LSW-359

SWEMAR GENERATOR

INSTRUCTION MANUAL

TABLE OF CONTENTS

1. GENERAL

The LSW-359 Swemar Generator is a general-purpose generator with a wide frequency range of 1 to 1500MHz (three bands).

It is best suited for use in the research and development, testing, and adjustment of VHF, UHF, and DBS equipment.

2. FEATURES

(1) Wide sweep frequency range of 1 to 1500MHz (three bands).

(2) Wide range of variable sweep width, permitting observation of frequency response in wide to narrow bands.

(3) Four convenient alternative sweep functions: FULL sweep, start/stop sweep, ΔF sweep, and CW.

(4) Wide range of variable sweep times from 10ms to 100s (selectable in four steps).

(5) Single-sweep function and pen lift output terminal facilitate connection of an X-Y recorder.

(6) Easy reading of frequencies by using 1MHz, 10MHz, 50MHz, and 100MHz harmonic markers (birdy).

These harmonic markers have a variety of amplitude for ready identification.

(7) Variable markers (pulse), which allow ready reading of frequencies during a FULL sweep and enable ΔF frequency to be set as the center frequency.

(8) Optional addition of up to three spot markers (birdy) or harmonic markers (birdy).

3. SPECIFICATIONS

Item	Specifications
Sweep Frequency Range	BAND 1; 1 ∿ 550MHz
	BAND 2; 450 ∿ 1000MHz
	BAND 3; 950 ∿ 1500MHz
Center Frequency	BAND 1; 1 ∿ 550MHz
	BAND 2; 450 ∿ 1000MHz
	BAND 3; 950 ∿ 1500MHz
Dial Setting Accuracy	±20MHz (at +7dBm)
Sweep Width	200kHz ∿ 550MHz
Sweep Function	FULL, START/STOP, ΔF, CW
Sweep Method	Variable Capacitance Diode
Output Voltage	+7dBm (50Ω)
Output Impedance	50Ω Unbalanced
Output Flatness	±0.5dB (at +7dBm)
Linearity	Within 5% (at +7dBm)
Spurious	Less than -30dBc
Attenuator	Rotary type 10dB x 6
	Electronic type 17dB
Attenuation Accuracy	BAND 1; ±0.5dB
	BAND 2; ±1.0dB
	BAND 3; ±1.5dB
Sweep Time	10ms ∿ 100s
Horizontal Output Voltage	More than 10Vp-p
Sweep Mode	LINE, AUTO, SINGLE, MANUAL
Marker Method	Variable Pulse Marker (FULL at sweep)
	Birdy Marker
Marker Frequency	1MHz Harmonic Marker
	10MHz Harmonic Marker
	50MHz Harmonic Marker
	100MHz Harmonic Marker
	Option: Spot Marker (1 to 1500MHz)
	: Harmonic Marker (2, 5, 20 and 25MHz)
	Optionally, up to three harmonic markers or spot markers can be added.

Marker Accuracy	Less than 0.01%
External Marker	The LSW-359 has a terminal for external markers. Input Voltage of about 70mVrms or more is necessary for external markers having identical amplitude width internal markers.
Birdy Marker Band Widths	WIDE, MIDDLE, NARROW three steps selector
AM Modulation	Option: Modulate frequency 1kHz sine wave
Remote Controlled	Band Selector (BAND 1, 2, 3)
	Sweep Function Selector (FULL, START/STOP, ΔF, CW)
	Sweep Mode Selector (LINE, AUTO, SINGLE)
	Sweep Trigger and Sweep Time Selector (10ms ∿ 100ms, 0.1 ∿ 1s, 1 ∿ 10s, 10 ∿ 100s MANUAL)
	Sweep Time Variable Control
	Start, Center Control
	Stop, Width Control
	Marker ON/OFF
	Electronic Attenuator Control
Pen Lift Output	Contact on during sweep period
Power Supply	50/60Hz 100, 120, 200 and 240V
Power Consumption	Approx. 43W
Size and Weight	400(W) x 150(H) x 400(D) mm, Approx. 12kg
Accessories	BNC ∿ BNC cable 3
	BNC ∿ BNC 50Ω cable 1
	3P Power Cord 1
	3P/2P Conversion Adaptor .. 1
	Time-lag Fuse 1
	Connector for remote controller 2
	Connector for pen-lifting.. 1

(NOTE): THE OPTION MUST BE INSTALLED BY US AT THE FACTORY.

4. HANDLING INSTRUCTIONS

4.1 Observe Supply Voltages

The supply voltage ranges for the LSW-359 are specified on the nameplate in the upper part of the rear panel inlet.

Use a supply voltage within ±10% of the specified voltage rating. Normal operation of the LSW-359 cannot be guaranteed if a supply voltage lower than -10% of the rating is used. Also, the power supply unit might overheat if operated using a supply voltage exceeding +10% of the specified rating.

Check the voltage and fuse ratings indicated on the rear panel as shown in the table to the right.

FUSE DATA

90 ∿ 132V	1.0A	TIME LAG
180 ∿ 264V	0.5A	

4.2 Attenuator Protection

When the output terminal of the LSW-359 is connected to a circuit conducting DC voltage, be sure to connect it using the appropriate capacitance; direct connection to the LSW-359 could result in attenuator overheating and burning.

4.3 Panel Control Backup

The LSW-359 panel control can retain its functions for about one month after the POWER switch is turned off. When the POWER switch is turned on, the panel control is automatically set to the functions in effect before the POWER switch was last turned off. However, these functions and their previous settings may not be retained, and may require resetting under any of the following conditions:

(1) The power has been turned off for more than one month.
(2) The power has been turned on for less than a total of 30 hours, although power has been applied a few times after being off for more than one month.

4.4 Changes in Oscillating Frequency due to Electronic Attenuator and Load Changes

The oscillating frequency can be varied to some extent by varying the electronic attenuator. With the rotary attenuator set to the 0 position, changes in the load impedance connected to the OUTPUT terminal may produce some changes in the oscillating frequency.

By chang EXTERNAL LOAD OR VSWR what will Happen to Freq (Called Freq. Pulling)

By chang P/S VOLTAGE within specified Tolerances, will Freq change? (called Freq. Pushing)

5. PANEL DESCRIPTION

5.1 Front and Rear Panel Views (Figures 5-1 and 5-2)

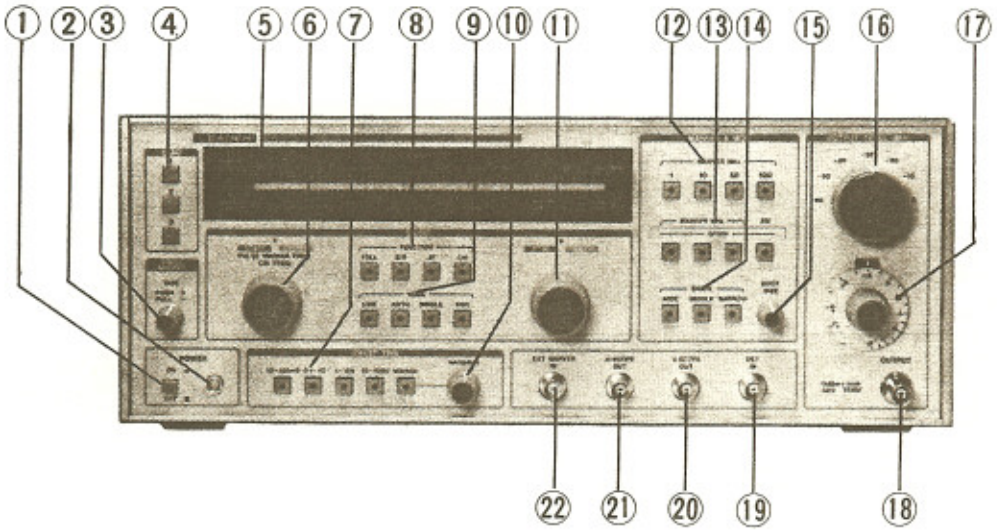


Figure 5-1 Front Panel

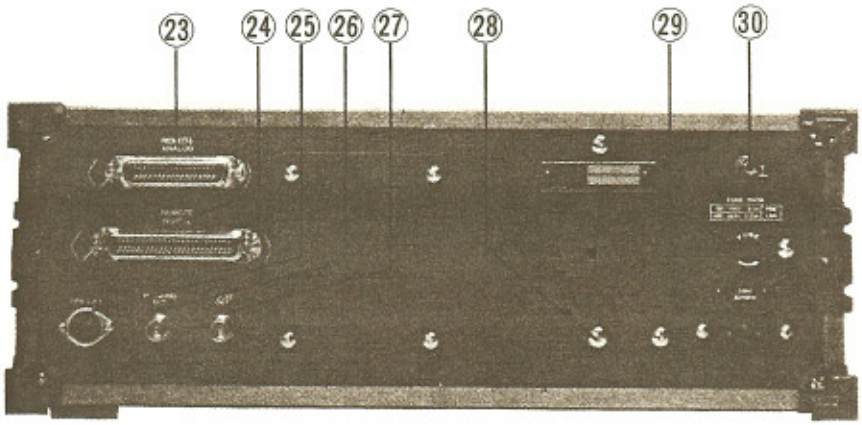


Figure 5-2 Rear Panel

5.2 Front Panel Description

(1) POWER switch

Power switch. Press this switch to turn POWER ON. Pilot lamp (2) goes on. Press it again to turn POWER OFF.

(2) Pilot lamp

Goes on when POWER is turned ON.

(3) PULSE MARKER SIZE

Varies the size of a variable pulse marker that is generated during a FULL sweep. Press in to generate positive pulses, and press again to generate negative pulses.

(4) BAND switch

Selects frequency bands.

BAND 1: 1 to 550MHz

BAND 2: 450 to 1000MHz

BAND 3: 950 to 1500MHz

A lamp goes on to the left of FREQUENCY scale (5) to indicate the frequency band selection.

(5) FREQUENCY scale

Indicates the sweep frequency.

The green index corresponds to [START] / [CENTER] /PULSE MARKER FREQ./CW FREQ. (6) and the red index corresponds to [STOP] / [WIDTH] (11). Upper scales are used for both WIDTH and BAND 1, while lower scales are used for BAND 2 and BAND 3.

(6) [START] / [CENTER] /PULSE MARKER FREQ./CW FREQ.

Control used to set frequencies with FUNCTION switch (8). The setting is indicated by the green index on FREQUENCY scale (5). Hereafter, this control will be called the START/CENTER control.

FULL sweep ..... Sets the pulse marker frequency.

S/S sweep ..... Sets the sweep start frequency.

ΔF sweep ..... Sets the sweep center frequency.

CW..... Sets the oscillating frequency.

(7) SWEEP TIME switch

Selects sweep time ranges. For AUTO and SINGLE sweeps, four alternative ranges are selectable: 10 to 100ms, 0.1 to 1s, 1 to 10s, and 10 to 100s. The sweep time within each range can be varied continuously by using VARIABLE control (10).

When the MANUAL switch is pressed, sweeps can be manually triggered by turning VARIABLE control (10).

(8) FUNCTION switch

Selects one of the four sweep functions: FULL sweep, S/S (START/STOP) sweep, ΔF sweep, and CW.

FULL sweep ... Sweeps all frequencies in a frequency band. A pulse marker is output, which can be varied by using START/CENTER control (6).

S/S sweep .... Sweeps from the frequency set by START/CENTER control (6) to the frequency set by STOP/WIDTH control (11).

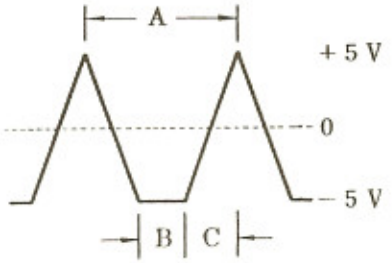
ΔF sweep ..... Sweeps in the sweep width set by STOP/WIDTH control (7) by centering around the frequency set by START/CENTER (6).

CW..... Oscillates continuous waves at the frequency set by START/CENTER control (6).

(9) MODE switch

Selects from among the LINE synchronous sweep, AUTO sweep, and SINGLE sweep modes.

LINE ..... Repeats a sweep in synchronism with the power frequency. The H. SCOPE oscilloscope observed in the LINE synchronous mode is shown in Figure 5-3.



AC50Hz ··· A = 20 ms, B = 6 ms, C = 7 ms
AC60Hz ··· A = 16.7 ms, B = 2.7 ms, C = 7 ms

Figure 5-3 H. SCOPE waveform in the LINE mode

AUTO ..... Repeats a sweep automatically during a preset sweep time. The H. SCOPE waveform is a triangular waveform.

SINGLE ..... A single sweep occurs when the TRIG switch is pressed. The H. SCOPE output initially remains at -5V. When the TRIG switch is pressed, a sweep is triggered from -5V to +5V, before the H. SCOPE output returns to -5V. If the TRIG switch is pressed during a sweep, the sweep is terminated and the H. SCOPE output returns to -5V in the shortest sweep time within each SWEEP TIME range, regardless of the VARIABLE control ⑩ setting. (For example, the return period is 1s in the 1 to 10s range.)

⑩ VARIABLE control

Varies the sweep time in the AUTO and SINGLE sweep modes. When the MANUAL switch is pressed, sweeps can be manually triggered by turning VARIABLE control ⑩ .

⑪ [STOP] / [WIDTH]

Control used to set frequencies with FUNCTION switch ⑧. The setting is indicated by the red index on FREQUENCY scale ⑤. Hereafter, this control will be called the STOP/WIDTH control.

FULL sweep ... No function.

S/S sweep .... Sets the sweep stop frequency.

ΔF sweep ..... Sets the sweep width.

CW ..... No function.

⑫ MARKER MHz switches

Select 1MHz, 10MHz, 50MHz, and 100MHz harmonic markers. When the 1MHz switch is turned on, harmonic markers are output at 1MHz intervals. At this time, 10MHz, 50MHz, and 100MHz markers are also output regardless of whether the 10MHz, 50MHz, and 100MHz switches are turned on or off. Next, when the 10MHz switch is turned on and the 1MHz switch is turned off, harmonic markers are output at 10MHz intervals. At this time, 50MHz and 100MHz

markers are also output regardless of whether the 50MHz and 100MHz switches are turned on or off.

Next, when the 50MHz switch is turned on and the 1MHz and 10MHz switches are turned off, harmonic markers are output at 50MHz intervals. At this time, 100MHz markers are also output regardless of whether the 100MHz switch is turned on or off.

When the 100MHz is turned on and other switches are turned off, harmonic markers are output at 100MHz intervals.

⑬ MARKER MHz (OPTION) and AM

The MARKER MHz switch turns option markers on and off. The AM switch turns the amplitude modulation of 1kHz sine waves (option) on and off.

⑭ SHAPE switch

Selects three alternative birdy marker band widths.

For WIDE, the bandwidth is the widest and birdy markers displayed on the screen appear excessively wide.

For NARROW, the bandwidth is the narrowest and birdy markers displayed on the screen appear excessively narrow.

For MIDDLE, birdy markers displayed on the screen have an intermediate width.

⑮ BIRDY SIZE control

Adjusts the amplitude of birdy markers.

⑯ Attenuator

Varies RF outputs by up to 60dB in 10dB steps.

⑰ Electronic Attenuator

Varies RF outputs 17dB continuously. The sum of the setting of attenuator ⑯ and that of electronic attenuator ⑰ indicates the dBm value of the RF output level.

⑱ OUTPUT

RF signal output terminal, with an output impedance of 50 ohms.

⑲ DET IN

Detected waveform input terminal, to which the output of a

circuit under test is connected through a detector. The detected waveform as input to this terminal is output to V.SCOPE OUT terminal (20), with overlayed birdy or pulse markers.

(20) V.SCOPE OUT

Vertical axis signal output terminal for an alignment scope or X-Y recorder.

The detected waveform as input to this terminal is output to V.SCOPE OUT terminal (20), with overlayed birdy or pulse markers.

(21) H.SCOPE OUT

Horizontal axis sweep signal output terminal for an alignment scope or X-Y recorder.

Output voltage: 10Vp-p or more

Output impedance: Approx. 1kΩ

(22) EXT MARKER IN

External marker input terminal. When a signal at a desired frequency within a sweep frequency range is input, it is displayed as an RF birdy marker.

Input impedance: 50Ω

Input sensitivity: The input voltage required for the same amplitude as that of the internal marker is approximately 70mVrms (-10dBm).

5.3 Rear Panel Description

(23) REMOTE ANALOG

Connector used to enable remote-control of the following front-panel operations:

- [START] / [CENTER] /PULSE MARKER FREQ./CW FREQ.
- [STOP] / [WIDTH]
- SWEEP TIME VARIABLE
- OUTPUT LEVEL electronic attenuator

(24) REMOTE DIGITAL

Connector used to enable remote-control of the following front-panel operations:

- BAND: 1, 2, 3
- FUNCTION: FULL, S/S, AF, CW

- MODE: LINE, AUTO, SIGNAL
- SWEEP TIME: 10 ∿ 100ms, 0.1 ∿ 1s, 1 ∿ 10s, 10 ∿ 100s, and MANUAL
- MARKER MHz: 1, 10, 50, 100MHz
- MARKER MHz: OPTION and AM
- SHAPE: WIDE, MIDDLE, NARROW

(25) PEN LIFT

DIN connector used for X-Y recorder pen lift signals. Pins 1 to 3 are conducting during a SINGLE sweep only when SWEEP TIME is set to 1 to 10s or 10 to 100s.

Permissible continuity ratings

Conducting contact:

Pins 1 to 3

Maximum power:

1.2W

Maximum voltage:

100mV min. to 24V max.

Maximum current:

100μA min. to 0.1A max.

Load:

Resistive load

Figure 5-4 DIN connector pin layout

(26) BLANKING OUT

Output terminal for signals of the same phase as internally used blanking signals.

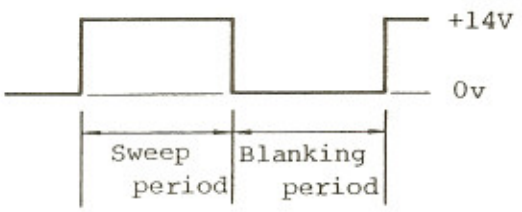


Figure 5-5 BLANKING OUT signal

(27) PULSE OUT

A variable pulse marker is output to this terminal during a FULL sweep.

Output voltage: +12Vp-p or -12Vp-p

(28) AC LINE

AC power inlet.

(29) FUSE

Turn counterclockwise to remove the fuse under the cap. Check for the fuse type and rating.

(30) GND

Frame ground terminal.

6. OPERATIONS

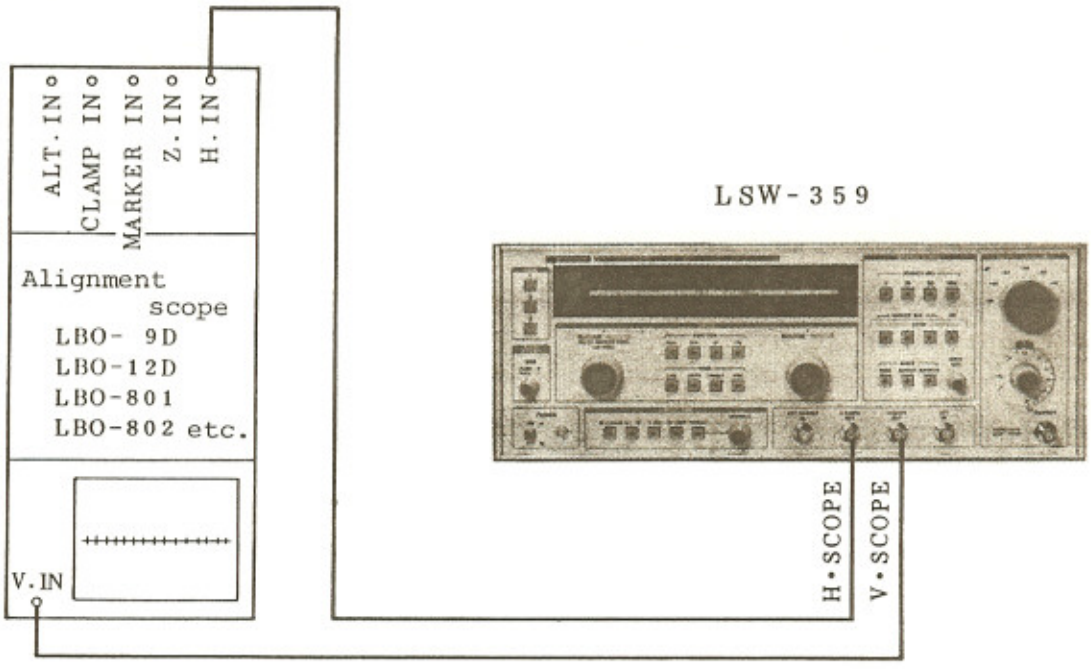
6.1 Preparations for Measurement

(1) Insert the power plug into an outlet rated at the specified voltage ±10% (50/60Hz).

(2) Push in the POWER switch and verify that the pilot lamp goes on.

(3) Allow a warm-up period of at least 15 minutes after power is turned on.

6.2 Set-up



6.3 Preliminary LSW-359 Control Settings

PULSE MARKER SIZE (3):	Fully turned clockwise, + polarity
BAND (4):	BAND 1
START/CENTER control (6):	300MHz
STOP/WIDTH control (11):	Fully turned clockwise
FUNCTION (8):	FULL
MODE (9):	AUTO
SWEEP TIME (7):	10 to 100ms

VARIABLE (10) :	Fully turned clockwise
MARKER MHz (12) :	50MHz
MARKER MHz OPTION (13) :	All OFF (If an option is installed.)
SHAPE (14) :	WIDE
BIRDY SIZE (15) :	Middle
Attenuator (16) :	Fully turned clockwise
Electronic Attenuator (17) :	Fully turned clockwise

6.4 Alignment Scope Setting

Adjust H.GAIN and H.POSITION for the size and position of the horizontal axis as required for the most-suitable observation. Next, display birdy markers by adjusting vertical axis sensitivity and V.POSITION.

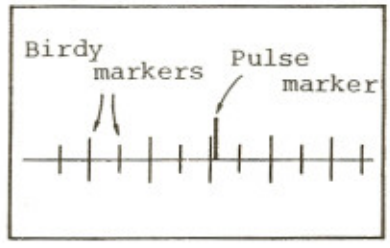


Figure 6-1
Pulse and Birdy Markers

6.5 Operation Check

Check that pulse and birdy markers are displayed as shown in Figure 6-1.

6.6 General Operation

(1) Interconnect the LSW-359 with an alignment scope, a circuit to be tested, and a detector as shown in Figure 6-2. Set the controls in the same way as mentioned in 6.3.

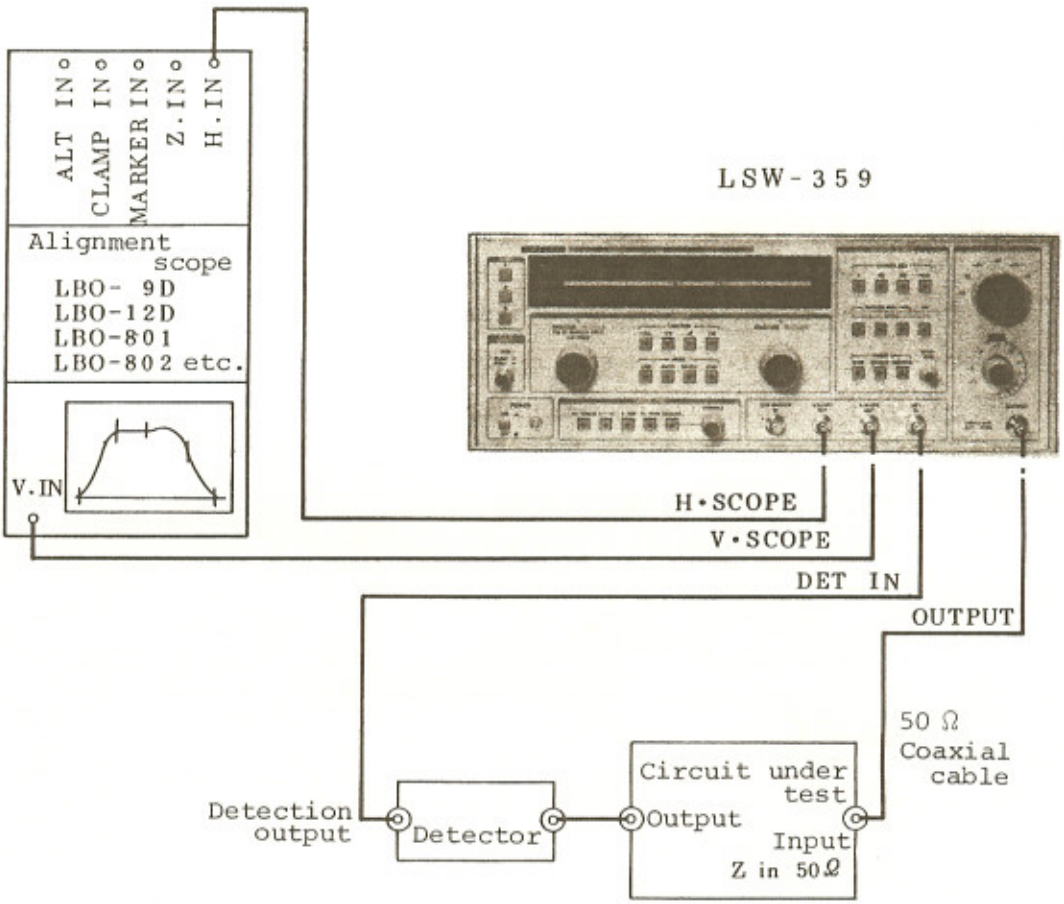


Figure 6-2 Set-up for general operation

(2) Adjust attenuator (16) and electronic attenuator (17) to a level that will not cause output from the circuit being tested to be saturated. [Figure 6-3 (a)]

(3) Adjust sensitivity of the alignment scope for the best possible view of the waveform being displayed.

(4) Turn START/CENTER control (6) and set the pulse marker to a particular part of the waveform. [Figure 6-3 (b)]

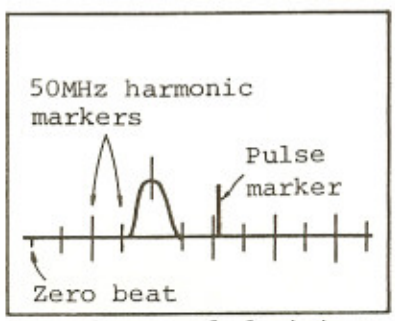


Figure 6-3 (a)

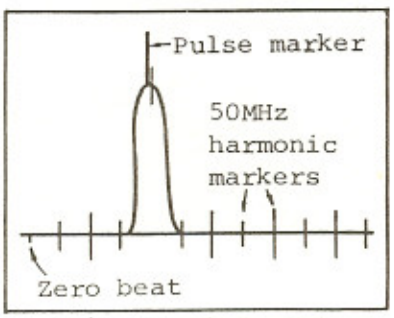


Figure 6-3 (b)

(5) Set FUNCTION switch (8) to ΔF. The frequency set in (4) is fixed as the center frequency. [Figure 6-3 (c)]

(6) Turn STOP/WIDTH control (11) for the best possible view of the waveform being displayed. Turn on the 10MHz marker, 1MHz marker, or OPTION marker as required.

(7) When the frequency range to be observed is fixed, set FUNCTION switch (8) to S/S, the lower limit frequency to be observed to S/S by using START/CENTER control (6), and set the upper limit by using STOP/WIDTH control (11) before beginning frequency range measurement.

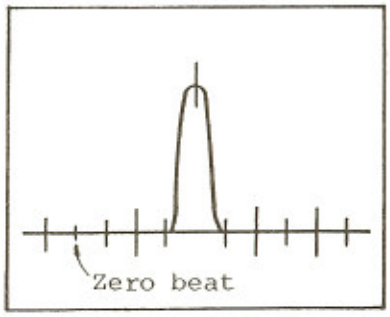


Figure 6-3 (c)

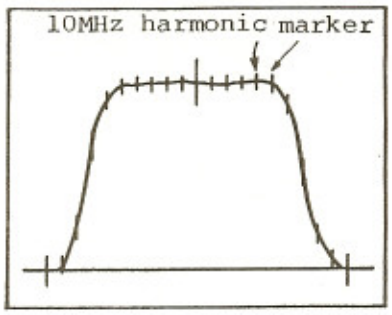


Figure 6-3 (d)

6.7 Errors Related to Sweep Speeds

When frequency response in a narrow frequency band are observed on a sweep oscillator, the center frequency of the waveform being displayed may be shifted in the sweep direction with respect to the real frequency response. This may result in an error related to the resultant broadening of the bandwidth and a lowering of the peak level as shown in Figure 6-4.

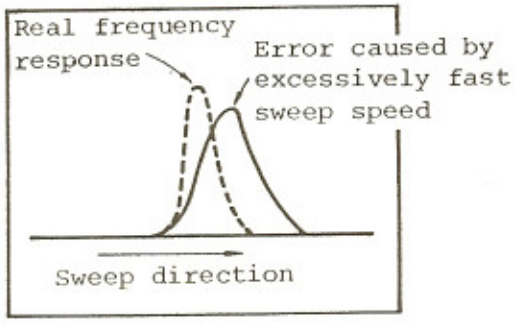


Figure 6-4
Effects of sweep speed

An error can be detected by checking to see if the waveform being displayed is varied when the sweep time is increased.

If such an error is detected, minimize the detection time constant of the detector and narrow the sweep width to the smallest extent possible. If the error remains, increase the sweep time until the waveform being displayed is unaffected by changes in the sweep time.

6.8 Combined Use with a Digital Storage Oscilloscope

A digital storage oscilloscope can be conveniently used in place of a regular alignment scope under the following conditions:

(1) When the sweep speed cannot be increased

The sweep speed cannot be increased due to a related error, and the waveform cannot be observed well because it flickers when displayed on a regular alignment scope.

(2) When multiple waveforms on display are compared

When two or three detected waveforms are compared on the same screen.

The uses of the LSW-359 under these conditions are explained below with reference to an LBO-5825 digital storage oscilloscope.

(1) When the sweep speed cannot be increased

(A) Connect the LSW-359 to an LBO-5825 in the setup shown in Figure 6-5.

(B) Set the LBO-5825 as follows:

V MODE	X - Y
SWEEP MODE	NORM
TRIG COUPLING	DC
TRIG SOURCE	CH 1
TRIG SLOPE	+
TRIG LEVEL	0
TRIG HOLDOFF	NORM
VIEW TIME	OFF
DISPLAY MODE	REAL

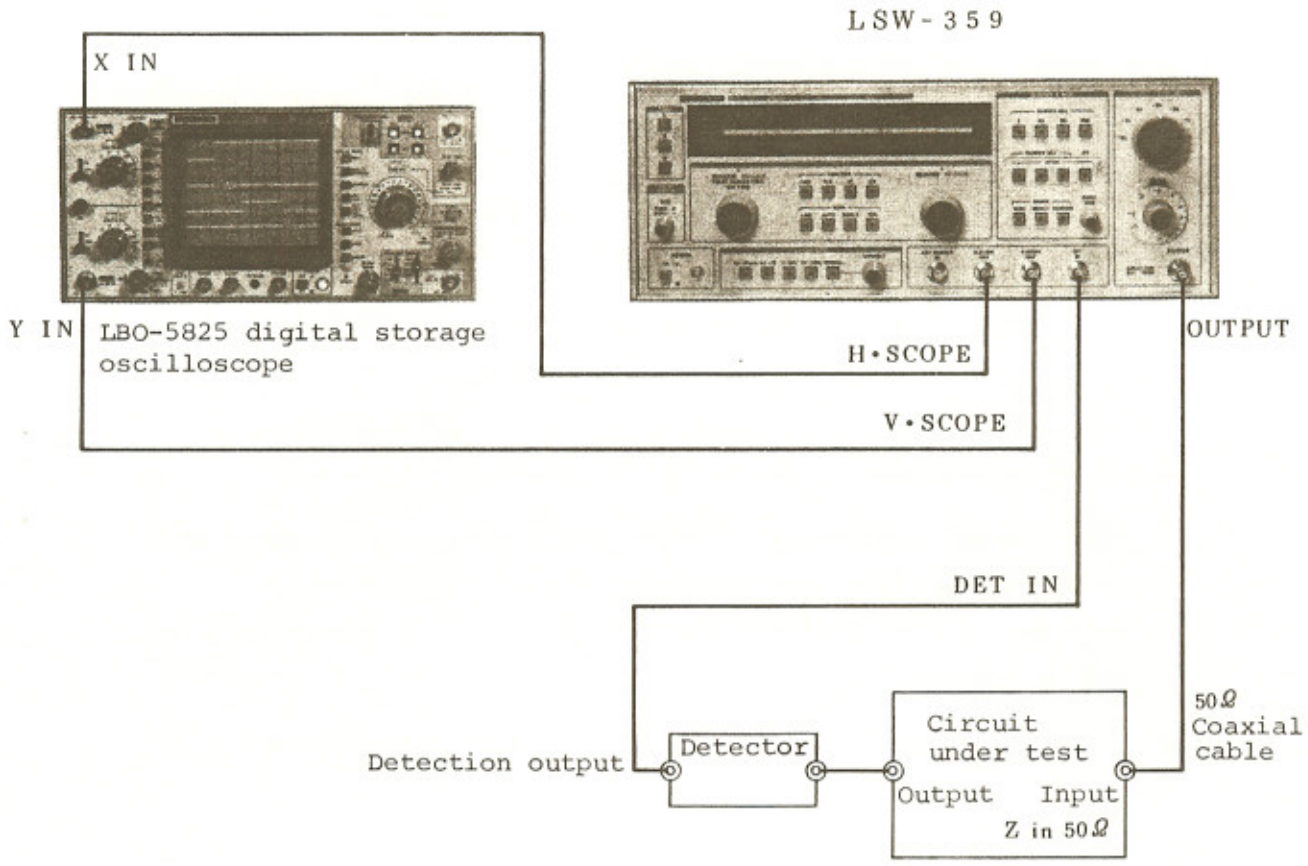


Figure 6-5 Connection to a digital storage oscilloscope

(C) Set the LSW-359 to a relatively slow sweep time whether in the LINE or AUTO mode, and display the detected waveform on the oscilloscope. A margin of error related to the sweep speed is permitted in the detected waveform.

(D) Adjust the X-axis sensitivity and ◀▶ POSITION of the LBO-5825 to set the waveform with ±4 divisions of the X-axis center [See Figure 6-6 (a)].

(E) Adjust the LSW-359 FUNCTION switch, sweep frequency range, and output level so that the detected waveform is visible at a suitable size.

(F) Adjust the Y-axis sensitivity and ↕ POSITION of the LBO-5825 to set the waveform within ±4 divisions of the Y-axis center (See Figure 6-6 (a)).

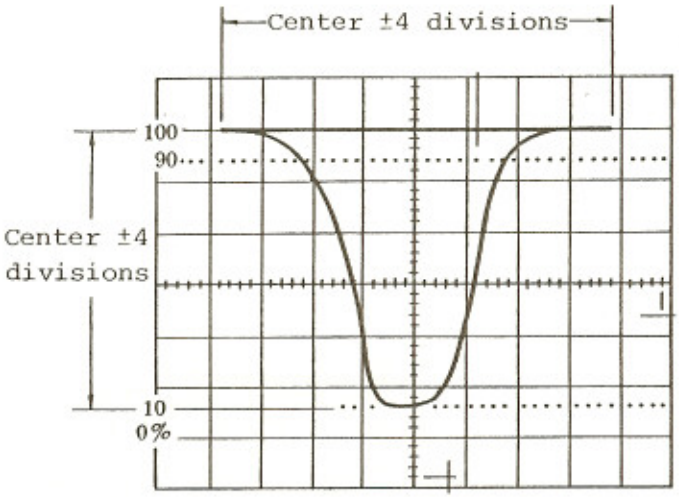


Figure 6-6 (a) Real waveform (Example of band-pass filter response)

(G) Set the LBO-5825 in the REAL & STORAGE display mode, set the X- and Y-axis STORAGE POSITION controls to the PULL DC OFFSET position, and adjust the DC OFFSET controls to display the overlayed real and stored waveforms. If the LBO-5825 storage write speed (10 times the setting of the TIME/DIV switch) is faster than the time required for a single sweep on the LSW-359, the entire single sweep by the LSW-359 cannot be stored and the stored waveform will appear broken as shown in Figure 6-6 (b). In this case, adjust the LBO-5825 TIME/DIV switch to slow the

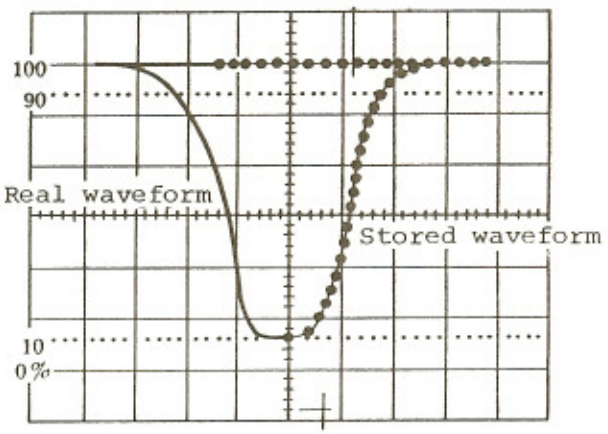


Figure 6-6 (b) Real and stored waveforms (When the sweep speed is too fast)

write speed until the stored waveform can be completely displayed.

(H) Set the LBO-5825 in the STORAGE display mode and reduce the LSW-359 sweep time until the sweep speed related error is eliminated.

Also, reduce the LBO-5825 write speed until the stored waveform is completely displayed.

Then, real response characteristics free from sweep speed related errors can be observed on the screen without flickering.

(I) If the stored waveform still appears broken when the LBO-5825 TIME/DIV switch is set to 0.5s/div, set it in the ROLL display mode and adjust the TIME/DIV switch again.

(2) When multiple waveforms on display are compared

(A) Connect the LSW-359 to an LBO-5825 in the set-up shown in Figure 6-5, and perform the steps (A) through (H) in (1) above.

(B) Simultaneously press MEMORY PROTECT HALF switches CH1 and CH2 to store the initial waveform.

(C) In this condition, change the circuit to be tested. Then, the waveforms of the old and new circuits being tested can be observed on the same screen.

(D) If no error occurs at a sweep speed setting that permits satisfactory observation of a real waveform, set the LBO-5825 in the REAL & STORAGE waveform, and up to three detected waveforms can be compared on the same screen by using MEMORY PROTECT switches HALF and ALL.

[Notes]:

(1) When a detected waveform is stored, the waveform becomes extremely difficult to observe because birdy or pulse markers are displayed at several points. Hence, accurate reading or comparison of frequencies is impossible.

(2) For information on how to operate a digital storage

oscilloscope, refer to the appropriate instruction manual.

6.9 Using an X-Y Recorder

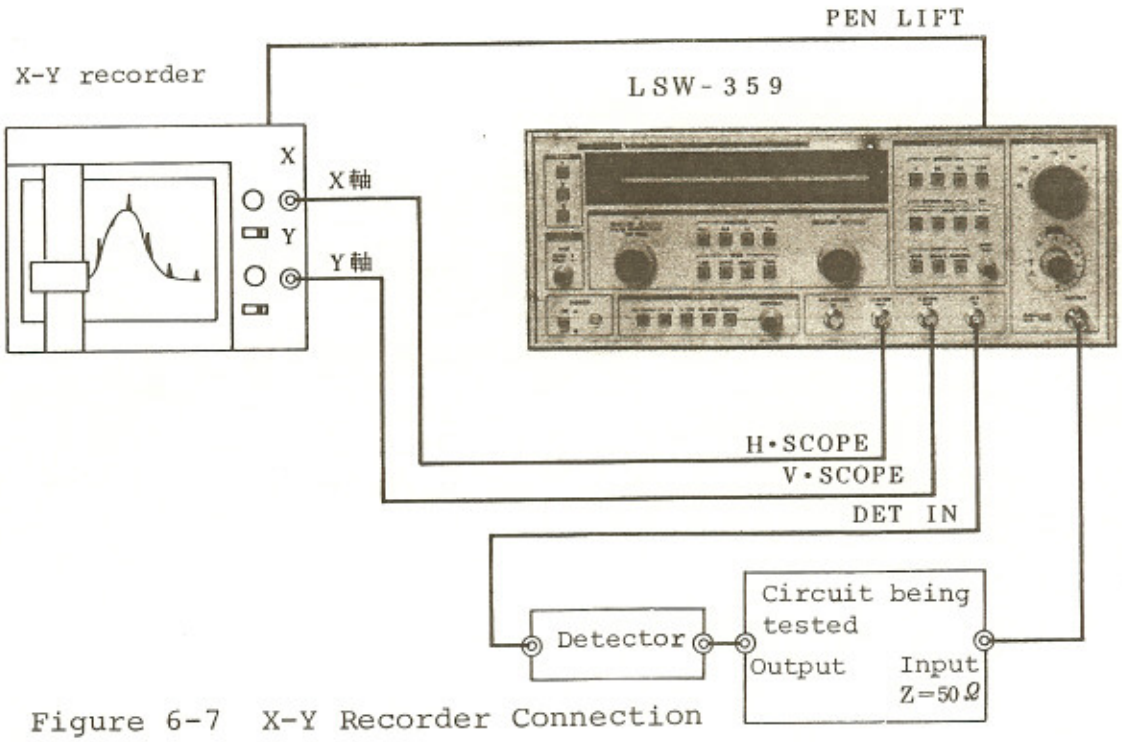


Figure 6-7 X-Y Recorder Connection

(1) Set the LSW-359 sweep frequency range, output level, markers, etc., according to the circuit to be tested. The set-up can be facilitated by pre-adjusting with an alignment scope.

(2) Interconnect the LSW-359 to an X-Y recorder as shown in Figure 6-7.

(3) After removing the PEN LIFT DIN connector from the rear panel, adjust sensitivity of the X-Y recorder X- and Y-axes in the MANUAL sweep mode with the pen lifted.

(4) Set the LSW-359 MODE switch to SINGLE and the SWEEP TIME switch to 1 to 10s or 10 to 100s.

(5) With the rear panel PEN LIFT DIN connector connected, load paper in the X-Y recorder and press the LSW-359

TRIG switch. The X-Y recorder will start plotting a response waveform.

(6) To suspend the sweep, press the TRIG switch again, and the pen will be lifted and return to the sweep start position. If the TRIG switch is pressed again during pen return, the pen will go down at its current position and resume the sweep. The TRIG switch is inoperative, however, during pen return after it has swept to the right end (about +5V).

(7) With the LSW-359 PEN LIFT signal, the pen will be lifted during the sweep return, and will draw no retrace line [Figure 6-8 (a)].

When the LSW-359 PEN LIFT signal is not used, and if a sweep is performed with the pen down in the X-Y recorder, a retrace line is always drawn as shown in Figure 6-8 (b).

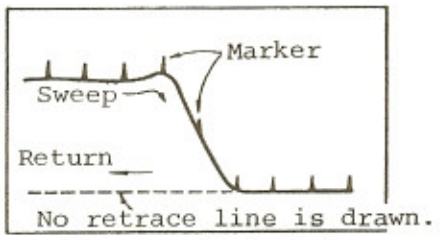


Figure 6-8 (a)
Using the PEN LIFT signal (Example of low-pass filter response)

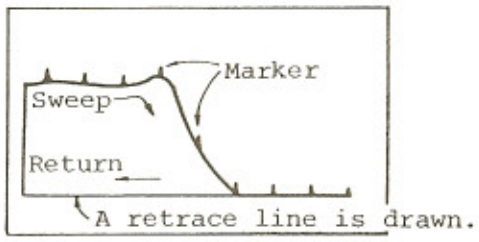


Figure 6-8 (b)
Sweep with the pen down (Example of low-pass filter response)

Notes:

(1) PEN LIFT output only activates DIN connector pins 1 and 2 conductivity during a SINGLE sweep when the sweep time is set to 1 to 10s or 10 to 100s. The pins are left open in all other cases.

Figure 6-9
DIN connector pin layout

(2) Birdy markers are rectified and envelopes of positive polarity are output during a SINGLE sweep only when the sweep time is set to 1 to 10s or 10 to 100s.

(3) With a relatively slow sweep time setting, the start of a SINGLE sweep may be delayed (by about 0 to 3s) after the TRIG switch is pressed. This is not a malfunction.

6.10 REMOTE ANALOG Connector Pin Assignments

Table 6-10 shows the pin assignments of the REMOTE ANALOG connector and its signal designations.

Signal designation	Pin NO.	Pin NO.	Signal designation
GND	1	19	GND
START CENTER VR ③	2	20	—
START CENTER VR ②	3	21	—
START CENTER VR ①	4	22	—
STOP WIDTH VR ③	5	23	—
STOP WIDTH VR ②	6	24	—
STOP WIDTH VR ①	7	25	—
SWEEP TIME VARIABLE VR③	8	26	—
SWEEP TIME VARIABLE VR②	9	27	—
SWEEP TIME VARIABLE VR①	10	28	—
SWEEP CONTROL REMOTE ON	11	29	—
GND	12	30	—
OUTPUT LEVEL REMOTE ON	13	31	—
GND	14	32	—
OUTPUT LEVEL VR ②	15	33	—
GND	16	34	—
OUTPUT LEVEL VR ①	17	35	—
GND	18	36	GND

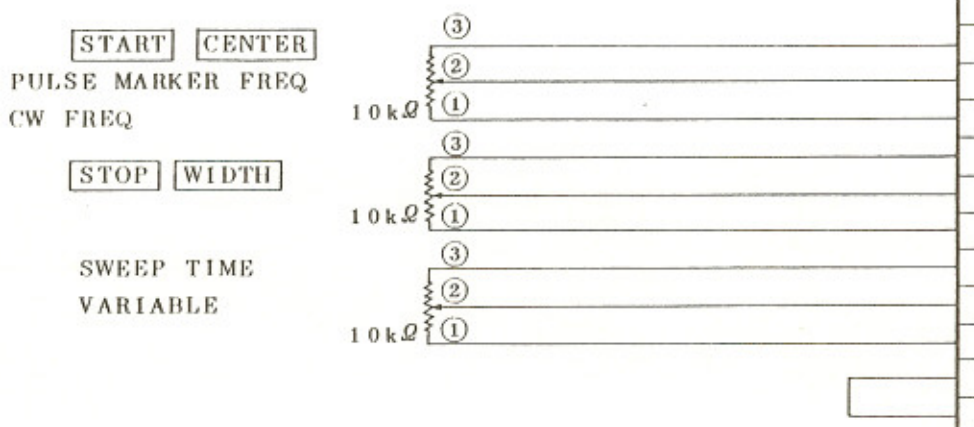
Figure 6-10 REMOTE ANALOG connector pin assignments and signal designations

(VR denotes a variable resistor.)

(1) When REMOTE ANALOG connector pin 11 SWEEP CONTROL REMOTE ON and pin 12 GND are jumpered to each other, the following panel operations can be remote-controlled:

- [START] / [CENTER] /PULSE MARKER FREQ./CW FREQ.
- [STOP] / [WIDTH]
- SWEEP TIME VARIABLE

It is not possible to selectively remote-control only one or two of these panel operations. Jumpering pins 11 and 12 will disable the above three functions at the panel. Make the connections shown in Figure 6-11 to remote-control these panel operations.

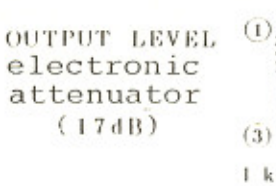


Pin NO.	Pin NO.
1	19
2	20
3	21
4	22
5	23
6	24
7	25
8	26
9	27
10	28
11	29
12	30
13	31
14	32
15	33
16	34
17	35
18	36

Figure 6-11 Sweep control remote control

(2) When REMOTE ANALOG connector pin 13 OUTPUT LEVEL REMOTE ON and pin 14 GND are jumpered to each other, the output level electronic attenuator (17dB) can be remote controlled. Jumpering pins 13 and 14 will disable the output level electronic attenuator at the panel.

Make the connections shown in Figure 6-12 to remote-control the output level electronic attenuator (17dB).



Pin NO.	Pin NO.
1	19
2	20
3	21
4	22
5	23
6	24
7	25
8	26
9	27
10	28
11	29
12	30
13	31
14	32
15	33
16	34
17	35
18	36

Figure 6-12 Output level remote control

6.11 REMOTE DIGITAL Connector Pin Assignments

Figure 6-13 shows the pin assignments of the REMOTE DIGITAL connector and its signal designations.

This connector permits remote-control of the following functions:

- BAND Selection
  BAND 1, 2, 3
- FUNCTION
  FULL, S/S, ΔF, CW
- MODE
  AUTO, LINE, SINGLE, TRIG
- SWEEP TIME
  10∿100ms, 0.1∿1s,
  1∿10s, 10∿100s,
  MANUAL
- MARKER
  1MHz, 10MHz, 50MHz,
  100MHz
- MARKER OPTION
  OPTION 1, 2, 3
- AM OPTION
- SHAPE
  WIDE, MIDDLE, NARROW

Signal designation	Pin NO.	Pin NO.	Signal designation
GND	1	26	GND
—	2	27	—
BAND 1	3	28	—
BAND 2	4	29	—
BAND 3	5	30	—
BU. GND	6	31	—
+5V (10mA max.)	7	32	—
GND	8	33	—
—	9	34	—
FULL	10	35	—
S/S	11	36	—
ΔF	12	37	1 MHz ON/OFF
CW	13	38	10 MHz ON/OFF
AUTO	14	39	50 MHz ON/OFF
LINE	15	40	100 MHz ON/OFF
MANUAL	16	41	OPTION 1 ON/OFF
SINGLE	17	42	OPTION 2 ON/OFF
TRIG	18	43	OPTION 3 ON/OFF
10～100ms	19	44	AM ON/OFF
0.1～1s	20	45	WIDE
1～10s	21	46	MIDDLE
10～100s	22	47	NARROW
BU. GND	23	48	BU. GND
—	24	49	—
GND	25	50	GND

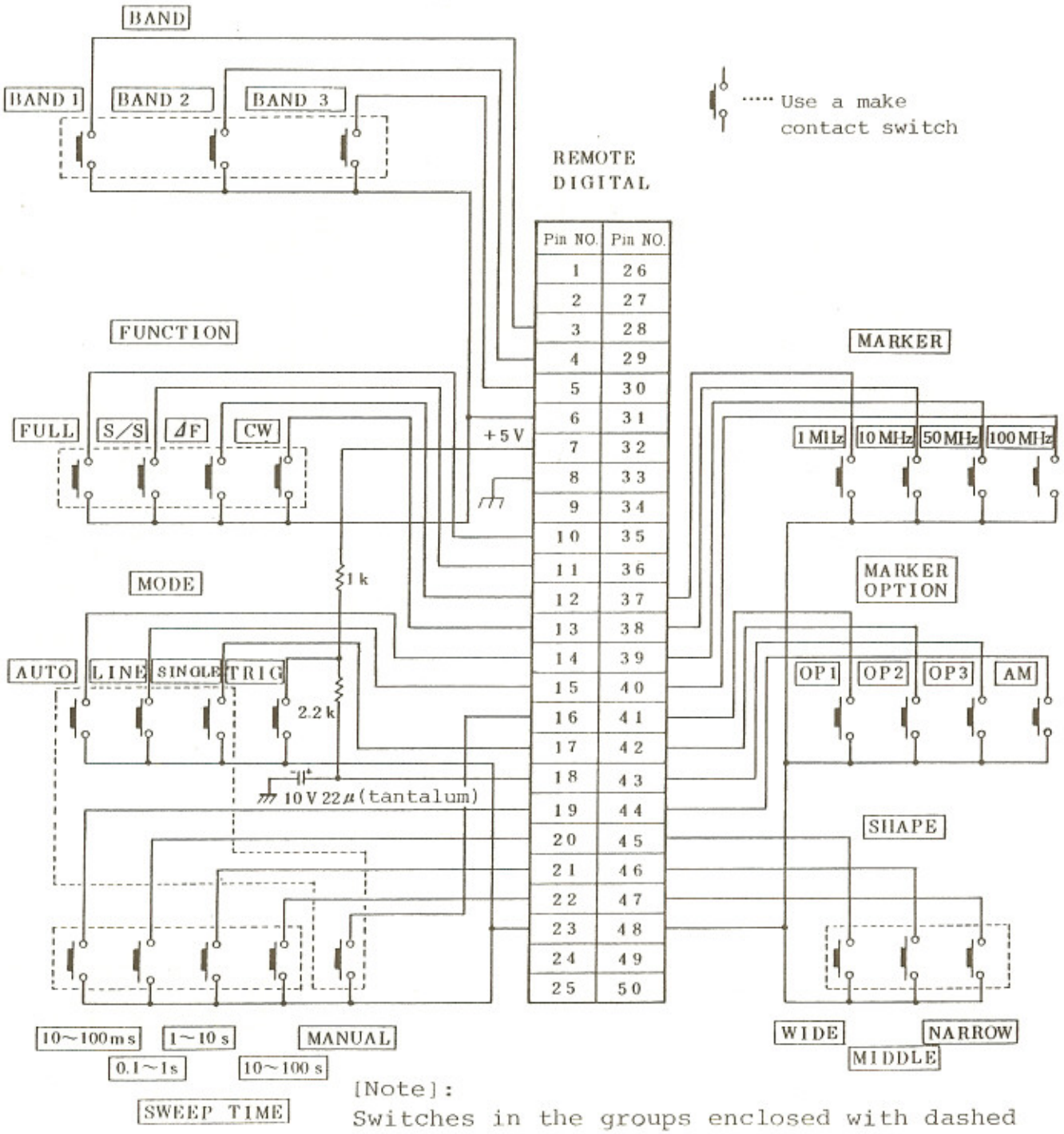
Figure 6-13
REMOTE DIGITAL connector pin assignments and signal designations

Make the connections shown in Figure 6-14 to remote-control these functions.

A cable extension for the remote connector cable used in an environment subject to noise or interference may result in malfunction. Such malfunctions can be eliminated by shielding the remote connector cable and

switches with the GNDs on pins 1, 25, 26, and 50. BU.GNDs on pins 6, 23, and 48 should not be used for grounding because they are terminals used to inhibit the switching functions during backup.

The set-up shown in Figure 6-14 permits concurrent execution of panel operations and remote controls.



[Note]:
Switches in the groups enclosed with dashed lines perform interlocked operations. These switches must not be turned on simultaneously. All other switches operate independently.

Figure 6-14 REMOTE DIGITAL connector connections

7. APPENDIX

7.1 dB-Voltage Conversion Table