User Manual

Tektronix

11T5H
Multistandard Video Trigger

070-7961-00

Please check for change information at the rear of this manual.

First Printing: January 1991

Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B010000	Tektronix, Inc., Beaverton, Oregon, USA
E200000	Tektronix United Kingdom, Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands

Instruments manufactured for Tektronix by external vendors outside the United States are assigned a two digit alpha code to identify the country of manufacture (e.g., JP for Japan, HK for Hong Kong, IL for Israel, etc.).

Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

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Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

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General Information

This manual describes installation, removal, and operation of the 11T5H Multistandard Video Trigger. The 11T5H is used with Tektronix Digitizing Mainframes. Service information and test procedures for the 11T5H are found in the *11T5H Service Reference*.

Features

The 11T5H provides the following features:

- Generates triggers on video signals originating from an external source or from Channel 1 or 2 of a companion 11A34V Video Amplifier plug-in.
- Accommodates the tri-level sync of HDTV signals.
- Triggers on line rates up to 1280.
- Allows for line selection.
- Allows selection among five trigger video signal sources.
- Allows selection of display clamping.
- Provides input impedance of 1 MΩ.
- Allows for trigger mode selection.
- Provides loopthrough output to route the incoming signal on to other instruments. This signal may be used for display and/or trigger.

This reference contains the following sections:

- **General Information**—provides general video signal theory, details about the compatibility of the 11T5H with Digitizing Mainframes, how to install and remove the 11T5H, the operating temperature of the 11T5H, and the options available for the 11T5H.
- **Operation**—explains how to operate the 11T5H in Digitizing Mainframes.
- **Operation with the 11A34V**—explains how to operate the 11T5H in conjunction with the 11A34V High Bandwidth Video Amplifier.
- **Specifications**—lists electrical, environmental, and physical specifications of the 11T5H.

General Video Signal Theory

This section describes the characteristics of video waveforms, principles of television transmission, and principles of video waveform analysis. This information is described from the perspective of the United States National Television Systems Committee (NTSC) broadcast standards. These standards are common for many non-NTSC broadcast standards.

The Video Waveform

The composite video signal contains both picture and synchronizing information.

Picture – Image information is both amplitude and position coded along each horizontal line. A picture that is to be transmitted is scanned by a camera. At lighter spaces of the picture a high amplitude signal is generated; darker spaces generate low amplitude signals.

When measured across 75 Ω, video signals are a standard amplitude of 1 V peak to peak. They are measured from the most negative point on the synchronizing pulse (see Sync) to the reference white (high amplitude) level.

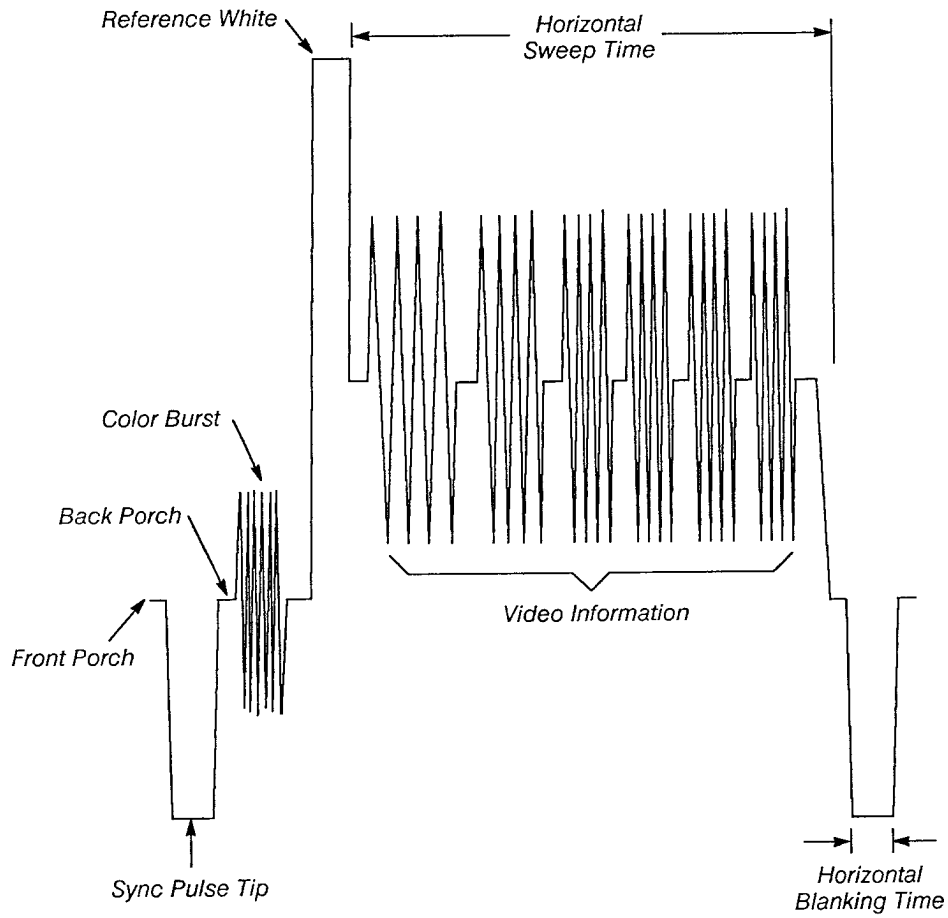

Figure 1-1 *– A Video Waveform*

Sync—The video signal contains synchronizing information referred to simply as sync. In a television receiving set, the image must be synchronized with the camera. It is the sync pulses that keep the image precisely timed. If sync information were not present, the image would appear scrambled.

The horizontal-sync (or line-sync) pulses define the beginning and the end of each sequential line. They cause the scanner to move from the left to the right of the screen to begin another horizontal scan (horizontal retrace). Vertical-sync pulses cause the television scanner to move from the bottom to the top of the screen to begin another picture (vertical retrace).

Front Porch—Before each horizontal-sync pulse is the area called the front porch. This area marks the beginning of the horizontal blanking interval (horizontal retrace). The front porch isolates the horizontal-sync pulse from picture information of the previous line. This prevents unstable horizontal-sync triggering.

Back Porch—Following the horizontal-sync pulse is the area called the back porch. Its amplitude is at the blanking level and serves as the reference for all other parts of the video waveform.

When a transmitted video signal is AC coupled or carried through long cable runs where it may be distorted, it is necessary for the signal to contain its own reference level on each horizontal line. The 11T5H Multistandard Video Trigger (which can be used in conjunction with the 11A34V) stabilizes the video signal by incorporating a back-porch clamp circuit (DC restorer). This circuit recreates the DC reference amplitude on the back porch level.

The back porch provides additional picture blanking time (horizontal retrace) for the camera and television set. The back porch may contain a color-reference signal called the color burst. The color burst indicates that the signal contains color information.

Color—Picture color information is transmitted by two separate components of the video waveform: the chrominance signal and the luminance signal. Chrominance contains hue (basic color content) and saturation (degree the color is diluted by white light). Luminance contains brightness information transmitted as white or shades of gray.

Chrominance is derived from a 3.579545 MHz subcarrier generated by color video equipment. The resultant sine wave signal varies in both amplitude and phase relative to a reference signal. The reference signal is a color burst transmitted on the back porch. Picture colors are decoded from the reference signal. The decoding is accomplished by processing the phase differences between the transmitted color burst and the chrominance signal. The amplitude of the luminance signal component determines brightness.

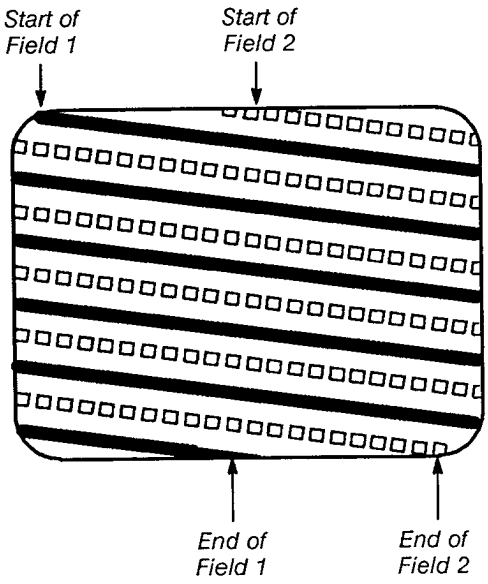

***Figure 1-2** — Typical Picture Scan Pattern*

Fields and Frames—In the NTSC color-television standard, 525 scan lines constitute one field and two fields create a frame (two frames create a picture). Each field is offset a half scan line from the other in a way that they become interlaced. Fields are drawn one at a time by the scanning beam, each with its own vertical-sync format. The interlace method reduces flicker and increases picture quality without requiring greater bandwidth.

Analyzing Video Signals

Monitoring and analyzing video signals to maintain and troubleshoot video equipment is accomplished by injecting known test signals in the video path. By monitoring the output signal it is possible to determine the extent of distortion caused by the video equipment.

Test Signals—Scan lines 10 through 20 of Field 1 and Field 2 are outside the normal viewing area. Test signals can be placed onto these lines without interrupting video signal transmission. These test signals can then be monitored.

Triggering—The trigger point for viewing any video line is the horizontal-sync pulse at the beginning of the respective line. Before a line can be viewed with a mainframe it is necessary to select the beginning of the line as the trigger point. To arrive at the desired field, the vertical-sync pulse must be detected.

Variations from the NTSC 525-line standard complicate the location and count of line numbers. In the NTSC and CCIR System M standards, line count starts three lines prior to vertical-sync pulse and is reset at the beginning of each field. In CCIR System B, PAL, and other 625-line standards, line count starts at the beginning of the vertical-sync pulse and is reset only at the beginning of Field 1.

For non-interlaced standards there is no differentiation between fields. Other triggering factors include differences in field rates and number of lines per frame.

Safety Summary

This general safety information applies to all operators and service personnel. Specific warnings and cautions will be found throughout thi manual where they apply, but may not appear in this summary.

Terms in Manuals

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.

Terms on Equipment

CAUTION warns you of possible hazards to the equipment or to yourself (but you are not exposed as you read the marking).

DANGER indicates that you are exposed to a personal injury hazard as you read the marking.

Symbols in Manuals

Static Sensitive Devices

Symbols on Equipment

DANGER
High Voltage

Protective ground (earth) terminal

ATTENTION
Refer to manual

Power Source

This 11T5H is intended to operate in a mainframe connected to a power source that will not apply more than 250 V rms between the supply conductors or between either a supply conductor and ground. A protective ground connection, through the grounding conductor in the mainframe power cord, is essential for safe system operation.

Grounding the 11T5H

This 11T5H is grounded through the grounding conductor of the mainframe power cord. To avoid electric shock, plug the mainframe power cord into a properly wired receptacle. A protective ground connection, through the grounding conductor in the mainframe power cord, is essential for safe operation.

Danger Arising from Loss of Ground

Upon loss of the protective ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulators), can cause an electric shock.

Do Not Remove Covers or Panels

Dangerous voltages exist at several points in this product. To avoid personal injury, do not remove side panels or covers while operating the instrument.

Compatibility of the 11T5H and the Mainframe

The 11T5H is designed for use in Digitizing Mainframes (that accept plug-in units) only. If the 11T5H is to be used to trigger on signals originating from an 11A34V High Bandwidth Video Amplifier, the 11T5H must be plugged into the rightmost plug-in compartment. Details of compatibility are included in System Specifications later in this manual. Refer to the Tektronix Corporate Catalog for additional information about compatibility of plug-in units and mainframes.

Initial Inspection

After unpacking, inspect the 11T5H and look for physical damage that may have occurred in transit. This 11T5H was inspected mechanically and electrically before shipment and should meet all electrical specifications. To verify that the 11T5H is functioning properly, you can perform the Checks and Adjustments procedures in the *11T5H Service Reference*. If you find that the 11T5H is damaged or deficient, contact your local Tektronix field office or representative, and again refer to the Packaging for Shipment instructions in this manual.

Operating Temperature

The 11T5H can be operated where the ambient air temperature is between 0°C and +50°C and can be stored in ambient temperatures from -40°C to +75°C. If stored at temperatures outside the operating limits, allow the chassis to reach operating temperature limits before applying power.

Installing and Removing the 11T5H

The 11T5H may be installed in any plug-in compartment of a Digitizing Mainframe. Install the 11T5H as follows:

☐ Step 1: Set the mainframe ON/STANDBY switch to STANDBY.

CAUTION

If the green indicator light remains on when the STANDBY position is selected, then the switch was internally disabled when the power supply was serviced. To enable the ON/STANDBY switch, refer to the Corrective Maintenance section of the Service Reference manual for your mainframe.

☐ Step 2: Align the grooves in the top and bottom of the 11T5H with the guides in the mainframe plug-in compartment.

Note: *If the 11T5H is to be used to trigger on signals originating from an 11A34V Video Amplifier, the 11T5H must be installed in the rightmost plug-in compartment of your mainframe.*

☐ Step 3: Slide the 11T5H into the compartment until the front panel of the 11T5H is flush with the front panel of the mainframe.

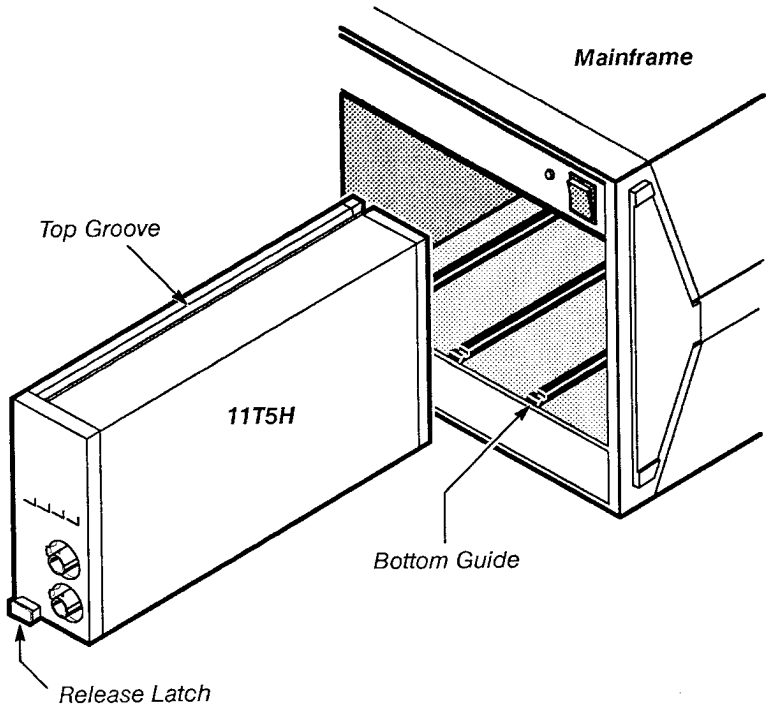

Figure 1-3 *— Installing and Removing the 11T5H*

Remove the 11T5H from the mainframe as follows:

☐ Step 1: Set the mainframe ON/STANDBY switch to STANDBY.

☐ Step 2: Pull the release latch (see Fig. 1-3) to disengage the 11T5H from the mainframe.

☐ Step 3: Slide the 11T5H straight out of the plug-in compartment.

Packaging for Shipment

If shipping the 11T5H to your local Tektronix service center for repair, attach a tag to it with the following information:

- Name and address of the 11T5H owner.
- Name of a person at your firm who can be contacted about the 11T5H.
- 11T5H type and serial number.
- Description of the service required.

Save and reuse the original carton and packaging when shipping the 11T5H by commercial transportation. Be sure to package and ship the plug-in and mainframe separately. If the original package is not available or is not reusable, package the 11T5H as follows:

1. Obtain a corrugated cardboard carton with dimensions at least six inches (15 cm) greater than the 11T5H dimensions. Use a carton with a bursting test strength of at least 200 pounds per square-inch.
2. Fully wrap the 11T5H with anti-static sheeting to protect its finish.
3. Tightly pack 3 inches of dunnage or urethane foam between the carton and the 11T5H to cushion it.
4. Seal the carton with shipping tape or with industrial staples.
5. Mark the address of the Tektronix service center and your return address on the carton in one or more prominent places.

Operation

This section describes the use of the 11T5H Multistandard Video Trigger in Digitizing Mainframes that accept plug-in units. All video signal triggering functions of the 11T5H are controlled through its front panel or the GPIB interface. For more information regarding mainframe and plug-in compatibility see the Specifications section of this manual. For more information regarding mainframe-to-plug-in communication see your mainframe *Programmer Reference*.

The Front Panel

The 11T5H front panel has five push buttons, one rotary knob, and two BNC connectors on the front panel. (Refer to Figure 2-1.) The front panel controls the following:

- The MODE button allows you to cycle through available trigger functions.
- The SETUP buttons allow you to toggle between the upper and lower trigger setup functions.
- The EXT 1 button allows you to display the external trigger source signal on the mainframe display. This button can be switched ON or OFF.
- The display window shows you the status of the currently selected SETUP button.
- The rotary knob allows you to change the setting for the currently selected SETUP button.
- The INPUT BNC connector allows for input of an external video signal.
- The OUTPUT BNC connector is connected to the INPUT BNC connector by a loopthrough connection. This output allows other video equipment to access the input video signal.

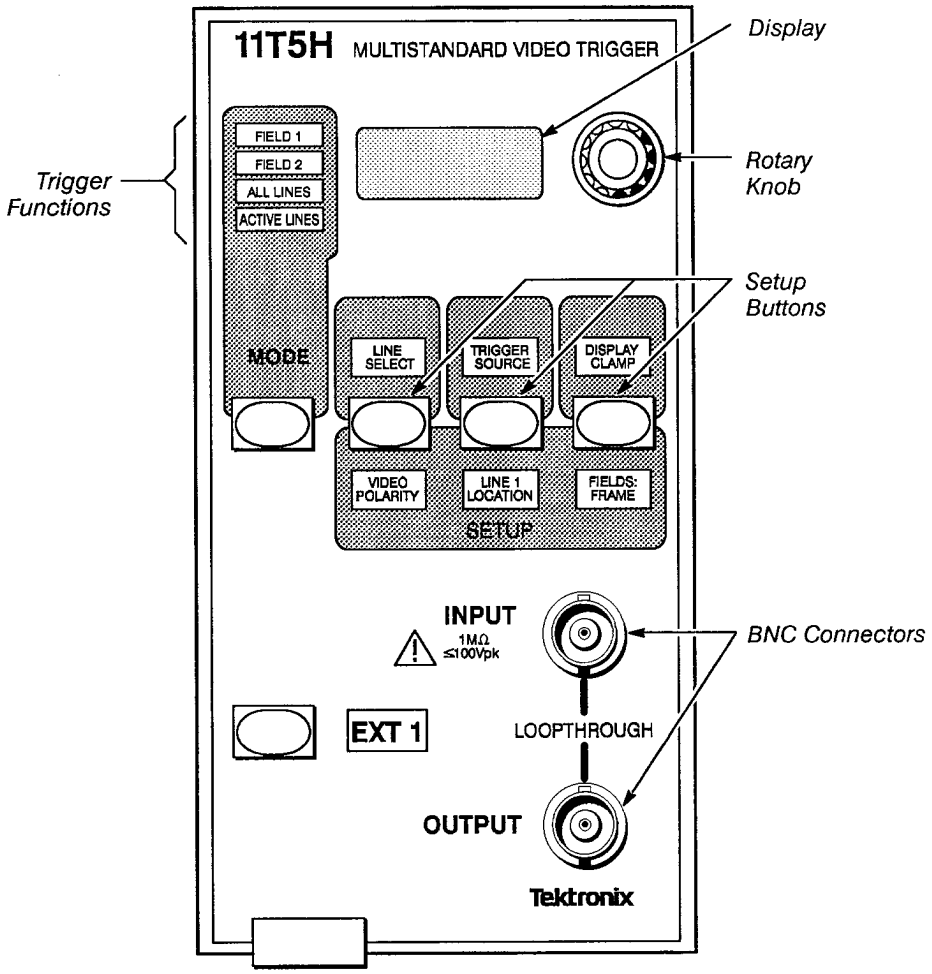

Figure 2-1 *— 11T5H Multistandard Video Trigger Front Panel*

Functions Controlled by the Front Panel

All functions of the 11T5H are accessible through the front panel. Table 2-1 lists the front panel trigger functions, their parameters, and the 11T5H display.

Table 2-1 — 11T5H Functions

Function	Parameter	11T5H Display
MODE	Field 1	FIELD1
	Field 2	FIELD2
	All video lines	ALL LINES
	Active video lines only	ACTIVE LINES
LINE SELECT	1 to maximum (depending on the video standard)	(integer #)
TRIGGER SOURCE	Left plug-in, CH 1 (11A34V)	L1
	Left plug-in, CH 2 (11A34V)	L2
	Center plug-in, CH 1 (11A34V)	C1
	Center plug-in, CH 2 (11A34V)	C2
	External Input (11T5H)	EXT1
DISPLAY CLAMP	Left plug-in, CH 1 (11A34V)	L1
	Left plug-in, CH 2 (11A34V)	L2
	Center plug-in, CH 1 (11A34V)	C1
	Center plug-in, CH 2 (11A34V)	C2
	External Input (11T5H)	EXT1
	Display Clamp Off	OFF
VIDEO POLARITY	Negative sync pulse slope	NORM
	Positive sync pulse slope	INV
LINE 1 LOCATION	Automatic	AUTO
	Previous to the sync pulse	PRE
	At the sync pulse	AT
	After (post) the sync pulse	POST
FIELDS: FRAME	One field per frame	1:1
	Two fields per frame	2:1
EXT 1	On	(N/A)
	Off	

MODE Function

The MODE function controls where the 11T5H will generate a trigger.

The following list explains how the 11T5H operates in each mode:

- FIELD 1 generates a trigger at the selected line number within Field 1 of the video frame. (See the LINE SELECT function.)
- FIELD 2 generates a trigger at the selected line number within Field 2 of the video frame.
- ALL LINES generates a trigger at all lines of the selected video signal source. (See the TRIGGER SOURCE function.)
- ACTIVE LINES generates a trigger on active video lines only. Triggers will not be generated during the vertical retrace interval of the video signal.

Note: *When setting MODE, be sure the FIELDS: FRAME setting matches the video standard's ratio for fields per frame. If FIELDS: FRAME is not set to match the video standard's ratio for fields per frame and MODE is set to Field 2, the 11T5H will improperly reset or continue the line number sequence.*

To select a Mode:

☐ Step 1: Push the MODE button to cycle through the four available modes, FIELD1, FIELD2, ALL LINES, or ACTIVE LINES until the desired mode is illuminated.

LINE SELECT Function

The LINE SELECT function allows you to select the line number that the 11T5H triggers on. This function allows observation of a picture element or vertical retrace area. The range of line numbers is from one to the maximum number the video standard allows.

To select a line:

☐ Step 1: Press the LINE SELECT/VIDEO POLARITY button until LINE SELECT is lighted.

☐ Step 2: Adjust the rotary knob until the desired line number appears in the 11T5H display.

TRIGGER SOURCE Function

This function allows you to specify the video signal trigger source channel. When installed in the *rightmost* plug-in compartment, the 11T5H will trigger on video signals originating from an 11A34V Video Amplifier plugged into the left or center plug-in compartment of your mainframe. The 11T5H will trigger on video signals from the external line input EXT 1 while in any plug-in compartment.

The following describes the possible 11T5H trigger sources:

- The C1 and C2 settings correspond to Channels 1 and 2 of the center plug-in compartment.
- The L1 and L2 settings correspond to Channels 1 and 2 of the left plug-in compartment.
- The EXT1 setting corresponds to the 11T5H external input.

Note: *When using the 11T5H in conjunction with the 11A34V, make sure the mainframe trigger source is set to R1 (the 11T5H).*

To select a trigger source:

☐ Step 1: Press the TRIGGER SOURCE/LINE 1 LOCATION button until TRIGGER SOURCE is lighted.

☐ Step 2: Adjust the rotary knob until the desired trigger source appears in the 11T5H display.

DISPLAY CLAMP Function

This function allows you to select the video signal source that the 11T5H will clamp on. The display clamp function stabilizes the video signal to the back porch level. This reduces bounce by changing average picture levels (APL) on AC coupled signals. The 11T5H will clamp or hold on video signals originating from an 11A34V Video Amplifier plugged into the left or center plug-in compartment of your mainframe, or signals input to EXT1 on the 11T5H. Display clamp can also be set to OFF. Clamp is independent of trigger source, but in order for clamp to function properly, the 11T5H must be triggered.

The following list describes the possible 11T5H display clamp sources:

- The C1 and C2 settings correspond to Channels 1 and 2 of the center plug-in compartment.
- The L1 and L2 settings correspond to Channels 1 and 2 of the left plug-in compartment.
- The EXT1 setting corresponds to the 11T5H external input.
- The OFF setting turns display clamp off.

To select a signal source or turn off the Display Clamp function:

☐ Step 1: Press the DISPLAY CLAMP/FIELDS:FRAME button until DISPLAY CLAMP is lighted.

☐ Step 2: Adjust the rotary knob until the desired signal source or OFF appears in the 11T5H display.

VIDEO POLARITY Function

This function allows you to select the sync pulse slope of the currently selected video signal (See TRIGGER SOURCE Function). Using this function, you can specify a normal (negative) or inverted (positive) sync pulse signal.

To select the Video Polarity:

☐ Step 1: Press the LINE SELECT/VIDEO POLARITY button until VIDEO POLARITY is lighted.

☐ Step 2: Adjust the rotary knob until the desired polarity normal or inverted (NORM or INV) appears in the 11T5H display.

LINE 1 LOCATION Function

This function allows you to select where the 11T5H will locate line 1 of the video signal, with respect the the sync pulse. Using this function ensures that the line count generated by the 11T5H matches the video standard used. Table 2-2 shows the line 1 location for the most common video standards.

Table 2-2 — Video Standards and Line 1 Locations

Video Standard	Line 1 Location	11T5H Display
NTSC	Prior (Previous) to the field sync	PRE
PAL	At (coincident with) the field sync	AT
HDTV 1050	After (Post) the field sync	POST
HDTV 1125	At (coincident with) the field sync	AT
HDTV 1250	After (Post) the field sync	POST

The line 1 location will not impair the ability to trigger on a video signal, but setting the proper line 1 location ensures that the 11T5H will number lines correctly. If the line 1 location is set to automatic, the 11T5H will recognize any one of the five video standards listed in Table 2-2 automatically.

To select where line 1 is located:

☐ Step 1: Press the TRIGGER SOURCE/LINE 1 LOCATION button until LINE 1 LOCATION is lighted.

☐ Step 2: Adjust the rotary knob until the proper setting (PRE, AT, POST, or AUTO) appears in the 11T5H display.

FIELDS:FRAME Function

You can control how the 11T5H will display and format its line numbers by setting the fields per frame function. This function allows you to select the fields per frame ratio for a particular TV standard. This ability is useful when viewing interlaced and non-interlaced TV signals.

The following procedure shows how to select a non-interlaced 1:1 format:

☐ Step 1: Press the DISPLAY CLAMP/FIELDS:FRAME button until FIELDS:FRAME is lighted.

☐ Step 2: Adjust the rotary knob until 1:1 appears in the 11T5H display.

This procedure shows how to select an interlaced 2:1 format:

☐ Step 1: Press the DISPLAY CLAMP/FIELDS:FRAME button until FIELDS:FRAME is lighted.

☐ Step 2: Adjust the rotary knob until 2:1 appears in the 11T5H display.

Functions Controlled by the GPIB Interface

All functions of the 11T5H can be accessed through the GPIB controller connected to the mainframe. (See your mainframe *Programmer Reference* and *User Reference*)

Note: *GPIB programming is not possible with the 11401, and 11402. For a complete list of GPIB compatible mainframes refer to System Specifications in this manual.*

Trigger Functions

Table 2-3 lists the GPIB command syntax for the 11T5H functions.

***Table 2-3** — Command Syntax*

Function	Parameter	Syntax
MODE	FIELD1	VTMODE F1
	FIELD2	VTMODE F2
	ALL LINES	VTMODE LINES
	ACTIVE LINES	VTMODE ACTIVE
LINE SELECT	One to Maximum	VTLINE <ui>
TRIGGER SOURCE	L1	VTSOURCE L1
	L2	VTSOURCE L2
	C1	VTSOURCE C1
	C2	VTSOURCE C2
	EXT 1	VTSOURCE EXT1
DISPLAY CLAMP	L1	VTCLAMP L1
	L2	VTCLAMP L2
	C1	VTCLAMP C1
	C2	VTCLAMP C2
	EXT1	VTCLAMP EXT1
	OFF	VTCLAMP OFF
VIDEO POLARITY	NORM	VTPOLARITY NORM
	INV	VTPOLARITY INV
LINE 1 LOCATION	AUTO	VTLINE1LOC AUTO
	PRE	VTLINE1LOC PRE
	AT	VTLINE1LOC AT
	POST	VTLINE1LOC POST
FIELDS:FRAME	1:1	VTFIELD 1
	2:1	VTFIELD 2

The 11T5H will not alter its display after a GPIB command has been sent. To verify a trigger function setting, use the VTDISPLAY command (See Display Functions, on the next page.)

Display Functions

The front panel buttons of the 11T5H can be controlled by the VTDISPLAY command. Table 2-4 lists the affected 11T5H front panel button when a VTDISPLAY command is given. The display window of the 11T5H will show the status of the associated button. For example, the command VTDISPLAY VTSOURCE lights Trigger Source and the trigger source is displayed in the display window.

Table 2-4 – Display Command Syntax

11T5H Front Panel	Command Syntax
MODE	VTDISPLAY VTMODE
LINE SELECT	VTDISPLAY VTLINE
TRIGGER SOURCE	VTDISPLAY VTSOURCE
DISPLAY CLAMP	VTDISPLAY VTCLAMP
VIDEO POLARITY	VTDISPLAY VTPOLARITY
LINE 1 LOCATION	VTDISPLAY VTLINE1LOC
FIELDS:FRAME	VTDISPLAY VTFIELD

Operation with the 11A34V

The 11T5H can be used in conjunction with the 11A34V High Bandwidth Video Amplifier. The 11A34V provides the 11T5H with two trigger or clamp channels. If two 11A34V plug-in amplifiers are used in conjunction with the 11T5H, one of four channels can be triggered and one of the four channels can be clamped independently.

The 11A34V provides accurate termination and enables precise vertical control of the displayed waveform.

Setup

When inserted into a Digitizing Mainframe, the 11A34V and 11T5H are internally connected within that mainframe.

Note: *When used in conjunction with the 11A34V, the 11T5H must be inserted in the rightmost plug-in compartment.*

The 11A34V can be in the left or center plug-in compartment. Two 11A34V plug-in units can be installed simultaneously.

Operation

Signal inputs can be connected to CH 1 through CH 4 on the 11A34V. The mainframe waveform description should be set accordingly. For example, if the signal input is CH 2 of the center plug-in, the waveform description should be C2 (Center 2). The front panel of the 11T5H specifies the plug-in unit and channel number of the trigger or clamp source. Only channels 1 and 2 provide trigger or clamp.

Note: *Mainframe trigger source must be specified as R1 (right plug-in, channel 1).*

Example

The following procedure is an example of using the 11A34V in conjunction with the 11T5H to measure amplitude and ringing of a 2T pulse (see Fig. 3-1) of a video waveform. Vertical and horizontal settings used in this example were selected while testing an HDTV Bar and Pulse video waveform generated from a Tektronix TSG 1250 HD Television Generator. These settings should be modified when testing different video signals.

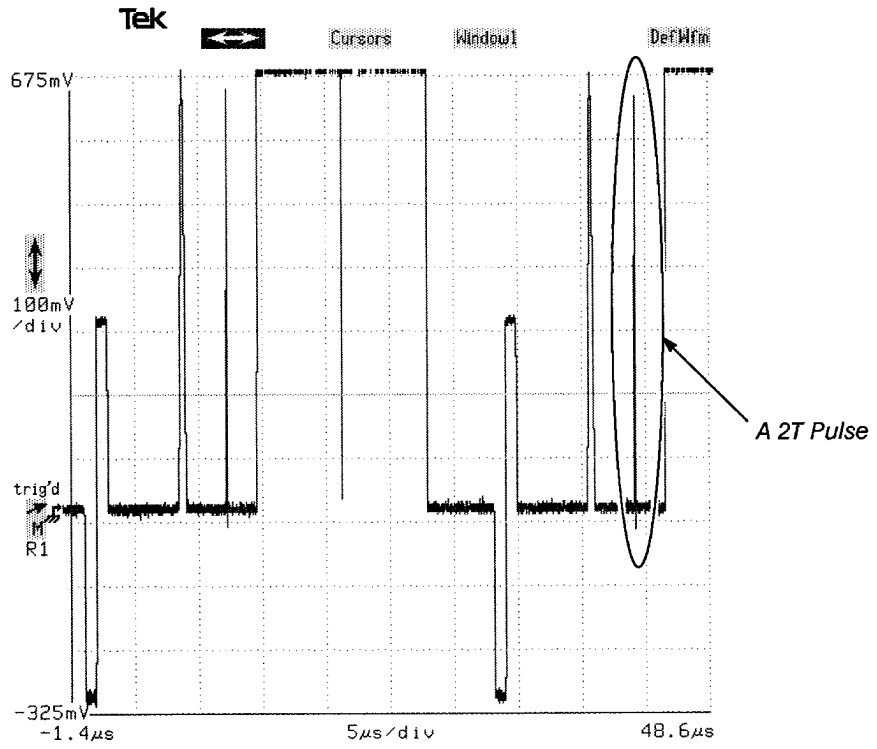

***Figure 3-1** — A 2T Pulse*

☐ Step 1: While the mainframe ON/STANDBY switch is OFF, insert the 11A34V in the leftmost plug-in compartment. Insert the 11T5H in the rightmost plug-in compartment. Switch the mainframe ON/STANDBY switch to ON.

☐ Step 2: Connect the signal source to CH 1 on the front panel of the 11A34V. Press the CH 1 button on the front panel of the 11A34V.

☐ Step 3: Press the **WAVEFORM** button on the front panel of the mainframe. Set the impedance to 75 Ω. On 11400 Series oscilloscopes: touch **Impedance**, and touch **75** Ω. On DSA 600 Series oscilloscopes: touch **Input Parameters**, and touch **75** Ω under the **Impedance** column.

☐ Step 4: Press the TRIGGER button on the mainframe front panel. Press the **Source Desc** menu selector on the mainframe touch screen. A pop-up menu appears. Press **R1**, then press **Enter Desc**.

☐ Step 5: On the mainframe touch screen, use the horizontal and vertical icons in conjunction with the knobs to set the horizontal size to 5 µs/div and the vertical size to 100 mV/div.

☐ Step 6: Using the MODE button on the 11T5H, set the mode to FIELD 1. Toggle the center SETUP button until TRIGGER SOURCE is lighted. Use the knob on the front panel of the 11T5H to select L1 as the trigger source.

☐ Step 7: On the 11T5H, toggle the leftmost SETUP button until LINE SELECT is lighted. Use the knob on the 11T5H to select a line that has a 2T pulse.

☐ Step 8: On the mainframe touch screen, touch the horizontal icon and use the knobs to expand the horizontal size to 2 µs/div.

☐ Step 9: On the mainframe touch screen, touch the Window icon to open a window. Touch the horizontal icon and use the knobs to position the window on the 2T pulse (see Fig. 3-2).

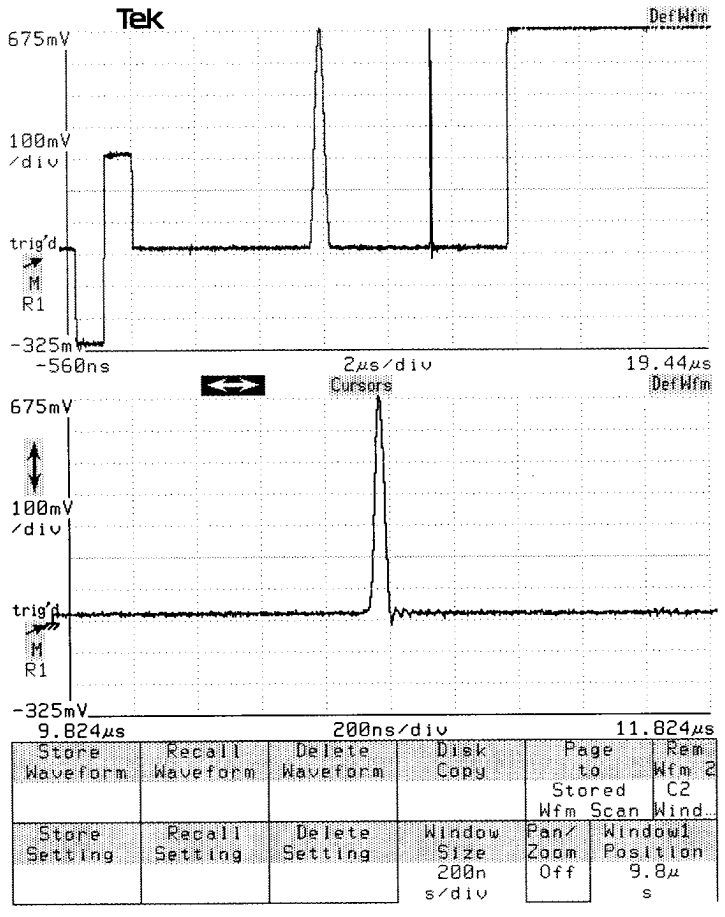

***Figure 3-2** — 2T Pulse Displayed in a Window*

☐ Step 10: To measure the 2T pulse amplitude, press the MEASURE button on the front panel of the mainframe. Touch the **Measurements** menu selector on the mainframe touch screen. Touch **Peak-Peak**. Touch **Exit Menu**.

☐ Step 11: Touch **Peak-Peak** in the major menu area of the mainframe touch screen. A pop-up menu will appear. Touch **Left Limit**. Touch **Peak-Peak** to remove the pop-up menu. Use the knobs to position the left and right limits. Position the left limit at the start of the 2T pulse. Position the right limit at the center (peak) of the 2T pulse. The number that appears below **Peak-Peak** in the menu is the amplitude of the 2T pulse.

☐ Step 12: To measure the 2T pulse ringing, touch the main (upper) waveform. Touch the vertical icon on the mainframe touch screen and use the knobs to set the vertical size to 10 mV/div. Make sure the vertical offset is 0 V.

☐ Step 13: Touch the window (lower) waveform. Touch **Peak-Peak** in the major menu area of the mainframe touch screen. A pop-up menu will appear. Touch **Left Limit**. Touch **Peak-Peak** to remove the pop-up menu. Use the knobs to position the left and right limits. Position the left limit at the start of the 2T pulse ringing. Position the right limit at the end of the 2T pulse ringing. The number that appears below **Peak-Peak** in the menu is the amplitude of the 2T pulse ringing.

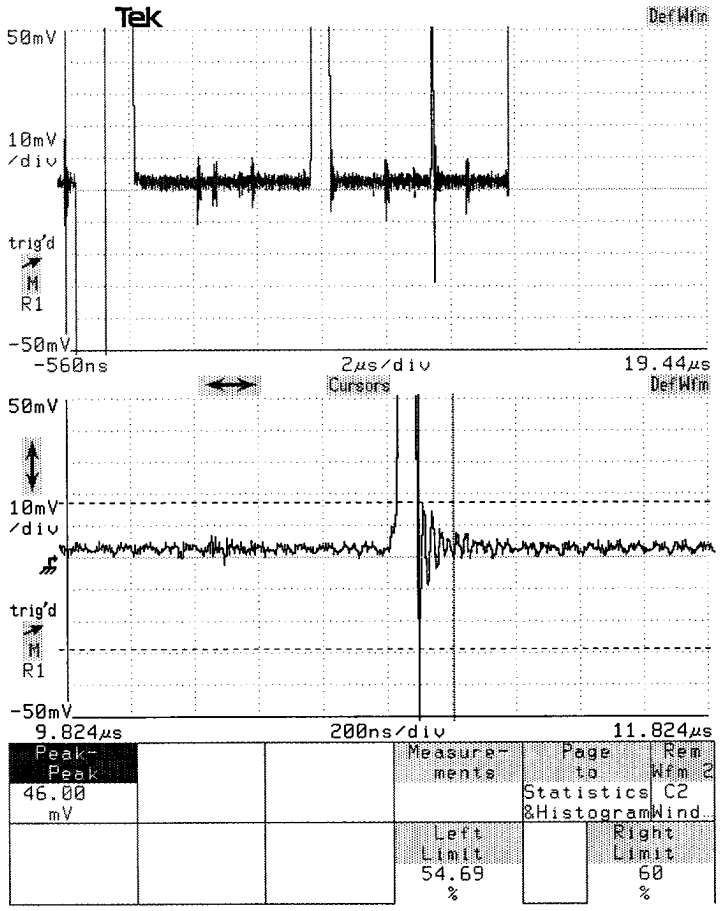

***Figure 3-3** — Measurement of the 2T Pulse Ringing*

In Case of Difficulty

If the 11A34V and 11T5H do not seem to be functioning correctly, check the following:

Are both plug-in units inserted correctly?

Make sure the plug-in units are firmly seated.

Do both plug-in units pass the mainframe power-up diagnostic tests?

The mainframe diagnostic tests will indicate a faulty plug-in that requires service.

Is the 11T5H inserted in the rightmost plug-in compartment?

The 11A34V can be used in conjunction with the 11T5H only if the 11T5H is in the rightmost plug-in compartment.

Is the trigger source set correctly on the 11T5H?

If the 11T5H is triggering from the 11A34V, the trigger source must be L1 (left plug-in, channel 1), L2, C1 or C2 (center plug-in channel 2) or EXT 1.

Is the trigger source set correctly on the mainframe?

If the 11T5H is the trigger source, the mainframe trigger source must be R1 (right plug-in, channel 1). Note that if all channels are turned off and a new channel is turned on, the mainframe trigger will automatically reset even though R1 was previously specified.

Is the signal source set correctly on the mainframe?

If the 11T5H is the trigger source, the signal source can be one or all of the vertical input channels and/or EXT 1. If no signal is displayed, make sure the channel button is illuminated.

Specifications

Performance Conditions

The specifications in Tables 4-1, 4-2, and 4-3 apply to the 11T5H Video Trigger in all digitizing mainframes. These specifications apply when the mainframe is in the Enhanced Accuracy state.

Enhanced Accuracy is initiated by pushing the Enhanced Accuracy button on the mainframe after the system has reached thermal equilibrium. Enhanced Accuracy is indicated on the display and remains in effect as long as the internal temperature of the mainframe is within ±5°C of the temperature at which the calibration was performed. When a 5°C change does occur, the system reverts to Normal accuracy. In the Normal accuracy condition, those characteristics that are temperature sensitive may not remain within the limits of these specifications. The specifications are valid at an ambient temperature of 0° to 50°C, unless otherwise stated.

Table 4-1 *– Electrical Characteristics*

Function	Characteristic	Performance Requirement
Line Select Range	1–1280 or format maximum	The lesser of 1280 or the number of lines in the field.
Mode	Field 1, Field 2, All Lines, Active Lines	Selectable.
Display Clamp	L1, L2, C1, C2, EXT1, OFF	Up to one channel can be clamped.
Line 1 Location	Auto, Post, At, Pre	Selectable.
Fields per Frame	1:1, 2:2	Selectable.
Jitter	3 ns typical	≤10 ns

Table 4-2 — Environmental Characteristics

Characteristic	Information
Ambient temperature (External to mainframe)	
Operating	0° to +50°C, mainframe ambient
Non-operating	-40° to +75°C
Humidity, Operating and Non-operating	Five days, per MIL-T-28800C. Type III, class 5 as described in 3.9.2.2 and 4.5.5.1.2.2
Altitude	
Operating	To 15,000 ft. (4,570 m.)
Non-operating	To 50,000 ft. (15,200 m.)
Vibration	
Operating, installed on Flexible Extender	MIL-T-28800C, Sec. 4.5.5.3.1, Type III, class 5
Shock, Non-operating (not installed in mainframe)	MIL-T-28800C, Sec. 4.5.5.4.1, Type III, class 5
Bench Handling (operating and Non-operating)	MIL-T-28800C, Sec. 4.5.5.4.3, Type III, class 5
Packaged Product Vibration and Shock	
Vibration and bounce of Packaged Product	Meets ASTM D999-75, Method A, Paragraph 3.1 (NSTA Project 1A-B-1)
Drop of Packaged Product	Meets ASTM D775-61, Method 1, Paragraph 5 (NSTA Project 1A-B-2)
Electromagnetic Compatibility	MIL-STD-461BFCC Part 15, Subpart J, Class A VDE 0871/6.78, Class B

Table 4-3 — Physical Characteristics

Characteristic	Information
Weight (max)	3 lb. (1.4 kg)
Weight of Packaged Product (max)	5 lb. (2.3 kg)
Dimensions (max)	See Figure 4-1

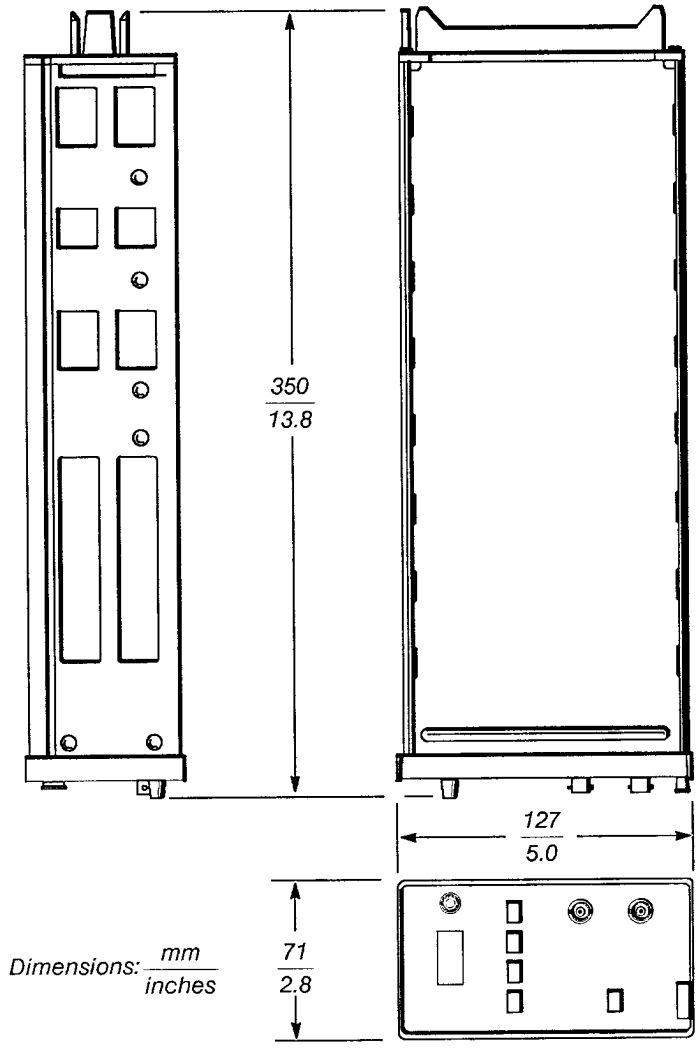

Figure 4-1 — Dimensions of the 11T5H Video Trigger

Recommended Probes

Tektronix recommends the P6101A (Opt. 01) modular 1X Passive Probe for use with the 11T5H. When using a probe, make sure nothing is connected to the OUTPUT connector.

System Specifications

The specifications in Tables 4-4 list compatible mainframes and plug-in units.

Table 4-4 *— Compatible Mainframes and Plug-in Units*

Instrument	Notes
Standalone Mainframes	
11401, 11402, 11403, 11402A, 11403A, CSA 404, DSA 600 Series.	The DSA 600 Series requires firmware version 2.0 or higher.
GPIB Programmable Mainframes	
11403, 11402A, 11403A, CSA 404, DSA 600 Series.	The 11403 and 11402A require firmware version 3.0 or higher. The DSA 600 Series requires firmware version 2.0 or higher.
Companion Plug-in Unit	
11A34V	