PDM SYSTEM
APPROVED
ShibaSoku Co.,Ltd.

91200091706-1

OPERATING INSTRUCTIONS

MODEL : AS953B

MPX TV SOUND SIGNAL GENERATOR

C O N T E N T S

1. General

The model AS953B MPX TV sound signal generator, based on the sound subcarrier system, is designed for the inspection, adjustment and design of sound multiplex receiver and tuner demodulator circuitry. Furthermore, if the TV channel signal generator is modulated with the unit's signal, it can also be used for the inspection and adjustment of the sound circuitry of receivers as TV signals.

When the unit's signal source is set to a single signal input, internally generated 100 Hz, 400 Hz, 1 kHz, 3 kHz and 7.5 kHz signals are available as well as external signals and, using the soft fingertip control FUNCTION switches (MONO, L+R, L, R, L-R, MAIN and SUB), adjustments and inspection can be performed speedily. When set to a dual signal input, the main channel and sub channel signals can be selected independently with the external signal which makes the unit ideal for inspection involving stereo signals and other multiplex signal programs.

The sub channel output band-pass filter can be switched ON and OFF and since a delay equalizer circuit is incorporated into the band-pass filter, it is possible to obtain FM signals with minimal distortion even through the band-pass filter.

The unit is also provided with internal oscillation frequency, function, mode and output signal remote control functions for enhanced operational ease.

2. Specifications

2-1. Main channel section

Input impedance	600 ohms, unbalanced
Input level	0 dBm
Pre-emphasis	75 μs, ON/OFF switchable
Frequency response	±0.5 dB, 50 Hz to 12 kHz
Distortion	Less than 0.05%
Signal-to-noise ratio	More than 80 dB
Delay line delay	15 to 25 μs, variable in 1 μs steps

2-2. Sub channel section

Input impedance	600 ohms, unbalanced
Input level	0 dBm
Pre-emphasis	75 μs, ON/OFF switchable
Subcarrier frequency	31.468 kHz ($2f_H$)
	Frequency accuracy: $\pm 1 \times 10^{-4}$
	External sync: Synchronized to f_H
Maximum frequency deviation	10 kHz (100% modulation)
Frequency response	±0.5 dB, 50 Hz to 7 kHz
	$^{+0}_{-1}$ dB, 7 kHz to 10 kHz
	$^{+0}_{-1.5}$ dB, 10 kHz to 12 kHz
Signal-to-noise ratio	More than 65 dB
Distortion	Less than 0.5%, 50 Hz to 1 kHz
	Less than fm/2000%, 3 kHz to 12 kHz
	fm: Modulation frequency

2-3. Crosstalk

Main channel → Sub channel	Less than -60 dB (50 Hz to 7 kHz)
	Less than -50 dB (7 kHz to 12 kHz)
Sub channel → Main channel	Less than -60 dB (50 Hz to 1 kHz)
	Less than -50 dB (1 kHz to 7 kHz)
	Less than -40 dB (7 kHz to 12 kHz)
2-4. Stereo separation	More than 40 dB (1 kHz)
2-5. Control channel (pilot signal)	
Control subcarrier frequency	55.069 kHz (3.5 f_H)
Modulation frequency	922.5 Hz (multiplex program)
	982.5 Hz (stereo program)
Modulation	60% amplitude modulation
2-6. Output signal	
Output impedance	600 ohms, 75 ohms; unbalanced
Main channel output level	0 dBm, 600 ohms
	2.2 Vp-p, 75 ohms
Sub channel output level	0.8 times main channel output (100%) for stereo signals
	0.6 times main channel output (100%) for multiplex programs
Control channel output level	0.08 times (peak value) main channel output (100%)
[Output values given when terminated with rated impedance]	
Output attenuator	0 to 40 dB (variable in 10 dB steps)

2-7. Internal signals

Frequency	100 Hz, 400 Hz, 1 kHz, 3 kHz, 7.5 kHz
Distortion	Less than 0.03%.

2-8. Subcarrier sync input

Input level	1 to 5 Vp-p
Frequency range	15.734 kHz ±10 Hz

2-9. Remote control — Negative logic, TTL level (See section 3-2-14)

2-10. Power requirements — AC 100 V ±10%, 50/60 Hz, approx. 30 VA

2-11. Dimensions — 426(W)×149(H)×360 (D)mm

Weight — Approx. 10 kg

3. Operation

3-1. Panel parts and controls

3-1-1. Front panel

Fig. 1 shows the front panel.

(1) SUB/R INPUT connector

Input connector for sub (R) channel of dual signal input.

Used when EXT signal selector (17) is depressed.

Input impedance is 600 ohms (unbalanced).

(2) MAIN/L INPUT connector

Input connector for main (L) channel of dual signal input.

Used when EXT signal selector (17) is depressed.

Input impedance is 600 ohms (unbalanced).

(3) SINGLE INPUT connector

External input connector for single signal input.

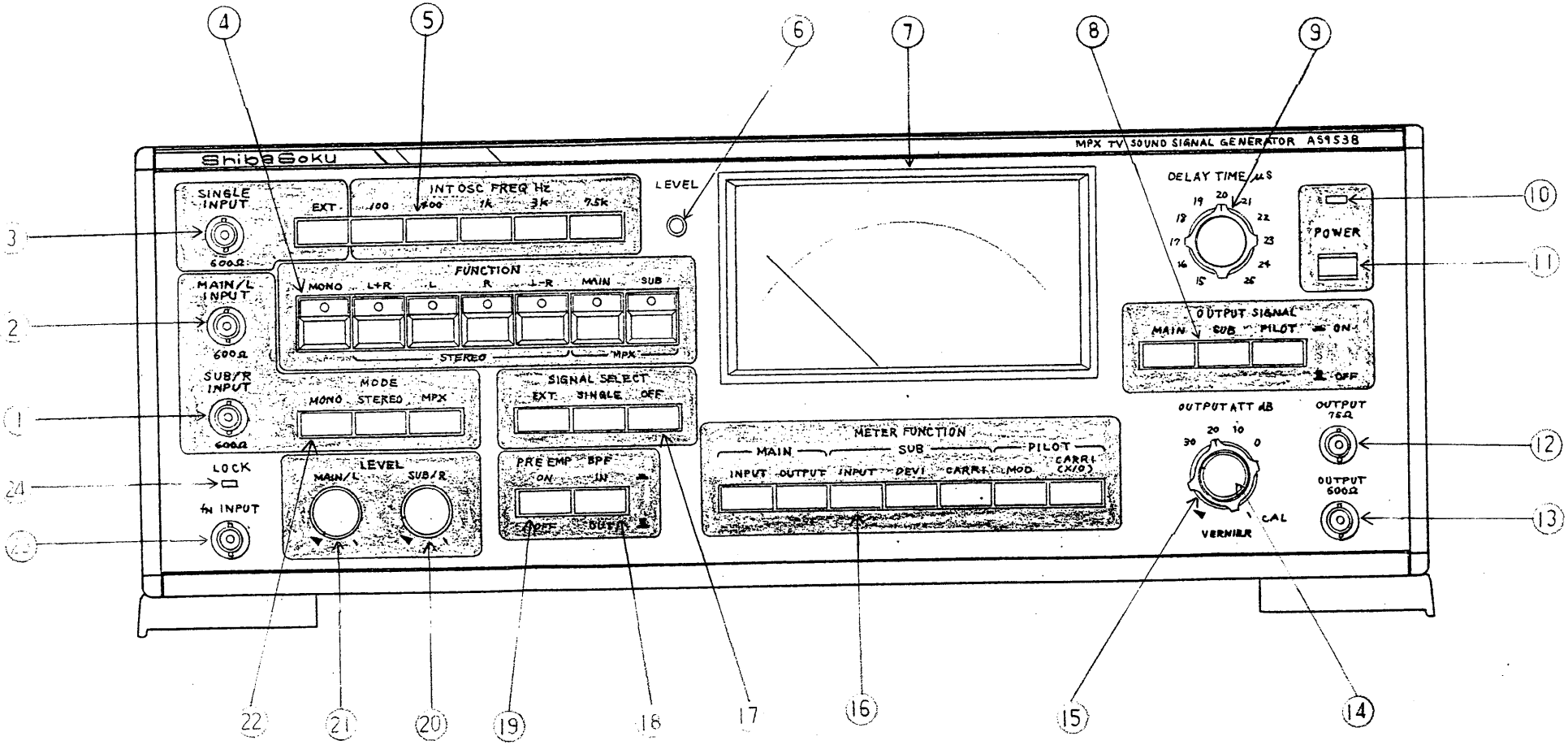


Fig.1 Front panel of model AS953B MPX TV sound signal generator

Used when SINGLE signal selector (17) is depressed.

Input impedance is 600 ohms (unbalanced).

(4) FUNCTION switches

Used to select the output signal with a single signal input. When one is depressed, the corresponding LED lights. These switches are used when the SINGLE signal selector (17) has been depressed, and can be operated by remote control.

(5) INT OSC FREQ switches

Used to select the internal oscillation frequency with a single signal input. When the EXT signal selector has been depressed, the signal is applied to the SINGLE INPUT connector (3) for use. The switches can be operated by remote control if any SIGNAL SELECT switch except EXT is depressed.

(6) LEVEL control

This semi-fixed controls is used to adjust the internal signal level with a single signal input. Its range of variation is about 10 dB.

(7) METER

Indication (signal level, frequency deviation, modulation etc.) corresponds to the METER FUNCTION pushbutton (16) which has been depressed.

(8) OUTPUT SIGNAL switches

Used to switch ON or OFF the main channel (MAIN), sub channel (SUB) and control channel (PILOT) signal. They can be operated by remote control.

⑨ DELAY TIME control

Allows the delay time of the main (L) channel to be set from 15 μs to 25 μs in 1 μs steps.

⑩ PILOT LAMP

Lights when the POWER switch ⑪ has been set to ON.

⑪ POWER switch

⑫ OUTPUT connector

Multiplex signal output connector with 75-ohm (unbalanced) output impedance.

⑬ OUTPUT connector

Multiplex signal output connector with 600-ohm (unbalanced) output impedance.

⑭ VERNIER control

Output level adjustment control providing variation of approximately 10.7 dB.

⑮ OUTPUT ATT

Output attenuator; can be set from 0 to 30 dB in 10 dB steps.

⑯ METER FUNCTION pushbutton switches

Select the indication of the meter.

⑰ SIGNAL SELECT pushbutton switches

Select either single signal input (SIGNAL) or dual signal input (EXT). The OFF switch cuts out the modulation signal.

⑱ BPF pushbutton switch

Used to set band-pass filter for sub channel band restriction to IN or OUT.

⑲ PRE EMP pushbutton switch

Used to set main and sub channel pre-emphasis to ON and OFF.

⑳ LEVEL control

Used to adjust the sub (R) channel signal level with a dual signal input; variation range of about 20 dB.

㉑ LEVEL control

Used to adjust the main (L) channel signal level with a dual signal input; variation range of about 20 dB.

㉒ MODE pushbutton switches

Used to select mono, MPX or stereo for the output signal with a dual signal input. These switches can be operated by remote control.

㉓ f_H INPUT connector

Input connector for externally supplied horizontal drive signal. When this signal is connected, the sub channel carrier automatically switches from the internal crystal Oscillator to the horizontal drive signal for synchronization. Input impedance is about 12 kilohms.

㉔ LOCK lamp

This lights when the sub channel carrier is locked to the externally supplied horizontal drive signal.

3-1-2. Rear panel

Fig. 2 shows the rear panel.

㉕ REMOTE INPUT connector

This is for controlling the unit from an outside source. Refer to Fig. 3 in section 3-2-14.

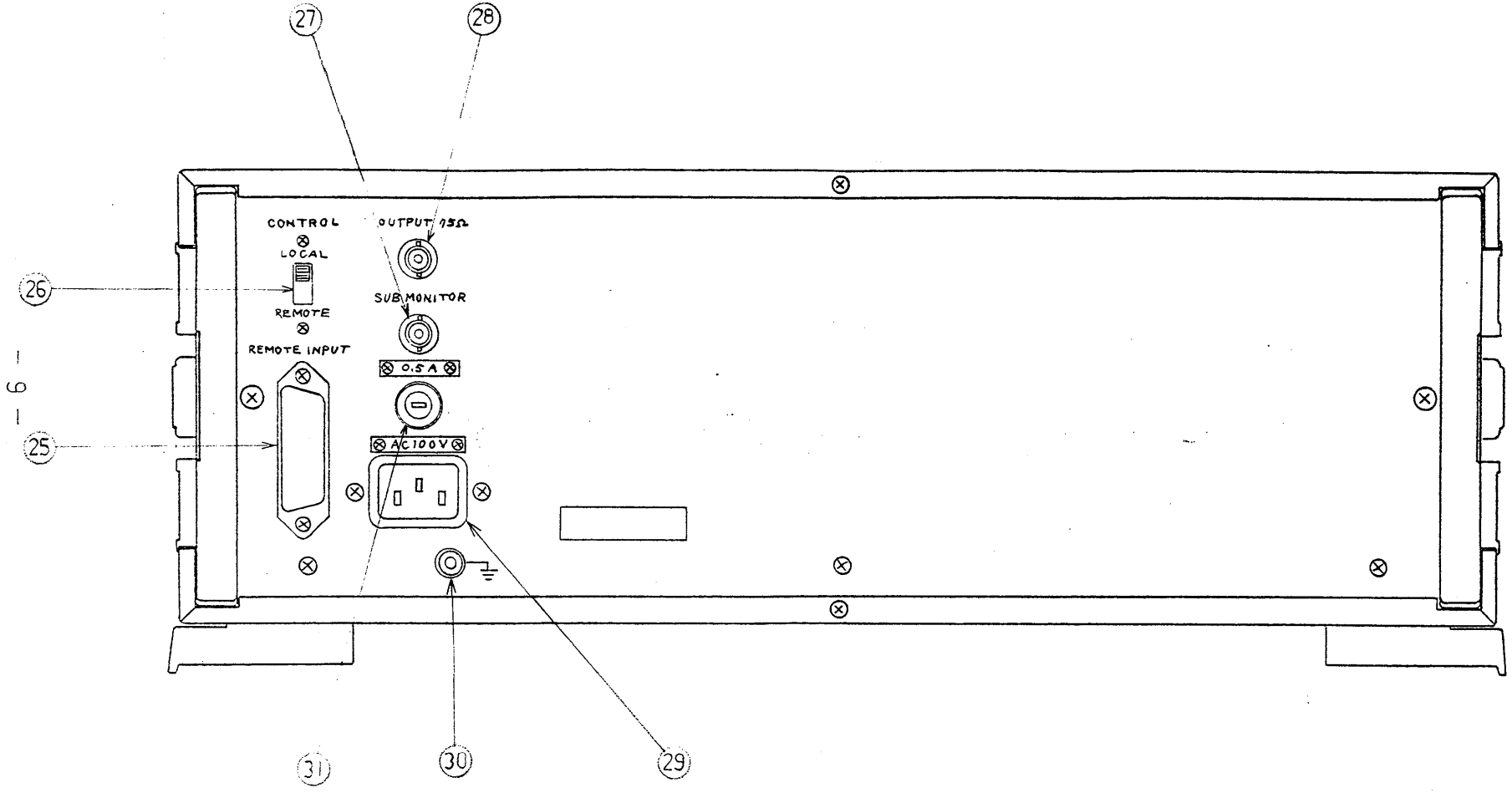


Fig.2 Rear panel of model AS953B MPX TV sound signal generator

㉖ CONTROL slide switch

Selects either LOCAL or REMOTE operation. When set to LOCAL, the front panel switches can be used for operation; when set to REMOTE, the functions, internal oscillation frequency, mode and output signals can be operated by remote control using the REMOTE ENABLE connector.

㉗ SUB MONITOR connector

Sub channel demodulated output connector; output impedance of about 1 kilohm.

㉘ OUTPUT connector

Multiplex signal output connector; this is connected in parallel to the OUTPUT connector ⑫ on the front panel.

㉙ Power connector

㉚ Ground terminal

㉛ Fuse holder (0.5A)

3-2. Operation

3-2-1. Power supply

This unit employs an AC 90 ∿ 110 V (50/60 Hz) power source. The neon lamp lights once the POWER switch has been set to ON.

3-2-2. SIGNAL SELECT switches

These switches are used to select the input signal: SINGLE for a single signal input, EXT for a dual signal input and OFF for non-modulation.

Depressing the SINGLE switch activates the FUNCTION and INT OSC FREQ switches; depressing the EXT switch activates the MODE switches. When the OFF switch is depressed, the

modulation signal is cut off so that there is no modulation regardless of the single or dual signal input.

When the EXT (dual signal input) or SINGLE (single signal input) signal selector is depressed, the input level can be displayed on the meter by depressing the MAIN INPUT or SUB INPUT meter function switch.

Note: The FM modulator's phase-locked loop circuit lock may be disengaged when a signal with a frequency of less than 50 Hz is introduced into the sub channel input.

3-2-3. MODE switches and LEVEL controls

The MODE switches are used when the EXT signal selector has been depressed. The input signal is connected to the MAIN/L INPUT and SUB/R INPUT connectors and selection is made between MONO, STEREO and MPX with the MODE switches. When the MONO mode switch has been depressed, only the main channel signal is fed out. When the STEREO switch has been depressed, the main channel input becomes the L signal and the sub channel input the R signal, these pass through the matrix circuit and are fed out as the stereo signal. The maximum modulation is 50% when the L and R signals are independent. When the MPX switch is depressed, the main and sub signals are fed out. (See Table 1)

The MODE switches can also be used for inspection when signals with different frequencies are connected to the input connector and multiplex programs received.

Table 1. Types of mode signals

MODE		Sub channel frequency deviation	Output level 600Ω (75Ω)			Control channel modulation frequency
			MAIN	SUB	PILOT	
MONO	M input	-	0 dBm(2.2Vp-p)	0	0	---
STEREO	M input+ S input	0	0 dBm(2.2Vp-p)	-1.94dBm (1.76Vp-p)	-21.9 dBm is indicated (-26 dBm mean value) (0.176Vp-p)	982.5 Hz
	M input	±5 KHz (50%)	-6dBm(1.1Vp-p)			
	S input	±5 KHz (50%)	-6dBm(1.1Vp-p)			
	M input - S input	±10KHz(100%)	0			
MPX	M input	0	0 dBm(2.2Vp-p)	-4.44dBm (1.32Vp-p)		922.5 Hz
	S input	±10KHz(100%)	0			

M input: MAIN/L INPUT S input: SUB/R INPUT

Table 2. Types of function signals

FUNCTION		Sub channel frequency deviation	Output level 600Ω (75Ω)			Control channel modulation frequency
			MAIN	SUB	PILOT	
MONO		-	0 dBm(2.2Vp-p)	0	0	---
STEREO	L + R	0	0 dBm(2.2Vp-p)	-1.94dBm (1.76Vp-p)	21.9 dBm is indicated (-26dBm mean value) (0.176Vp-p)	982.5 Hz
	L	±5 KHz (50%)	-6dBm(1.1Vp-p)			
	R	∓5 KHz (50%)	-6dBm(1.1Vp-p)			
	L - R	±10KHz(100%)	0			
MPX	MAIN	0	0 dBm(2.2Vp-p)	-4.44dBm (1.32Vp-p)		922.5 Hz
	SUB	±10KHz(100%)	0			

The input level can be adjusted from 0 dBm to about -20 dBm using the LEVEL (MAIN/L, SUB/R) controls.

The MODE switches can be operated by remote control by connecting the mode control with the REMOTE ENABLE connector (see section 3-2-14).

3-2-4. FUNCTION switches

The FUNCTION switches are used when the SINGLE signal selector switch has been depressed. When the MONO, L+R, L, R, L-R, MAIN or SUB switch is depressed, the corresponding LED lights.

When the MONO function switch is depressed, the main channel signal only is fed out. When any of the STEREO switches (L+R, L, R, L-R) are depressed, the main channel input becomes the L signal and the sub channel input the R signal, they pass through the matrix circuit and are fed out as the stereo signal. When the MPX (MAIN or SUB) switch is depressed, the main or sub signal is fed out.

When the MAIN or SUB MPX function switch is depressed, the PRE EMP switch is at OFF and the level of the input signal is 0 dBm, a 100% modulated output signal is produced.

When any of the STEREO function switches (L+R, L, R, L-R) are depressed, the following signals are available: 100% modulated left channel signal and non-modulated right channel signal with L+R, 50% modulated left and right channel signals with L; 50% modulated left and right channel signals with R (reversed polarity for R channel), and a 100% modulated right

channel signal and non-modulated left channel signal with L-R. (See Table 2)

The FUNCTION switches can be operated by remote control by connecting the FUNCTION control with the REMOTE ENABLE connector (see section 3-2-14).

3-2-5. INT OSC FREQ switches

The INT OSC FREQ switches are used to select the frequency of the internal oscillator, and so they are used when the SINGLE signal selector switch is depressed. Depending on the operation of the FUNCTION switches, the signal is supplied to the main or sub channel. The signal level of the internal oscillator is normally set to 0 dBm but when so required the LEVEL control (semi-fixed variable resistor) can be rotated for adjustment from 0 dBm to about -10 dBm.

When the EXT internal oscillation frequency switch is depressed, the external signal can be connected to the SINGLE INPUT connector for use.

The INT OSC FREQ switches can be operated by remote control by connecting the INT OSC FREQ control to the REMOTE ENABLE connector (see section 3-2-14) except when the EXT switch has been depressed.

3-2-6. PRE EMP switch

When this switch has been set to the OFF position, the frequency response for both the sub and main channels is flat; when it is set to ON, the level increases for frequencies over 400 Hz.

Table 3 shows the standard pre-emphasis characteristics.

Frequency (Hz)	Gain (dB)
400	0
1K	0.72
2K	2.61
3K	4.62
4K	6.43
5K	8.01
6K	9.39
7K	10.6
8K	11.67

Frequency (Hz)	Gain (dB)
9K	12.63
10K	13.51
11K	14.3
12K	15.03
13K	15.71
14K	16.34
15K	16.92
20K	19.38

Table 3. Standard pre-emphasis characteristics

3-2-7. BPF switch

When this switch is set to the IN position, the band-pass filter is inserted into the output of the sub channel's FM modulator, the signal is restricted to the bandwidth required for transmission, and the interference between the main channel and control channel as well as the noise level is reduced.

This unit features a circuit that compensates for the BPF delay time at the main channel side and this is switched along with the IN/OUT setting of the BPF switch. This means that even when the BPF switch is set to ON, there will be no delay time difference from the main channel.

3-2-8. f_H INPUT connector

This connector is used to lock the externally supplied horizontal drive signal (15.734 kHz) to the subcarrier frequency. When no signal is connected here, the subcarrier frequency is locked to the reference frequency of the internal crystal oscillator but as soon as the horizontal drive signal is connected to the f_H INPUT connector, the subcarrier frequency is automatically locked to a frequency which is double that of the f_H input signal. Once locked, the LOCK lamp lights.

3-2-9. METER FUNCTION switches

These are used to select the meter indication (signal level, frequency deviation, modulation, etc.).

a. MAIN INPUT: Main channel input signal level is indicated.

b. MAIN OUTPUT: Main channel output signal level is indicated.

c. SUB INPUT: Sub channel input signal level is indicated.

d. SUB DEVI: Frequency deviation of sub channel FM signal is indicated.

e. SUB CARRI: Sub channel subcarrier level is indicated. When the MODE or FUNCTION MPX switch has been selected, a subcarrier level which is 0.6 times the main channel 100% level is indicated and when the STEREO switch has been selected, a subcarrier level which is 0.8 times the level is displayed.

f. PILOT MOD: AM modulation of control channel is indicated.

g. PILOT CARRI: The peak level of pilot signal is indicated at 10 times its actual value due to the low meter indication.

3-2-10. DELAY TIME control

This control is used to compensate for the delay time of the band-pass filter at the reception side's sub channel in the main channel at the transmission side. This delay time in the main channel can be set from 15 us to 25 us in 1 us steps. Normally it is kept at the 20 us position.

3-2-11. OUTPUT SIGNAL switches

These are used to select three output signals: MAIN, SUB and PILOT.

The output signal contains the main, sub and pilot signals mixed in a fixed percentage. By setting the above switches, each of the signals can be switched ON and OFF. If the MONO function or mode switch has been depressed, however, only the MAIN signal is fed out even if the MAIN, SUB and PILOT switches are all at the ON position.

The level of the output signals is indicated on the meter by depressing the MAIN OUTPUT, SUB CARRI and PILOT CARRI meter function switches.

The meter circuit employs a peak detector circuit and so a correct value is shown with a dual signal input even if signals with differing frequencies are fed in.

The meter indicates values when the output connector is terminated with a 75-ohm or 600-ohm impedance, the OUTPUT ATT

control is set to 0 dB and the VERNIER control has been set to CAL. The 75-ohm OUTPUT connectors on the front and rear panels are connected in parallel so that the signal may be fed out from either.

The main channel output signal can be fed out as an audio frequency signal but the sub channel signal is fed out as an FM signal with a maximum frequency deviation of 10 kHz with a 31.468 kHz ($2f_H$) frequency as the carrier. The control (PILOT) channel signal is a 60% modulated AM signal with a 55.069 kHz ($3.5f_H$) frequency as the carrier. When the MPX switch has been depressed, the modulation frequency is 922.5 Hz and when the STEREO switch has been depressed, it is 982.5 Hz.

The OUTPUT SIGNAL switches can be operated by remote control by connecting the OUTPUT SIGNAL control to the REMOTE ENABLE connector.

3-2-12. OUTPUT ATT and VERNIER controls

The OUTPUT ATT control is used to adjust the output voltage and variation can be provided from 0 to 30 dB in 10 dB steps. The VERNIER control gives a variation of about 10.7 dB and so in combination with the OUTPUT ATT control, continuous variation from 0 to 40 dB is possible.

3-2-13. SUB MONITOR CONNECTOR

This connector enables the distortion or waveforms of a demodulated sub channel FM signal to be monitored. It is located on the rear panel.

3-2-14. CONTROL switch and REMOTE INPUT connector

The CONTROL switch is used to select between the LOCAL and REMOTE modes while the REMOTE INPUT connector receives the control signals from the external source.

Fig. 3 shows the REMOTE INPUT connector connections.

When the CONTROL switch is set to LOCAL, operation is performed at the front panel; when it is set to REMOTE, remote control is possible. However, even if the CONTROL switch is at REMOTE, remote control is not possible unless the REMOTE INPUT control pins (FUNCTION: pin 8, MODE: pin 12, INT OSC FREQ: pin 18 and OUTPUT SIGNAL: pin 22) are connected to the REMOTE ENABLE:pin 23. For instance, for remote control of functions, connect the FUNCTION CONTROL: pin 8 only to the REMOTE ENABLE: pin 23 and leave the other CONTROL pins free. This means that the mode, internal oscillation frequency and output signal operations cannot be performed by remote control and that operation can be performed with the front panel controls as in the LOCAL mode.

Negative logic and TTL level are used, Table 4 gives the order of the signals' priority.

4. Description of circuitry

4-1. Input circuit 1 (A1)

Input circuit 1 is composed of single input and dual signal input amplifiers whose input impedance in either case is 600 ohms (unbalanced) and whose gain is +6 dB.

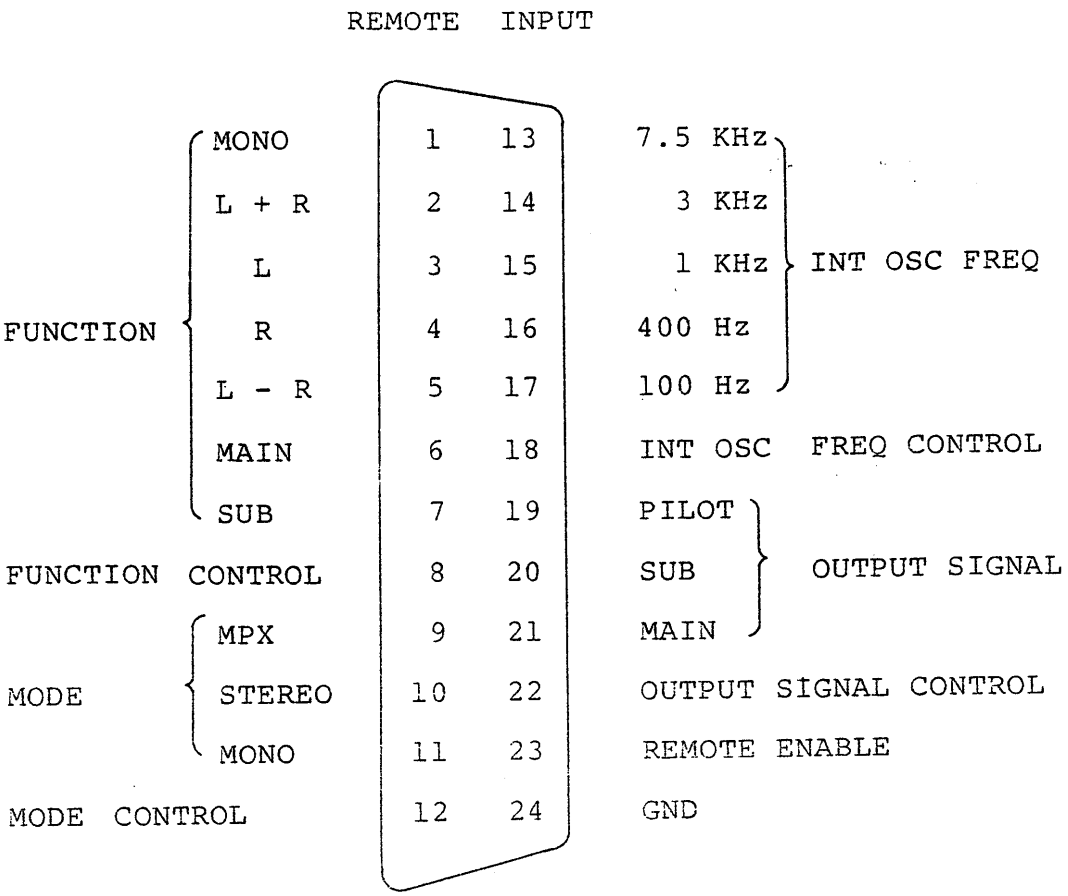


Fig. 3 REMOTE INPUT pin connections

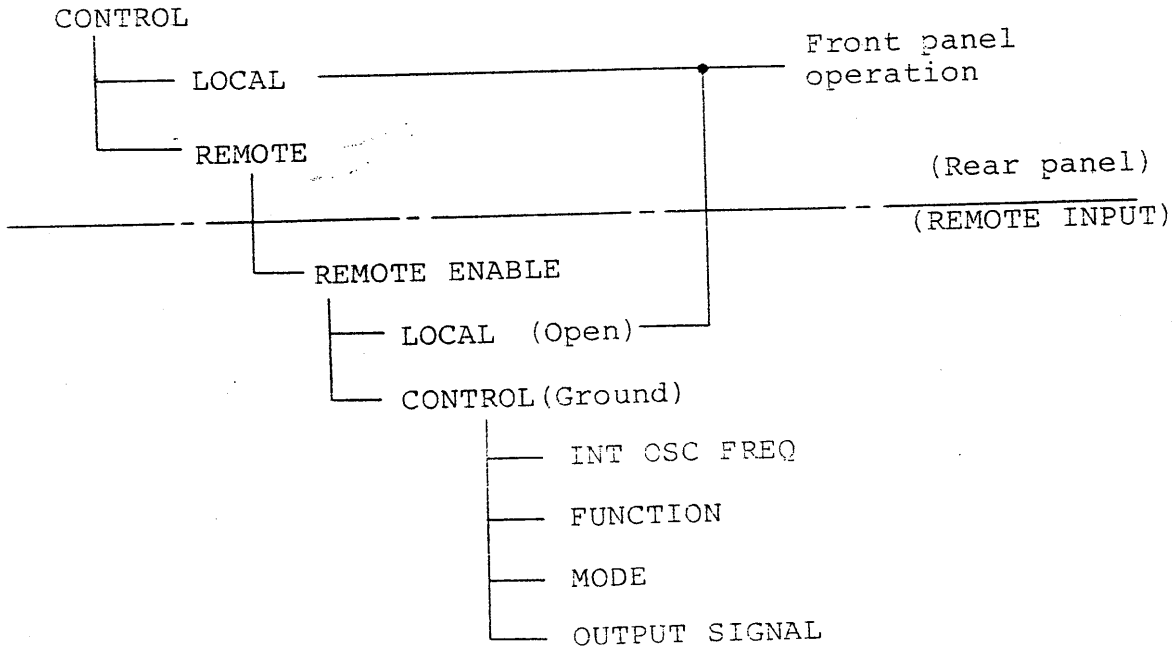


Fig. 4 Order to signal priority

The output is selected by the SIGNAL SELECT switches (single signal by SINGLE and dual signal by EXT), and it is supplied to the next circuit.

4-2. Logic circuit (A2, A12)

The logic circuit is for setting the unit's operation to the LOCAL or REMOTE mode, and it is composed of circuits that exercise remote control over the function, mode, internal oscillation frequency and output signal operations.

When the MONO function or mode switch has been depressed, the meter gives only the MAIN INPUT, MAIN OUTPUT and SUB INPUT indication so that only the MAIN output signal is fed out.

4-3. Input circuit 2 and RC oscillator circuit (A3)

The input circuit 2 is composed of a matrix circuit, pre-emphasis circuit and amplitude limiter circuit.

When the STEREO function switch is depressed, L+R, L, R, and L-R signals are produced by the matrix circuit and these are supplied to the pre-emphasis circuit.

The pre-emphasis circuit emphasizes the high frequency components at the signal generator side and, in combination with the de-emphasis circuit at the reception side, suppresses the noise components in the high frequency range.

The amplitude limiter circuit functions when the input signal has a level of more than +3 dBm.

The RC oscillator circuit switches the frequency to 100 Hs, 400 Hz, 1 kHz, 3 kHz or 7.5 kHz, and operation is possible in

either the LOCAL or REMOTE modes. The amplitude is stabilized with a low distortion of under 0.03%.

4-4. Delay circuits (A4)

One delay circuit compensates for the delay in the band-pass filter at the main channel side and the delay caused by the sub channel FM modulator; another delay circuit compensates for the delay caused in the sub channel at the reception side.

The circuit that compensates for the delay caused by the FM modulator is always inserted but the other circuit is coupled to the IN/OUT operations of the BPF switch. The compensation for the delay in the sub channel at the reception side can be set at the front panel from 15 us to 25 us in 1 us steps. It is normally set to 20 us.

4-5. Main and sub channel low-pass filters (A5)

Active low-pass filters with a cutoff frequency of 15 kHz are used to prevent the main channel's harmonic waves from being mixed in the sub channel band.

If the low-pass filter is inserted into the main channel only, the delay time with the sub channel undergoes change and so the same low-pass filter as that for the main channel is inserted at the sub channel side.

4-6. FM demodulator and meter circuit (A6)

There are two circuits on this board: one demodulates the output signal of the FM modulator and monitors it, and the other indicates the signal selected by the METER FUNCTION switches on the meter.

The FM demodulator circuit employs the pulse counting system and a pulse train equivalent to a frequency which is double that of the input signal is obtained. This pulse train is smoothed by a low-pass filter with a cutoff frequency of 15 kHz and the signal is taken out at the demodulated output. This output is used for waveform monitoring at the SUB MONITOR connector and it also indicates the sub channel deviation in the meter circuit.

The meter circuit employs a peak detector circuit and so the correct value is indicated even when a dual signal input with a frequency differing from that of a stereo signal is fed in.

4-7. FM modulator (A7)

This unit's FM modulator operates under the direct frequency modulation method where the directly modulated signal is applied to the varactor diode of the oscillator and the FM signal is produced by varying the frequency.

The subcarrier frequency is a low 31.468 kHz and since a signal with a high frequency deviation must be produced, the frequency of the voltage-controlled oscillator (VCO) which provides frequency modulation is made a high 7.0803 MHz, and the 31.468 kHz subcarrier is yielded through beat-down with the reference 7.048832 MHz VCO and balanced mixer.

However, the subcarrier frequency is still unstable and so it is applied to the PLL circuit where the frequency is stabilized. The phases of the signal produced by dividing

(1/225) the frequency modulation VCO signal and the signal produced by dividing (1/224) the reference VCO signal are detected and compared with the 31.468 kHz crystal oscillator signal. A comparison voltage corresponding to the detected phase difference is generated, the output passes through the low-pass filter and only the required component is applied to the VCO as the control voltage.

In order to form this type of loop, the free-running VCO starts to oscillate at a frequency matching the frequency and phase. A stable subcarrier is now produced with the PLL lock.

4-8. f_H circuit, crystal oscillator and frequency divider (A8)

The f_H circuit multiplies the frequency to $2f_H$ so that the externally supplied 15.734 kHz (f_H) horizontal drive signal is locked to the subcarrier frequency. When the horizontal drive signal is connected to the f_H INPUT connector, the subcarrier is also incorporated into the circuit that automatically switches from the internal crystal oscillator circuit to the horizontal drive signal as well as the circuit that lights the LOCK lamp by means of the sync detector circuit if the $2f_H$ signal is locked to the subcarrier frequency.

Also provided are a crystal oscillator circuit used for the PLL circuit's phase detected reference signal and a frequency divider. The crystal oscillator generates a 314.68 kHz signal which is divided (1/10) to produce a 31.468 kHz signal. The frequency divider is a circuit with 1/224 and 1/225 frequency division ratios.

4-9. Control signal oscillator circuit and amplitude modulator circuit (A9)

This circuit board is composed of the signal oscillator circuit that discriminates whether the sound multiplex signal is a multiplex or stereo signal, and a circuit that amplitude modulates the control channel subcarrier frequency (55.069 kHz).

The modulation frequency which selects the MPX or stereo signal divides down the crystal oscillator signal frequency to 922.5 Hz for MPX and 982.5 Hz for stereo.

The modulator circuit provides 60% amplitude modulation for the control channel subcarrier with the 922.5 Hz or 982.5 Hz signal.

4-10. ALC circuit, BPF and output circuit (A10)

This circuit board is composed of the ALC (automatic level control) circuit that keeps the sub channel carrier level to a fixed value, a band-pass filter that allows only the sub channel signal to pass through, a delay equalizer circuit for making the BPF's delay characteristics flat, and an output circuit that mixes the main channel, sub channel and control channel signals.

Based on the main channel 100% (0 dBm) level, the ALC circuit sets the sub channel carrier level to 0.6 times in the MPX mode and 0.8 times in the STEREO mode.

The BPF limits the bandwidth of the sub channel signal to that required for transmission. Since its delay characteristics are not flat, a delay equalizer circuit is inserted

after the BPF to make the delay in the bandwidth flat.

The output circuit is composed of an adder circuit based on an operational amplifier and an output amplifier. The adder circuit allows the main channel, sub channel and control channel signals to be mixed or fed out separately, and the output amplifier feeds out the prescribed output signal at a 75-ohm or 600-ohm load.

4-11. Output attenuators

Both a 10 dB step resistance attenuator and a 10 dB variable attenuator based on a variable resistor are available. Continuous variation can be provided between 0 dB and 40 dB. The output impedance is 75 ohms or 600 ohms (unbalanced).

4-12. Power supply circuit (All)

This is a DC regulated power supply with a 3-pin regulator that supplies DC +12 V, -12 V and +5 V voltages.

5. Calibration

To perform adjustments, rotate ~~the twc~~ rotate the two scrervis, remove the top panel and then detach the clamping board of the printed circuit boards.

5-1. Meter zero point adjustment

a. Set the front panel switches as follows.

Depress the SINGLE signal selector switch.

Depress the MONO function switch.

Depress the EXT internal oscillation frequency switch.

Set the PRE-EMP switch to OFF.

Depress the MAIN INPUT meter function switch.

b. Do not connect a signal to the SINGLE INPUT connector.

c. When the meter pointer does not point to zero, adjust the ZERO ADJ VR on circuit board A6 and align with zero.

5-2. Meter sensitivity adjustment

a. Set the front panel switches as follows.

Depress the SINGLE signal selector switch.

Depress the MONO function switch.

Depress the EXT internal oscillation frequency switch.

Set the PRE EMP switch to OFF.

Depress the MAIN INPUT meter function switch.

b. Supply a 0 dBm signal with a 1 kHz frequency to the SINGLE INPUT connector.

c. When the meter pointer does not point to OdBm, adjust the ZERO ADJ VR on circuit board A6 and align with OdBm.

5-3. Main channel gain adjustment

a. Set the front panel switches as follows.

Depress the SINGLE signal selector switch.

Depress the MAIN function switch.

Depress the EXT internal oscillation frequency switch.

Set the PRE EMP switch to OFF.

Depress the MAIN OUTPUT meter function switch.

b. Supply a 0 dBm signal with a 1 kHz frequency to the SINGLE INPUT connector.

c. When the meter pointer does not point to 100% (OdBm), adjust the MAIN GAIN VR on circuit board A5 and adjust to 100%.

5-4. Sub channel deviation adjustment

a. Set the front panel switches as follows.

Depress the SINGLE signal selector switch.

Depress the SUB function switch.

Depress the EXT internal oscillation frequency switch.

Set the PRE EMP switch to OFF.

Set the BPF switch to OUT.

Depress the SUB DEVI meter function switch.

b. Supply a 0 dBm signal with a 1 kHz frequency to the SINGLE INPUT connwctor.

c. When the meter pointer does not point to 10 kHz (100%), adjust the SUB GAIN VR on circuit board A5 and set to 10 kHz.

5-5. Sub channel carrier adjustment

a. Set the front panel switches as follows.

Depress the EXT signal selector switch.

Depress the STEREO mode switch.

Do not connect a signal to the MAIN/L INPUT connector.

Do not connect a signal to the SUB/R INPUT connector.

Depress the SUB CARRI meter function switch.

b. When the meter pointer does not point to 80%, adjust the SUB CARRI VR on circuit board A10 and align with 80%.

c. Set the front panel switches as follows.

Depress the MPX mode switch.

d. Check that the meter pointer has deflected to 60%.

5-6. Pilot modulation adjustment

a. Set the front panel switches as follows.

Depress the PILOT MOD meter function switch.

b. When the meter pointer does not point to 60%, adjust the PILOT MOD VR on circuit board A9 and align with 60%.

5-7. Pilot carrier adjustment

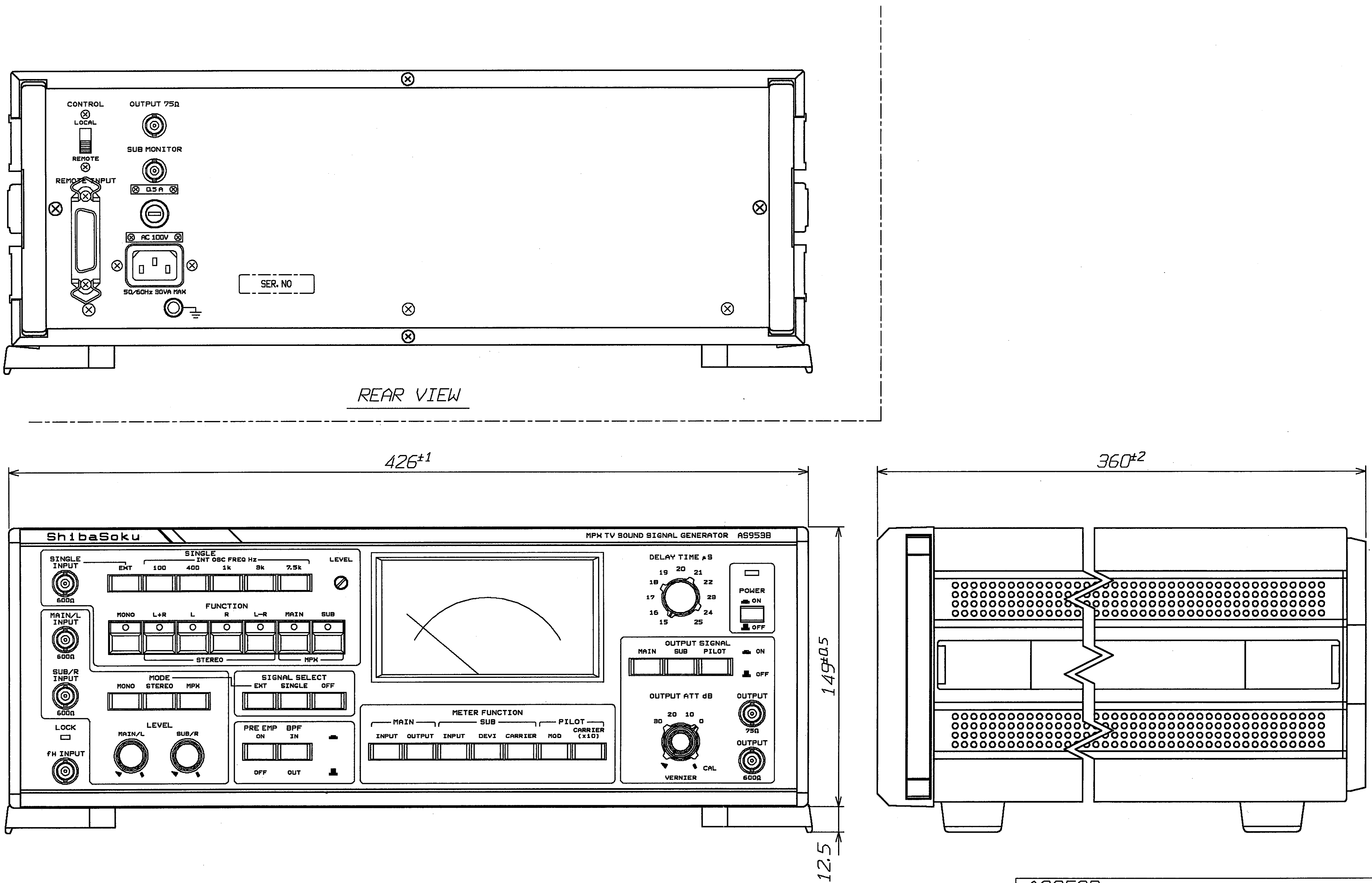
a. Set the front panel switches as follows.

Depress the PILOT CARRI meter function switch.

b. Terminate the unit's output with a 600-ohm load and connect an AC voltmeter. Adjust the PILOT LEVEL VR on circuit board A9 and align the AC voltmeter indication to -26 dBm (mean value indication).

c. When the meter pointer does not deflect to 80% (actually 8% but this is multiplied by 10), adjust the PILOT CARRI VR on circuit board A6 and align with 80%.

d. Since this unit features a peak meter, -21.9 dBm is indicated but -26 dBm is displayed when an average indication voltmeter is employed.



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