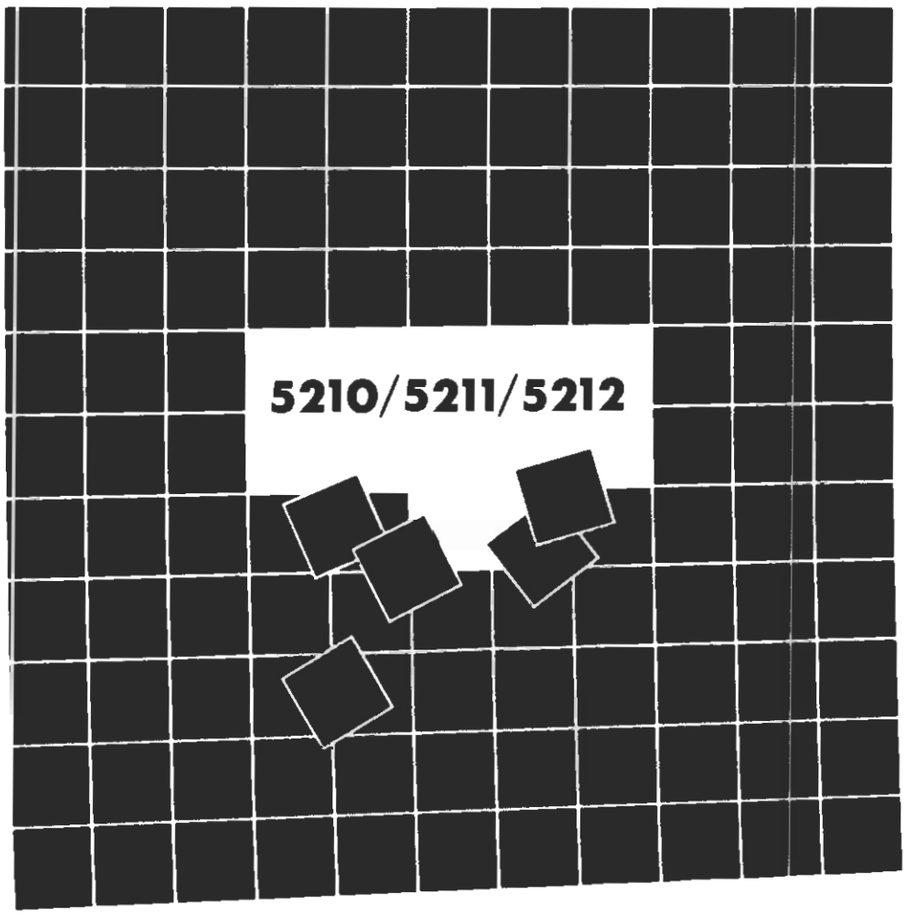
LEADER

VECTORSCOPE

NTSC/PAL

INSTRUCTION MANUAL



LEADER ELECTRONICS CORP.

TABLE OF CONTENTS

1. SPECIFICATIONS

1.1 Description

The Models 5210/5211/5212 are precision Vectorscope designed to monitor video signals. The 5210 series with its bright CRT features a vector display, DG/DP function to measure differential gain and differential phase with a line display, X-Y display mode for stereo audio signals, and menu screen for setting functions.

These instruments have three video inputs and one external reference input channel. Up to four waveforms, including the external reference, can be displayed. The newly developed digital phase control ensures a phase measurement accuracy of within 1%. These instruments can also be remotely controlled when combined with the 5220 series Waveform Monitor.

MODEL	5210	5211	5212
Subcarrier Frequency	3.58MHz	4.43MHz	3.58/4.43MHz
Sync System	M	B, G, H, I	M, B, G, H, I
Color System	NTSC	PAL	NTSC/PAL

1.2 Features

- Three video inputs and one external reference input channel
  Up to four waveforms, including the external reference, can be displayed simultaneously.

- Digital phase control
  The newly developed digital phase control ensures a phase measurement accuracy of within 1% and display resolution of within 0.1° with alphanumeric readout.

- DG/DP measuring function
  These instruments enable accurate measurement of differential gain DG and differential phase DP with alphanumeric readout.

- X-Y display function
  The level and phase of stereo audio signals can be measured.

- Auto phase
  The burst phase of the selected reference channel is set to the burst axis.

• Mag burst
The burst amplitude of the selected reference channel is set on the circle.

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

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

• Automatic NTSC/PAL system discriminator (5212 only)
The 5212 automatically selects the NTSC or PAL color system.

• Y/C input
The C signal vector can be displayed by respectively applying the Y signal and C signal to the CH1 and CH2 input connectors.

• Remote control
These instruments can also be remotely controlled when combined with the 5220 series Waveform Monitor. The line selected by the waveform monitor is displayed automatically.

• Bright CRT, accelerating potential of 16.5kV

• Universal AC power supply, 90 to 250V

• White phosphor CRT (Factory option)

1.3 Specifications

1.3.1 CRT

Type	150mm rectangular (P31)
Accelerating Potential	16.5kV
Effective Display Area	100 (H) x80 (V)mm
Graticule	Illuminated internal graticule

1.3.2 Input

Input Channel	CH1, CH2, CH3, EXT
Input Connector	BNC
Input Impedance	≥15kΩ, 75Ω loop-through
Maximum Input Voltage	±12V (DC+peak AC)
Return Loss	≥40dB (50kHz to 6MHz)
Isolation between Channels	≥70dB (Fsc)
Gain Difference between Channels	≤±0.5%
Phase Difference between Channels	≤±0.5 (Fsc)
Loop-Through Isolation	≥70dB (Fsc)

1.3.3 Synchronization

Sync Amplitude	5210/5212 NTSC	5211/5212 PAL
CH1, CH2, CH3		
Video Signal	Burst, sync amplitude	
	0.286Vp-p±6dB	0.3Vp-p±6dB
EXT		
Video Signal	Burst, sync amplitude	
	0.286Vp-p±6dB	0.3Vp-p±6dB
Subcarrier	2Vp-p±6dB	2Vp-p±6dB
Signal Selection	Video or subcarrier, selectable	

1.3.4 Vector Mode

Bandwidth

	5210/5212 NTSC	5211/5212 PAL
Upper -3dB Point	Fsc+500kHz ±100kHz	Fsc+500kHz ±100kHz
Lower -3dB Point	Fsc-500kHz ±100kHz	Fsc-500kHz ±100kHz
Center Frequency (Fsc)	3.579545MHz	4.43361875MHz

Display	Color bars 75%, 100%
	MAG mode setting

Phase Accuracy	OFF: Within ±1° BURST: Within ±2° X5 MAG: Within ±2°
Amplitude Accuracy	OFF: Within ±3% BURST: Within ±3% X5 MAG: Within ±5%
Orthogonality	Within ±0.5°
Digital Phase Control	
Phase Accuracy	Within ±0.5°
Subcarrier Regeneration	
Pull-In Range	Within ±150Hz
Pull-In Time	Within 1 sec
Phase Control Range	360
Phase Shift	Within ±2° (Fsc ±50Hz)
Phase Shift	Within ±2° (Burst amplitude ±6dB)
Burst Jitter	≤ ±0.5°
Position Control Range	
Vertical Position	At least ±8mm from center
Horizontal Position	At least ±8mm from center

1.3.5 DG/DP Mode

Measurement Accuracy	
DG	Within ±0.5%
DP	Within ±0.5°
Position Control Range	
Vertical Position	±40mm ±4mm from center
Horizontal Position	At least ±8mm from center
Auto Setup	At CAL position
DG Setup Accuracy	Within ±2%
DP Setup Accuracy	Within ±2°

1.3.6 X-Y Mode

Input	DC coupled differential inputs (Balanced input)
Input Impedance	≥20kΩ
Calibration Accuracy	Within ±3%
Input Amplitude	0dBm to 12dBm (600Ω) (2 to 9Vp-p) (0.775V to 3.1Vrms)
Maximum Input Voltage	±12V (DC+peak AC)
Frequency Response	DC to 20kHz, ≤3dB
X-Y Phase Difference	≤1° (20kHz)
Input Connector	15-pin D-sub connector (rear panel)

V Position Control Range	At least ±8mm from center
H Position Control Range	At least ±8mm from center

1.3.7 Gain

Gain Variable Range	+3dB to -14dB or more
Phase Shift by GAIN	Within ±1° (+3dB to -6dB)

1.3.8 +V

In the PAL system, this mode inverts and places -V axis display on the +V axis

1.3.9 REF

INT	CH1, CH2, or CH3 is selected as a reference channel. When one channel is selected, the reference is switched to selected channel automatically. For multi-channel display, first selected channel is held.
EXT	REF channel is fixed at EXT

1.3.10 Auto Phase	Burst phase is set to -(B-Y) axis
Accuracy	Within ±2°

1.3.11 REF SET

VECT Mode	PHASE display is set to 0.0°
DG Mode	DG display is set to 0.00%
DP Mode	DP display is set to 0.00°

1.3.12 Preset Function	Up to 10 panel settings
Controllable Functions	All front panel controls (except INTEN, FOCUS, ROTATION, ILLUM, GAIN VAR, POWER), and Menu (SYSTEM, DISPLAY)

1.3.13 Remote Control

Combinations	5220 → 5210 (NTSC) 5221 → 5211 (PAL) 5222 → 5212 (NTSC/PAL)
Line Selection	Full line selection capability Window display capability
Recall Function	Available
Controllable Functions	INPUT, REF, Y/C, RECALL
Control Signal	TTL, low active
Input Connector	9-pin D-sub connector (rear panel)

1.3.14 CRT Readout

Color System	NTSC/PAL (SYNC ABSENT)
Phase	0.0° to 359.9°
Display Resolution	0.1°
NTSC Setup	SETUP 7.5%/SETUP 0%
REF Channel	CH1, CH2, CH3, EXT
DG	+10.00% to -10.00% (DG mode)
Display Resolution	0.01%
DP	+10.00° to -10.00° (DP mode)
Display Resolution	0.01°
X-Y Display	X-Y scale is displayed (X-Y mode)
Recall Mode	Address to be recalled
Y/C Display	Y/C is displayed (Y/C mode)

1.3.15 General Specifications

Power Requirements	90 to 250VAC, 48 to 440Hz
Fuse	1.6A time-lag fuse
Power Consumption	≤35W
Environmental Conditions	
Guaranteed Accuracy	Temperature: 10 to 35°C
	Humidity: 10 to 80%
Operating	Temperature: 0 to 50°C
	Humidity: 10 to 90%
Size and Weight	215 (W) x132 (H) x423 (D)mm, 4kg

1.3.16 Accessories

Supplied Accessories	Illumination lamp	5
	Fuse (ST-4, 1.6A)	1
	Screw, rack mounting (inch size)	2
	15-pin D-sub connector	1
	Metal case, 15-pin D-sub connector	1
	9-pin to 9-pin D-sub connector cable	1
	Instruction manual	1
	Power cord	1
	Cover, inlet stopper	1
	Screw lock	6
	E-ring	3

Optional Accessories

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

2. OPERATING PRECAUTIONS

2.1 Line Voltage

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

2.2 Input Voltage

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

2.3 Excessive Magnetic Fields

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

2.4 High Temperature and Humidity

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

2.5 CRT

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

2.6 Battery Backup

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

2.7 Cabinet

Install the instrument in the optional cabinet for safety purpose. Refer to Section 1.4, "Accessories" for detail.

3. PANEL DESCRIPTION

3.1 Front Panel

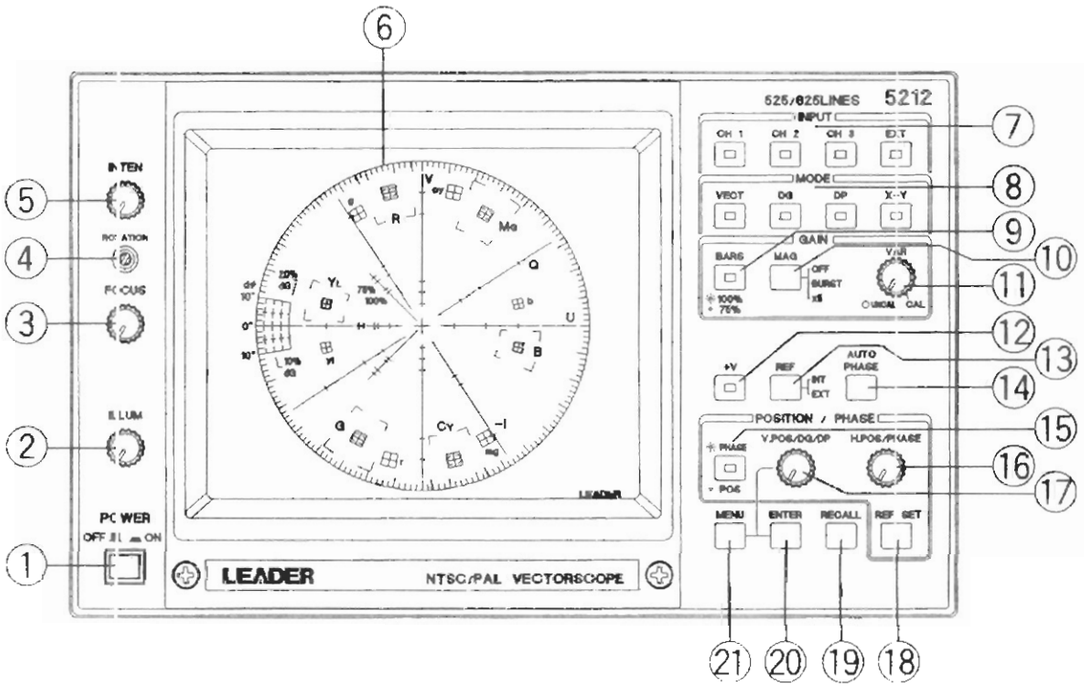


Figure 3-1 Front Panel

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

② ILLUM knob
Controls brightness of the scale illuminator. Turn clockwise to increase brightness.

③ FOCUS knob
Adjusts trace sharpness.

④ ROTATION adjustment
Compensates for the affects of terrestrial magnetism.

⑤ INTEN knob
Controls brightness of the displayed waveform.

⑥ Vector graticule
NTSC graticule: 5210, 5212
PAL graticule: 5211, 5211
Refer to Section 4.1, "Graticule" for detail.

⑦ INPUT keys
Select input channel: CH1, CH2, CH3, or EXT

⑧ MODE keys
Select the display mode: VECTOR, DG, DP, or X-Y.

⑨ BARS key
Selects 75% or 100% color bars
Lit LED indicates the 100% color bar.
This key is only effective when the VAR ⑪ is set to CAL.

⑩ MAG key
Selects gain OFF, BURST,or X5.
The BURST is only effective when the VAR ⑪ is set to CAL.

⑪ VAR knob
Adjusts gain from 1/5 to 1.4 times continuously.

⑫ +V key (5211, 5212)
Switches PAL display NTSC.

⑬ REF key
Selects sync source INT or EXT.

⑭ AUTO PHASE key
Sets the burst phase to the burst axis automatically.

⑮ PHASE/POS key
Sets function of the H.POS/PHASE knob ⑯. and V.POS/DG/DP knob ⑰ to position or phase controller.
Select the PHASE to select menu item.

⑯ H POS/PHASE knob
Adjusts the horizontal position of vector, DG, DP and X-Y, and the vector phase.

⑰ V.POS/DG/DP knob
Adjusts the vertical position of vector, DG, DP and X-Y.
Also, this key is used to select the menu.

⑱ REF SET key
This key is used to set the readout of phase to 0.0°, DG to 0.00%, or DP to 0.00°.

⑲ RECALL key
Recalls stored control settings sequentially.

⑳ ENTER key
Enters selected menu.

㉑ MENU key
Displays menu.
The menu can be selected and entered by using the V.POS/DG/DP knob ⑰ and ENTER key ⑳.

3.2 Rear Panel

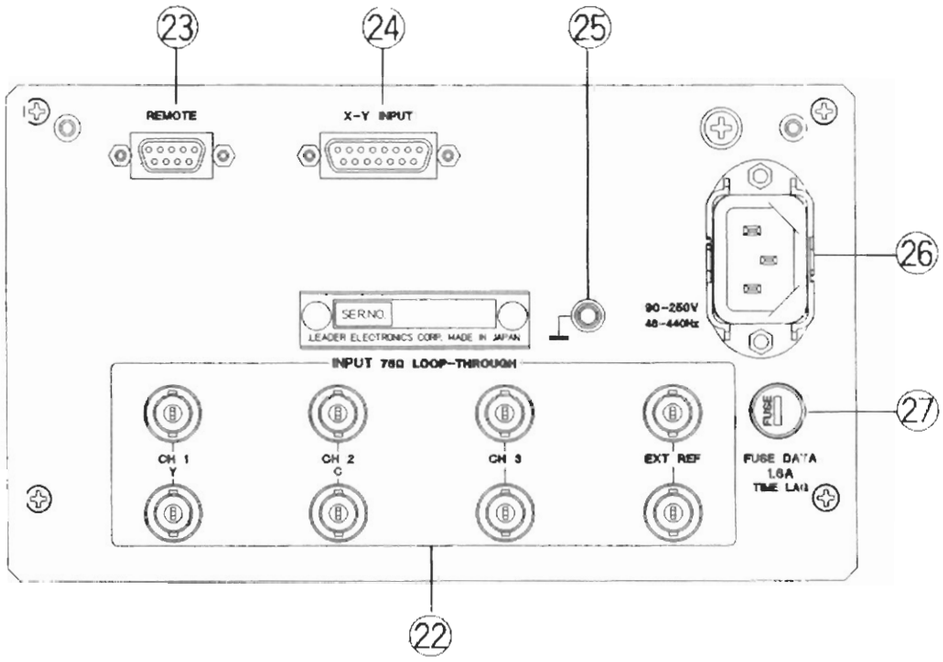


Figure 3-2 Rear Panel

㉒ INPUT connector
Loop-through input connectors; CH1, CH2, CH3, and EXT.

㉓ REMOTE connector
Input connector for remote control.

㉔ X-Y INPUT connector
Audio signal input connector.
The stereo signal amplitude and polarity can be displayed in lissajous patten.

㉕ Ground terminal

㉖ AC Inlet
Voltage range is 90 to 250V, universal.

㉗ Fuse
Power supply fuse.
Use specified fuse when replace it.

4. OPERATING PROCEDURE

4.1 Graticule

The graticule for the 5212 is shown in Figure 4-1.
For the 5210, remove the PAL scale from this graticule.
For the 5211, remove the NTSC scale from this graticule.

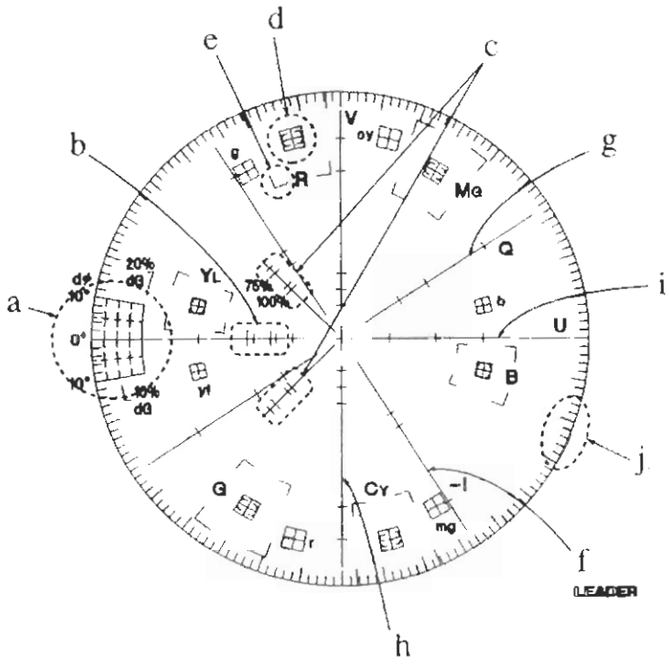


Figure 4-1 Vector Graticule

a: DG, DP measurement scale (all models)
Amplitude direction is DG measurement scale, and phase direction is DP measurement scale.

b: NTSC color burst measurement scale (5210, 5212)

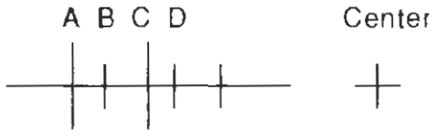


Figure 4-2 NTSC Burst Scale

A: Burst level for 75/7.5/75/7.5 color bars
B: Burst level for 75/0/75/0 color bars
C: Burst level for 100/7.5/100/7.5 color bars
D: Burst level for 100/0/100/0 color bars

75 indicates color bar amplitude of 75%.
100 indicates color bar amplitude of 100%.
7.5 indicates setup of 7.5%.
0 indicates setup of 0%.

c: PAL color burst measurement scale (5211, 5212)

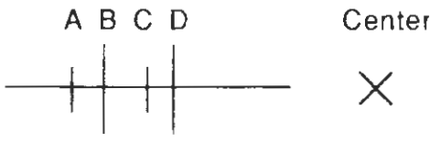


Figure 4-3 PAL Burst Scale

A: Burst level for 75/7.5/75/7.5 color bars
B: Burst level for 75/0/75/0 color bars (5212)
C: Burst level for 100/7.5/100/7.5 color bars
D: Burst level for 100/0/100/0 color bars (5212)

d: Amplitude and phase tolerance scale for R (red) vector.

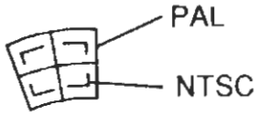
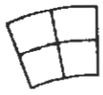


Figure 4-4 Vector Scale



PAL (5211, 5212)
Amplitude tolerance: ±5%
Phase tolerance: ±3°

NTSC (5210, 5212)
Amplitude tolerance: ±2.5 IRE
Phase tolerance: ±2.5°

Other scales
All models: B (Blue), G (Green), CY (Cyan), YL (Yellow), MG (Magenta)
PAL (5211, 5212): r, g, b, cy, yl, mg

e: Tolerance scale
Amplitude tolerance: ±20%
Phase tolerance: ±10°

f: I axis (5210, 5212)
The scale on the I axis indicates the perpendicular of each color.

g: Q axis (5210, 5212)
The scale on the Q axis indicates the perpendicular of each color.

h: V axis (5211, 5212)
The scale on the V axis indicates the perpendicular of each color.

i: U axis (5211, 5212)
The scale on the U axis indicates the perpendicular of each color.

j: Phase scale
Major division: 10
Minor division: 2°

4.2 Basic Operation of the Menu Screen

The items marked with asterisk in Figure 4-5 are set once the default setting is made.

4.2.1 Menu Structure

MENU	DESCRIPTION
MAIN MENU	
SYSTEM	Color, setup, composite, Y/C
COLOR SYSTEM	Color system selection (5212)
* AUTO	Automatic selection
NTSC	NTSC
PAL	PAL
NTSC SETUP	Setup selection (5210, 5212)
* 0%	0%
7.5%	7.5%
FORMAT	Signal type selection
* COMPOSITE	Composite
Y/C	Y/C
RETURN TO MAIN MENU	
DISPLAY	Readout display, readout intensity, test circle selection
READOUT	Readout on/off
* ON	On
OFF	Erases current display 5 sec after the last control operation
READOUT INTEN	Readout intensity adjustment
VAR [MAX]	Variable, displays MIN or MAX
TEST CIRCLE	Test circle selection
* OFF	Vector display
ON	Test circle display
RETURN TO MAIN MENU	
CALIBRATION	Gain adjustment
NTSC GAIN	NTSC gain adjustment (5212, 5210)
VAR	Variable, displays MIN or MAX
PAL GAIN	PAL gain adjustment (5212, 5211)
VAR	Variable, displays MIN or MAX
RETURN TO MAIN MENU	
PRESET	Address setting
1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Address setting, 1 to 10
BEGIN ADDRESS [1]	Begin address setting
END ADDRESS [10]	End address setting
RETURN TO MAIN MENU	
END	End, for measurement screen

Figure 4-5 Menu Structure

4.2.2 Main Menu Display

Procedure

1. Press the MENU key ㉑.
2. The MAIN MENU is displayed.

SCREEN	DESCRIPTION
****** MAIN MENU ******	
SYSTEM	Color, Setup, Y/C
DISPLAY	Readout on/off, Readout inten, Test circle
CALIBRATION	Gain adjustment
PRESET	Address setting, 1 to10
→ END	Return to measurement screen
Select : V. POS knob	
Set : ENTER key	

Figure 4-6 Main Menu

3. Move the cursor to the desired item by rotating the V.POS/DG/DP knob ⑰.
4. Press the ENTER key ⑳.
5. The selected menu screen is displayed.
6. To quit the menu screen for measurement screen, position the cursor to END and press the ENTER key ⑳.

4.2.3 Color System Display (5212)

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the SYSTEM screen.

SCREEN	DESCRIPTION
*** SYSTEM ***	
COLOR SYSTEM	Color system selection
* AUTO	Automatic (#1)
NTSC	NTSC (#2)
PAL	PAL (#3)
NTSC SETUP	
* 0%	
7.5%	
FORMAT	
* COMPOSITE	
Y/C	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: "NTSC" or "PAL" is displayed at the upper-left corner.
#2: "NTSC" is displayed at the upper-left corner.
#3: "PAL" is displayed at the upper-left corner.

Figure 4-7 Color System

2. Move the cursor to the desired color system by rotating the V.POS/DG/DP knob ⑰.
   Selectable color systems: AUTO, NTSC, PAL
3. Press the ENTER key ⑳.
4. The selected item is entered and marked with an asterisk.
5. The cursor moves to RETURN TO MAIN MENU.
6. Press the ENTER key ⑳.
7. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
8. Press the ENTER key ⑳.
   The measurement screen is displayed.

4.2.4 Setup Selection (5212, 5210)

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the SYSTEM screen.

SCREEN	DESCRIPTION
*** SYSTEM ***	
COLOR SYSTEM	
* AUTO	
NTSC	
PAL	
NTSC SETUP	Setup selection(#1)
* 0%	0%
7.5%	7.5%
FORMAT	
* COMPOSITE	
Y/C	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: "SETUP" is displayed at the lower-left corner.

Figure 4-8 Setup

2. Move the cursor to the desired setup level by rotating the V.POS/DG/DP knob ⑰.
   Selectable setup levels: 7.5%, 0%
3. Press the ENTER key ⑳.
4. The selected item is entered and marked with an asterisk.
5. The cursor moves to RETURN TO MAIN MENU.
6. Press the ENTER key ⑳.
7. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
8. Press the ENTER key ⑳.
   The measurement screen is displayed.

4.2.5 Signal Format Setting

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the SYSTEM screen.

SCREEN	DESCRIPTION
*** SYSTEM ***	
COLOR SYSTEM	
* AUTO	
NTSC	
PAL	
NTSC SETUP	
* 0%	
7.5%	
FORMAT	Signal format selection
* COMPOSITE	Composite
Y/C	Y/C (#1)
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: "Y/C" is displayed at the upper-right corner.

Figure 4-9 Format

2. Move the cursor to the desired signal format by rotating the V.POS/DG/DP knob ⑰.
   Selectable formats: COMPOSITE, Y/C
3. Press the ENTER key ⑳.
4. The selected item is entered and marked with an asterisk.
5. The cursor moves to RETURN TO MAIN MENU.
6. Press the ENTER key ⑳.
7. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
8. Press the ENTER key ⑳.
   The measurement screen is displayed.

4.2.6 Readout Setting

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the DISPLAY screen.

SCREEN	DESCRIPTION
*** DISPLAY ***	
READOUT	Readout display
* ON	On
OFF	Off (#1)
READOUT INTEN	
VAR [MAX]	
TEST CIRCLE	
* OFF	
ON	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

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

Figure 4-10 Readout

2. Move the cursor to the desired readout by rotating the V.POS/DG/DP knob ⑰.
   Selectable readout: ON, OFF
3. Press the ENTER key ⑳.
4. The selected item is entered and marked with an asterisk.
5. The cursor moves to RETURN TO MAIN MENU.
6. Press the ENTER key ⑳.
7. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
8. Press the ENTER key ⑳.
   The measurement screen is displayed.
9. When READOUT ON is set, the readout is always displayed. When READOUT OFF is set, the readout is only displayed by operating the key or knob. The readout is automatically erased five seconds after the last key or knob operations.

4.2.7 Readout Intensity Setting

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the DISPLAY screen.

SCREEN	DESCRIPTION
*** DISPLAY ***	
READOUT	
* ON	
OFF	
READOUT INTEN	Readout intensity
VAR [MAX]	Variable (#1)
TEST CIRCLE	
* OFF	
ON	
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: Displays "MAX" for maximum intensity, "MIN" for minimum intensity.

Figure 4-11 Readout Intensity

2. Move the cursor to the VAR by rotating the V.POS/DG/DP knob ⑰.
3. Press the ENTER key ⑳. The cursor stops blinking.
4. The readout intensity can be adjusted by rotating the V.POS/DG/DP knob ⑰.
5. Press the ENTER key ⑳.
6. The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ⑳.
8. Display returns to the MAIN MENU screen. The cursor is positioned at END.
10. Press the ENTER key ⑳. The measurement screen is displayed. The readout intensity will be held even turning power off.

4.2.8 Test Circle Setting

Procedure

1. Input the subcarrier signal to the INPUT connector to display the vector.
2. Press the MENU key ㉑ to display the MAIN MENU screen, then select the DISPLAY screen.

SCREEN	DESCRIPTION
*** DISPLAY ***	
READOUT	
* ON	
OFF	
READOUT INTEN	
VAR [MAX]	
TEST CIRCLE	Test circle selection
* OFF	Vector display
ON	Test circle display
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

Figure 4-12 Test Circle

3. Move the cursor to the desired test circle by rotating the V.POS/DG/DP knob ⑰.
   Selectable test circle: ON or OFF
4. Press the ENTER key ⑳.
5. The selected item is entered and marked with an asterisk.
6. The cursor moves to RETURN TO MAIN MENU.
7. Press the ENTER key ⑳.
   When ON is selected, the vector rotates in asynchronous status and circle is displayed normally.
   The perfect circle should be displayed.
   When the ellipse or dual-circle is displayed, the calibration should be made.
   When OFF is selected, the vector synchronizes.
8. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
9. Press the ENTER key ⑳.
   The measurement screen is displayed.

4.2.9 Calibration Procedure

Procedure

1. Set the NTSC, PAL, or SETUP mode according to the input signal.
2. Input the color bar signal used as a reference to the INPUT connector to display the vector.
3. Set the VAR knob ⑪ to CAL position for the calibration.
   The calibration cannot be performed in the UNCAL mode.
4. Adjust H.POS/PHASE knob ⑯ and V.POS/DG/DP knob ⑰ to position the vector center to the graticule center.
5. Press the MENU key ㉑ to display the MAIN MENU screen, then select the CALIBRATION screen.

SCREEN	DESCRIPTION
*** CALIBRATION ***	
NTSC GAIN	NTSC gain adjustment (5210,5212)
VAR	Variable (#1)
PAL GAIN	PAL gain adjustment (5211, 5212)
VAR	Variable (#1)
SETUP 0%	Displays current setup
GAIN VARIABLE UNCAL	GAIN VAR: UNCAL (unsettable)
→ RETURN TO MAIN MENU	
Select : V. POS knob	
Set : ENTER key	

#1: Displays "MAX" for maximum gain,
"MIN" for minimum gain.

Figure 4-13 Calibration

6. Move the cursor to the VAR of desired color system by rotating the V.POS/DG/DP knob ⑰.
7. Press the ENTER key ⑳.
   The cursor stops blinking.
8. Adjust V.POS/DG/DP knob ⑰ to position each vector to the G, B, R, MG, YL, and CY scale center.
9. Press the ENTER key ⑳.
10. The cursor moves to RETURN TO MAIN MENU.
11. Press the ENTER key ⑳.
12. Display returns to the MAIN MENU screen.
    The cursor is positioned at END.
13. Press the ENTER key ⑳.
    The measurement screen is displayed.
    The calibrated accuracy will be held even turning power off.

4.2.10 Address Setting

Procedure

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the PRESET screen.
2. Set the front panel controls as required.
   The function of the keys and knobs ⑦ through ㉑ (except ⑪), and SYSTEM and DISPLAY in the menu can be preset.

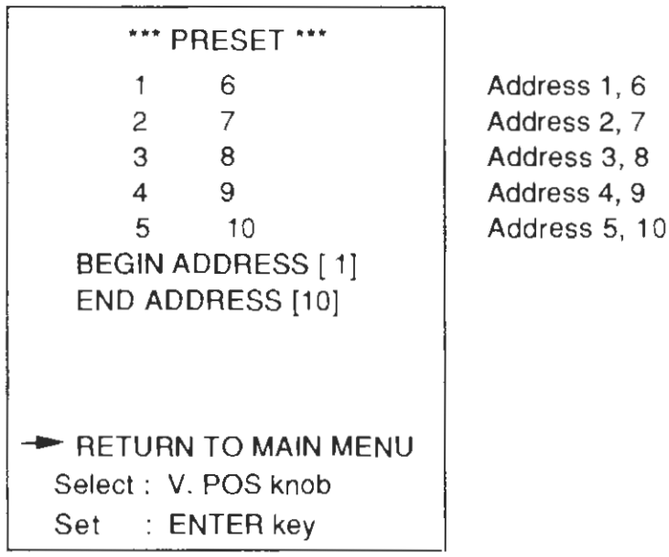


Figure 4-14 Preset Address

3. Move the cursor to desired address by rotating the V.POS/DG/DP knob ⑰.
4. Press the ENTER key ⑳.
5. The setting data is stored in the selected address.
6. The cursor moves to RETURN TO MAIN MENU.
7. To set the address continuously, repeat from step "2."
8. Press the ENTER key ⑳ to finish address setting.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ⑳.
    The measurement screen is displayed.

4.2.11 Begin and End Addresses Setting

Procedure

1. This function is used to set the address range to be recalled.
2. Press the MENU key ㉑ to display the MAIN MENU screen, then select the SYSTEM screen.

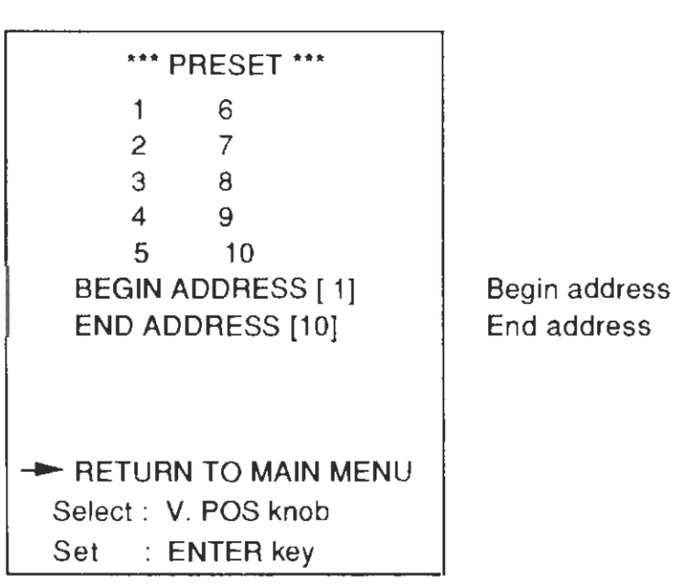


Figure 4-15 Begin and End Addresses

3. Move the cursor to BEGIN ADDRESS or END ADDRESS by rotating the V.POS/DG/DP knob ⑰.
4. Press the ENTER key ⑳.
   The cursor stops blinking.
5. Move the cursor to the desired address by rotating the V.POS/DG/DP knob ⑰.
6. Press the ENTER key ⑳.
7. The cursor moves to RETURN TO MAIN MENU.
8. Press the ENTER key ⑳.
9. Display returns to the MAIN MENU screen.
   The cursor is positioned at END.
10. Press the ENTER key ⑳.
    The measurement screen is displayed.

4.2.12 Description of Readout

DESCRIPTION	SCREEN		DESCRIPTION
Sync on/off	SYNC ABSENT	Y/C	Y/C mode
Color system	NTSC	REF CH1	Reference input
Recall mode	RECALL		
Setup	SETUP	PHASE	Phase
	7.5%	359.6°	

Figure 4-16 Readout

4.3 Signal Measurement Procedure

4.3.1 Input Selection

Procedure

1. Select the input channel from the CH1, CH2, CH3, or EXT by pressing the INPUT key ⑦ as described below.
2. Press the desired INPUT key ⑦.
   The LED is turned on or off alternately by pressing the key.
   The vector of the selected channel indicated by lit LED is displayed.
   Up to four channels can be displayed.
   Since the EXT REF signal can also be displayed simultaneously, the phase relationship of the CH1, CH2, or CH3 input with respect to the reference signal can be measured.

4.3.2 Internal and External References

Sync selection procedure

1. The REF key ⑬ is used to select the sync signal.
2. INT or EXT is alternately selected by pressing the REF key ⑬.
   The selected sync signal name is displayed at the upper-right corner of the screen.
   When the INT is selected, the initially selected channel in the CH1, CH2, or CH3 is used as a sync reference.
   When the selected input signal has no sync signal, "SYNC ABSENT" is displayed at the upper-left corner of the screen.

4.3.3 Vector Display

Procedure

1. Press the VECT key ⑧ for the vector display mode.
   Four types of color bars can be displayed:
   75/7.5/75/7.5
   75/0/75/0
   100/7.5/100/7.5
   100/0/100/0
2. To measure the color bar amplitude and phase, set 100% amplitude, 75% amplitude, and SETUP according to the color bar signal to be measured.
   Use BARS key ⑨ to set 100% or 75% amplitude.
3. Use the menu to select the SETUP, 0% or 7.5%.
   In the PAL system, the setup is 0% only.
   Refer to Section 4.2.4, "Setup Selection" for detail.
4. To adjust the phase, use H.POS/PHASE knob ⑯.
   The shifted phase angle is displayed at the lower-right corner of the screen.
5. By pressing the AUTO PHASE key ⑭, the burst phase is positioned at the burst scale automatically.
   Figure 4-17 shows the NTSC vector display.

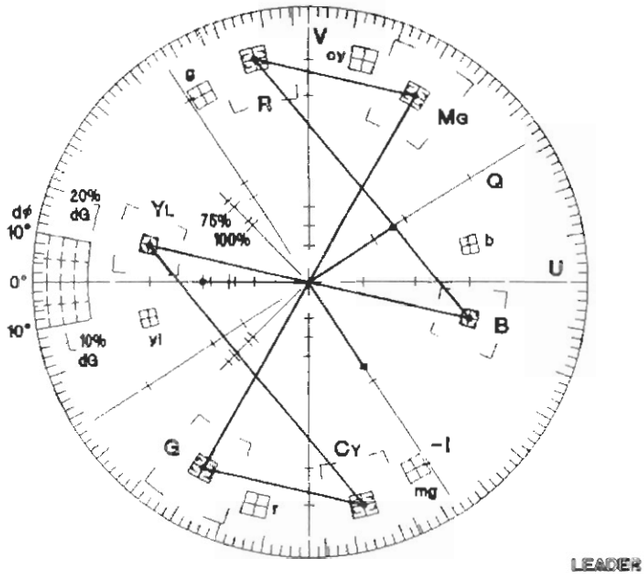


Figure 4-17 Vector Pattern

4.3.4 Burst Measurement

Procedure

1. Use the burst scale to measure burst amplitude.
2. Set the setup and color bars.
3. Measure the burst amplitude using the burst scale.

Burst phase measurement between channels

1. Input two video signals to be measured.
2. Set the REF key ⑬ to INT. Press the CH1 key ⑦ , then press the CH2 key ⑦ to display both signals. REF CH1 is also displayed.
3. Position the burst on the burst scale by using the AUTO PHASE key ⑭ or H.POS/PHASE knob ⑯.
4. To set the burst amplitude to match the graticule circle, use either procedure shown below.
   - Select BURST by pressing the MAG key ⑩.
   - Select x5 by pressing the MAG key ⑩ and adjust the VAR knob ⑪.

   By selecting the BURST of the MAG key ⑩, the burst amplitude is automatically set to the graticule circle.
   When the signal level is changed after setting the BURST, select it again.
   The BURST the MAG key ⑩ does not operate automatically when the VAR knob ⑪ is set to the UNCAL position.
5. Press the REF SET key ⑱ to set the displayed phase value to 0°.
6. Adjust the H.POS/PHASE knob ⑯. so that the burst to be measured is positioned at the reference burst.
7. The phase difference is displayed on the screen.

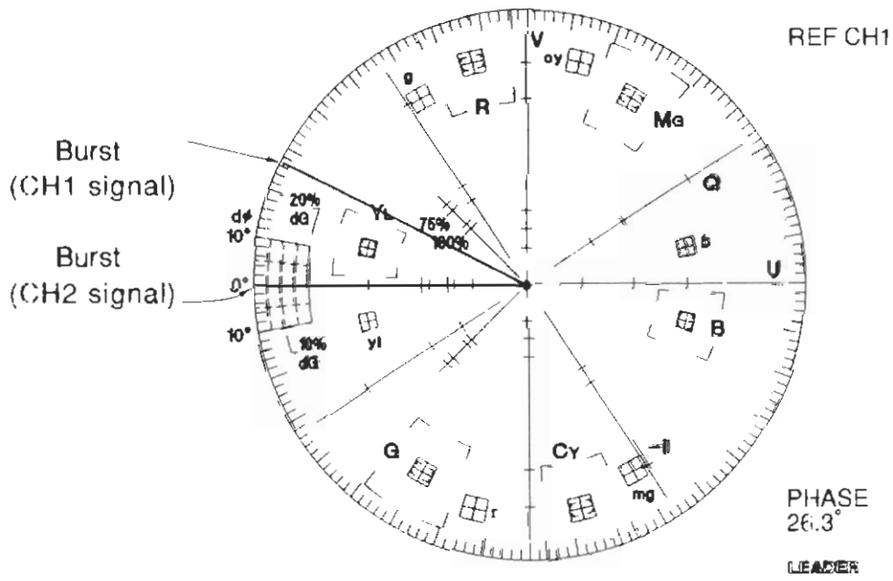


Figure 4-18 Burst Measurement

4.3.5 DG Measurement

Procedure

1. Use modulated staircase or modulated ramp signal for measurement.
2. Set the VAR knob ⑪ to CAL and press the DG key ⑧. The signal amplitude is automatically set.
3. The DG can be obtained as follows by using the V.POS/DG/DP knob ⑰.
   - Position the maximum point of the DG signal to the reference line (marker).
   - Press the REF SET key ⑱ to set the displayed DG value to 0%.
   - Position the minimum point of the DG signal to the reference line
   - The DG value is displayed on the screen.
     The polarity is indicated with "+" when the amplitude is greater than the reference.
4. When the INPUT key or signal level is changed, press the DG key ⑧ again to set the reference amplitude.
5. When the VAR knob ⑪ is set to UNCAL position, the burst level should be adjusted manually.
   Position the spot of modulated ramp signal to the reference point of the DG measurement , then press the DG key ⑧.

Reference point
for DG measurement

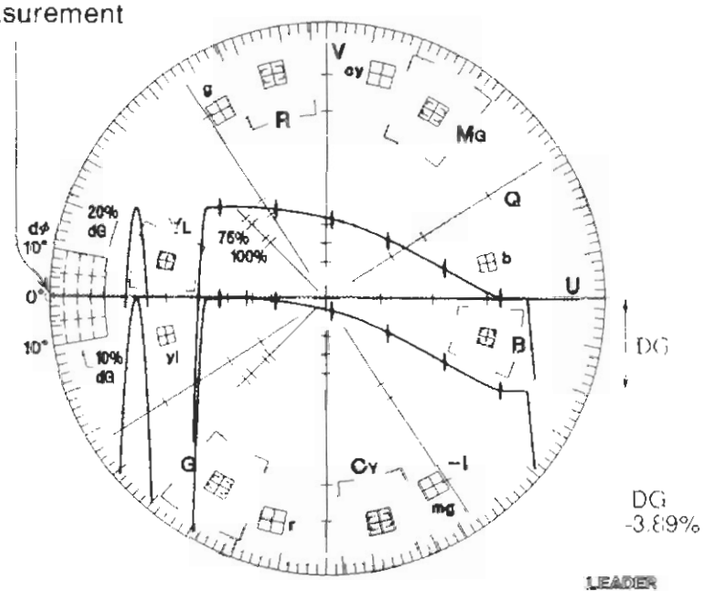


Figure 4-19 DG Measurement

4.3.6 DP Measurement

Procedure

1. Use modulated staircase or modulated ramp for measurement.
2. Set the VAR knob ⑪ to CAL and press the DP key ⑧. The signal phase and amplitude are automatically set.
3. The DP can be obtained as follows by using the V.POS/DG/DP knob ⑰.
   - Position the maximum point of the DP signal to the reference line.
   - Press the REF SET key ⑱ to set the displayed DP value to 0%.
   - Position the minimum point of the DP signal to the reference line (marker).
   - The DP value is displayed on the screen.
     The polarity is indicated with "+" when the phase is more progressive than the reference.
4. When the INPUT key or signal level is changed, press the DP key ⑧ again to set the reference phase and amplitude.
5. When the VAR knob ⑪ is set to UNCAL position, the burst level should be adjusted manually.
   Position the spot of modulated ramp signal to the reference point of the DP measurement, then press the DP key ⑧.

Reference point for DP measurement

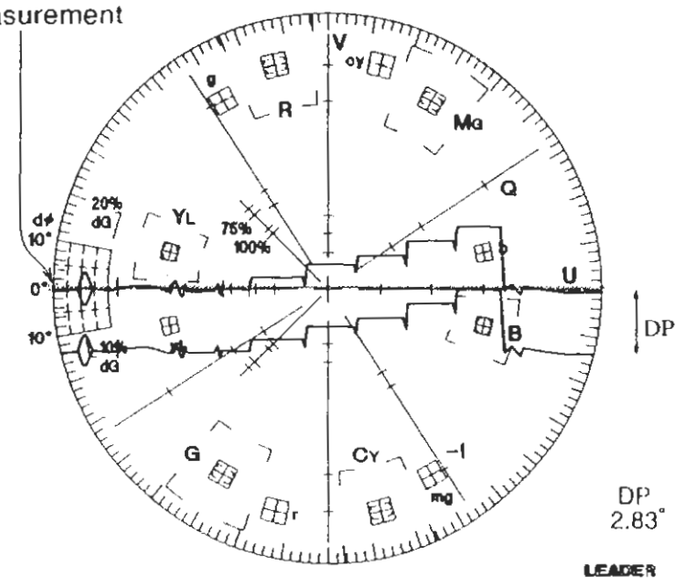


Figure 4-20 DP Measurement

4.3.7 X-Y Measurement

Procedure

1 Input the audio signal to the X-Y INPUT connector on the rear panel.
The pin assignment is shown below.

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	-X INPUT	9	-X INPUT
2	GND	10	GND
3	+X INPUT	11	+X INPUT (HIGH GAIN)
4	GND	12	GND
5	-Y INPUT	13	-Y INPUT
6	GND	14	GND
7	+Y INPUT	15	+Y INPUT (HIGH GAIN)
8	GND	16	GND

2. Press the X-Y key ⑧ for X-Y measurement.
The level scales are displayed at the upper-right and lower-left of the screen.
+ : Center
Small box : ±0.5dB
Large box : ±1dB

3. The audio signal is displayed in lissajous pattern.
The amplitude and phase can be measured.

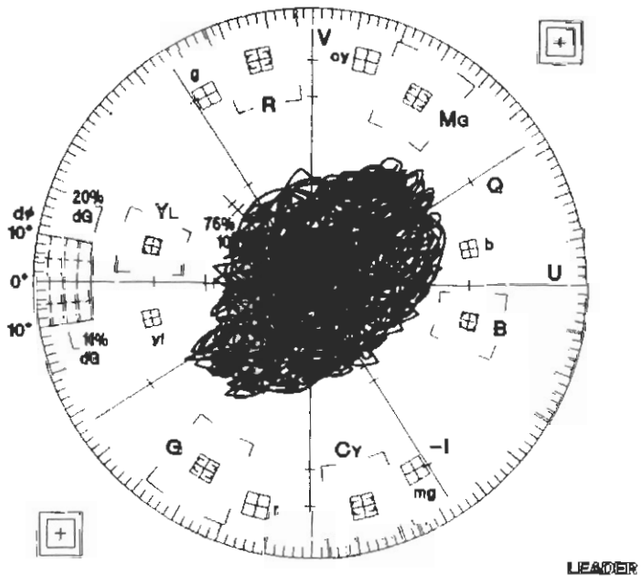


Figure 4-21 X-Y Measurement

4.3.8 Y/C Signal Measurement

Connection

1. Connect the Y signal to the CH1 INPUT connector.
2. Connect the C signal to the CH2 INPUT connector.

Setting

1. Press the MENU key ㉑ to display the MAIN MENU screen, then select the SYSTEM screen.
   Move the cursor to Y/C by rotating the V.POS/DG/DP knob ⑰.
   Following mode is initially selected.
   INPUT: CH1, CH2
   REF: INT
2. When the component signal is input to the CH1, CH2, or CH3, the vector does not synchronize.
3. The Y/C signal can also be observed as follows.
   Input the composite signal synchronized with the Y/C signal.
   Press the REF key ⑬ for EXT.
4. Refer to Figure 4-16 for readout characters.

4.3.9 PAL Signal Inversion (5211, 5212)

1. The PAL signal phase is inverted 180° every line. Therefore, it is difficult to observe the vector because color components indicated with "lowercase letters" are displayed.
   For easy observation, this function inverts the inverted signal again to position the color components on the scale indicated with the "uppercase letters."
2. Press the +V key ⑫.
   The inverted vector is overlaid on the in-phase vector.
   When the vector is not overlaid, adjust H.POS/PHASE knob ⑯. for overlaid display.
   If the vector is still not overlaid, the input signal phase is shifted.
   When vector is overlaid, however, the each color component is displaced from the scale in the same angle, adjust the ROTATION adjustment ④ for correct display.

4.3.10 Recall Mode Setting

Procedure

1. This function is used to recall the stored control settings.
   Prior to recall the control settings, it should be stored in the memory.
   Refer to Section 4.2.10, "Address Setting" for detail.
   Also, begin and end addresses should be set.
   Refer to Section 4.2.11, "Begin and End Addresses Setting" for detail.
2. Press the RECALL key ⑲. The address increments by 1 with this key.
   When the address reaches to the end, it returns to the begin address.
   The address is displayed at the upper-left corner of the screen.
3. By operating the front panel keys or knobs ⑦ through ㉑ (except ⑪) in the recall mode, the address of controlled function is erased. When the RECALL key ⑲ is pressed, the recall operation will be started from the erased address. In this case, controlled function is only changed and other functions are held as is.
4. When the readout display is set to off (recall display is erased), recall operation will be started from the erased address by pressing the RECALL key ⑲ .

4.3.11 Center Dot Blanking

When no signal is applied to the instrument in the vector or X-Y mode, bright dot appears at the graticule center. It may cause phosphor burnt-out.

The instrument has the center-dot blanker to prevent such trouble even no signal is applied.

4.3.12 Subcarrier Input

The black burst (BB) or subcarrier (SC) can be used as the external reference signal.

The BB is set when shipped from the factory.

To select the SC input, remove the shield plate and set the jumper switch as follows.

MODE	JUMPER SWITCH
BB	1 - 2
SC	2 - 3

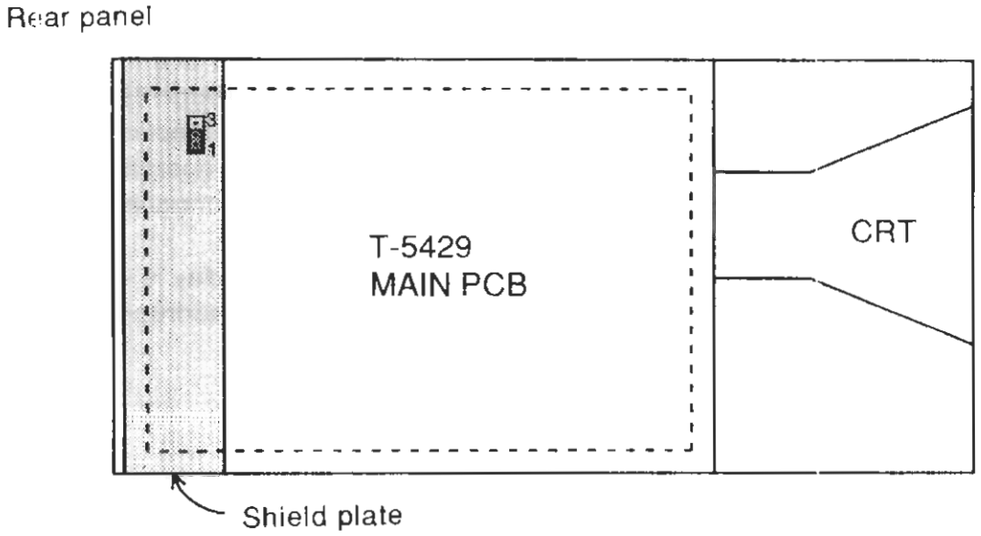


Figure 4-22 External Reference Selection

4.4 Remote Control

4.4.1 Remote Control Between Instruments

By using the remote control mode, you can remotely control the vectorscope through the waveform monitor.

Use the supplied 9-pin to 9-pin D-sub connector to connect the instruments.

The functions built in the waveform monitor but not in the vectorscope will be ignored.

The front panel controls and menu can also be set in the remote control mode.

When the remote control operation and front panel setting are duplicated, lately set mode becomes effective.

Connectable combination is as follows.

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

4.4.2 Controllable Functions

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

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.

5.2 Calibration Procedure

The gain is calibrated within ±3% when shipped from the factory. When the gain accuracy is reduced by longtime use, you can calibrate it.

The reference color bar signal is required for calibration.

5.3 Default Settings

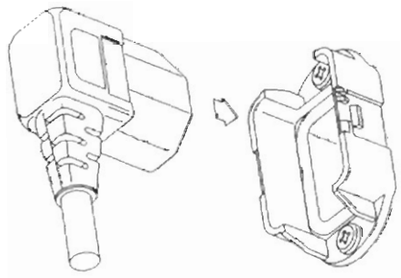
1. Turn power off.
2. Hold down the CH1 key, then turn the power on.
   The default settings will be made.

5.4 To Prevent Power Cord Disconnection

The 5210/5211/5212 comes with a power cord designed to fit AC inlet. To prevent the power cord disconnection from the inlet, the Connector Cover is supplied as an accessory. Refer to procedure below.

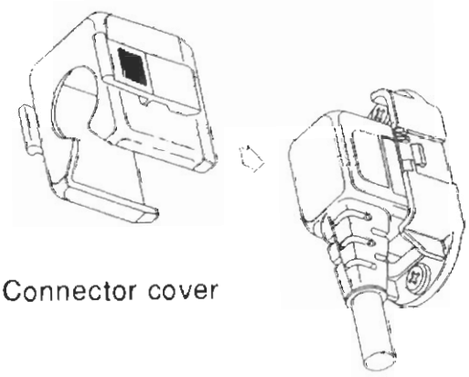
5.4.1 Connecting the Power Cord

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



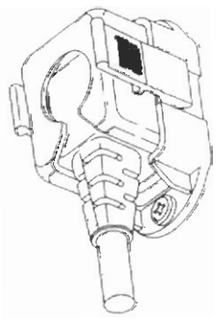
Connector Base

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



Connector cover

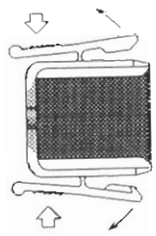
(3) Press the cover until it clicks into place.



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

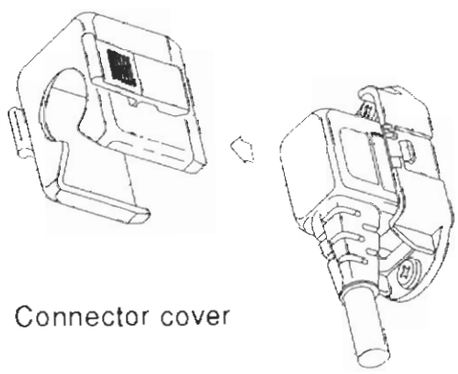
5.4.2 Disconnecting the Power Cord

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



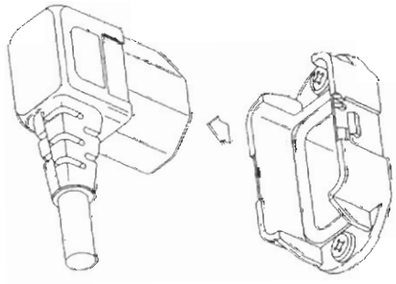
Connector cover (side view)

(2) Remove the connector cover from the base.



Connector cover

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



Connector Base

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