have rear-panel outputs.

The 1410 rear panel has the following signal connectors for SPG outputs: COMP SYNC, COMP BLANKING, FIELD REF, H (horizontal or line) DRIVE, BURST FLAG, V (vertical or field) DRIVE, and two identical SUBCARRIER OUT jacks. However, all outputs may not be present with a particular SPG. Check the SPG Instruction Manual as to which outputs are provided.

Spare Connectors

J22 is connected so that it can be used as an input or an output by adding a cable from the desired point. J30 and J31 are connected as a loop-through, with a 15-kΩ resistor connected off the center of the loop.

Remote Connector

Sync Pulse Generator. Seven REMOTE connector pins are dedicated to SPG remote operation. They are pins 25 through 31, and are used differently in each of the SPGs. When considering remote operation of the 1410, consult the specific SPG Instruction Manual to determine what functions are performed by the remote inputs. Table 4-2 is a specific example of how the SPG2 is remote controlled. The table includes the connector pin number and what it is used for.

Table 4-2

SPG2 REMOTE

J41 Pin #	Used For	Condition Required
25	SUBCARRIER ABSENT	requires LED & gnd.
26	INTERNAL mode indicator	requires LED & gnd.
27	SYNC ABSENT	requires LED & gnd.
29	Mode Switching[a]	high-internal, gnd-remote.
30	Reference Selection	gnd-external, high-internal.
31	Reference Selection	gnd-gen lock, high-internal.
36	Ground	

[a]If only pin 29 is high, operation is the same as the front-panel switch. When pin 29 is grounded, front-panel switching is disabled.

Test Modules. Each test module location has three REMOTE connector pins assigned to it. These pins are connected to test module plug pins 55, 56, and 57 at each location. For specific TEST SIGNAL GENERATOR remote operation, consult that particular Instruction Manual. Table 4-3 is a list of REMOTE connector (J41) pins, their assignment to locations, and interface plugs and pins.

Table 4-3

TEST MODULE REMOTE CONNECTIONS

J41 Pin #	Location	Interface Plugs	Pin #
1	Module 6	P70-P71-P72	55
2	Module 6	P70-P71-P72	56
3	Module 6	P70-P71-P72	57
4	Module 5	P67-P68-P69	55
5	Module 5	P67-P68-P69	56
6	Module 5	P67-P68-P69	57
7	Module 4	P64-P65-P66	55
8	Module 4	P64-P65-P66	56
9	Module 4	P64-P64-P66	57
10	Module 3	P61-P62-P63	55
11	Module 3	P61-P62-P63	56
12	Module 3	P61-P62-P63	57
13	Module 2	P58-P59-P60	55
14	Module 2	P58-P59-P60	56
15	Module 2	P58-P59-P60	57
16	Module 1	P55-P56-P57	55
17	Module 1	P55-P56-P57	56
18	Module 1	P55-P56-P57	57
36	Ground		

Remote VITS Keying

Test module pin 19 is dedicated to the VITS Key signal. When the VITS Key line goes low, the Test Signal Generator will provide one or more lines of composite video. REMOTE connector pin 24 is the Remote VITS Key for test module location 1. Table 4-4 gives the REMOTE connector pin and test module location it controls.

NOTE

The male plug for the REMOTE connector is Tektronix Part Number 131-0293-00.

Table 4-4

REMOTE VITS KEY LINES

J41 Pin #	Test Module Location
24	1
23	2
22	3
21	4
20	5
19	6
36	Ground

Internal VITS Keying

Interface lines 14 through 19 are used to key the VIT signals. Because only pin 19 on each module has a connection, lines rotate position between each module so that each module will connect to a different remote line. Figure 4-4 shows how the line positions are altered between locations.

Internal VITS Keying is provided by some modules (VIRS on SPG1, SPG2, and TSG4). If internal VITS Keying is used, Remote Keying is ineffective for that module.

The TSP1 NTSC Switcher/Convergence Pattern Generator module may be used to internally VITS Key each module, since the VITS Key lines are different for each module location. The TSP1 and TSG modules must be installed in their preferred locations (see Fig. 4-3) to key the correct VITS.

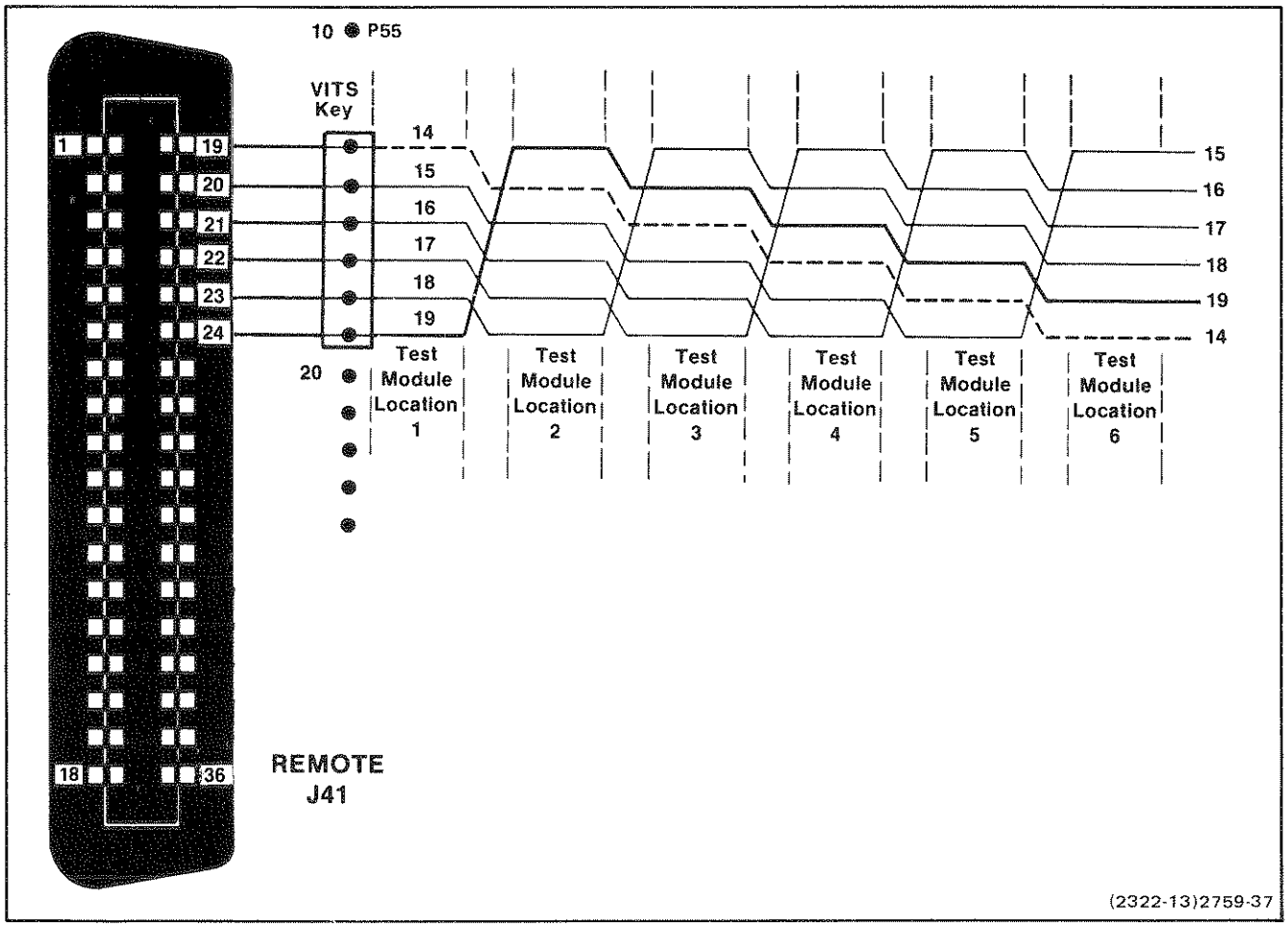

Fig. 4-3. VITS Key lines, showing how interface lines rotate to plug position 19.