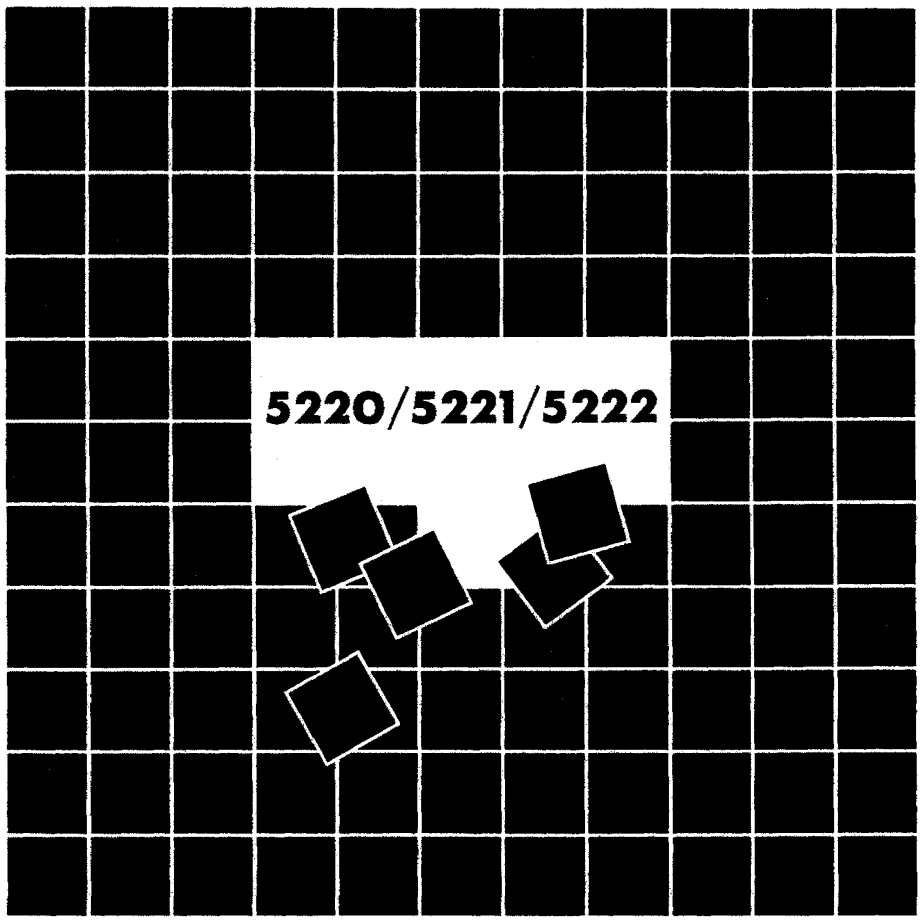
LEADER

WAVEFORM MONITOR

NTSC/PAL/SECAM

INSTRUCTION MANUAL



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LEADER ELECTRONICS CORP.

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1. SPECIFICATIONS

1.1 Description

The Models 5220/5221/5222 are precision Waveform Monitors designed to monitor video signals. The 5220 series with its bright CRT adds such extra features to conventional waveform monitors as a line selector, picture monitor mode, X-Y display mode for stereo audio signals, and menu screen for setting functions.

These instruments have eight video inputs and one external reference input channel. Up to four waveforms, component or composite signals and the external reference, can be displayed side-by-side to reduce system size. These instruments can also be remotely controlled when combined with the 5210 series Vectorscope.

MODEL	5220	5221	5222
Scanning Lines	525	625	525/625
Field Frequency	60Hz	50Hz	60/50Hz
Subcarrier Frequency	3.58MHz	4.43MHz	3.58/4.43MHz
Sync System	M	B,C,D,G,H,I,K	B,C,D,G,H,I,K,M
Color System	NTSC	PAL/SECAM	NTSC/PAL/SECAM

1.2 Features

- Precise measurements with cursor

  The cursor permits signal level measurements with 0.5% accuracy.

- Full line selector

  Since one or two lines of a video signal can be displayed, you can conveniently observe VITS, VIR, or teletext signals. This function also helps to test video camera characteristics.

- Picture display function

  These instruments can display video signals as a TV picture even without a picture monitor.

  In the line selector mode, the selected line is intensified for identification on the picture.

- Eight video inputs and one external reference input channel (5211, 5222)
  These instruments have eight video inputs and one external reference input channel. Up to four waveforms, including the external reference, can be displayed simultaneously.
  The parade (side-by-side) or overlaid display is selectable.
  The component signal can be displayed in the bowtie configuration.
  Use of bowtie has been authorized by Tektronix, Inc.

- Menu function
  For user-friendly front panel control, a menu controller is provided for various functions.

- Dual filter
  Both FLAT and LUM (low-pass filter) filtered characteristics can be displayed simultaneously.

- Preset function
  The front panel settings, including vertical and horizontal positioning, can be stored in memory, and recalled from the front panel or via the remote control connector on the rear panel. You can reduce setup time by presetting frequently used measuring conditions.

- Clamping point setting
  The clamping point can be set to any position, with the position being intensified on the waveform.

- RGB/YRGB display function

- Y/C input connectors

- Bright CRT, accelerating potential of 16.5kV

- Universal AC power supply, 90 to 250V

- White phosphor CRT (Factory option)

- X-Y mode (Factory option)

1.3 Specifications

1.3.1 CRT

Type	150mm rectangular (P31)
Accelerating Potential	16.5kV
Effective Display Area	100 (H) x 80 (V)mm
Graticule	Illuminated internal graticule

1.3.2 Input

	5221/5222 (625)	5220 (525)
Input Channel	CHA: 1,2,3,4 CHB: 1,2,3,4	CH 1,2,3
Input Impedance	≥15kΩ, 75Ω loop-through	
Maximum Input Voltage	±2V (DC+peak AC)	
Connector	BNC	
Return Loss	≥40dB, 50kHz to 6MHz (regardless of power on or off)	
Isolation between Channels	≥60dB (Fsc)	
Gain Difference between Channels	≤0.5% CH1 to CH4	
Loop-Through Isolation	≥70dB (Fsc)	

1.3.3 Measurement Signal

5220: NTSC video signal (525/60)
5221: PAL/SECAM video signal (625/50)
5222: NTSC/PAL/SECAM video signal (525/60, 625/50)

1.3.4 Vertical Axis

Deflection Factor	±1%: 1Vp-p full scale (140 IRE ref) ±2%: x5 ±0.5%: Cursor measurement
Variable Range	0.5Vp-p to 1.45Vp-p: x1 full scale 0.1Vp-p to 0.29Vp-p: x5

1.3.5 Filter Characteristics

FLAT	Within ±2% (25Hz to 6MHz) Within +2 to -5% (6MHz to 8MHz) (50kHz ref)
LUM	
Attenuation	≥35dB (Fsc)

CHROMA	Band-pass filter

	5220/5222 (525)	5221/5222 (625)
Bandwidth	Fsc±2.2MHz	Fsc±2.4MHz
Bandwidth Error	2.2MHz±200kHz	2.4MHz±200kHz

Amplitude Error	≤1% (Fsc)
DIF'D STEP	400kHz band-pass filter (for luminance linearity measurement)
Gain	x5±10% (FLAT ref)
Attenuation	≥20dB (14kHz , 2MHz) 400kHz ref
Attenuation	≥40dB (Fsc) 400kHz ref
Step Response	For 1V full scale, FLAT, 2T pulse, 2T bar
Overshoot	±2% or less
Preshoot	±1% or less
Ringing	±2% or less
Pulse/Bar Ratio	Within ±1% (0.99:1 to 1.01:1)
Vertical Tilt	Within 1%
Differential Gain	≤1%

1.3.6 DC Restorer

Frequency Response	
Slow Mode	≤20% (absolute attenuation at 60Hz input)
Fast Mode	≥80% (absolute attenuation at 60Hz input)
Clamping Point	Back porch
Variable Range	5 to 7μs or more (with respect to sync pulse leading edge)

Blanking Level Shift (with 10 to 90% APL or color burst on/off)
≤1%

1.3.7 Video Output

Frequency Response	Within ±3% (25Hz to 6MHz)
Output Impedance	75Ω
Input/Output Gain Ratio (luminance)	1:1 ±3% (75Ω term.)
Return Loss	≥30dB (50kHz to 6MHz)
Differential Gain	≤1%
Differential Phase	≤1°
Connector	BNC

1.3.8 Horizontal Axis

Operation Mode	
Overlay	Displays waveforms in overlay mode
Parade	Displays waveforms in parade mode
Overlay/Parade	Displays up to six waveforms simultaneously (three channels per system) in the A/B display mode (5221, 5222)
Sweep Mode	Automatic
1H Sweep	Displays 1H waveform
2H Sweep	Displays 2H waveform
1μs/div	Magnifies 2H display 10 times
0.2μs/div	Magnifies 1H display 25 times
1V Sweep	Displays 1V waveform
2V Sweep	Displays 2V waveform
V.MAG	Magnifies 1V or 2V display 20 times
Time Accuracy	Within ±3% (1μs/div) Within ±3% (0.2μs/div)
Sweep Length	12.5 div ±0.7div
Linearity	Within ±3%
Position Control Range	Anywhere in the screen

1.3.9 RGB/YRGB

Staircase Input	10V±15%, 9 divisions display
Maximum Input Voltage	±12V (DC+peak AC)
Time Base	RGB: 30% of standard display 1H (27 to 33%) YRGB: 22% of standard display 1H (20 to 25%)
Control Signal	TTL low active to REMOTE connector
Repetition Rate	Field or line rate of signal to be displayed
Sweep Length	3.4 to 4.1 divisions in 3-step (RGB) 2.5 to 3.1 divisions in 4-step (YRGB)

1.3.10 CAL

Amplitude	1V±0.5% With two horizontal cursors

1.3.11 EXT REF

Input Impedance	≥15kΩ, 75Ω loop-through
Return Loss	≥40dB (50kHz to 6MHz)
Maximum Input Voltage	±12V (DC+peak AC)
Connector	BNC
Deflection Accuracy	±3%, x1

1.3.12 Synchronization

Sync Amplitude

5220: CH1, 2, 3
5222: CH1A, 4A, 1B, 4B
5221/5222: CH1A, 4A, 1B, 4B

	5220/5222 (525)	5221/5222 (625)
INT	Video signal sync amplitude: 0.286Vp-p±6dB	Video signal sync amplitude: 0.3Vp-p±6dB
EXT	Video signal sync amplitude: 0.286Vp-p±6dB Composite sync amplitude: 143mV to 4V	Video signal sync amplitude: 0.3Vp-p±6dB Composite sync amplitude: 143mV to 4V

Remote Sync Sensitivity

2.0 to 5.0V square wave or 4.0V composite sync (activates at sync leading edge)

1.3.13 Line Selector

	5220/5222 (525)	5221/5222 (625)
Field 1, 3	Line 1 - 263	Line 1 - 313
Field 2, 4	Line 1 - 262	Line 314 - 625
ALL	Line 1 - 262	Line 1 - 312
Field Selection	FD 1, 3	FD 1, 3
	FD 2, 4	FD 2, 4
	ALL	ALL

1.3.14 Preset Function

Up to 10 front panel settings Recallable

Controllable Functions

All front panel controls (except REMOTE, INTEN, ROTATION, FOCUS, GAIN VAR, POWER)

1.3.15 Remote Control

Combinations

5220 → 5210 (NTSC)

5221 → 5211 (PAL/SECAM)

5222 → 5212 (NTSC/PAL/SECAM)

Controllable Functions

INPUT, REF, Y/C, RECALL, LINE SELECT

Control Signal

TTL (low active)

Control Input

Rear panel
D-sub, 15-pin (REMOTE A)
D-sub, 9-pin (REMOTE B)

1.3.16 Cursor Measurement

Configuration	Two horizontal cursors (REF, Δ) Two vertical cursors (REF, Δ)
Amplitude Measurement	Voltage between the REF and Δ cursors Unit: V, IRE, %

	5220/5222 (525)	5221/5222 (625)
Measurement Range	0 - 2000.0mV 0 - 280.0 IRE	0 - 2000.0mV 0 - 286.0%

Calibration Accuracy	0.5%, vertical
Resolution	0.5mV, 0.1 IRE, or 0.1%
Amplitude Ratio Measurement	When % is selected with the menu, the amplitude between the REF and Δ cursors with respect to 100% REF is displayed in percentage (%) When dB is selected with the menu, amplitude between the REF and Δ cursors with respect to 0dB REF set is displayed in dB
Time Measurement	Time between the REF and Δ cursors
Measurement Range	±6 div or more from center
Calibration accuracy	±3%
Resolution	1/80 div
Time Ratio Measurement	When % is selected with the menu, time between the REF and Δ cursors with respect to 100% REF is displayed in percentage (%)
Frequency Measurement	Frequency between the REF and Δ cursors

1.3.17 CRT Readout

Front Panel Controls

Line Number	TV FIELD, LINE number

	5221/5222	5220
Reference Input	CH1A, 4A, 1B, 4B, EXT	CH1, 2, 3, EXT

Cursor Measurement Value	Voltage, voltage ratio, time, time ratio, frequency
TV Format	525/60, 625/50 (5222)
Unit	100 IRE = 0.714V, 100% = 0.700V (5222)
Input Channel	A/B/A, B (5221, 5222)
Recall Mode	Address to be recalled
Remote Control	"REMOTE" is displayed

1.3.18 General Specifications

Power Requirements	90 to 250VAC, 48 to 440Hz
Fuse	1.6A time-lag fuse
Power Consumption	≤40W
Environmental Conditions	
Guaranteed Accuracy	Temperature: 10 to 35°C Humidity: 10 to 80%
Operating	Temperature: 0 to 40°C Humidity: 10 to 90%
Size and Weight	215 (W) x132 (H) x423 (D)mm, 4.2kg

1.3.19 Accessories

Supplied Accessories	Illumination lamp	5
	Fuse	1
	Screw, rack mounting (inch size)	2
	15-pin D-sub connector	1
	Metal case, 15-pin D-sub connector	1
	Instruction manual	1
	Power cord	1
	Cover, inlet stopper	1
	Screw lock	2
	E-ring	1

Optional Accessories

Cabinet
LR-2427, Cabinet with handle
LR-2404, Cabinet without handle
LR-2400 V-I, Rack-Mount Adapter, inch size
LR-2400 V-M, Rack-Mount Adapter, metric size

2. OPERATING PRECAUTIONS

2.1 Line Voltage

Connect the instrument to a power line voltage of 90V to 250V. Note that using a voltage outside this range can cause trouble.
The line frequency range is 48Hz to 440Hz.

2.2 Input Voltage

Do not apply ±12Vp-p or higher voltage to the input connector.
Excessive input voltage can cause trouble.

2.3 Excessive Magnetic Fields

Waveform distortion or tilt may occur when the instrument is operated in proximity to such strong magnetic field as a speaker system. Use the magnetic shield in such case.

2.4 High Temperature and Humidity

Avoid to use this instrument in the high temperature and high humidity environments. When rack mounting the instrument, install a fan to keep temperature 40°C or low.

2.5 CRT

To prevent damage to the CRT or reduce accuracy, be careful not to expose the instrument to other forms of severe mechanical shock.

2.6 Battery Backup

When the instrument is first powered on after purchase or left for longer than one month without supplying power, the stored data may be lost with the instrument assuming the default settings. Therefore, leave the instrument powered on at least eight hours to charge the backup battery. The factory setting data is retained because it is stored in the EEPROM.

2.7 Cabinet

Install the instrument in the optional cabinet for safety purpose. Refer to Section 1.3.19, "Accessories" for detail.

3. PANEL DESCRIPTION

3.1 Front Panel

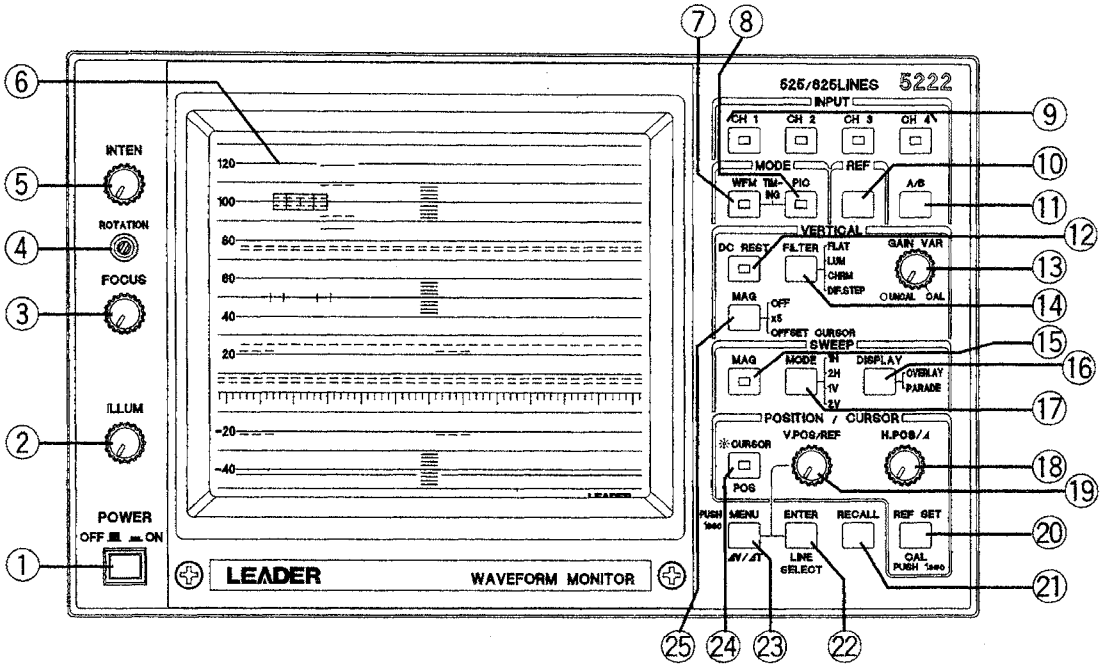


Figure 3-1-1 Front Panel (5221, 5222)

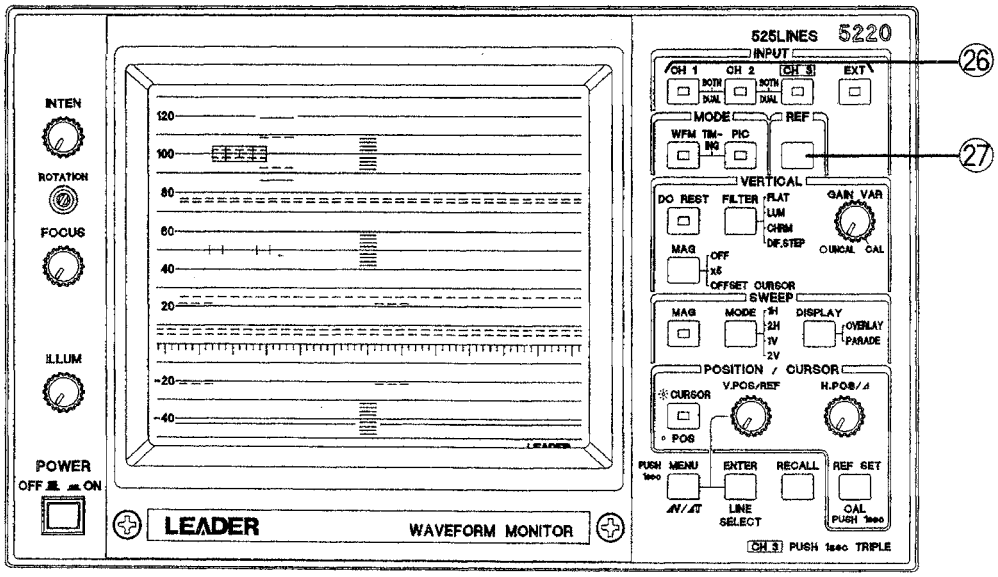


Figure 3-1-2 Front Panel (5220)

① POWER switch
Press to turn on power.
Press again to release button to turn off power.

② ILLUM knob
Controls brightness of the scale illuminator.

③ FOCUS knob
Adjusts trace sharpness.

④ ROTATION adjustment
Compensates for slight tilting of the trace due to terrestrial magnetism.

⑤ INTEN knob
Controls brightness of the displayed waveform.

⑥ Waveform graticule
Common to both 525/60 (5220, 5222) and 625/50 (5221, 5222) formats.
Refer to Section 4.1, "Graticule" for detail.

⑦ WFM key
Selects waveform monitor mode. The LED lights.
For the timing display mode, press this key and PIC key ⑧ simultaneously.
When the remote control mode is selected with the menu, this key is used to turn on/off the remote control mode.
Refer to Section 4.11 for detail.

⑧ PIC key
Selects picture monitor mode and LED lights.
For the timing display mode, press this key and WFM key ⑦ simultaneously.

⑨ INPUT keys (5221, 5222)
Selects input channel: CH1, CH2, CH3, or CH4.
The CH1 to CH4 keys can be turned on/off independently.
Lit LED indicates selected channel.
All channels cannot be turned off.

⑩ REF key (5221, 5222)
Selects sync signal source.
The CH1A, CH4A, CH1B, CH4B, or EXT can be selected sequentially by pressing this key.
The selected channel is displayed at the upper-right corner of the screen.

⑪ A/B key (5221, 5222)

- A: Displays INPUT A signal.
- B: Displays INPUT B signal.
- A/B: Displays INPUT A and B signals in overlay mode.

A, B, or A/B display can be selected sequentially by pressing this key.
The selected channel name is displayed at the lower-right corner of the screen.
The A/B mode can display up to six waveforms (three channels per system).
When four channels using the A or B INPUT are displayed, two-channel display cannot be obtained even the A/B key ⑪ is pressed.

⑫ DC REST key

Fixes the pedestal level when waveform is moves by changing Average Picture Level (APL) or turning the burst on/off. The mains hum component affection can also be removed.
The LED lights when the DC REST is on.

⑬ GAIN VAR knob

Input sensitivity control.
The sensitivity is calibrated at the CAL position.
In the UNCAL position, the sensitivity can be varied from 0.14 to 1.5 times continuously.
Red LED lights when this control is at UNCAL position.

⑭ FILTER key

Selects frequency response

FLAT:	Flat response
LUM:	Low-pass filter
CHRM:	Band-pass filter. The center frequency is chroma subcarrier frequency, 3.58MHz or 4.43MHz.
DIF'D STEP:	Band-pass filter to measure luminance component linearity. The center frequency is 400kHz.
FLAT+LUM:	The signals passed through the FLAT and LUM are displayed simultaneously.

⑮ MAG key

Magnifies horizontal sweep.
The sweep rate is as follows according to the MODE key ⑰ setting.
1H mode: 0.2μs/div (25 times of 1H)
2H mode: 1μs/div (10 times of 2H)
1V mode: 20 times of 1V
2V mode: 20 times of 2V
The LED lights when the MAG is on.

⑯ DISPLAY key

Selects display mode to display two or more signals simultaneously.

OVERLAY: Displays signals in overlay mode.

PARADE: Displays signals in parade mode.

⑰ MODE key

Selects sweep rate.

1H: Displays 1-line waveform

2H: Displays 2-line waveform

1V: Displays 1-field waveform

2V: Displays 2-field waveform

1V+1H: Displays 1-field waveform at the left half of the trace, and 1-line waveform at the right half.

When the DISPLAY key ⑯ is set to the PARADE mode, this key is used to select 1H or 1V display.

⑱ H.POS/Δ knob

When the POS is selected with the CURSOR/POS key ㉔, this control is used to move the waveform horizontally.

When the CURSOR is selected with the CURSOR/POS key ㉔, this control is used to move the Δ cursor.

⑲ V.POS/REF knob

When the POS is selected with the CURSOR/POS key ㉔, this control is used to move the waveform vertically.

When the CURSOR is selected with the CURSOR/POS key ㉔, this control is used to move the Δ cursor.

⑳ REF SET/CAL (PUSH 1 sec) key

Sets the reference value for the voltage or time ratio measurement.

When the unit is set to [%], [°], or [dB] with the menu screen, arbitrary cursor position is used as reference.

To display CAL signal, press this key one second or longer. The CAL signal can be moved vertically by rotating the H.POS/Δ knob ⑱.

To go off the CAL signal, press this key one second or longer.

㉑ RECALL key

Recalls stored control settings.

The preset numbers are displayed sequentially by pressing this key.

The begin and end addresses can be set with the menu.

㉒ ENTER/LINE SELECT key

The ENTER is used to enter the selected menu. This key is only effective during menu screen display.

The LINE SELECT is used to set the line selector mode.

By pressing this key, the V.POS/REF knob ⑲ functions as the line number selector.

㉓ MENU (PUSH 1 sec) ΔV/ΔT key

To display the menu screen, press this key one second or longer.

To display the voltage or time cursor, press the this key less than one second.

By pressing this key, ΔV, ΔT, or OFF can be selected sequentially.

㉔ CURSOR/POS key

Selects the function of H.POS/Δ knob ⑱ and V.POS/REF knob ⑲.

CURSOR: LED on. The H.POS/Δ and V.POS/REF knobs are used to move the cursor.

POS: LED off. The H.POS/Δ knob ⑱ and V.POS/REF knob ⑲ are used to move the waveform.

㉕ MAG key

Selects input sensitivity.

OFF: x1

x5: x5

OFFSET CURSOR: Sets voltage cursor (ΔV) and input sensitivity five times.

㉖ INPUT keys (5220)

Selects input channel: CH1, CH2, CH3, or EXT.

Lit LED indicates selected channel.

CH1, CH2, or CH3 can be turned on/off independently.

The EXT key is used to turn on/off the external reference. The EXT cannot be displayed independently

For the one-channel display, press the key to be displayed.

For the two-channel display, press two keys to be displayed.

For the three-channel display, press the CH3 key one second or longer.

㉗ REF key (5220)

Selects sync signal source.

The INT and EXT is selected by pressing this key.

The selected channel is displayed at the upper-right corner.

Refer to Section 4.3.3 for detail.

3.2 Rear Panel

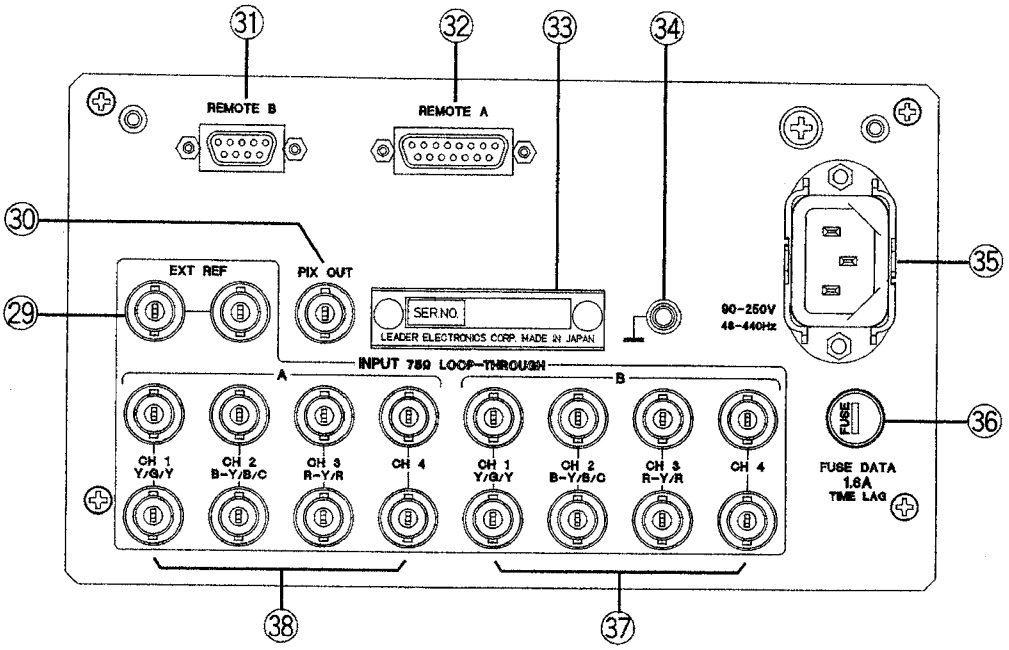


Figure 3-2-1 Rear Panel (5221, 5222)

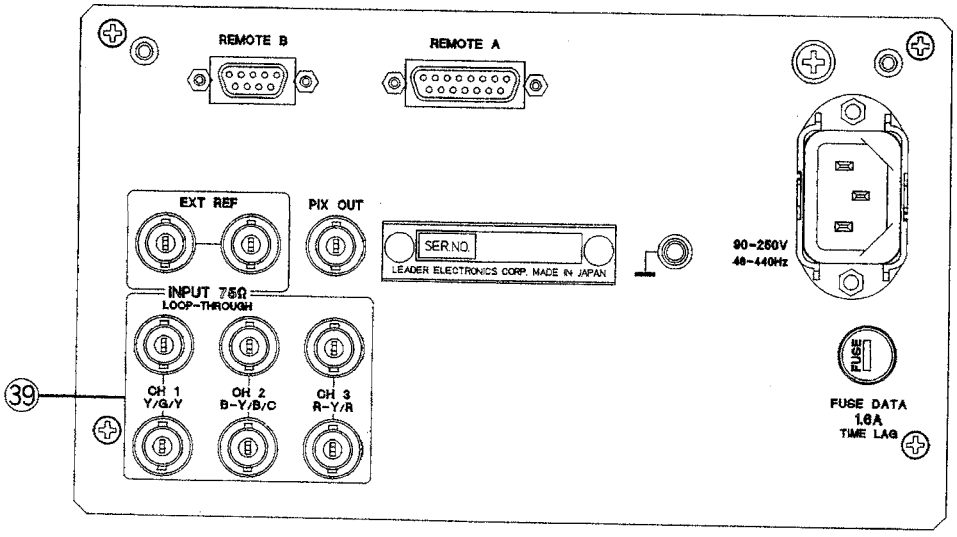


Figure 3-2-2 Rear Panel (5220)

㉙ EXT REF connector
Loop-through input connectors for external reference signal.

㉚ PIX OUT connector
Outputs the signal applied to the CH1, CH2, CH3, or CH4 input.
In the line selector mode, the selected line is displayed on the picture monitor in white.

㉛ REMOTE B connector
Remote control connector to control the vectorscope.
Refer to Section 4.11 for detail.

㉜ REMOTE A connector
Input connector for external remote control.
Use this connector for parade display and preset control.
Refer to Section 4.12 for detail.

㉝ Serial number plate

㉞ Ground terminal

㉟ AC Inlet
Voltage range is 90 to 250V, universal.

㊱ Fuse
Power supply fuse. Use specified fuse when replace it.

㊲ INPUT B connectors (5221, 5222)

㊳ INPUT A connectors (5221, 5222)
Loop-through input connectors for CH1, CH2, CH3, and CH4.
Table below shows the cable connection to input the analog component signal other than composite signal.
Refer to Sections 4.7 and 4.8 for detail.

Table 3-1

	COLOR DIFFERENCE SIGNAL	RGB SIGNAL	Y/C SIGNAL
CH1	Y	G	Y
CH2	B-Y	B	C
CH3	R-Y	R	-
CH4	Composite signal	Composite signal	-

㊴ INPUT connectors (5220)
Loop-through input connectors for CH1, CH2, and CH3.

4. OPERATING PROCEDURE

4.1 Graticule

The graticule shown in Figure below is common to both 525-line and 625-line systems.

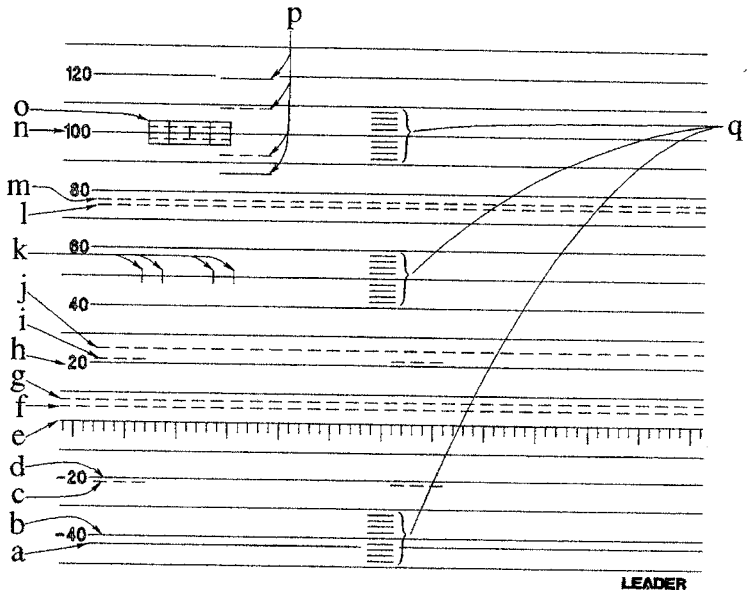


Figure 4-1

a. -43 IRE scale (5221, 5222)
Indicates sync signal level (0.3V) of the 625-line PAL and SECAM systems.
The "0.3" is displayed at the lower-right corner of the screen.

b. -40 IRE scale (5220, 5222)
Indicates sync signal level of the 525-line NTSC systems.

c. Indicates burst signal level of the 625-line PAL (0.15V) system.

d. -20 IRE scale
Indicates burst signal level of the 525-line NTSC systems.

e. 0 IRE scale
Marked with 12 major divisions and 5 subdivisions.

f. 5 IRE scale for camera setup.

g. 7.5 IRE scale for setup

h. 20 IRE scale
Indicates burst signal level of the 525-line NTSC systems.

i. Indicates burst signal level of the 625-line PAL (0.15V) system.

j. 25 IRE scale
For camera setup (5 IRE) adjustment.
When x5 is selected by pressing the MAG key ㉕, the 5 IRE equals 25 IRE on the screen.

k. K factor measurement scale.
To position the leading and trailing edges of the bar signal.

l. 75 IRE scale.
Indicates 75% white level in the 75/0/0/0 color bars.

m. 77 IRE scale.
Indicates 75% white level in the 75/0/7.5/0 color bars.

n. 100 IRE scale.

o. K factor measurement scale.

p. Kpb factor measurement scale.

q. 2-IRE step scale.

4.2 Basic Operation of the Menu Screen

4.2.1 Menu Structure

The items marked with asterisk in the menu are set once the default setting is made.

MENU	DESCRIPTION
MAIN MENU	Press MENU key for hierarchical 2
SYSTEM	
FRAME RATE	Frame frequency
* AUTO	Automatic selection
525/60	525/59.94
625/50	625/50
FORMAT	
Y,B-Y,R-Y	B-Y, R-Y vertical positioning
* RGB	Matches RGB pedestal levels
Y/C	Displays Y/C as a composite signal
RETURN TO MAIN MENU	
LINE SELECTOR	
FIELD SELECT	Field selection
* ALL	Displays both fields
FD 1, 3	Displays odd fields
FD 2, 4	Displays even fields
LINE WINDOW	Setting number of lines
LENGTH [1]	Number of lines
RETURN TO MAIN MENU	
DISPLAY	
READOUT	Readout on/off
* ON	On
OFF	Erases current display 5 sec after the last control operation
READOUT INTEN	Readout intensity
VAR	Variable
RETURN TO MAIN MENU	
CURSOR	
AMPLITUDE (ΔV)	Amplitude measurement
* [IRE]<PAL: [%]>	Amplitude in IRE
[V]	Amplitude in volts
[%] - 100% ref set	Amp. ratio between REF and Δ in %
[dB] - 0dB ref set	Amp. ratio between REF and Δ in dB
TIME (ΔT, ΔF)	Time measurement
* [s]	Displays in second
[Hz]	Displays in Hz
[%] -100% ref set	Time ratio between REF and Δ in %
RETURN TO MAIN MENU	
CALIBRATION	
V.GAIN	Vertical gain adjustment
VAR	
SWEEP TIME	Sweep time adjustment
VAR	
CH2, 3 V.POS	CH2, 3 position adjustment
VAR	
RETURN TO MAIN MENU	

(continued on next page)

DC RESTORER	
RESPONSE	Response of DC restorer
* SLOW	Slow responding
FAST	Fast responding
SAMPLE POINT	Sampling position of DC restorer
VAR	Variable
RETURN TO MAIN MENU	
INPUT	
COUPLING	Input coupling
* AC	AC coupling
DC	DC coupling
EXT REF	External sync
* BLACK BURST	Selects black burst input
COMPOSITE	Selects composite sync input
EXT REF	Displays EXT (5221, 5222)
* OFF	Displays input signal selected by INPUT key
ON	Displays input signals selected by INPUT key and EXT REF
RETURN TO MAIN MENU	
PRESET	
1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Presetting
BEGIN ADDRESS [1]	Begin address setting
END ADDRESS [10]	End address setting
RETURN TO MAIN MENU	
REMOTE	
REMOTE	Remote control on/off (with 5210 series)
* OFF	
ON	
REMOTE 1	To set input combinations between 5210/5211/5212 and 5220/5221/5222
CH1 - CH1A	
CH2 - CH2A	
CH3 - CH3A	
REMOTE 2	To set input combinations between 5210/5211/5212 and 5220/5221/5222
CH1 - CH4A	
CH2 - CH4B	
RETURN TO MAIN MENU	
STAIRCASE SELECT	Staircase Setting
* RGB	2-step for 3-waveform display
YRGB	3-step for 4-waveform display
RETURN TO MAIN MENU	
END	End, for measurement screen

Figure 4-2

4.2.2 Main Menu Display

Procedure

1. Press the MENU key ㉓.
2. The MAIN MENU is displayed.

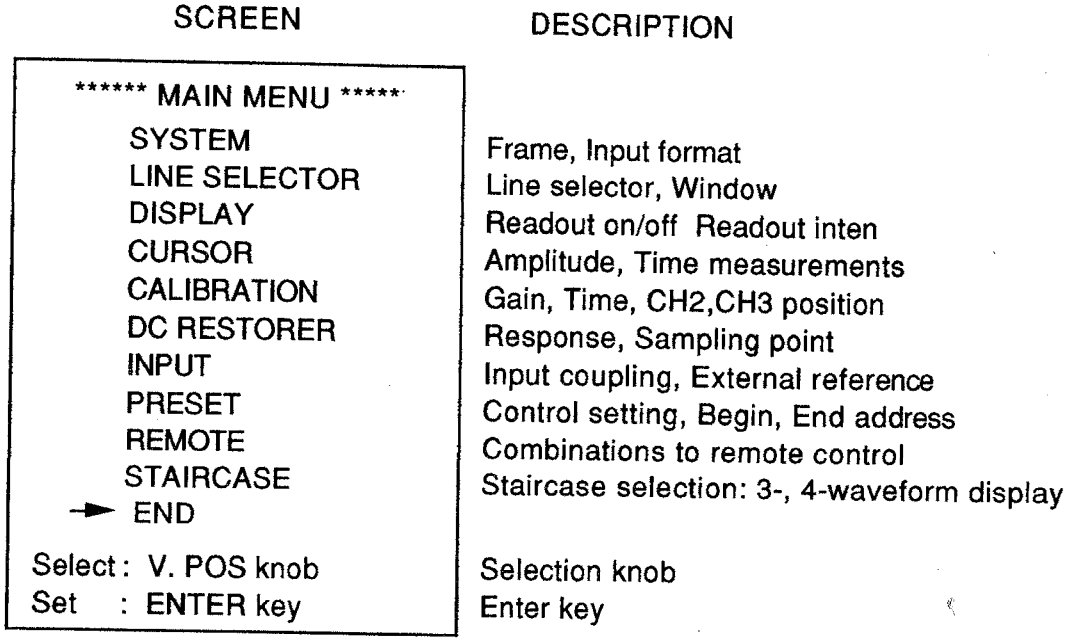


Figure 4-3

3. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
4. Press the ENTER key ㉒.
5. The selected menu screen is displayed.
6. To quit the menu screen for measurement screen, position the cursor to END and press the ENTER key ㉒.

4.2.3 Frame Rate Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.

SCREEN	DESCRIPTION
*** SYSTEM ***	
FRAME RATE	Frame frequency
* AUTO	Automatic selection
525/60	525/59.94
625/50	625/50
FORMAT	
* Y, B-Y, R-Y	
RGB	
Y/C	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-4

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.4 Video Signal Format Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.

SCREEN	DESCRIPTION
*** SYSTEM ***	
FRAME RATE	
* AUTO	
525/60	
625/50	
FORMAT	
* Y, B-Y, R-Y	Moves B-Y, R-Y to 50 IRE
RGB	Matches G B R pedestal levels
Y/C	Adds Y and C for composite signal
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-5

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.5 Line Selector Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the LINE SELECTOR screen.

SCREEN	DESCRIPTION
*** LINE SELECTOR ***	
FIELD SELECT	Field selection
* ALL	Both fields display
FD 1, 3	Odd field display
FD 2, 4	Even field display
LINE WINDOW	
LENGTH [1] H	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-6

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.6 Line Window Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the LINE SELECTOR screen.

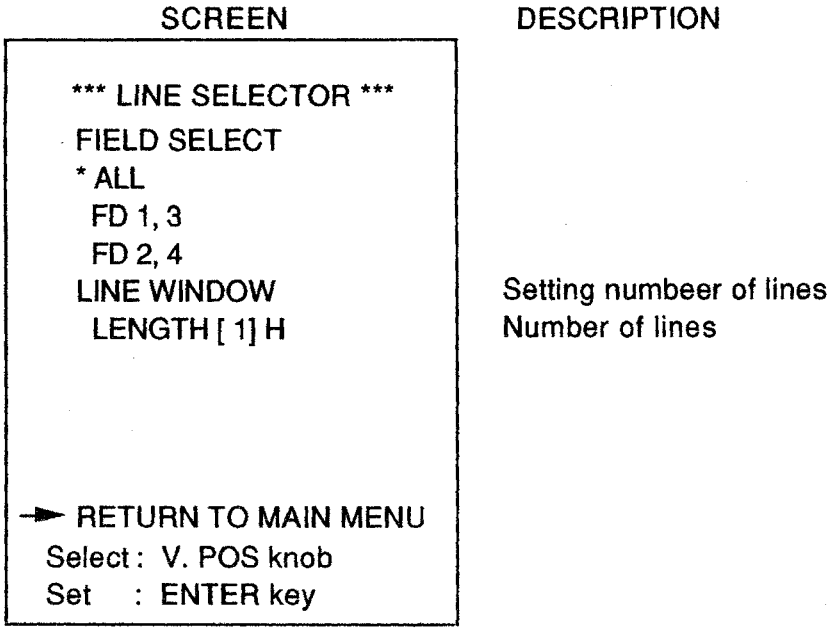


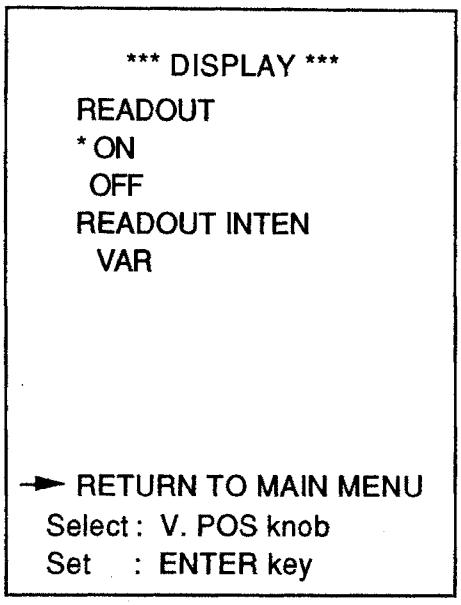
Figure 4-7

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒. The selected item is marked with an asterisk.
4. Select the number of line to be displayed by rotating the V.POS/REF knob ⑲.
5. Press the ENTER key ㉒.
6. The selected item is entered.
   The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ㉒.
8. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
9. Press the ENTER key ㉒.
   The measurement screen is displayed.

4.2.7 Readout Display Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the DISPLAY screen.



#1: Erases the current display five seconds after the last control operation.

Figure 4-8

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.8 Readout Intensity Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the DISPLAY screen.

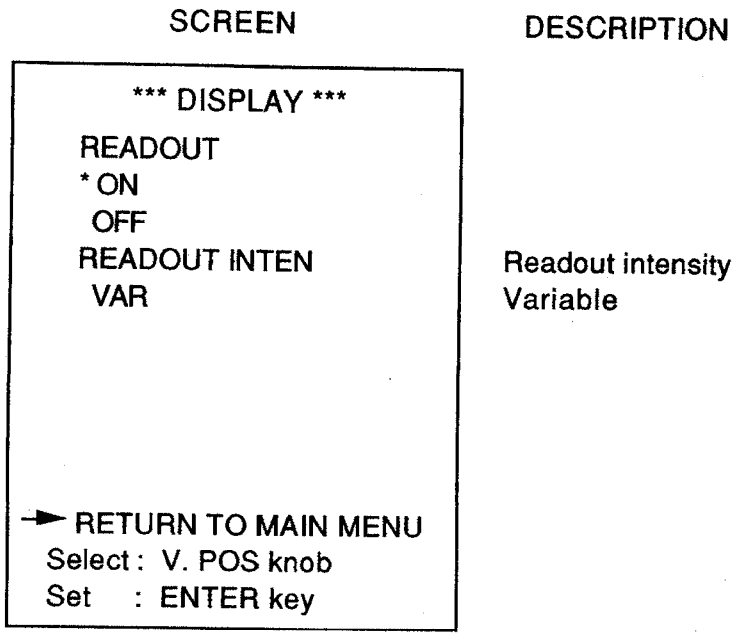


Figure 4-9

2. Move the cursor to the desired item in the READOUT INTEN VAR by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. Set the readout intensity as required by rotating the V.POS/REF knob ⑲.
5. Press the ENTER key ㉒.
6. The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ㉒.
8. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
9. Press the ENTER key ㉒.
   The measurement screen is displayed.

4.2.9 Cursor Setting for Amplitude Measurement

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CURSOR screen.

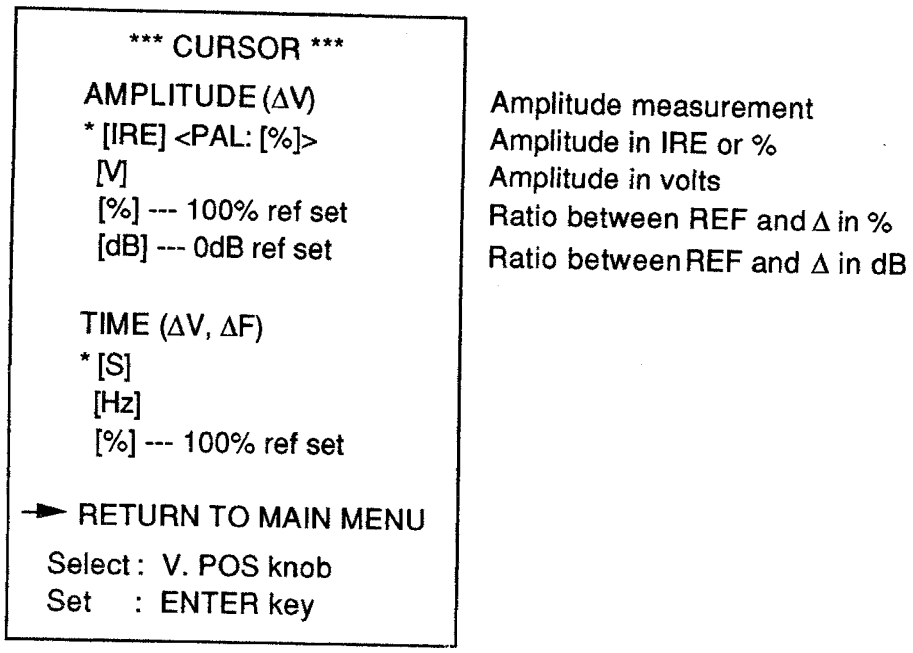


Figure 4-10

2. Move the cursor to the desired item in the AMPLITUDE by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.10 Cursor Setting for Time Measurement

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CURSOR screen.

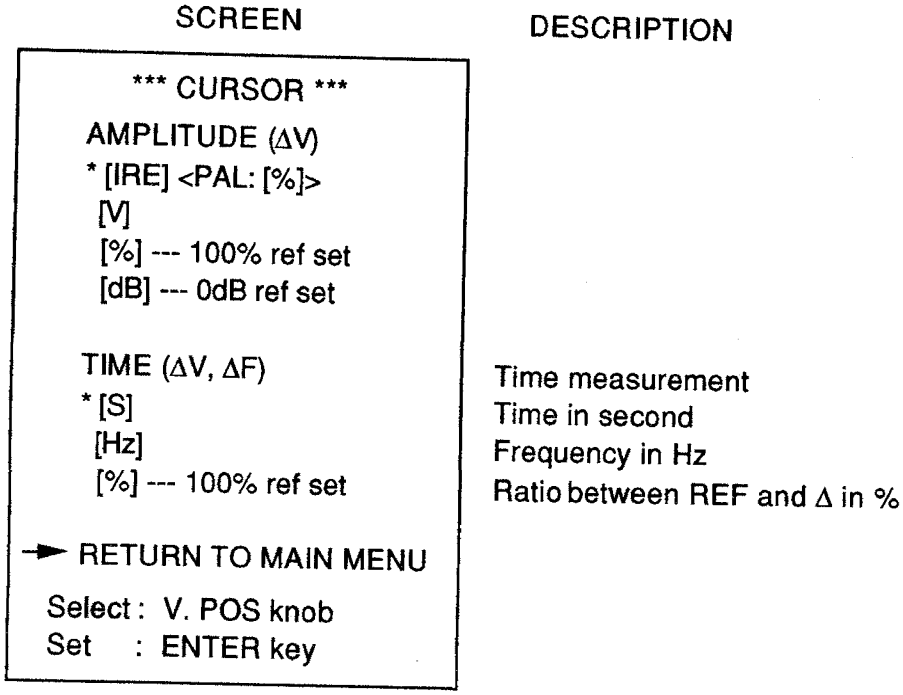


Figure 4-11

2. Move the cursor to the desired item in the TIME by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.11 Vertical Gain Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CALIBRATION screen.

SCREEN	DESCRIPTION
*** CALIBRATION *** V.GAIN VAR SWEEP TIME VAR CH2, 3 V.POS (Y, B-Y, R-Y) VAR → RETURN TO MAIN MENU Select : V. POS knob Set : ENTER key	Vertical gain adjustment

Figure 4-12

2. Move the cursor to the V.GAIN VAR by rotating the V.POS/REF knob ⑲.
3. Apply 1Vp-p video signal to the INPUT connector.
4. Press the ENTER key ㉒.
5. Adjust the video signal amplitude on the graticule as follows by rotating the V.POS/REF knob ⑲.
   NTSC: 140 IRE
   PAL: 143 IRE
6. Press the ENTER key ㉒.
7. The vertical gain is set.
   The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ㉒.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ㉒.
    The measurement screen is displayed.

4.2.12 Sweep Time Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CALIBRATION screen.

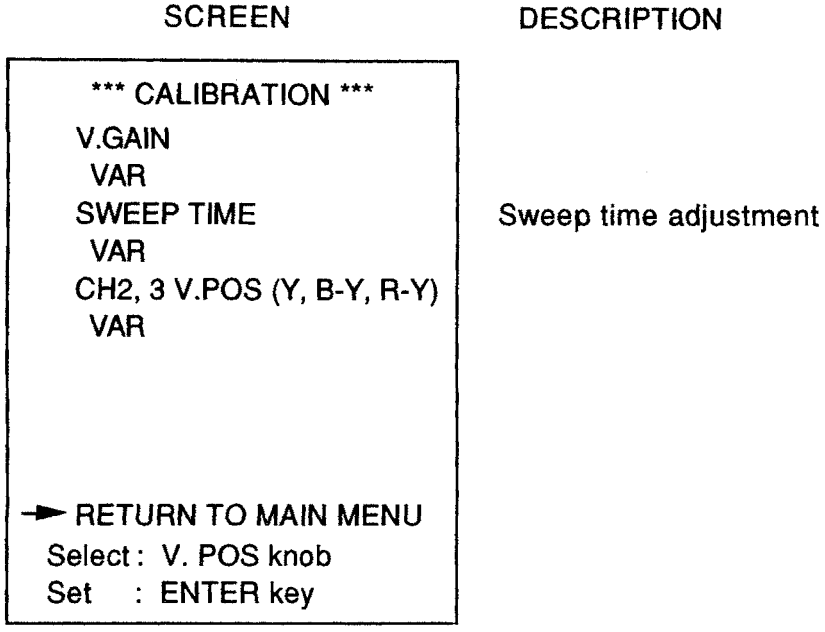


Figure 4-13

2. Move the cursor to the SWEEP TIME VAR by rotating the V.POS/REF knob ⑲.
3. Apply 1Vp-p video signal to the INPUT connector.
   Position the cursors to obtain the following readout time.
   NTSC: 63.5μs
   PAL: 64μs
4. Press the ENTER key ㉒.
5. Adjust the 1H of video signal to the cursored span by rotating the V.POS/REF knob ⑲.
6. Press the ENTER key ㉒.
7. The sweep time is set.
   The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ㉒.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ㉒.
    The measurement screen is displayed.

4.2.13 Vertical Positioning of CH2 and CH3

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CALIBRATION screen.

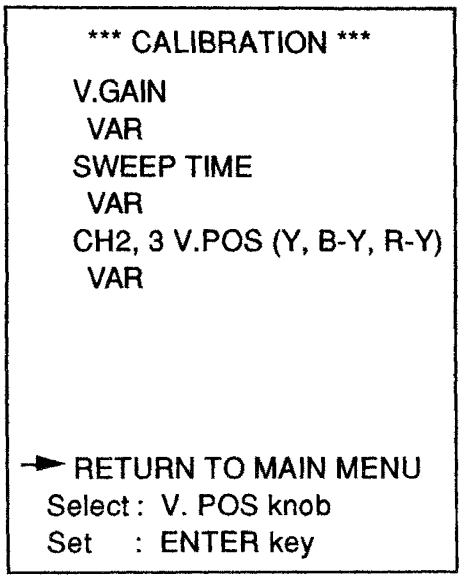


Figure 4-14

2. Move the cursor to the CH2,3 V.POS VAR by rotating the V.POS/REF knob ⑲.
3. Apply 1Vp-p video signal to the INPUT connector. Set the DISPLAY key to PARADE.
4. Press the ENTER key ㉒.
5. Set the CH2 and CH3 waveforms to the desired position by rotating the V.POS/REF knob ⑲.
6. Press the ENTER key ㉒.
7. The vertical position is set. The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ㉒.
9. Display returns to the MAIN MENU screen. The cursor is positioned at END.
10. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.14 DC Restorer Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the DC RESTORER screen.

SCREEN	DESCRIPTION
*** DC RESTORER ***	
RESPONSE	DC restorer response
* SLOW	Slow
FAST	Fast
SAMPLE POINT	
VAR	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-15

2. Move the cursor to the desired item in the RESPONSE by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.15 DC Restorer Sampling Point Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the DC RESTORER screen.
   Select the display for 1H or 2H.

SCREEN	DESCRIPTION
*** DC RESTORER ***	
SPEED	
* SLOW	
FAST	
SAMPLE POINT	DC restorer sampling point
VAR	Variable
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-16

2. Move the cursor to the SAMPLE POINT VAR by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
   The sampling point is intensified.
   Set the DC REST key ⑫ to on.
4. Move the cursor to the desired point by rotating the V.POS/REF knob ⑲.
5. Press the ENTER key ㉒.
6. The selected item is entered.
   The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ㉒.
8. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
9. Press the ENTER key ㉒.
   The measurement screen is displayed.

4.2.16 Input Coupling Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the INPUT screen.

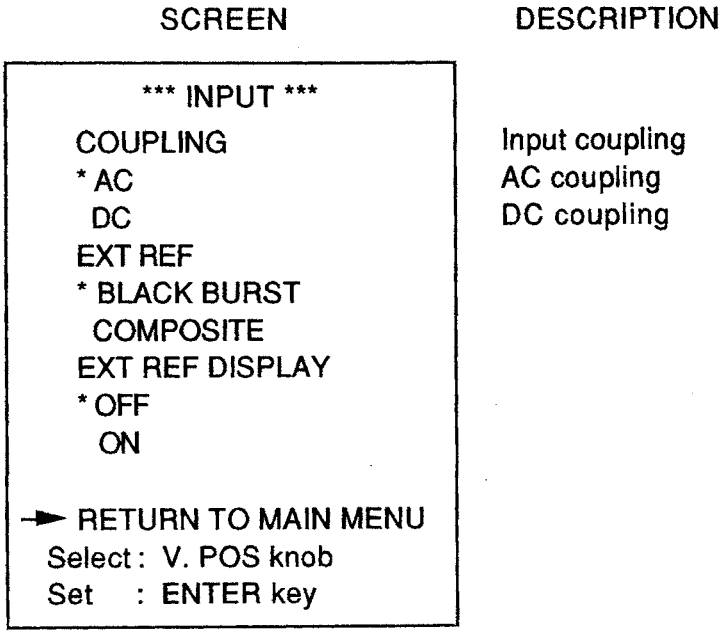


Figure 4-17

2. Move the cursor to the desired item in the COUPLING by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.17 EXT REF Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the INPUT screen.

SCREEN	DESCRIPTION
*** INPUT ***	
COUPLING	
* AC	
DC	
EXT REF	External sync selection
* BLACK BURST	Black burst
COMPOSITE	Composite sync
EXT REF DISPLAY	
* OFF	
ON	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-18

2. Move the cursor to the desired item in the EXT REF by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.18 EXT REF Display

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the INPUT screen.

SCREEN	DESCRIPTION
*** INPUT ***	
COUPLING	
* AC	
DC	
EXT REF	
* BLACK BURST	
COMPOSITE	
EXT REF DISPLAY	External reference display (#1)
* OFF	Input signal selected by INPUT key
ON	Input signals selected by INPUT key and EXT REF
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: (5221, 5222)

Figure 4-19

2. Move the cursor to the desired item by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.19 Preset Address Setting

Procedure

1. Set the front panel controls as required.
   The function of the keys and knobs ⑦ through ㉕ (except ⑬) can be preset.
2. Press the MENU key ㉓ to display the MAIN MENU screen, then select the PRESET screen.

SCREEN	DESCRIPTION
*** PRESET ***	Preset
1 6	Address 1, 6
2 7	Address 2, 7
3 8	Address 3, 8
4 9	Address 4, 9
5 10	Address 5, 10
BEGIN ADDRESS [1]	
END ADDRESS [10]	
►RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-20

3. Move the cursor to the desired address by rotating the V.POS/REF knob ⑲.
4. Press the ENTER key ㉒.
   The cursor stops blinking.
5. The control setting data is stored in the selected address.
   The cursor moves to RETURN TO MAIN MENU.
6. Press the ENTER key ㉒.
7. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
8. Press the ENTER key ㉒.
   The measurement screen is displayed.

4.2.20 Begin and End Address Setting

Procedure

1. This function is used to set the address range to be recalled.
2. Press the MENU key ㉓ to display the MAIN MENU screen, then select the PRESET screen.

SCREEN	DESCRIPTION
*** PRESET ***	
1 6	
2 7	
3 8	
4 9	
5 10	
BEGIN ADDRESS [1]	Begin address to be recalled
END ADDRESS [10]	End address to be recalled
►RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-21

3. Move the cursor to BEGIN ADDRESS or END ADDRESS by rotating the V.POS/REF knob ⑲.
4. Press the ENTER key ㉒.
   The cursor stops blinking.
5. Move the cursor to the desired address by rotating the V.POS/REF knob ⑲.
6. Press the ENTER key ㉒.
   The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ㉒.
8. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
9. Press the ENTER key ㉒.
   The measurement screen is displayed.

4.2.21 Remote Control Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the REMOTE screen.

SCREEN	DESCRIPTION
*** REMOTE ***	5210 series remote control
REMOTE	Remote control on/off
* ON	
OFF	
* REMOTE 1	REMOTE 1
CH1 - CH1A	Input combinations between
CH2 - CH2A	5210/5211/5212 and 5220/5221/5222
CH3 - CH3A	
REMOTE 2	REMOTE 2
CH1 - CH4A	Input combinations between
CH2 - CH4B	5211/5212 and 5221/5222
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-22

2. Move the cursor to the desired item in the REMOTE by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.
8. For the vectorscope remote control mode, press the WFM key ⑦ one second or longer. The "REMOTE" is displayed at the upper-right corner.

4.2.22 Staircase Setting

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the STAIRCASE screen.

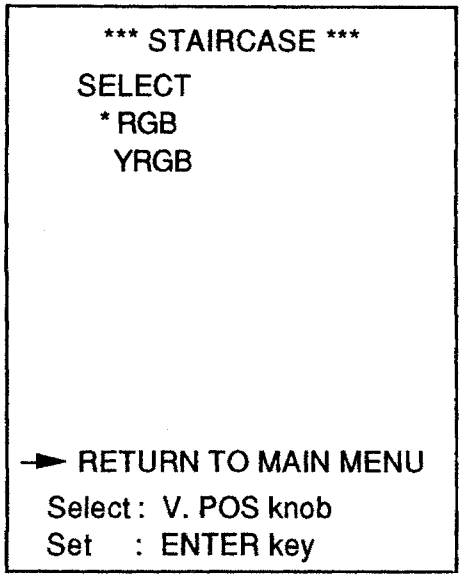


Figure 4-23

2. Move the cursor to the desired item in the STAIRCASE by rotating the V.POS/REF knob ⑲.
3. Press the ENTER key ㉒.
4. The selected item is entered and marked with an asterisk. The cursor moves to RETURN TO MAIN MENU.
5. Press the ENTER key ㉒.
6. Display returns to the MAIN MENU screen. The cursor is positioned at END.
7. Press the ENTER key ㉒. The measurement screen is displayed.

4.2.23 Recall Mode Setting

Procedure

1. This function is used to recall the stored control settings.
   Prior to recall the control settings, it should be stored in the memory.
   Refer to Section 4.2.19 for detail.
   Also, begin and end addresses should be set.
   Refer to Section 4.2.20 for detail.

2. Press the RECALL key ㉑. The address increments by 1 with this key.
   When the address reaches to the end, it returns to the begin address.
   The address is displayed at the upper-left corner of the screen.

3. By operating the front panel keys or knobs ⑦ through ㉕ (except ⑬) in the recall mode, the address of controlled function is erased. When the RECALL key ㉑ is pressed, the recall operation will be started from the erased address. In this case, controlled function is only changed and other functions are held as is.

4. When the readout display is set to off (recall display is erased), recall operation will be started from the erased address by pressing the RECALL key ㉑.

4.3 Waveform Observation

4.3.1 Connection

The INPUT connectors ㊲ and ㊳ are the loop-through configuration as shown in Figure below.

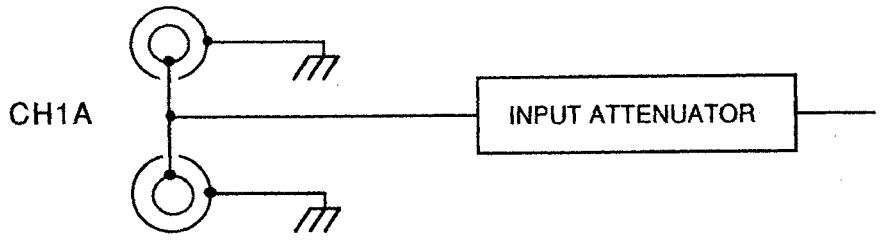


Figure 4-24

Apply the signal to either connector, and terminate the other connector with 75-Ω terminator or 75-Ω equipment.
Use 75-Ω cable for connection.

4.3.2 To Display the Trace

Procedure

1. Connect the power plug to the mains.
2. Set the FOCUS knob ③ and INTEN knob ⑤ to the center.
3. Turn the POWER switch ① on.
4. Wait about 10 seconds until the trace appears.
5. If the trace is tilted, adjust ROTATION adjustment ④ to make the baseline parallel to horizontal graticule line.

Note: If no trace is appeared, it may be positioned off screen. Rotate the H.POS/Δ knob ⑱ and V.POS/REF knob ⑲ as required to display the trace.

4.3.3 Triggering

The Table below shows the sync signal source.

Table 4-1

SYNC SOURCE	5221/5222	5220
Internal	CH1 A CH4 A CH1 B CH4 B	CH1 CH2 CH3 -
External	EXT REF	EXT REF

5221/5222:
The REF key ⑩ is used to select the internal or external sync signal source.

5220:
The REF key ⑩ is used to select the internal or external sync signal source.
For the single-channel display, the selected input signal is used as the sync signal source.
For the multi-channel display, the initially selected channel is used as the sync signal source.

4.3.4 DC Restorer

- The DC restorer maintains the pedestal level at a constant level despite changes the signal amplitude, APL, and mains hum.

- The FAST or SLOW response can be selected with the DC RESTORER in the menu screen.

4.3.5 Using the Filter

Select the filter by pressing the FILTER key ⑭.

- FLAT
  No filtering is performed.

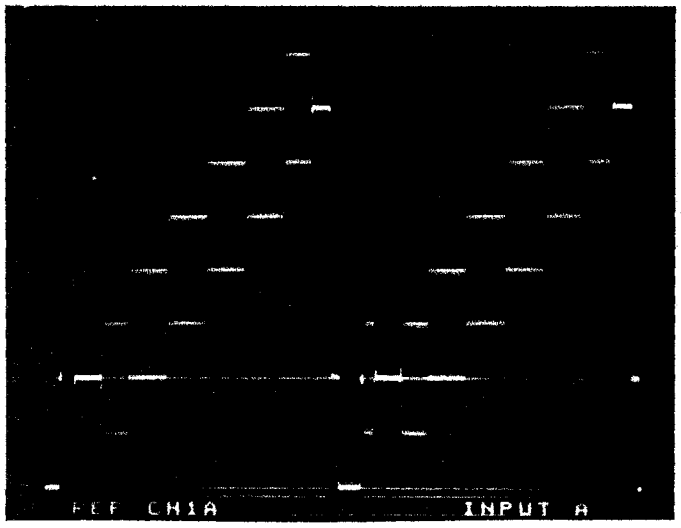


Figure 4-25-1

- LUMINANCE

  The chrominance signal is filtered from the composite signal to display the luminance signal.

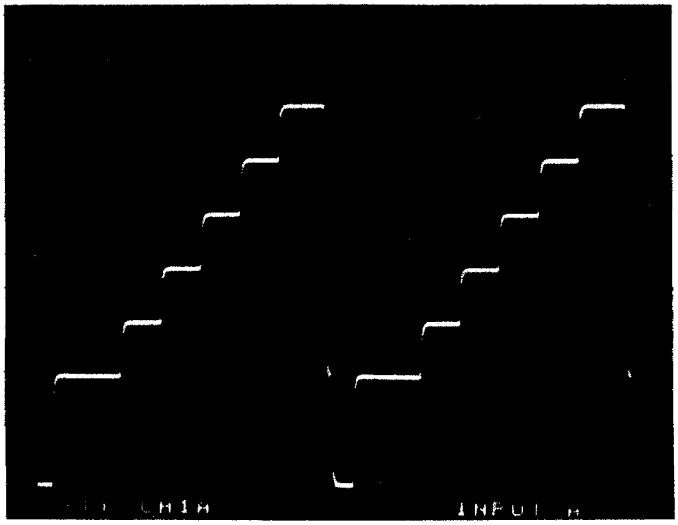


Figure 4-25-2

- CHROMA

  The luminance signal is filtered from the composite signal to display the chrominance signal.

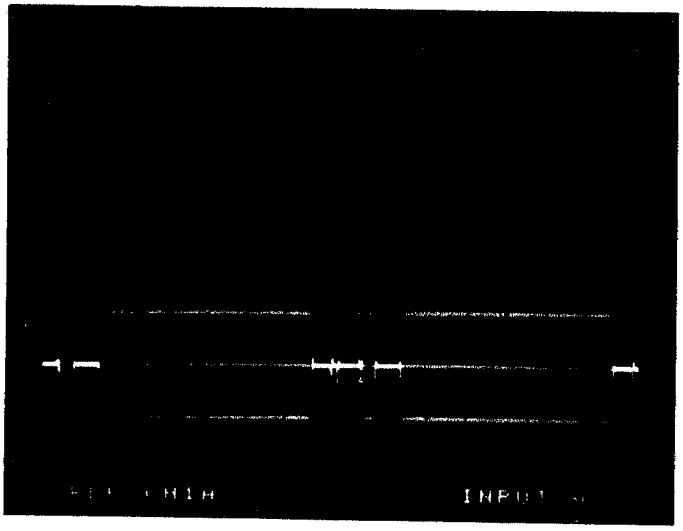


Figure 4-25-3

• DIF'D STEP
The differentiated staircase is displayed.

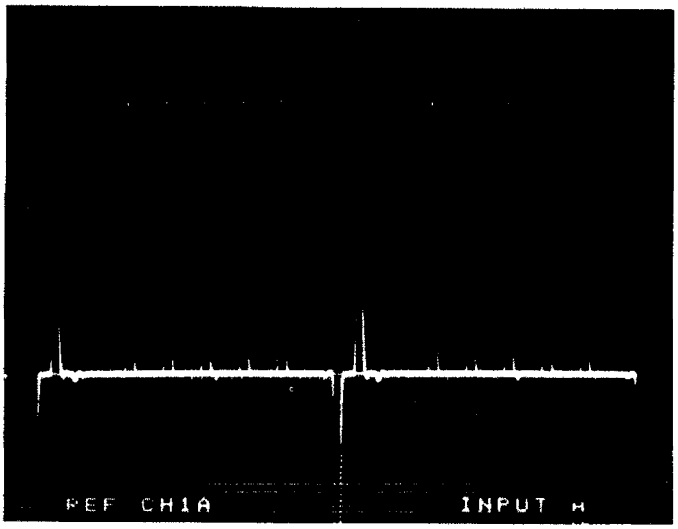


Figure 4-25-4

4.3.6 Using the Display Mode

The DISPLAY key selects display mode as follows to display two or more waveforms simultaneously.

OVERLAY: Displays waveforms in overlay mode.
PARADE: Displays waveforms in parade mode.
The parade display can be obtained when the MODE key ⑰ is set to 1H or 1V.

The CH2 and CH3 waveforms can be moved vertically. Refer to Section 4.2.13 for detail.

4.3.7 Using the Line Selector Mode

The line selector is used to display the specified line such as Vertical Interval Test Signal (VITS) or Vertical Interval Reference (VIR).
When the line selector mode is selected, the specified field and line numbers are displayed at the upper-left corner of the screen.
The line number 1 to 15 can be specified.
Refer to Section 4.2.6 for detail.

Procedure

1. Press the LINE SELECT key ㉒.
2. Press the CURSOR/POS key ㉔.
3. Rotate the V.POS/REF knob ⑲ to select the line number of the test signal.

Note: The line selector is disabled when the 1V or 2V sweep is selected in the parade display mode by pressing the MODE key ⑰.

Note: Refer to Section 4.2.5 for field selection.

4.4 Waveform Measurement using the Cursor

The voltage and time can be measured by positioning the REF and Δ cursors on the waveform to be measured.

4.4.1 Voltage Measurement [IRE], [%]

Procedure

1. Press the ΔV/ΔT key ㉓ to display two horizontal cursors.
2. Press the CURSOR/POS key ㉔. The LED lights.
3. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

- If the Δ cursor is positioned below the REF cursor, a negative sign "-" will be displayed.
- Unit
  [IRE]: 525-line system (5220, 5222)
  [%]: 625-line system (5221, 5222)

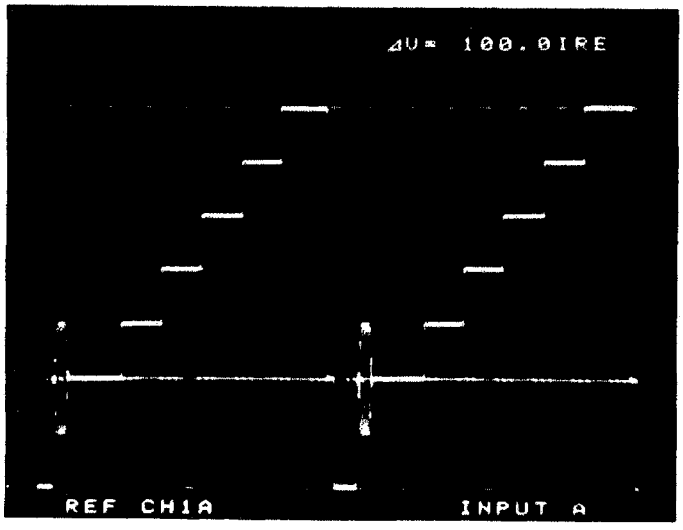


Figure 4-26

4.4.2 Voltage Ratio Measurement [%]

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CURSOR screen.
   Select the [%] in the AMPLITUDE by rotating the V.POS/REF knob ⑲.
2. Press the ΔV/ΔT key ㉓ to display two horizontal cursors.
3. Press the CURSOR/POS key ㉔. The LED lights.
4. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor to the two points that represent the reference value as 100%.
   Press the REF SET key ⑳.
   The measured value between cursors is displayed as "100.0%."
5. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

- If the Δ cursor is positioned below the REF cursor, a negative sign "-" will be displayed.

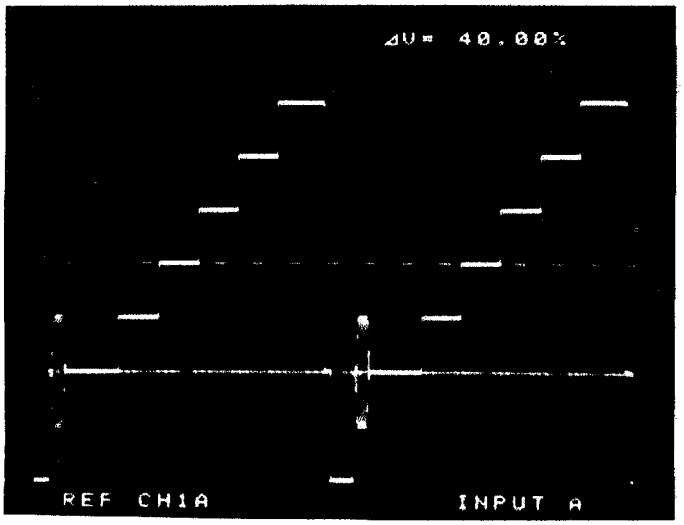


Figure 4-27

4.4.3 Voltage Ratio Measurement [dB]

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CURSOR screen.
   Select the [dB] in the AMPLITUDE by rotating the V.POS/REF knob ⑲.
2. Press the ΔV/ΔT key ㉓ to display two horizontal cursors.
3. Press the CURSOR/POS key ㉔. The LED lights.
4. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor to the two points that represent the reference value as 0dB.
   Press the REF SET key ⑳.
   The measured value between cursors is displayed as "0.00dB."
5. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

- If the Δ cursor is positioned at the left side of the REF cursor, a negative sign "-" will be displayed.

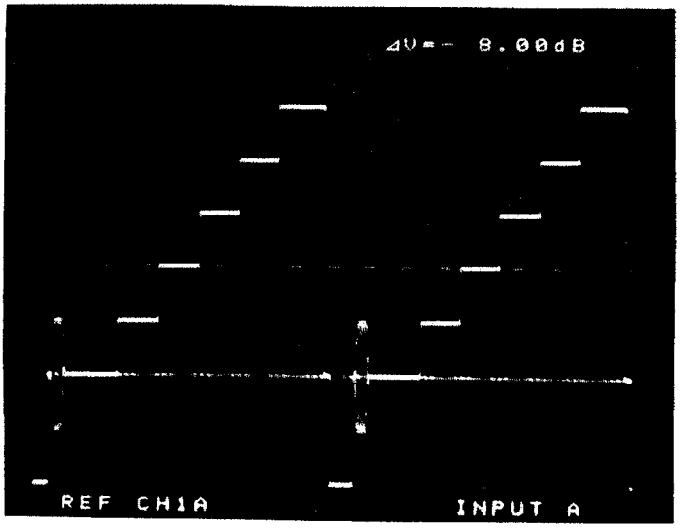


Figure 4-28

4.4.4 Time Measurement [s]

Procedure

1. Press the ΔV/ΔT key ㉓ to display two vertical cursors.
2. Press the CURSOR/POS key ㉔. The LED lights.
3. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

- When the Δ cursor is positioned at the left side of the REF cursor, a negative sign "-" will be displayed.

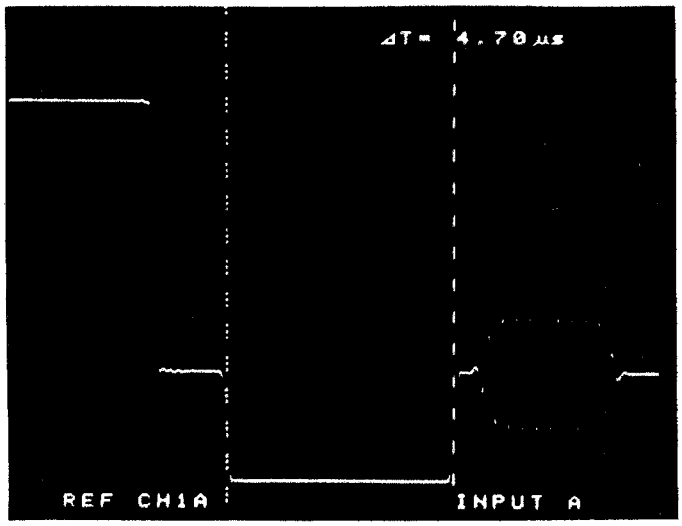


Figure 4-29

4.4.5 Time Ratio Measurement [%]

Procedure

1. Press the MENU key ㉒ to display the MAIN MENU screen, then select the CURSOR screen.
   Select the [%] in the TIME by rotating the V.POS/REF knob ⑲.
2. Press the ΔV/ΔT key ㉓ to display two vertical cursors.
3. Press the CURSOR/POS key ㉔. The LED lights.
4. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to set the reference value as 100%.
   Press the REF SET key ⑳.
   The measured value between cursors is displayed as "100.0%."

5. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

   • When the Δ cursor is positioned at the left side of the REF cursor, a negative sign "-" will be displayed.

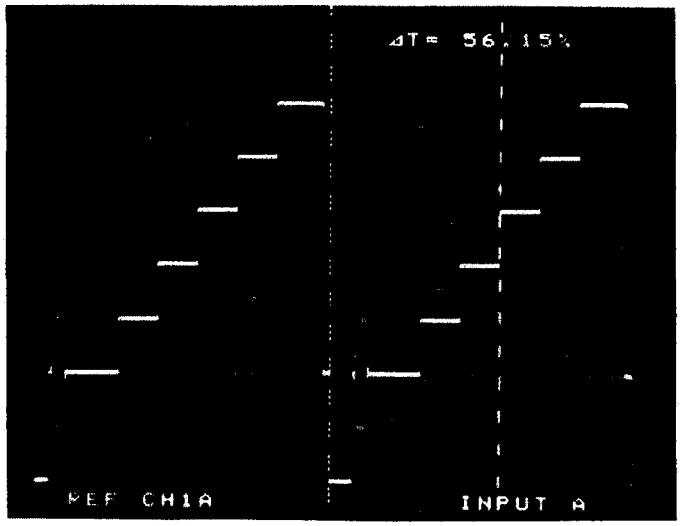


Figure 4-30

4.4.6 Frequency Measurement [Hz]

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CURSOR screen.
   Select the [Hz] in the TIME by rotating the V.POS/REF knob ⑲.
2. Press the ΔV/ΔT key ㉒ to display two vertical cursors.
3. Press the CURSOR/POS key ㉔. The LED lights.
4. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
   The measured value between cursors is displayed at the upper-right corner of the screen.

   • When the Δ cursor is positioned at the left side of the REF cursor, a negative sign "-" will be displayed.

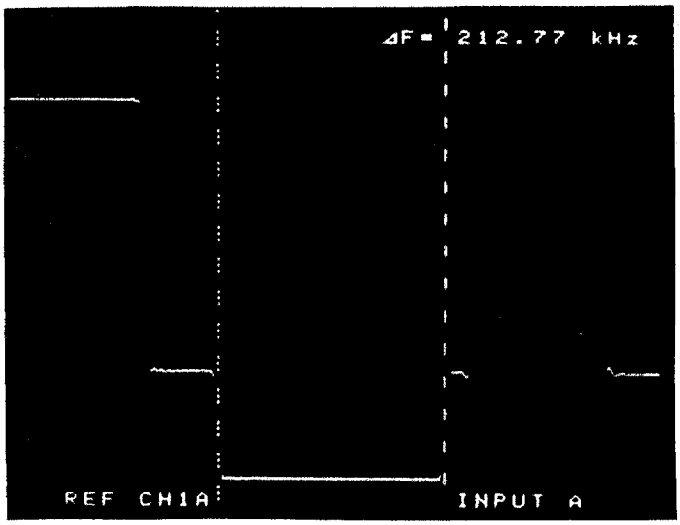


Figure 4-31

4.5 Using the Offset Cursor

The voltage cursors (REF and Δ)are always displayed on the both sides of the screen with 1H or 1V span even the vertical sensitivity is magnified 5 times.

Procedure

1. Press one of the INPUT key to select the channel to be measured. (The offset cursor mode cannot be used in the multi-channel display mode.)
2. Press the ΔV/ΔT key ㉓ to display two horizontal cursors.
3. Press the CURSOR/POS key ㉔. The LED lights.
4. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
5. Select OFFSET CURSOR by pressing the MAG key ㉕.
6. Two horizontal cursors are displayed around the screen center.
7. Rotate the V.POS/REF knob ⑲ and H.POS/Δ knob ⑱ to position the each cursor on the waveform to be measured.
8. To move the display vertically or two cursors are located in the distance, proceed as follows.
   Press the CURSOR/POS key ㉔. The LED lights.
   Adjust the V.POS/REF knob ⑲ to move all waveforms and cursors.
   Adjust the H.POS/Δ knob ⑱ to move the waveform and cursor on the Δ cursor-side.

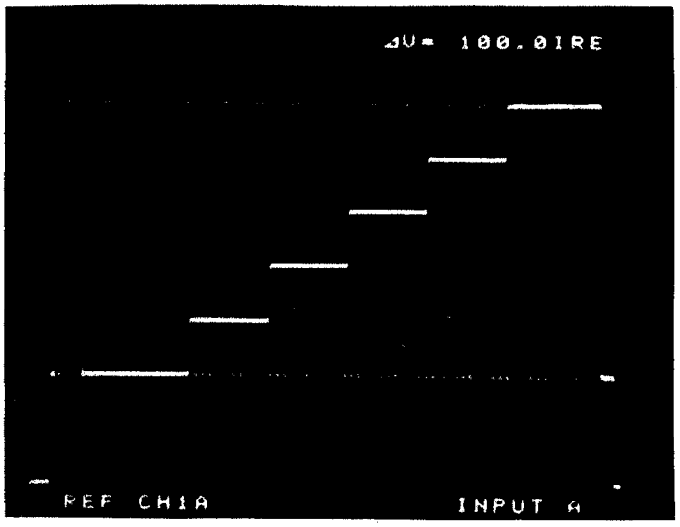


Figure 4-32-1

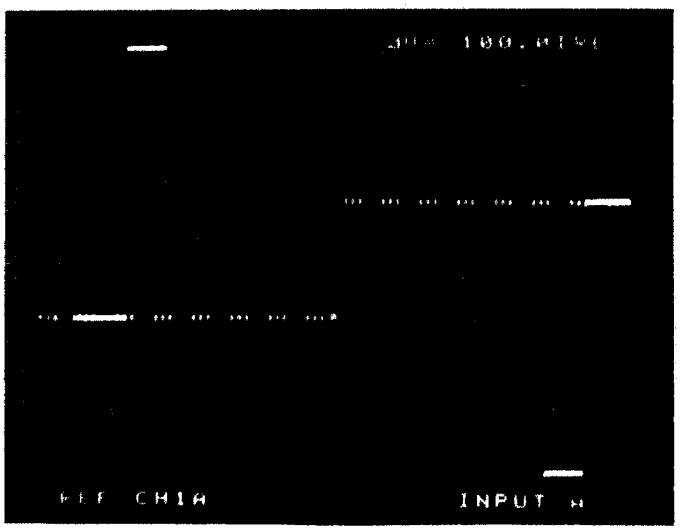


Figure 4-32-2

4.6 Using the External Reference (5211, 5222)

The external sync reference can be displayed to measure the delay time between signals.

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the INPUT screen.
2. Select the BLACK BURST or COMPOSITE in the EXT REF.
3. Select the ON in the EXT DISPLAY.
4. Select the OVERLAY or PARADE by pressing the DISPLAY key ⑯.

Note: The EXT ON cannot be displayed with the menu in the following conditions.
Four-channel display using the A or B input.
Two-channel display using the A/B mode.
Offset cursor is being used.

4.7 RGB Display

The camera's RGB signal can be displayed in parade mode.
The Table below shows the cable connection.

Table 4-2

INPUT CONNECTOR	5221/5222	5220
CH1	G	G
CH2	B	B
CH3	R	R
CH4	Composite signal	-

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.
2. Select the RGB in the FORMAT.
3. The CH2 and CH3 waveforms can be moved vertically. Select the CH2, 3 V.POS in the CALIBRATION.
Refer to Section 4.2.13 for detail.

Note: Connectable RGB channels are as follows.
5221, 5222: 2
5220: 1
When the two-system display is selected, up to six channels (three channels per system) can be displayed.
When four-channel display is selected using the A or B input, two-system display cannot be obtained even the A/B key ⑪ is pressed.

4.8 Y, B-Y, R-Y Display

The color difference signals (Y, B-Y, and R-Y) can be displayed in parade mode.

The Table below shows the cable connection.

Table 4-3

INPUT CONNECTOR	5221/5222	5220
CH1	Y	Y
CH2	B-Y	B-Y
CH3	R-Y	R-Y
CH4	Composite signal	-

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.
2. Select the Y, B-Y, R-Y in the FORMAT.
3. The CH2 and CH3 waveforms can be moved vertically. Select the CH2, 3 V.POS in the CALIBRATION.
   Refer to Section 4.2.13 for detail.

4.9 Timing/Bowtie Display

The delay time can be measured using the timing or bowtie signal of the analog component signal.

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.
2. Select the Y, B-Y, R-Y or RGB in the FORMAT.
3. Press the WFM key ⑦ and PIC key ⑧ simultaneously for the timing display mode.

Note: In the timing display mode, the CH4 cannot be accepted when the CH1, CH2, and CH3 are on.
The cursor is not displayed.

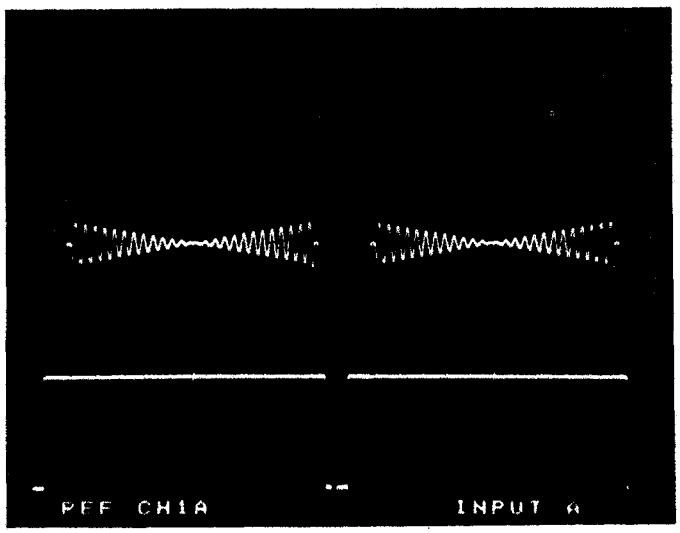


Figure 4-33

4.10 Y/C Signal Display

The luminance (Y) and chrominance (C) components of the S video signal are added and displayed as the component signal.

The Table below shows the cable connection.

Table 4-4

INPUT CONNECTOR	INPUT SIGNAL
CH1	Y
CH2	C

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the SYSTEM screen.
2. Select the Y/C in the FORMAT.
3. The Y and C components are added and displayed as the component signal.

Note: In the Y/C mode:
When the CH1 and CH2 of the INPUT key ⑨ or ㉖ are on, other keys are not accepted.
The cursor is not displayed.

4.11 Remote Control

4.11.1 Remote Control Between Instruments

By using the remote control mode, you can remotely control the vectorscope through the waveform monitor.
Use the supplied 9-pin to 9-pin D-sub connector to connect the instruments.

The functions built in the waveform monitor but not in the vectorscope will be ignored.
The front panel controls and menu can also be set in the remote control mode.
When the remote control operation and front panel setting are duplicated, lately set mode becomes effective.

Connectable combination is as follows.

WAVEFORM MONITOR		VECTORSCOPE
5220	→	5210
5221	→	5211
5222	→	5212

For the vectorscope remote control mode, proceed as follows.

Press the MENU key ㉓ to display the MAIN MENU screen, then select the REMOTE screen.
Select ON in the REMOTE.
Press the WFM key ⑦ one second or longer.
The "REMOTE" is displayed at the upper-right corner.

4.11.2 Controllable Functions

Table 4-5

FUNCTION	DESCRIPTION
PRESET 1	Selects PRESET 1
PRESET 2	Selects PRESET 2
PRESET 3	Selects PRESET 3
PRESET 4	Selects PRESET 4
PRESET 5	Selects PRESET 5
PRESET 6	Selects PRESET 6
PRESET 7	Selects PRESET 7
PRESET 8	Selects PRESET 8
PRESET 9	Selects PRESET 9
PRESET 10	Selects PRESET 10
RECALL 1	Selects RECALL 1
RECALL 2	Selects RECALL 2
RECALL 3	Selects RECALL 3
RECALL 4	Selects RECALL 4
RECALL 5	Selects RECALL 5
RECALL 6	Selects RECALL 6
RECALL 7	Selects RECALL 7
RECALL 8	Selects RECALL 8
RECALL 9	Selects RECALL 9
RECALL 10	Selects RECALL 10
CH1	Selects CH1
CH2	Selects CH2
CH3	Selects CH3
CH1 + CH2	Selects simultaneous CH1/CH2 display
CH1 + CH3	Selects simultaneous CH1/CH3 display
CH2 + CH3	Selects simultaneous CH2/CH3 display
CH1 + CH2 + CH3	Selects simultaneous CH1/CH2/CH3 display
EXT	Selects EXT
Y/C	Selects Y/C mode
CH4A → CH1	Selects CH1 of the vectorscope by selecting CH4A of waveform monitor
CH4B → CH2	Selects CH2 of the vectorscope by selecting CH4B of waveform monitor
REF INT	Selects REF INT
REF EXT	Selects REF EXT

4.12 Using the Picture Monitor

- The waveform monitor can display the video signal on the screen as a picture.
- Since the selected line is intensified on the screen in the line selector mode, the relationship between the video signal and picture can easily be monitored.

Note: When the line selector mode is selected, waveform lacking occurs under the intensified marker due to the line number is displayed. This phenomenon is erased by turning off the line selector mode.

4.13 Using the Line Selector

- The line selector mode is used to display the specified line of the video signal. When the field is displayed, the specified line is intensified.
  The specified field and line numbers are displayed at the upper-left corner of the screen.

Table 4-6

MODE KEY	DISPLAY
1H	1H waveform
2H	2H waveform
1V	1 field with intensified 1H
2V	1 frame with intensified 1H

- The lines, 1 to 15, can be displayed by using the menu screen (i.e., LINE WINDOW in the LINE SELECTOR).
  When the number of lines to be displayed are increased, the waveform intensity is also raised.

Note: In the 2H-display mode the 1H line of FD2,4 cannot displayed in the following conditions:
Field FD1,3 is selected.
The 263H line is set with the V.POS/REF knob ⑲.

The 1H line of FD1,2 cannot displayed in the following conditions:
Field FD2, 4 is selected.
The 262H line is set with the V.POS/REF knob ⑲.

The LINE WINDOW in the menu indicates [2H] or greater.

4.14 Application of Staircase Signal

The camera's RGB signal can be displayed in parade mode.

Procedure

1. Set the pin 2 of the REMOTE A connector ㉛ to GND for RGB display.
2. Apply the staircase signal (0V to 10V) to the pin 1 of REMOTE A connector ㉛.
3. Press the MENU key ㉓ to display the MAIN MENU screen, then select the STAIRCASE screen.
   Select RGB or YRGB.
   Refer to Section 4.2.21 for detail.

Table 4-7 REMOTE A Connector Pin Assignment

PIN NO.	NAME	DESCRIPTION
1	RGB STAIR INPUT	Input pin for RGB/YRGB staircase
2	RGB ENABLE	Enable control pin for RGB/YRGB
3	1 SWEEP	Control pin for 1 sweep
4	REMOTE SYNC ENABLE	Enable control pin for REMOTE SYNC
5	RECALL 2	Control pin to recall preset 2
6	RECALL 3	Control pin to recall preset 3
7	RECALL 1	Control pin to recall preset 1
8	RECALL 4	Control pin to recall preset 4
9	GND	Ground
10	REMOTE SYNC INPUT	REMOTE SYNC input pin, TTL low active
11	STORE	Control pin for store inhibit at low, protects preset data
12	RECALL 5	Control pin to recall preset 5
13	RECALL 6	Control pin to recall preset 6
14	RECALL 7	Control pin to recall preset 7
15	RECALL 8	Control pin to recall preset 8

5. MAINTENANCE

5.1 Illumination Lamp Replacement

Procedure

1. Remove two screws on the hood.
2. Pull the lamp housing out.
3. Remove the burned out lamp.
4. Mount the new lamp to the pins.
5. To reinstall the parts, reverse the order of the removal steps.

Ordering Information

To obtain extra lamp, contact your local agent and provide followings.

LI-2306 Lamp (5 pieces per set)

5.2 Calibration Procedure

5.2.1 Preparation

The gain is calibrated within ±1% when shipped from the factory. When the gain accuracy is reduced by longtime use, you can calibrate it.

The reference color bar signal is required for calibration.

Procedure

1. Select the color system and setup according to the input signal.
2. Apply reference color bar signal to the INPUT connector to display the waveform.

5.2.2 Vertical Gain

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CALIBRATION screen.

SCREEN	DESCRIPTION
*** CALIBRATION *** V.GAIN VAR SWEEP TIME VAR CH2, 3 V.POS (Y, B-Y, R-Y) VAR → RETURN TO MAIN MENU Select : V. POS knob Set : ENTER key	Vertical gain adjustment

Figure 5-1

2. Move the cursor to the V.GAIN VAR by rotating the V.POS/REF knob ⑲.
3. Apply 1Vp-p video signal to the INPUT connector.
4. Press the ENTER key ㉒.
5. Adjust the video signal amplitude on the graticule as follows by rotating the V.POS/REF knob ⑲.
   NTSC: 140 IRE
   PAL: 143 IRE
6. Press the ENTER key ㉒.
7. The vertical gain is set.
   The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ㉒.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ㉒.
    The measurement screen is displayed.

5.2.3 Sweep Time

Procedure

1. Press the MENU key ㉓ to display the MAIN MENU screen, then select the CALIBRATION screen.

SCREEN	DESCRIPTION
*** CALIBRATION *** V.GAIN VAR SWEEP TIME VAR CH2, 3 V.POS (Y, B-Y, R-Y) VAR → RETURN TO MAIN MENU Select : V. POS knob Set : ENTER key	Sweep time adjustment

Figure 5-2

2. Move the cursor to the SWEEP TIME VAR by rotating the V.POS/REF knob ⑲.
3. Apply 1Vp-p video signal to the INPUT connector.
   Position the cursors to obtain the following readout time.
   NTSC: 63.5μs
   PAL: 64μs
4. Press the ENTER key ㉒. The selected item is marked with an asterisk.
5. Adjust the 1H of video signal to the cursored span by rotating the V.POS/REF knob ⑲.
6. Press the ENTER key ㉒.
7. The sweep time is set.
   The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ㉒.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ㉒.
    The measurement screen is displayed.

5.3 Default Settings

1. Turn power off.
2. Hold down the CH1 key, then turn the power on.
   The default settings will be made.

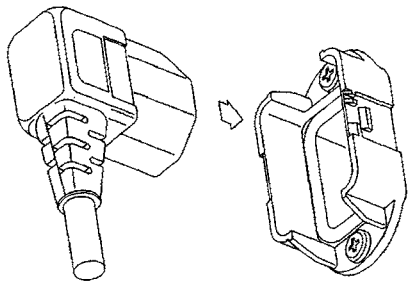
Note: Preset data will be erased by default setting.

5.4 To Prevent Power Cord Disconnection

The 5220/5221/5222 comes with a power cord designed to fit AC inlet. To prevent the power cord disconnection from the inlet, the Connector Cover is supplied as an accessory. Refer to procedure below.

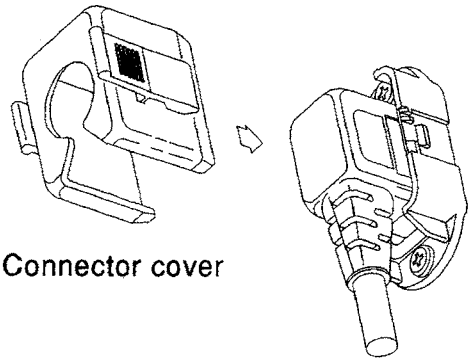
5.4.1 Connecting the Power Cord

(1) Insert the power cord connector into the AC inlet.



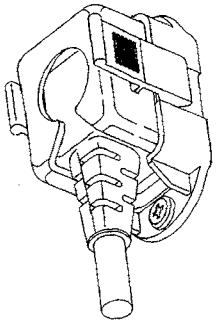
Connector Base

(2) Place the connector cover on top of the connector as shown in the figure below.



Connector cover

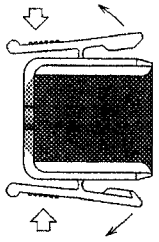
(3) Press the cover until it clicks into place.



(4) Confirm that the connector cover is locked to the base.

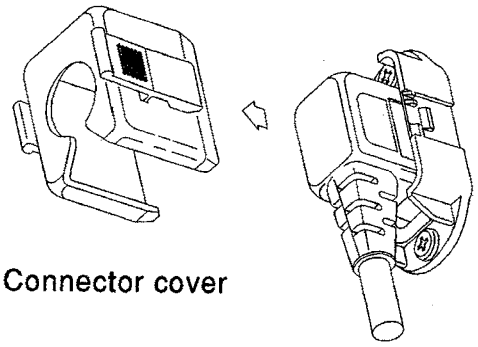
5.4.2 Disconnecting the Power Cord

(1) Press the levers on the connector cover with your fingers to release.



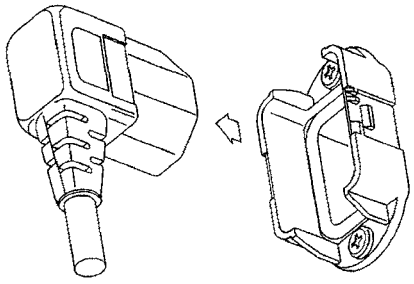
Connector cover (side view)

(2) Remove the connector cover from the base.



Connector cover

(3) Disconnect the power cord connector from the AC inlet.



Connector Base