TOYOTA

AUDIO COMPONENT SERVICE MANUAL

AM-FM MPX RADIO

WITH ELECTRONIC TUNER

VEHICLE	DESTINATION	PRODUCED AFTER	TOYOTA PART No.	FUJITSU TEN MODEL No.
CELICA, CELICA SUPRA COROLLA, CAMRY TERCEL, STARLET MODEL-F, HILUX	NORTH AMERICA	September 1983	86120-14650	AE-3060

GENERAL

◦ Features

RADIO	AUDIO
PLL FREQUENCY SYNTHESIZER, AM/FM, TUNING (MANUAL, SEEK, PRESET) DISTANT/LOCAL, LCD (LIQUID CRYSTAL DISPLAY), KEYED AGC, NOISE BLANKER, MPX.	VOLUME, BASS, TREBLE, FADER, LOUDNESS, HIGHT POWER

◦ Combination

RECEIVER	TAPE PLAYER	WOOFER AMP.	SPEAKER SYSTEM
86120-14650 (AE-3060)	86260-14180 (SP-1300A)	86280-14100 (UM-108)	5-Speaker

Manufactured for TOYOTA

by *FUJITSU TEN LIMITED*

PUB. NO. **SM-521**

REPAIRING PRECAUTIONS MOS IC

The following precautions are necessary for repairing PC boards containing MOS ICs.
This model contains MOS ICs as follows:

RN-EIM-UPD1708G-514

1. MOS ICs should be stored or transported in conductive material so that all exposed leads are shorted together.
   MOS ICs must not be inserted into conventional stylo-form or plastic trays of the type used for storage and transportation of other semiconductor devices.
   Sometimes, several kilo-volt static may exist on an ungrounded bench surface and human body.
2. Therefore, MOS ICs should be placed on a grounded bench surface and the technicians should ground themselves prior to handling devices. This is done most effectively by having the technician wear a conductive wrist strap in series with 100k ohm to ground.
3. Nylon clothing should not be worn while handling MOS circuits.
4. Do not insert or remove MOS ICs with power applied.
5. Use a grounded soldering iron when soldering.
6. MOS ICs should be handled by their packages and not by the leads, if at all possible. Prior to touching the unit, the technician should touch an electrical ground to remove any static charge that may have been accumulated.

COMPOSITION

TOYOTA Part No.	FUJITSU TEN Part No.	Description	86120-14650 (AE-3060TL1)	86120-14650 (AE-3060TM2)
86120-14650	AE-3060	Receiver assembly	1	1
———	RN-MXM-1006	Owners manual		1
———	RN-MXM-1007	Owners manual		1

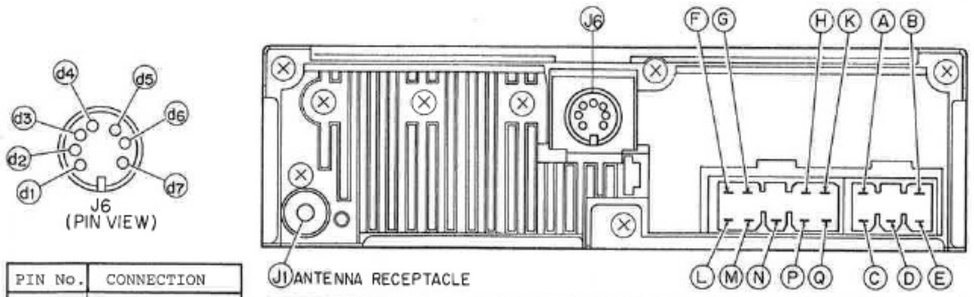
FCC ID: BAB9JIAE-3060

SPECIFICATIONS

(RADIO SECTION)	AM	FM
TUNING RANGE	530 to 1620 kHz (10 kHz step)	88.1 to 107.9 MHz (.2 MHz step)
INTERMEDIATE FREQUENCY	450 kHz	10.7 MHz
SENSITIVITY	26 dBμ or better (1.4V output)	18 dBμ or better (at S/N 30 dB)
SENSITIVITY AT ELECTRONIC TUNING	Distant: 30±5 dBμ Local: Distant plus 20±5 dBμ	Distant: 20±6 dBμ Local: Distant plus 25±5 dBμ
LIMITING SENSITIVITY		10±5 dBμ
SEPARATION		25 dB or better
ELECTRICAL FIDELITY	100 Hz: 0±3 dB (74 dBμ input, 1.4V output) 4 kHz: −20±5 dB (74 dBμ input, 1.4V output)	100 Hz: 0±3 dB (74 dBμ input 1.4V output) 4 kHz: −12±5 dB (54 dBμ input, 1.4V output)
SPEAKER IMPEDANCE	4 ohm per channel	
POWER OUTPUT	4 watts×2 (Front) 7 watts×2 (Rear)	
POWER INPUT	12-volt car battery, negative terminal to ground	
Voltage	13.2 VDC	
Current	Approx. 10m ampere (Back up) Approx. 5 ampere (Max.)	

SEMICONDUCTOR ·····17 ICs, 28 Transistors, 33 Diodes **〔AE-3060〕**
DIMENSIONS ·····180(W)×50(H)×130(D)mm (7-9/32", 1-31/32", 5-1/8")
WEIGHT·····Unit—1.1 kg (2.4 lbs.)

CONNECTIONS



PIN No.	CONNECTION
d1	GROUND
d2	R-ch INPUT
d3	CS +B(13.2V)
d4	L-ch INPUT
d5	AR +B(+13.2V)
d6	DIMMER(+13.2V)
d7	ACC (+13.2V)

PIN No.	CONNECTION	PIN No.	CONNECTION	PIN No.	CONNECTION
A	REAR L-ch(+)	F	ANT +B(+13.2V)	M	AMP +B(13.2V)
B	REAR R-ch(+)	G	ACC (+13.2V)	N	GROUND
C	REAR L-ch(-)	H	FRONT L-ch(+)	P	FRONT L-ch(-)
D	BACK UP(+13.2V)	K	FRONT R-ch(+)	Q	FRONT R-ch(-)
E	REAR R-ch(-)	L	DIMMER(+13.2V)		

Fig. 1 (C23033060)

NOTE: If cassette tape player isn't combined with this model, insert the short-connector (RN-EJU-R04V-537) to J6.

SCHEMATIC (FM FRONT-END)

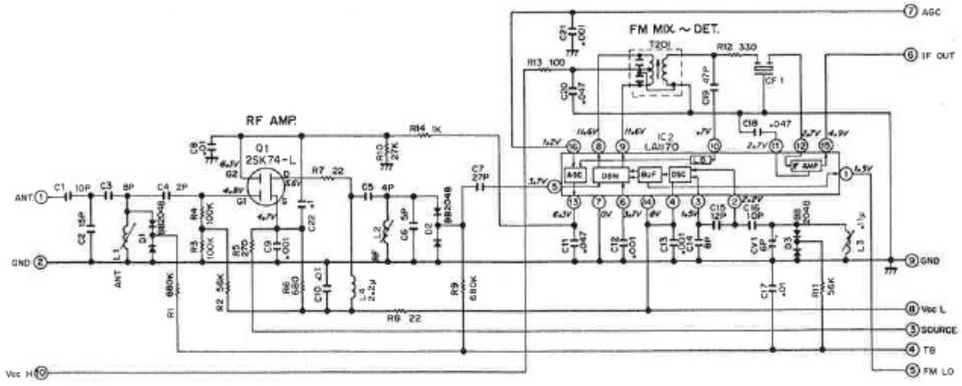


Fig. 0

INSTRUMENT WIRING

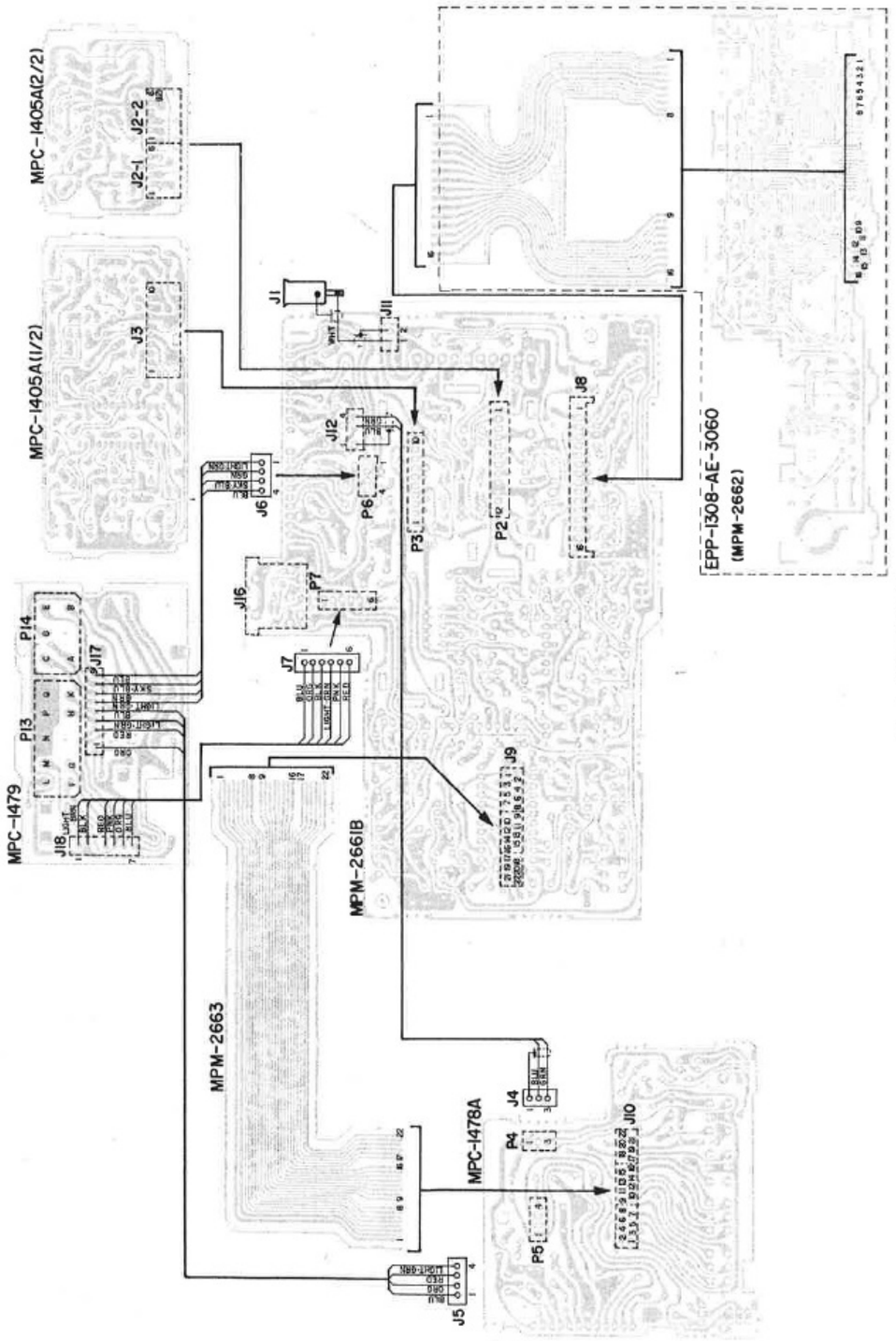


Fig. 2 (C27033060)

SCHEMATIC

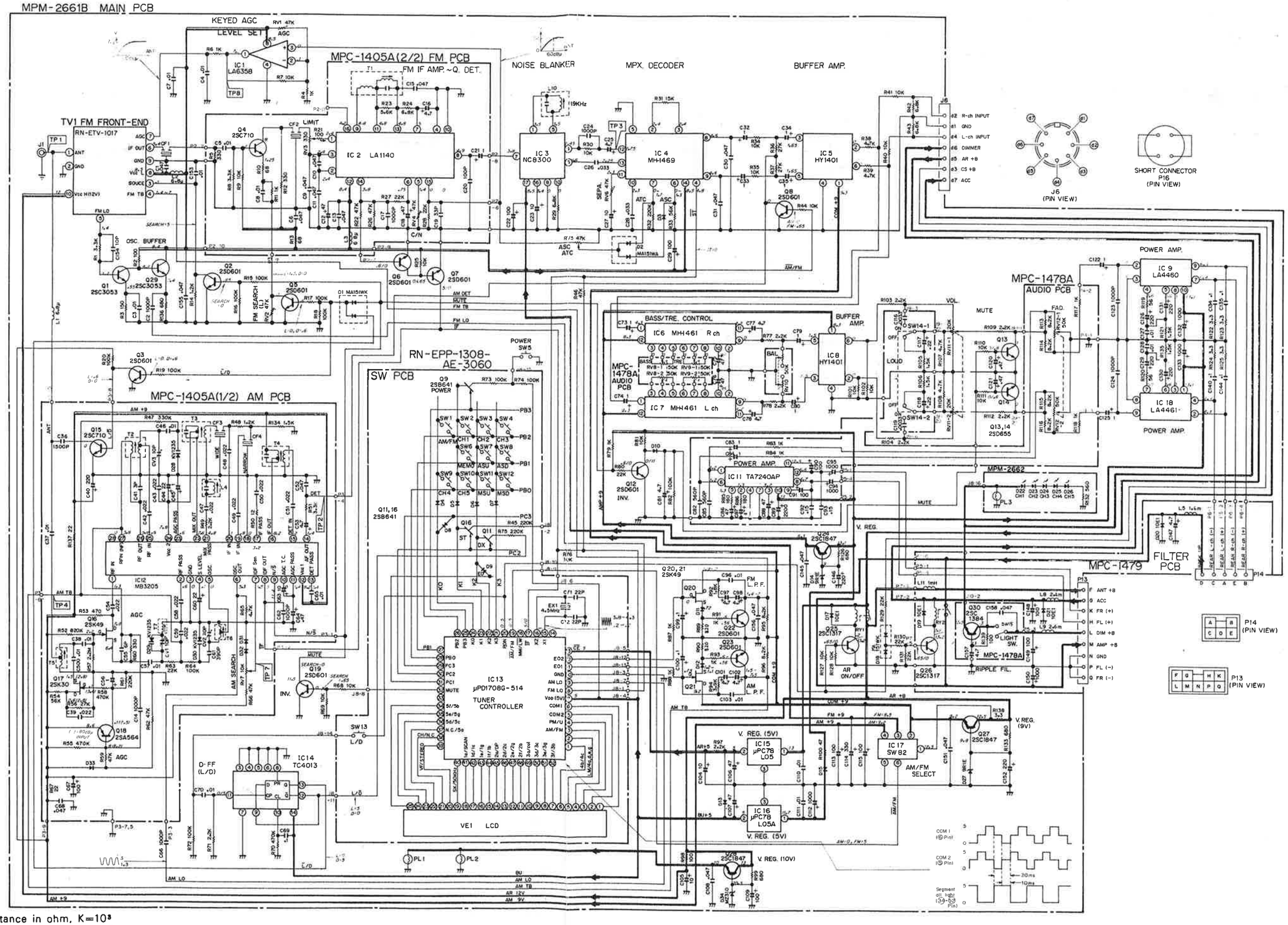


Fig. 3 (C24033060)

NOTES :

1. All resistance in ohm, K=10^3
2. All capacitance in μF, P=$\mu\mu$F
3. All inductance in henly, m=10^{-3}, μ=10^{-6}
4. DC voltage against the chassis measured with 100k ohm/volt meter, power supply set at +13.2 VDC, no signal input. (Unit : V)
5. Diode unless otherwise assigned shows 1S1555.
6. A red line and a red dotted feeble line show a power supply system flow and a signal system flow, respectively.

MAIN PC BOARD (MPM-2661B)

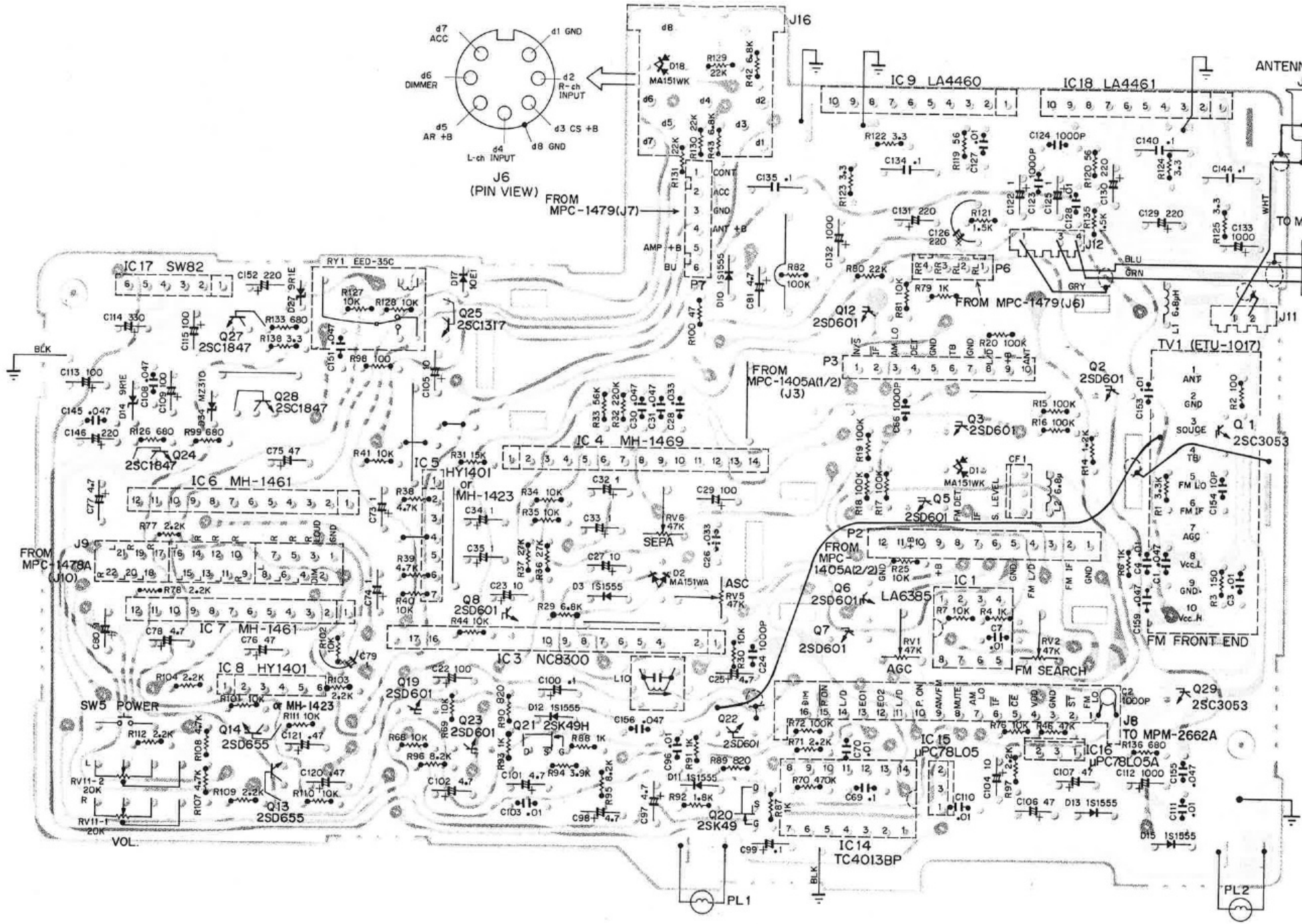


Fig. 4 (C27033060)

AM/FM PC BOARD (MPC-1405A)

〔AE-3060〕

◦ AM PC BOARD (MPC-1405A(½))

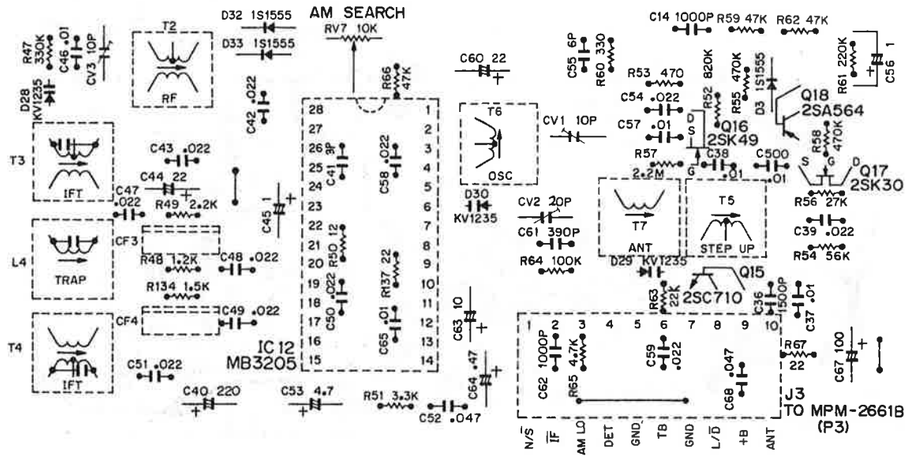


Fig. 5 (C27033060)

◦ FM PC BOARD (MPC-1405A(⅔))

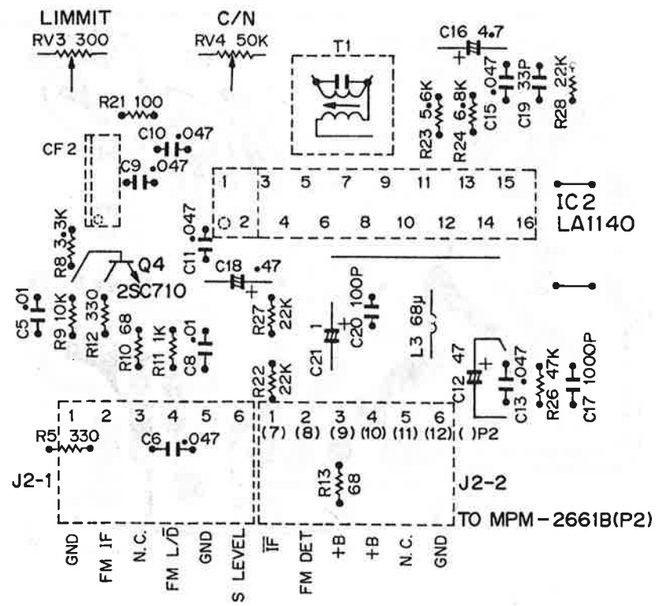


Fig. 6 (C27033060)

FILTER PC BOARD (MPC-1479)

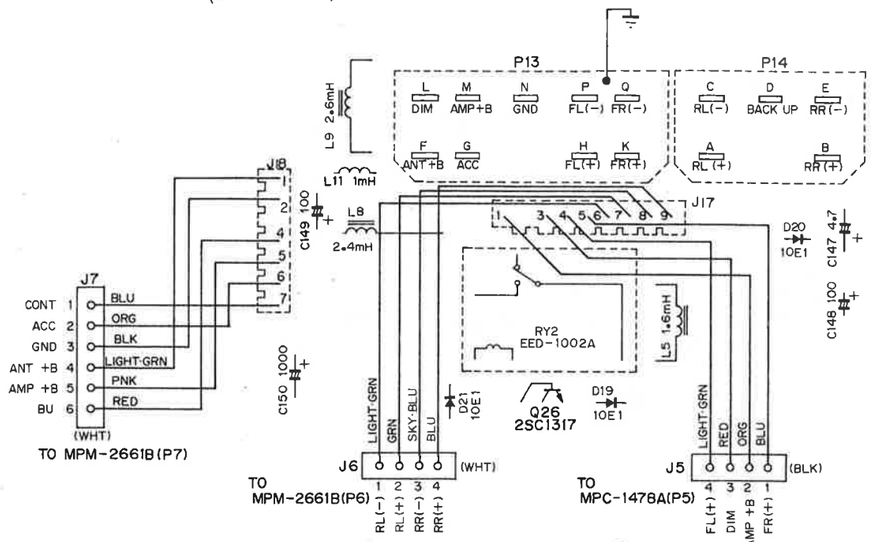


Fig. 7
(C27033060)

AUDIO PC BOARD (MPC-1478A)

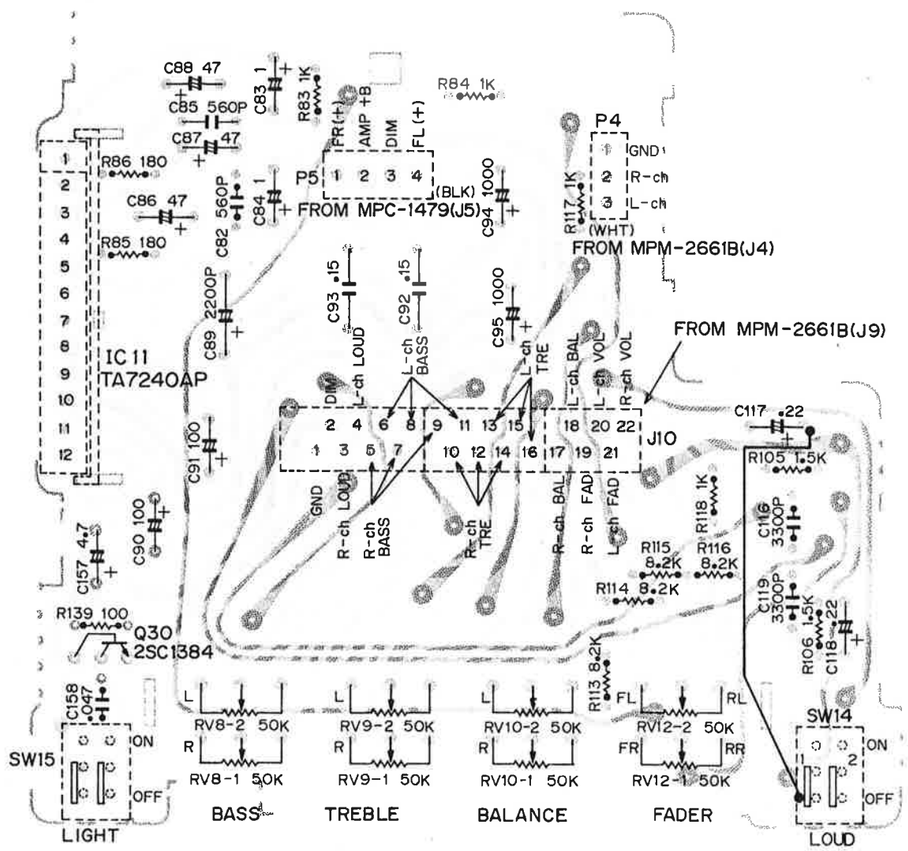


Fig. 8
(C27033060)

SWITCH PC BOARD (RN-EPP-1308-AE-3060)

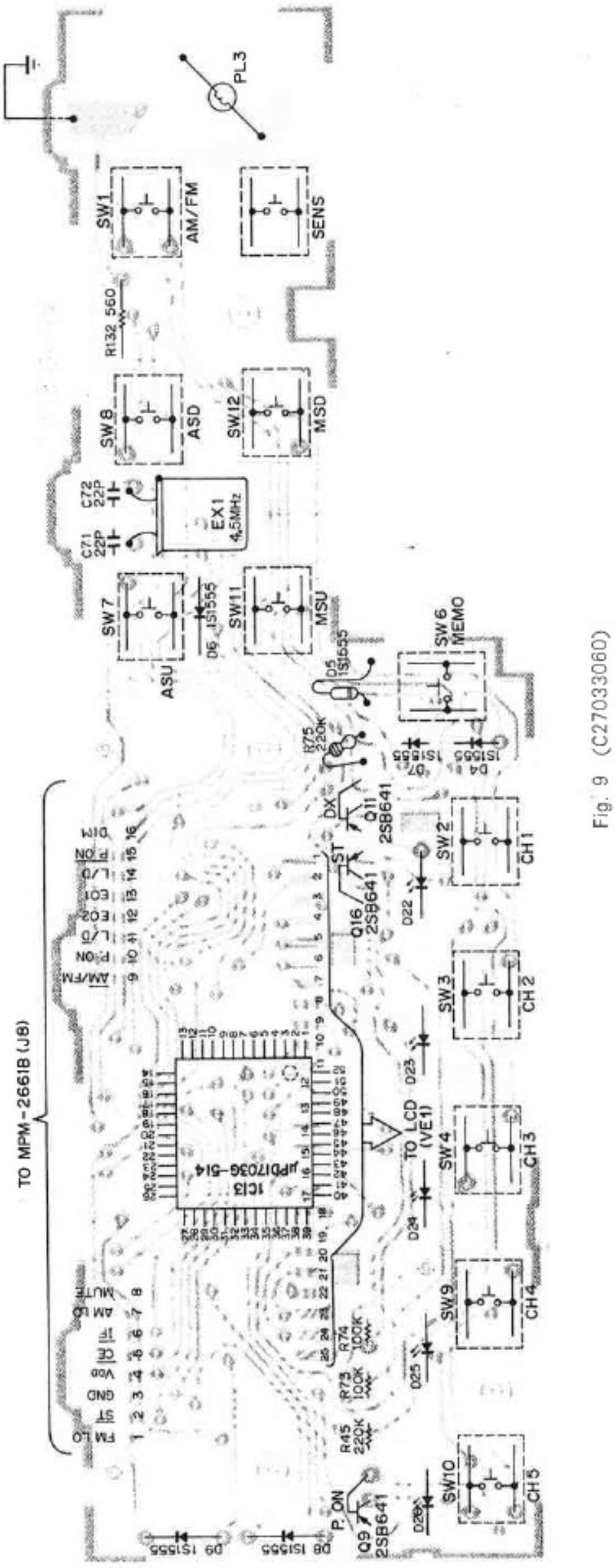


Fig. 9 (C27033060)

SWITCH PC BOARD (RN-EPP-1308-AE-3060)

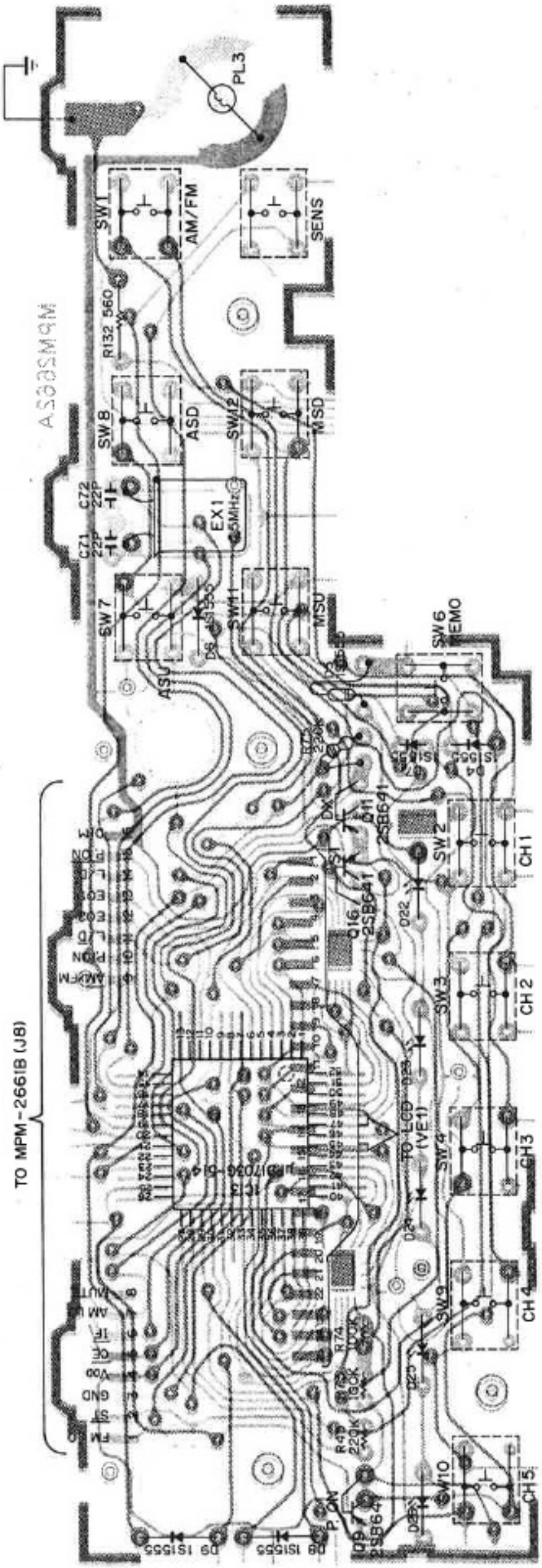


Fig. 9 (C27033060)

AM ALIGNMENT

Pre-setting of the frequency at each adjustment point will make the tuning for adjustment easier.
AM Frequnecy to be pre-set : 530 kHz, 600 kHz, 1400 kHz, 1000 kHz, 1620 kHz
FM Frequency to be pre-set : 88.1 MHz, 98.1 MHz, 107.9 MHz
Standard adjustment condition

a. Power supply·····13.2V
b. AM/FM Changing switch·····AM
c. Loudness switch·····off(▙)
d. Sensitivity switch·····Distant
e. Balance, bass, treble and fader control·····Center
f. Volume·····Adjust to get 2V output level.
g. Connections

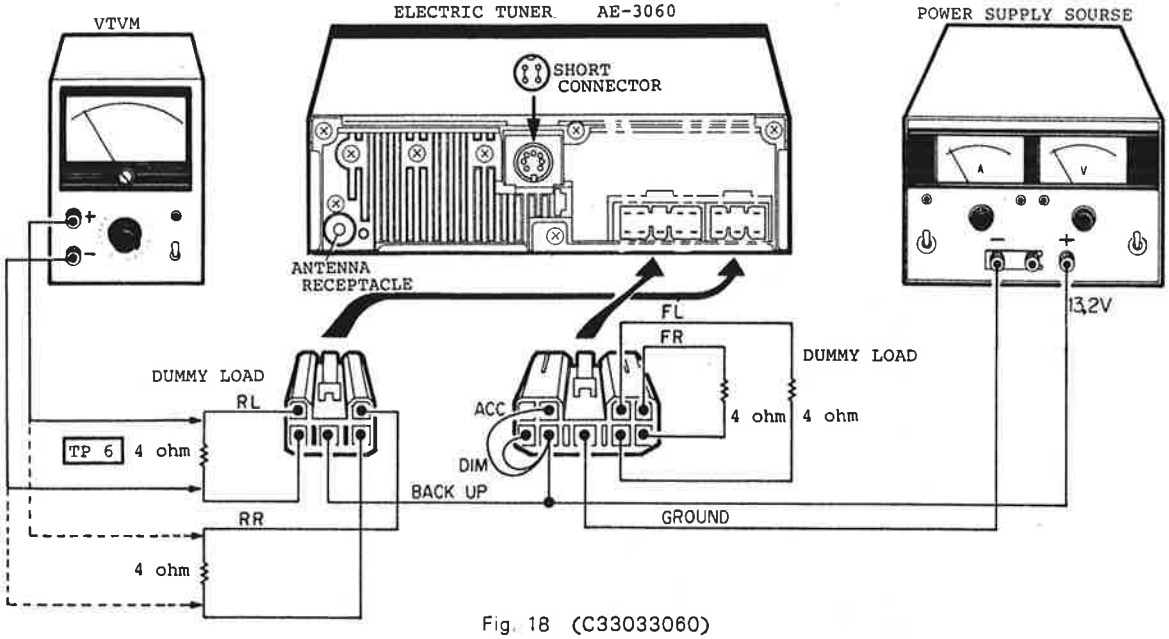


Fig. 18 (C33033060)

[1] IF Alignment

(1) Connections

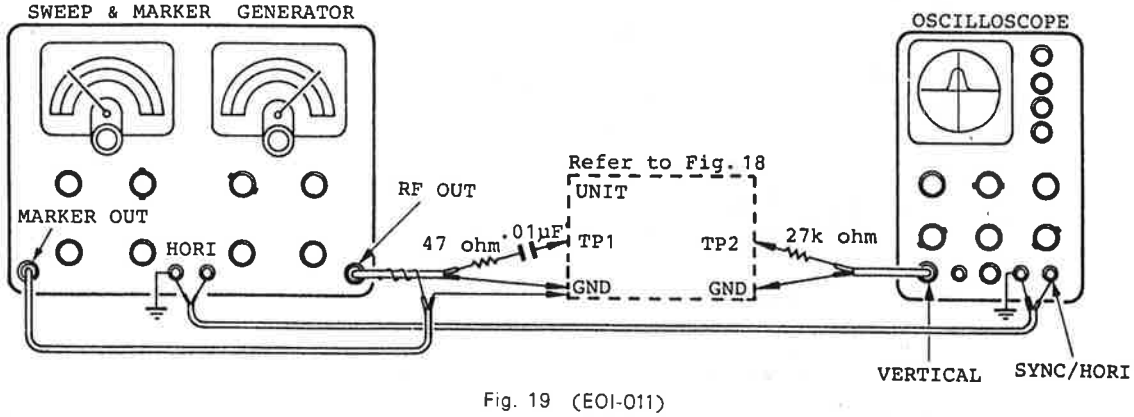


Fig. 19 (EOI-011)

SWEEP GENERATOR OUTPUT	OSCILLOSCOPE VERTICAL INPUT	OSCILLOSCOPE HORIZONTAL INPUT
Antenna receptacle (J1)	Connect TP 2 in Fig. 19 through 27k-ohm resistor	Connect with HORIZONTAL terminal of sweep generator

(2) Alignment (Refer to Fig. 20)

STEP	SWEEP GENERATOR		ADJUSTMENT POINTS	PROCEDURE
	MARKER	OUTPUT LEVEL		
1	450 kHz	Minimum	T 3	Get maximum IF curve and best symmetry on both sides.
2			T 4	
3	Repeat STEP 1 to 2 until no further gain in output can be obtained.			

〔2〕 Tuning bias and tracking alignment

(1) Connections

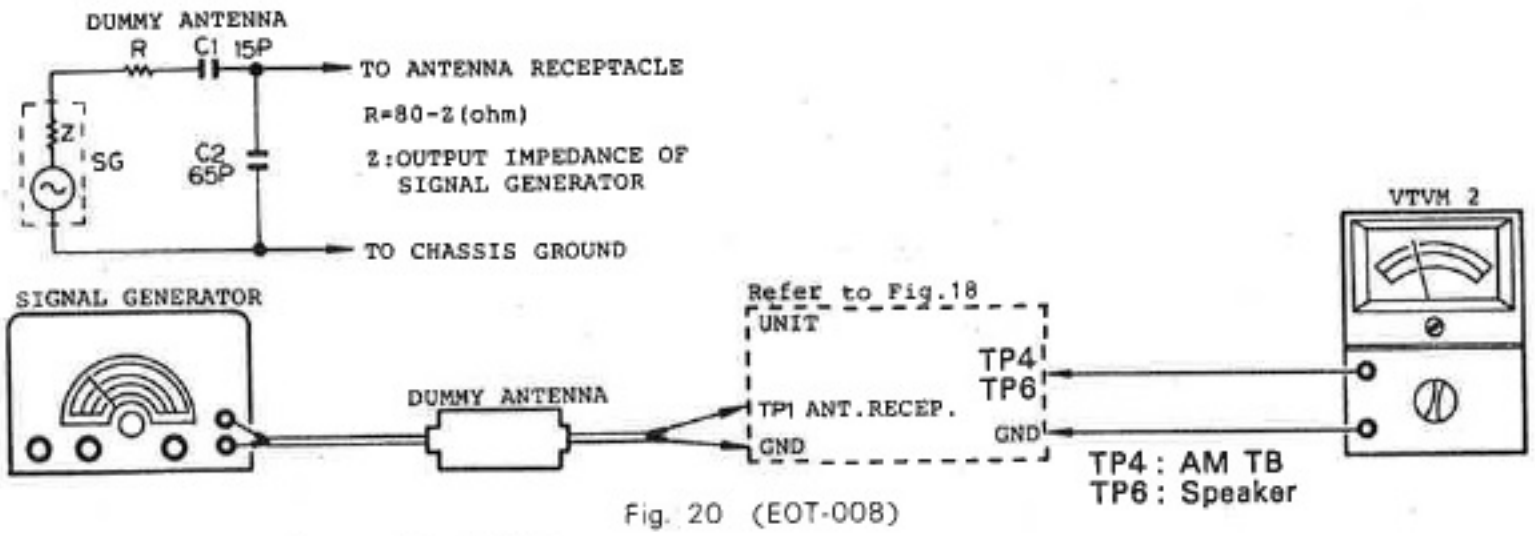


Fig. 20 (EOT-008)

(2) Alignment (Refer to Fig 20-1)

STEP	PURPOSE	SIGNAL GENERATOR FREQUENCY	FREQ. DISPLAY OF UNIT	ADJUSTMENT POINTS	PROCEDURE
1	Tuning bias range	———	1620 kHz	CV 2 (OSC)	Adjust AM tuning bias for 7.5V.
2		———	530 kHz	T 6 (OSC)	Adjust AM tuning bias for 1.5V.
3	Repeat Steps 1 and 2 for alignment to stably obtain 1.5±.1V at 530 kHz and 7.5±.1V at 1620 kHz as dias.				
4	Tracking	600 kHz (400 Hz, 30%, AM)	600 kHz	T 7, T 2 (ANT, RF)	Adjust output voltage (TP6) for maximum. (See Fig. 18)
5		1400 kHz (400 Hz, 30%, AM)	1400 kHz	CV1 , CV3 (ANT, RF)	
6	Repeat steps 4 and 6.				

〔3〕 SEEK Alignment

(1) Connections Refer to Fig. 20 Signal generator·····connect the TP 1

VTVM2 ·····No used

(2) Alignment (Refer to Fig 20-1)

STEP	PURPOSE	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINTS	PROCEDURE
1	Set the local/distant selector switch in the distant position.				
2	Distant sensitivity	1000 kHz (400Hz, 30% AM)	30 dBμ (±5 dBμ)	RV 7	Depress SEEK button to start searching, and then adjust sensitivity so that the search tuning may stop right near 1000 kHz.

〔4〕 Beat trap alignment

(1) Connections Refer to Fig. 20 signal generator·····connect the TP 1

VTVM2 ·····connect the TP 6

(2) Alignment (Refer to Fig. 20-1)

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINTS	PROCEDURE
1	900 kHz (No modulation)	74 dBμ	L 4	Adjust output voltage for minimum.

◦ Adjustment points

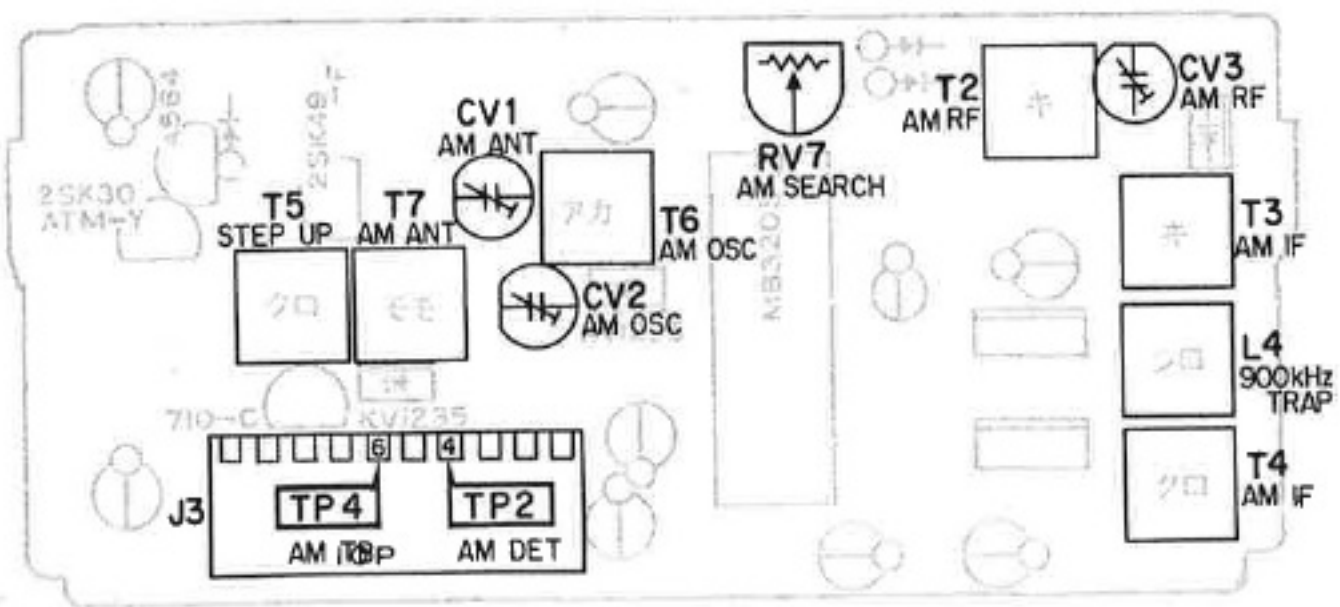


Fig. 20-1 (C33033060)

FM ALIGNMENT

* Standard Adjustment Condition

FM adjustment should be the same as in AM standard adjusting condition, (AM/FM selector switch is, however, in FM position.)

NOTE: Since the electronic tuner unit is employed at FM front end section, no tracking and receiving frequency range adjustment are required.

[1] IF Alignment

(1) Connections

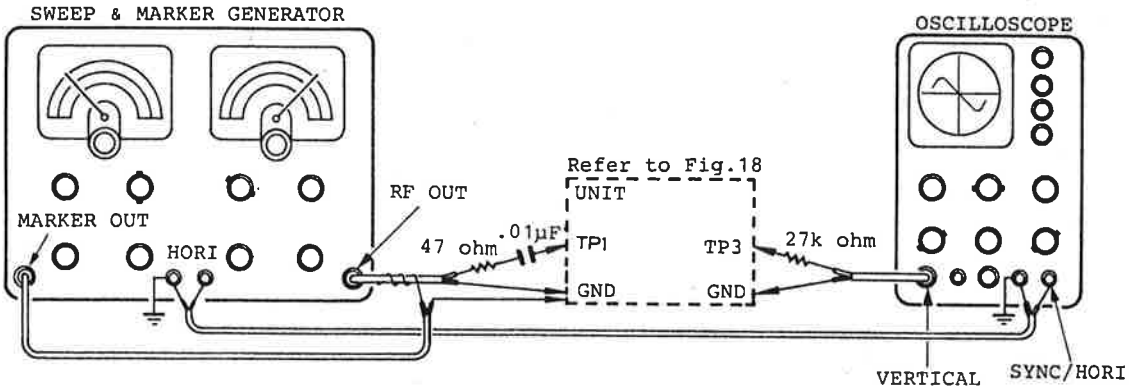


Fig. 21 (EOI-012)

SWEEP GENERATOR OUTPUT	OSCILLOSCOPE VERTICAL INPUT	OSCILLOSCOPE HORIZONTAL INPUT
Antenna receptacle (J1)	Connect [TP 3] in Fig. 21 through 27K-ohm resistor	Connect with HORIZONTAL terminal of sweep generator

(2) Alignment (Refer to Fig. 25)

STEP	PURPOSE	SWEEP GENERATOR FREQUENCY	ADJUSTMENT POINTS	PROCEDURE
1	S curve	10.7 MHz	T 201	Adjust for full gain and length of s-curve at linears. (See Fig. 23)
2	S curve (Center)	SG 10.7 MHz (400 Hz, 30%)	T 1	Fine-adjust the potential difference between IC 2 ⑦ and ⑱ pins for 0V.

COLOR	CENTER FREQUENCY
Red	10.70 MHz ± 30 kHz

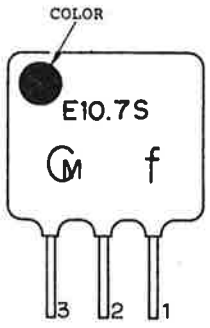


Fig. 22

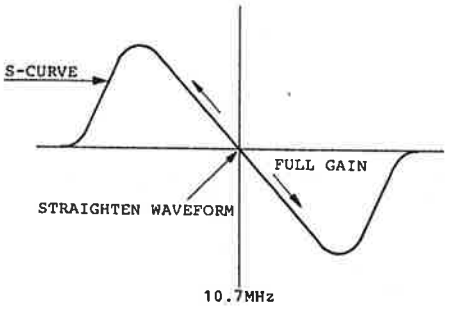


Fig. 23

NOTE: S curve center can be adjusted in the same manner by receiving local FM broadcast near 98.1 MHz.

〔2〕 Limiting sensitivity alignment

(1) Connections

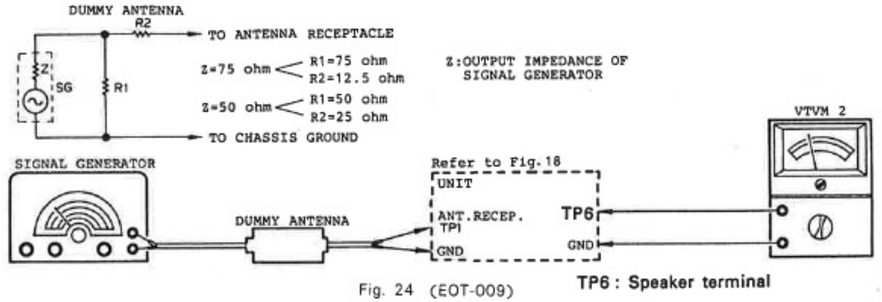


Fig. 24 (EOT-009)

TP6 : Speaker terminal

(2) Alignment (Refer to Fig. 25)

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (400Hz, 30%)	54 dBμ	———	Adjust volume control (VOL) until TP 6 output voltage is 2V.
2		10±5 dBμ	RV 3	Adjust output voltage for −3 dB (1.4V).

〔3〕 SEEK Alignment

(1) Connections Refer to Fig. 24

(2) Alignment (Refer to Fig. 25)

STEP	PURPOSE	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	Set the local/distant selector switch in the distant position.				
2	Distant sensitivity	98.1 MHz (400Hz, 30%)	———		Depress SEEK button to actuate the searching, and then make sure that the output level ("Distant" earch sensitivity) of the signal generator when the searching function stpos nearly at 98.1 MHz is 20±6 dBμ.
3	Set the local/distant selector switch in the local position.				
4	Local sensitivity	98.1 MHz (400Hz, 30%)	Distant sensitivity plus 25 dBμ.	RV 2	Depress SEEK button to actuate the searching, and then adjust sensitivity so that the searching action may stop nearly at 98.1MHz.

〔4〕 Noise blanker alignment

(1) Connections a. Stereo signal generator·····Connect the TP 1

b. Oscilloscope ·····Connect the TP 3

(2) Alignment (Refer to Fig. 25)

STEP	STEREO SIGNAL GENERATOR FREQUENCY	STEREO SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (No modulation, Stereo mode)	54 dBμ	L 10	After making sure of "STEREO" display, adjust the pilot signal wave (19 kHz) for minimum.

〔5〕 Separation alignment

(1) Connections a. Stereo signal generator·····Connect the TP 1

b. Oscilloscope ·····Connect the TP 6 (L-ch)

(2) Alignment (Refer to Fig. 25)

STEP	STEREO SIGNAL GENERATOR FREQUENCY	STEREO SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (Lch : 1 kHz, 30% Rch : no mobulation)	54 dBμ	RV 6	Adjust R-ch. output level for minimum.

〔6〕 ASC Working sensitivity adjustment

(1) Connections Same as separation alignment

(2) Alignment (Refer to Fig. 25)

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (1 kHz, 30%)	74 dBμ	———	Adjust volume control until the output voltage is 2V.
2		40 dBμ	RV 5	Adjust the separation for 15±8 dBμ.

〔7〕 C/N Alignment

(1) Connections Same as in Section 〔6〕

(2) Aligement (Refer to Fig. 25)

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (400 Hz, 30%)	54 dBμ	———	Adjust volume control so that the output voltage may be 2V.
2	Disconnect the signal generator.		RV 4	Adjust the output voltage (residual noise) for 63mV.

〔8〕 AGC Voltage adjustment

(1) Connections Refer to Fig. 24 a. VTVM2 ·····connect the TP 8

(2) Alignment (Refer to Fig. 25)

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL	ADJUSTMENT POINT	PROCEDURE
1	98.1 MHz (400 Hz, 30%)	15 dBμ	RV 1	Adjust the output voltage for 3±.5V

◦ Adjustment points

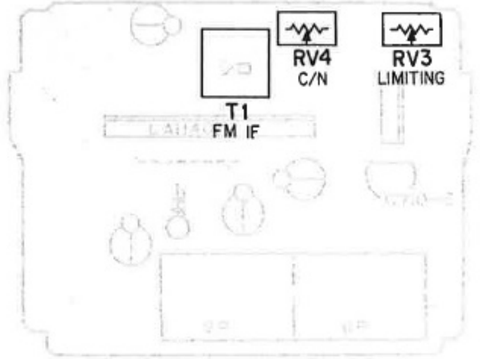


Fig. 25-1

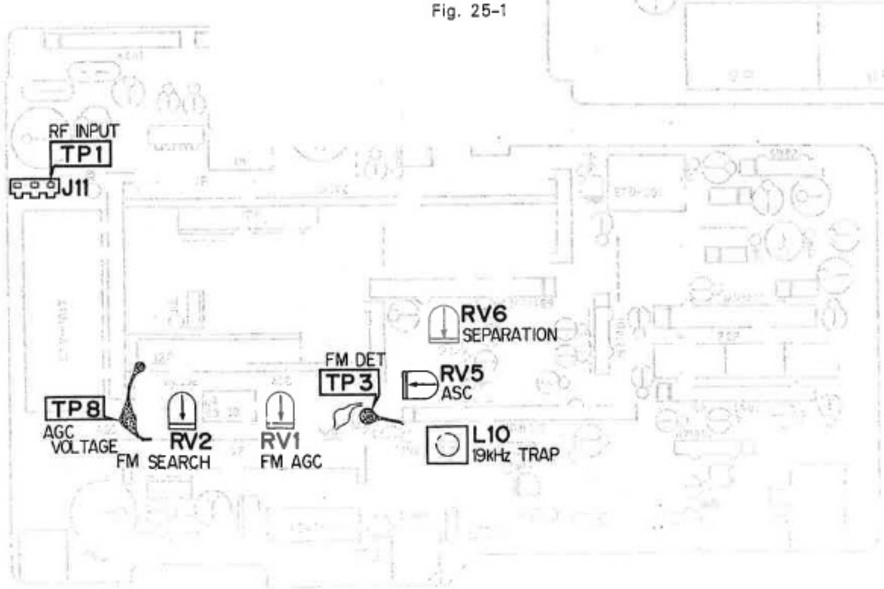


Fig. 25-2

EXPLODED VIEW

〔AE-3060〕

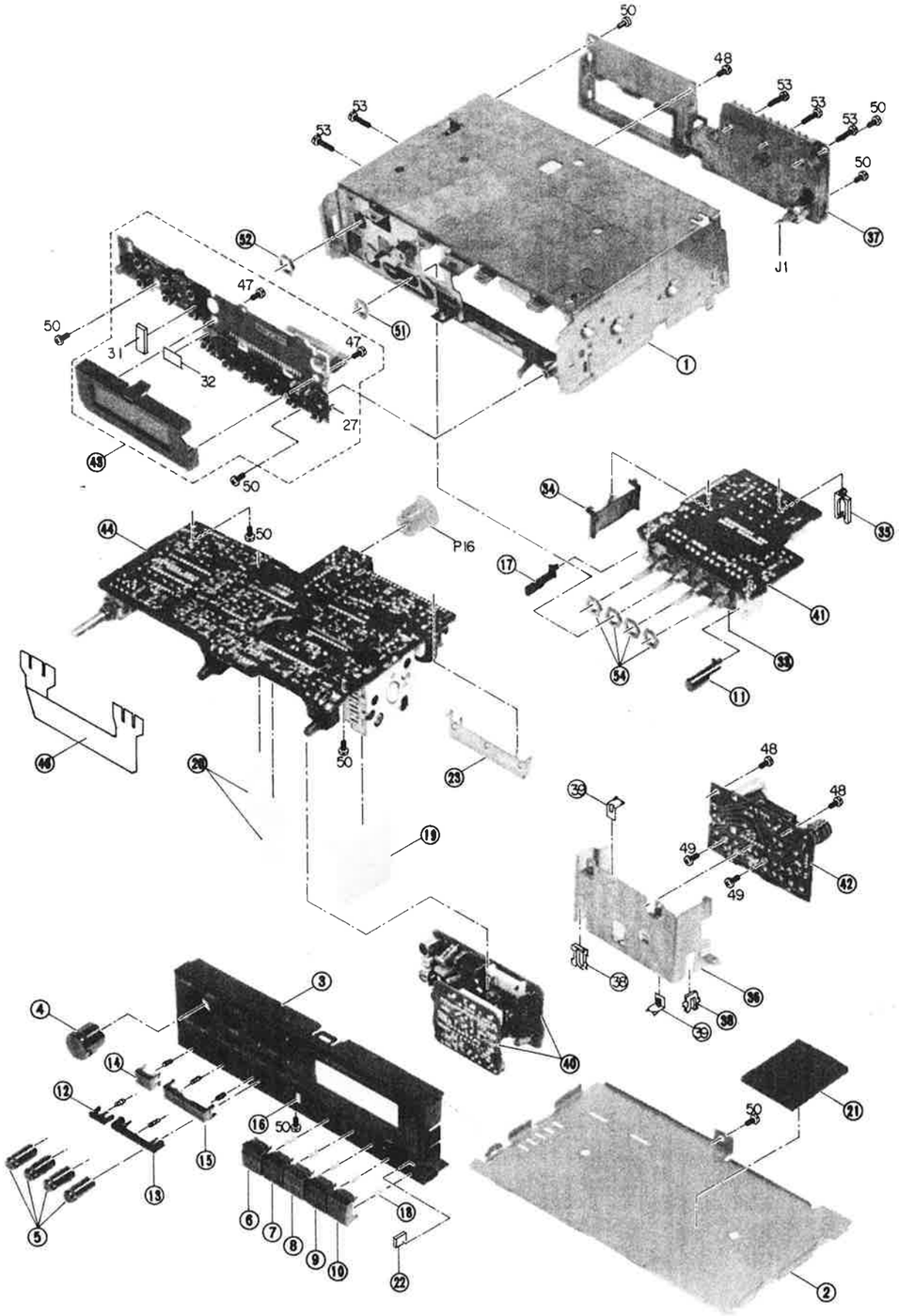


Fig. 26

EXPLANATION OF CIRCUIT OPERATION

[1] Regarding Control IC

1. Summary

(1) Characteristics

(a) To be exclusively used for ETR based on PLL synthesizer system, and to be composed of 4 bit type micro-computer.

(b) A one chip type of IC controller furnished with prescaler, LCD driver, PLL synthesizer, and reset circuit other than control function.

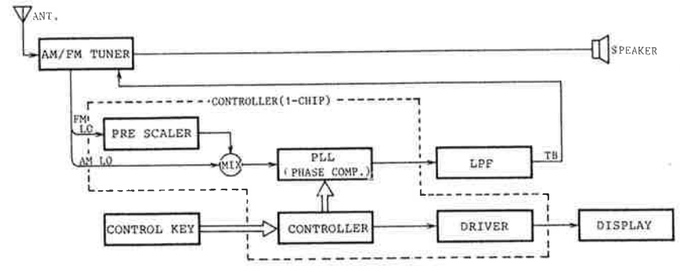


Fig. 1-1

(c) To be characterized with low-level-power cosumption due to C-MOS configuration.

(d) Capable of being driven with singular power supply

At PLL operation (Radio "ON")	---	3.5 - 5.5(V)
At only controller operation (Radio "OFF")	---	3.5 - 5.5(V)
At backup operation (CE="L", ACC="OFF")	---	2.5 - 5.5(V)

(e) As a pre-scaler has been incorporated, local frequency can be directly input.

(f) An input voltage level of local frequency is comparatively low as compared with usual ones.

(g) To be abundant in the reference frequency of an internal phase comparator

(h) To be provided with 2 sets of phase comparating outputs

(i) LIC display system with a scarce driving current has been employed for display system.

(j) Capable of being applied to a vast application area.

As described above, effective cost-saving, much improvement in receiving performance, and circuit standardization have been achieved for a radio set.

(2) System Configuration

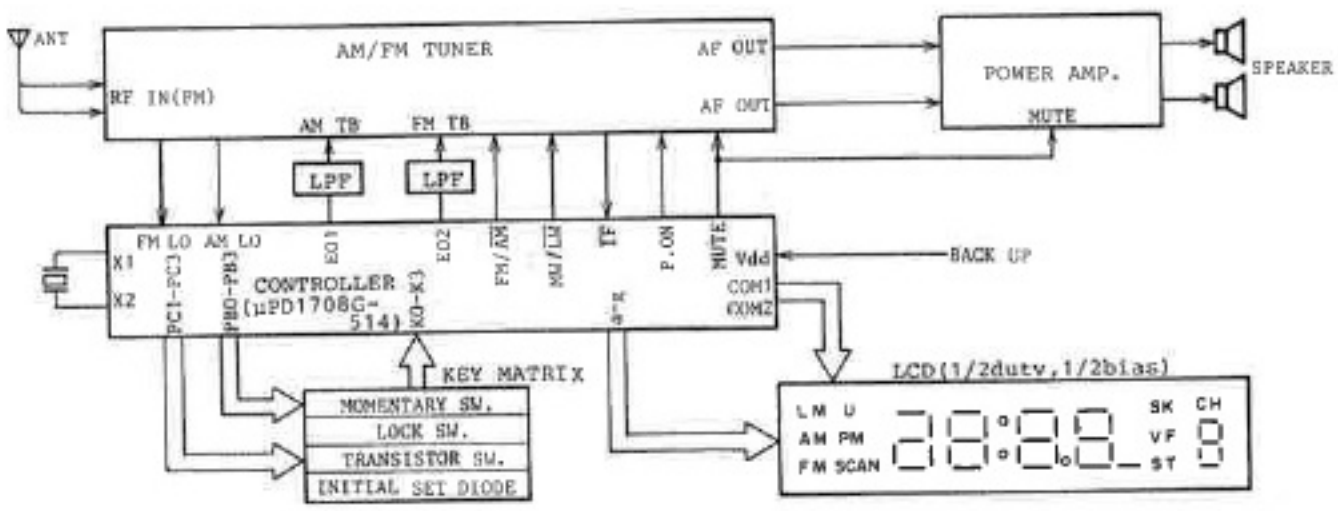


Fig. 1-2

(3) Processing Functions of Control IC

Functions			Remarks
Large Classification	Middle Classification	Small Classification	
Search function	Automatic search	Up	Slow sweep 0.5 sec. Quick feed LW 125 ms MW/FM 50 ms
		Down	
	Manual search	Up	"
		Down	
	Intermittent search (scanning)	Up only	"
	Memory search (Preset search)	AM (MW/LW)	MW/LW random 5 channels in a maximum
		FM	5 channels in a maximum
	Last channel	AM (MW/LW)	Last one(1) channel amongst either MW or LW
		FM	One(1) channel
Clock function	Initialization		Flashing at AM1:00, no count until execution of time correction
	Count	System	12 hours/24 hours, Interconnecting changeover co-operative with receiving area
	Correction	Reference time correction	One-shot operation
		Hour adjusting	Slow feed 0.5 sec. Quick feed 250 ms
		Minute adjusting	"
Display	Device		LCD
	Driving system		1/2 duty, 1/2 bias
	Item		Refer to Fig. 1-8
	Contents	Receiving frequency Clock	3-1/2 digits, internal changeover
Output	LCD display	Common signal	2 signals
		Segment signal	23 signals
	P.D.		2 signals (identical signal)
	MUTE		1 signal, Active "H"
	Band information	FM/AM	FM --"H" MW/LW --- "L"
		MW/LW	MW --"H" FM & LW -- "L"
Receiving frequency	LW	General	See Table 1-1
	MW	U.S.A. I	
		Japan, U.S.A.II	
		Australia	
		Europe	
	FM	Japan	
		U.S.A.	
		Australia	
		Europe	

Note: No clock function has been applied to the system (AE-3060)

(4) Application band

Receiving band		MW			FM				LW
Application area		Japan, Australia Europe	USA I	USA II	Japan	USA	Europe	Australia	General
Receiving status	Receiving frequency	KHZ 522-1611	4 KHZ 530-1620	KHZ 522-1620	MHZ 76.0-90.0	MHZ 88.1-107.9	MHZ 87.5-108.0	MHZ 88.1-107.9	KHZ 155-281
	Channel separation	9 KHZ	10 KHZ	9 KHZ	100 KHZ	200 KHZ	50 KHZ	100 KHZ	9 KHZ
	Intermediate frequency	KHZ +450	KHZ +450	KHZ +450	MHZ -10.7	MHZ +10.7	MHZ + 10.7	MHZ +10.7	KHZ +450
	Local station frequency	KHZ 972-2061	KHZ 980-2070	KHZ 972-2070	MHZ 65.3-79.3	MHZ 98.8-118.6	MHZ 98.2-118.7	MHZ 98.8-118.6	KHZ 605-731
PLL Operation status	Reference frequency	9 KHZ	10 KHZ	9 KHZ	25 KHZ	25 KHZ	25 KHZ	25 KHZ	9 KHZ

Table 1-1

Terminals location

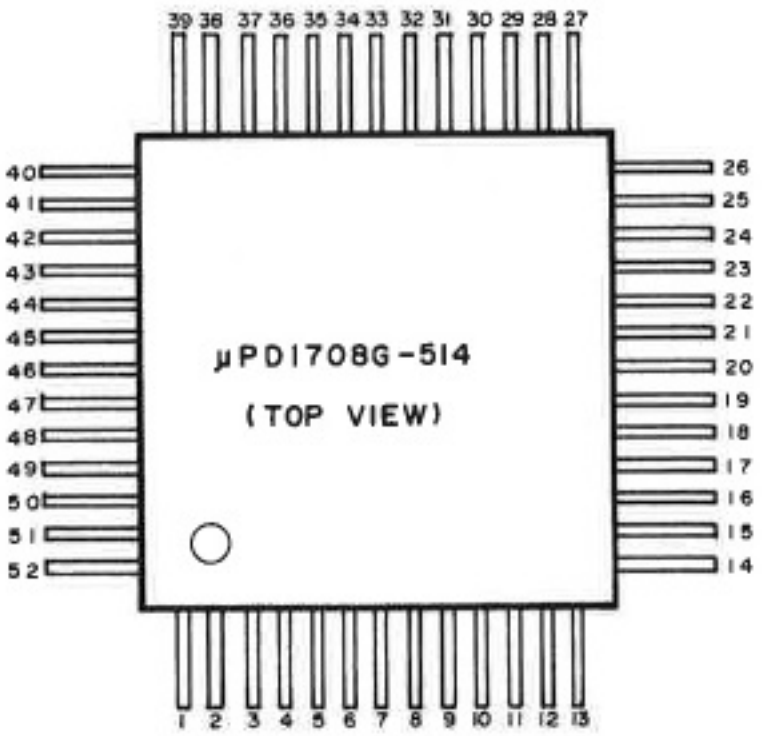


Fig. 1-3

2. Explanation of Terminals

Pin No.	Symbol	Function
1 – 4 34 – 52	LCD1 〜 LCD23	Corresponding to segment signal output terminals for use with LCD display. With respect to details, please refer to descriptions on page 35.
5	COM2	Corresponding to common signal output terminals for use with LCD display. With respect to details, please refer to descriptions on page 35.
6	COM2	
7	VDD	Corresponding to power supply input terminals of device. +5.0V (4.5V - 5.5V): A voltage of 3.5V to 5.5V and 2.5V to 5.5V can be applied to the operation at only CPU operation (radio OFF) and at backup (CE terminal "L") operation, respectively.
8	FM LO	Corresponding to local frequency (frequency for comparation) input terminals of FM band. To be capable of applying an input signal with maximum frequency of 150 MHZ and minimum input voltage of 0.3V p-p under AC-coupling system.
9	AM LO	To be applied as local frequency input terminals of AM band. Capable of applying an input signal with maximum frequency of 10 MHZ and minimum input voltage of 0.3Vp-p under AC-coupling system.
10	GND	Grounding terminal 0V
11	EO1	Corresponding to the charge-pump output of a phase comparator. In case a divided frequency of local frequency is higher and lower than the reference frequency, an "H" level and an "L" level signal will be issued from these terminals, respectively. And on the occasion of coincidence, these move to floating conditions. Although EO1 and EO2 simultaneously issue a frequency coincidence signal, no interference occurs due to independent internal buffer register.
12	EO2	
13	CE (chip Enable)	Corresponding to such an input terminal as controls the operation of a device. In case of "H" level: Normal operation as a controller is available. In case of "L" level: Shifting to the following status, i.e. display OFF PLL function stop, a clock only to continue operation, and memory holding. However, if VDD moves to "L" level during the peirod, the controller is reset. No "L" lever signal can be accepted unless its pressure time is more than 140 usec.
14	N.C.	No connection

Pin No.	Symbol	Function
15	X1	Corresponding to the connecting terminal of a crystal oscillator.
16	X2	4.5 MHz
17	$\overline{IF}$	Corresponding to the input terminal of stop signal under automatic tuning operation. IF detecting signal from a radio circuit is input in active "L" condition.
18	MW/LW	Corresponding to the changeover signal output terminal of radio receiving band. At "H" level: MW band At "L" level: LW band In case of "L" level at CE terminal and "OFF" status for a radio, the output terminal provides high-impedance.
19	FM/AM	Corresponding to the changeover signal output terminal of radio receiving band. At "H" level: FM band At "L" level: AM band In case of "L" level at CE terminal and "OFF" status for a radio, th- output terminal provides high-impedance.
20	P.ON	Corresponding to the output terminal to control a radio power supply. At "H" level: Radio ON At "L" level: Radio OFF In case of "L" level at CE terminals, the output terminal changes to high-impedance. In case of "H" level, the power supply ON/OFF is to be controlled by means of an externally equipped relay due to a scarce output current.
21 ∫ 24	K3(KEY) ∫ K0(KEY)	Corresponding to the key-return signal input terminal for use with key-matrix. In relation to details, please refer to descriptions provided on page 25.
25 ∫ 28	PB3 ∫ PB0	Corresponding to the timing signal output terminal for use with key-matrix.
29 ∫ 31	PC3 ∫ PC1	In relation to details, please refer to desctiptions provided on page 25.
32	MUTE	Corresponding to the outout terminal of a mute signal to cut a noise generated at PLL unlocked situation. Active "H" In case of "L" level at CE terminal, "L" level signal will be issued.
33		No connection

Remarks

1. Regarding the activities of $\overline{CE}$ terminal:

   With respect to the functions of $\overline{CE}$ terminal, the following two(2) kinds of operations are avaialble in conjunction with the status of VDD terminal. That is, in case the voltage of VDD terminal drops below a holding voltage (+5V) during "L" level at $\overline{CE}$ terminal, it operates as a reset signal output terminal, and

   (a) Contents of preset memory (CH1 to 5) will be replaced with a tracking frequency.

   (b) Turning "ON" a radio, a minimum receiving frequency will be displayed.

   (c) In case of clock display, flashing occurs at AM1:00 (Europe area only at 0:00), as described above, it returns to the initial status.

   Meanwhile, in case the voltage of VDD terminal does not fall down below a holding voltage (+5V) during "L" level at $\overline{CE}$ terminal, it operates as HALT, and maintains the following backed up statuses:

   (a) Contents of a preset memory (CH1 to 5) can be held as they were.

   (b) In case a radio is turned "ON", it will receive the "Last Memory".

   (c) The clock will continue count up.

2. With respect to AM/FM band changeover as well as radio power supply ON/OFF, taking into considerations the specifications required for a radio, the key-matrix has been composed so that either momentary switch or alternate switch may be selectively used.

3. Key-input is performed by means of keys K0 through K3 (Key 0 through Key 3), and key "ON" status acknowledgement can be effected by means of only "H" level input.

3. Key-matrix

(1) Symbol and connection of key

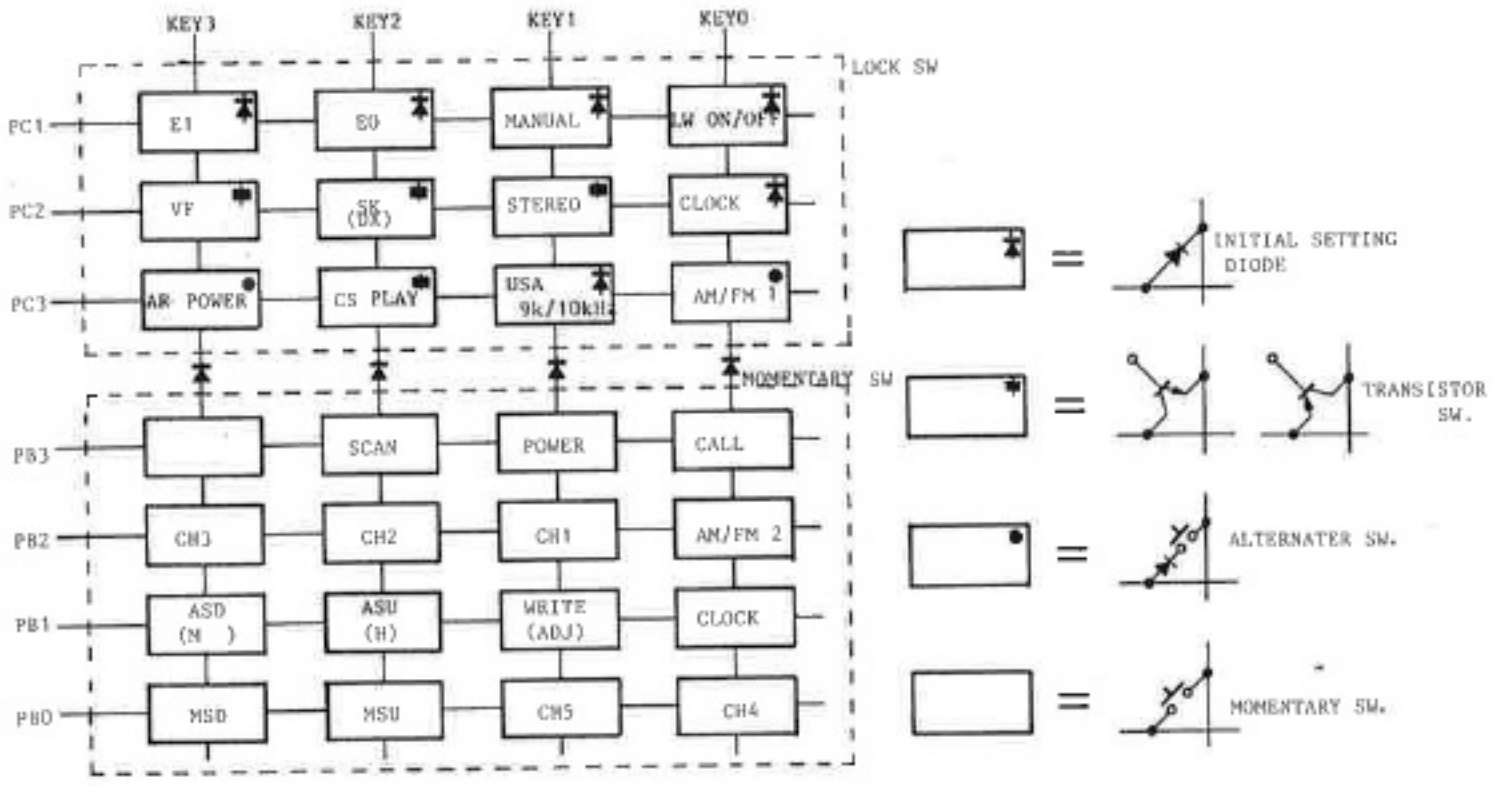


Fig. 1-4

(2) Functions of key

(a) ASU (Automatic Search Up)

Corresponding to an automatic tuning key. On the kdy turned "ON", a receiving frequency is automatically stepped up with every channel space of each band (Dividing ratio: N+1), and on receiving a broadcasting, the corresponding receiving frequency is maintained. The broadcasting detection during automatic search up is performed by checking wheterh an $\overline{IF}$ signal from the IF section of a tuner exists or not, and as soon as the $\overline{IF}$ terminal of a control changes to "L" level, the automatic search up is stopped due to the judgement of broadcasting frequency to move to the receiving status. The search speed is 0.5 sec. to the first one time trial, and 50 msec./step*1 to the following search up operations. During search up operation, MUTE signal is issued. Besides, if the key remains turned "ON", an automatic search up is continually carried out all over the period irrelevant to whether a broad casting frequency is available or not.

*1 The search speed is 125 msec/step to LW band only.

(b) ASD (Automatic Search Down)

To be corresponding to an automatic tuning key. When the key is turned "ON", a receiving frequency is automatically stepped down with every channel space of each individual band (Dividing ratio: N-1), and on receiving a broadcasting frequency, the corresponding receiving frequency is held. Every function of the kdy is basically same in comparison with one of ASU although the seeping direction is different from it.

(c) MSU (Manual Search UP)

To be corresponding to a manual tuning key. The manual tuning key is enabled by selecting either momentary key switch or rotary type pulse generation switch, and the kdy switch selection is enabled by Manual key.

° In case of Momentary Switch:
Whenever the key is turned on, the receiving frequency is stepped up as much as each channel space. In addition, if the key remains turned "ON" for more than 0.5 sec., the receiving frequency can be swept at the rate of 50 m sec/step until it is turned "OFF". However, $\overline{IF}$ signal detection is not carried out all over the period.

° In case of Rotary Switch:
Whenever the key is turned "ON", the receiving frequency is stepped up as much as each channel space, however, only one step is enabled even if the key is continually turned "ON".

A MUTE signal is issued on every 60 msec./step*2 even if either switch has been selected. (0.5 sec/step to the frequency step from one band-edge to the other band-edge). In case the Momentary Key remains turned "ON", a MUTE signal is issued with overlapped since a search speed is 50 msec/step, and therefore, apparently, a MUTE signal is being continually applied.

*2 The search speed is 124msec/step to only LW band, which is using a Momentary swtich.

(d) MSD (Manual Search Down)

To be corresponding to a Manual Tuning Key. Every function of it is basically identical with that of an MSU key, except that the sweeping direction is different to each other.

(e) SCAN

To be corresponding to a Scan Tuning Key. The kdy serves to implementing both start-up and reset of SCAN sweeping, based on toggle action.
On moved to SCAN mode, the receiving frequency is stepped up as much as each channel space of individual bands.
On detecting an IF signal, the frequency SCAN is interrupted for 5 sec. under holding conditions. Unless the SCAN mode operation is reset (SCAN key again turned "ON") during this period, SCAN sweeping operation is re-started. In case the SCAN mode is reset during holding period, the finally sanned broadcasting remains.
Meanwhile, if the SCAN mode is reset during sweeping operation, the SCAN sweeping operation is certainly stopped immediately after detection of the first IF signal even if a SCAN key is continually depressed.
When the SCAN sweeping is stopped in SCAN mode, a controller memorizes the corresponding broadcasting channel as the last memory,*3 and preset operation is also enabled. The sweeping system is basically similar to that of ASU.
If the key is turned "ON" during either ASU or ABD operation, either ASU or ASD is interrupted and SCAN sweeping is effected.
The information whether SCAN mode or not will be output to the segment signal output (LCD16) terminal.

*3 The last memory means an internal memory to store a frequency which should be received at power supply OFF ON, frequency band change-over by means of AM/FM switch, and CS play ON OFF.

[Points stored in Last Memory]

Manual tuning ----- All of points where dividing ratio N has been changed.

Pre-set tuning ----- All of points received by means of CH key (A channel No. at preset receiving is also simultaneously stored.)

Automatic tuning (including SCAN) ----- All of points where automatic search has been stopped by means of $\overline{IF}$ signal. A frequency during sweep is not stored.

(f) CH1 - CH5

To be corresponding to a Preset Search keys. These keys are preset pushbutton switches corresponding to 5PB of u-tuner radio.- Five(5) channels of frequency per each for AM (LW/MW) and FM can be preset by using these preset keys. The system to store (preset) frequency is performed by Random Access Memory (RAM) inside the control IC, and therefore, a backup power supply is required. In case a power source is applied for the first time, the tracking frequency is stored in RAM corresponding to CH1 to CH5 to each individual band. (Refer to Table 1-2)

In case CH key is turned "ON", it can be forecasted that a MUTE output signal may heavily change from the lower limit to the upper limit or from the upper limit to the lower limit of receiving frequency, and therefore, taking the disappearance of ringing noise into adequate considerations in advance, a MUTE signal will be issued for 0.5 sec.

Band	Application area	Internal frequency *1					Last memory
		CH1	CH2	CH3	CH4	CH5	
AM	Japan	603	999	1404	522	1611	522
	Australia	603	999	1404	522	1611	522
	USA II	603	999	1404	522	1620	522
	USA I	600	1000	1400	530	1620	530
	Europe	603	999	1404	522	1611	522
	Europe *2	155	218	603	999	1404	522
FM	Japan	76.0	83.0	90.0	80.0	87.0	76.0
	Australia	88.1	98.1	107.9	105.1	95.1	88.1
	USA	88.1	98.1	107.9	105.1	95.1	88.1
	Europe	87.5	98.1	108.0	105.1	95.0	87.5

Table 1-2

*1;AM--kHz FM--MHz
*2;with MW

(g) WRITE (MEMO)

On turning "ON" the key, the specified conditions where the present receiving frequency can be stored in one of preset search keys (CH1 to CH5) can be obtained. On depressing one of those keys CH1 through CH5 during the above conditions, the specified conditions capable of storage are immediately reset simultaneously with the current receiving frequency being stored in the corresponding key.
The specified conditions capable of storage are not time-sequentially reset until the following operations are taken place, excepting the above described operation.

[Reset Keys]
ASU, ASD, MSU, MSO, SCAN, AM/FM, POWER

A MUTE signal is not issued even if these keys are turned "ON".
Preset capable conditions are not reset by means of CLOCK or CALL key. These keys can be accepted only when the underdescribed conditions are not available plus under the conditions of radio "ON" status.

[Unacceptable Conditions]

a) During sweeping operated by means of ASU, ASD or SCAN

b) In the case of the key continually turned "ON" from the period of sweeping.

(h) AM/FM2

The key is applied to changing over the receiving band (AM and FM) of a radio.
The key is sensed at the moment of turned "ON", and the FM/AM output is changed as a toggle output in H/L level on every time of followable sensing.
The output of FM/AM is "L" level and "H" level at AM and FM, respectively.
A MUTE signal is issued for 0.5 sec.

(i) POWER

The key is applied to turning ON/OFF of radio power supply. On turning "ON" the kdy, the power supply of a radio is turned ON (or OFF), and thereafter, no more operation occurs even if the kdy is continually depressed. (momentary type)
The key is effective only under the conditions of ACC ON and CS NOT PLAY. On sensing switch on once, it turns on the radio power, and on sensing the next switch on, it turns off the radio power, based on a toggle operation. Meanwhile, a MUTE signal is issued for 0.5 sec. when the radio power is turned on, however it is issued continuously when the radio power is turned off.

(j) E1, E0

These switches are applied to the selection of receiving area and clock count system. Either one of Japan/U.S.A./Europe/ Australia can be selected.

E1	E0	Receiving area	Clock counting system
OFF	OFF	Japan	12 hours
OFF	ON	U.S.A.	"
ON	OFF	Europe	24 hours
ON	OFF	Australia	12 hours

ON: diode short
OFF: open

Table 1-3

(k) Manual

The switch is applied to the selection of MSU and MSD switch type. Either one of rotary type/Momentary type can be selected.
ON: Rotary type
OFF: Momentary type

(l) LW ON/OFF

The switch is applied to the selection of LW band and Not LW band.
The switch is effective to only Europe area selected by E1 and E0.
ON: With LW band
OFF: Without LW band (MW band only is available for AM)

[Regarding sweep of LW/MW]

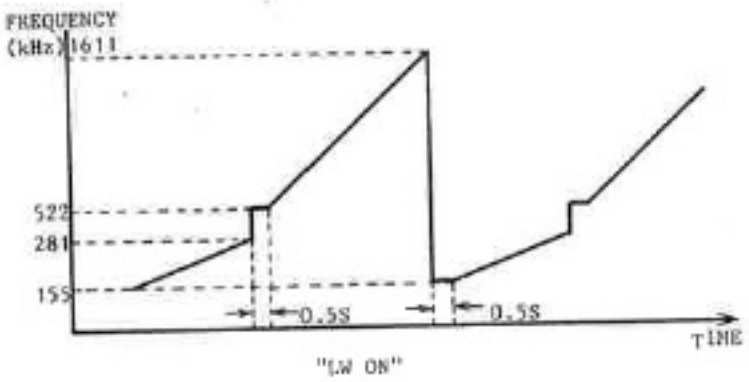


Fig. 1-5

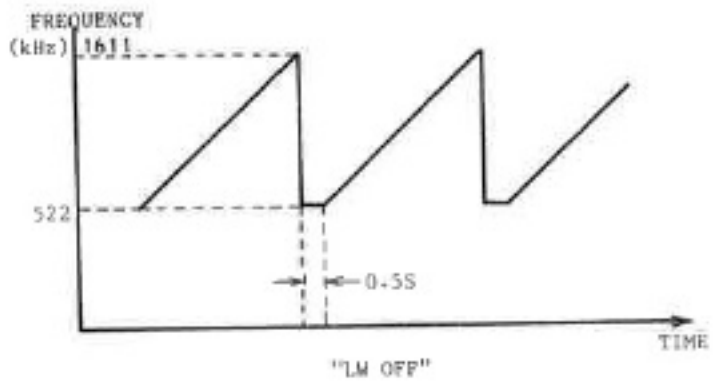


Fig. 1-6

(m) AR POWER

The switch shows the ON/OFF status of radio power, and an alternate type of switch (lock type switch) will be used.
ON: Radio power ON
OFF: Radio power OFF
The switch is furnished with the same function as POWER key switch, however, the swtich is characterized with employment of a lock type switch, differred from the other.

(n) FM/AM1

The switch is applied to the selection of radio receiving bands, and an alternate type of switch (lock type switch) will be used.
ON: FM band
OFF: AM band (*MW or LW band)

* The difference between MW/LW band can be discriminated by the controller output.

The switch is furnished with the same function as FM/AM2 key switch, however, the switch is characterized with employment of a lock type switch, differred from the other.

(o) STEREO

The key is used for "STEREO" display by means of LCD.

ON: STEREO display

OFF: STEREO disappearance (Monoral)

The "STEREO" display signals are output to Segment Signal output (LCD18) terminals.

(p) CS PLAY

The switch is used for signal input whether a cassette deck is under operation or not.

ON: Cassette deck under operation

OFF: Cassette deck not under operation.

When the switch is turned over from ON to OFF, the internal system is returned to the status before tuned on.

(Last memory data will be received.)

[Note] As the last memory is received, the preset channel No. is also displayed if preset receiving has been executed prior to CS PLAY key turned "ON".

(q) CLOCK

The key is used for the selection of whether clock function is used or not.

ON: Clock function to be used (Higher priority is put on clock display)

OFF: Clock function not to be used (Frequency display only)

(r) USA 9 kHz/10 kHz

The key is specifically used so as to respond to the variation of frequency conditions when the channel separation moves to 9 KHZ from 10 KHZ in the LW band of U.S.A.

ON: 9 KHZ

OFF: 10 KHZ

(s) SK (DX)

The key is used for implementing "SK (or DX)" display by means of LCD.

ON: SK (DX) to be displayed

OFF: SK (DX) to be disappeared.

The "SK (DX)" display signals will be output to Segment Signal output (LCD 17) terminals. The key is controlled with informations stored by means of flip-flop. (Refer to Item 〔3〕)

(t) VF

The key is used for implementing "VF" display by means of LCD.

ON: VF to be displayed

OFF: VF to be disappeared

The key is effective to the FM area only in Europe.

4. Timing of MUTE Output

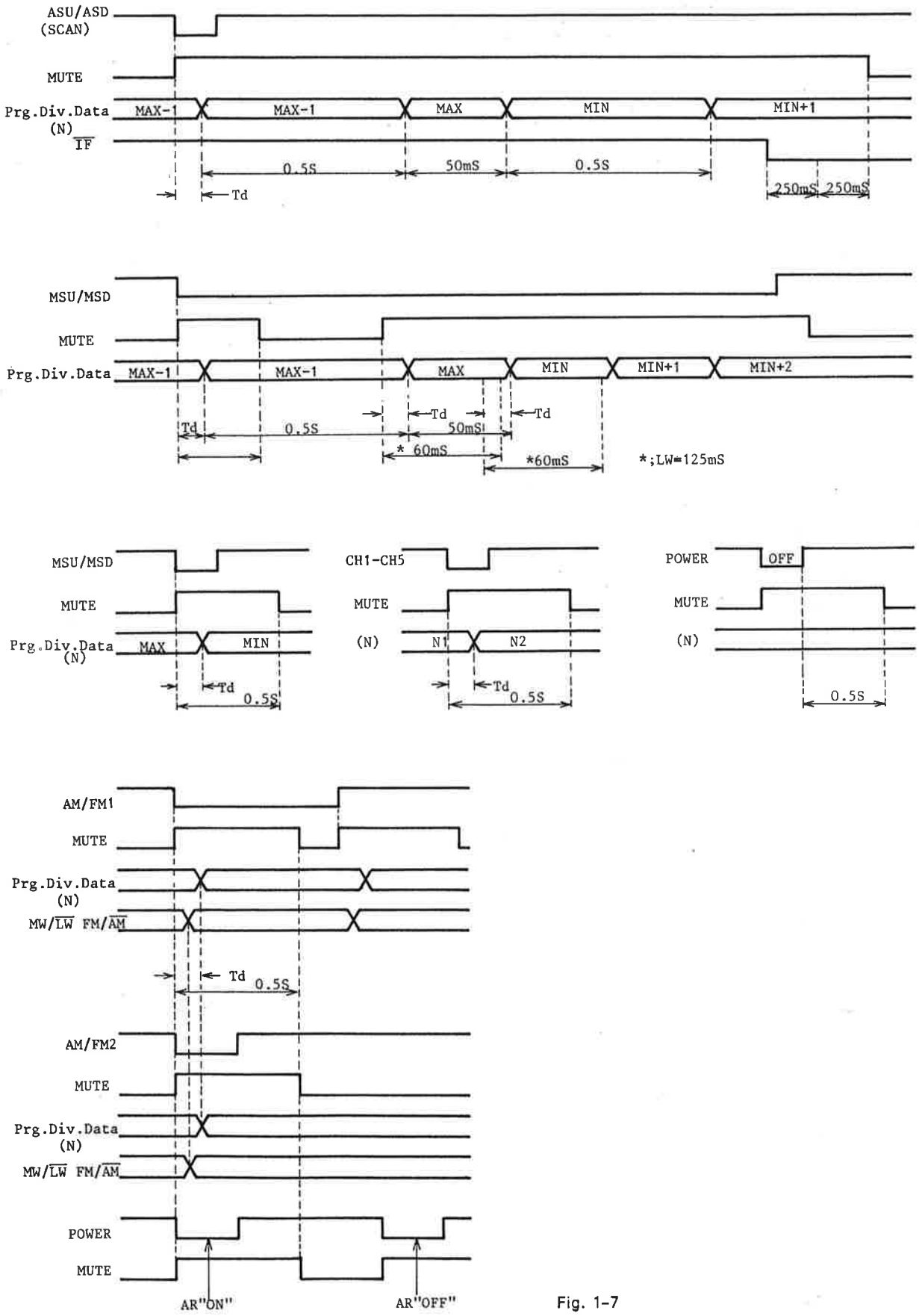


Fig. 1-7

5. Output of Display Segment

The control IC, which is furnished with 23 pins of segment output terminals and 2 pins of common output terminals, drives LCD (Liquid Crystal Display) under the condition of 1/2 duty and 1/2 bias.

(1) Display Items

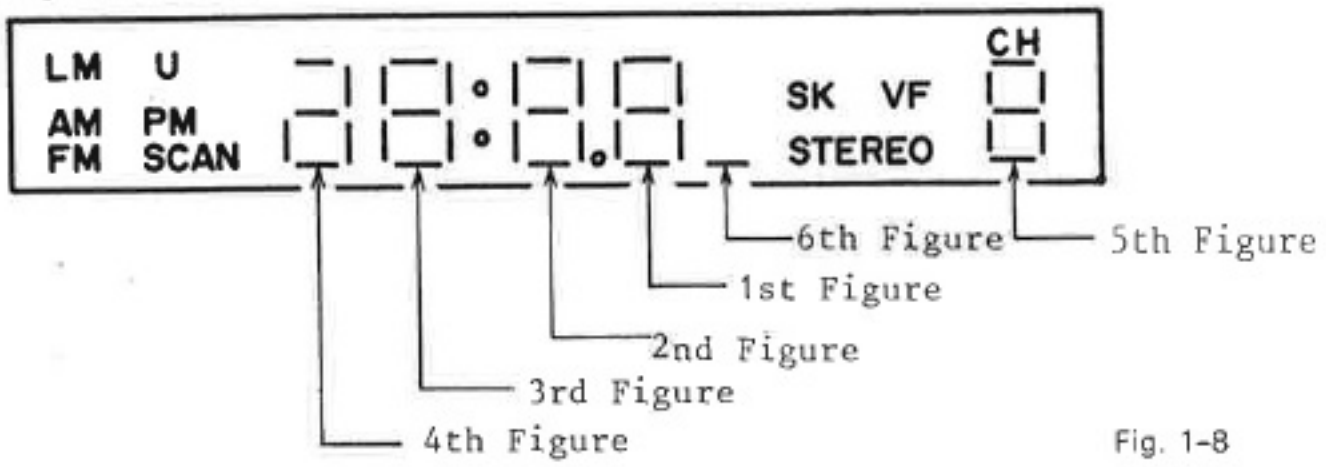


Fig. 1-8

(2) Pattern of 7-segment Display

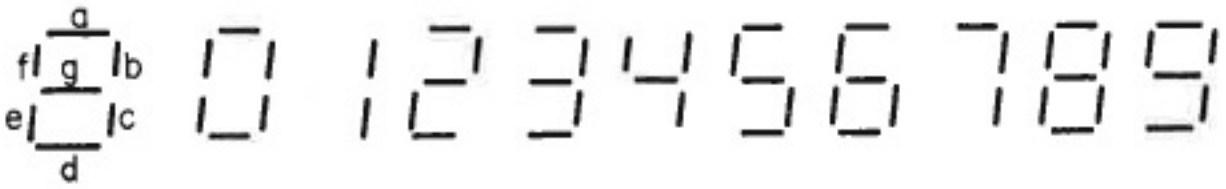


Fig. 1-9

(3) Relationship between Segment Output and Common Output

Pin No. of Control IC	SYMBOL	COMMON 1	COMMON 2
4	LCD1	PM	U
3	" 2	AM	FM
2	" 3	LM	a,d,e,g for 4th digit
1	" 4	b for 4th digit	c for 4th digit
52	" 5	f for 3rd digit	h for 3rd digit
51	" 6	e "	g "
50	" 7	d "	c "
49	LCD8	a for 3rd digit	Colon
48	" 9	f for 2nd digit	h for 2nd digit
47	" 10	e "	g "
46	" 11	d "	c "
45	" 12	a "	D.P.
44	" 13	f for 1st digit	h for 1st digit
43	" 14	e "	g "
42	" 15	d "	c "

Pin No. of Control IC	SYMBOL	COMMON 1	COMMON 2
41	" 16	a "	SCAN
40	" 17	SK	(50 KHZ) for 6th digit
39	" 18	VF	STEREO (ST)
38	" 19	CH	No connection
37	" 20	No connection	a for 5th digit
36	" 21	d for 5th digit	c "
35	" 22	e "	g "
34	" 23	f "	h "

(4) Explanation of Display Segment

Segment	Explanation
CH	To display preset memory capable status and receiving time of preset search
5th digit (7 segments)	To display channel No. at preset search by using 7 segments.
LM and U	To display the receiving band in Europe. LM: MW/LW band, U: FM band
AM, PM and FM	To display the receiving band of area other than Europe and the 12 hours type of clock time AM: To display "AM" of 12 hours type of clock time (To be disappeared in case of 24 hours type of clock time) To be commonly used with receiving band "AM" display PM: To display "PM" of 12 hours type of clock time (To be disappeared in case of 24 hours type of clock time) FM: FM band
SCAN	To display under SCAN mode operation
4th digit - 1st digit (7 segments)	To display time and receiving frequency by using 7 segments
Colon	To be corresponding to the colon for clock time display, and to display the order of second. To flash at intervals of 0.5 sec.
D.P.	To display the decimal point of receiving frequency in FM band

Segment	Explanation
6th digit	To display 50 KHZ of FM band in Europe
ST	To display Stereo Broadcasting receiving status. If radio "ON", "ST" display is implemented even during clock time display.
SK (or DX) and VF	To display that the radio set has been set in "SK (DX)" or "VF" receiving status. If radio "ON", "SK(DX)" or "VF" display is implemented even during clock time display.

(5) Electrode Pattern Diagram of LCD

Fig. 1 - 9 shows the standard LCD electrode pattern corresponding to the controller. In addition, the LCD, which has been practically applied to the radio set, will be shown in Fig. 1-11.

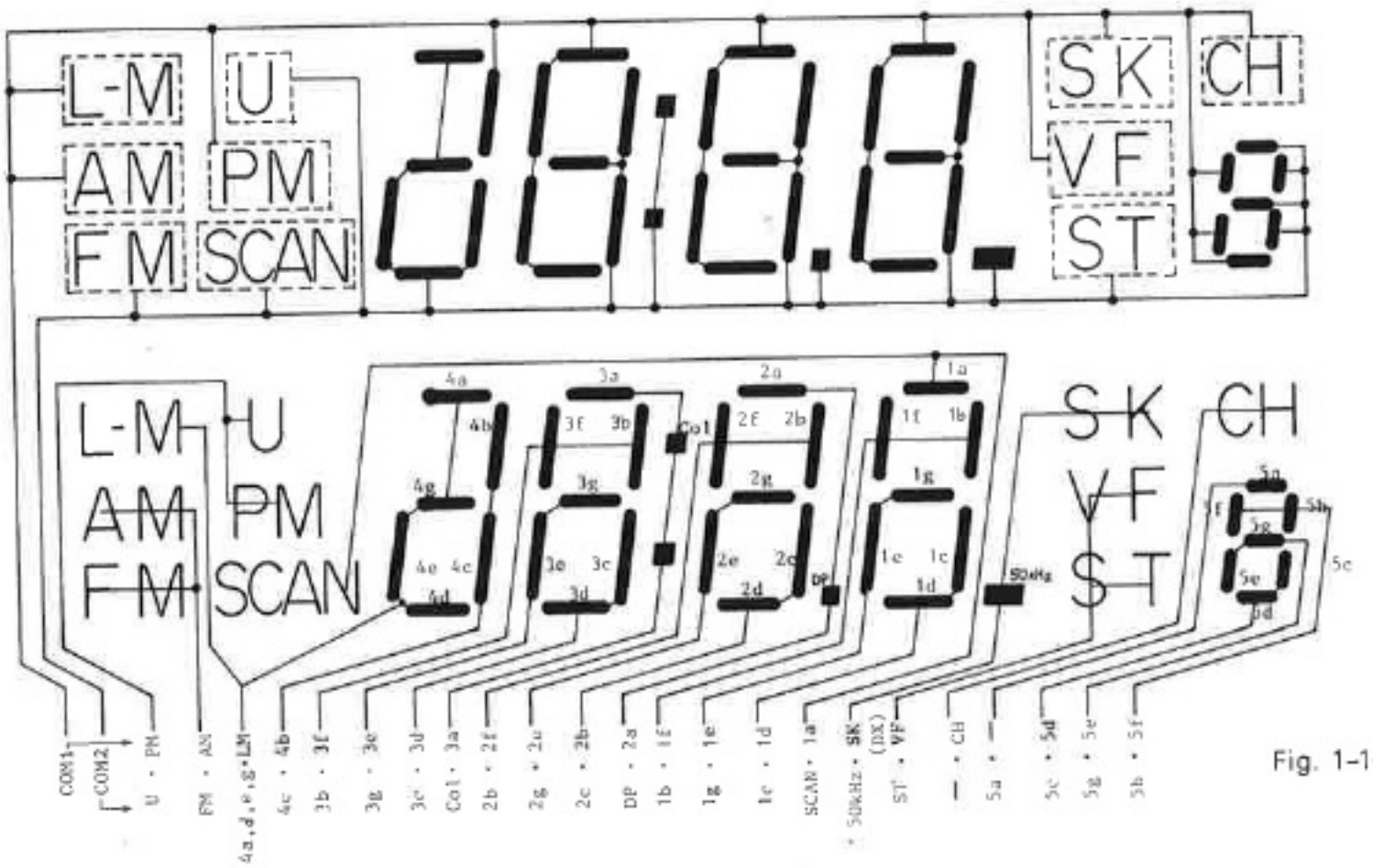


Fig. 1-10

Fig. 1-11

[2] Display Section

1. LCD

LCD (Liquid Crystal Display) electronic technology has been rapidly developed in the market of an electronic computator and an electronic digital watch, making TN type (Twist Nematic type) of LCD as a main streams, since it was first industrialized in 1973. Recently, the industrialization of LCD application has also much remarkably improved in unexpected field other than the above through the development of new technology, and as a result of it, LCD is now being applied to the kinds of instruments etc. also for an automobile as the first time trial.

The company has promptly employed the LCD technology, which is abundant in originality as for application to an audio apparatus equipped in an automobile.

(1) Features

(a) The power consumption is extremely small and the driving voltage is also very low. Accordingly, it can be directly driven by means of C-MOS LSI.

(b) The display part can be arbitrarily designed in response to one's favourite, and the display area can be enlarged.

(c) Two(2) kinds of display, i.e., transmission type and reflection type, are available. Accordingly, multi-superposed layer LCD display can be realized.

(d) Color display can be achieved by changing the color of polaroid plate.

(e) LCD display unit with extra-thin type can be realized.

(f) LCD display of which structural feature is simple is in abundant in mass-producibility, and is economically superior.

2. Operational Principle

The liquid crystal has been furnished with characteristics of a crystal (anisotropy) from the electrical and optical point of view although it is apparently liquid. The liquid crystal, which has been arranged (directional arrangement) to the same direction, can be re-arranged with a specific regularity by applying an external electric field to it, accompanied with a kind of optical change.

The liquid crystal display component is the very thing that has artificially utilized the above described optical change based on the re-arrangement of liquid crystal. The liquid crystal display component, which has been generally prevailed, is of TN type, and has the following structural features.

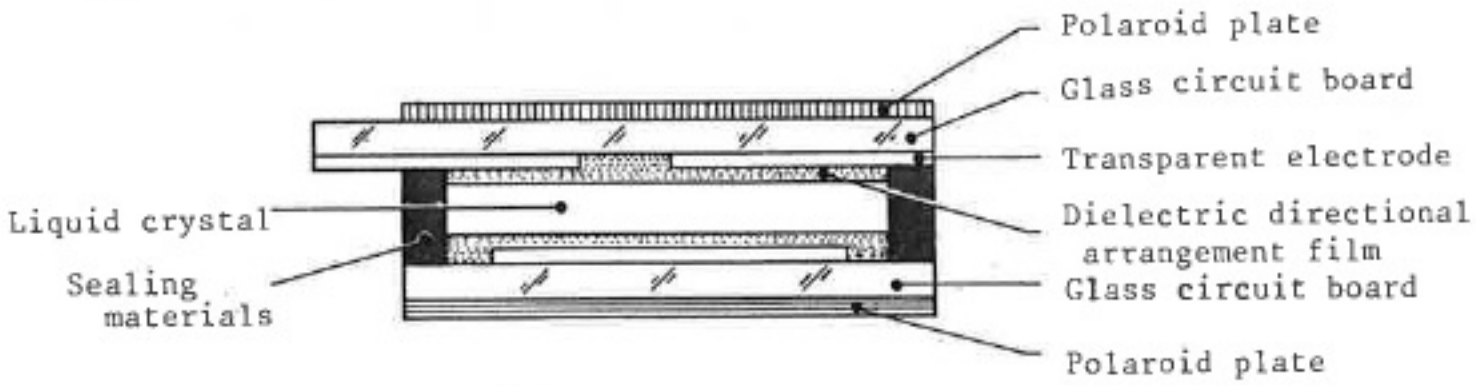


Fig. 2-1 Structural Features (at cross section area) of TN-type LCD

The operational principle diagram will be shown in Fig. 2-2.

There are two(2) sheets of polaroid plates, which have been set at the outside of glass-made circuit board sealed with liquid crystal, and the incidence beam provided from the left side shown in Fig. 1-2 remains as the perpendicular component only owing to the polaroid plate 1. In case a voltage between electrodes equals zero(0) V, the liquid crystal elements are maintained horizontally against 2 pieces of electrodes, and in addition, are arranged with 90° twisted angle. Therefore, a ray is distorted as much as an angle of 90° and becomes a horizontal polarization beam when it passes over through the liquid crystal layer.
Meanwhile, the polaroid plate 2 has been set so that a horizontal ray can pass over it, and therefore, the ray passes over the polaroid plate 2. As a result of it, the area between A and B becomes transparent.

On the other hand, when a voltage is applied to both electrodes, the liquid crystal elements are regularly arranged in compliance with the direction of an electric field, and their specific ability, which can distort a ray progression, is lost at the same time. As a result of it, the polarization beam, which has been perpendicularly injected into the liquid crystal layer, is directly reached to the polaroid plate 2, and eventually, the area between A and B becomes opaque since the polarization beam can not pass over the horizontal polaroid plate 2.

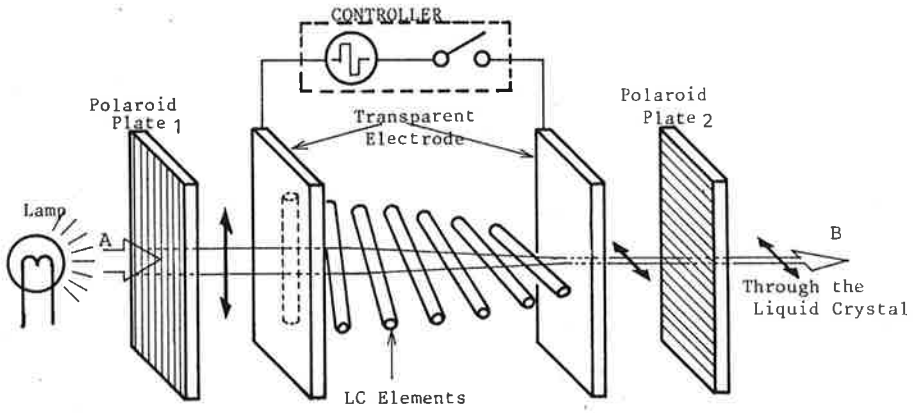


Fig. 2-2 OFF Liquid Crystal elements have been arranged with a distortion angle of 90°

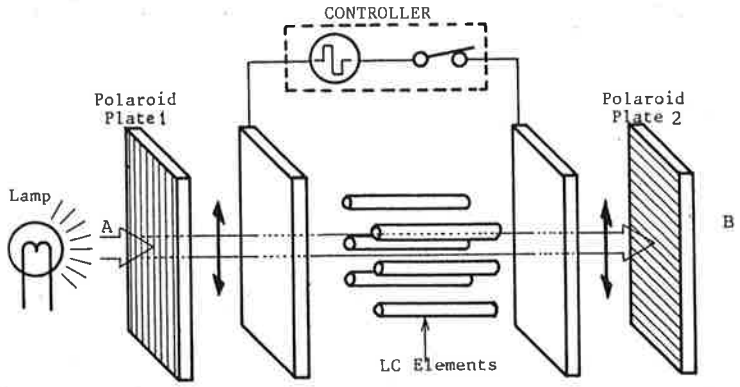


Fig. 2-3 ON Liquid Crystal elements have been arranged in compliance with the direction of an electric field.

Operational Principle of TN-type LCD

The above description is an explanation for the operational principle of TN-type LCD, which has been used as a transmission type. In the practical LCD unit provided by us, a transmission type LCD has been combined with a reflection type, which displays,

utilizing the reflection of a sun-light going out of polaroid plate 2 by inserting a translucent reflection plate between the liquid and the polaroid plate 1. As a result of it, easy-to-recognize display by day time and by night has been realized.

3. Driving System

Although there are various kinds of LCD driving system available, an explanation relational to dynamic type driving system will be provided in this paper.

Fig. 2-4 shows a typical example of interconnecting wiring in case of dynamic driving system (2 separation type).

The liquid crystal elements have been arranged between electrodes drawn up with a real line (LCD 1 - 8) and ones drawn up with a dotted line (COM 1,2), and each individual segment is turned ON (opaque)/OFF (transparent) by applying a specific voltage shown in Fig. 2-4. The ON/OFF statuses of LCD can be decided by the potential difference between common signal and segment signal. That is, in case the potential difference between common signal and segment signal corresponds to the part of V_{DD} (5V), it is turned ON, however in any case other than the above, it is not turned ON.

In the dynamic driving system, which is observed at an usual fluorescent indicating tube or LED display unit, the illumined digit has moved up from the bottom digit to the top digit one after another, however, in the LCD's dynamic driving system, all of digits are simultaneously turned on from the top column to the bottom column since 7 segment display components have been divided into top and bottom two parts (COM 1, 2).

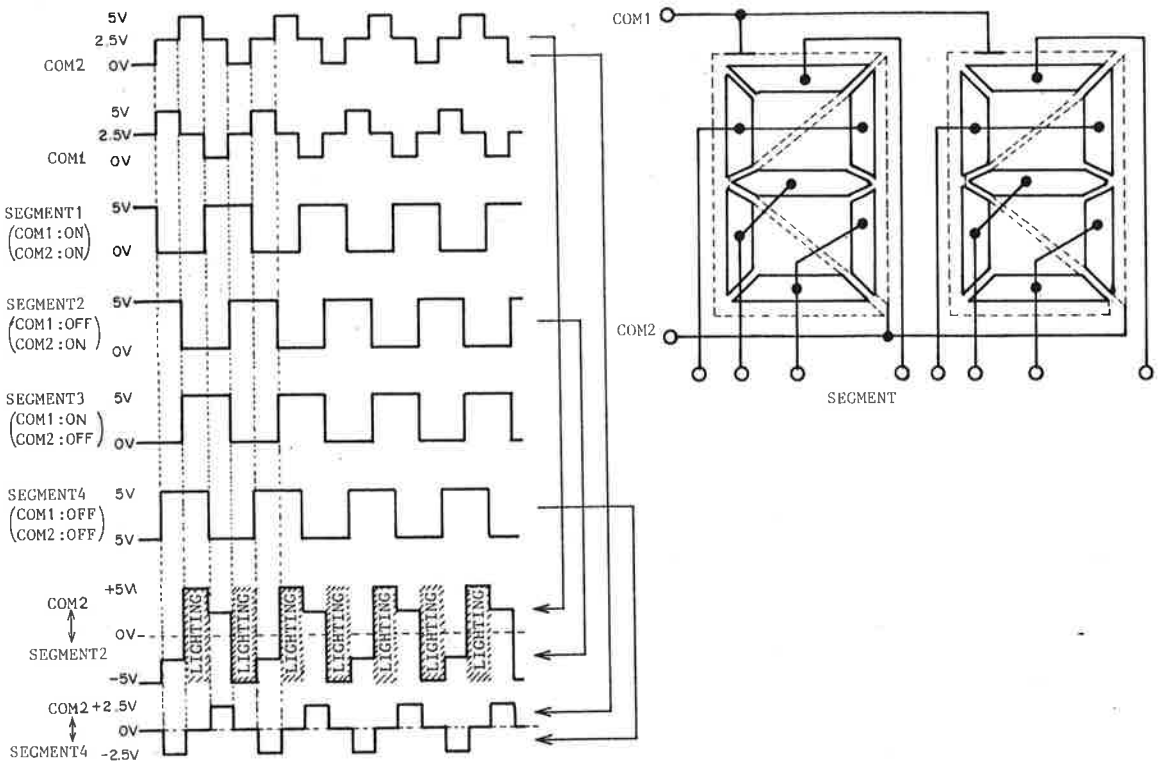


Fig. 2-4 Dynamic Driving Waveform (1/2 duty, 1/2 bias)

The waveform of each individual segment signal, which has been observed by means of oscilloscope, is always a rectangular wave with 50% duty. (However, the timing to a common signal is different in response to segment ON/OFF.)

4. Cautions to Maintenance

(1) Regarding LCD assembly

Both control IC circuit board and individual electrodes of LCD display have been connected with conductive rubber connector.

However, LCD must not be separated from circuit board even if any kind of reason arises for the purpose of protecting both LCD and electrodes of circuit board from contamination (finger print), corrosion, damage, abnormal particle intrusion, and dimensional discrepancy between electrodes. If the replacement of either one of them is required, the whole assembly (RN-EPP-1308-AE-3060) is to be replaced with the corresponding new one.

(2) Regarding handling procedures

(a) As the liquid crystal can be degraded by the influence of ultra-violet beam, it must not be left for a long time under the influence of sun-light as well as fluorescent lamp.

(b) As the liquid crystal display (LCD) is made of glass, it must not be fallen or hit with a solid substance.

(c) As the polaroid plate is soft enough to be easily injured, an adequate causion must be paid on its handling.

(d) The LCD has been sealed after an appropriate directional arrangement processing, and therefore, it must not be pressurized with fingers, etc. When pressurized abnormally, the directional arrangement is disturbed, and according to circumstances, it is subject not to be restored.

(e) Any d.c. voltage must not beapplied to the LCD since the LCD element is degraded through electrochemistry reaction.

(f) The LCD must not be quickly cooled with coolant (Icer etc.) since it is ubject to be solidified to lead cell damage and defective directional arrangement.

(g) The cleaning of liquid crystal display (LCD) elements must be executed by using a dry and soft cloth. Any kind of organic solvent must not be applied to the cleaning of LCD.

[3] FLIP FLOP (TC4013BP)

The TC4013BP has been incorporated with two(2) unit circuits of B-type flip-flop.

An input signal applied to data input is transferred to both Q and $\overline{Q}$ at the rising edge of a clock-pulse.

Turning a clear (reset0 input to "H" level, a Q-output is turned to "L" level, irrelevant to other inputs, while, turning both clear input and preset (set) input to "L" and "H" level, respectively, the Q-output is turned to "H" level, irrelevant to Clock Data.

In case both Clear and Reset are "H" level, the first priority is provided for Clear, and the equation, Q="L" and $\overline{Q}$="H" can be conducted.

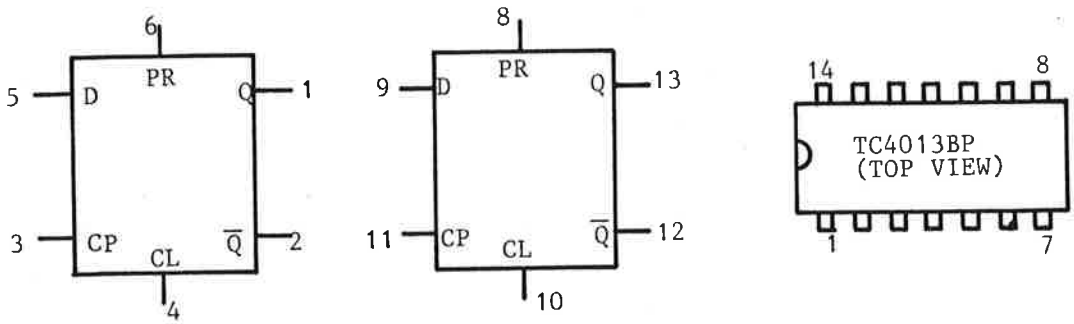


Fig. 3-1 BLOCK DIAGRAM

While $\overline{Q}$ output is being fed back to D input, Q output is repeatedly inverted whenever "H" level is applied to CP. Accordingly, the above described circuit has been employed for Search Sensibility change-over (D/L).

INPUTS				OUTPUTS	
CL	PR	D	CP △	Q	$\overline{Q}$
L	H	*	*	H	L
H	L	*	*	L	H
H	H	*	*	L	H
L	L	L	↑	L	H
L	L	H	↑	H	L
L	L	*	↓	Q·	$\overline{Q}$·

TRUTH TABLE

* : Dont't care

△ : Level change

· : No change

[4] AM Tuner Section

1. AM Tuner IC (MB 3205M)

(1) Summary

The MB3205M is a one(1) chip IC, which has employed a varicap (variable capacitor), for use with an electronic tuning AM tuner, and the internal hardware configuration has been composed of the following various kind of circuits; 2 stages of RF amplifier, local oscillator with low level operation, mixer, 2 stages of IF amplifier, detective circuit, AGC circuit for IF and RF, MUTE circuit required for a search control, IF detecting circuit, PLL, OSC buffer amplifier for coupling with IC, and S meter circuit for display of IF frequency band width change-over and input signal level.

In relation to the operational performance, it can be characterized with large input characteristic, improvement of distortion factor, and maximum restriction of output level fluctuation against input fluctuation, and consequently, it can be adequately employed as an AM stereo tuner. In addition, it can be fully operated with a low voltage power supply.

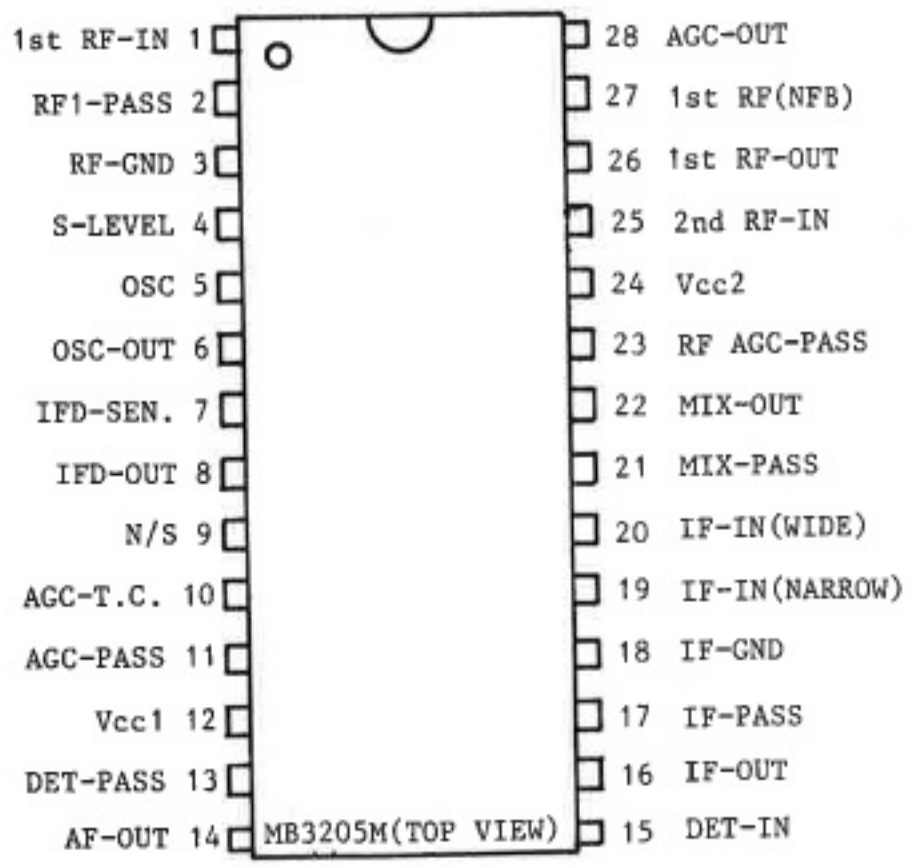


Fig. 4-1 Terminal symbol

(2) Terminal Explanation

Terminal No.	Symbol	Explanation
1	1st RF-IN	RF Input terminal
2	RF1-PASS	Pass-condenser connecting terminal of RF circuit
3	RF-GND	Grounding terminal of RF circuit
4	S-LEVEL	Signal strength indicating output terminal. To output a DC voltage proportional to an input level of RF. Not used.
5	OSC	Local oscillator terminal
6	OSC-OUT	Local oscillator frequency output terminal for use with PLL input. The output stage has been composed of an Open-Emitter circuit, and the output voltage of 2V p-p can be obtained.
7	IFD-SENS	Voltage input terminal for setting IF detecting sensibility
8	IFD-OUT	IF detection output terminal, "L" level at detection, open-collector output
9	N/S	Receive/Search change-over input terminal, "H" level: during receiving, "L" level: during search
10	AGC-T.C.	Terminal for use with changing-over the time-constant of AGC, "L" level during receiving, "H" level during search. Not used.
11	AGC-PASS	Pass-condenser connecting terminal of AGC circuit
12	V_{CC} 1	Power supply terminal (7 - 13V)
13	DET-PASS	Pass-condenser connecting terminal for detective circuit
14	AF-OUT	Detective output terminal (90 - 200 mV, RMS)
15	DET-IN	IF input terminal
16	IF-OUT	IF output terminal
17	IF-PASS	Pass-condenser connecting terminal for 2nd IF amplifying circuit
18	IF-GND	Grounding terminal of IF stage
19	IF-IN (NARROW)	Input terminal of IF passing over a narrow frequency band ceramic filter (4 KHZ), which is used for IF detection during channel search

Terminal No.	Symbol	Explanation
20	IF-IN (WIDE)	Input terminal of IF passing over a broad band ceramic filter (8 KHZ)
21	MIX-PASS	Pass-condenser connecting terminal of mixer circuit
22	MIX-OUT	RF.OSC Mixing (IF) output terminal
23	RF-AGC-PASS	Pass-condenser connecting terminal of RF-DET, which is commonly used as a pass-condenser for pop-sound countermeasures at power switch on
24	V_{CC} 2	Power supply terminal
25	2nd RF-IN	RF input terminal
26	1st RF-OUT	RF output terminal
27	1st RF-NFB	RF feedback terminal, applying AGC to the tuning frequency band
28	AGC OUT	When an antenna input becomes a powerful input with more than approx. 80 dBu, the voltage of this terminal is increased from OV in proportion to an input and applies AGC to the input terminal. Not used.

(3) AM Tuner Circuit

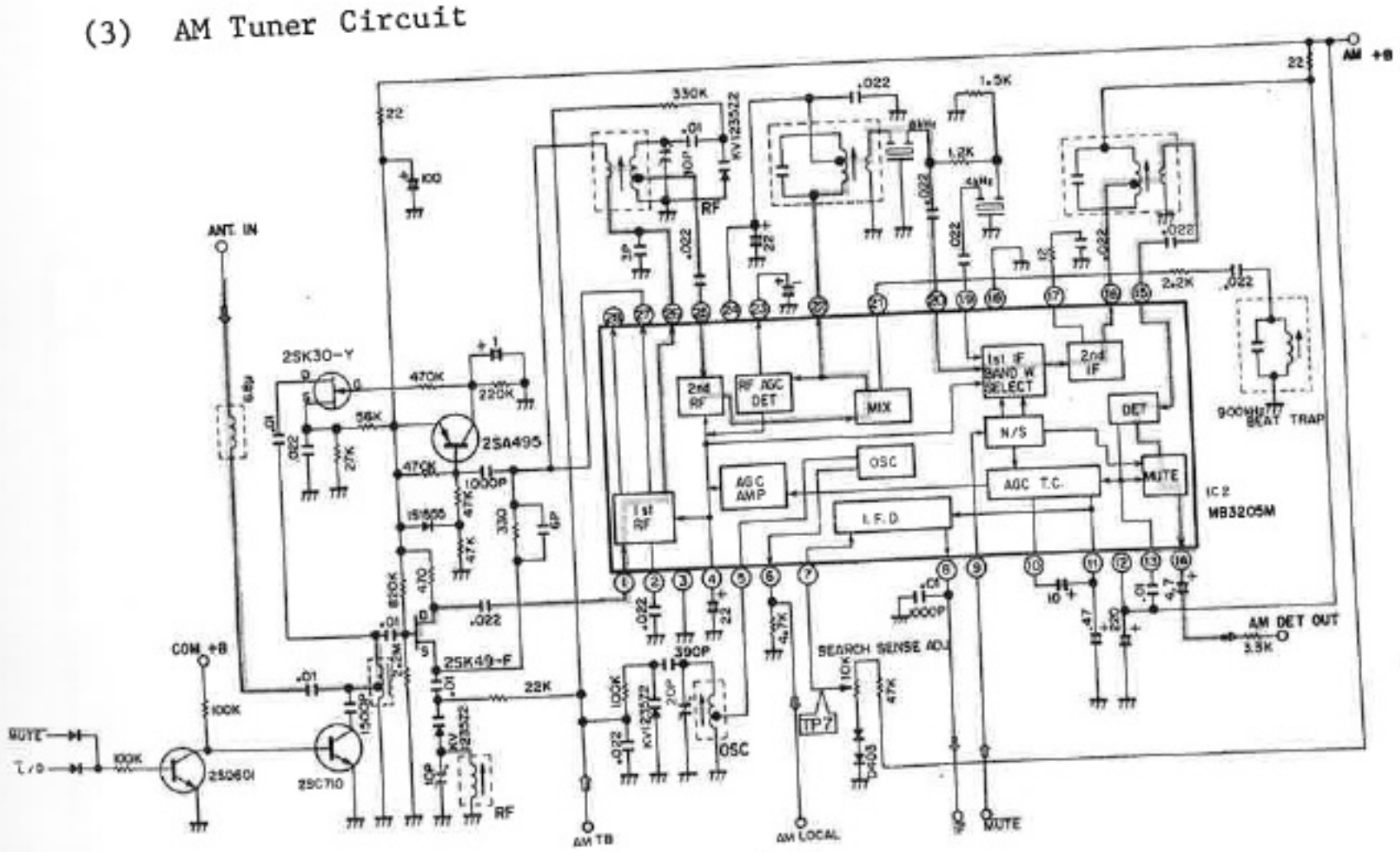


Fig. 4-2

(4) AGC Circuit

The operation of AGC is realized through by-passing an RF signal via capacitor C500 and an internal resistor of FET and reducing the level of a signal applied to RF amplifier. The "ON" resistance is reversely decreased in proportion as the gate voltage of Q17 is increased., and as a result of it, the effect of AGC is improved.

The base of a transistor Q18, which is providing the gate voltage, has been provided with such bias voltage that is nearly equivalent or less than a voltage which can certainly turn on Q18, by dividing 0.6V positive bias voltage of D33 with R55 and R59. At this point, when RF voltage is applied to IC12 pin No. 27, a half-wave rectified RF voltage is provided for the collector of Q18, and thereafter, smoothed by means of C56 and R61, it controls the gate of Q17 as AGC voltage.

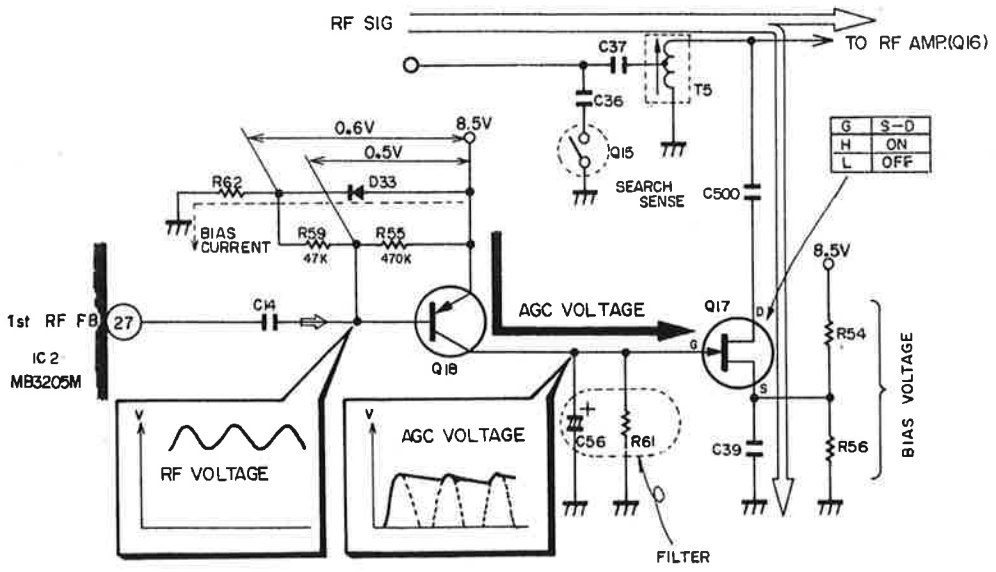


Fig. 4-3 AGC circuit

〔5〕 FM Tuner Section

1. IF AMP. - DET (LA1140)

The IF signal is applied to pin No. 1 of LA1140 (IC2) after passing over a ceramic filter (CF1), IF amplifier (Q4) and a ceramic filter (CF2). The inside of IC has been composed of 6 stages of differential amplifier, limiter, quadrature detective circuit, and AF pre-amplifier, and a detection signal will be issued from pin No. 8.

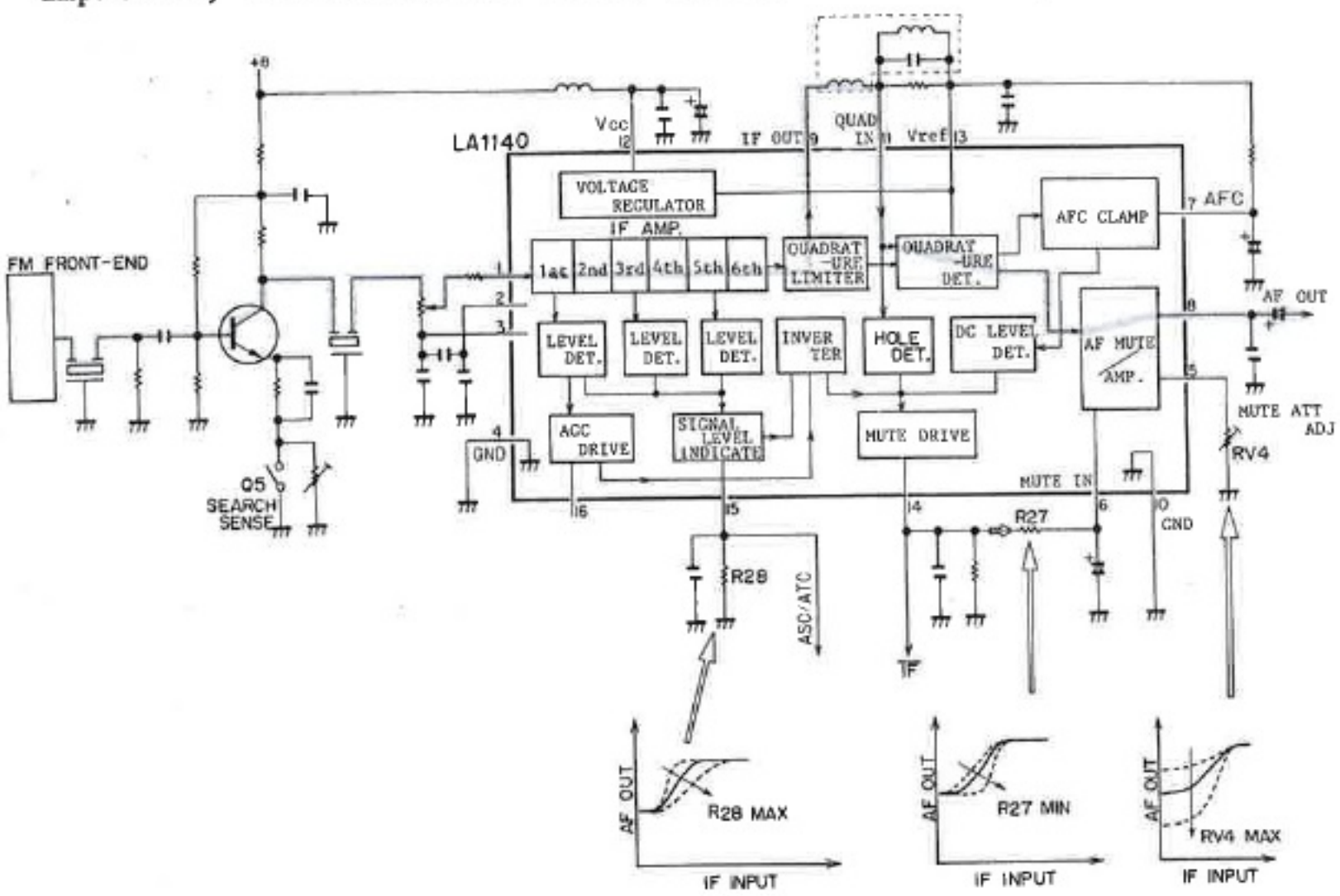


Fig. 5-1 IF AMP. - DET Circuit

(1) Major terminal functions of LA1140

Pin No.	Designation	Functions
6	Muting control input	Muting for a detective output is implemented by means of control current applied to the terminal. Muting is carried out by means of internal AF amplifier of which gain is continually changed by control current. The lower limit (maximum attenuating colume) of gain is decided by a resistor (RV4) connected to pin No. 5. The terminal which is to be connected to pin No. 14 by using R27, is controlled in response to the level of IF signal.

Pin No.	Designation	Functions
14	Muting drive output	Muting drive outputs have been composed of the following 3 kinds; (a) Hall detection output, which will be issued when C/N (Carrier/Noise) value of a carrier wave is dropped in case of weak signal. (b) Inverted output of signal strength indication output (pin No. 15) (c) Frequency muting drive output, which will be issued when AFC output exceeds a constant voltage under the condition of frequency detuning. These are combined with internal OR circuit.
15	Signal strength indication output	A d.c. voltage, which is corresponding to the input level of IF signal, is output. The output will be used for improving S/N ratio in case of weak signal, combined with multiplex IC.
16	AGC voltage output	A delayed AGC voltage for front-end will be issued.

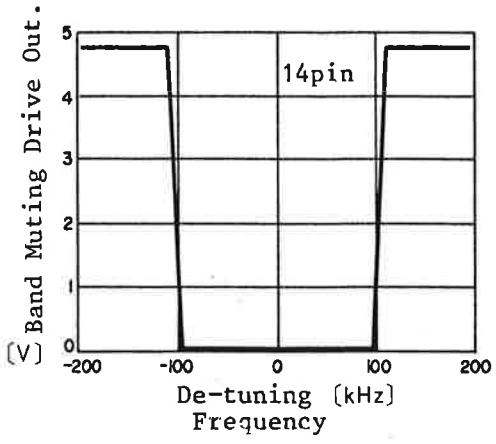


Fig. 5-2 Band Muting Drive Output

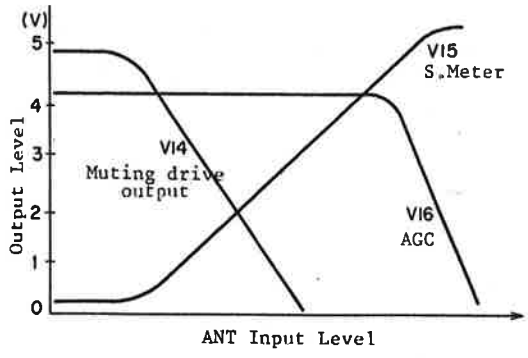
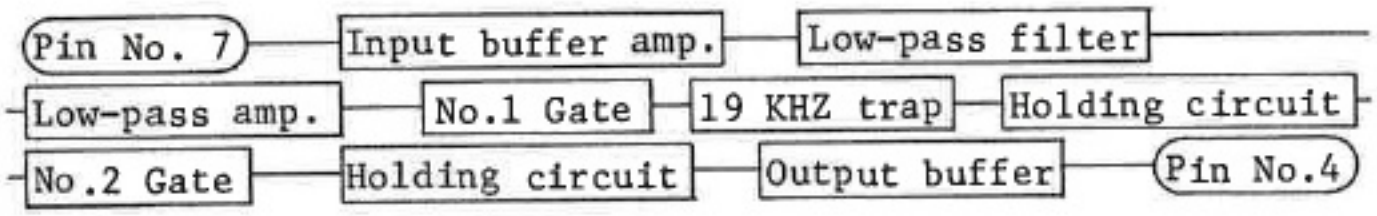


Fig. 5-3 Output Characteristics of Individual Control Terminals

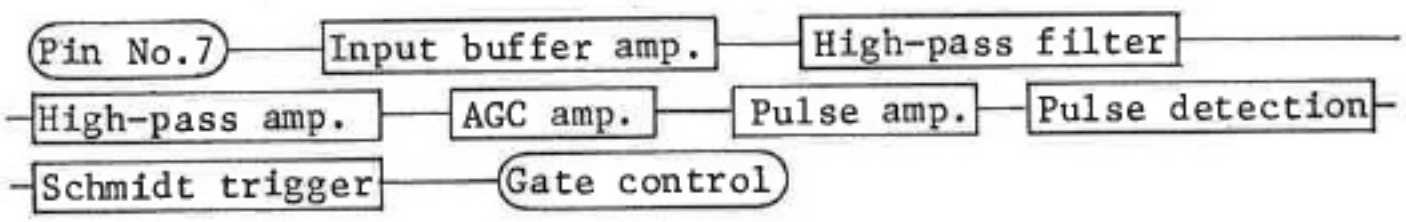
2. Noise Blanka (NC8300)

The noise blanka serves to improving the S/N ratio without increasing distortion, cutting off only a pulsive noise like engine noise etc. superposed to FM detection output signal. (Gain equals 0 dB)

(1) Signal system flow



(2) Control system



An input signal is divided into a signal system and a control system by means of low-pass filter and high-pass filter. In case of control system, superposed noise is checked whether it is pulsive signal or contimuous one, and a noise is cut off by opening the first and the second gate in synchronization with a signal system. If such procedures are continually applied, a signal flow is interrupted on every cutting, and as a result of it, the distortion of a signal is increased.

And therefore, a holding circuit (capacitor) has been employed so as to hold the signal status prior to cutting and to restrain signal distortion. In addition, as 19 KHZ pilot signal for stereo broadcasting regeneration has not been included in the output signal, no stereo demodulation is available. Therefore, an output signal is separately amplified and thereafter, it is issued from pin No. 6.

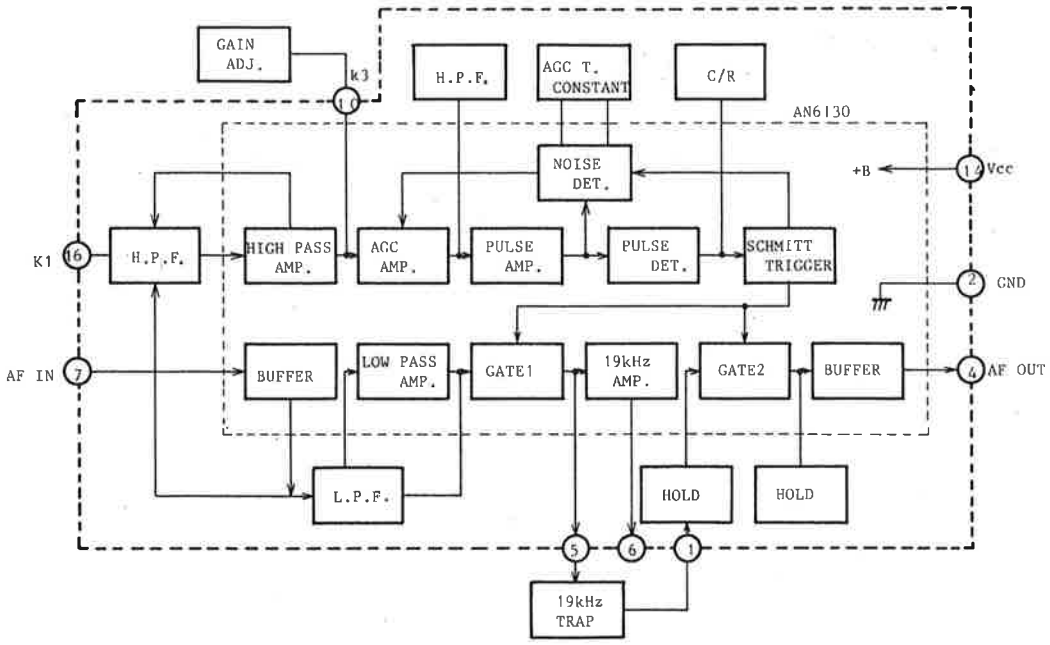


Fig. 5-4 Block Diagram

3. FM Stereo Demodulation (MH-1469)

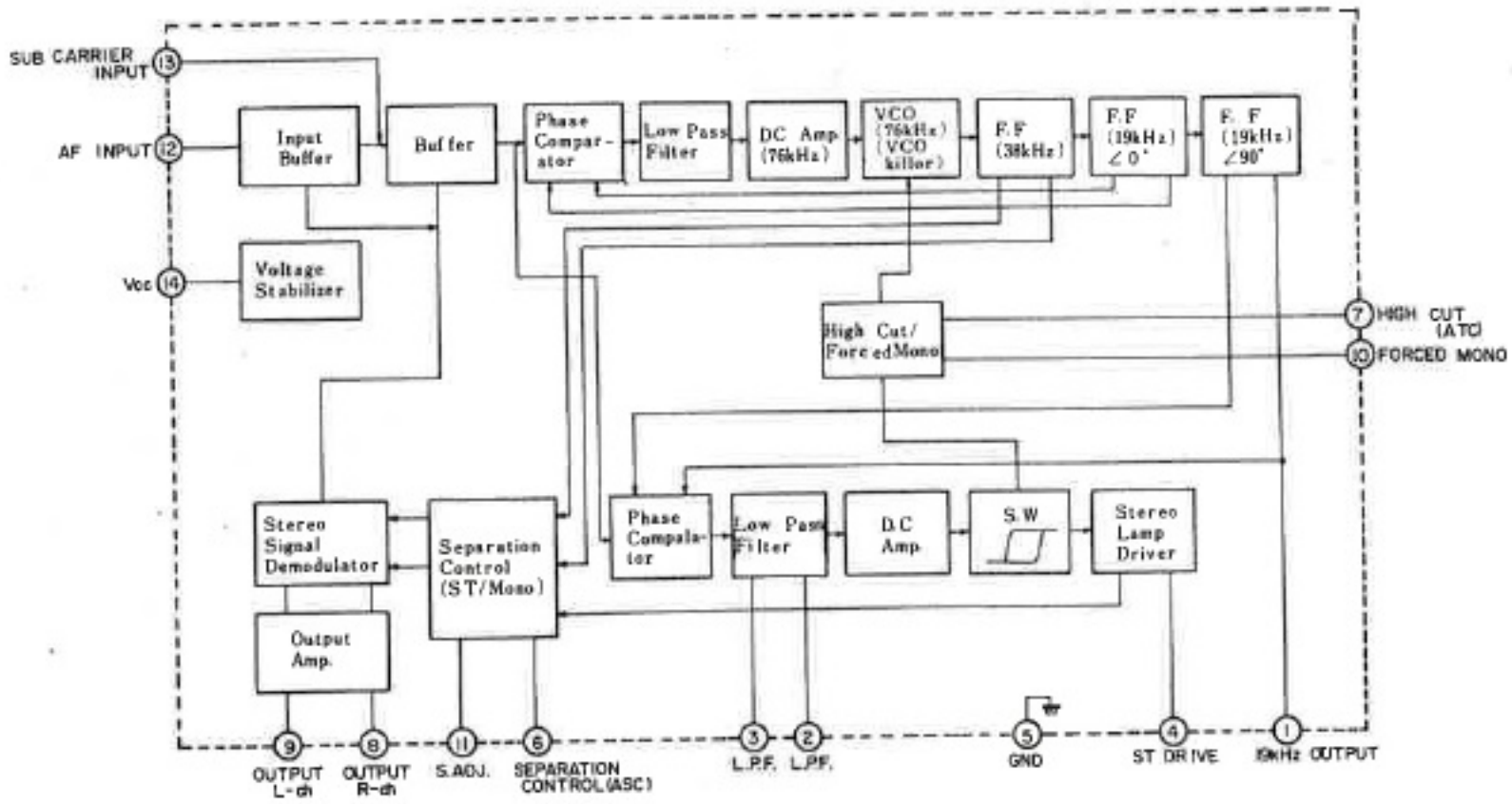


Fig. 5-5 MPX Block-diagram

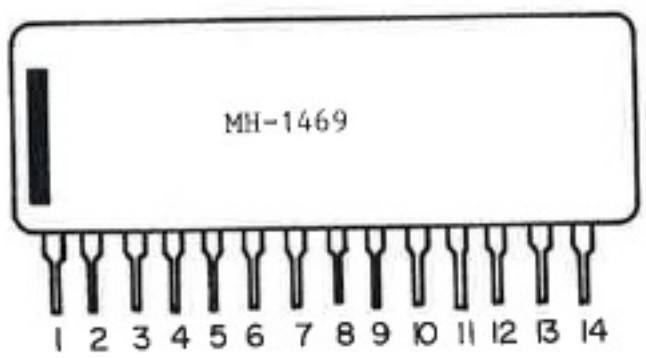


Fig. 5-6

(1) Major terminal functions

Pin No.	Designation	Functions
6	Separation control	When an applied voltage to the terminal is lowered, the separation degree of demodulated output is also decreased, and as a result of it, both left and right side of noises can be cancelled. ASC function
7	Tone control	When an applied voltage to the terminal is lowered, the high-pass components (noise) of demodulated output are attenuated. ATC function
4	ST	Moving to "L" level at stereo demodulation

〔6〕 Audio Section

1. Buffer Amp. (HY1401)

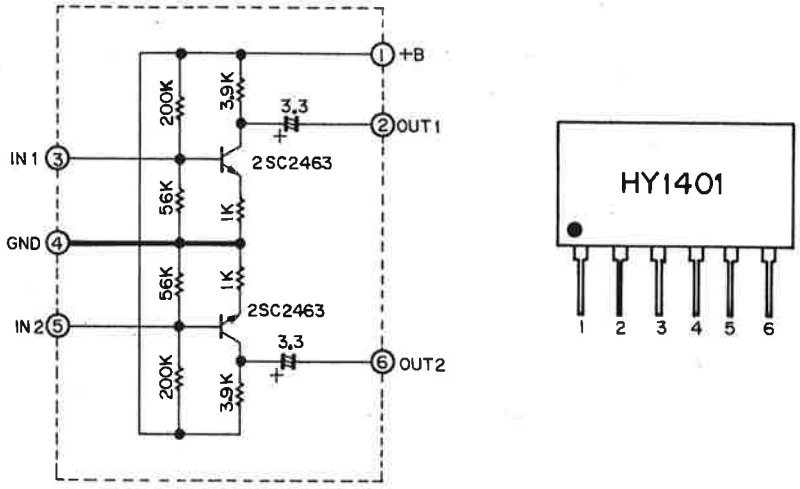


Fig. 6-1 Block Diagram

2. Bass/Tre. control (MH-1461)

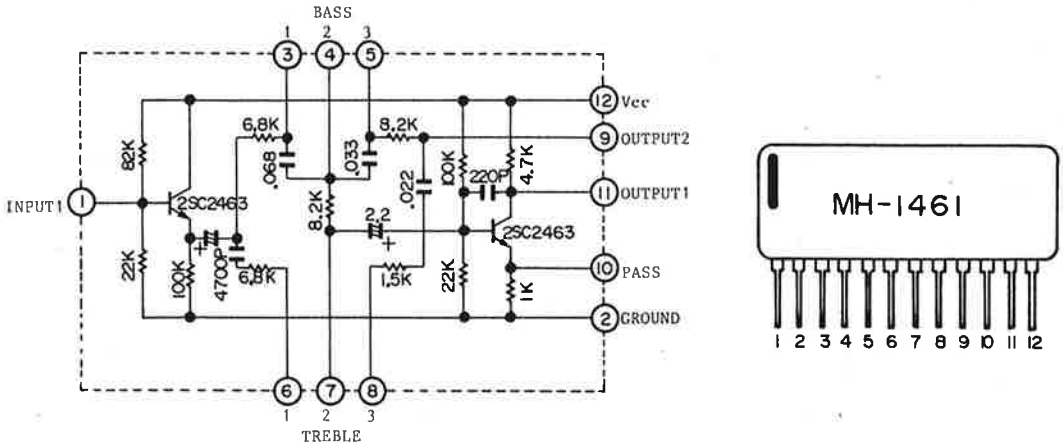


Fig. 6-2 Block Diagram

3. POWER Amp. (TA7240AP)

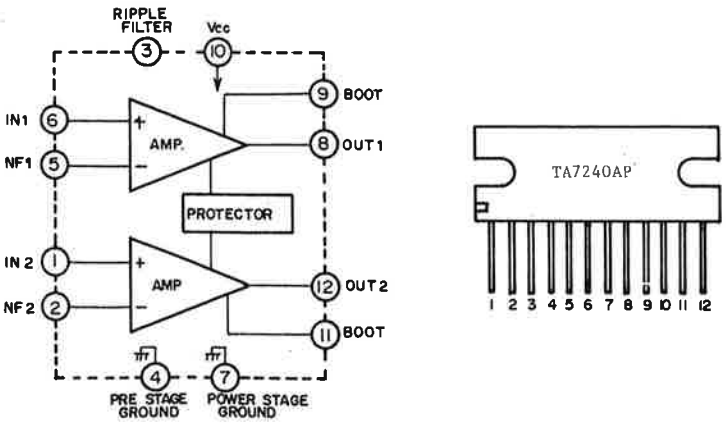


Fig. 6-3 Block Diagram

4. Power Amp. (LA4460, LA4461)

LA4460 and LA4461 are basically identical to each other, excepting those terminal connections are mutually symmetric.

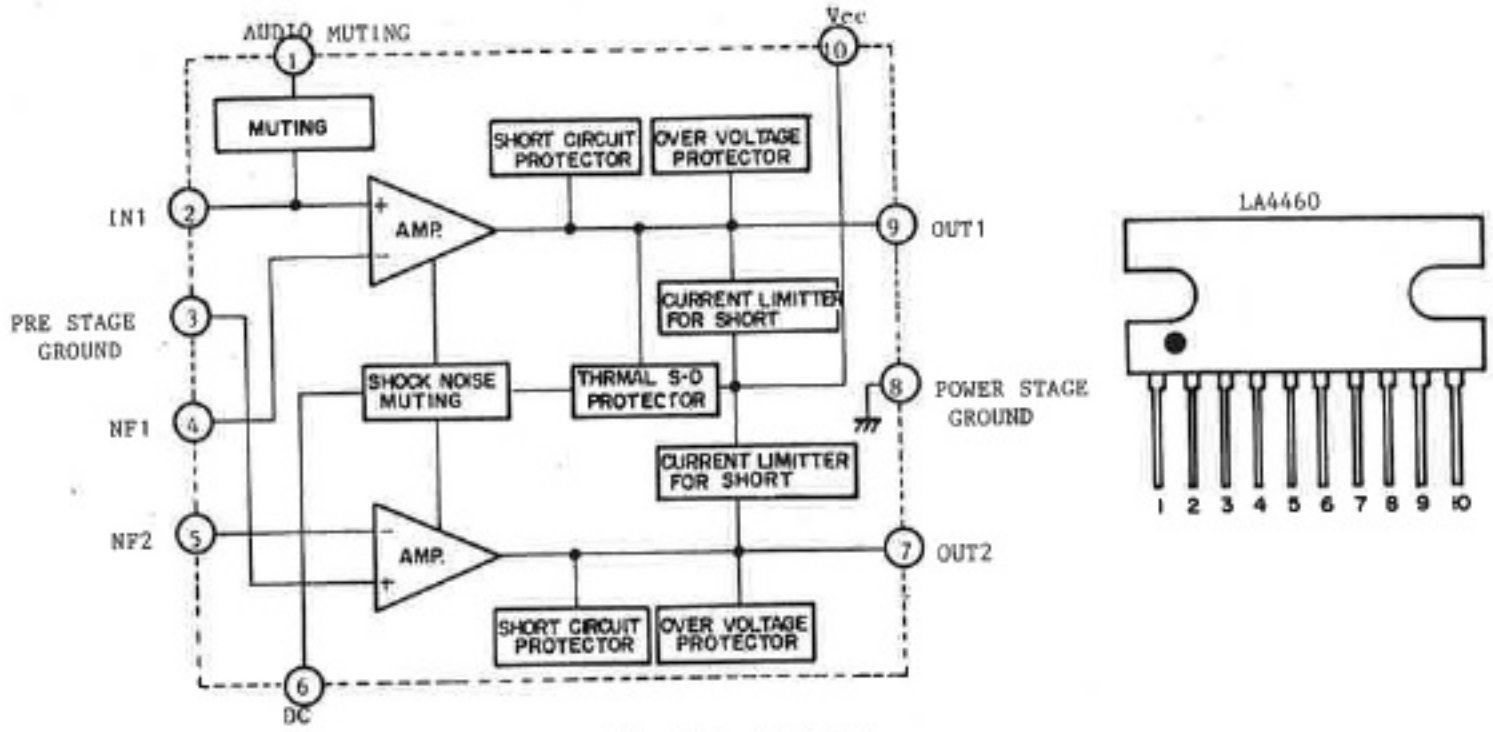


Fig. 6-4 LA4460

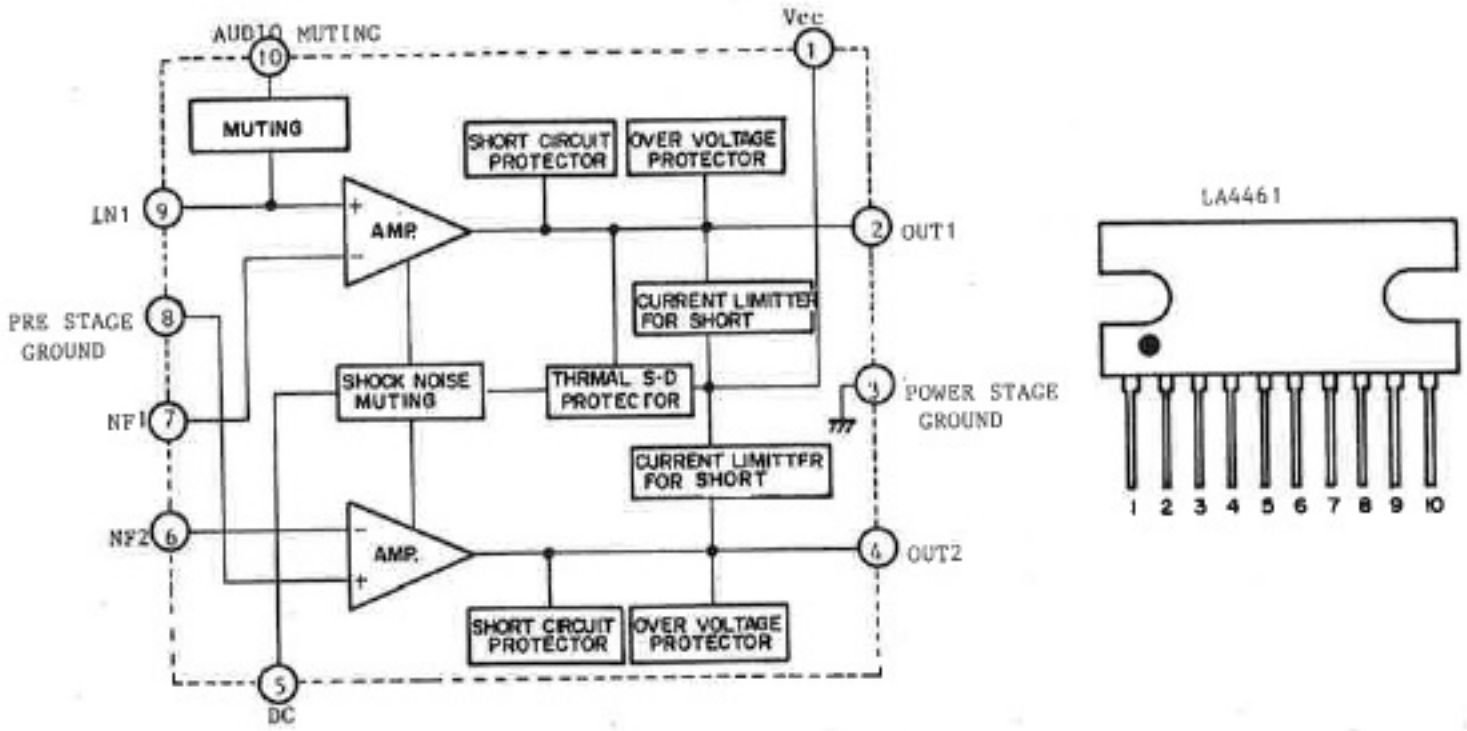
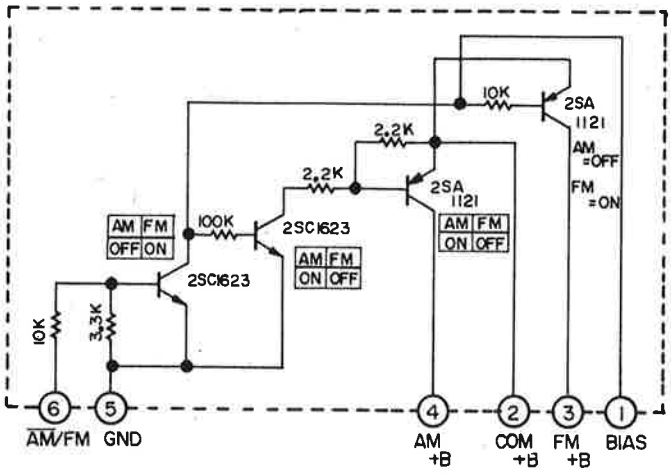


Fig. 6-5 LA4461

5. AM/FM Power Supply Change-over (SW82)



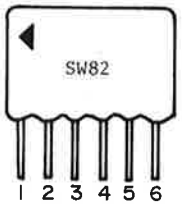


Fig. 6-6 Block Diagram

The power supply change-over can be performed by control voltage applied to pin No. 6.

"H" level: FM

"L" level: AM

6. OP. Amp. (LA6358)

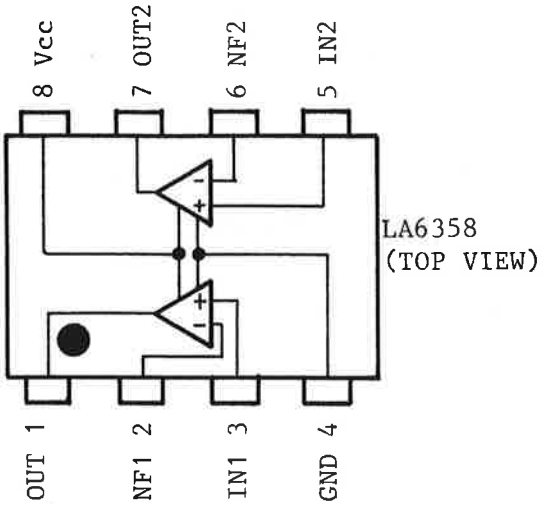


Fig. 6-7

REPLACEMENT PARTS LIST

Note: Main replacement parts are marked ○ in the remarks column.

〔AE-3060〕

Symbol No. (Fig. 3)	Stock No.	Description			Remark
CAPACITORS					
C 1, 30, 31,108 145,155,156,151	RN-ECK-CF1H473Z/TP-1	.047 μF	50V	ceramic (chip)	
C 2, 24, 66,123 124	RN-ECK-CB1H102K/TP-1	1000 pF	50V	ceramic (chip)	
C 3, 4, 7,70,96 103,110,111,127 128,153	RN-ECK-CF1H103Z/TP-1	.01 μF	50V	ceramic (chip)	
C 5, 8, 37, 38 46, 57, 65,500	RN-ECK-CD1H103M/CA-4	.01 μF	50V	ceramic (chip)	
C 6, 9, 10, 11 13, 15, 52, 68	RN-ECK-CD1E473M/CA-4	.047 μF	25V	ceramic (chip)	
C12, 75, 76,106 86~88, 107	RN-ECE-M470V10-31	47 μF	10V	electrolytic	
C14, 17, 62	RN-ECK-CD1H102M/CA-4	1000 pF	50V	ceramic (chip)	
C16, 53	RN-ECE-M4R7V25-52	4.7 μF	25V	electrolytic	
C18, 64	RN-ECE-MR47V50-52	.47 μF	50V	electrolytic	
C19	RN-ECC-CSL1H330J/CA-4	33 pF	50V	ceramic (chip)	
C20	RN-ECC-CSL1H101J/CA-4	100 pF	50V	ceramic (chip)	
C21, 45, 56	RN-ECE-M1R0V50-52	1 μF	50V	electrolytic	
C22, 29, 67,113 115, 90, 91	RN-ECE-M101V10-6	100 μF	10V	electrolytic	
C23, 27,104,105	RN-ECE-M100V16-32	10 μF	16V	electrolytic	
C25, 77, 78, 81 147	RN-ECE-M4R7V25-6	4.7 μF	25V	electrolytic	
C26, 28	RN-ECK-CF1H333Z/TP-1	.033 μF	50V	ceramic (chip)	
C32~35, 73, 74 79,80,83,84,125	RN-ECE-M1R0V50-32	1 μF	50V	electrolytic	
C36	RN-ECK-CD1H152M-4/CA	1500 pF	50V	ceramic (chip)	
C39, 42, 43 47~51, 54, 58 59	RN-ECK-CD1H223M/CA-4	.022 μF	50V	ceramic (chip)	
C40	RN-ECE-M221V10-11	220 μF	50V	electrolytic	
C41	RN-ECC-CSL1H030C/CA-4	3 pF	50V	ceramic (chip)	
C44, 60	RN-ECE-M220V16-52	22 μF	16V	electrolytic	
C55	RN-ECC-CSL1H060D/CA-4	6 pF	50V	ceramic (chip)	
C61	RN-ECC-CTH1H391K/CA-4	390 pF	50V	ceramic (chip)	
C63	RN-ECE-M100V16-42	10 μF	16V	electrolytic	
C126, 129, 130 131, 146, 152	RN-ECE-M221V10-11	220 μF	10V	electrolytic	
C69	RN-ECK-CF1E104Z/TP-1	.1 μF	25V	ceramic (chip)	
C71, 72	RN-ECC-DCH220JY	22 pF	50V	ceramic	
C82, 85	RN-ECC-CSL1H561J/TP-1	560 pF	50V	ceramic (chip)	
C89	RN-ECE-M222V16-7	2200 μF	16V	electrolytic	
C92, 93	RN-ECF-R154K50-12	.15 μF	50V	mylar	
C94, 95	RN-ECE-M102V10-7	1000 μF	10V	electrolytic	
C97,98,102,101	RN-ECY-M4R7V16-M1	4.7 μF	16V	tantalum	
C99, 100	RN-ECY-MR10V16-M1	.1 μF	16V	tantalum	
C109	RN-ECE-M101V16-6	100 μF	16V	electrolytic	
C112,132,133,150	RN-ECE-M102V16-51	1000 μF	16V	electrolytic	
C114	RN-ECE-M331V10-6	330 μF	10V	electrolytic	
C116, 119	RN-ECK-CB1E332M/TP-1	3300 pF	25V	ceramic (chip)	
C117, 118	RN-ECE-MR22V50-32	.22 μF	50V	electrolytic	
C120, 121	RN-ECE-MR47V50-32	.47 μF	50V	electrolytic	
C122	RN-ECE-M1R0V50-42	1 μF	50V	electrolytic	
C134,135,140,144	RN-ECF-R104V50	.1 μF	50V	mylar	
C148, 149	RN-ECE-M101V16-10	100 μF	16V	electrolytic	
C154	RN-ECC-CSL1H100D-1/TY	10 pF	50V	ceramic (chip)	
C157	RN-ECE-M4R7V25-32	4.7 μF	25V	electrolytic	
C158	RN-ECK-CF1H473Z-2/TY	.047 μF	50V	ceramic (chip)	

Symbol No. (Fig. 3)	Stock No.	Description				Remark
VARIABLE CAPACITORS						
C V 1, 3	RN-E C V-A11-69	11 pF			ceramic	
C V 2	RN-E C V-A20-70	20 pF			ceramic	
RESISTORS						
R 1	RN-E R G-I C332 J-1/TY	3.3k ohm	5%	1/8W	carbon (chip)	
R 2, 98	RN-E R G-I C101 J/TP-1	100 ohm	5%	1/8W	carbon (chip)	
R 3	RN-E R G-I C151 J-1/TY	150 ohm	5%	1/8W	carbon (chip)	
R 4, 6, 79, 87 88, 91, 93, 83 84, 117, 118	RN-E R G-I C102 J/TP-1	1k ohm	5%	1/8W	carbon (chip)	
R 5, 12, 60	RN-E R G-I C331 J/CA-1	330 ohm	5%	1/8W	carbon (chip)	
R 7,25,30,34,35 40,41,44,68,69 76,81,101,102 110,111,127,128	RN-E R G-I C103 J/TP-1	10k ohm	5%	1/8W	carbon (chip)	
R 8, 51	RN-E R G-I C332 J/CA-1	3.3k ohm	5%	1/8W	carbon (chip)	
R 9	RN-E R G-I C103 J/CA-1	10k ohm	5%	1/8W	carbon (chip)	
R10, 13	RN-E R G-I C680 J/CA-1	68 ohm	5%	1/8W	carbon (chip)	
R11	RN-E R G-I C102 J/CA-1	1k ohm	5%	1/8W	carbon (chip)	
R14	RN-E R G-I C122 F-1/TY	1.2k ohm	5%	1/8W	carbon (chip)	
R15~20, 72, 82	RN-E R G-I C104 J/TP-1	100k ohm	5%	1/8W	carbon (chip)	
R21	RN-E R G-I C101 J/CA-1	100 ohm	5%	1/8W	carbon (chip)	
R22,26,59,62,66	RN-E R G-I C473 J/CA-1	47k ohm	5%	1/8W	carbon (chip)	
R23	RN-E R G-I C562 J/CA-1	5.6k ohm	5%	1/8W	carbon (chip)	
R24	RN-E R G-I C682 J/CA-1	6.8k ohm	5%	1/8W	carbon (chip)	
R27,28,63	RN-E R G-I C223 J/CA-1	22k ohm	5%	1/8W	carbon (chip)	
R29,42,43	RN-E R G-I C682 J/TP-1	6.8k ohm	5%	1/8W	carbon (chip)	
R31	RN-E R G-I C153 J/TP-1	15k ohm	5%	1/8W	carbon (chip)	
R32	RN-E R G-I C224 J/TP-1	220k ohm	5%	1/8W	carbon (chip)	
R33	RN-E R G-I C563 J/TP-1	56k ohm	5%	1/8W	carbon (chip)	
R36, 37	RN-E R G-I C273 J-1/TY	27k ohm	5%	1/8W	carbon (chip)	
R38,39,107,108	RN-E R G-I C472 J/TP-1	4.7k ohm	5%	1/8W	carbon (chip)	
R45, 75	RN-E R D-C C224 J A	220k ohm	5%	1/8W	carbon	
R46	RN-E R G-I C473 J/TP-1	47k ohm	5%	1/8W	carbon (chip)	
R47	RN-E R G-I C334 J/CA-1	330k ohm	5%	1/8W	carbon (chip)	
R48	RN-E R G-I C122 J/CA-1	1.2k ohm	5%	1/8W	carbon (chip)	
R49	RN-E R G-I C222 J/CA-1	2.2k ohm	5%	1/8W	carbon (chip)	
R50	RN-E R G-I C120 J/CA-1	12 ohm	5%	1/8W	carbon (chip)	
R52	RN-E R G-I C824 J/CA-1	820k ohm	5%	1/8W	carbon (chip)	
R53	RN-E R G-I C471 J/CA-1	470 ohm	5%	1/8W	carbon (chip)	
R54	RN-E R G-I C563 J/CA-1	56k ohm	5%	1/8W	carbon (chip)	
R55, 58	RN-E R G-I C474 J/CA-1	470k ohm	5%	1/8W	carbon (chip)	
R56	RN-E R G-I C273 J/CA-1	27k ohm	5%	1/8W	carbon (chip)	
R57	RN-E R G-I C225 J/CA-1	2.2M ohm	5%	1/4W	carbon (chip)	
R61	RN-E R G-I C224 J/CA-1	220k ohm	5%	1/4W	carbon (chip)	
R64	RN-E R G-I C104 J/CA-1	100k ohm	5%	1/4W	carbon (chip)	
R65	RN-E R G-I C472 J/CA-1	4.7k ohm	5%	1/4W	carbon (chip)	
R67, 137	RN-E R G-I C220 J/CA-1	22 ohm	5%	1/4W	carbon (chip)	
R70	RN-E R G-I C474 J/TP-1	470k ohm	5%	1/4W	carbon (chip)	
R 71,77,78,97 103,104,109,112	RN-E R G-I C222 J/TP-1	2.2k ohm	5%	1/4W	carbon (chip)	
R73, 74	RN-E R D-C C104 J A	100k ohm	5%	1/4W	carbon	
R80,129~131	RN-E R G-I C223 J/TP-1	22k ohm	5%	1/8W	carbon (chip)	
R85, 86	RN-E R G-I C181 J/TP-1	180 ohm	5%	1/8W	carbon (chip)	
R89, 90	RN-E R G-I C821 J/TP-1	820 ohm	5%	1/4W	carbon (chip)	
R92	RN-E R G-I C182 J/TP-1	1.8k ohm	5%	1/8W	carbon (chip)	
R94	RN-E R G-I C392 J/TP-1	3.9k ohm	5%	1/8W	carbon (chip)	
R95,96,113~116	RN-E R G-I C822 J/TP-1	8.2k ohm	5%	1/8W	carbon (chip)	
R99,126,133,136	RN-E R G-I C681 J/TP-1	680 ohm	5%	1/8W	carbon (chip)	
R100	RN-E R G-I C470 J/TP-1	47 ohm	5%	1/8W	carbon (chip)	
R105,106,121,135	RN-E R G-I C152 J/TP-1	1.5k ohm	5%	1/8W	carbon (chip)	
R119, 120	RN-E R G-I C560 J/TP-1	56 ohm	5%	1/8W	carbon (chip)	
R122, 123, 124 125, 138	RN-E R G-I C3R3 J/TP-1	3.3 ohm	5%	1/8W	carbon (chip)	
R132	RN-E R D-AC561 J A	560 ohm	5%	1/8W	carbon	
R134	RN-E R G-I C152 J/CA-1	1.5k ohm	5%	1/8W	carbon (chip)	
R139	RN-E R G-I C101 J-1/TY	100 ohm	5%	1/8W	carbon (chip)	

Symbol No. (Fig. 3)	Stock No.	Description			Remark
VARIABLE RESISTORS					
RV 1, 2, 5, 6	RN-ERV-0N1-230/CA	47k ohm		carbon	
RV 3	RN-ERV-0N1-266	330 ohm		carbon	
RV 4	RN-ERV-0N1-271	47k ohm		carbon	
RV 7	RN-ERV-0N1-228	10k ohm		carbon	
RV 8~10, 12	RN-ERV-1N2-177	50k ohm	BASS, TRE, BAL, FADER	carbon	O
RV11 (SW5)	RN-ERV-1P2-145	20k ohm	VOL	carbon	O
SEMICONDUCTORS					
IC 1	RN-EIC-LA6358	AGC Amp., linear-monolithic IC			O
	or RN-EIC-LM358N				O
IC 2	RN-EIC-LA1140	FM IF amp.~Q. DET, linear-monolithic IC			O
IC 3	RN-EIE-NC8300	FM Noise blanker, hibrid IC			O
IC 4	RN-EIE-MH-1469	Stereo MPX decoder, hibrid IC			O
IC 5, 8	RN-EIE-HY1401	Buffer amp., hibrid IC			O
	or RN-EIE-MH-1423	Buffer amp., hibrid IC			O
IC 6, 7	RN-EIE-MH-1461	Tone control, hibrid IC			O
IC 9	RN-EIC-LA4460	Power amp., linear-monolithic IC			O
IC11	RN-EIC-TA7240AP	Power amp., linear-monolithic IC			O
IC12	RN-EIC-MB3205P-SH	AM Tuner, linear-monolithic IC			O
IC13	RN-EIM-UPD1708G-514	Controller, digital monolithic IC			O
IC14	RN-EID-TC4013BP	D-FF, digital monolithic IC			O
IC15	RN-EIC-UPC78L05	Voltage regulator, linear-monolithic IC			O
IC16	RN-EIC-UPC78L05A	Voltage regulator, linear-monolithic IC			O
IC17	RN-EIE-SW82	Selector, hibrid IC			O
IC18	RN-EIC-LA4461	Power amp., linear-monolithic IC			O
Q 1, 29	RN-EVS-2SC3053-C/TZ	Silicon transistor			O
Q 2, 3, 5, 6, 7 8,12,19,22,23	RN-EVS-2SD601-QRS/TZ or RN-EVS-2SC3052-EF/TZ	Silicon transistor			O
Q 4	RN-EVS-2SC710-E	Silicon transistor			O
Q 9, 11, 16	RN-EVS-2SB641-QR	Silicon transistor			O
Q13, 14	RN-EVS-2SD655S	Silicon transistor			O
Q15	RN-EVS-2SC710-C	Silicon transistor			O
Q16	RN-EVF-2SK49-F	FET			O
Q17	RN-EVF-2SK30ATM-Y	FET			O
Q18	RN-EVS-2SA564-PQ	Silicon transistor			O
Q20, 21	RN-EVF-2SK49-H RN-EVF-2SK193-H1 RN-EVF-2SK195-F	FET			O
Q24, 27, 28	RN-EVS-2SC1847-PQR	Silicon transistor			O
Q25, 26	RN-EVS-2SC1317-QR	Silicon transistor			O
Q30	RN-EVS-2SC1384-QR	Silicon transistor			O
D 1, 18	RN-EDS-MA151WK/TY	Silicon diode			O
D 2	RN-EDS-MA151WA/TY	Silicon diode			O
D 3~13, 15 31~33	RN-EDS-1S1555	Silicon diode			O
D14, 27	RN-EDT-RD9R1EB3	Zener diode, 9.1V			O
D17,19~21	RN-EDS-10E1	Silicon diode			O
D22~26	RN-EDP-LN01301D	LED			O
D28~30	RN-EDC-KV1235Z2	Varactor diode, AM			O
D34	RN-EDT-MZ310	Zener diode			O
TRANSFORMERS					
T 1	RN-ETF-1004A/CA	FM IF, 10.7 MHz			
T 2	RN-ETX-1009/CA	AM RF, 240 μH			
T 3	RN-ETA-1020/CA	AM IF, 450 kHz			
T 4	RN-ETA-1021/CA	AM IF 450 kHz			
T 5	RN-ETX-1007/CA	AM ANT, step up			
T 6	RN-ETH-1012/CA	AM OSC, 120 μH			
T 7	RN-ETX-1008/CA	AM RF, 240 μH			
COILS					
L 1, 2	RN-ELH-C6R8-3/TP	Choke, 6.8 μH			
L 3	RN-ELH-C680-3/TP	Choke, 68 μH			
L 4	RN-ELT-1006/CA	Trap, 1.8 MHz			
L 5	RN-ELL-1008	Choke, 1.6 mH			
L 8	RN-ELL-332	Choke, 2.4 mH			

Symbol No. (Fig. 3)	Stock No.	Description	Remark
L 9	RN-ELL-336	Choke, 2.6 mH	
L10	RN-ELT-1002/CA	Trap, 19 kHz	
L11	RN-ELH-C102-5/TP	Choke, 1mH	
CERAMIC FILTER			
CF 1	RN-EFC-F2-120	FM IF, 10.7 MHz (RED)	
CF 2	RN-EFC-F2-117	FM IF, 10 7 MHz (RED)	
CF 3	RN-EFC-A1-129	AM IF, 450 kHz (8 kHz)	
CF 4	RN-EFC-A1-130	AM IF, 450 kHz (4 kHz)	
MISCELLANEOUS ELECTRICAL			
EX 1	RN-EXC-1018	Crystal, 4.5 MHz	
TV 1	RN-ETV-1017	FM Front-end	
PL 1, 2	RN-EPM-1107	Lamp	
PL 3	RN-EPM-1109A	Lamp	
RY 1	RN-EED-35C	DC Relay	O
RY 2	RN-EED-1002A	DC Relay	O
SW 1~4, 6~13	RN-ESB-1N1-171	Push switch	O
SW 5	———	Included in RV11	
SW14, 15	RN-ESB-2L2-160	Push switch	O
VE 1	RN-EPP-1308-AE-3060	PC board and parts (LCD) assembly	
J 1	RN-EJA-105	Antenna receptacle	
J 2-1, J 2-2	RN-EJU-S06W-751	6P-connector	
J 3	RN-EJU-S10W-754	10P connector	
J 4-J12	RN-EWJ-3351	3P-4P connector and lead assembly	
J 5-J 6-J17	RN-EWJ-3348	4P-4P-9p connector and lead assembly	
J 7, J18	RN-EWJ-3349	6P-7P connector and lead assembly	
J 8	RN-EJU-S16W-653	16P connector	
J 9, J10	RN-EJU-S22V-762	22P connector	
J11	RN-EWJ-3352	2P connector and lead assembly	
J16	RN-EJU-S07W-904	7P connector	
P 2	RN-EJU-S12V-313	12P connector	
P 3	RN-EJU-S10V-312	10P connector	
P 4	RN-EJU-S03V-562	3P connector	
P 5	RN-EJU-S04V-563B	4P connector (BLK)	
P 6	RN-EJU-S04V-563	4P connector	
P 7	RN-EJU-S06V-565	6P connector	
P13	RN-EJU-S09V-381	9P connector	
P14	RN-EJU-S05V-379	5P connector	
P16	RN-EJU-R04V-537	4P connector, short	

Illus. No. (Fig. 26)	Stock No.	Description	Q'ty	Remark
1	RN-MTD-1115A	Chassis, main	1	
2	RN-MTD-1116	Chassis, cover	1	
3	RN-MDP-1263	Escutcheon	1	O
4	RN-MYN-1079	Knob, VOL	1	O
5	RN-MYN-1080A	Knob, BASS, TRE, BAL, FAD	4	O
6	RN-MYB-1333A	Button, CH1	1	O
7	RN-MYB-1334A	Button, CH2	1	O
8	RN-MYB-1335A	Button, CH3	1	O
9	RN-MYB-1336A	Button, CH4	1	O
10	RN-MYB-1337A	Button, CH5	1	O
11	RN-MYB-1339	Button, LOUD	1	O
12	RN-MYB-1340	Button, SENS	1	O
13	RN-MYB-1341	Button, TUNE	1	O
14	RN-MYB-1342	Button, AM/FM	1	O
15	RN-MYB-1343	Button, SEEK	1	O
16	RN-MYB-1344A	Button, MEMO	1	O
17	RN-MYB-1338	Button, LIGHT	1	O
18	RN-MSC-1219	Spring, CH1~5, AM/FM, SEEK, SENS, TUNE, MEMO	12	
19	RN-MCE-1071	Clamp, PC board	1	
20	RN-MCE-1072A	Clamp, PC board	2	
21	RN-MSE-1215	Spacer, top cover	1	
22	RN-MST-1075	Spacer, CH1~5	5	
23	RN-MHE-1320	Holder, Power IC	1	
27	RN-MST-1066A	Spacer, LED	1	
31	RN-MLC-1132	Shield plate, SW PC board	1	
32	RN-MIP-1262	Insulator, SW PC board	1	
33	RN-MHE-1317A	Holder, volume	1	
34	RN-MHE-1318A	Holder, Power IC	1	
35	RN-MCE-1070A	Clamp, Audio PC board	1	
36	RN-MHE-1319	Holder, Filter PC board	1	
37	RN-MRE-1059A	Radiator, Power IC	1	
38	RN-MCE-1058	Clamp, Filter PC board	2	
39	RN-MSP-167	Spring, ground	2	
40	RN-MPC-1405A	PC board, FM/AM	1	
41	RN-MPC-1478B	PC board, audio	1	
42	RN-MPC-1479	PC board, filter	1	
43	RN-EPP-1308-AE-3060	PC board and parts assembly	1	
44	RN-MPM-2661B	PC board, main	1	
46	RN-MPM-2663	PC board, flexible	1	
47	RN-MET-147	Special screw, 3×8mm	2	
48	RN-MET-168	Special screw, 3×6mm	3	
49	RN-MET-253	Special screw, 3×8mm	2	
50	RN-MET-168	Special screw, 3×6mm	7	
51	RN-MEN-70	Nut, 9mm, TRE	1	
52	RN-MSN-1003	Nut, 9mm	1	
53	F6-SBD-3×10S	Screw, 3×10mm	5	
54	——	Nut, Included in variable resistor	——	

NOTE : Modifications reserved !

PARTS AVAILABILITY

HOW TO ORDER REPLACEMENT PARTS

Replacement parts can be ordered from either a Parts Depot or directly from TOYOTA MOTOR CORPORATION. When ordering, please refer to the Replacement Parts List in this service manual to insure that you receive the correct part.

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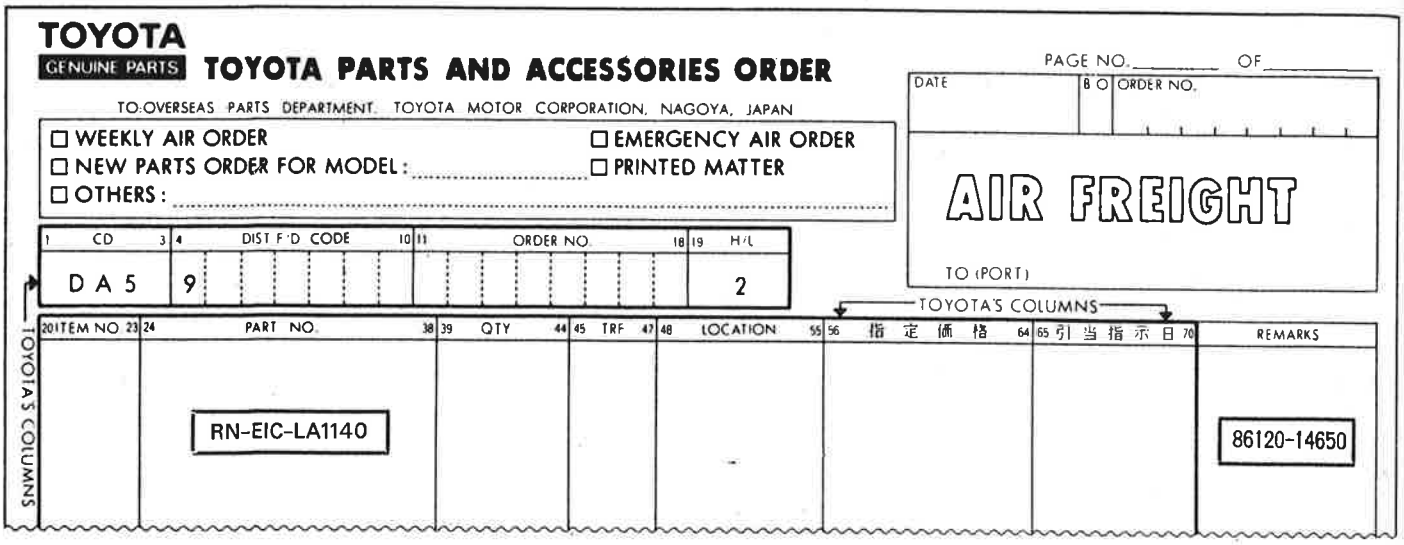

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