JVC

SERVICE MANUAL

MODEL T-M1

FM QUARTZ SYNTHESIZER TUNER

No. 2466
MAR. 1979

Contents

Warning: When replacing the parts marked with ⚠ , be sure to use the designated parts to ensure safety.

1. Specifications

Tuning range	: 87.5 MHz — 108.0 MHz
Usable sensitivity	: 0.9 μV/75 Ω (10.3 dBf IHF)
50 dB S/N sensitivity	: Mono 2.0 μV/75 Ω (17.3 dBf IHF)
Signal to noise ratio (IHF A-network)	: Mono 75 dB Stereo 72 dB
Distortion at 1 kHz (100 % Mod.)	: 0.08 % (Mono) 0.12 % (Stereo)
Capture ratio	: 1.0 dB
Alternate channel selectivity	: 75 dB
Image rejection	: 75 dB
IF rejection	: 90 dB
Spurious rejection	: 90 dB
AM suppression	: 65 dB
Stereo separation at 1 kHz	: 50 dB
Frequency response	: 30 Hz — 15 kHz + 0.3 dB, - 1.0 dB
Output level	: 650 mV (400 Hz, 100 % Mod.)
Antenna	: 75 Ω unbalanced, 300 Ω balanced
Dimensions	: 93(H) x 230(W) x 269(D) mm (3-11/16" x 9-1/16" x 10-9/16")
Weight	: 3.7 kg (8.2 lbs)
Accessories	: FM feeder antenna Signal cord

Differences between Models intended for different areas.

	Continental Europe, Australia	United Kingdom	U.S.A.	Other areas
Power supply	220—240 V∿ 50 Hz	240 V∿ 50 Hz	AC 120 V 50/60 Hz	110—120 V/ 220—240 V selectable 50/60 Hz
Power consumption	12 W	12 W	11 W	12 W
Line voltage selector	Fitted	Not fitted	Not fitted	Fitted
Rear panel power switch	Not fitted	Fitted	Not fitted	Not fitted

Design and specifications subject to change without notice.

2. Names of Parts and Their Functions

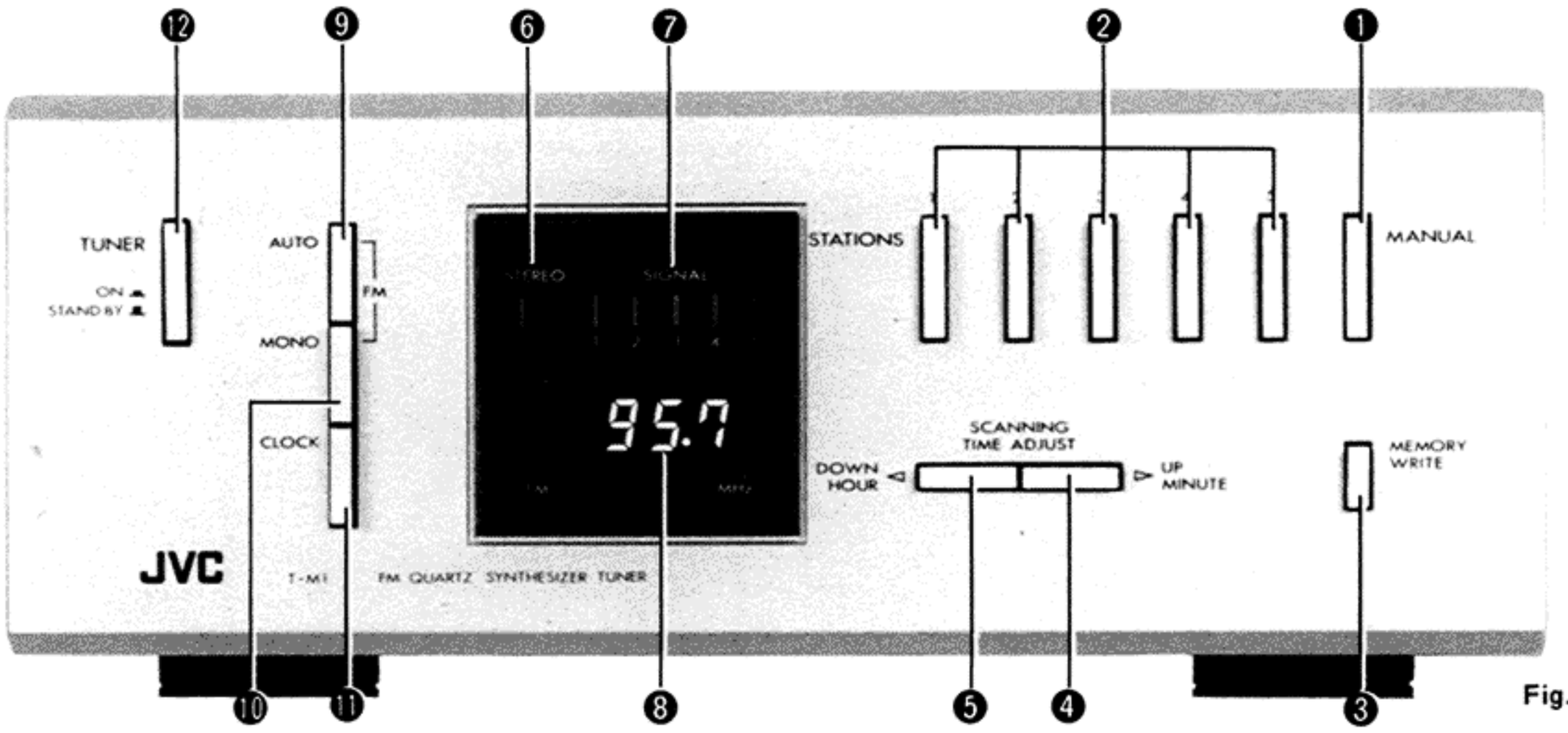


Fig. 1

1. **MANUAL button**
   Press to readjust the tuned-in frequency or clock time. Unless this button is pressed in, pressing the UP/MINUTE or DOWN/HOUR button has no effect on the displayed frequency or time.
   When this button is pressed in, an indicator lamp built into the button itself will light.
2. **STATIONS (1 – 5) buttons**
   When one of these buttons is pressed within 5 seconds after the MEMORY WRITE button is pressed, the station which is being received is entered into the memory of the corresponding channel. To select one of the preset stations, just press the corresponding button. The indicator lamp built into each individual button will light to show which channel is in operation.
3. **MEMORY WRITE button**
   If the STATIONS button is pressed within about 5 seconds after this MEMORY WRITE button has been pressed, the frequency of the station being received becomes preset to that channel. No memory writing takes place if the STATIONS button is pressed after that 5-second period has lapsed. In such a case, perform tuning once again and follow the same procedure as discribed above.
4. **UP/MINUTE button**
   This button can be used in combination with the MANUAL button for tuning or for adjusting the time. When the FM AUTO or FM MONO button is pressed, a single, brief pressing of this button changes the tuned-in frequency in 0.1-MHz increments in the direction of increasing frequencies. If you hold the button pressed for about a 0.6-second interval, automatic rapid scanning starts. When 108.0 MHz is reached, the display returns to 87.5 MHz. When the CLOCK button is pressed, pressing the UP/MINUTE button advances the minute indication in 1-minute increments. Holding the button continuously for about a 0.6-second interval starts rapid advancement of the minute indication.
5. **DONW/HOUR button**
   Functions are identical with those of the UP button. Press to tune in the direction of decreasing frequencies. When 87.5 MHz is reached, the display returns to 108.0 MHz. When the CLOCK button is pressed, pressing the DOWN/HOUR button advances the hour indication in 1-hour increments. Holding the button continuously for about a 0.6-second interval starts rapid advancement of the hour indication. After 12 is reached, the hour indication changes back to 1, conforming with a 12-hour indication system.
6. **STEREO indicator**
   This indicator lights when you are tuned to a stereo broadcast with the "FM AUTO" button pressed in.
7. **SIGNAL strength indicator**
   Indicates the strength of the signal being received. Best reception is obtained when all five LEDs light. Adjust the antenna so that the maximum number of LEDs light in their brightest condition.
8. **Digital display**
   When the FM AUTO or FM MONO button is pressed, the display indicates the tuned-in frequency. It shows the clock time when the CLOCK button is pressed. When the TUNER switch is in its STAND BY position, the digital display indicates the clock time even if the FM AUTO or FM MONO button is pressed.
9. **FM AUTO button**
   Press to listen to FM broadcasts. Stereo broadcasts are received in stereo and monaural broadcasts are received in mono automatically. Pressing this button also activates the muting circuit to eliminate inter-station noise while tuning. Normally use this button for listening to FM broadcasts.
10. **FM MONO button**
    Press this button to listen to FM broadcasts in weak signal areas. The stereo broadcasts are monauralized, however, their clarity of reception is improved.
11. **CLOCK button**
    Press to obtain the clock time display. However, even with the CLOCK button pressed in, if you set the TUNER switch to ON and operate the STATIONS buttons, the display indicates the tuned-in frequency for about 5 seconds and then changes back to the clock time.
    Note: With the CLOCK button pressed, the tuner itself functions the same as when the FM AUTO button is pressed.
12. **TUNER switch**
    Press to ON to listen to broadcasts. Press again to release the button to the STAND BY position.
    Note: As long as the power cord is plugged into an AC outlet (and, with sets for the United Kingdom, as long as the rear panel power switch is set to ON) the digital display indicates the clock time when the TUNER switch is set to STAND BY.

3. New Technology

3-(1) PLL Synthesizer

- **Block diagram**

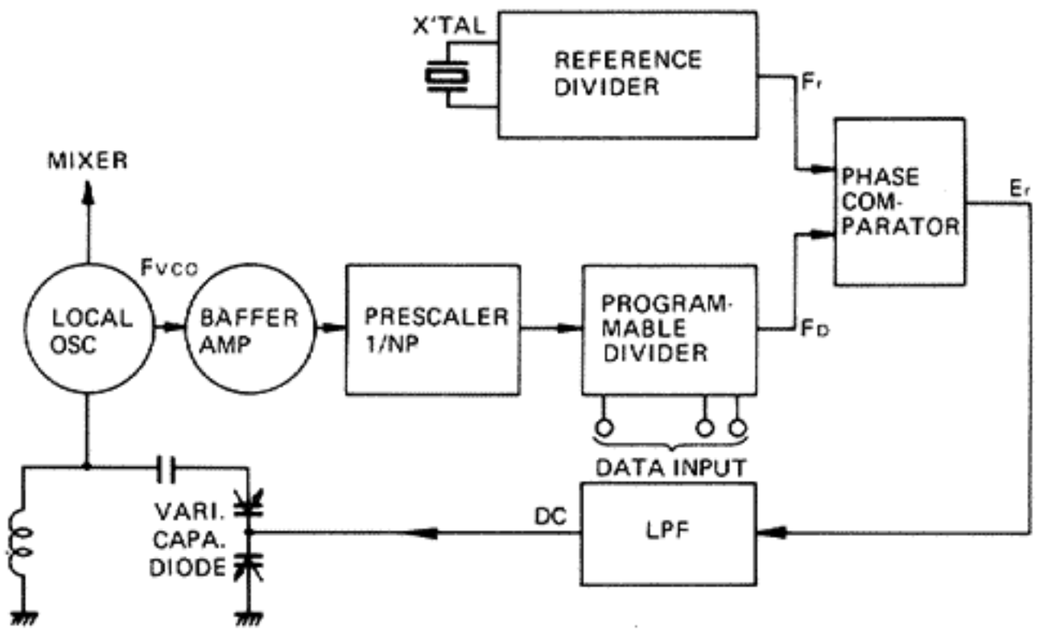


Fig. 2

Conventional radio receivers use variable capacitors (or inductors) which are moved mechanically to tune to broadcast signals. On the other hand PLL (Phase Lock Loop) synthesizers vary the capacitance of a varactor electronically to achieve the same object. In this system, tuning is done by determining value N of the programmable divider, as shown above, by external digital signals. In above figure, the closed loop (phase locked loop) operates to equalize divided reference frequency Fr and frequency FD which is the output frequency of the local oscillator (VCO) prescaled to 1/Np by the prescaler and further divided to 1/N by the programmable divider. In fact, Fr is equal to FD when the phase locked loop (PLL) is locked. Since

$FD = Fvco/Np \cdot N,$

$FVCO = Np \cdot N \cdot Fo = Np \cdot N \cdot Fr$

Let Np = 20 and Fr = 5 kHz. Then,

$FVCO = 20 \times N \times 5\ kHz$

$= 100 \times N\ kHz$

Thus the VCO (local oscillator) frequency will vary in intervals of 100 kHz as division ratio N of the programmable divider is varied in units of one. For FM signals, the local oscillator frequency is as high as 98.2 to 118.7 MHz. In this case, a high-speed frequency divider is used as the prescaler to reduce the input frequency of the programmable divider.

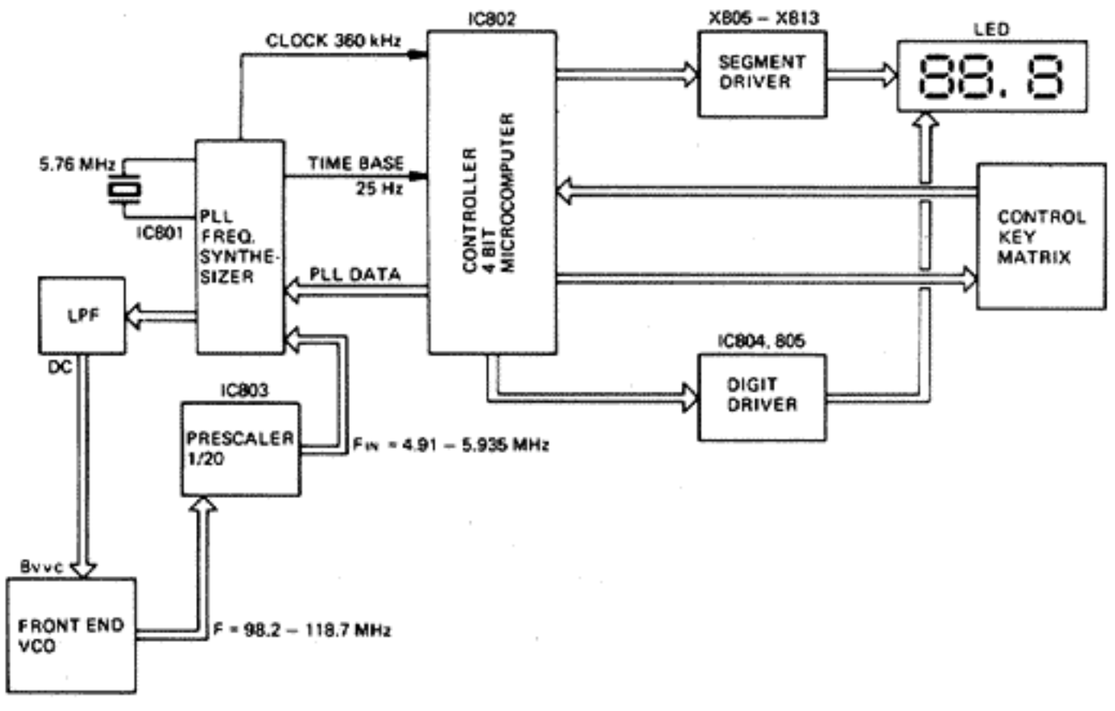


Fig. 3

3-(2) Prescaler (μPB551C, IC 803)

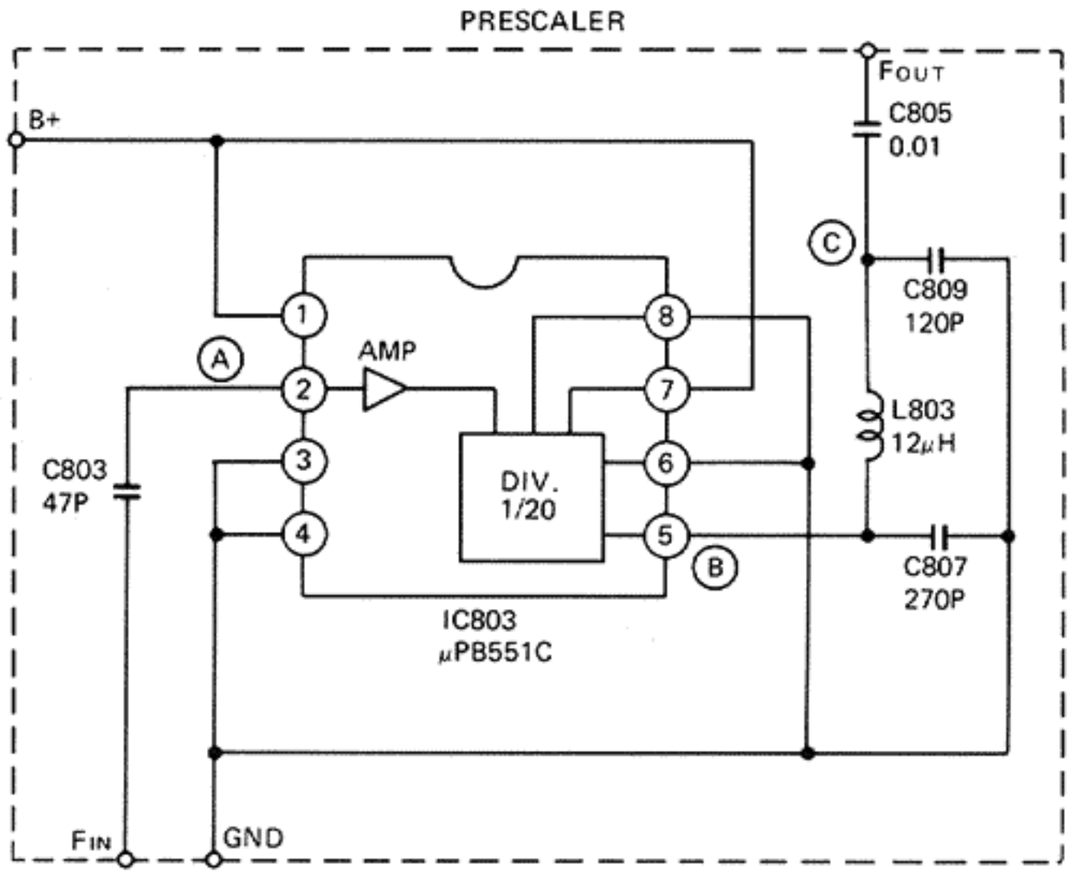


Fig. 4

The local oscillator output (98.2 – 118.7 MHz) comes from the front-end FOUT terminal (pin 15) to pin 2 of μPB551C (IC 803, ECL) where the input frequency is divided by 20 into FIN (4.91 – 5.935 MHz) and the resulting signal is input to the programmable divider in μPD2819C (IC 801, PLL synthesizer).

WAVEFORM AT Ⓐ, Ⓑ, Ⓒ

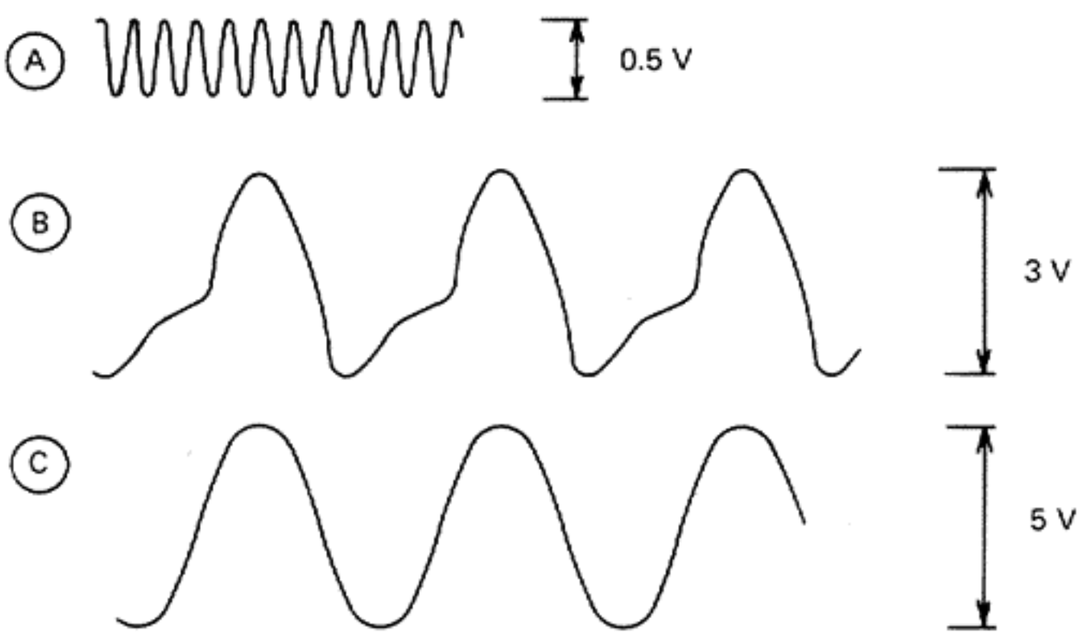


Fig. 5

3-(3) PLL Synthesizer (μPD2819C, IC 801)

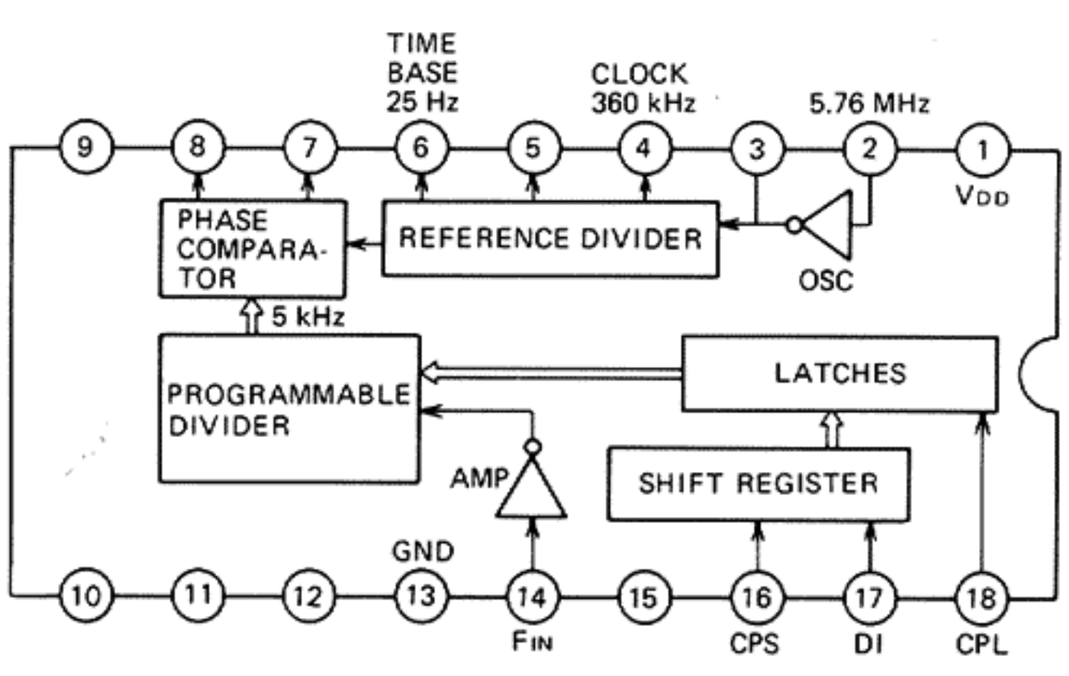


Fig. 6

Functions of main terminals

Pins 2 and 3

Reference signal terminals. A 5.76 MHz crystal oscillator is connected to these terminals. The reference frequency is adjusted to exactly 5.76 MHz (±10 ppm) by varying the capacitance of trimmer capacitor C817 (1 – 10 pF).

WAVEFORM OF REFERENCE OSCILLATOR

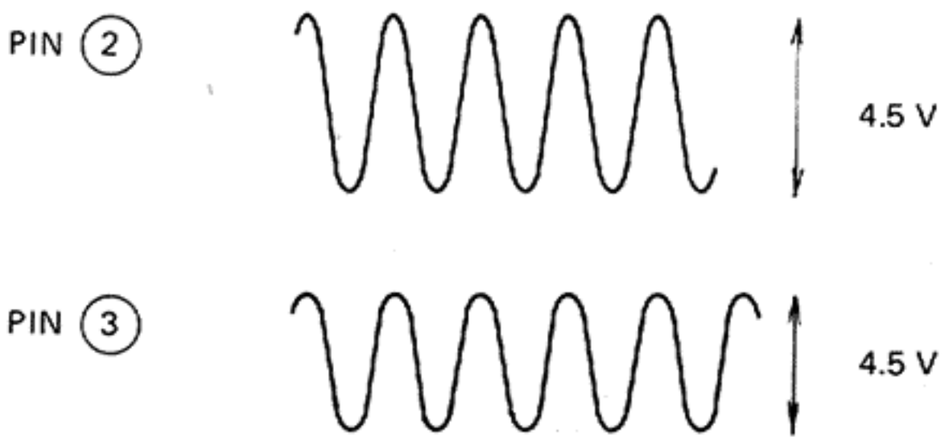


Fig. 7

Pin 4

The reference frequency, divided by sixteen (360 kHz), is output from pin 4. The controller (IC 802) which will be described later uses this as the main clock signal.

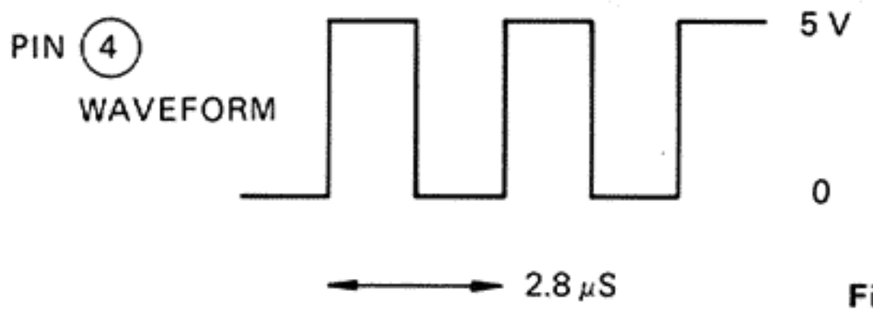


Fig. 8

Pin 6

The basic time signal (25 Hz) for the clock is fed to the controller (IC 802) from here.

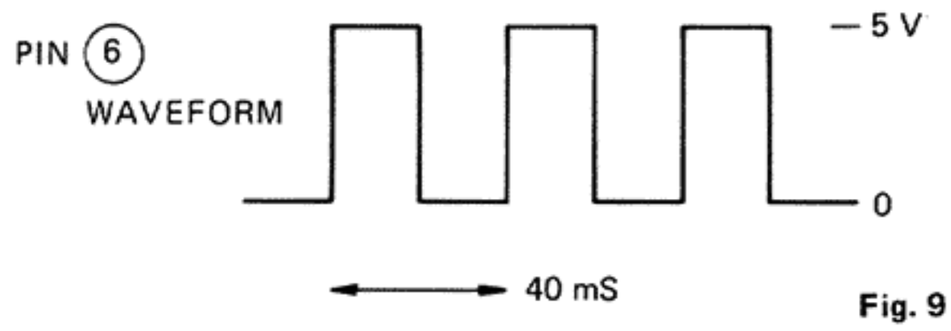


Fig. 9

Pin 7

This is the output terminal of the muting signal generated by the phase comparator. It is "1" (high level) when the PLL is locked. When it is not locked (e.g. during tuning), square wave is output to turn off X801.

Pin 8

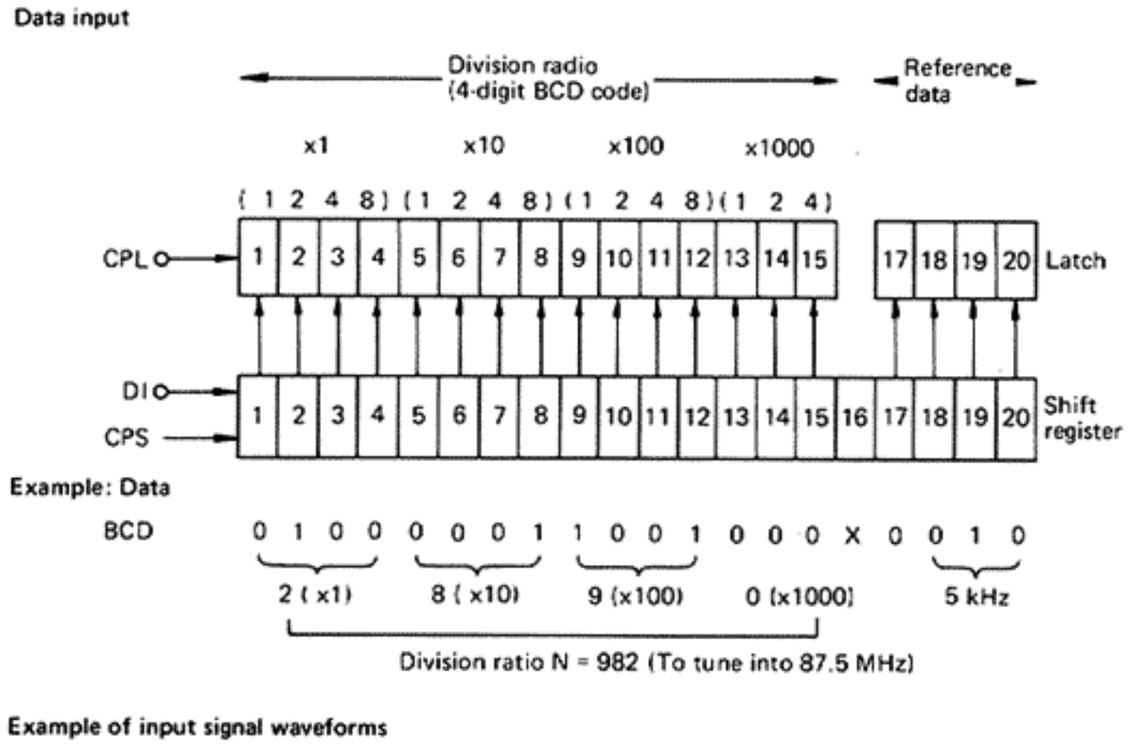
This is the error output terminal of the phase comparator which is connected to the active low-pass filter consisting of X802 and X803. According to the tuned frequency a DC voltage will be fed back to the Vvvc terminal (pin 10) in the front end.

Pin 14

Input terminal for the signal from the prescaler to the programmable divider.

Pins 16 (CPS), 17 (DI), and 18 (CPL)

Programmable divider input terminals determining the division ratio and reference frequency. Data signals applied to DI are read into a shift register, inside the IC, at the positive transition of a clock pulse delivered to CPS and latched at the falling edge of CPL.



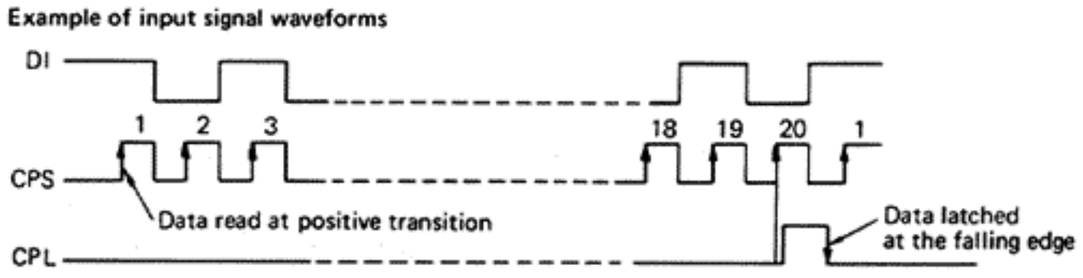


Fig. 10

3-(4) Controller (μPD1530C, IC 802)

This is a 1-chip, 4-bit microprocessor which is capable of generating data to determine the division ratio of the programmable divider, driving LEDs, tuning, presetting memory, and providing clock signals.

Functions of main terminals

1. Pin 42 (Clock signal in)
   The main clock terminal to which the PLL IC delivers 360 kHz for the microprocessor.
2. Segment outputs (active low)

PIN		
	2	a
	3	b
	4	c
	5	d
	8	e
	9	f
	10	g

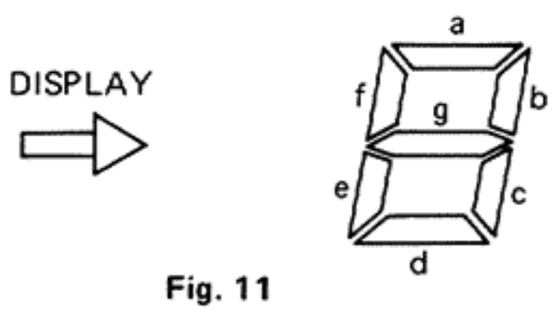


Fig. 11

3. Pin 6
   Time base (25 Hz) input for the clock.
4. Pin 7
   Initialization terminal to which the external differential circuit delivers a reset pulse when power is just supplied. After the power cord is plugged into an AC outlet, the controller's power supply will start working gradually with a predetermined delay. The microprocessor will work incorrectly if its starts operation before the power supply is ready. To prevent this, pin 7 is set at a high level so that the microprocessor will not start before the power supply is ready. When it is ready, pin 7 becomes low level and the microprocessor starts.

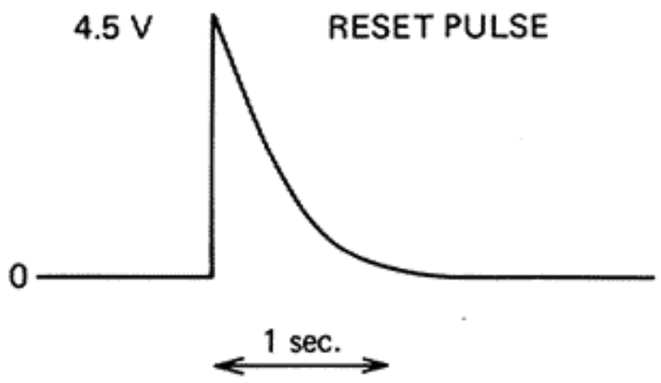


Fig. 12

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No. 2466

5. Data outputs
   Terminals to output data (BCD) which determines the division ratio and reference frequency of the programmable divider. 20 bits of data are output serially with a predetermined timing.
   Pin 13 CPL: latch pulse out
   Pin 14 DI: data out
   Pin 15 CPS: clock pulse out
6. Digit outputs
   Pin 12 D0
   Pin 16 D1 (Digit 1)
   Pin 22 D2 (Digit 2)
   Pin 26 D3 (Digit 3)
   Pin 30 D4 (Digit 4)
   Control key scanning signals and display digit signals are output through these terminals.
7. Pin 17
   Muting output. Muting signals are output to suppress noise when PLL is not locked during manual scanning. It generates high level while the UP/DOWN button is kept depressed.
8. Pin 25
   Decimal point (DP) segment output terminal for FM display.
9. Pin 27
   Colon segment output terminal for time display. The output will be inverted every 0.5 second to display time in seconds.
10. Pin 29
    This turns to high level during the chip select mode (the clock and memory are working but the display is idle) to reduce current leakage from the pull-down resistor of the segment output by turning X814 on and X815 off.
11. Key input terminals
    Pins 33, 34, 35 and 36 are control key input terminals. Key inputs are combined with digit output (D1 through D4) by a matrix.
    Control keys are combined as shown below.

A0 (Pin 33)	STATION 4	STATION 5	UP	—
A1 (Pin 34)	STATION 3	—	DOWN	—
A2 (Pin 35)	STATION 2	—	HOUR ADJUST	—
A3 (Pin 36)	STATION 1	MEMORY WRITE	MINUTE ADJUST	—
	D4 (Pin 30)	D3 (Pin 26)	D2 (Pin 22)	D1 (Pin 16)

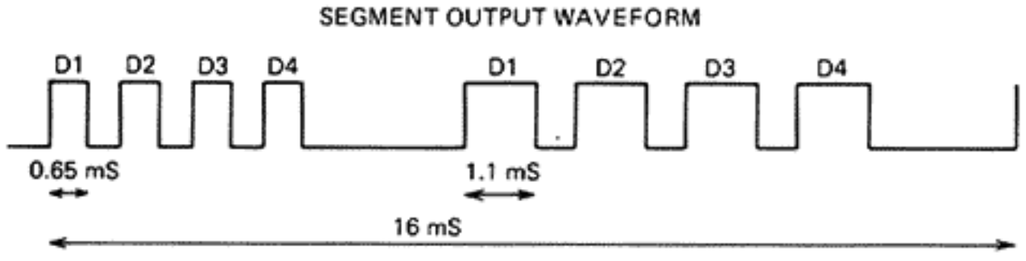
12. Mode input terminals
    Pins 37 (M0), 38 (M1), and 39 (M2) are input terminals for mode setting.
    The mode signal is combined with digit outputs (D0 through D4) by a matrix to select the mode. Combination of signals is as follows.

	M0 (Pin 37)	M1 (Pin 38)	M2 (Pin 39)
D4 (Pin 30)	Display / No display	—	—
D3 (Pin 26)	Frequency or clock / Clock display	—	—
D2 (Pin 22)	Clock priority display / Frequency display	—	—
D1 (Pin 16)	—	Band edge 108 / 104	100 k / 50 k
D0 (Pin 12)	87.5–108 / 76.0–90.0	European Band / US Band	80 ms/step / 160 ms/step

(note) A/B: A shows mode switch "ON"
B shows mode switch "OFF"

3-(5) Segment Driver (X805 through X813)

According to the segment outputs (active low) delivered by the controller, LED segments are lit by these transistors. Segment outputs can be checked by monitoring waveforms developed across the currentlimiting resistors of the segment driver. (R823 through R831)



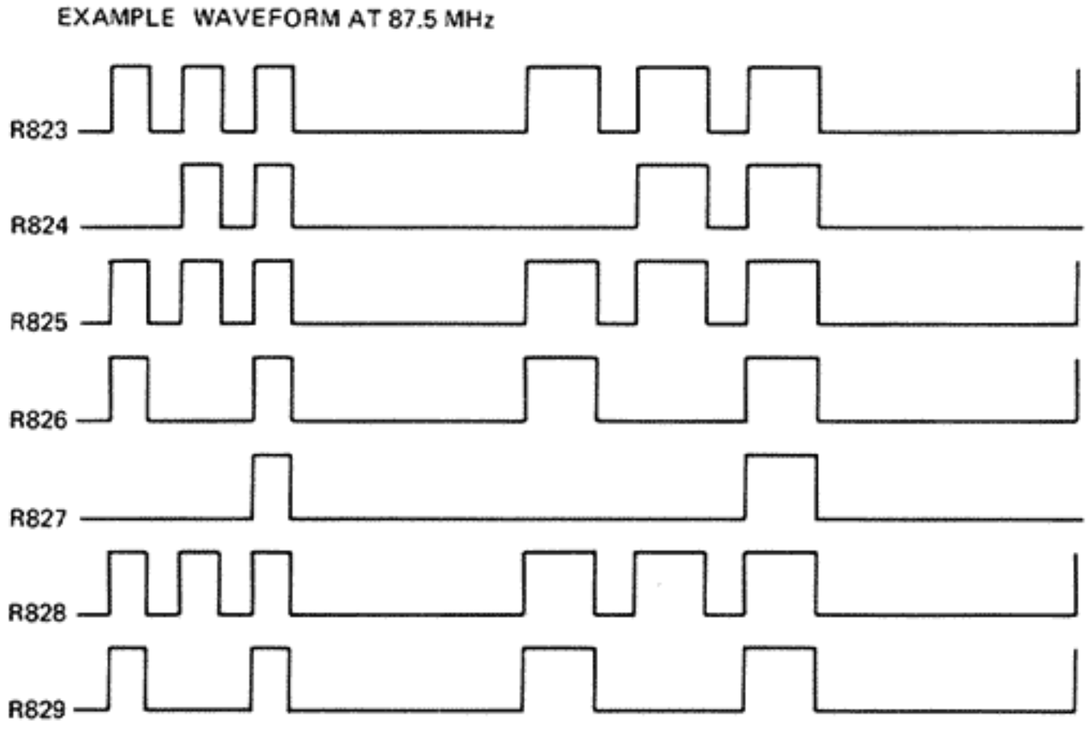


Fig. 13

3-(6) Digit Driver (IC804 and 805)

Each LED digit is lit by a Darlington array of NPN transistors according to the digit output inverted by an inverter.

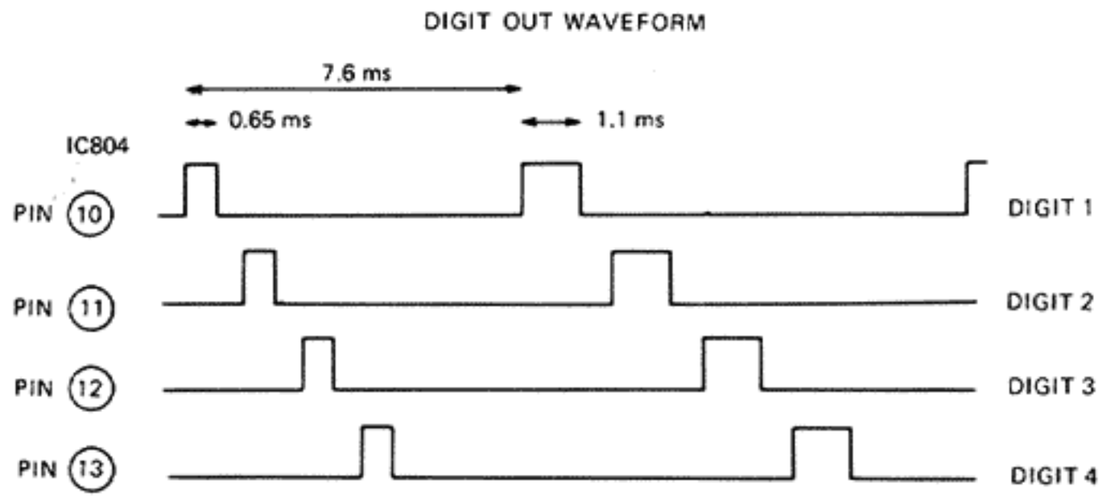


Fig. 14

3-(7) Mode Select Circuits

(1) X401, X402 and X804 are transistor switches.
X401 turns the digital display on and off. X402 and X804 select the frequency or clock display mode as shown below.

Tuner switch	Mode switch	Digital display	X401	X402	X804
ON	FM AUTO	Frequency	ON	OFF	ON
	FM MONO	Frequency	ON	OFF	ON
	CLOCK	Clock/ frequency	ON	ON	ON
Standby	FM AUTO	Clock	ON	OFF	OFF
	FM MONO	Clock	ON	OFF	OFF
	CLOCK	Clock	ON	ON	OFF

(2) IC301 (TC4016BP)
Incorporating 4 electronic switches, this selects the MANUAL SCAN button's function (tuning and clock adjustment mode) as given below.

Mode	IC301 pins							
	⑤	⑥	⑫	⑬	①-②	③-④	⑧-⑨	⑩-⑪
FM	HIGH	HIGH	LOW	LOW	OFF	ON	ON	OFF
CLOCK	LOW	LOW	HIGH	HIGH	ON	OFF	OFF	ON

3-(8) Preset Circuit

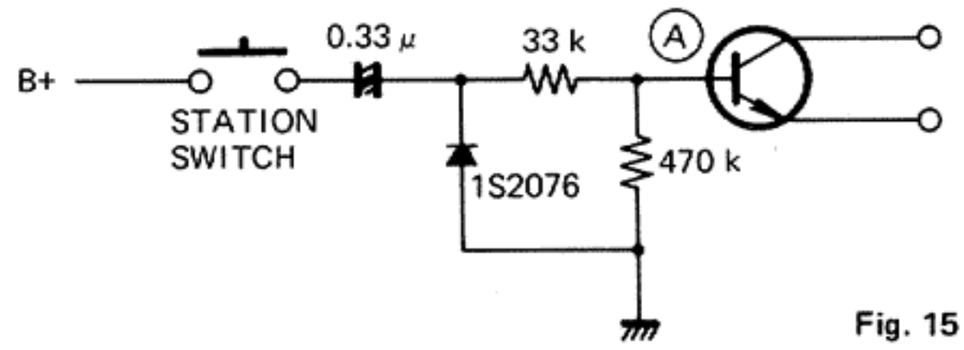


Fig. 15

When the STATION button is depressed, a signal with the voltage waveform shown below develops in the differential circuit shown above, turning on transistors X301 through 305 for 100 to 300 msec.

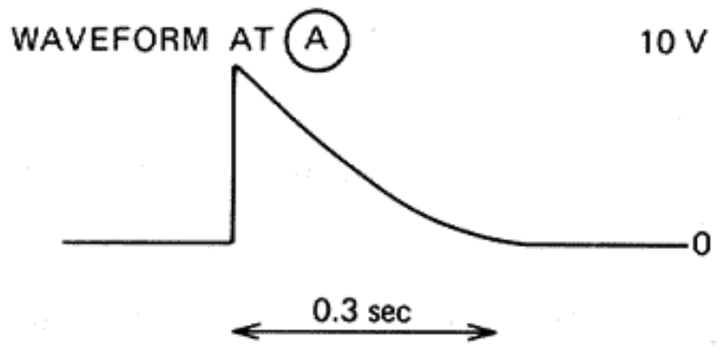


Fig. 16

4. FM Alignment Procedures

4-(1) Front End

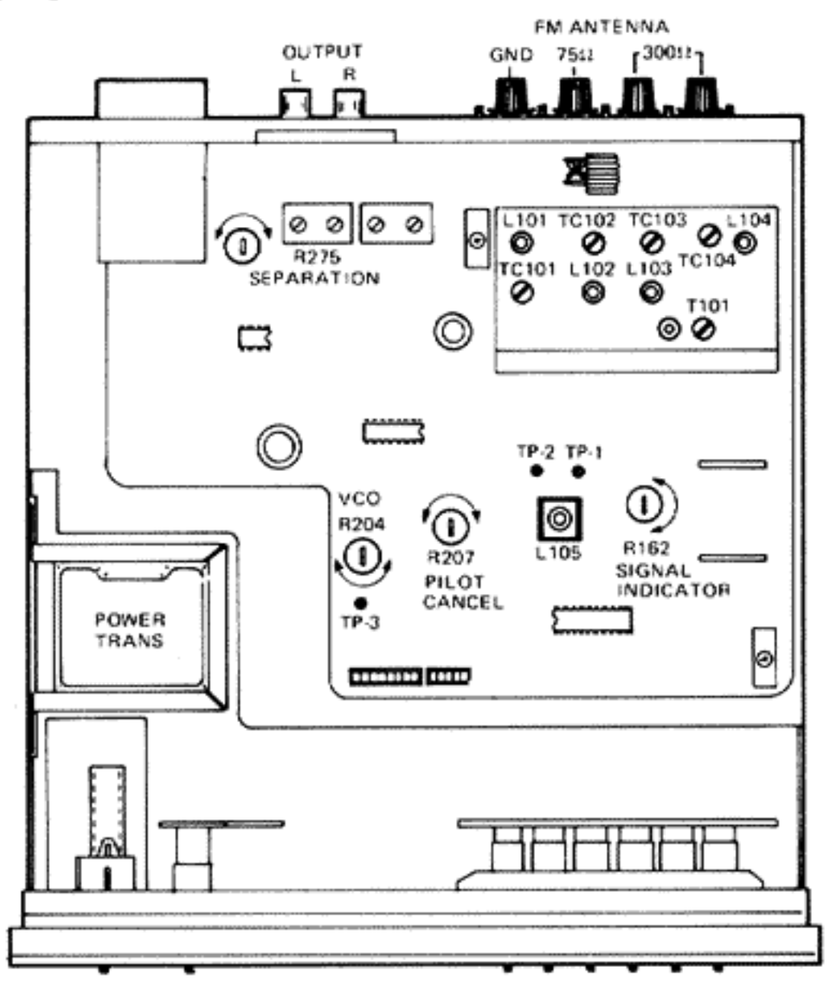


Fig. 17

L101 ANT tuned coil
L102 RF1 tuned coil
L103 RF2 tuned coil
} Maximize sensitivity at 88 MHz.

TC101 ANT trimmer
TC102 RF1 trimmer
TC103 RF2 trimmer
} Maximize sensitivity at 108 MHz.

T101 IFT
Maximize sensitivity with antenna input level reduced.

4-(2) FM Section

L105 detector transformer
Connect a high-sensitivity DC VTVM (resolution: 10 mV or less) to test points TP-1 and TP-2. Tuning to a signal, adjust voltage to 0 V by turning the transformer's core.

R204 MPX VCO free-run frequency control
Connecting a frequency counter to test point TP-3, adjust the free-run frequency to 76 kHz with the control.

R207 MPX pilot canceller control
Tuning to stereo signal, adjust the control to minimize leakage of the 19-kHz pilot signal. Turn the control clockwise to raise the cancellation level and counterclockwise to reduce it.

LP251
LP252
} MPX low-pass filters
They do not require adjustment.

R275 channel separation control
Adjust R275 to minimize crosstalk in the L-channel from the R-channel.

R162 signal indicator level control
Receiving a signal, adjust the control so that the signal indicator light at the proper level. Turn R162 clockwise to reduce the indicator's sensitivity and counterclockwise to raise it.

4-(3) Reference Signal Frequency

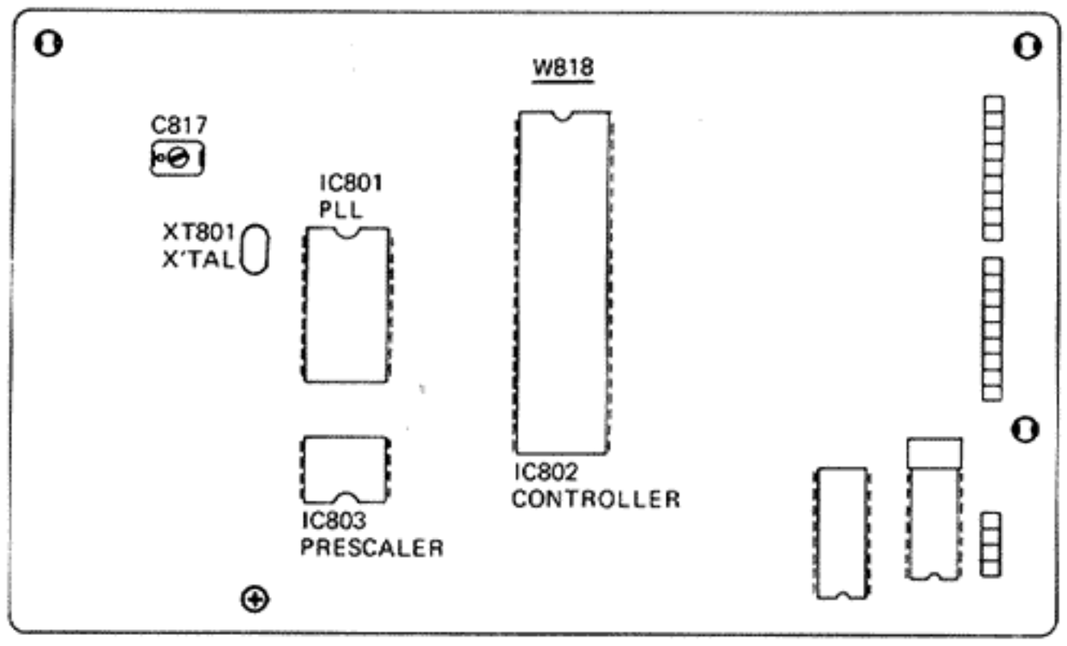


Fig. 18

Connecting a frequency counter to W818, adjust C817 so that it reads 360.000 kHz.

Note: *A deviation of 1 Hz (0.001 kHz) is equivalent to* 2.7 ppm or, for the clock, 0.24 sec/day (approximately 7.2 seconds/month).

4-(4) Channel Separation

Highly accurate adjustment of FM stereo signal channel separation requires the use of instruments. Adjustment receiving an FM stereo signal is possible if great accuracy is not required.

1. Tune to an FM stereo broadcast. Turn MPX VCO free-run frequency control R204 (D-1) from the minimum position toward the maximum position, and the stereo indicator will light for a certain range. Set R204 to the mid-point of this range.
2. When the T-M1 is connected to an integrated amplifier with S.E.A., maximize the controls over 10 kHz and minimize those below 10 kHz. If the amplifier is not provided with S.E.A., set the amplifier's BASS control at its minimum position and its TREBLE control at its maximum and minimize noise at high frequencies over 15 kHz (that is, minimize carrier leak) by adjusting pilot *canceler control R207.*
3. Receiving a stereo broadcast, adjust R275 to minimize crosstalk.

5. Removal Procedures

5-(1) Metal Cover

Remove four screws (1) and two screws (2) on the rear. Then pull off the metal cover.

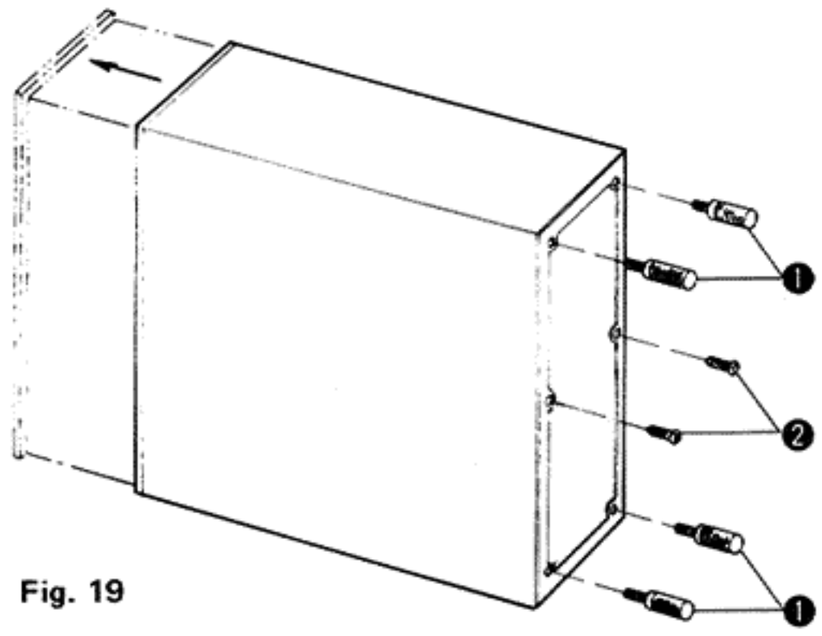


Fig. 19

5-(2) Front Panel

1. Remove the cover.
2. Remove four screws (1 to 4). Pull off the front panel in the direction of arrow.

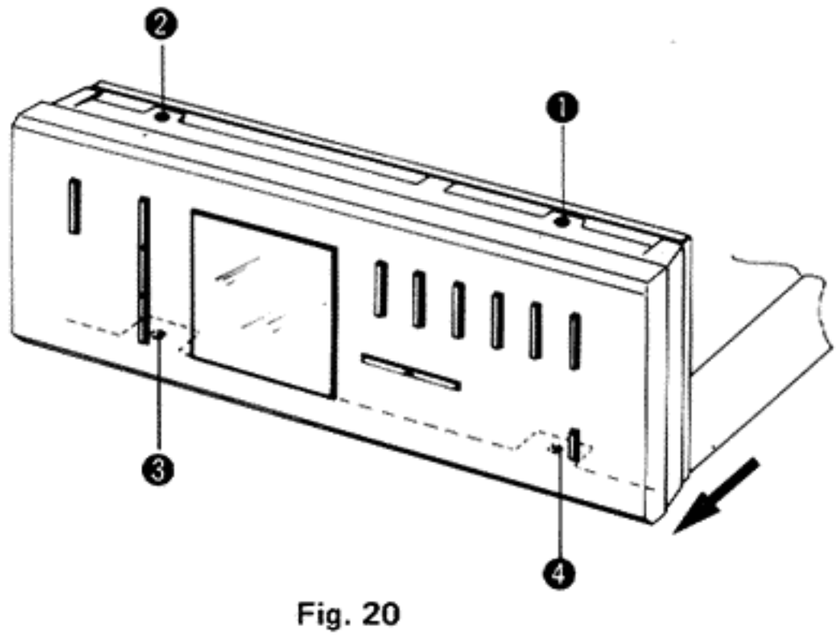


Fig. 20

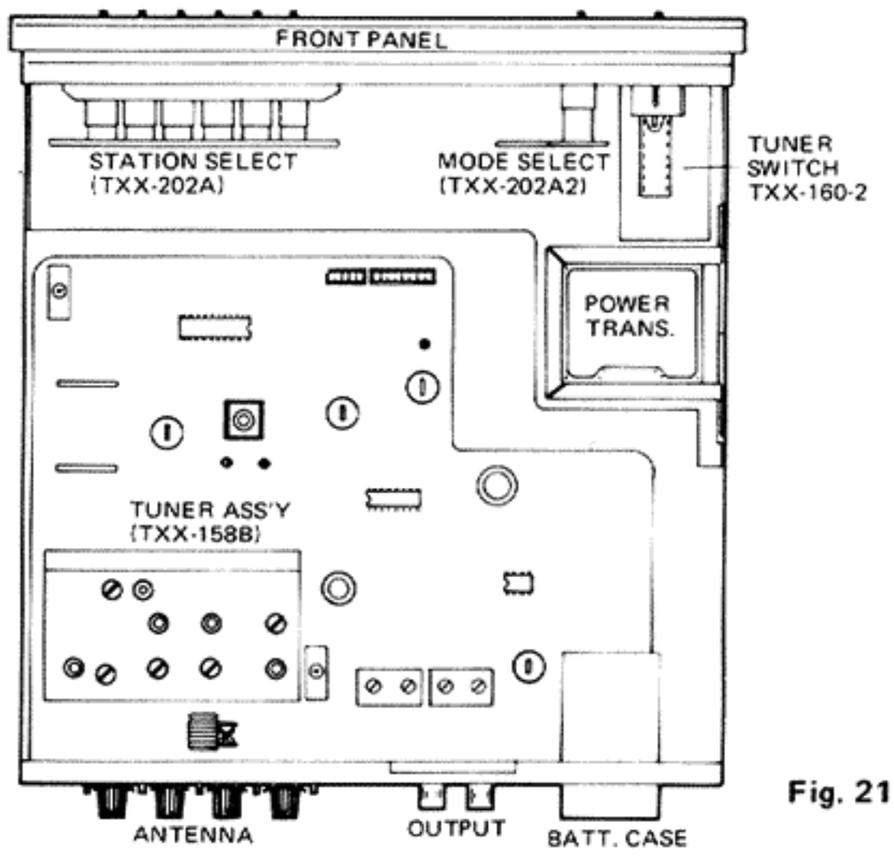


Fig. 21

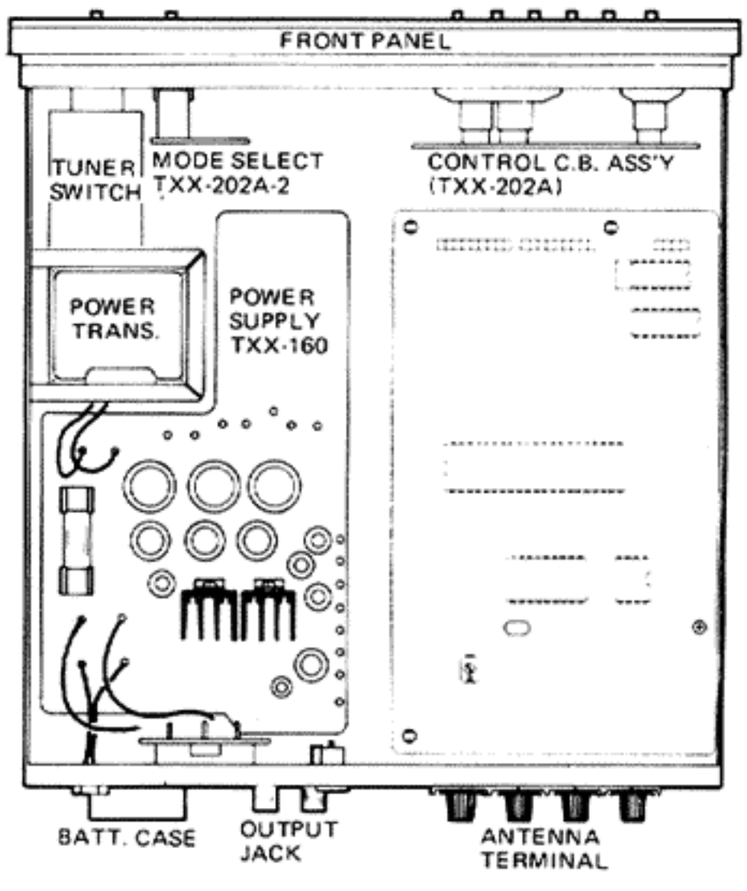


Fig. 22

5-(3) Tuner Board (TXX-158B)

1. Remove 2 screws (1 and 2) fixing the antenna terminals.
2. Remove 2 screws (3 and 4) fixing the output terminals.
3. Remove 4 screws (5 to 8) fixing the circuit board.
4. Now the circuit board comes off the chassis.
   Do not disconnect wires during servicing unless unavoidable.

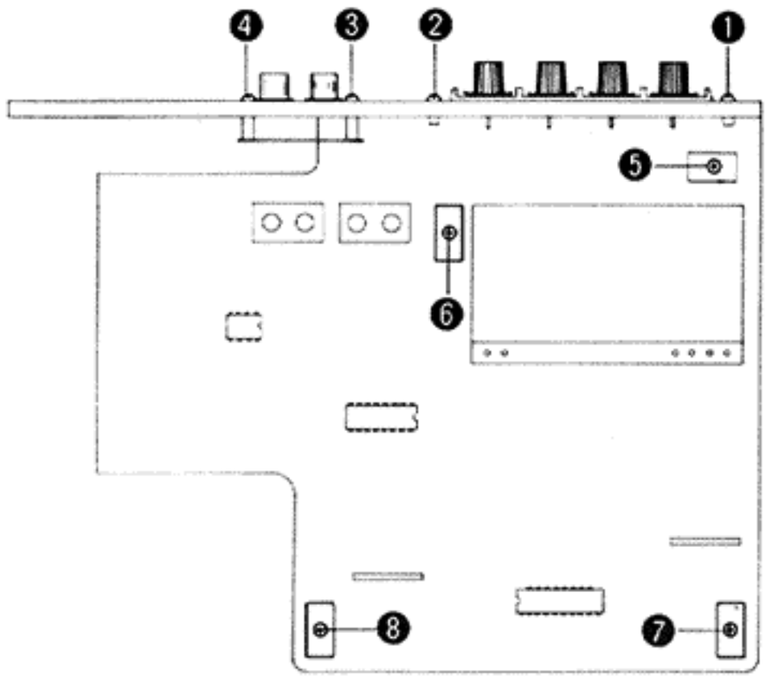


Fig. 23

5-(4) Synthesizer Board (TDC-35A)

1. Remove a screw (1) fixing the board.
2. Pull off the board from fasteners (2 to 4).
3. Now the board comes off the chassis. Do not disconnect wires during servicing unless unavoidable.

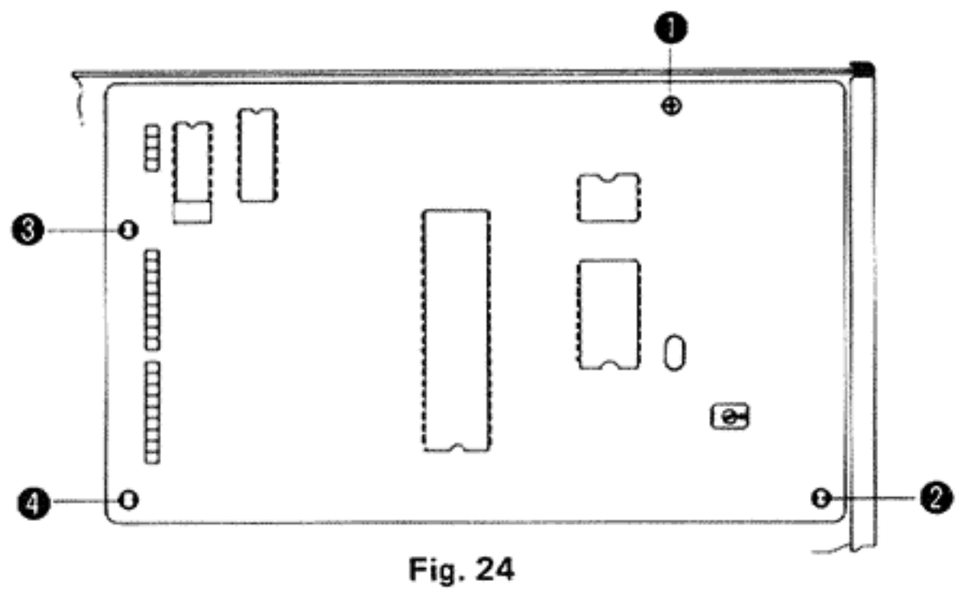


Fig. 24

5-(5) Power Supply Board (TXX-160)

1. Pull off the board from fixed fasteners (1 to 5).
2. Now the board comes off the chassis. Do not disconnect wires during servicing unless unavoidable.

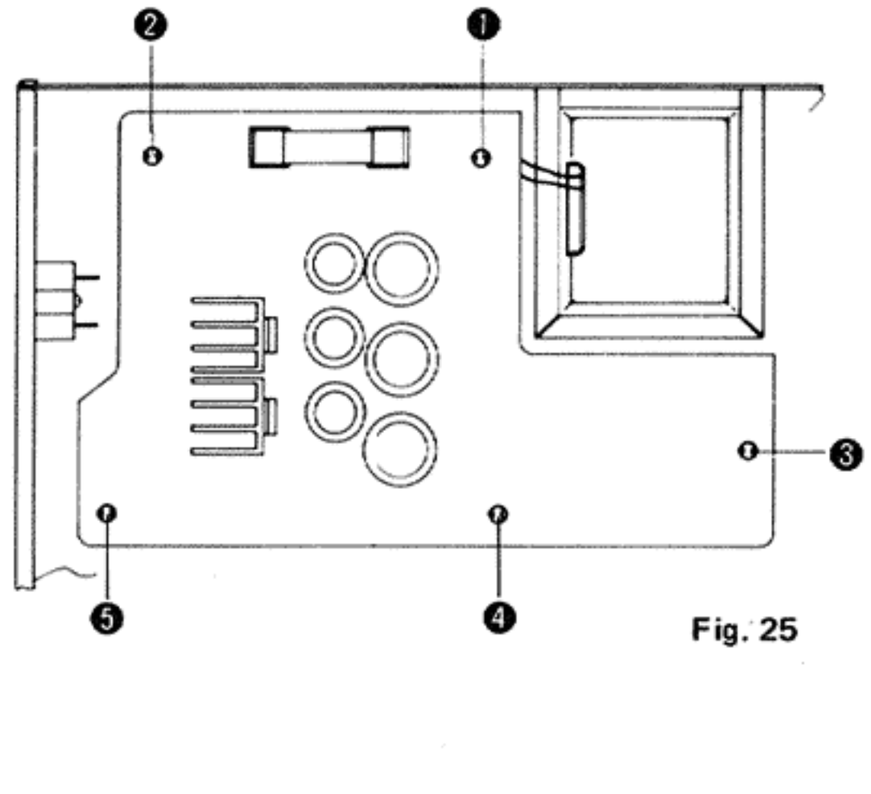


Fig. 25

5-(6) Tuner Switch Board (TXX-160-2), Mode Select Board (TXX-202-2), Control Board (TXX-202A)

1. Remove the front panel.
2. Remove two screws (1) and pull off the power switch board, together with its bracket, toward you.
3. Remove two screws (2) to remove the mode switch board.
4. Remove six screws (3 to 5) to remove the control board.
5. Now the boards come off the front bracket. Do not disconnect wires during servicing unless unavoidable.

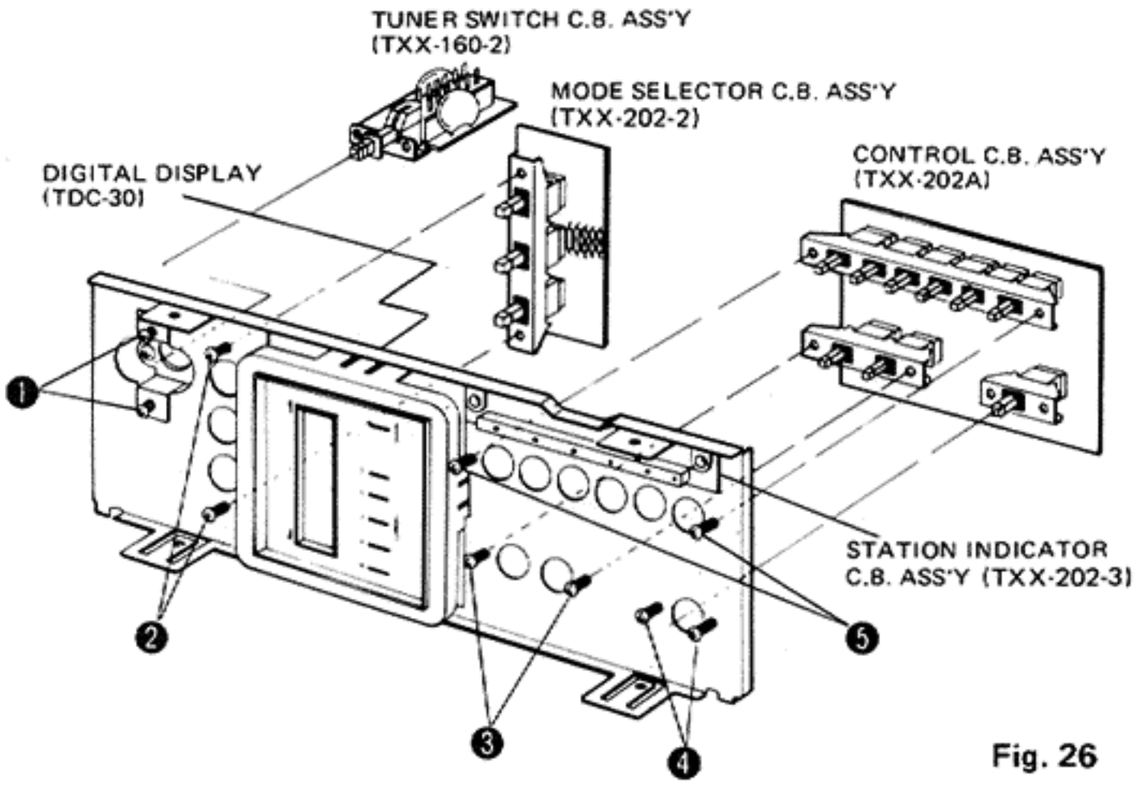


Fig. 26

5-(7) Digital Display Board (TDC-30)

1. Pressing the dial escutcheon at its top and bottom fitted with stoppers, pull it off toward you as illustrated.
2. Remove two plastic rivets (1) fixing the board.
3. Now the board comes off the escutcheon. Do not disconnect wires during servicing unless unavoidable.

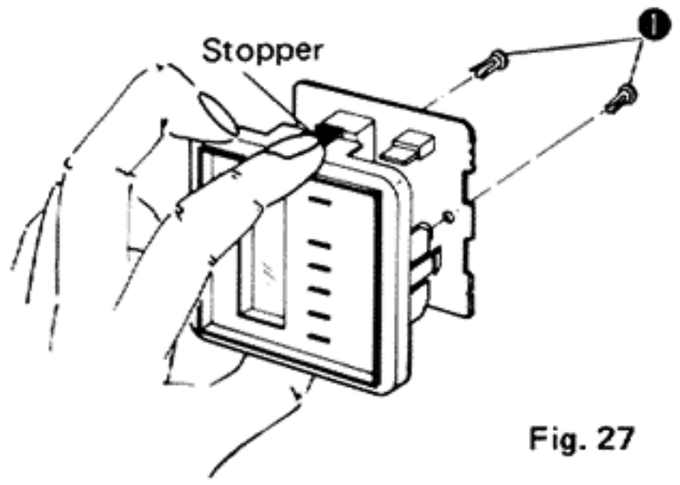


Fig. 27

5-(8) Station Indicator Board (TXX-202-3)

1. Remove two plastic rivet (1) fixing the board.
2. Now the board comes off the front bracket. Do not disconnect wires during servicing unless unavoidable.

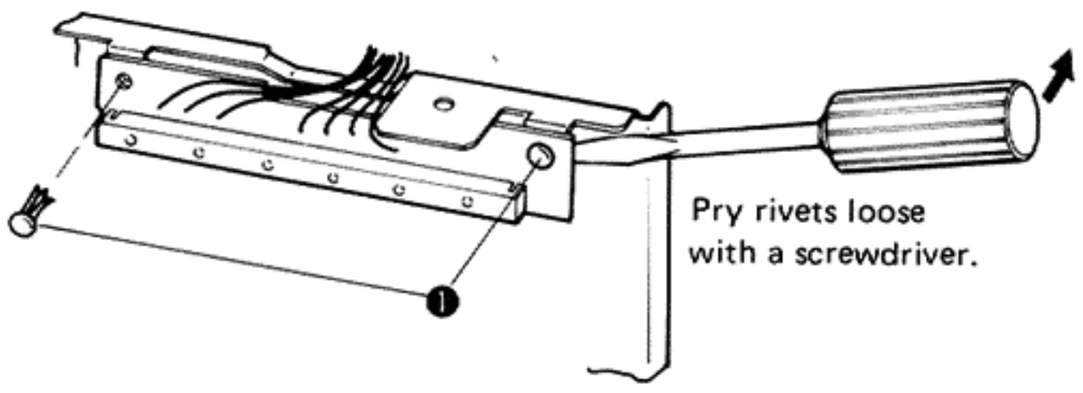


Fig. 28

T-M1
No. 2466

6. Main Parts Locations

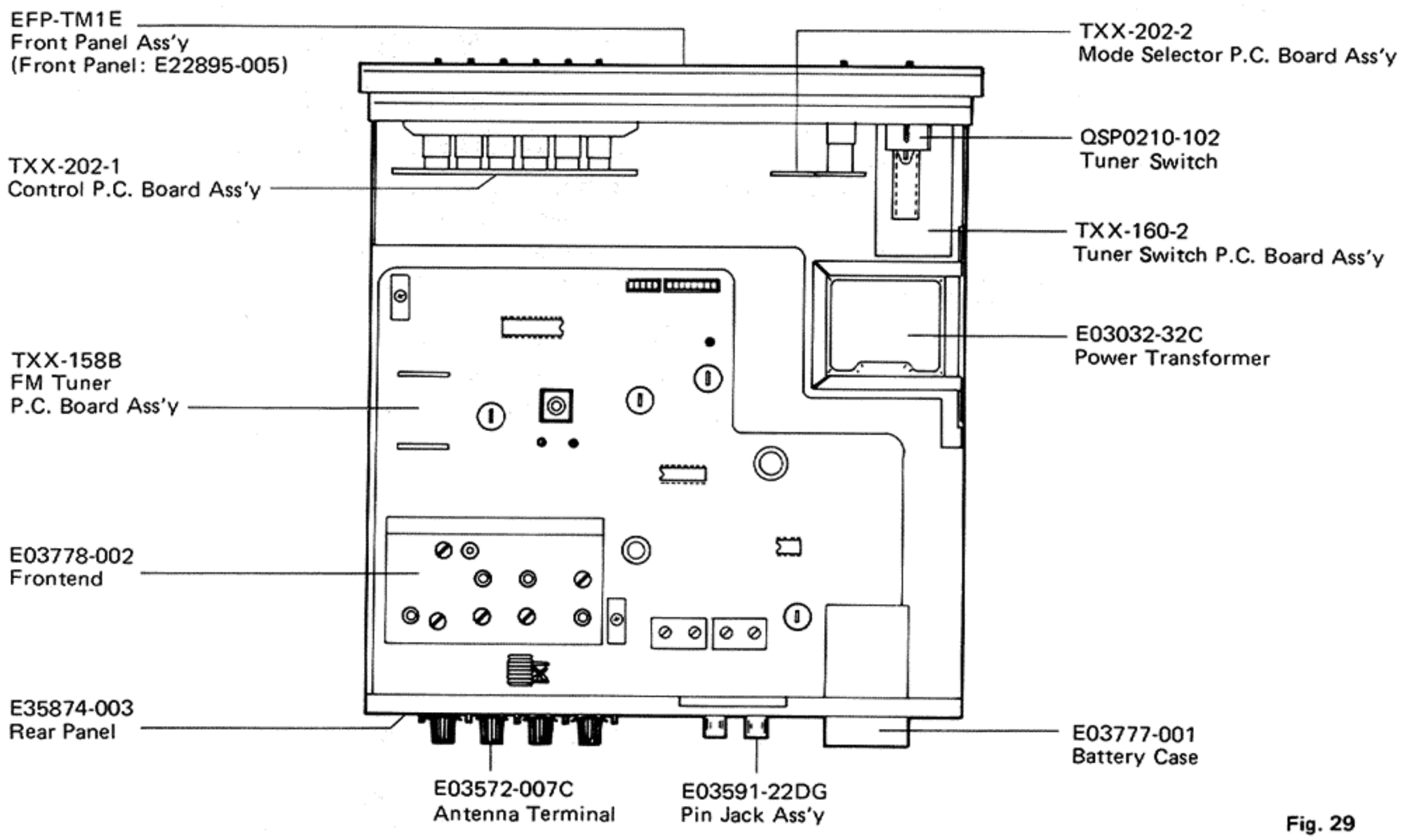


Fig. 29

7. Exploded Views and Part Numbers

7-(1) Metal Cover

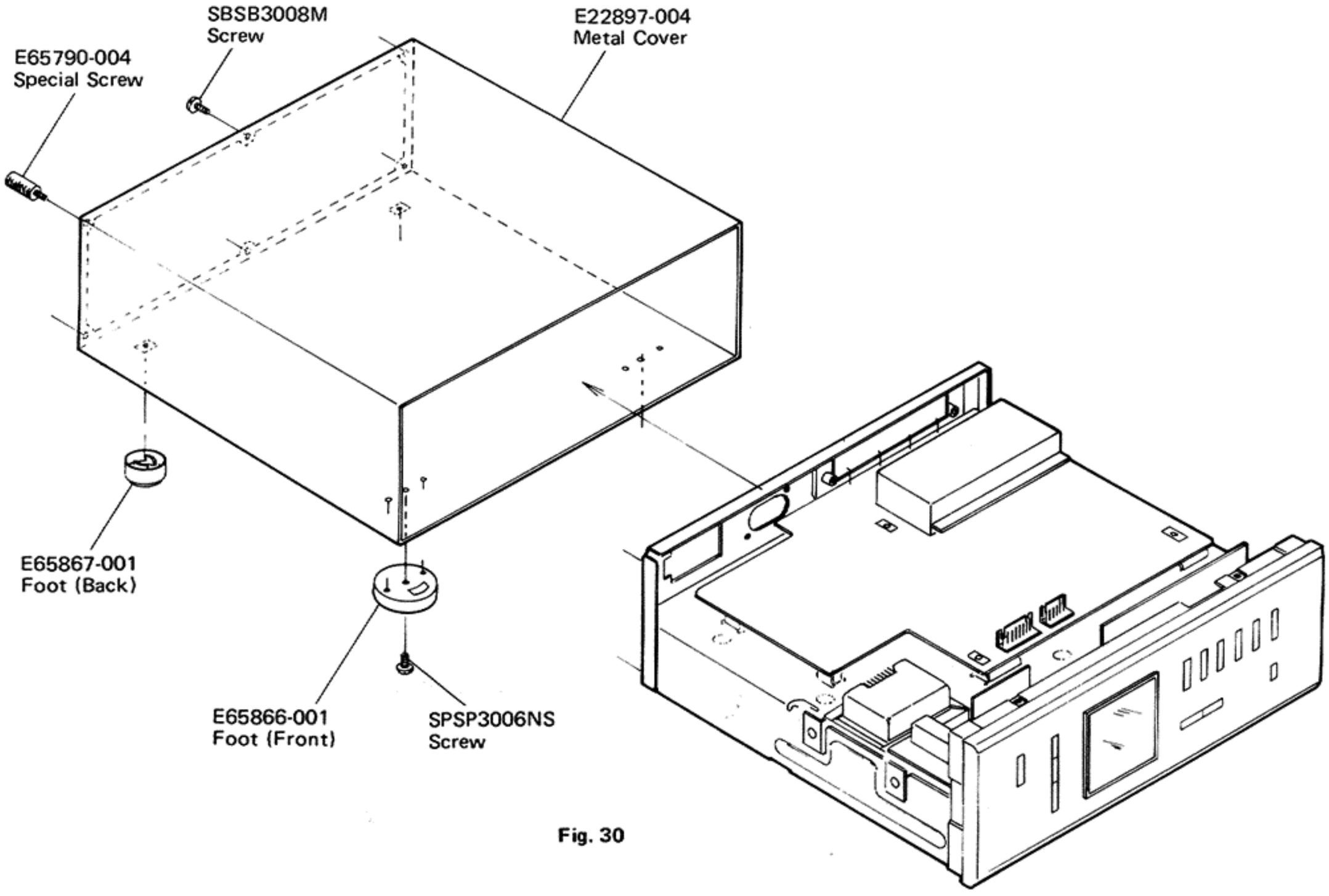


Fig. 30

7-(2) Front Panel & Chassis Base

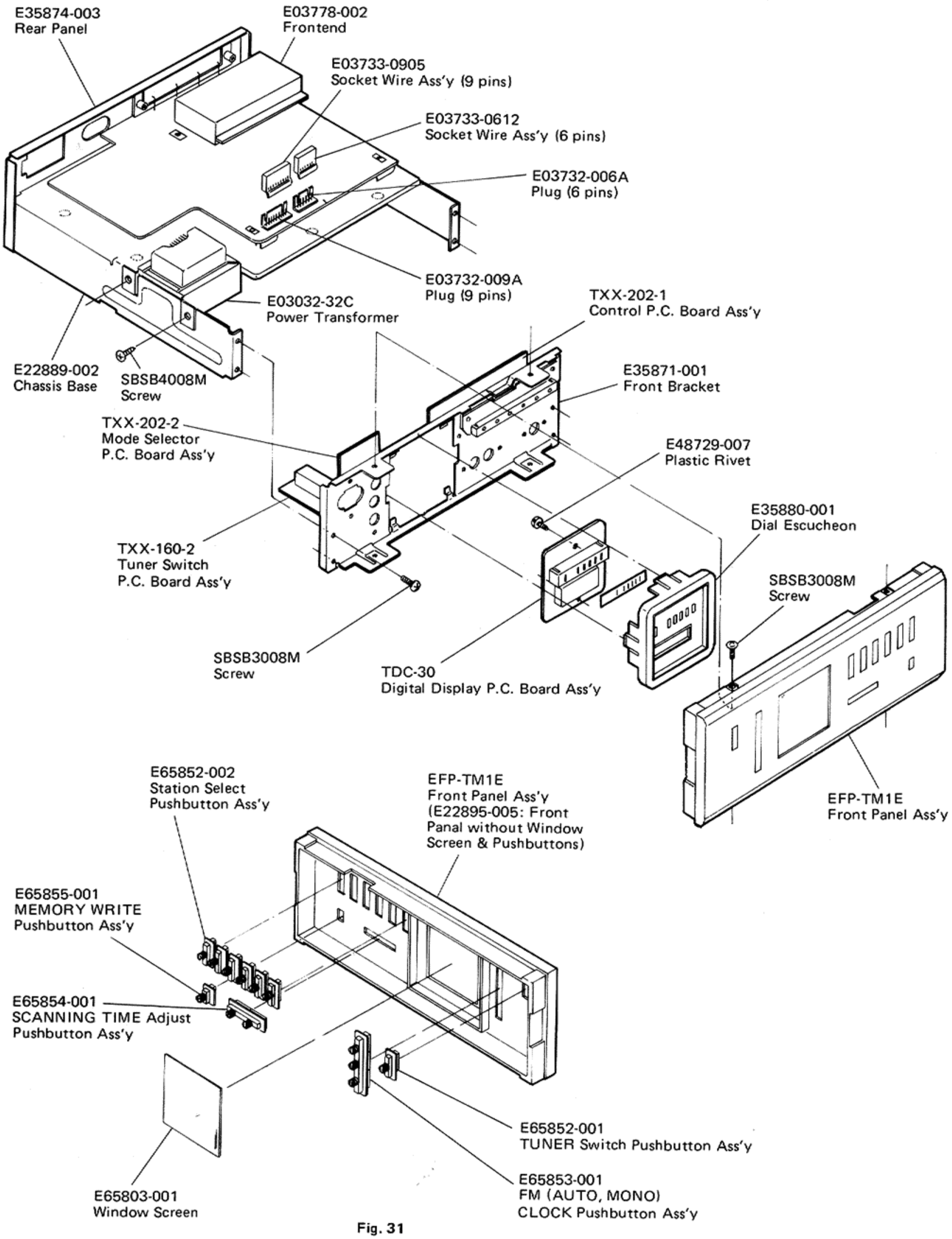


Fig. 31

7-(3) Rear Panel & Chassis Base

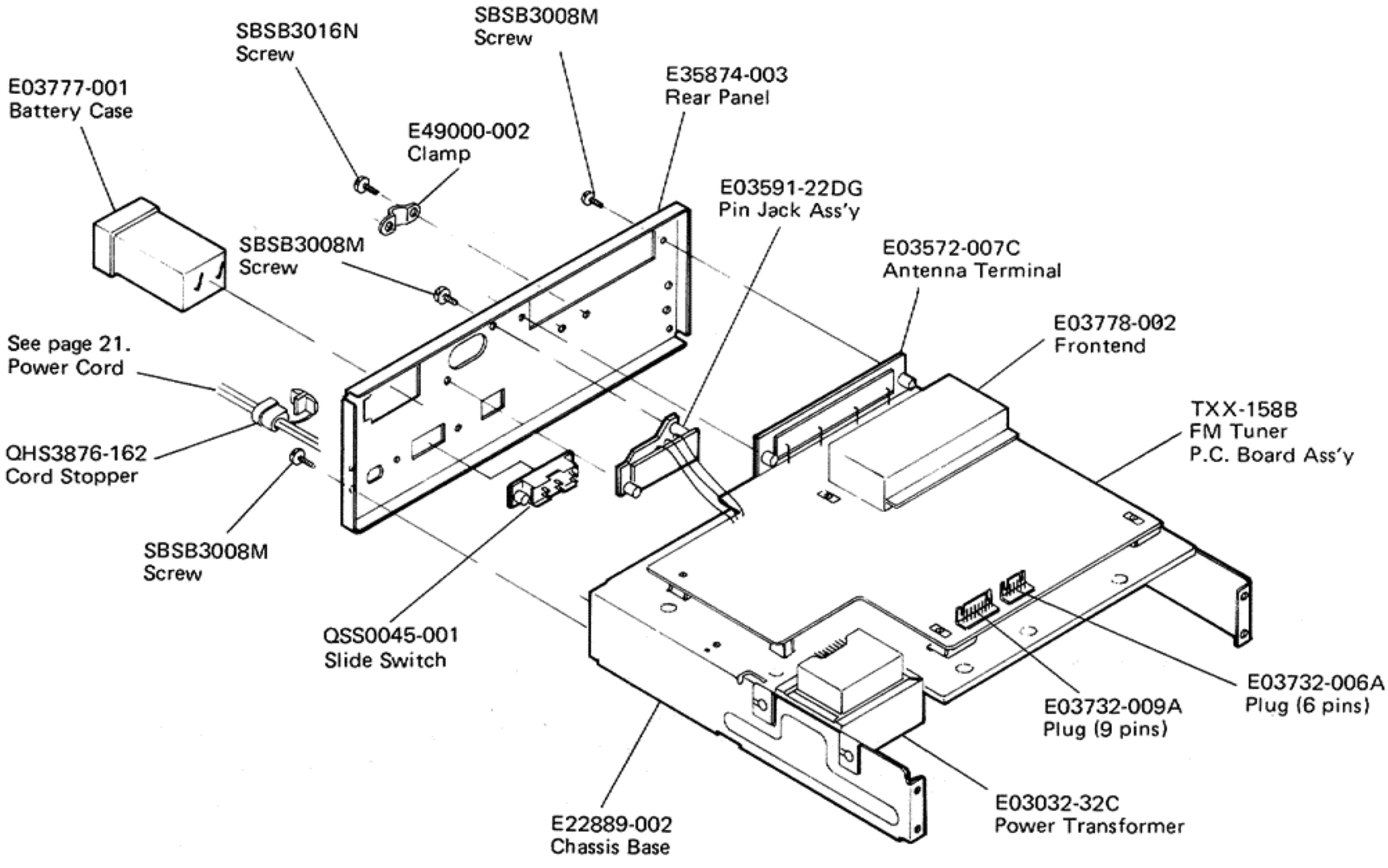


Fig. 32

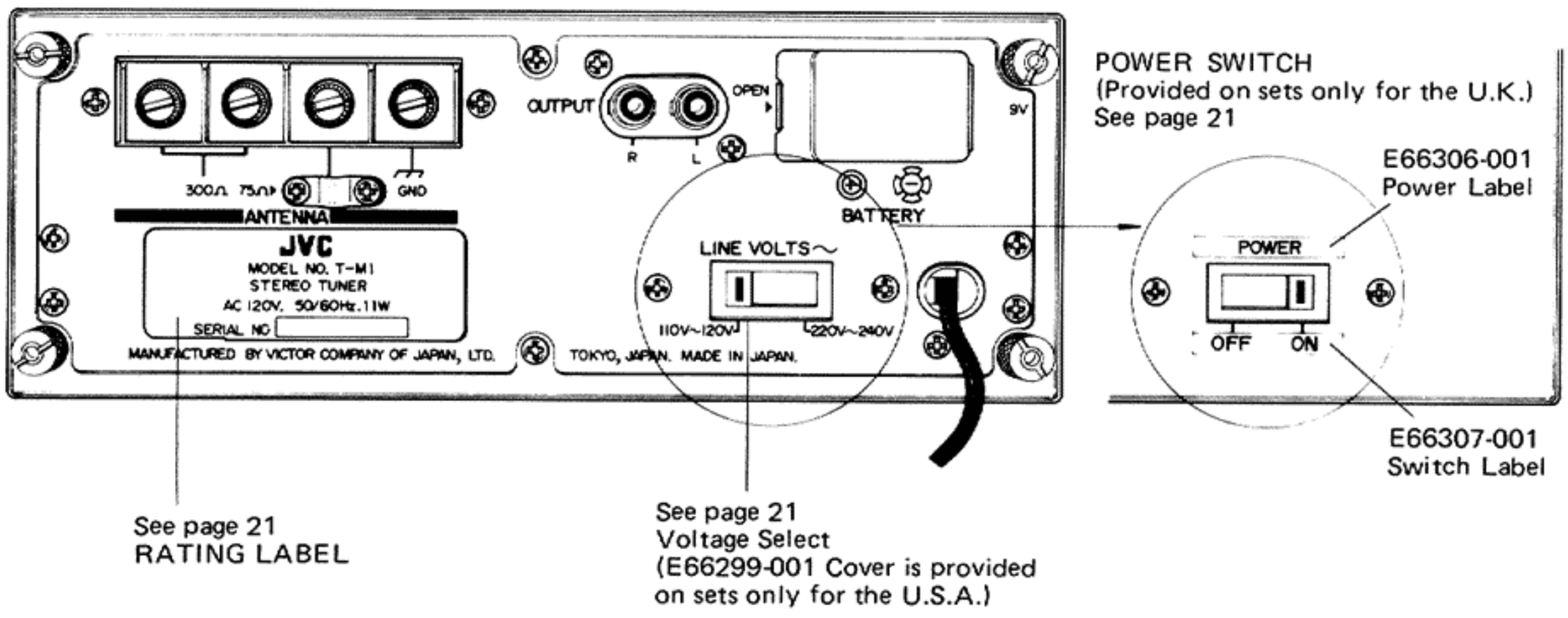


Fig. 33

8. Printed Circuit Board and Part Numbers

8-(1) TXX-158 FM Tuner P.C. Board Ass'y & TDC-30 Digital desplay P.C. Board Ass'y

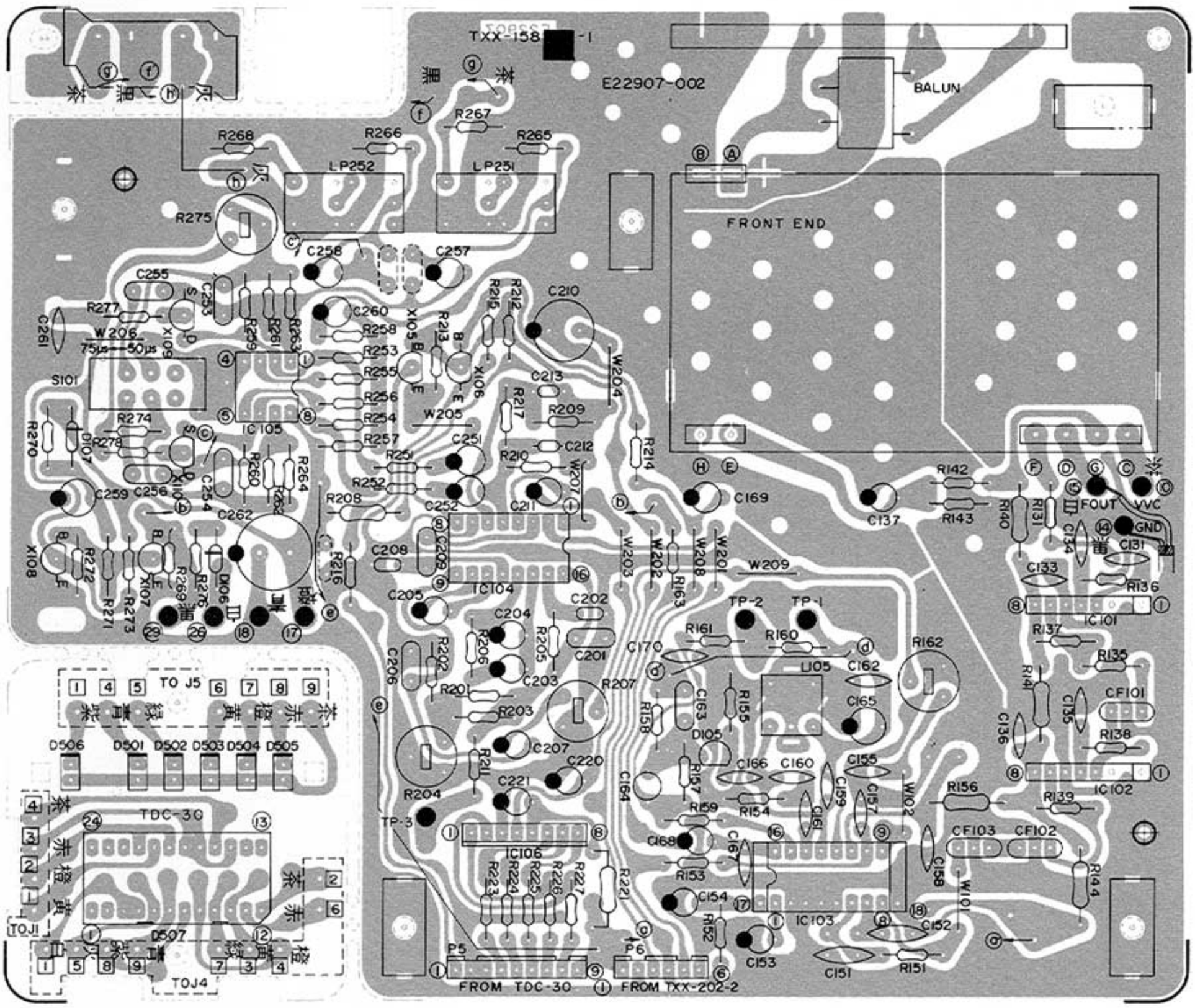


Fig. 34

Transistors

Item No.	Part Number	Rating		Description	
		Pc	fT		Maker
X105	2SC458(D)	0.2 W	230 MHz	Silicon	Hitachi
X106	2SC458(D)	"	"	"	"
X107	2SC458(D)	"	"	"	"
X108	2SC458(D)	"	"	"	"
X109	2SK68(M,N)	0.25 W	146 MHz	F E T	NEC
X110	2SK68(M,N)	"	"	"	"

Integrated Circuits

Item No.	Part Number	Rating	Description	
		PC		Maker
IC101	HA1211	0.2 W	IC AMP.	Hitachi
IC102	HA1211	"	" "	"
IC103	HA11211	0.73 W	IC FM IF AMP & DET.	"
IC104	HA11223 W		MPX	"
IC105	NUM4558D	0.5 W	IC AF AMP	JRC
IC106	M51903L		IC Signal Level Ind.	Mitsubishi

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D105	FC64M(L)		Variable Capacitor	Fujitsu
D106	1S2076-31		Silicon Diode	Hitachi
D107	1S2076-31		"	"
D501	TLG205		LED (Green)	Toshiba
D502	TLG205		"	"
D503	TLG205		"	"
D504	TLG205		"	"
D505	TLG205		"	"
D506	TLR205		(Red)	"

Filters

Item No.	Part Number	Rating	Description
	E03177-001		Balun 300 Ω – 75 Ω
CF101	E03357-011A	10.7 MHz ± 20 k	Ceramic Filter
CF102	E03357-011A	10.7 MHz ± 20 k	Ceramic Filter
CF103	E03357-011A	"	"
LP251	E03427-014		Low Pass Filter
LP252	E03427-014		"

T-M1
No. 2466

Coils & Transformers

Item No.	Part Number	Rating	Description
L105	E03078-40	10.7 MHz	Det. Coil

Capacitors

Item No.	Part Number	Rating		Description
C131	QCF31HP-223Z	0.022 μF	50 V	Ceramic
C133	QCF21HP-223	"	"	"
C134	QCF31HP-223Z	"	"	"
C135	QCF31HP-223Z	"	"	"
C136	QCF31HP-223Z	"	"	"
C137	QET51ER-106	10 μF	25 V	Electrolytic
C151	QCC21EM-473	0.047 μF	"	Ceramic
C152	QCC31EM-473Z	"	"	"
C153	QET51HR-225	2.2 μF	50 V	Electrolytic
C154	QET51HR-475	4.7 μF	"	"
C155	QCF21HP-223	0.022 μF	"	Ceramic
C156	QET51CR-107	100 μF	16 V	Electrolytic
C157	QCF21HP-223	0.022 μF	50 V	Ceramic
C158	QCF31HP-223Z	"	"	"
C159	QCT26CH-5R0	5 pF	50 V	"
C160	QCT26CH-5R0	"	50 V	"
C161	QCT25CH-100Z	10 pF	50 V	"
C162	QCC31EM-223Z	0.022 μF	25 V	Ceramic
C163	QCT25UJ-471	470 pF	50 V	"
C164	QEZ0046-475	4.7 μF	50 V	Electrolytic (Non Polar Capacitor)
C165	QET51HR-105	1 μF	50 V	Electrolytic
C166	QCC31EM-223Z	0.022 μF	25 V	Ceramic
C167	QCS31HJ-471Z	470 pF	50 V	"
C168	QEB51EM-475	4.7 μF	25 V	Low Leak Current Electrolytic
C169	QET51HR-105	1 μF	50 V	Electrolytic
C170	QCC21EM-223	0.022 μF	25 V	Ceramic
C201	QFP31HJ-102	1000 pF	50 V	P.P. Capacitor
C202	QFM31HK-222Z	2200 pF	50 V	Mylar
C203	QEB51EM-106	10 μF	25 V	Low Leak Current Electrolytic
C204	QEB51HM-474	0.47 μF	50 V	"
C205	QEB51EM-475M	4.7 μF	25 V	"
C206	QFM31HK-103Z	0.01 μF	50 V	Mylar
C207	QET51HR-474	0.47 μF	"	Electrolytic
C208	QFM31HK-152	1500 pF	"	Mylar
C209	QFM31HK-473Z	0.047 μF	"	"
C210	QET51CR-227	220 μF	16 V	Electrolytic
C211	QET51HR-474	0.47 μF	50 V	"
C212	QFM31HJ-102Z	1000 pF	"	Mylar
C213	QFM31HJ-102Z	"	"	"
C220	QET51CR-226	22 μF	16 V	Electrolytic
C221	QET51ER-106	10 μF	25 V	"
C251	QEB51EM-475	4.7 μF	"	Low Leak Current Electrolytic
C252	QEB51EM-475	"	"	"
C253	QFP31HG-102	1000 pF	50 V	P.P. Capacitor
C254	QFP31HG-102	"	"	"
C255	QFP31HG-511	510 pF	"	"
C256	QFP31HG-511	"	"	"
C257	QEB51EM-475	4.7 μF	25 V	Low Leak Current Electrolytic
C258	QEB51EM-475	"	"	"
C259	QET51CR-476	47 μF	16 V	Electrolytic
C260	QET51ER-106	10 μF	25 V	"
C261	QCF31HP-223Z	0.022 μF	50 V	Ceramic
C262	QET51CR-108	1000 μF	16 V	Electrolytic

Resistors

Item No.	Part Number	Rating		Description
R131	QRD141J-221SY	220 Ω	1/4 W	Carbon
R135	QRD141J-121SY	120 Ω	"	"
R136	QRD141J-331SY	330 Ω	"	"
R137	QRD141J-221SY	220 Ω	"	"
R138	QRD141J-331SY	330 Ω	"	"
R139	QRD141J-331SY	"	"	"
R140	QRD129J-100	10 Ω	1/2 W	" (Uninflammable)
R141	QRD129J-100	"	"	"
R142	QRD141J-103SY	10 kΩ	1/4 W	"
R143	QRD141J-332SY	3.3 kΩ	"	"
R144	QRD129J-100	10 Ω	1/2 W	"
R151	QRD141J-331SY	330 Ω	1/4 W	"
R152	QRD141J-123SY	12 kΩ	"	"
R153	QRD141J-222SY	2.2 kΩ	"	"
R154	QRD141J-272SY	2.7 kΩ	"	"
R155	QRD141J-334SY	330 kΩ	"	"
R156	QRD129J-100	10 Ω	1/2 W	"
R157	QRD141J-153SY	15 kΩ	1/4 W	"
R158	QRD141J-822SY	8.2 kΩ	"	"
R159	QRD141J-682SY	6.8 kΩ	"	"
R160	QRD141J-222SY	2.2 kΩ	"	"
R161	QRD141J-822SY	8.2 kΩ	"	"
R162	QVP4AOB-223	22 kΩ	1/8 W	Variable
R163	QRD141J-683SY	68 kΩ	1/4 W	Carbon
R201	QRD141J-682SY	6.8 kΩ	"	"
R202	QRD141J-822SY	8.2 kΩ	"	"
R203	QRD141J-224SY	220 kΩ	"	"
R204	QVP4A0B-222	2.2 kΩ	1/8 W	Variable
R205	QRD141J-333SY	33 kΩ	1/4 W	Carbon
R206	QRD141J-102SY	1 kΩ	"	"
R207	QVP4A0B-104	100 kΩ	1/8 W	Variable
R208	QRD129J-270	27 Ω	1/2 W	Carbon (Uninflammable)
R209	QRD141J-392SY	3.9 kΩ	1/4 W	"
R210	QRD141J-392SY	"	"	"
R211	QRD141J-224SY	220 kΩ	"	"
R212	QRD141J-682SY	6.8 kΩ	"	"
R213	QRD141J-102SY	1 kΩ	"	"
R214	QRD141J-473SY	47 kΩ	"	"
R215	QRD141J-273SY	27 kΩ	"	"
R216	QRD141J-122SY	1.2 kΩ	"	"
R217	QRD141J-473SY	47 kΩ	"	"
R221	QRD129J-100	10 Ω	1/2 W	" (Uninflammable)
R223	QRD141J-122SY	1.2 kΩ	1/4 W	"
R224	QRD141J-122SY	"	"	"
R225	QRD141J-122SY	"	"	"
R226	QRD141J-122SY	"	"	"
R227	QRD141J-122SY	"	"	"
R251	QRD141J-103SY	10 kΩ	"	"
R252	QRD141J-103SY	"	"	"
R253	QRD141J-273SY	27 kΩ	"	"
R254	QRD141J-273SY	27 kΩ	1/4 W	Carbon
R255	QRD141J-102SY	1 kΩ	"	"
R256	QRD141J-102SY	"	"	"
R257	QRD141J-103SY	10 kΩ	"	"
R258	QRD141J-103SY	"	"	"
R259	QRD141J-821SY	820 Ω	"	"
R260	QRD141J-821SY	"	"	"
R261	QRD141J-823SY	82 kΩ	"	"
R262	QRD141J-823SY	"	"	"
R263	QRD141J-104SY	100 kΩ	"	"
R264	QRD141J-104SY	"	"	"
R265	QRD141J-332SY	3.3 kΩ	"	"

Note: The specific symbols (赤 , 黒, 白 . . . etc.) on a surface of P.C. Board are actually unrelated to the repair service and are significant denotement in order to process the proper assembly of P.C. Board at the factory.

Resistors

Item No.	Part Number	Rating		Description
R266	QRD141J-332SY	3.3 kΩ	1/4 W	Carbon
R267	QRD141J-332SY	"	"	"
R268	QRD141J-332SY	"	"	"
R269	QRD141J-27SY	270 kΩ	"	"
R270	QRD141J-273SY	27 kΩ	"	"
R271	QRD141J-184SY	180 kΩ	"	"
R272	QRD141J-183SY	18 kΩ	"	"
R273	QRD141J-184SY	180 kΩ	"	"
R274	QRD141J-472SY	4.7 kΩ	"	"
R275	QVP4A0B-473	47 kΩ	1/8 W	Variable
R276	QRD141J-333SY	33 kΩ	1/4 W	Carbon
R277	QRD141J-474SY	470 kΩ	"	"
R278	QRD141J-474SY	"	"	"

Others

Item No.	Part Number	Rating	Description
	E03572-007C		Antenna Terminal
	E03591-22DG		Pin Jack Assy
P6	E03732-006A	6 P Plug	From TXX-202-2
P5	E03732-009A	9 P Plug	From TDC-30
	E03733-0404	4 P	Socket Wire Assy (To Plug P1)
	E03733-0905	9 P	" (To Plug P5)
	E03733-0906	9 P	" (To Plug P4)
	E03778-002		FM Front End
	E60700-001		Earth Plate
	E65792-001		LED Holder
	E65849-001		Shield Case
S101	QSS2201-002		Slide Switch (Deemphasis select)
D507	TLG2120		Digital Display LED

8-(2) TDC-35 Synthesizer P.C. Board Ass'y

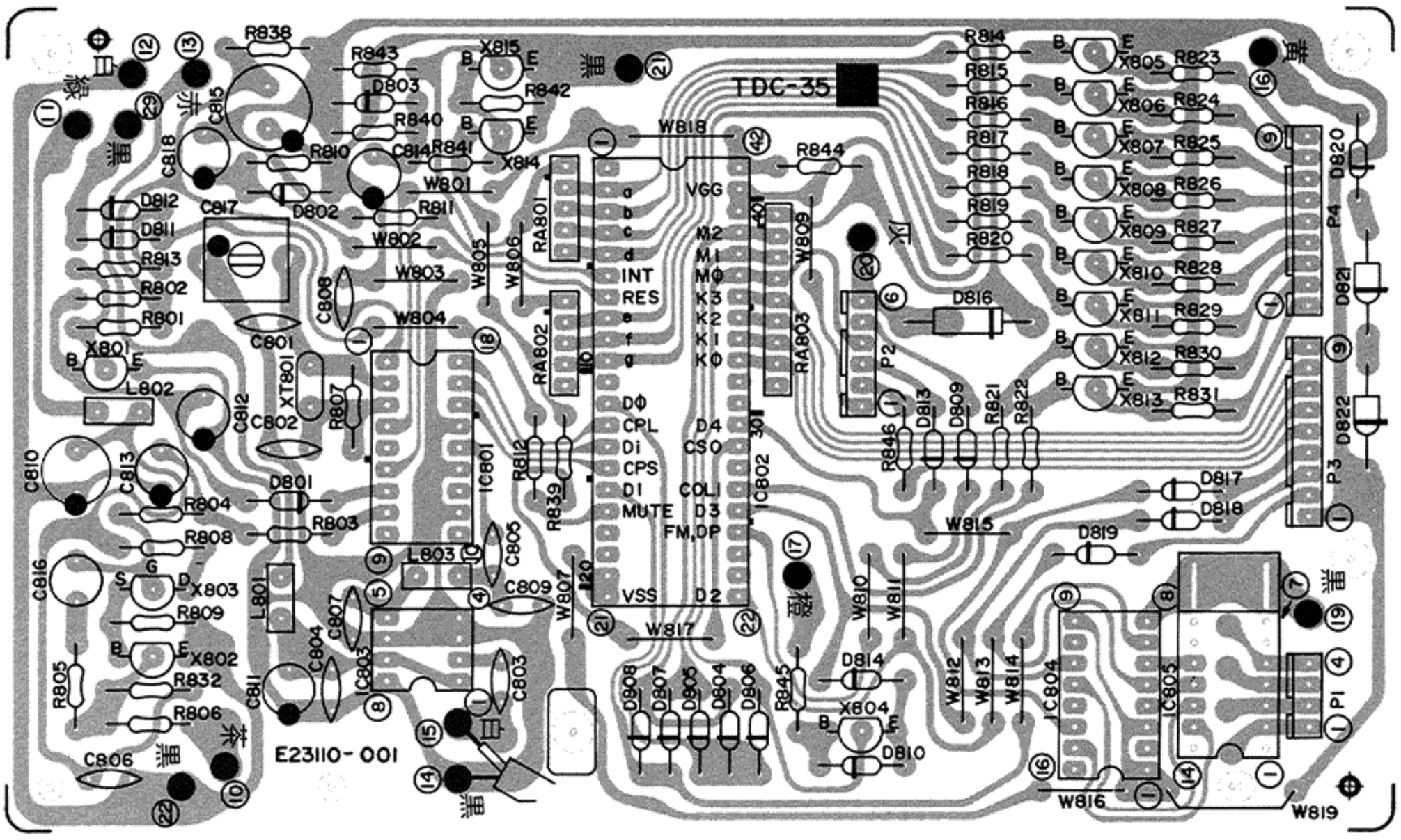


Fig. 35

Transistors

Item No.	Part Number	Rating		Description	
		Pc	fT		Maker
X801	2SC458(D)	0.2 W	230 MHz	Silicon transistor	Hitachi
X802	2SC458(D)	"	"	"	"
X803	2SK68A(L)	0.25 W	146 MHz	FET	NEC
X804	2SC458(D)	0.2 W	230 MHz	Silicon	Hitachi
X805	2SA1084(E)	0.3 W	"	"	"
X806	2SA1084(E)	"	"	"	"
X807	2SA1084(E)	"	"	"	"
X808	2SA1084(E)	"	"	"	"
X809	2SA1084(E)	"	"	"	"
X810	2SA1084(E)	"	"	"	"
X811	2SA1084(E)	"	"	"	"
X812	2SA1084(E)	"	"	"	"
X813	2SA1084(E)	"	"	"	"
X814	2SC458(D)	0.2 W	230 MHz	Silicon	Hitachi
X815	2SC458(D)	"	"	"	"

Note:
The specific symbols (赤,黒,白. . etc.) on a surface of P.C. Board are actually unrelated to the repaire service and are significant denotement in order to process the proper assembly of P.C. Board at the factory.

Integrated Circuits

Item No.	Part Number	Rating	Description	
		PC		Maker
IC801	MPD2819C		PLL Synthesizer IC	NEC
IC802	MPD1530C		Control LSI	"
IC803	MPB551C		ECL IC	"
IC804	TC4049BP		CMOS IC	Toshiba
IC805	UPA57C		Transistor Array	NEC

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D801	1S2076-31		Silicon Diode	Hitachi
D802	1S2076-31		"	"
D803	1S2076-31		"	"
D804	1S2076-31		"	"
D805	1S2076-31		"	"
D806	1S2076-31		"	"
D807	1S2076-31		"	"
D808	1S2076-31		"	"
D809	1S2076-31		"	"
D810	1S2076-31		"	"
D811	1S2076-31		"	"
D812	1S2076-31		"	"
D813	1S2076-31		"	"
D814	1S2076-31		"	"
D816	ERB12-02RKL1	1 A	"	Fuji
D817	1S2076-31		"	Hitachi
D818	1S2076-31		"	"
D819	1S2076-31		"	"
D820	1S2076-31		"	"
D821	SV03		"	Sanken
D822	SV03		"	"

Coils

Item No.	Part Number	Rating	Description
L801	E03522-2R2KY	2.2 μH	Choke Coil
L802	E03522-391KY	390 μH	"
L803	E03522-120K	12 μH	"

Capacitors

Item No.	Part Number	Rating		Description
C801	QCT26CH-180	18 pF	50 V	Ceramic
C802	QCT26CH-220	22 pF	50 V	"
C803	QCS21HJ-470	47 pF	50 V	"
C804	QCF21HP-103	0.01 μF	"	"
C805	QCF21HP-103	"	"	"
C806	QCF21HP-223	0.022 μF	"	"
C807	QCS21HJ-271	270 pF	"	"
C808	QCF21HP-223	0.022 μF	"	"
C809	QCS21HJ-121	120 pF	"	"
C810	QET51HR-226	22 μF	"	Electrolytic
C811	QET51AR-107	100 μF	10 V	"
C812	QEB51EM-106	10 μF	25 V	Low Leak Current Electrolytic
C813	QEB51HM-474	0.47 μF	50 V	"
C814	QET51ER-106	10 μF	25 V	Electrolytic
C815	QET50JR-477	470 μF	6.3 V	Electrolytic
C816	QEZ0046-225	2.2 μF	50 V	Electrolytic (NON POLAR)
C817	QAT2001-001	10 pF		Trimmer
C818	QEB51EM-225	2.2 μF	25 V	Low Leak Current Electrolytic

Resistors

Item No.	Part Number	Rating		Description
R801	QRD141J-223SY	22 kΩ	1/4 W	Carbon
R802	QRD141J-105SY	1 MΩ	"	"
R803	QRD141J-332SY	3.3 kΩ	"	"
R804	QRD141J-152SY	1.5 kΩ	"	"
R805	QRD141J-392SY	3.9 kΩ	"	"
R806	QRD141J-102SY	1 kΩ	"	"
R807	QRD141J-334SY	330 kΩ	"	"
R808	QRD141J-561SY	560 Ω	"	"
R809	QRD141J-271SY	270 Ω	"	"
R810	QRD141J-224SY	220 kΩ	"	"
R811	QRD141J-473SY	47 kΩ	"	"
R812	QRD141J-223SY	22 kΩ	"	"
R813	QRD141J-223SY	"	"	"
R814	QRD141J-682SY	6.8 kΩ	"	"
R815	QRD141J-682SY	"	"	"
R816	QRD141J-682SY	"	"	"
R817	QRD141J-682SY	"	"	"
R818	QRD141J-682SY	"	"	"
R819	QRD141J-682SY	"	"	"
R820	QRD141J-682SY	"	"	"
R821	QRD141J-682SY	"	"	"
R822	QRD141J-682SY	"	"	"
R823	QRD141J-220SY	22 Ω	"	"
R824	QRD141J-220SY	"	"	"
R825	QRD141J-220SY	"	"	"
R826	QRD141J-220SY	"	"	"
R827	QRD141J-220SY	"	"	"
R828	QRD141J-220SY	"	"	"
R829	QRD141J-220SY	"	"	"
R830	QRD141J-220SY	"	"	"
R831	QRD141J-220SY	"	"	"
R832	QRD141J-562SY	5.6 kΩ	"	"
R838	QRD141J-151SY	150 Ω	"	"
R839	QRD141J-224SY	220 kΩ	"	"
R840	QRD141J-473SY	47 kΩ	"	"
R841	QRD141J-184SY	180 kΩ	"	"
R842	QRD141J-473SY	47 kΩ	"	"
R843	QRD141J-104SY	100 kΩ	"	"
R844	QRD141J-152SY	1.5 kΩ	"	"
R845	QRD141J-104SY	100 kΩ	"	"
R846	QRD141J-103SY	10 kΩ	"	"

Others

Item No.	Part Number	Rating	Description
P1	E03732-004A		4 P Plug
P2	E03732-006A		6 P Plug
P3	E03732-009A		9 P Plug
P4	E03732-009A		9 P Plug
RA801	ERGS4XK-223	22 kΩ x 4	Resistor Array
RA802	ERGS4XK-223	"	"
RA803	ERGS8XK-104	100 kΩ x 8	"
XT801	E03737-005	5.76 MHz	X'tal

8-(3) TXX-160 Power Supply P.C. Board Ass'y

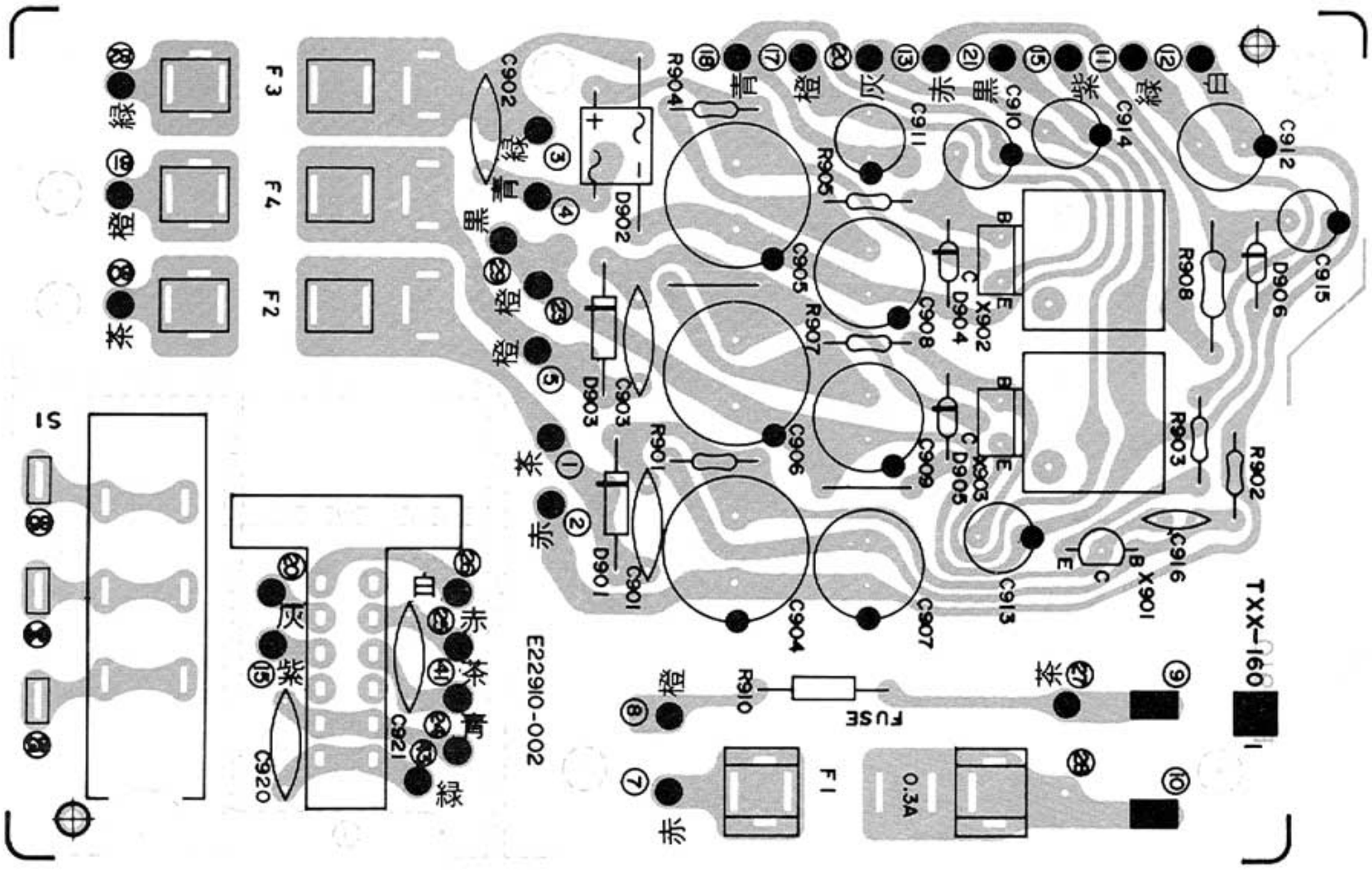


Fig. 36

Transistors

Item No.	Part Number	Rating		Description	
		Pc	fT		Maker
X901	2SD438(D,E)	750 mW	180 MHz	Silicon Transistor	Sanyo
X902	2SD313V(D,E)	30 W	8 MHz	〃	〃
X903	2SD313V(D,E)	30 W	8 MHz	〃	〃

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D901	ERB12-02RKL1	1 A	Silicon Diode	Fuji
D902	ESAB03-02A	1 A	Silicon Diode Bridge	〃
D903	ERB12-02RKL1	1 A	Silicon Diode	〃
D904	XZ-132	13.2 V, 500 mW	Zener Diode	JRC
D905	RD6.8EB3	6.8 V, 400 mW	〃	NEC
D906	WZ-050	5.0 V, 500 mW	〃	JRC

Resistors

Item No.	Part Number	Rating		Description
R901	QRD148J-103S	10 kΩ	1/4 W	Carbon
R902	QRD148J-683S	68 kΩ	〃	〃
R903	QRD148J-102S	1 kΩ	〃	〃
R904	QRD148J-102S	〃	〃	〃
R905	QRD148J-122S	1.2 kΩ	〃	〃
R907	QRD148J-122S	〃	〃	〃
R908	QRG017J-220S	22 Ω	1 W	Oxide Metal Film
R910	QRC121K-275E	2.7 MΩ	1/2 W	Comp. (for TXX-160B)

Capacitors

Item No.	Part Number	Rating		Description
C901	QCE22HP-103	0.01 μF	500 V	Ceramic
C902	QCE22HP-103	〃	〃	〃
C903	QCE22HP-103	〃	〃	〃
C904	QET51HR-477	470 μF	50 V	Electrolytic
C905	QET51ER-108	1000 μF	25 V	〃
C906	QET51ER-108	〃	〃	〃
C907	QET51VR-477	470 μF	35 V	〃
C908	QET51ER-477	〃	25 V	〃
C909	QET51ER-477	〃	〃	〃
C910	QET51CR-107	100 μF	16 V	〃
C911	QET51CR-107	〃	〃	〃
C912	QET51VR-227	220 μF	35 V	〃
C913	QET51CR-107	100 μF	16 V	〃
C914	QET51CR-107	〃	〃	〃
C915	QET51AR-107	〃	10 V	〃
C916	QCF21HP-103	0.01 μF	50 V	Ceramic
C920	QCE22HP-103	〃	500 V	〃
C921	QCE22HP-103	〃	〃	〃

Others

Item No.	Part Number	Rating	Description
S901	E48965-002	250 V, 4 A	Fuse Clip (For TXX-160C, D)
	E61537-001		Heat Sink (X902,903)
	QSP0210-102		Push Switch
	QSS0045-001		Voltage Select Switch (For TXX-160B, C)
	E61381-007		Fuse Label (315 mAT) (For TXX-160C, D)
	E61381-007		Fuse Label (315 mAT) (For TXX-160C, D)
	E61381-007		Fuse Label (315 mAT) (For TXX-160C, D)
	E45524-002		Fuse Clip (For TXX-160B)

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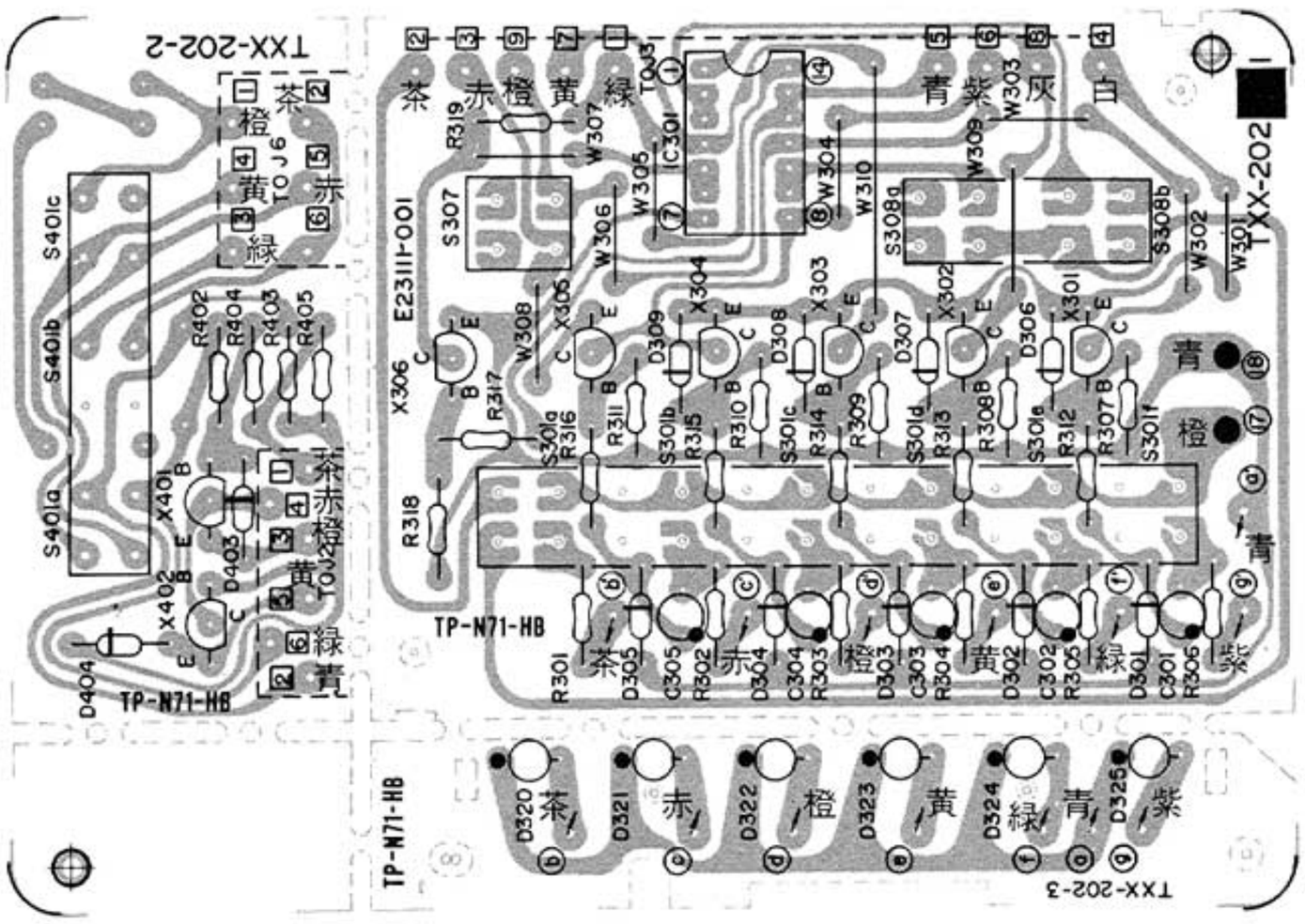
8-(4) TXX-202 Mode Select and Control P.C. Board Ass'y



Note:
The specific symbols (白 , 茶 . . . etc.) on a surface of P.C. Board are actually unrelated to the repaire service and are significant denotement in order to process the proper assembly of P.C. Board at the factory.

Fig. 37

Transistors

Item No.	Part Number	Rating		Description	
		Pc	fT		Maker
X301	2SC458(C,D)	250 mW	230 MHz	Silicon Transistor	Hitachi
X302	2SC458(C,D)	"	"	"	"
X303	2SC458(C,D)	"	"	"	"
X304	2SC458(C,D)	"	"	"	"
X305	2SC458(C,D)	"	"	"	"
X306	2SC458(C,D)	"	"	"	"
X401	2SC458(C,D)	"	"	"	"
X402	2SC458(C,D)	"	"	"	"

Integrated Circuits

Item No.	Part Number	Rating	Description	
		PC		Maker
IC301	TC4016BP		CMOS IC	Toshiba

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D301	1S2076-31		Silicon Diode	Hitachi
D302	1S2076-31		"	"
D303	1S2076-31		"	"
D304	1S2076-31		"	"
D305	1S2076-31		"	"
D306	1S2076-31		"	"
D307	1S2076-31		"	"
D308	1S2076-31		"	"
D309	1S2076-31		"	"
D320	SEL102S		LED (RED)	Sanken
D321	SEL102S		"	"
D322	SEL102S		"	"
D323	SEL102S		"	"
D324	SEL102S		"	"
D325	SEL102S		"	"
D403	1S2076-31		Silicon Diode	Hitachi
D404	1S2076-31			"

Capacitors

Item No.	Part Number	Rating		Description
C301	QEB51HM-334	0.33 μF	50 V	Low Leak Current Electrolytic
C302	QEB51HM-334	"	"	"
C303	QEB51HM-334	"	"	"
C304	QEB51HM-334	"	"	"
C305	QEB51HM-334	"	"	"

Resistors

Item No.	Part Number	Rating		Description
R301	QRD148J-122S	1.2 kΩ	1/4 W	Carbon
R302	QRD148J-122S	"	"	"
R303	QRD148J-122S	"	"	"
R304	QRD148J-122S	"	"	"
R305	QRD148J-122S	"	"	"
R306	QRD148J-122S	"	"	"
R307	QRD148J-474S	470 kΩ	"	"
R308	QRD148J-474S	"	"	"
R309	QRD148J-474S	"	"	"
R310	QRD148J-474S	"	"	"
R311	QRD148J-474S	"	"	"
R312	QRD148J-333S	33 kΩ	"	"
R313	QRD148J-333S	"	"	"
R314	QRD148J-333S	"	"	"
R315	QRD148J-333S	"	"	"
R316	QRD148J-333S	"	"	"
R317	QRD148J-103S	10 kΩ	"	"
R318	QRD148J-104S	100 kΩ	"	"
R319	QRD148J-104S	"	"	"
R402	QRD148J-683S	68 kΩ	"	"
R403	QRD148J-103S	10 kΩ	"	"
R404	QRD148J-273S	27 kΩ	"	"
R405	QRD148J-104S	100 kΩ	"	"

Others

Item No.	Part Number	Rating	Description
	E03733-0612		Socket Wire Ass'y (To P6)
	E03733-0614		" (To P2)
	E03733-0908		" (To P3)
	E65791-001		LED Holder
S301	QSP0028-601		Push Switch (For Station Select)
S307	QSP0028-101		" (For Memory Write)
S308	QSP0028-201		" (For Up/Down)
S401	QSP0028-301		" (For Mode Select)

10. Packing Materials and Part Numbers

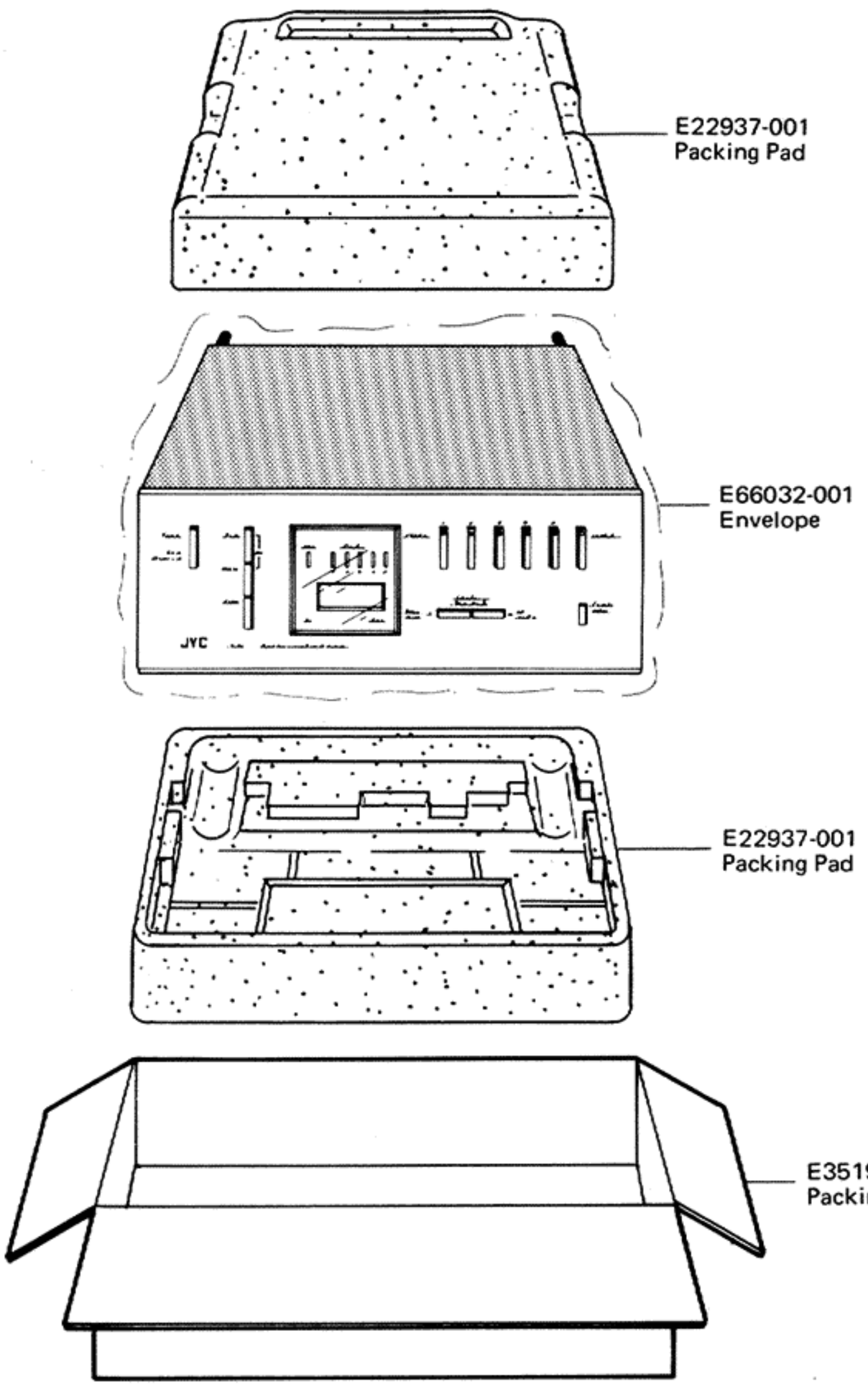


Fig. 40

11. Accessories List

Description	Parts Number					Q'ty
	For U.S.A.	For European continent, Scandinavian countries & Finland	For U.K.	For Australia	For other countries	
Instruction Book	E30580-740A	E30580-740A	E30580-740A	E30580-740A	E30580-740A	1
Envelope (for Inst. book)	E41202-9	E41202-9	E41202-9	E41202-9	E41202-9	1
Envelope (for Accessories)	EPGA014-02005	EPGA014-02005	EPGA014-02005	EPGA014-02005	EPGA014-02005	1
FM Antenna	E03614-002	E03614-002	E03614-002	E03614-002	E03614-002	1
Signal Cord	E03479-003G	E03479-003G	E03479-003G	E03479-003G	E03479-003G	1
Siemens Plug	–	–	–	–	E04056	1
Warranty Card	BT20032	–	BT20013B	BT20029	BT20032 (for U.S. Military Market)	1
'Do It Better"	BT20024B	–	–	–	–	1
Service Procedures	BT20023	–	–	–	–	1
Caution Label	–	E66305-002 (for 220 – 240 V)	–	E66305-002 (for 220 – 240 V)	E66305-001 (for 110 – 120 V) or E66305-002 (for 220 – 240 V)	1

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12. Parts List with Specified Numbers for Designated Areas

Page	Item No.	Description	U.S.A.	Europe	U.K.	Australia	Other countries
11		Power Cord ⚠	QMP1200-200	QMP3900-200	QMP9017-008	QMP2560-244	QMP7600-250
11		Cord Stopper ⚠	QHS3876-162	QHS3876-162	QHS3876-162	QHS3876-162	QHS3876-162
11		Cover	E66299-001	–	–	–	–
	F1	Fuse (Pri'y) ⚠	QMF61U1-R30	QMF51A2-R315L	QMF51A2-R315L	QMF51A2-R315L	QMF60S1-R30
	F3	Fuse (Sec'y) ⚠	–	QMF51A2-R315L	QMF51A2-R315L	QMF51A2-R315L	–
	F4	Fuse (Sec'y) ⚠	–	QMF51A2-R315L	QMF51A2-R315L	QMF51A2-R315L	–
11		Power Switch ⚠	–	–	QSS0045-001	–	–
11		Voltage Select ⚠	QSS0045-001	QSS0045-001	–	QSS0045-001	QSS0045-001
		Fuse Label ⚠	E61378-008	–	–	–	–
11		Rating Plate ⚠	E48761-087	E65403-011	E65403-012	E65403-011	E65402-009
16	R910	Composition Res ⚠	QRC121K-275E	–	–	–	–
16		Power P.C. Board Ass'y ⚠	TXX-160B	TXX-160C	TXX-160D	TXX-160C	TXX-160B
		Warning Label ⚠ (for Power Cord)	–	–	E60965-001	–	–
11		Power Label ⚠	–	–	E66306-001	–	–
11		Switch Label ⚠	–	–	E66307-001	–	–

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