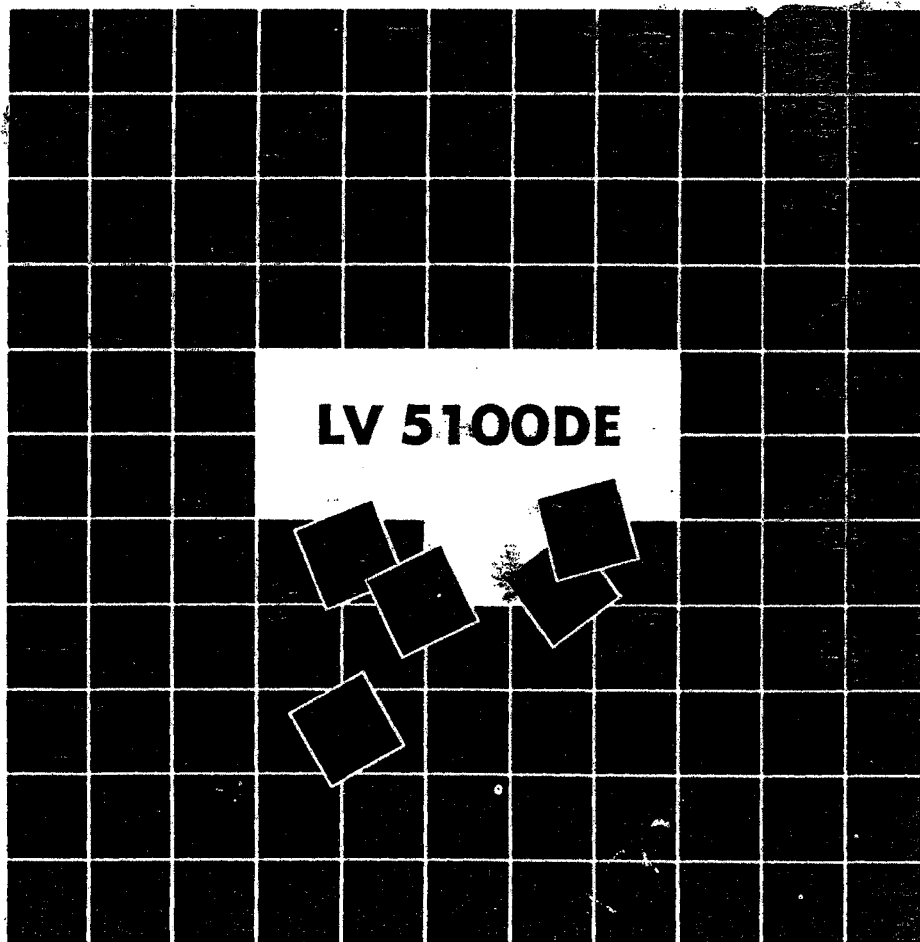


LEADER

COMPONENT DIGITAL WAVEFORM MONITOR

INSTRUCTION MANUAL



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TABLE OF CONTENTS

| | |
|---|-----|
| 1. INTRODUCTION | 1-1 |
| 1.1 For Safety's Sake | 1-1 |
| 1.2 Operating Precautions | 1-2 |
| 1.2.1 Line Voltage and Fuse | 1-2 |
| 1.2.2 Maximum Allowable Input Voltage | 1-2 |
| 1.2.3 Installation | 1-3 |
| 1.2.4 CRT | 1-3 |
| 1.2.5 Notes on Turning Power On | 1-3 |
| 1.2.6 Last Memory and Default Setting | 1-3 |
| 1.2.7 Cabinet | 1-4 |
| 2. SPECIFICATIONS | 2-1 |
| 2.1 Description | 2-1 |
| 2.2 Features | 2-1 |
| 2.3 Basic Operation Mode and Principal Function | 2-3 |
| 2.3.1 Basic Operation Mode | 2-3 |
| 2.3.2 Principal Function | 2-3 |
| (1) Serial digital/analog component signal measurements | 2-3 |
| (2) Serial digital signal measurements | 2-3 |
| 2.4 Specifications | 2-4 |
| 2.4.1 Measurement Signal | 2-4 |
| (1) Video Signal | 2-4 |
| (2) Audio Signal | 2-4 |
| 2.4.2 Synchronization | 2-4 |
| 2.4.3 Input | 2-4 |
| (1) Serial Digital Input | 2-4 |
| (2) Analog Input | 2-4 |
| (3) Analog EXT REF Input | 2-5 |
| 2.4.4 Output | 2-5 |
| (1) Serial Digital Active Output | 2-5 |
| (2) Analog Picture Monitor Output | 2-5 |
| 2.4.5 Vertical Axis | 2-5 |
| (1) Deflection System | 2-5 |
| (2) Filter Characteristics | 2-6 |
| (3) Timing Mode | 2-6 |
| 2.4.6 DC Restorer | 2-6 |
| 2.4.7 Horizontal Axis | 2-6 |
| 2.4.8 Vectorscope Mode (VEC) | 2-7 |
| 2.4.9 Picture Mode (PIC) | 2-7 |
| 2.4.10 Audio Mode (AUDIO) | 2-7 |
| 2.4.11 Eye Pattern Display | 2-8 |
| 2.4.12 Digital Function | 2-8 |

| | | |
|--------|--------------------------------------|------|
| 2.4.13 | Calibration Signal | 2-8 |
| 2.4.14 | Line Selector | 2-8 |
| 2.4.15 | Line Window | 2-9 |
| 2.4.16 | Preset Function | 2-9 |
| 2.4.17 | Remote Control | 2-9 |
| 2.4.18 | Cursor Measurement | 2-9 |
| 2.4.19 | CRT | 2-10 |
| 2.4.20 | General Specifications | 2-10 |
| 2.4.21 | Supplied Accessories | 2-10 |
| 2.4.22 | Optional Accessories (Cabinet) | 2-10 |
| | | |
| 3. | PANEL DESCRIPTION | 3-1 |
| 3.1 | Front Panel | 3-1 |
| 3.2 | Rear Panel | 3-6 |
| | | |
| 4. | OPERATING PROCEDURE | 4-1 |
| 4.1 | Menu Operation and Structure | 4-1 |
| 4.1.1 | Basic Menu Operation | 4-1 |
| 4.1.2 | Using the CLEAR Key | 4-2 |
| (1) | Clearing the Menu | 4-2 |
| (2) | Clearing All Readouts | 4-2 |
| 4.1.3 | Menu Structure | 4-3 |
| 4.1.4 | Using the Menu | 4-7 |
| 4.2 | Graticule | 4-8 |
| 4.3 | Connection | 4-10 |
| 4.4 | Displaying the Trace | 4-10 |
| 4.5 | Using the SELECT Key | 4-11 |
| 4.5.1 | Input Signal Selection | 4-11 |
| 4.5.2 | CAL Mode | 4-11 |
| 4.6 | Using the MODE Key | 4-12 |
| 4.7 | Waveform Monitor Mode | 4-13 |
| 4.7.1 | Using the INPUT Keys | 4-13 |
| 4.7.2 | Using the DISPLAY Key | 4-14 |
| (1) | Overlay Display | 4-14 |
| (2) | Parade Display | 4-14 |
| (3) | Timing Display | 4-14 |
| (4) | Eye Display | 4-15 |
| 4.7.3 | Using the SWEEP Key | 4-16 |
| (1) | Basic Operation | 4-16 |
| (2) | Sweep Rate Selection | 4-16 |
| (3) | Sweep Magnification | 4-17 |
| (4) | Sweep Time | 4-17 |
| 4.7.4 | Using the CURSOR Key | 4-18 |
| (1) | Basic Operation | 4-18 |
| (2) | Voltage Measurement | 4-18 |
| (3) | Voltage Ratio Measurement | 4-19 |
| (4) | Time Measurement | 4-19 |

| | |
|--|------|
| (5) Frequency Measurement | 4-19 |
| (6) Time Ratio Measurement | 4-20 |
| (7) Rise/Fall Times (Tr, Tf) Measurement (Eye pattern Mode only) | 4-20 |
| (8) Jitter Measurement (Eye pattern Mode only) | 4-21 |
| 4.7.5 Using the LINESEL Key | 4-21 |
| (1) Basic Operation | 4-22 |
| (2) Field Selection | 4-22 |
| (3) Specifying the Line Window | 4-22 |
| 4.7.6 Using the FILTER/GAIN Key-1 (GAIN) | 4-23 |
| (1) Basic Operation | 4-23 |
| (2) Gain Selection | 4-23 |
| (3) Gain Variable Mode | 4-24 |
| 4.7.7 Using the FILTER/GAIN Key-2 (FILTER) | 4-24 |
| (1) Basic Operation | 4-24 |
| (2) Filter Selection | 4-25 |
| (3) Using the Differential-Step Filter | 4-25 |
| 4.7.8 Using the EXT REF Key | 4-26 |
| 4.8 Vectorscope Mode | 4-27 |
| 4.8.1 System Setting | 4-27 |
| (1) Basic Operation | 4-27 |
| (2) Color Bars Selection | 4-28 |
| (3) Format Selection | 4-28 |
| (4) Setup Selection | 4-28 |
| (5) System Combinations | 4-28 |
| 4.8.2 GAIN Menu | 4-28 |
| (1) Basic Operation | 4-28 |
| (2) Gain Selection | 4-29 |
| (3) Gain Variable Mode | 4-29 |
| 4.8.3 Line Selector | 4-29 |
| 4.9 Picture Monitor Mode | 4-30 |
| 4.10 Audio Mode | 4-31 |
| 4.10.1 Connecting Audio Signal | 4-31 |
| 4.11 Eye Pattern Mode | 4-32 |
| 4.11.1 Measuring Eye Pattern | 4-32 |
| 4.12 Using the PRESET Key | 4-33 |
| (1) Basic Operation | 4-33 |
| (2) Preset MMode | 4-33 |
| (3) Rename Mode | 4-34 |
| 4.13 Using the SYSTEM Key | 4-35 |
| 4.13.1 Using the ANALOG SYSTEM Menu | 4-35 |
| (1) Basic Operation | 4-35 |
| (2) Frame Rate Setting | 4-35 |
| (3) Input Format | 4-36 |
| (4) Display Format | 4-36 |
| (5) Input Coupling | 4-36 |
| 4.13.2 Using the DIGITAL SYSTEM Menu | 4-36 |
| (1) Basic Operation | 4-36 |

| | |
|---|------|
| (2) Frame Rate Setting | 4-37 |
| (3) EAV - SAV Display | 4-37 |
| (4) Display Format | 4-37 |
| (5) Picture Monitor Output | 4-37 |
| 4.13.3 Using the DC RESTORER Menu | 4-37 |
| (1) Basic Operation | 4-37 |
| (2) Response Setting | 4-38 |
| (3) Sample Point | 4-38 |
| (4) KNOB Function Setting | 4-38 |
| 4.13.4 Using the Cb/B, Cr/R POS Menu | 4-38 |
| (1) Basic Operation | 4-38 |
| (2) Signal Selection | 4-39 |
| (3) KNOB Function Setting | 4-39 |
| 4.13.5 Using the VECTOR Menu | 4-39 |
| 4.13.6 Using the CALIBRATION Menu | 4-39 |
| (1) Basic Operation | 4-40 |
| (2) Gain Mode | 4-40 |
| (3) Sweep Mode | 4-41 |
| (4) Calendar Mode | 4-42 |
| 4.14 Using the DIGITAL Key | 4-43 |
| 4.14.1 Parameter Check Screen (Page 1/3) | 4-43 |
| (1) FUNCTION KEY Assignments | 4-43 |
| (2) Screen Description | 4-44 |
| (3) Equivalent Cable Length | 4-44 |
| (4) Concerning Error | 4-44 |
| 4.14.2 ALARM LED Setting Screen (Page 2/3) | 4-45 |
| (1) FUNCTION KEY Assignments | 4-45 |
| (2) Screen Description | 4-46 |
| (3) Timing Reference EAV and SAV | 4-46 |
| (4) Combination of TRS, EAV, and SAV | 4-47 |
| 4.14.3 Dump List Display Screen (Page 3/3) | 4-47 |
| (1) FUNCTION KEY Assignments-1 (Line Selector Mode) ... | 4-47 |
| (2) FUNCTION KEY Assignments-2 (Error Mode) | 4-48 |
| (3) Display Example of Line Dump | 4-48 |
| (4) Display Example of Component Dump | 4-49 |
| 4.15 REMOTE Connector | 4-50 |
| | |
| 5. MAINTENANCE | 5-1 |
| 5.1 Illumination Lamp Replacement | 5-1 |
| 5.2 To Prevent Power Cord Disconnection | 5-2 |
| 5.2.1 Connecting the Power Cord | 5-2 |
| 5.2.2 Disconnecting the Power Cord | 5-3 |

1. INTRODUCTION

Thank you for purchasing our product. Please read the instruction manual carefully before operating this instrument.

1.1 For Safety's Sake

WARNING


- Do not remove any cases or covers.
The high-voltage section inside this instrument can cause electrical shock.
- Do not operate this instrument and connected units in a volatile or flammable atmosphere.
An explosive can result.
- Do not insert metal objects (e.g., wire, pin) into the vents.
Otherwise, you may damage the instrument or suffer electrical shock.
- Connect this instrument to the rated power line voltage.
Excessive voltage can cause fire.
- Do not touch the high-voltage section with hand directly when measuring it.
You may suffer electrical shock.
- Do not connect this instrument to equipment whose chassis has electrical potential to ground (i.e., transformerless equipment).
Otherwise, you may damage the instrument or suffer electrical shock.


CAUTION

- Use only the fuse of correct type and rating for replacement.
Before replacing the fuse, be sure to turn the power switch off and disconnect the power cord from the mains.

Cautions on operation appear in the instruction manual. Read the manual carefully to ensure correct operation.

Explanation of the Terms.

 **WARNING** ... The **WARNING** calls attention to abnormal conditions or dangerous practices that could result in personal injury or death.

 **CAUTION** ... The **CAUTION** calls attention to abnormal conditions or dangerous practices that could result in damage to the instrument or other property.

1.2 Operating Precautions

⚠ CAUTION

1.2.1 Line Voltage and Fuse

Confirm that the power line voltage is correct before connecting the power cord.

The voltage range and fuse rating are indicated on the rear panel.

The instrument must be connected to the rated line voltage and line frequency of 48 Hz to 440 Hz.

When replacing the fuse, turn the power switch off and disconnect the power cord from the mains. Use specified fuse only.

| Voltage Range | Fuse | |
|---------------|--------------|---------------------|
| | Rating | Leader Parts Number |
| 90 to 250V | 2A, time-lag | 4363780002 |

1.2.2 Maximum Allowable Input voltage

The maximum allowable input voltage to the input connectors is shown in Table below.

Do not apply excessive voltage to prevent damage the instrument.

| Input Connector | Maximum Allowable Input Voltage |
|------------------------|---------------------------------|
| SERIAL INPUT A, B | ± 5 V(DC + peak AC) |
| ANALOG INPUT Y, Cb, Cr | ± 2 V(DC + peak AC) |
| ANALOG EXT REF | ± 12 V(DC + peak AC) |

The maximum input voltage of " ± 12 V(DC+peak AC)" is as shown in Figure 1-1.

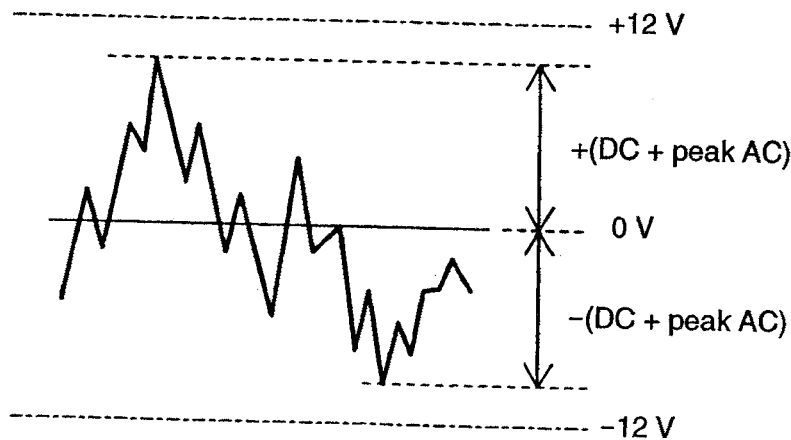


Figure 1-1

1.2.3 Installation

Do not use the instrument in the following environments.

- High temperature environments

Do not place the instrument under direct sunlight or near a heater (e.g., stove). Do not move the instrument from cold to warm environment abruptly, it may cause condensation.

Operating temperature range: 0 to 40°C

- High humidity environments

Do not place the instrument in the high humidity environment (e.g., bathroom, near a humidifier).

Operating humidity range: 10 to 85% RH

- Dusty environments

- Excessive magnetic fields

Do not place the instrument by the strong magnetic field (e.g., high-power transformer). Waveform distortion or tilt may occur.

1.2.4 CRT

Do not leave the instrument with high intensity or displaying sharp spot. The CRT screen may be burned-in or its life may reduce.

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

1.2.5 Notes on Turning Power On

After turning the power off, wait at least 5 seconds before turning the power on. Otherwise, the instrument may malfunction. Turn the power off again and wait at least 5 seconds, then turn the power back on in this case.

1.2.6 Last Memory and Default Setting

The last memory function retains the panel settings immediately before turning the power off is retained.

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.

To forcibly obtain the default settings, hold down the CH2 key, then turn the power on. "PUSH ANY KEY" is displayed. Press any key.

1.2.7 Cabinet

Install the instrument in the optional cabinet for safety purpose and avoiding EMI. Refer to Section "2.4.21 Optional Accessories (Cabinet)" for optional cabinet.

2. SPECIFICATIONS

2.1 Description

The Model LV 5100DE Component Digital/Analog Waveform Monitor is used for the 525/60-and 625/50-line systems. This epoch-making instrument is ideal for both digital and analog inputs, and features two component serial digital input systems and one triple-channel component analog input system.

For digital signals, the following functions are provided: eye pattern display, monitoring transmission errors by Error Detection and Handling (EDH), equivalent cable length measurement, and digital data dump.

The analog component waveform monitor mode enables TV picture display using the picture monitor function, the line selector mode supported by high-intensity CRT, and the menu screen to set various functions.

2.2 Features

- Eye pattern display function
Used to measure amplitude and jitter of the serial digital signal.

- Two serial digital input systems and one output system
Two serial digital passive loop-through inputs conforming to ITU-R656-1 and SMPTE 259M standards, and one active output system for retransmitting either input.

- Equivalent cable length measurement function
Measures and displays signal level applied to serial digital input as an equivalent length of 5C-2V coaxial cable.

- EDH monitor and digital functions
Serial transmission errors can be monitored using EDH codes. In the digital function, go/no-go judgment for TRS, and detection for ANC of audio signal can be displayed.

- Digital data dump function
Digital video data after converted into parallel can be displayed in hexadecimal notation for simplified data analysis.

- Component analog input (Y, Cb, Cr or GBR)
The component analog input allows this instrument to be used even when digital and analog signals exist simultaneously. The analog composite signal can be observed by connecting this signal to the Y(G) input connector.

- **Format conversion, Y, Cb, Cr to GBR**

This instrument can convert Y, Cb, Cr format signals into GBR format for display. Digital signal picture monitor output can also be converted into GBR format.
- **Picture display function**

This instrument can display Y or G video signal as a TV picture even without a picture monitor. In the line selector mode, the selected line displayed on a picture monitor is highlighted for easier line identification.
- **Vectorscope mode**

Both digital and analog signals can be displayed in vector format.
- **Cursor measurement functions**

Cursor use enables signal level measurement accuracy as high as 0.5%.
- **Lissajous display for stereo signals**

Analog stereo audio signals can be displayed in lissajous pattern.
- **Preset function**

Up to 10 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.
- **Full-line selector**

The arbitrary line selection function in each field allows VITS, VIR, or teletext signal observation. Up to 15 lines can be continuously selected to emphasize display intensity.
- **Timing display**

Time difference and amplitude difference between channels can be observed by using the timing display mode.
- **Universal power supply, 90 to 250 VAC**

2.3 Basic Operation Mode and Principal Function

2.3.1 Basic Operation Mode

| | |
|-----------------------------|---|
| WFM (Waveform monitor mode) | Displays up to three channel waveforms. |
| VEC (Vectorscope mode) | Vector display of Cb and Cr channel input signals. |
| PIC (Picture monitor mode) | Monochrome display of Y/G channel input signals. |
| AUDIO (Audio mode) | Lissajous display of analog stereo audio signal. |
| EYE (Eye Pattern Mode) | Displays serial digital signal in eye pattern format. |

2.3.2 Principal Function

(1) Serial digital/analog component signal measurements

| | |
|--------------------|---|
| Cursor function | Voltage and time measurements (WFM, EYE). |
| Full line selector | Selects line on each field (WFM, VEC, PIC, EYE). |
| Timing measurement | Measures time difference between Y/G channel and Cb/B,Cr/R channel (WFM only). |
| Format converter | Converts Y, Cb, Cr format signal into GBR format for displaying signal on the CRT (selectable). |

(2) Serial digital signal measurements

| | |
|--|---|
| Data analysis function | Analyzes EDH signal, and TRS and ANC data. |
| Digital data dump function | |
| Equivalent cable length measurement function | Displays signal level as an equivalent length of 5C-2V coaxial cable. |
| Format converter | Converts Y, Cb, Cr format signal into GBR format for displaying signal on a picture monitor (selectable). |

2.4 Specifications

2.4.1 Measurement Signal

(1) Video Signal

| | |
|-----------------------|---|
| Serial Digital Signal | Conforms to ITU-R656-3, SMPTE 259M standards |
| Analog Signal | 4:2:2 serial digital component video signal Three wire analog component video signal, Y, Cb, Cr or GBR |
| System Selection | 525/60 or 625/50 system can be selected automatically or manually. |

(2) Audio Signal Signal

Analog stereo audio signal

2.4.2 Synchronization

Sync Signal Amplitude

| Input Signal | Amplitude |
|----------------|----------------------------|
| Serial Digital | 0.8 V _{p-p} ±10% |
| Analog | 0.3 V _{p-p} ±6 dB |
| External | 0.3 V _{p-p} ±6 dB |

Sync Signal Source

| Input Signal | Int Sync | Ext Sync |
|----------------|-------------|----------|
| Serial Digital | Regenerated | A/B* |
| Analog | A/B* | A/B* |

* A/B: Analog composite or black bust signal

2.4.3 Input

(1) Serial Digital Input

| | |
|----------------------------|---|
| Input Connector | BNC, 2 passive loop-through inputs |
| Return Loss | ≥25 dB, 1 MHz to 270 MHz ≥15 dB, 1 MHz to 270 MHz (powered on and off) |
| Input Impedance | 75Ω loop-through |
| Maximum Input Voltage | ±5V (DC+peak AC) |
| Isolation between Channels | ≥50 dB, 50 kHz to 300 MHz |
| Loop-Through Isolation | ≥50 dB, 50 kHz to 300 MHz |

(2) Analog Input

| | |
|----------------------------|--|
| Input Connector | BNC, 1 passive loop-through input |
| Return Loss | ≥40 dB, 50 kHz to 6 MHz (powered on and off) |
| Input Impedance | 75Ω loop-through |
| Maximum Input Voltage | ±2V (DC+peak AC) |
| Isolation between Channels | ≥60 dB, at 4.43 MHz |
| Loop-Through Isolation | ≥70 dB, at 4.43 MHz |

(3) Analog EXT REF Input

| | |
|-----------------------|--|
| Input Connector | BNC, 1 passive loop-through input |
| Return Loss | ≥ 40 dB, 50 kHz to 6 MHz (powered on and off) |
| Input Impedance | 75 Ω loop-through |
| Maximum Input Voltage | ± 2 V (DC+peak AC) |

2.4.4 Output

(1) Serial Digital Active Output

| | |
|------------------|---------------------------------|
| Output Signal | Retransmits either input signal |
| Output Impedance | 75 Ω |
| Output Connector | One BNC connector |
| Output Level | 800 mVp-p $\pm 10\%$ |

(2) Analog Picture Monitor Output

| | |
|-------------------------------|---|
| Format | |
| Serial Digital Signal Input | Y, Cb, Cr or GBR (0 V back porch clamp), selectable |
| Analog Component Signal Input | Same format as input signal |
| Output Amplitude | 1 Vp-p $\pm 3\%$, for analog signal (video+sync) 0.7 Vp-p $\pm 3\%$, for digital signal (video) 0.3 Vp-p $\pm 10\%$, for digital signal (sync) |
| Frequency Response | 500 kHz to 5 MHz ($\pm 3\%$) |
| Output Impedance | 75 Ω |
| Output Connector | Three BNC connectors, one system |

2.4.5 Vertical Axis

(1) Deflection System

| | |
|-----------------------------|---|
| Deflection Factor | $\pm 1\%$, 1 V full scale $\pm 2\%$, X5 MAG $\pm 2\%$, X1, GBR display |
| Amplitude Variable Range | At least 0.5 to 1.4 times |
| Variable Range | 0.7 Vp-p to 2 Vp-p, X1 full scale 0.14 Vp-p to 0.4 Vp-p, X5 MAG |
| Step Response (2T Pulse) | Within $\pm 1\%$, Pulse/bar ratio Within $\pm 2\%$, Overshoot Within $\pm 1\%$, Preshoot Within $\pm 2\%$, Ringing Within $\pm 2\%$, Sag (vertical tilt) |

(2) Filter Characteristics

FLAT(X1 Gain)

Frequency Response for Serial Digital Signal Input

| | |
|--------|---|
| Y | Within±3%, 50kHz to 5.5 MHz (50kHz ref) |
| Cb, Cr | Within±3%, 50kHz to 2.5 MHz (50kHz ref) |

Frequency Response for Analog Component Signal Input (common to each channel)

| |
|---|
| Within±2%, 50kHz to 6 MHz (50kHz ref) |
| Within+2 and -5%, 6 MHz to 8MHz (50kHz ref) |

LOW PASS

| | |
|-------------|-----------------|
| Attenuation | ≥35 dB, 3.58MHz |
|-------------|-----------------|

DIF'D STEP

| | |
|-------------|-------------------------------------|
| Gain | 400 kHz band-pass filter |
| Attenuation | X5 MAG±10%, FLAT ref |
| | ≥20 dB, 14 kHz, 2 MHz (400 kHz ref) |
| | ≥40 dB, at 3.58 MHz |

(3) Timing Mode

| | |
|----------|-----|
| Accuracy | ±5% |
|----------|-----|

2.4.6 DC Restorer

Frequency Response

| | |
|-----------|--|
| Slow Mode | ≤20% (absolute value of attenuation at 60Hz input) |
|-----------|--|

| | |
|-----------|--|
| Fast Mode | ≥80% (absolute value of attenuation at 60Hz input) |
|-----------|--|

Clamp Position

| | |
|----------------|---|
| Variable Range | Back porch |
| | At least 5 to 7μs (with respect to sync pulse falling edge) |

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

2.4.7 Horizontal Axis

Operation Mode

| | |
|---------|--|
| OVERLAY | Displays waveforms in overlay mode |
| PARADE | Displays waveforms in parade mode |
| TIMING | To measure time difference between channels using the bowtie* signal |
| | (*Use of bowtie has been authorized by Tektronix, Inc.) |

| | |
|---------------------|--|
| Sweep Mode | Automatic sweep |
| Sweep Time | |
| Line Display | 1H, 2H, 3H |
| Line Magnification | 1H MAG, 2H MAG, 3H MAG |
| Field Display | 1V, 2V, 3V |
| Field Magnification | 1V MAG, 2V MAG, 3V MAG |
| Time Accuracy | Within $\pm 3\%$ |
| Sweep Length | 12.5 div ± 0.7 div |
| Linearity | Within $\pm 3\%$ |
| Display Positioning | Any parts of the waveform can be displayed in all sweep modes. |

2.4.8 Vectorscope Mode(VEC)

Vectorscope capability by using Cb, Cr signals.

Input Format

Serial Digital Signal Input Conforms to SMPTE 125M/ITU-R601 standards

Analog Component Signal Input

Conforms to 525/60 Betacam, MII, SAPTE standards.

Conforms to 625/50 EBU/N10 standards.

| | |
|--------------------------|--|
| Vertical Axis Bandwidth | ≥ 1 MHz |
| Vertical Axis Accuracy | $\pm 1\%$ |
| Horizontal Axis Accuracy | $\pm 1\%$ |
| Display Axes | Horizontal axis: Cb Vertical axis: Cr |

2.4.9 Picture Mode(PIC)

Displays Y or G signal as a picture.

Signal Displayed Monochrome display of Y or G signal

Contrast Adjustable with menu

2.4.10 Audio Mode(AUDIO)

Displays stereo signal in lissajous pattern.

| | |
|-----------------------|------------------------------------|
| Input | Direct coupled (balanced input) |
| Input Connector | D-sub, 25-pin (rear panel) |
| Input Impedance | ≥ 20 k Ω |
| Calibration Accuracy | 0 dBm ± 0.5 dB |
| Full Scale | 0, 2, 4 dBm (selectable with menu) |
| Maximum Input Voltage | ± 12 V(DC+peak AC) |
| Bandwidth | ≥ 20 kHz (-3 dB) |
| X-Y Phass Difference | $\leq 1^\circ$ (20 kHz) |

2.4.11 Eye Pattern Display

| | | |
|--------------------|--|-----------------|
| Method | Equivalent time sampling | |
| Frequency Range | 50 kHz to 450 MHz (within-3 dB, +1 dB) | |
| Amplitude Accuracy | Within $\pm 5\%$ at 800 mV input | |
| Time Base | 1 ns/div, 3 ns/div, 500 ps/div | |
| Time Base Accuracy | Within $\pm 3\%$ | |
| Jitter Filter | 10 Hz High-pass filter | -3 dB at 10 Hz |
| | 100 Hz High-pass filter | -3 dB at 100 Hz |
| | 1 kHz High-pass filter | -3 dB at 1 kHz |

2.4.12 Digital Function

| | |
|--|--|
| Error Indicator | ALARM LED (when error occurs on the serial digital input signal.) |
| EDH Function | Conforms to SMPTE RP-165 standards |
| Signal Bit Rate Confirmation | |
| TRS Monitoring | Monitors SAV position with respect to EAV, and format. |
| ANC Data Monitoring | Monitors presence of audio data, and channel display format. |
| Data Dump Function | Displays 10 bits digital data in hexadecimal notation after parallel conversion is made. |
| Series Display | Displays data in address order specified by SMPTE 125M/ITU-R601 standards. |
| Component Display | Displays in parallel with Y and Cb, Cr addresses |
| Equivalent Cable Length Measurement Function | Converts input signal level into equivalent length of 5C-2V cable. |

2.4.13 Calibration Signal

| | |
|-----------|--|
| Amplitude | 1V \pm 0.5% |
| Time | One cycle per 2 divisions |
| | One cycle per 10 divisions (at 1H MAG) |

2.4.14 Line Selector

| | | |
|-----------------|---------------------------|---------------------------|
| Operation Mode | WFM, VEC, PIC, EYE | |
| Operation Field | FLD1, FLD2, ALL | |
| Selectable Line | | |
| | <u>525/60-Line system</u> | <u>625/50-Line system</u> |
| FLD1 and 2 | Line 1 to 262 | Line 1 to 312 |
| ALL | Line 1 to 525 | Line 1 to 625 |

2.4.15 Line Window

| | |
|-----------------|------------------------------|
| Function | Displays lines continuously. |
| Window Range | 1 to 15H |
| Operation Mode | WFM,VEC,PIC |
| Operation Field | FLD1,FLD2,ALL |

2.4.16 Preset Function

| | |
|--|--|
| Number of Presettable and Recallable Items | Up to 10 |
| Presettable and Recallable Items | All front panel controls(except INTEN, READOUT INTEN, ROTATION, FOCUS, ILLUM, POWER) |

2.4.17 Remote Control

| | |
|---------------|----------------------------------|
| Control Input | Rear panel, D-sub, 25pin(REMOTE) |
|---------------|----------------------------------|

2.4.18 Cursor Measurement

| | |
|-----------------------|--|
| Configuration | Two horizontal cursors (REF, Δ) Two vertical cursors (REF, Δ) |
| Amplitude Measurement | Measures voltage between the REF and Δ cursors |
| Unit | mV or IRE |
| Measurement Range | 0 to 2.006 V, 0 to 286.6 IRE (0.7 V) 0 to 2.006 V, 0 to 280.6 IRE (0.714 V) |
| Calibration Accuracy | $\pm 0.5\%$ |
| Resolution | 2 mV, or 0.2 IRE |

Amplitude Ratio Measurement

Displays amplitude between the REF and Δ cursors in % with respect to an arbitrary set level as a 100% reference.

| | |
|----------------------|--|
| Time Measurement | Measures time between the REF and Δ cursors |
| Measurement Range | Within ± 6 div from screen center |
| Calibration accuracy | $\pm 3\%$ |
| Resolution | 1/80 div |

Time Ratio Measurement
Displays time between the REF and Δ cursors in % with respect to an arbitrary set time as a 100% reference.

Frequency Measurement
Frequency is displayed in reciprocal of period between the REF and Δ cursors.

Tr, Tf Measurement (EYE) V cursors are displayed at 20% and 80% positions for measuring rise and fall times. Use the H cursors (REF, Δ) to measure time.

2.4.19 CRT

| | |
|-------------------------|--------------------------------|
| Type | 150mm rectangular (P31) |
| Accelerating Potential | 16.5 kV |
| Effective Display Area | 80 x 100mm |
| Graticule | |
| Waveform Monitor Mode | Illuminated internal graticule |
| Vectorscope, Audio Mode | Electronic graticule |

2.4.20 General Specifications

| | |
|--------------------------|--|
| Power Requirements | 90 to 250 VAC, 48 to 440 Hz |
| Fuse | Time-lag, 2A 250V |
| Power Consumption | ≤70W |
| Dimensions and Weight | 215 (W) x 132 (H) x 429 (D)mm, 5kg |
| Environmental Conditions | |
| Guaranteed Accuracy | Temperature: 10 to 35°C Humidity: 10 to 80% RH |
| Operating | Temperature: 0 to 40°C Humidity: 10 to 85% RH Indoor use Altitude up to 2,000m Overvoltage Category II Pollution degree 2 |

2.4.21 Supplied Accessories

| | |
|----------------------------------|---|
| Illumination lamp | 5 |
| Fuse | 1 |
| Screw, rack mounting (inch size) | 2 |
| Power cord | 1 |
| Cover, inlet stopper | 1 |
| D-sub, 25-pin connector | 1 |
| D-sub, 25-pin connector cover | 1 |
| Instruction manual | 1 |

2.4.22 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) |

3. PANEL DESCRIPTION

3.1 Front Panel

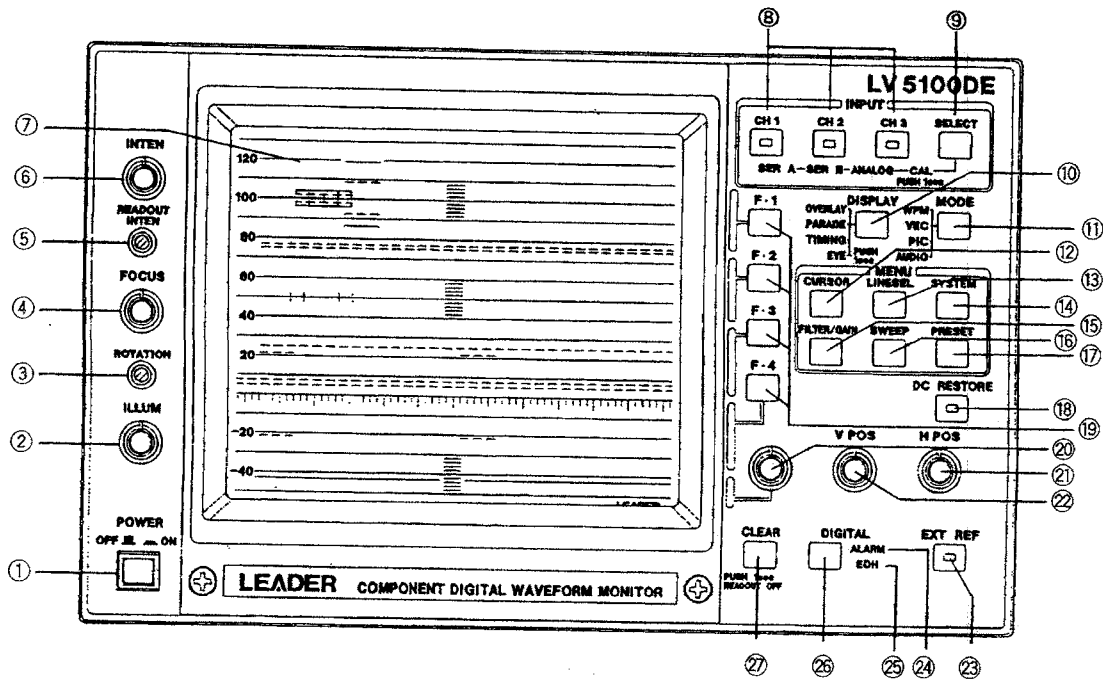


Figure 3-1

- ① POWER switch
Press to turn power on.
Release to turn power off.
- ② ILLUM control
Controls brightness of the scale illuminator.
Clockwise rotation increases brightness.
- ③ ROTATION adjustment
Compensates for slight tilting of the trace due terrestrial magnetism.
- ④ FOCUS control
Adjusts trace sharpness.

- ⑤ READOUT INTEN adjustment
Controls intensity of the readout characters.
- ⑥ INTEN control
Control intensity of the displayed waveform.
- ⑦ Graticule
Common to both 525/60 and 625/50 systems.
Refer to Section "4.2 Graticule" for detail.
- ⑧ Y/G,Cb/B,Cr/R keys
Select channel to be displayed in the WFM mode.
The channel can be selected respectively. Lit LED indicates the selected channel.
All channels cannot be turned off simultaneously.
- ⑨ SELECT key
Selects input signal sequentially: SER A (serial digital A), SER B (serial digital B), or ANALOG can be selected.
To obtain the CAL mode, press this key for at least one second.
- ⑩ DISPLAY key
Selects waveform display format in the WFM mode.
The OVERLAY, PARADE, TIMING, or EYE can be selected sequentially by pressing this key.
Holding down this key for at least one second to display eye pattern.

OVERLAY: Displays signals in overlay mode.
 PARADE: Displays signals in parade mode.
 TIMING: The delay time between signals can be measured by applying timing signal(bowtie signal)to the Y/G,Cb/B,and Cr/R connectors on the rear panel.
 EYE: Displays serial signal in eye pattern format.

- ⑪ MODE key
Selects operation mode.
The WFM, VEC, PIC, or AUDIO can be selected sequentially.

WFM: Waveform monitor mode
 VEC: Vectorscope mode
 PIC: Picture monitor mode
 AUDIO: Audio monitor mode

⑫ - ⑰ MENU key group

Select the menu.

The selected menu can be operated by using the FUNCTION KEY (F·1 to F·4) and FUNCTION KNOB.

⑫ CURSOR key

This key is only effective in the WFM mode.

By pressing this key, the key LED lights, and the cursor menu and cursor are displayed.

To cancel the cursor menu and cursor, press this key again. The key LED goes off.

⑬ LINESEL key

This key can be used in the all operation modes except the AUDIO mode.

By pressing this key, the key LED lights, and the line selector menu and selected line are displayed.

To cancel the selector menu mode, press this key again. The menu is cleared and key LED goes off.

⑭ SYSTEM key

Sets basic operation mode of this instrument.

By pressing this key, the SYSTEM menu is displayed.

To cancel the SYSTEM menu display, press this key again.

⑮ FILTER/GAIN key

The filter can only be set in WFM and EYE modes as shown below.

WFM MODE FILTER

FLAT/LOW PASS/DIF STEP Filter setting

EYE MODE JITTER HPF

10Hz/100Hz/1KHz

High-pass filter for jitter measurement

The filter setting is only effective in the WFM mode.

The gain setting is effective in all modes.

By pressing this key, the key LED lights, and the FILTER/GAIN menu is displayed. The waveform is also displayed according to the current setting conditions.

By pressing this key again, the default setting (X1 gain, VARIABLE off) is made. The menu is displayed and the key LED lights.

The gain can be set in the VEC and WFM modes respectively. The gain factor is set to X1 after canceling the menu.

In the PIC mode, the picture contrast can be set.

In the AUDIO mode, the gain setting mode is used to set the input sensitivity. Select the same sensitivity as the scale. The setting condition is retained after canceling the menu.

- ⑩ SWEEP key
This key is only effective in the WFM mode.
By pressing this key, the sweep menu used for setting the sweep time is displayed.
To cancel the sweep menu display, press this key again.
- ⑪ PRESET key
This key is used for storing and recalling the panel settings.
By pressing this key, the preset menu is displayed.
To cancel the preset and recall modes, press this key again.
- ⑫ DC RESTORE key
This key is only effective in the WFM mode.
By pressing this key, the key LED lights and the pedestal level of analog component signal is fixed.
This key fixes the pedestal level when waveform is moved by changing Average Picture Level (APL).
To cancel the mode, press this key again. The key LED goes off.
When the serial digital input is selected, the DC restorer is always set on regardless of the key setting.
- ⑬ FUNCTION KEYS (F·1, F·2, F·3, F·4)
The key function depends on the menu. The function is displayed on the screen.
- ⑭ FUNCTION KNOB
The controllable function depends on the menu. The function is displayed on the screen.
- ⑮ H POS control
Moves waveform horizontally.
- ⑯ V POS control
Moves waveform vertically.
- ⑰ EXT REF key
Selects trigger source.
When the external trigger source is selected, the key LED lights. When the internal trigger source is selected, the key LED goes off.
- ⑱ ALARM LED
Lights when error occurs on the digital input signal.
- ⑲ EDH LED
Lights when EDH signal is superimposed on the digital signal.
The EDH function is only effective when the LED lights.

⑳ DIGITAL key

Displays digital operation mode screen used for checking the digital signal conditions.

To cancel this mode, press this key again. The key LED goes off.

The digital menu screen consists of three pages. The pages can be selected by pressing the F·1 key.

The waveform intensity is reduced automatically for easier observation.

Adjust the INTEN control ㉔ as required.

㉑ CLEAR key

By pressing this key, the menu is only cleared. During the key LED (㉒, ㉓, ㉔, ㉕) lights, the setting conditions are retained even when this key is pressed.

All readout display can be cleared when this key is pressed for at least one second. If part of the waveform is obscured by readout display, this phenomenon can be eliminated.

3.2 Rear Panel

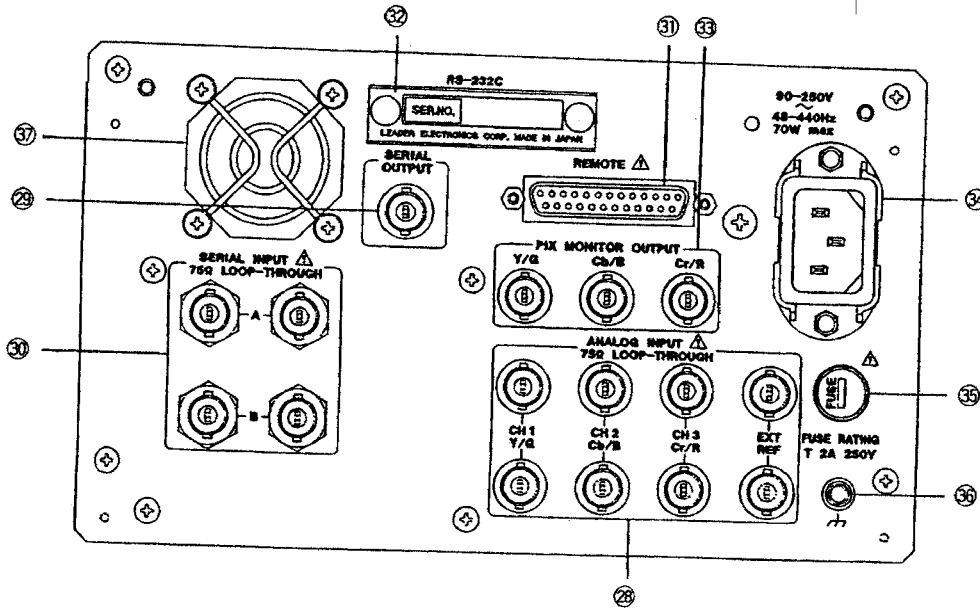


Figure 3-2

- ②⑧ **ANALOG INPUT** connectors
 Analog signal input connectors and external trigger source input connector. Three analog input systems are provided, and accept either Y, Cb, Cr or GBR format. Input configuration is loop-through. Use the Y/G connector to display the composite signal.
- ⚠ CAUTION**
 Do not apply ± 2 V (DC+peak AC) or higher voltage to the CH1 Y/G, CH2 Cb/B, and CH3 Cr/R connectors.
 Do not apply ± 12 V (DC+peak AC) or higher voltage to the EXT REF connectors.
 Excessive input voltage can cause trouble.
- ②⑨ **SERIAL OUTPUT** connector
 Serial digital active output connector. Signal applied to the SERIAL INPUT B is retransmitted when the SER B is selected. Signal applied to the SERIAL INPUT A is retransmitted when other INPUT is selected.

③⑩ SERIAL INPUT connector
Serial signal input connector.
Two systems (A and B) are provided. Input configuration is loop-through.

③⑪ REMOTE control connector
D-type subminiature, 25-pin connector.
Pins are assigned for remote control and X-Y audio input.
Refer to Section "4.14 REMOTE Connector" for detail.

 CAUTION

Since the maximum allowable input voltage to this connector (Pin 4 and 17 ~ 25) is TTL level, do not apply voltage exceeding 0 V and +5 V.
Excessive input voltage can cause trouble.

③⑫ Instrument serial number

③⑬ PIX MONITOR OUTPUT connector
Picture monitor output connector.
When digital signal is input, the Y, Cb, Cr or GBR output format can be selected by using the menu.

③⑭ AC inlet
Voltage range is 90 to 250 VAC, universal.

③⑮ Fuse
Power supply fuse. Use specified fuse when replace it.

③⑯ Signal ground terminal

4. OPERATING PROCEDURE

4.1 Menu Operation and Structure

4.1.1 Basic Menu Operation

The MENU key group (CURSOR ⑫, LINESEL ⑬, SYSTEM ⑭, FILTER/GAIN ⑮, SWEEP ⑯, PRESET ⑰) is used to display the menu.

To operate the menu, use the FUNCTION KEY (F·1 to F·4) and FUNCTION KNOB according to the menu.

The CURSOR ⑫, LINESEL ⑬, FILTER/GAIN ⑮, and SWEEP ⑯ keys are equipped with LED. When the menu mode or user setting is in operation, the key LED lights. When the default setting is selected, the key LED goes off (IMPORTANT!).

Each key can set the function on or off alternately.

The CURSOR ⑫, LINESEL ⑬, FILTER/GAIN ⑮, and SWEEP ⑯ key are convenient due to user setting and default setting can be selected by simply pressing the key.

The default setting are as follows.

| | |
|-------------------|------------------|
| CORSOR key : | OFF |
| LINESEL key : | OFF |
| FILTER/GAIN key : | |
| FILTER | FLAT |
| GAIN | X1, VARIABLE OFF |
| SWEEP MAG key : | OFF |

The MENU key can be turned on simultaneously (LED on), however, the last keyed function is only operative.

For example to set the gain after the cursor has been set, press the FILTER/GAIN key ⑮ (both CURSOR and FILTER/GAIN key LEDs light), then set the gain. To set the cursor again, press the CURSOR key ⑫ for operating the cursor mode.

4.1.2 Using the CLEAR key

(1) Clearing the Menu

When a waveform is displayed with menu and part of the waveform is obscured by the menu, press the CLEAR key to eliminate the menu. The menu setting condition is retained even when cleared.

To display the menu again, press the corresponding menu key in the MENU key group.

(2) Clearing All Readouts

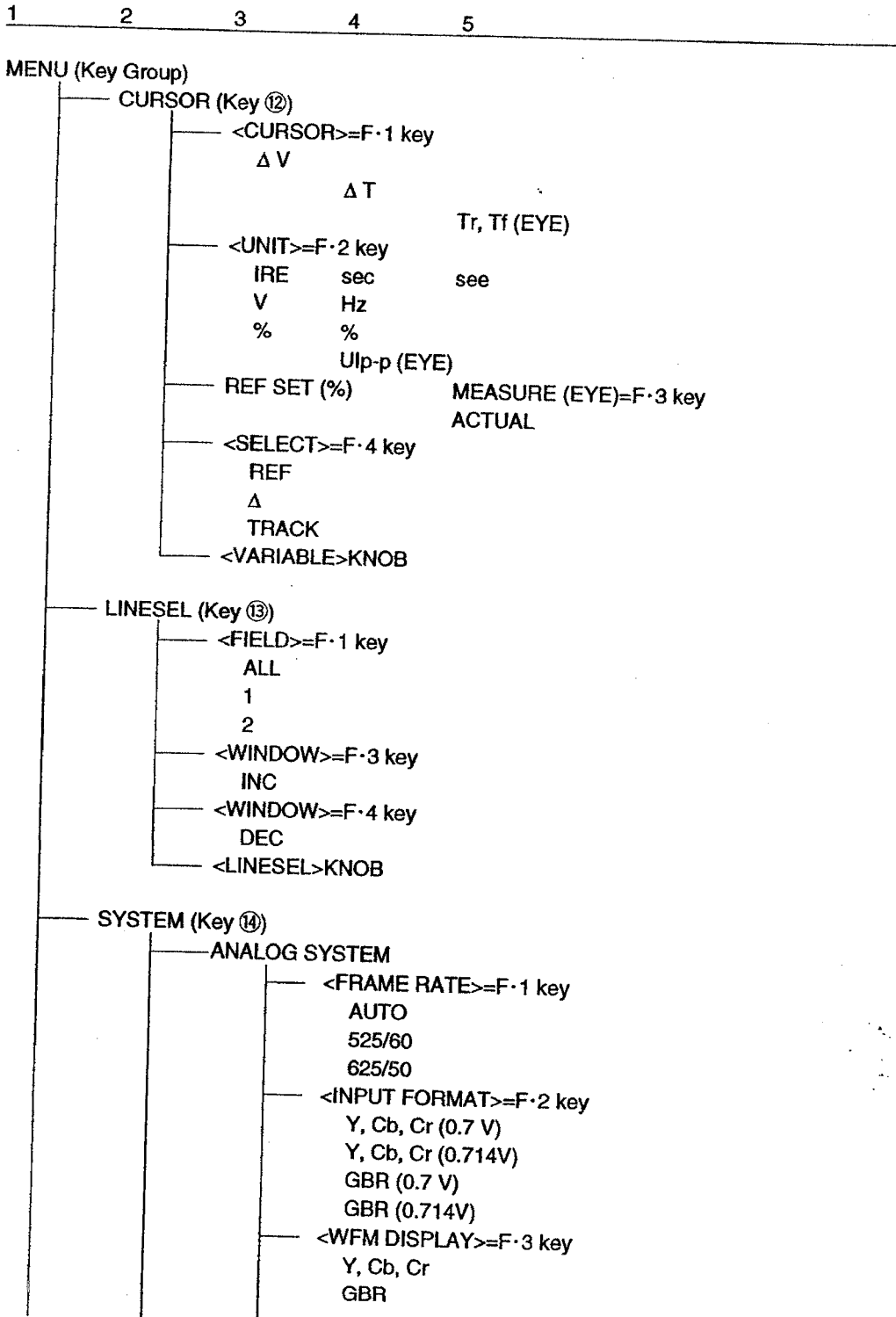
All readouts can be cleared by pressing CLEAR key for at least one second.

To display readouts again, press this key for at least one second, or press the corresponding menu key.

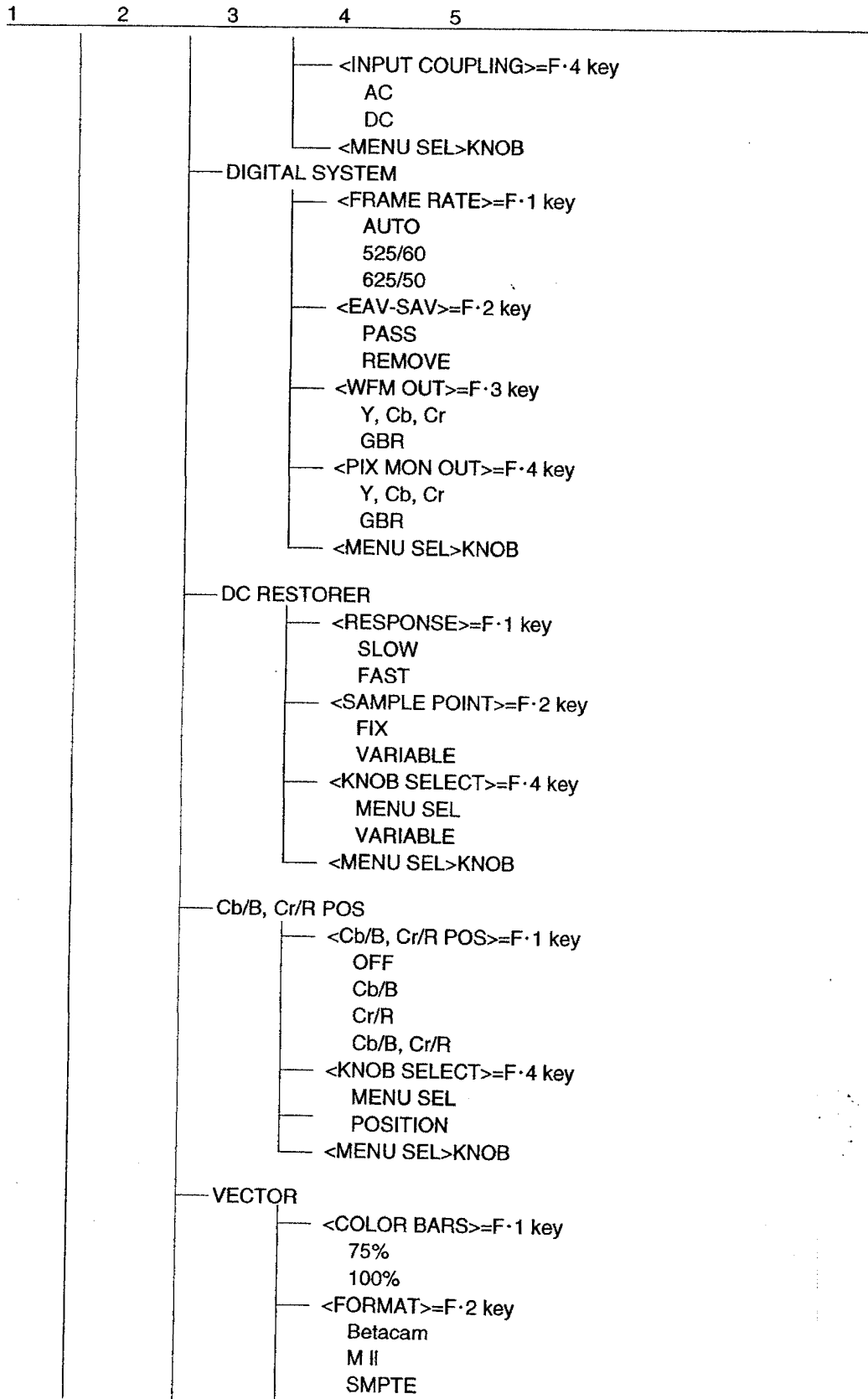
4.1.3 Menu Structure

The menu structure is shown below. Refer to applicable section for detail.

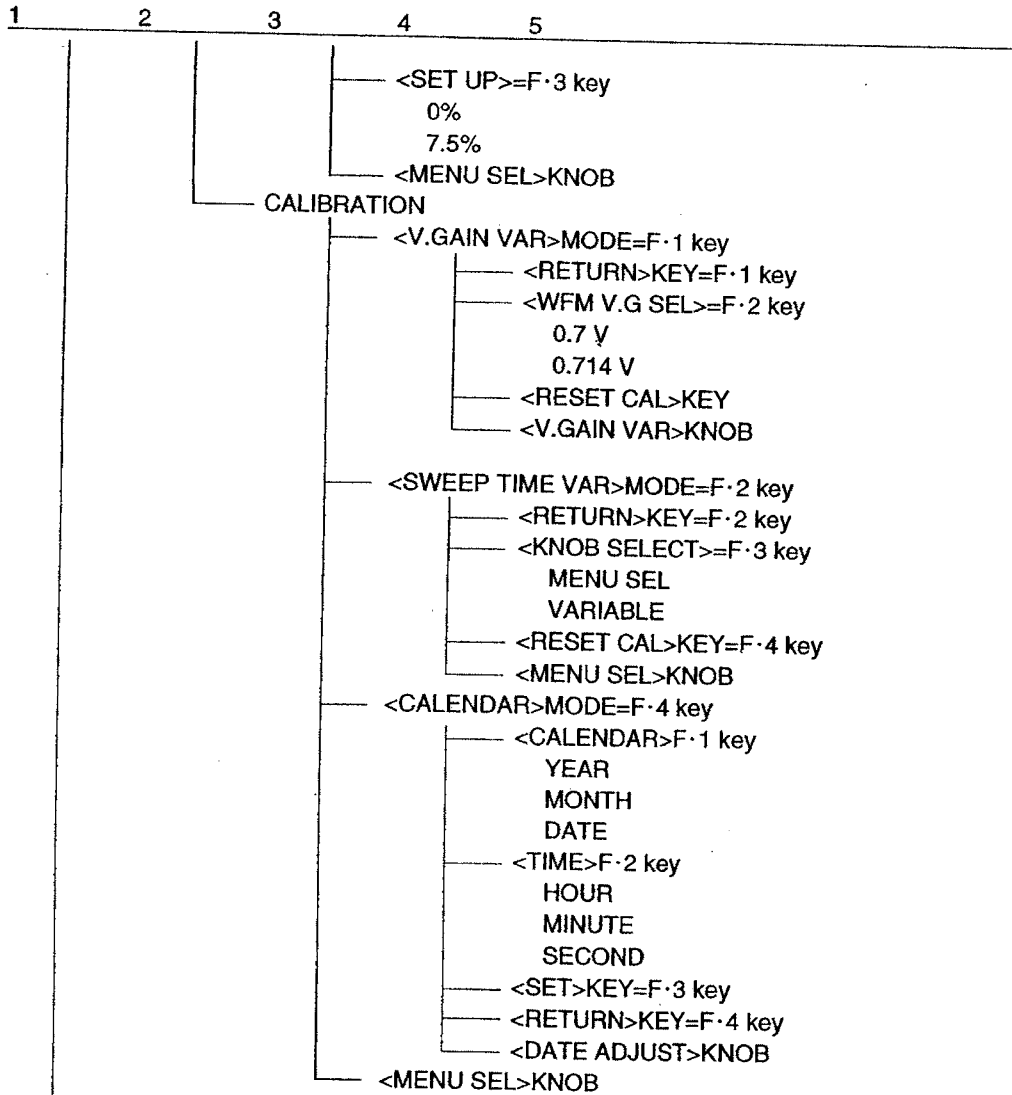
Hierarchy



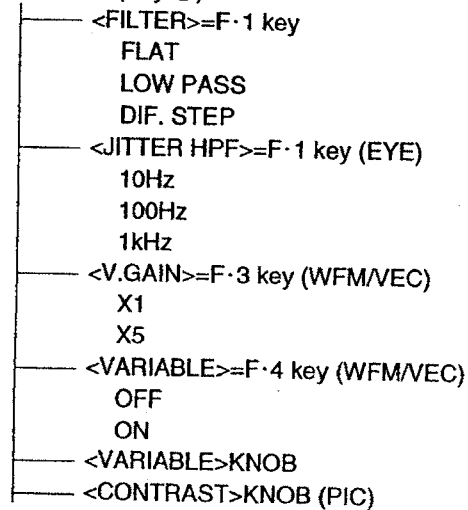
Hierarchy



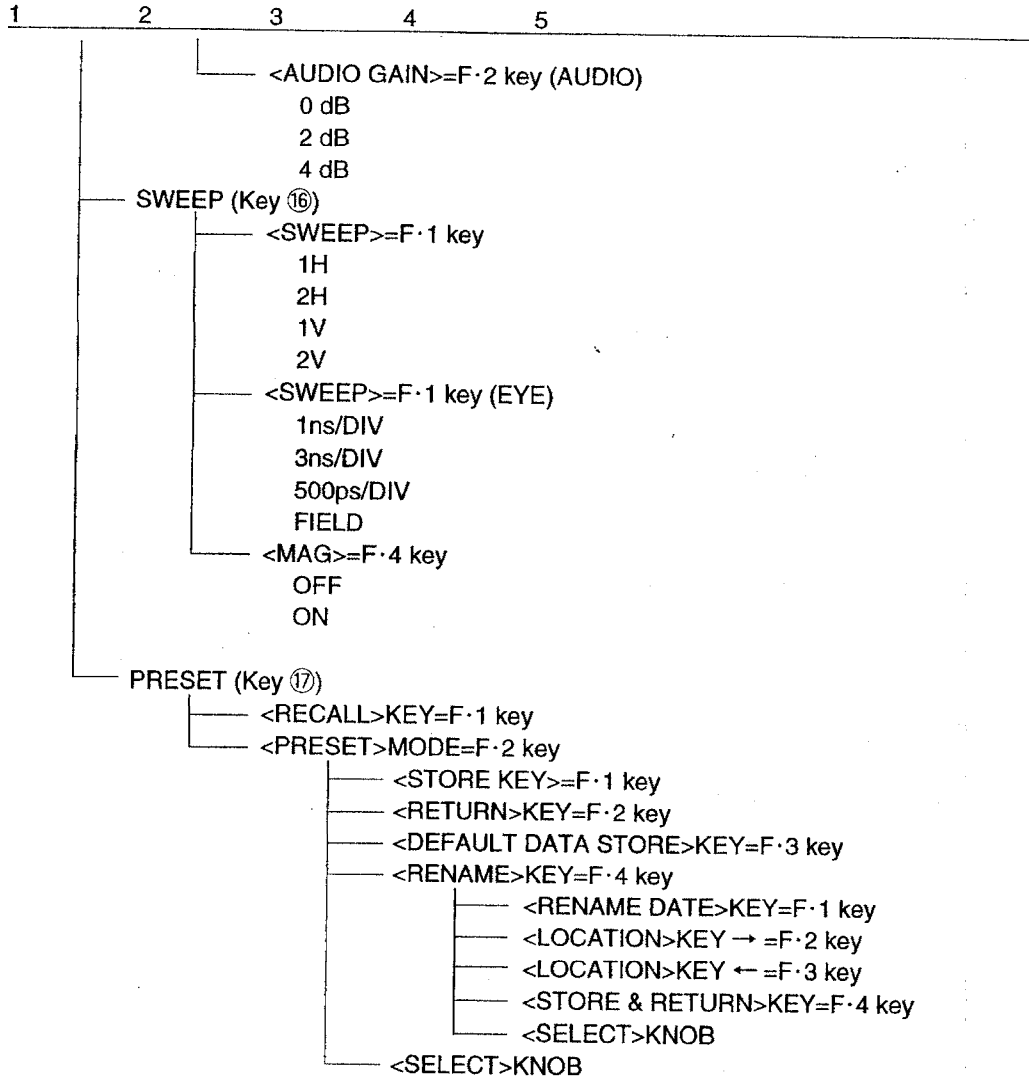
Hierarchy



FILTER/GAIN (Key 15)



Hierarchy



4.1.4 Using the Menu

The menu operation procedure is described in brackets.

Procedure : [XXX - XXX - XXX]

- Example to set the 1V sweep time calibration in the 525/60 system.

Procedure : [SYSTEM - CALIBRATION - F·2<SWEEP TIME VAR>MODE -
F·3<KNOB SELECT>MENU - <CAL SWEEP>525/60 1V -
F·3<KNOB SELECT>VARIABLE]

1. Press the SYSTEM key ⑭.
The SYSTEM menu is displayed. The waveform intensity is reduced.
2. Highlight the CALIBRATION by using the <MENU SEL>KNOB.
The next hierarchical menu is displayed at the right margin of the screen.
3. The <SWEEP TIME>MODE is displayed at the F·2. Press the F·2 key.
4. The MENU SEL and VARIABLE are displayed at the F·3 as a selection item of the <KNOB SELECT>.
Highlight the MENU SEL by pressing the F·3 key.
The selection item of the CAL SWEEP menu are displayed at the left margin of the screen.
Highlight the 525/60 1V by using the <MENU SEL>KNOB.
5. Select the VARIABLE in the <KNOB SELECT> by pressing the F·3 key.
The calibration signal is displayed instead of the waveform.
Adjust the INTEN control as required.
The sweep rate can be adjusted by using the <VARIABLE>KNOB.
6. To escape from the menu after calibration is completed, press the SYSTEM key ⑭ or CLEAR key ⑳.

4.2 Graticule

The graticule is common to the video signal amplitude of 0.7 V and 0.714 V System. The scale unit is IRE.

When the input format of the digital or analog signal is set to Y, Cb, Cr(0.7 V) or GBR (0.7 V), the 100 IRE equals 0.7 V (called 0.7 V System).

When the input format of the analog signal is set to Y, Cb, Cr (0.714 V) or GBR (0.714 V), the 100 IRE equals 0.714 V (called 0.714 V System).

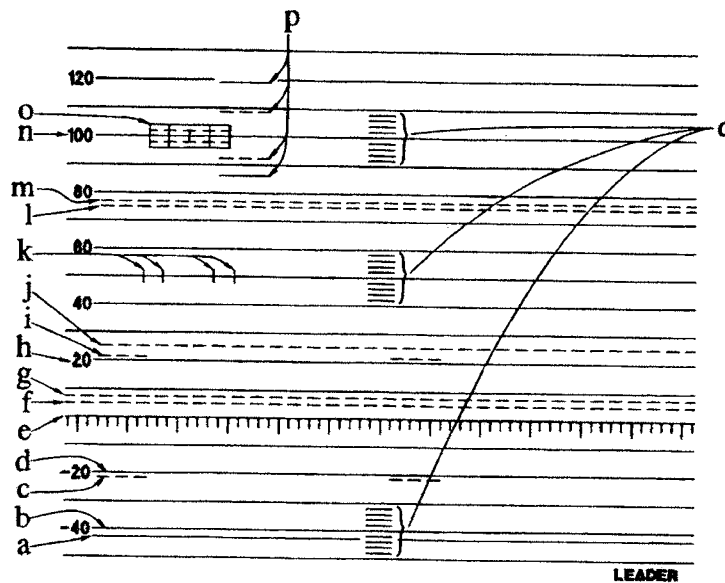


Figure 4-1

- a. -43 IRE scale
Indicates sync tip level of the 0.7 V System.
- b. -40 IRE scale
Indicates sync tip level of the 0.714 V System.
- c. Indicates burst level (composite signal) of the 0.7 V System.
- d. -20 IRE scale
- e. 0 IRE scale
Divided into 12 major divisions and 5 subdivisions.
- f. 5 IRE scale
Indicates camera setup level.

- g. 7.5 IRE scale
Indicates setup level.
- h. 20 IRE scale
Indicates burst level(composite signal) of the 0.714 V System.
- i. Indicates burst level(composite signal) of the 0.7 V System.
- j. 25 IRE scale
Used for adjusting a camera setup(5 IRE) level.
When X5 MAG is selected, 5 IRE scale equals 25 IRE on the screen.
- k. K factor measurement scale
- l. 75 IRE scale
Indicates 75% white level of 75/0/0/0 color bars.
- m. 77 IRE scale
Indicates 75% white level of 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

4.3 Connection

The SERIAL INPUT and ANALOG INPUT connectors on the rear panel are the loop-through configuration as shown in Figure 4-2.

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

CAUTION

Do not apply ± 5 V (DC+peak AC) or higher voltage to the SERIAL INPUT connectors.

Do not apply ± 2 V (DC+peak AC) or higher voltage to the ANALOG INPUT (CH1 Y/G, CH2 Cb/B, CH3 Cr/R) connectors.

Do not apply ± 12 V (DC+peak AC) or higher voltage to the ANALOG INPUT (EXT REF) connectors.

Excessive input voltage can cause trouble.

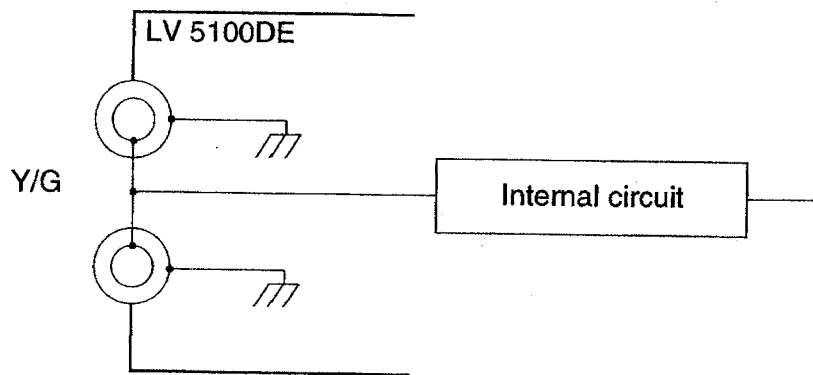


Figure 4-2 Loop-through input

4.4 Displaying the Trace

Procedure

1. Connect the power plug to the mains.
2. Set the FOCUS control ④ and INTEN control ⑥ 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 ③ to make the baseline parallel to horizontal graticule line.

Note : If no trace is appeared, it may positioned off screen. Rotate the H POS control ②① and V POS control ②② as required to display the trace.

For brightening the graticule, rotate the ILLUM control ② as required.

This setting is convenient for photographing.

The READOUT INTEN ⑤ control is used to adjust readout intensity.

4.5 Using the SELECT Key

4.5.1 Input Signal Selection

This key is used to select the signal (i.e., serial digital A, serial digital B, analog) applied to each input connector.

4.5.2 CAL Mode

To obtain the CAL mode, press SELECT key ⑨ for at least one second. The calibration signal is displayed.

The signal amplitude is 1 Vp-p.

One-cycle square wave equals 2 horizontal divisions. See Figure 4-3.

When the 1 H MAG is selected, one-cycle square wave equals 10 divisions. See Figure 4-4.

To escape from the CAL mode, press the SELECT key ⑨ again.

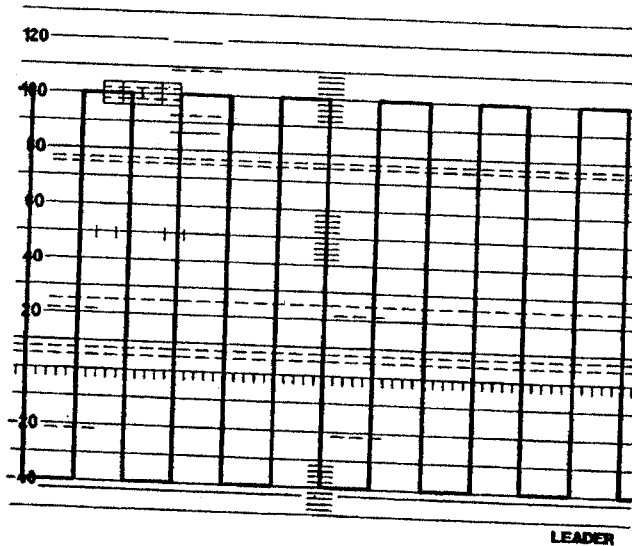


Figure 4-3 Calibration signal

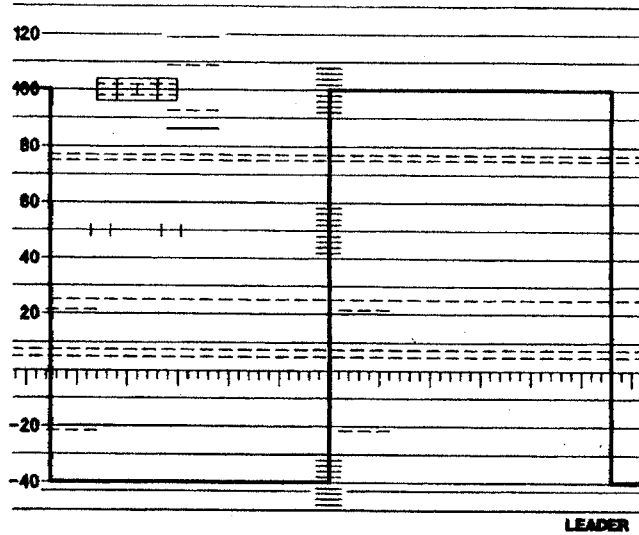


Figure 4-4 Calibration signal, 1H MAG

4.6 Using the MODE Key

This key is used to select the basic operation mode.

The WFM, VEC, PIC, and AUDIO mode (i.e., waveform monitor, vectorscope, picture monitor, audio mode) can be selected sequentially by pressing this key.

4.7 Waveform Monitor Mode

Before operating the waveform monitor mode, set the system according to the signal to be measured. Use the SYSTEM key ⑭ and associated menus. Refer to Section "4.12 Using the SYSTEM Key " for detail.

Set the following systems. Underlined items are the default settings.

- System setting for observing serial digital signal
 - Frame rate AUTO, 525/60, 625/50
 - TRS waveform display PASS(display), REMOVE(no display)
 - Waveform display format Y, Cb, Cr or GBR
 - Picture monitor output format Y, Cb, Cr or GBR

- System setting for observing analog component signal
 - Frame rate AUTO, 525/60, 625/50
 - Input signal format Y, Cb, Cr (0.7 V)
GBR (0.7 V)
Y, Cb, Cr (0.714 V)
GBR (0.714 V)
 - Waveform display format Y, Cb, Cr or GBR
 - Input coupling AC, DC

- Other system settings
 - DC restorer Sample point, response speed
 - Cb/B, Cr/R position Vertical positioning

4.7.1 Using the INPUT Keys

The channel to be displayed can be selected by using the Y/G, Cb/B, and Cr/R keys ⑧.

By pressing the key, the selected channel's waveform is displayed. The key LED lights.

By pressing the key again, the LED goes off. All channels cannot be turned off. When the TIMING is selected by pressing the DISPLAY key ⑩, the (Y/G)-(Cb/B) is displayed at the left of the graticule center, and (Y/G)-(Cr/R) is displayed at the right of the graticule center regardless of the Y/G, Cb/B, Cr/R key ⑧ setting.

When measuring the serial digital signal, the Y, Cb, or Cr signal separated by SMPTE 125M/ITU-R601 standards can be selected.

When measuring the analog component signal, lit LED indicates the selected channel.

4.7.2 Using the DISPLAY Key

This key is used to select the multichannel display mode and time difference measurement mode.

The OVERLAY, PARADE, TIMING, EYE can be selected sequentially by pressing this key. Lit LED indicates the selected mode.

Holding down this key for at least one second to display eye pattern.

(1) Overlay Display

The waveforms are displayed in overlay mode.

(2) Parade Display

The waveforms are displayed in parade mode (side-by-side) in Y, Cb, Cr or G, B, R order from the left end.

Sweep rate set by using the SWEEP menu is shown below.

| Selectable Function | Display |
|---------------------|---------|
| 1H, 2H | 1H |
| 1V, 2V | 1V |

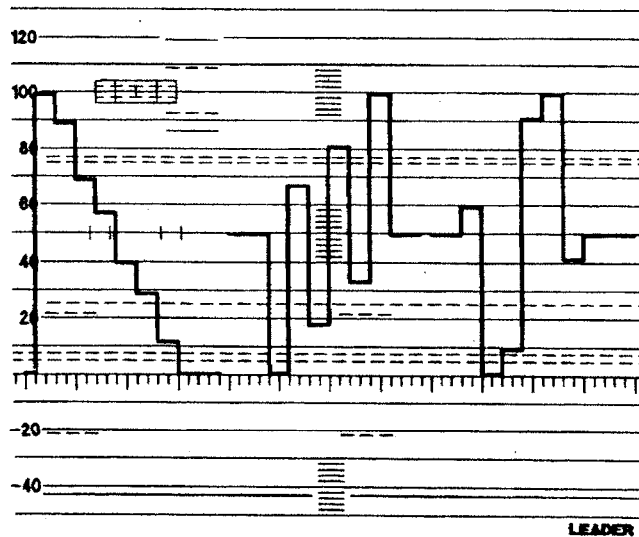


Figure 4-5 Parade display

(3) Timing Display

This is used to measure time difference and amplitude difference between channels with respect to the Y/G channel.

Apply the bowtie or timing signal. Figure 4-6 shows the waveform using the bowtie signal.

Two bowtie waveforms are displayed: left side waveform is (Y/G)-(Cb/B), and right side waveform is (Y/G)-(Cr/R). Vertical lines are the marker. The large markers at the center of both waveforms are the reference. The marker interval is 20 ns.

Read the time difference between the null point and center marker using 20 ns-marker.

When the null point is positioned at the left of the reference marker, the Cb/B or Cr/R is advanced with respect to the Y/G, and vice versa.

When the amplitude difference exists between the channels, the null point becomes thicker.

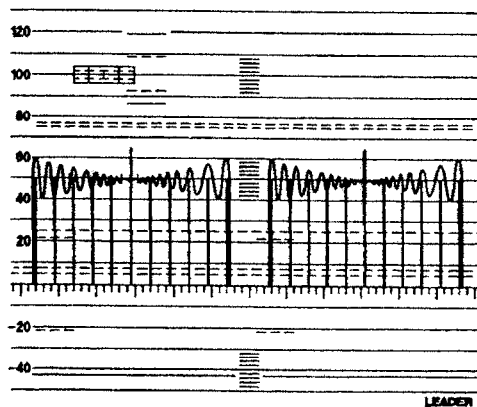


Figure 4-6 Timing display

(4) Eye Display

Select the eye pattern display mode when measuring amplitude, rise/fall times, jitter, and overshoot of the serial digital signal.

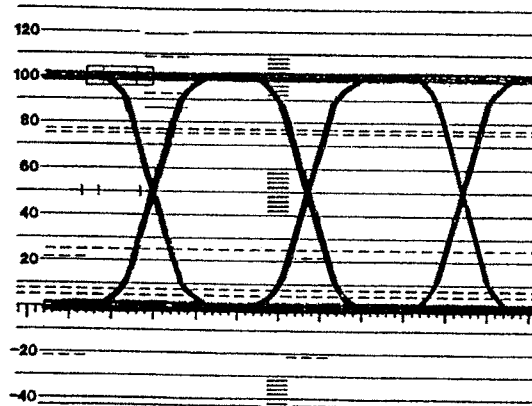


Figure 4-7 Eye display

4.7.3 Using the SWEEP Key

This key is used to set the sweep rate and sweep magnification. Four sweep rates (i.e., 1H, 2H, 1V, 2V) can be selected, however, some exceptions exist. See Step (2).

The magnification display can be used for all display modes.

(1) Basic Operation

The sweep menu can be displayed by pressing this key. The key LED lights.

By this setting, waveform is displayed with current setting condition.

The F·1 key is used to set the sweep rate.

The F·4 key is used to set the X5 on or off.

Press the SWEEP key ⑯ after sweep rate setting is completed, or to turn the sweep magnification mode off. Menu is cleared and sweep magnification mode is set to X1. The key LED goes off.

To clear the menu with magnification mode on, press the CLEAR key ⑳. The menu is only cleared and LED retains on.

To return to the sweep rate setting mode, press the SWEEP key ⑯ again.

| Key | Display | Function |
|-----|---------------------|--------------------------|
| F·1 | <SWEEP> 1H:2H:1V:2V | Selects sweep rate |
| F·4 | <MAG> OFF:ON | Sets sweep magnification |

(2) Sweep Rate selection

Procedure: [SWEEP- F·1 <SWEEP> 1H:2H:1V:2V]

<1> WFM Mode

[SWEEP → F·1 <SWEEP> 1H:2H:1V:2V]

The DISPLAY key ⑩ determines sweep time.

OVERLAY display

1H: Displays one-line waveform.

2H: Displays two-line waveform.

1V: Displays one-field waveform.

2V: Displays two-field waveform.

PARADE display

1H, 2H: One-line display for each waveform.

1V, 2V: One-field display for each waveform.

TIMING display

Display timing measurement mode regardless of the sweep rate setting.

<2> EYE Mode

[SWEEP → F·1 <SWEEP>1 ns/DIV:3 ns/DIV:500 ps/DIV:FIELD]

- 1 ns/DIV: Displays about three eye patterns.
- 3 ns/DIV: Displays about ten eye patterns.
- 500 ps/DIV: Displays about one eye pattern.
- FIELD: Displays eye pattern in field rate.

(3) Sweep Magnification

Procedure: [SWEEP- F·4 <MAG> OFF:ON]

This setting magnifies the waveform horizontally.
The magnification depends on the sweep rate set by pressing the F·1 key.

(4) Sweep Time

Unit "s/div" indicates the sweep time in second per major division. The scale is marked on the 0 IRE graticule.

Table 4-1 Sweep rate in overlay display mode

| | 1H | 2H |
|---------|------------------|-----------------|
| MAG:OFF | 5 μ s/div | 10 μ s/div |
| MAG:ON | 0.2 μ s/div | 0.4 μ s/div |
| 525/60 | 1V | 2V |
| MAG:OFF | 1.25 ms/div | 2.5 ms/div |
| MAG:ON | 62.5 μ s/div | 125 μ s/div |
| 625/50 | 1V | 2V |
| MAG:OFF | 1.55 ms/div | 3.1 ms/div |
| MAG:ON | 77.5 μ s/div | 155 μ s/div |

Table 4-2 Sweep rate in parade display mode

| | 1H | 2H | 3H |
|---------|------------------|-----------------|-------------------|
| MAG:OFF | 5 μ s/div | 10 μ s/div | 15 μ s/div |
| MAG:ON | 0.2 μ s/div | 0.4 μ s/div | 0.6 μ s/div |
| 525/60 | 1V | 2V | 3V |
| MAG:OFF | 1.25 ms/div | 2.5 ms/div | 3.75 ms/div |
| MAG:ON | 62.5 μ s/div | 125 μ s/div | 187.5 μ s/div |
| 625/50 | 1V | 2V | 3V |
| MAG:OFF | 1.55 ms/div | 3.1 ms/div | 4.65 ms/div |
| MAG:ON | 77.5 μ s/div | 155 μ s/div | 232.5 μ s/div |

4.7.4 Using the CURSOR Key

This key is used to measure voltage and time.

The REF and Δ cursors are displayed by pressing this key. The voltage and time can be obtained by measuring the interval between the cursors.

The voltage, voltage ratio, time, frequency, and time ratio can be measured.

The cursor measurement is ideal for precise measurement.

(1) Basic Operation

By pressing the CURSOR key ⑫, the REF and Δ cursors, and menu are displayed. The key LED lights.

Use the FUNCTION KEY to select the function.

Use the FUNCTION KNOB to move the cursor.

To cancel the cursor measurement mode, press the CURSOR key ⑫, again. The menu is cleared and key LED goes off.

To clear the menu after cursor setting is completed, press the CLEAR key ⑳. The menu is only cleared and LED retains on. To return to the cursor measurement mode, press the CURSOR key ⑫ again.

| Key | Display | Function |
|------|----------------------------------|--|
| F·1 | <CURSOR> ΔV : ΔT | Selects voltage/time measurement |
| F·2 | <UNIT> IRE:V:% sec:Hz:% | Unit for ΔV Unit for ΔT |
| F·3 | REF SET | Reference setting in % |
| F·4 | <SELECT> REF: Δ : TRACK | Selects cursor |
| KNOB | <VARIABLE>KNOB | Moves cursor |

(2) Voltage Measurement

Procedure: [CURSOR-F·1 <CURSOR> Δ V-F·2<UNIT> IRE:V]

The voltage between the cursors can be measured.

Select the unit (IRE or V) by pressing the F·2<UNIT> key.

Position the REF and Δ cursors to the desired points on the waveform by using the FUNCTION KNOB.

The measured value between the cursors is displayed at the upper-right corner of the screen.

When the TRACK is selected by pressing the F·4 <SELECT> key, both REF and Δ cursors can be moved simultaneously.

When the Δ cursor is positioned below the REF cursor, a negative sign "-" is displayed.

(3) Voltage Ratio Measurement

Procedure: [CURSOR- F·1 <CURSOR> Δ V- F·2 <UNIT>%]

The voltage ratio between the reference points (100%) and desired points can be measured.

The F·3 <REF SET> key is used to set the reference points.

Position the REF and Δ cursors to the reference points on the waveform, then press the F·3 <REF SET> key.

The reference value "100.00%" is displayed.

Position the REF and Δ cursors to the desired points on the waveform by using the FUNCTION KNOB.

The measured value between the cursors is displayed at the upper-right corner of the screen.

(4) Time Measurement

Procedure: [CURSOR- F·1 <CURSOR> Δ T- F·2 <UNIT>sec]

The time between the cursors can be measured.

Position the REF and Δ cursors to the desired points on the waveform by using the FUNCTION KNOB.

The measured value between the cursors is displayed at the upper-right corner of the screen.

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

(5) Frequency Measurement

Procedure: [CURSOR- F·1 <CURSOR> Δ T- F·2 <UNIT>Hz]

The frequency between the cursors can be measured.

Position the REF and Δ cursors to the desired points on the waveform by using the FUNCTION KNOB.

The measured value between the cursors is displayed at the upper-right corner of the screen.

(6) Time Ratio Measurement

Procedure: [CURSOR- F·1 <CURSOR> Δ T- F·2 <UNIT>%]

The time ratio between the reference points (100%) and desired points can be measured. The F·3 <REF SET> key is used to set the reference points.

Position the REF and Δ cursors to the reference points on the waveform, then press the F·3 key. The reference value "100.00%" is displayed.

Position the REF and Δ cursors to the desired points on the waveform by using the FUNCTION KNOB.

The measured value between the cursors is displayed at the upper-right corner of the screen.

(7) Rise/Fall Times (Tr, Tf) Measurement (Eye pattern Mode Only)

[CURSOR → F·1 <CURSOR> Tr, Tf → F·3 <REF SET>]

Rise and fall times of the eye pattern can be measured.

Refer to Step (1) "Basic Operation." Position the V cursors (REF, Δ) at the bottommost and topmost of the eye pattern.

Pressing the F·3 (REF SET) key moves the V cursors to the 20% and 80% positions. The instrument enters TIME mode and H cursors are displayed. Position the H cursors (REF, Δ) to Tr or Tf of the eye pattern to measure rise or fall time.

Select MEASURE or ACTUAL by pressing the F·3 key

MEASURE: Displays rise or fall time measured by this instrument.

ACTUAL: Displays rise or fall time (approximate value) calculated from measurement value.

Note: Actual rise/fall times differ from the rise/fall times measured by this instrument because the measured value includes the rise/fall times of this instrument.

To obtain the actual rise/fall times, the following formula is applied.

$$T_a = \sqrt{(T_m)^2 - (500 \text{ ps})^2}$$

where

Ta: actual rise/fall times between 20 and 80% (approximate value)

Tm: rise/fall times between (20 and 80%) measured by this instrument

500 ps: rise/fall times of this instrument bandwidth: 450 MHz approx.

- (8) Jitter Measurement (Eye pattern Mode Only)
 [CURSOR → F·1 <CURSOR> Δ V → F·2<UNIT>U|p-p]

When measuring jitter of eye pattern, the units of Ulp-p can also be used to indicate the jitter.

Refer to Step (1) "Basic Operation." Position the H cursors (REF, Δ) at the intersection of the eye pattern. The measurement value between cursors is displayed at the upper-right corner of the screen.

Note: Jitter is time displacement of the digital signal with respect to the clock signal, and is indicated in units of UI (Unit Interval).

For example, when the component signal is applied,
 1 UI = 1/270 Mbs = 3.7 ns

where

bit rate: 270 Mbs

Jitter is indicated as follows:

Jitter (Ulp-p) = measurement value (ns)/period of clock signal (ns)

4.7.5 Using the LINESEL Key

This key is used to display arbitrary line of a video signal.

This function is ideal for observing such specified lines as Vertical Interval Test Signal (VITS) or Vertical Interval Reference (VIR).

With the line window function, up to 15 lines started with the specified line can be displayed.

When the 1V or 2V is selected by using the SWEEP menu, the selected line (including line window) is highlighted.

Figure 4-8 shows an example of the line 100 under the following settings.

DISPLAY: PARADE
 LINE WINDOW: 1
 FIELD: ALL

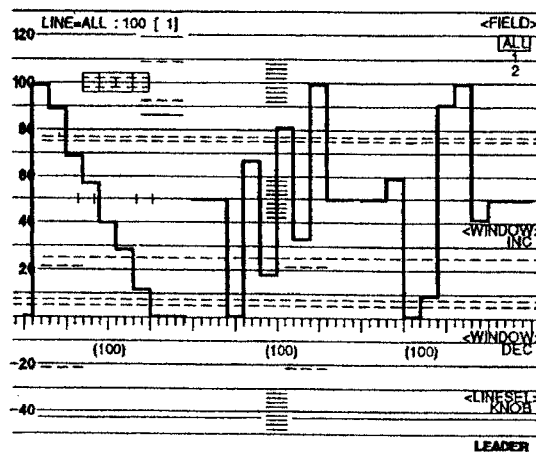


Figure 4-8 Display of line 100

4.7.6 Using the FILTER/GAIN Key-1 (GAIN)

This section describes the operating procedure of the vertical gain setting and variable gain control.

Two waveform amplitude control functions, X5 and continuous variable, are provided.

(1) Basic Operation

By pressing the FILTER/GAIN Key ⑮, the current set gain is recalled. The menu is displayed and the key LED lights.

Use the FUNCTION KEY to turn the magnification and variable modes on or off.

Use the FUNCTION KNOB for adjusting the gain when the variable mode is on.

To obtain the default setting (X1, VARIABLE OFF), press the FILTER/GAIN key ⑮ again. The menu is cleared and key LED goes off.

To clear the menu after gain setting is completed, press the CLEAR key ⑳. The menu is only cleared, and LED retains on.

To change the gain, press FILTER/GAIN key ⑮ again and repeat the procedure.

This menu is common to the filter selection menu described later. To set the gain to the default setting when LOW PASS or DIF. STEP is selected, set the F-3 key to X1, and F-4 key to OFF.

| Key | Display | Function |
|------|---------------------------------|-----------------|
| F-1 | <FILTER> FLAT:LOW PASS:DIF.STEP | Selects filter |
| F-3 | <V.GAIN> X1:X5 | Selects gain |
| F-4 | <VARIABLE> OFF:ON | Variable on/off |
| KNOB | <VARIABLE> KNOB | Gain variable |

(2) Gain Selection

Procedure: [FILTER/GAIN- F-3<V.GAIN> X1:X5]

The gain (X1 or X5) can be selected by pressing the F-3 key.

(3) Gain variable Mode

Procedure: [FILTER/GAIN- F·4<VARIABLE>ON - <VARIABLE>KNOB]

To obtain the variable mode, select VARIABLE ON by pressing the F·4 key, then use the FUNCTION KNOB to set the gain. Clockwise rotation increases gain.

The variable range is as follows.

X1: 0.7 Vp-p to 2 Vp-p

X5: 0.14 Vp-p to 0.4 Vp-p

4.7.7 Using the FILTER/GAIN Key-2 (FILTER)

This section describes the operating procedure of the filter mode.

The FLAT, LOW PASS, or DIF.STEP can be selected. The default setting is the FLAT.

(1) Basic Operation

By pressing the FILTER/GAIN Key ⑮, the waveform according to the current filter setting condition is displayed.

The menu is displayed and the key LED lights.

Press the F·1 key to select the filter.

To obtain the default setting (FLAT), press the FILTER/GAIN key ⑮, again. The menu is cleared and key LED goes off.

This menu is common to the gain selection menu described before. To set the filter to the default setting (FLAT) when gain mode is set to X5 and VARIABLE ON, press the F·1 key instead of the FILTER/GAIN key ⑮.

To clear the menu after filter setting is completed, press the CLEAR key ⑳. The menu is only cleared and LED retains on.

To return to the filter mode, press the CURSOR key ㉑ again.

| Key | Display | Function |
|------|---------------------------------|----------------------|
| F·1 | <FILTER> FLAT:LOW PASS:DIF.STEP | Selects filter |
| F·3 | <V.GAIN> X1:X5 | Selects gain |
| F·4 | <VARIABLE> OFF:ON | Gain variable on/off |
| KNOB | <VARIABLE> KNOB | Gain variable |

(2) Filter Selection

Procedure: [FILTER/GAIN- F·1<FILTER>FLAT:LOW PASS:DIF.STEP]

The following filters can be selected.

FLAT: Flat (default setting)

LOW PASS: Video signal passes the low-pass filter (-35 dB at 3.58 MHz)

DIF.STEP: Video signal passes 400 kHz band-pass filter. Refer to the next step for detail.

(3) Using the Differential-Step Filter

This filter is used to measure the nonlinear distortion of the luminance component.

Apply 5-step staircase signal to the equipment under test.

Figure 4-9 shows the differentiated waveform.

To obtain the nonlinear distortion, proceed as follows.

Select the voltage ratio measurement mode of the CURSOR menu.

Position the cursors to the largest pulse (reference, 100%) by pressing the F·3 key.

Position the cursors to the smallest pulse.

Read the measured value (A % in this case).

$$\text{Nonlinear distortion} = (100-A)\%$$

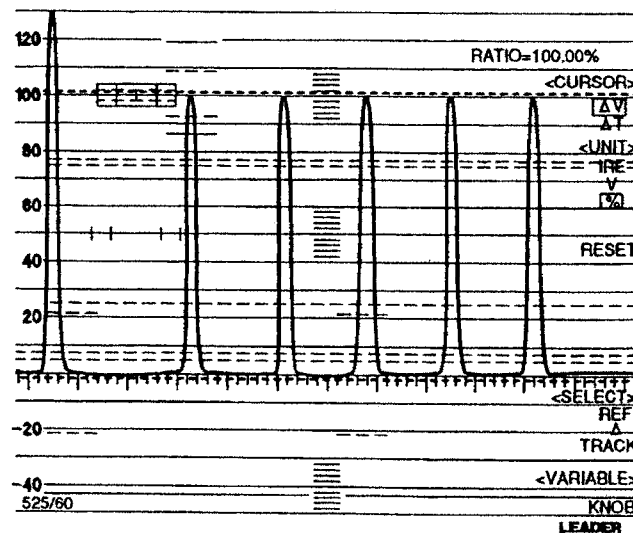


Figure 4-9 DIF.STEP display

4.7.8 Using the EXT REF Key

When using an external trigger source, use the EXT REF key ②③.

Apply the signal (e.g., black burst) to the EXT REF connector.

To select the internal trigger source, press this key again. The key LED goes off.

When composite sync signal is used as an external trigger source, the video signal triggered by the composite signals can be displayed.

The signal applied to the Y/G connector is used for internal sync signal when measuring the analog component signal.

4.8 Vectorscope Mode

Select the VEC mode by pressing the MODE key ⑪.

The vectorscope mode operates as a X-Y display using Cb (horizontal axis) and Cr (vertical axis). See Figure 4.10.

The electronic graticule is appeared.

The GBR format analog component signal is converted into color difference signal and displayed as a vector pattern. The composite signal cannot be displayed in vector format.

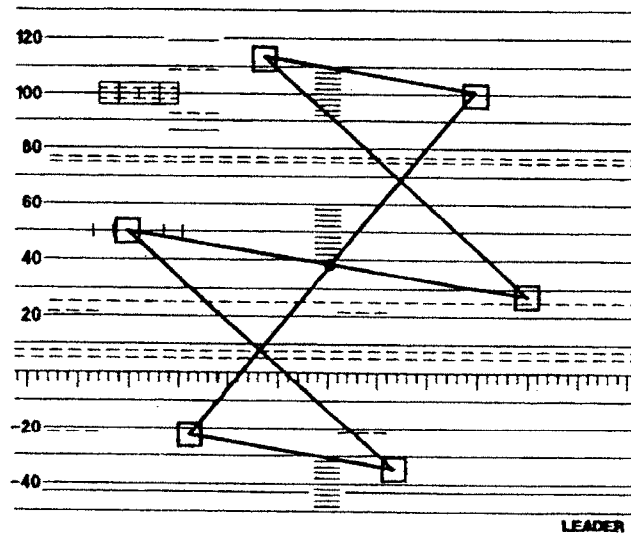


Figure 4-10 Vector display

4.8.1 System Setting

By pressing the SYSTEM key ⑭, the menu is displayed.

Use the SELECT KNOB for selecting the vectorscope mode, and setting the system as described below.

(1) Basic Operation

| Key | Display | Function |
|------|----------------------------|--------------------|
| F·1 | <COLOR BARS> 75%:100% | Selects color bars |
| F·2 | <FORMAT> Betacam:MII:SMPTE | Selects format |
| F·3 | <SETUP> 0%:7.5% | Selects setup |
| KNOB | <MENU SEL>KNOB | Selects menu |

- (2) Color Bars Selection
Select the 75% or 100% according to input signal amplitude by pressing the F·1 key.
- (3) Format Selection
Select the Betacam, M II, or SMPTE according to input signal by pressing the F·2 key.
This menu is displayed when the ANALOG SYSTEM in the SYSTEM menu is selected.
This menu is also displayed when the 525/60 in the ANALOG SYSTEM is selected.
- (4) Setup Selection
Select the 0% or 7.5% according to the setup of the component signal by pressing the F·3 key.
This menu is displayed when the ANALOG SYSTEM in the SYSTEM menu is selected.
This menu is also displayed when the 525/60 in the ANALOG SYSTEM is selected.
- (5) system Combinations

Table 4-3

| Signal | Digital | Analog | |
|------------|----------------------|--------------------------|----------------|
| Frame Rate | 525/625 | 525 | 625 |
| Saturation | 75%/100% | 75%/100% | 75%/100% |
| System | SMPTE/EBU (fixed) | Betacam M II SMPTH | EBU (fixed) |
| Setup | 0% (fixed) | 0%/7.5% | 0% (fixed) |

4.8.2 GAIN Menu

- (1) Basic Operation
By pressing the FILTER/GAIN key (15), the menu is displayed. The key LED lights.
The F·1<FILTER> is not used in the vectorscope mode.

| Key | Display | Function |
|------|---------------------------------|----------------------|
| F·1 | <FILTER> FLAT:LOW PASS:DIF.STEP | Selects filter |
| F·3 | <V.GAIN> X1:X5 | Selects gain |
| F·4 | <VARIABLE> OFF:ON | Gain variable on/off |
| KNOB | <VARIABLE> KNOB | Gain variable |

(2) Gain Selection

Procedure: [FILTER/GAIN- F·3<V.GAIN>X1: X5]

The gain (X1 or X5) can be selected by pressing the F·3 key.

(3) Gain Variable Mode

Procedure: [FILTER/GAIN- F·4<VARIABLE>ON - <VARIABLE>KNOB]

To obtain the variable mode, select VARIABLE ON by pressing the F·4 key, then use the FUNCTION KNOB to set the gain.

4.8.3 Line Selector

The line selector function (includes selecting the field, specifying the line window) of the vectorscope mode can be used as the waveform monitor mode. Refer to Section "4.7.5 Using the LINESEL Key" for detail.

4.9 Picture Monitor Mode

The video signal applied to the Y/G connector can be displayed as a TV picture.

In the line selector mode, the selected line can easily be identified since the selected line is highlighted on the picture.

The line selector function (includes selecting the field, specifying the line window) of the picture mode can be used as the waveform monitor mode. Refer to Section "4.7.5 Using the LINESEL Key" for detail.

A picture contrast can be controlled by using the FILTER/GAIN menu.

When the line selector mode is selected and part of the picture is obscured by readout display, the readouts can be eliminated by setting the line selector mode off.

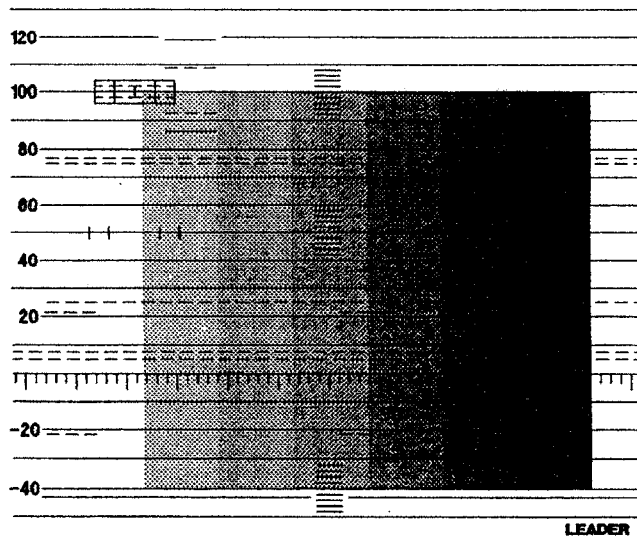


Figure 4-11 Picture mode

4.10 Audio Mode

The audio signal is displayed in lissajous pattern. This mode is ideal to observe an audio signal amplitude and stereo signal polarity.

The electronic graticule is appeared in this mode.
See Figure 4-11.

The targets indicate as follows.

| | |
|-------------------|--------------------|
| Center cross "+": | Reference value |
| Inner box: | $\pm 0.5\text{dB}$ |
| Outer box: | $\pm 1\text{dB}$ |

The reference value (i.e., 0dB, 2dB, 4dB) can be set by using the FILTER/GAIN menu.

Apply the signals to the REMOTE connector (D-sub, 25-pin connector) on the rear panel.

Refer to Section "4.14 REMOTE Connector" for pin assignments.

4.10.1 Connecting Audio Signal

The audio signal input configuration is a balanced input. Refer to Section "4.14 REMOTE Connector" for detail. Terminate the Y+ and Y-, and X+ and X- inputs as required.

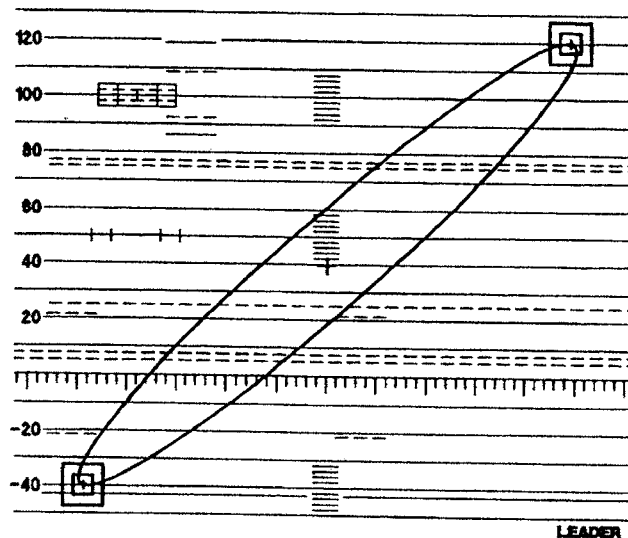


Figure 4-12 Audio mode

4.11 Eye Pattern Mode

This mode displays the serial digital signal in eye pattern format by using an equivalent time sampling method.

Amplitude, rise time, fall time, overshoot, ringing, and jitter of the serial digital signal can be measured.

Signal quality can also be evaluated based on this information.

4.11.1 Measuring Eye Pattern

Holding down the DISPLAY key ⑩ for at least one second enters eye pattern mode.

The serial signal selected by the INPUT key is displayed in eye pattern format.

When the ANALOG is selected, the signal applied to the SER A is displayed.

Pressing the FILTER/GAIN KEY ⑮ displays the filter menu at the F·1 key.

Select the high-pass filter (i.e., 10 Hz, 100 Hz, 1 kHz) as required.

Frequency Component of the jitter can be measured.

10 Hz: Timing jitter

1 kHz: Alignment jitter

Use the menus (related to gain adjustment) at the F·3 and F·4 keys for accurate measurement.

Pressing the SWEEP key ⑯ displays sweep time at the F·1 key. Select the time range as required.

500 ps/DIV, 1 ns/DIV: Used for accurate measurement.

3 ns/DIV: Used for measuring the relative jitter against the word and line.

Press the CURSOR key ⑫ to display V or H cursor for accurate measurement.

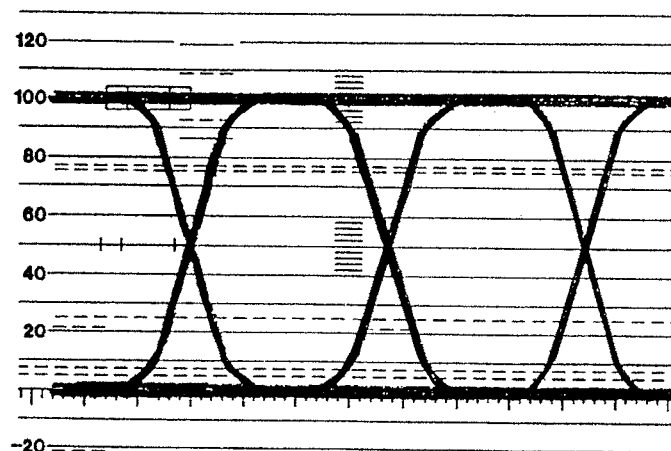


Figure 4-13 Eye mode

4.12 Using the PRESET Key

(1) Basic Operation

The recall menu can be displayed by pressing the this key. This menu is used to set the address to be recalled. Use the SELECT KNOB to set the address.

Select the address, then press the F·1 key.

| Key | Display | Function |
|-----|---------------|-------------|
| F·1 | <RECALL> KEY | Recall key |
| F·2 | <PRESET> MODE | Preset mode |

(2) Preset Mode

Apply the "(1) Basic Operation" procedure.

By pressing the F·2 key, PRESET mode is obtained.

This mode is used for naming and renaming the address.

See Figure 4-14.

F·1 key Stores data with current name.

F·2 key To previous hierarchy.

F·3 key To default setting.

F·4 key To rename mode.

| Key | Display | Function |
|-----|--------------------------|-----------------------|
| F·1 | <STORE> KEY | Store key |
| F·2 | <RETURN> KEY | To previous hierarchy |
| F·3 | <DEFAULT DATA STORE> KEY | Default data store |
| F·4 | <RENAME> MODE | Rename mode |

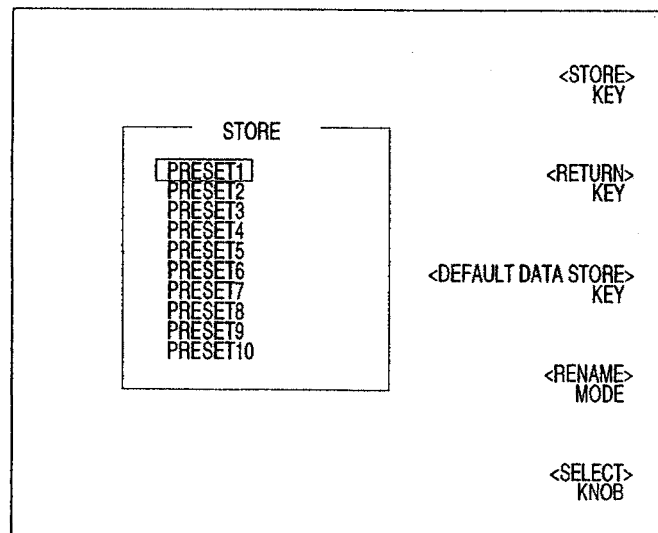


Figure 4-14 Preset mode

(3) Rename Mode

A dialog box and character list are provided for renaming the address.
See Figure 4-15.

F·1 key

Enters time set at CALIBRATION.

F·2, F·3key

Locates character in the dialog box.

F·4 key

Enters name into specified address. While storing data, "COMPLETE" is displayed.

| Key | Display | Function |
|-----|----------------------|--|
| F·1 | <RENAME DATA> KEY | Rename date key |
| F·2 | <LOCATION> → KEY | Selects character location |
| F·3 | <LOCATION> ← KEY | Selects character location |
| F·4 | <STORE & RETURN> KEY | Stores data, returns to previous hierarchy |

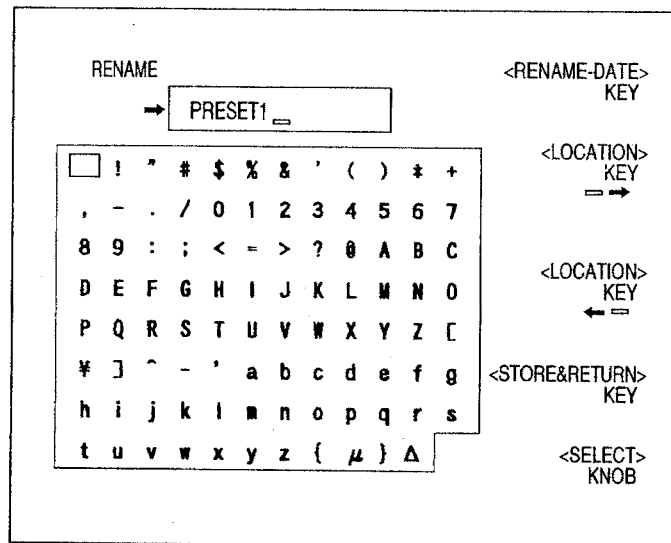


Figure 4-15 Rename mode

4.13 Using the SYSTEM Key

By pressing the SYSTEM key ⑭, the system menu is displayed.
See Figure 4-16.

Use the <MENU SEL> KNOB to select the next hierarchy.
The menu structure is shown below.

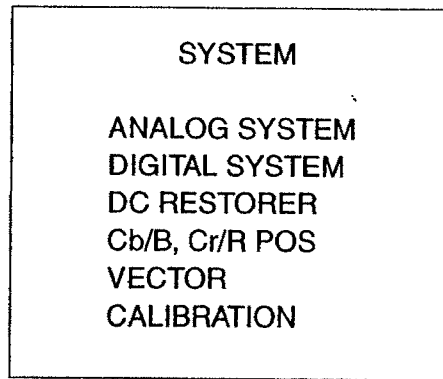


Figure 4-16 System menu

4.13.1 Using the ANALOG SYSTEM Menu

This menu is used to set the frame rate, input format, display format, and input coupling for the analog component signal.

(1) Basic Operation

| Key | Display | Function |
|------|---|----------------|
| F·1 | <FRAME RATE> AUTO:525/60:625/50 | Frame rate |
| F·2 | <INPUT FORMAT> Y, Cb, Cr (0.7V): Y,Cb, Cr (0.714V): GBR (0.7V): GBR (0.714V) | Input format |
| F·3 | <WFM OUT> Y, Cb, Cr:GBR | Display format |
| F·4 | <INPUT COUPLING> AC:DC | Input coupling |
| KNOB | <MENU SEL> | Selects menu |

(2) Frame Rate Setting

Procedure:

[SYSTEM-ANALOG SYSTEM-F·1 <FRAME RATE> AUTO:
525/60:625/50]

The AUTO sets the frame rate to 525/60 or 625/50 automatically.
The 525/60 and 625/50 are used for manual setting.

(3) Input Format

Procedure:

[SYSTEM - ANALOG SYSTEM - F·2<INPUT FORMAT> Y, Cb, Cr
(0.7 V) : Y, Cb, Cr (0.714 V) : GBR (0.7 V) : GBR (0.714 V)]

Select the format shown below according to the input signal.

Y, Cb, Cr (0.7 V)
Y, Cb, Cr (0.714 V)
GBR (0.7 V)
GBR (0.714 V)

The "0.714 V" is only used for the Betacam, 525/60 system.
Use the "0.7 V" for other systems.

(4) Display Format

Procedure:

[SYSTEM - ANALOG SYSTEM - F·3<WFM OUT> Y, Cb, Cr:GBR]

Set the waveform display format to Y, Cb, Cr or GBR.

(5) Input Coupling

Procedure:

[SYSTEM-ANALOG SYSTEM-F·4<INPUT COUPLING> AC:DC]

Set the input coupling to AC or DC.

4.13.2 Using the DIGITAL SYSTEM Menu

This menu is used to set the frame rate according to digital input signal, input format, and picture monitor output format.

(1) Basic Operation

| Key | Display | Function |
|------|---------------------------------|------------------------|
| F·1 | <FRAME RATE> AUTO:525/60:625/50 | Frame rate |
| F·2 | <EAV-SAV> PASS:REMOVE | EAV - SAV display |
| F·3 | <WFM OUT> Y, Cb, Cr:GBR | Display format |
| F·4 | <PIX MON OUT> Y, Cb, Cr:GBR | Picture monitor output |
| KNOB | <MENU SEL> | Selects menu |

(2) Frame Rate Setting

Procedure:

[SYSTEM - DIGITAL SYSTEM - F·1<FRAME RATE> AUTO : 525/60 :
625/50]

The AUTO sets the frame rate to 525/60 or 625/50 automatically.
The 525/60 and 625/50 are used for manual setting.

(3) EAV-SAV Display

Procedure:

[SYSTEM - DIGITAL SYSTEM-F·2<EAV-SAV> PASS:REMOVE]

This procedure is used to set the EAV-SAV (sync signal of digital signal,
TRS) on or off.

PASS: Display
REMOVE: No display

(4) Display Format

Procedure:

[SYSTEM-DIGITAL SYSTEM-F·3<WFM OUT> Y, Cb, Cr:GBR]

Set the waveform display format to Y, Cb, Cr or GBR.

(5) Picture Monitor Output

Procedure:

[SYSTEM-DIGITAL SYSTEM-F·4 <PIX MON OUT> Y, Cb, Cr:GBR]

Set the picture display output format to Y, Cb, Cr or GBR.

4.13.3 Using the DC RESTORER Menu

This menu is used to set the response time and clamp position.

(1) Basic Operation

| Key | Display | Function |
|------|----------------------------------|-----------------------|
| F·1 | <RESPONSE> SLOW:FAST | Response |
| F·2 | <SAMPLE POINT> FIX:VARIABLE | Sample point |
| F·4 | <KNOB SELECT> MENU SEL: VARIABLE | Selects KNOB function |
| KNOB | <MENU SEL> | Selects menu |

(2) Response Setting

Procedure:

[SYSTEM-DC RESTORER-F·1<RESPONSE> SLOW:FAST]

The amplitude becomes as follows when 60 Hz sine wave is applied as 100% and the OFF is selected.

SLOW: $\geq 80\%$

FAST: $\leq 20\%$

(3) Sample Point

Procedure:

[SYSTEM-DC RESTORER-F·2<SAMPLE POINT> FIX:VARIABLE]

Set the DC clamp position to FIX or VARIABLE.

When the FIX is selected, the VARIABLE cannot be selected by pressing the F·4 key.

(4) KNOB Function Setting

Procedure: [SYSTEM - DC RESTORER-F·4<KNOB SELECT>]

This procedure is used to set the KNOB function: for selecting the menu or varying the sample point.

When the VARIABLE is selected, the POS SELECT is displayed instead of the <KNOB SELECT>. The clamp position can be set by using the KNOB.

This function is used to compensate the clamp position displacement caused by timing difference between the external sync signal and video signal.

4.13.4 Using the Cb/B, Cr/R POS Menu

This menu is used for positioning the Cb/B and Cr/R waveforms with respect to the Y/G waveform.

(1) Basic Operation

| Key | Display | Function |
|------|---|-----------------------|
| F·1 | <Cb/B, Cr/R POS> OFF:Cb/B:Cr/R:Cb/B, Cr/R | Selects signal |
| F·4 | <KNOB SELECT> MENU SEL:VARIABLE | Selects KNOB function |
| KNOB | <MENU SEL> | Selects menu |

(2) Signal Selection

Procedure:

[SYSTEM-Cb/B, Cr/R POS-F·1<Cb/B, Cr/R POS>OFF : Cb/B : Cr/R :
Cb/B, Cr/R]

This menu is used to select the signal for positioning.

OFF: The waveform is positioned by the default setting.

Cb/B POS, Cr/R POS:

The waveform position can be set respectively.

Cb/B, Cr/R POS:

The waveform position can be set simultaneously.

(3) KNOB Function Setting

Procedure: [SYSTEM-Cb/B:Cr/R POS-F·4<KNOB SELECT>]

This menu is used for positioning the waveform respectively.

MENU SEL: Selects menu.

POSITION: Moves the waveform (Cb/B POS, Cr/R POS, or Cb/B, Cr/R
POS) selected by pressing the F·1 key.

4.13.5 Using the VECTOR Menu

This menu is used to obtain the same format as the input signal in the vectorscope mode. Refer to Section "4.8 Vectorscope Mode" for detail.

4.13.6 Using the CALIBRATION Menu

This menu is used to set the vertical amplitude, SWEEP TIME, and calender.

The calibration signal (1 V_{p-p}±0.5%) is provided for calibrating this instrument. An external calibration signal can also be used.

This section describes calibration procedure using the internal calibration signal.

(1) Basic Operation

Select the CALIBRATION menu by pressing the SYSTEM key ⑭.
By this setting, menu shown below is displayed.

| Key | Display | Function |
|------|-----------------------|---------------|
| F·1 | <V.GAIN VAR> MODE | Gain mode |
| F·2 | <SWEEP TIME VAR> MODE | Sweep mode |
| F·4 | <CALENDAR> MODE | Calendar mode |
| KNOB | <MENU SEL> KNOB | Selects menu |

(2) Gain Mode

This mode is used for calibrating this instrument. The calibration should be performed for both 0.7 V System and 0.714 V System.

a. Operating the Gain Mode Menu

Apply the "(1) Basic Operation" procedure.

By pressing the F·1 key, V. GAIN VAR menu is displayed.

| Key | Display | Function |
|------|-----------------------------|--------------------------|
| F·1 | <RETURN> KEY | To previous hierarchy |
| F·2 | <WFM V.G SEL> 0.7 V:0.714 V | Selects signal amplitude |
| F·4 | <RESET CAL> KEY | Default setting |
| KNOB | <V.GAIN VAR> KNOB | Gain variable |

b. Vertical Axis Amplitude Calibration

F·1 key

By pressing this key, the menu returns to previous hierarchy.

Press the SELECT key ⑨ for at least one second to display calibration signal.

F·2 key

This key is used to select the system (0.7 V or 0.714 V System) to be calibrated.

In the 0.7 V System, adjust the VARIABLE GAIN KNOB for a calibration signal amplitude of 143 IRE.

In the 0.714 V System, adjust the VARIABLE GAIN KNOB for a calibration signal amplitude of 140 IRE.

Adjust both systems as required using the procedure above.

F·4 key

By pressing this key, stored data is rewritten to the default setting.

(3) Sweep Mode

a. Gain Mode Operation

Apply the "(1) Basic Operation" procedure.

By pressing the F·2 key, SWEEP TIME VAR menu and Figure 4-15 are displayed.

| Key | Display | Function |
|------|------------------------------|--------------------------|
| F·1 | <RETURN> KEY | To previous hierachy |
| F·2 | <KNOB SEL> MENU SEL:VARIABLE | Selects signal amplitude |
| F·4 | <RESET CAL> KEY | Default setting |
| KNOB | <MENU SEL> KNOB | Selects menu |

b. Sweep Time Calibration

F·1 key

By pressing this key, the menu returns to previous hierarchy.
Press the SELECT key ⑨ for at least one secong to display calibration signal.

F·3 key

This key is used to select the KNOB function.
When the MENU SEL is selected, menu shown in Figure 4-15 is displayed. Select the sweep mode.

When the VARIABLE is selected, the KNOB can be used for calibrating the sweep time.

Adjust the VARIABLE for an one cycle or 2 divisions display. See Figure 4-3.

When the 1H MAG is selected, adjust the VARIABLE for an one cycle of 10 divisions display. See Figure 4-4.

F·4 key

By pressing the key, stored data is rewritten to the default setting.

| |
|---------------|
| CAL SWEEP |
| <V SWEEP> |
| 525/60 1V |
| 525/60 1V MAG |
| <H SWEEP> |
| 1H |
| 1H MAG |
| 1H MAG |

Figure 4-17 Sweep calibration selection menu

(4) Calendar Mode

This mode is used to set date and time.

a. Calendar Mode Operation

Apply the "(1) Basic Operation" procedure.

By pressing the F·4 key, CALENDAR menu is displayed.

| key | Display | Function |
|------|----------------------------|-----------------------|
| F·1 | <CALENDAR> YEAR:MONTH:DATE | Year, month, date |
| F·2 | <TIME> HOUR:MINUTE:SECOND | Hour, minute, second |
| F·3 | <SET> KEY | Set key |
| F·4 | <RETURN> KEY | To previous hierarchy |
| KNOB | <DATE ADJUST> KNOB | Time setting KNOB |

b. Using the Timer

F·1 key

Press the F·1 key to select year, month, and date, then set them by using the <TIME ADJUST> KNOB.

The date is displayed.

F·2 key

Press the F·2 key to select hour, minute, and second, then set them by using the <TIME ADJUST> KNOB.

The time is displayed.

F·3 key

Press the F·3 key to set the current time. This time is used for the <RENAME DATE> in the preset menu.

F·4 key

By pressing the F·4 key, the menu returns to previous hierarchy.

Figure 4-18 shows an example of calendar setting. The current time is framed, and time being set is displayed underneath.

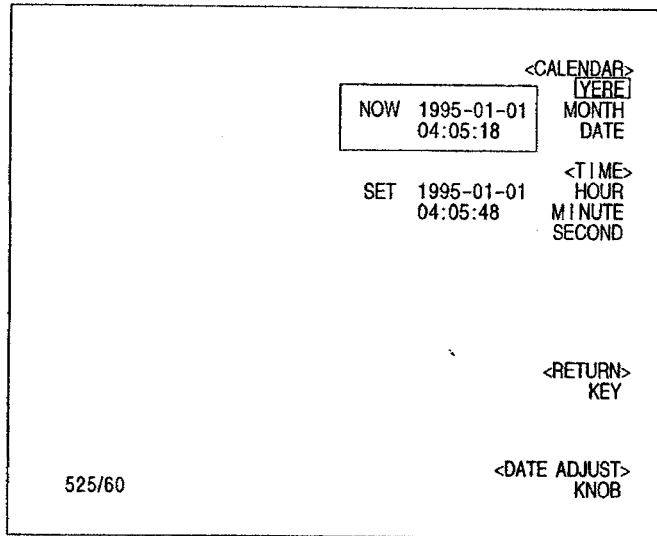


Figure 4-18 Calendar mode

4.14 Using the DIGITAL Key

The DIGITAL key $\text{\textcircled{26}}$ can be used to check the parameter of the serial digital signal. By pressing this key, DIGITAL screen is displayed.

The waveform intensity is reduced for easier DIGITAL screen observation. To disappear the DIGITAL screen, press this key again.

The DIGITAL screen consists of three pages that can be selected by pressing the F·1 key. For other settings, use the FUNCTION KEY displayed on the screen.

4.14.1 Parameter Check Screen (Page 1/3)

(1) FUNCTION KEY Assignments

| Key | Display | Function |
|-----|---------------|-------------------|
| F·1 | <Page> NEXT | To page 2/3 |
| F·3 | <ERROR> RESET | Resets error data |

F·1: Opens page 2/3

F·3: Clears error display time and waits for next error.

(2) Screen Description

| Display | | Description |
|--------------|----------------|--------------------------------|
| | ITEM STATE | |
| | SIGNAL PRESENT | Input signal is present. |
| | MISSING | No input signal is present. |
| | CABLE <100m | Equivalent cable length, <100m |
| | >300m | Equivalent cable length, >300m |
| | ... | No input signal is present. |
| VIDEO FORMAT | 525/60 | Format at 270 Mb/s. |
| | 625/50 | Format at 270 Mb/s. |
| | ... | No input signal is present. |
| ANC DATA | CATCH | ANC flag is found. |
| | ... | No data is present. |
| AUDIO | CATCH | Audio flag is present. |
| | ... | No audio flag is present. |
| EDH | CATCH | EDH data is detected. |
| | ... | No EDH data is present. |
| ERROR | ... | No error is present. |
| | FOUND | Signal has error. |
| | [12:11:10] | Time of first error found. |

(3) Equivalent Cable Length

The equivalent cable length is displayed by converting a received serial digital signal level into a 5C-2V cable length. The signal source level of 800 mV is used for calculation.

(4) Concerning Error

Resets the error found time and error contents. This function is effective when the signal is 525/60 or 625/50, and 270 Mb/s. This function is unrelated to ALARM LED setting.

4.14.2 ALARM LED Setting Screen (Page 2/3)

(1) FUNCTION KEY Assignments

| Key | Display | Function |
|------|---------------------------|------------------|
| F·1 | <Page> NEXT | To page 3/3 |
| F·2 | <TRIG MODE> LINESEL:ERROR | Trigger mode |
| F·3 | <ERROR> RESET | Error reset key |
| F·4 | <ALARM LED> ON/OFF | Alarm setting |
| KNOB | <CURSOR> | Moves the cursor |

F·1: Opens page 3/3.

F·2: Selects the following items.

LINESEL The line selector mode is selected as the trigger mode. Data of the line selected by the line selector is fetched as dump list data.

ERROR The error mode is selected as the trigger mode. Data of the line having TRS error or ANC error is fetched as dump list data.

F·3: Resets the error counter. Error found time is also reset.

F·4: Selects the ALARM LED ON/OFF mode on each item when error occurs.

Select the item by using the FUNCTION KNOB, then set the ON/OFF respectively.

The ALARM LED lights when error is detected even two or more items are selected.

(2) Screen Description

| Display | | | Description |
|---------------|-----------|---------|---|
| ALARM LED | ITEM | STATE | |
| ON/OFF | TRS | PRESENT | TRS is correct. |
| | | ERROR | TRS protection bit is incorrect. |
| | | ... | No signal is present. |
| ON/OFF | SAV | PRESENT | SAV is correct. |
| | | ERROR | SAV position is displaced with respect to EAV. |
| | | ... | TRS error, or no signal is present. |
| ON/OFF | EAV | PRESENT | EAV is correct. |
| | | ERROR | Position is displaced with respect to EAV. |
| | | ... | TRS error, or no signal is present. |
| OF/OFF | ANC | ERROR | ANC data format (checksum or parity) is incorrect. |
| | | ... | ANC data is correct, no ANC data, no signal. |
| | | ... | Embedded channel is displayed. |
| AUDIO CHANNEL | 1,2,3,4 | ... | No signal is present. |
| ON/OFF | AP CRC | ... | No AP CRC is present. |
| | | NORMAL | Normal |
| | | CHANGED | Differs from CRC in the EDH packet, and no valid flag is present. |
| | | ERROR | Differs from CRC in the EDH packet, and valid flag is present. |
| ON/OFF | FF CRC | ... | No FF CRC is present. |
| | | NORMAL | Normal |
| | | CHANGED | Differs from CRC in the EDH packet, and no valid flag is present. |
| | | ERROR | Differs from CRC in the EDH packet, and valid flag is present. |
| ON/OFF | EDH FLAGS | FOUND | EDH flags are found in the transmission system. |
| | | ... | No EDH flags are present. |

(3) Timing Reference of EAV and SAV

In the 525/60 system, EAV on line 3 is used as a reference for EAV.

In the 625/50 system, EAV on line 1 is used as a reference for EAV.

For the SAV, the EAV at the previous line is used as a reference.

(4) Combination of TRS, EAV, and SAV

| SIGNAL | PRESENT | PRESENT | MISSING |
|--------|---------|---------|---------|
| TRS | PRESENT | ERROR | ... |
| SAV | PRESENT | ... | ... |
| | ERROR | ... | ... |
| EAV | PRESENT | ... | ... |
| | ERROR | ... | ... |

4.14.3 Dump List Display Screen (page 3/3)

(1) FUNCTION KEY Assignments-1 (Line Selector Mode)

This section describes FUNCTION KEY assignments when the line selector mode is selected as the trigger mode.

| Key | Display | Function |
|------|----------------------------|---------------------------|
| F·1 | <Page> NEXT | To page 1/3 |
| F·2 | <MODE> LINE:COMPONENT | Selects display mode |
| F·3 | <DATA> FREEZE:SAMPLE | Freezes/fetches data |
| F·4 | <VARIABLE> LINESEL:ADDRESS | Selects item to be varied |
| KNOB | <LINESEL>, <ADDRESS> | Moves display |

F·1: Opens page 1/3.

F·2: Selects the following items.

LINE Displays serial signal in input order.
COMPONENT Separates the video signal into Y, Cb, and Cr, then displays each address.

F·3: Selects the following items.

FREEZE Freezes fetched data.
SAMPLE Fetches data of the specified line in real time.

F·4: Selects the following items.

LINESEL Changes the number of lines to be selected.
ADDRESS Changes screen display address.

KNOB: Controls the item (LINESEL OF ADDRESS) selected by pressing the F·4 key.

The SAV is used as a reference of address in the line selector mode.

(2) FUNCTION KEY Assignments-2 (Error Mode)

This section describes FUNCTION KEY assignments when the error mode is selected as the trigger mode.

| Key | Display | Function |
|------|-----------------------|----------------------|
| F·1 | <Page> NEXT | To page 1/3 |
| F·2 | <MODE> LINE:COMPONENT | Selects display mode |
| F·3 | <DATA> NEW | Fetches new data |
| KNOB | <ADDRESS> | Changes address |

F·1: Opens page 1/3.

F·2: Selects the following items.

LINE Displays serial signal in input order.

COMPONENT Separates the video signal into Y, Cb, and Cr, then displays each address.

F·3: Clears displayed data, and fetches new data when error occurs.

KNOB: Changes displayed address.

The address becomes incorrect in the error mode.

(3) Display Example of Line Dump

| ADDRESS | COLOR | DATA |
|---------|-------|------|
| <1440> | Cb | 3FF |
| <1441> | Y | 000 |
| <1442> | Cr | 000 |
| <1443> | Y' | XYZ |
| <1444> | Cb | 200 |
| <1445> | Y | 040 |
| <1446> | Cr | 200 |
| <1447> | Y' | 040 |
| <1448> | Cb | ... |

(4) Display Example of Component Dump

| Y.ADR | Y | C.ADR | Cb | Cr |
|-------|-----|-------|-----|-----|
| <720> | 000 | <360> | 3FF | 000 |
| <721> | XYZ | | | |
| <722> | 040 | <361> | 200 | 200 |
| <723> | 040 | | | |
| <724> | 040 | <362> | 200 | 200 |
| <725> | 040 | | | |
| <726> | 040 | <363> | 200 | 200 |
| <727> | 040 | | | |
| <728> | 040 | <364> | 200 | 200 |

4.15 REMOTE Connector

Table below shows REMOTE connector pin assignment.
This connector is used for both remote control and audio input.

| Pin No. | Name | Description |
|---------|------------|---|
| 1 | NC | No connection |
| 2 | GND | Ground |
| 3 | NC | No connection |
| 4 | /EXT BLANK | Decreases intensity at low level input. |
| 5 | GND | Ground |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | +Y | Audio input, Y(V) axis, positive polarity |
| 9 | -Y | Audio input, Y(V) axis, negative polarity |
| 10 | +X | Audio input, X(H) axis, positive polarity |
| 11 | -X | Audio input, X(H) axis, negative polarity |
| 12 | NC | No connection |
| 13 | NC | No connection |
| 14 | GND | Ground |
| 15 | NC | No connection |
| 16 | SVA | Sets level to low when ALARM LED (serial video alarm output) is on. |
| 17 | /PRESET 1 | Reads preset 1 at low level. |
| 18 | /PRESET 2 | Reads preset 2 at low level. |
| 19 | /PRESET 3 | Reads preset 3 at low level. |
| 20 | /PRESET 4 | Reads preset 4 at low level. |
| 21 | /PRESET 5 | Reads preset 5 at low level. |
| 22 | /PRESET 6 | Reads preset 6 at low level. |
| 23 | /PRESET 7 | Reads preset 7 at low level. |
| 24 | /PRESET 8 | Reads preset 8 at low level. |
| 25 | /STORE | Stores "/PRESET 1-8" at low level. |

CAUTION

Since the maximum allowable input voltage to this connector (Pin 4 and 17~25) is TTL level, do not apply voltage exceeding 0 V and +5 V. Excessive input voltage can cause trouble.

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 Leader agent and provide followings.

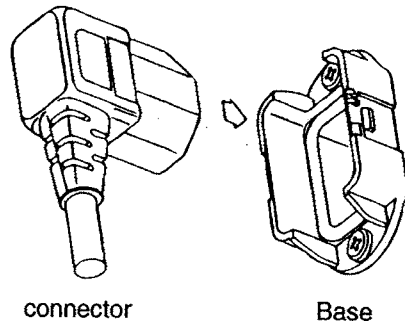
LI-2306 Lamp (5 pieces per set)

5.2 To Prevent Power Cord Disconnection

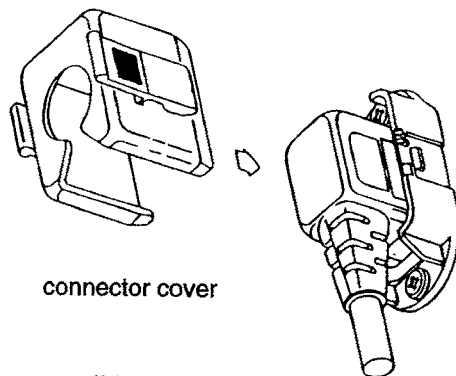
This instrument comes with a power cord designed to fit AC inlet. To prevent the power cord disconnection from the inlet, the Connector Cover is supplied as an accessory. Refer to procedure below.

5.2.1 Connecting the Power Cord

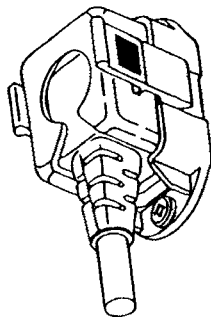
- (1) Insert the power cord connector into the AC inlet.



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



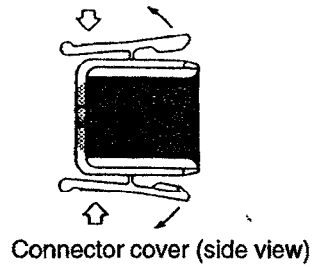
- (3) Press the cover until it clicks into place.



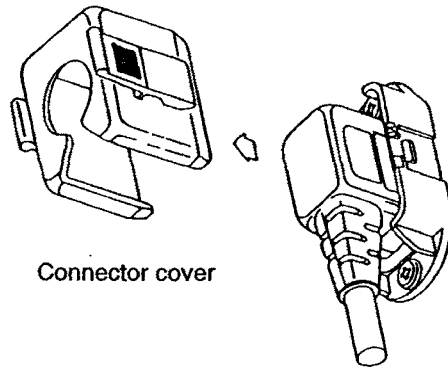
- (4) Confirm that connector cover is locked to the base.

5.2.2 Disconnecting the Power Cord

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



- (2) Remove the connector cover from the base.



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

