

# FURUNO

## SERVICE MANUAL

SSB RADIOTELEPHONE

MODEL FS-1550



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NISHINOMIYA, JAPAN

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FS-1550

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**SPECIFICATIONS OF FS-1550****GENERAL CHARACTERISTICS****1. Frequency Range**

1.6 to 23MHz in 10Hz steps  
525 - 1605kHz (receive only, where permitted by authorities. Degraded sensitivity)

**2. Frequency Accuracy**

After warmup: TX  $\pm$  20Hz  
Tuning Error: RX 20Hz (5Hz by clarifier)  
Tuning Drift: RX 10Hz (15 min.)

**3. Communication System**

Simplex or semi-duplex

**4. Class of Emission**

J3E, H3E, R3E  
(option: A1A, F1B; T/A spec not considered)  
Automatic selection H3E on 2182kHz, manual override to other emission.

**5. Number of Channels****Separate TX, RX Frequencies:**

TX: 64 factory programmed, recalled by CH No.

RX: 10Hz step free selection independent of TX frequency, user programmable with CH No. 1 - 64.

**Paired TX/RX Frequencies:** Factory programmed 64 TX/RX pairs selected by CH No. 1 - 64.

**ITU HF:** 192 ITU channels (Available in both Separate and Paired TX/RX frequency versions)

**6. Power Supply**

13.6 VDC  $\pm$  15%, 18A (TX), 1.2A (Standby)

24 or 32VDC with extra DC-DC converter

110/220VAC with extra rectifier

**TRANSMITTER CHARACTERISTICS****1. RF OUTPUT POWER**

J3E/R3E/H3E: 150 W<sub>p</sub>ep at 50 ohm load (@13.6VDC, IEC rec.), reduction to 60 W<sub>p</sub>ep or less

A1A/F1B (option): 100W

**2. Two-tone Alarm Generator**

Built in as standard.

**ANTENNA COUPLER CHARACTERISTICS****1. Input Impedance** 50 ohms**2. Antenna** 6 - 15m wire or whip**3. Tuning Speed** 0.2 to 2 sec typical**RECEIVER CHARACTERISTICS****1. Receiving System**

Double-conversion superheterodyne  
IF: 54.455MHz and 455kHz

**2. Sensitivity**

Input level at 50 ohms to produce SINAD 20dB  
J3E/R3E: 3dBuV (1.4uV<sub>rms</sub>)  
H3E: 16dBuV (6.3uV<sub>rms</sub>)

**3. Selectivity**

J3E/R3E: 350 to 2700Hz H3E:  $\pm$ 3kHz  
A1A/F1B(option):  $\pm$ 150Hz

**4. Scan**

8 groups (8 ch/group), All channels in selected band on ITU channels. Dwell time 1 - 9 sec where traffic is present.

**5. Audio Output**

3W rated into internal speaker  
5W max. into external 4-ohm speaker

**6. Other Features**

AGC: ON/OFF; RF Gain: Adjustable;  
Noise Blanker: always in circuit;  
Squelch: ON/OFF;  
Dimmer: OFF/Dark/Med/Bright;  
Speaker: ON/OFF (Handset always alive)

**EQUIPMENT LIST****(Standard)**

Main Unit w/ Mounting Bracket	1set
Telephone Handset	1set
Antenna Coupler	1set

**(Optional)**

DC-DC Converter PC-220 for 24 or 32 VDC	
Rectifier PR-270 for 110/220VAC mains	
Flushmount Adapter for Main Unit	

**ANTENNA COUPLER (AT-1500)**

Tuning System	CPU controlled fully automatic tuning system
Frequency Range	1.6 to 25 MHz
Input Impedance	50 ohms (Viewed from transceiver)
Antenna Required	6 to 15 m wire or whip
Power Capability	150 W <sub>pep</sub> , 75 W continuous
Tuning Power	10 W
VSWR	Less than 1.5
Tune-up Time	Within 2 to 15 sec. Within 0.5 sec. in the pretuned bands
Switches/controls	MANUAL 2182 kHz tuning facility TEST switch (Self-test)
Power Requirement	15 VDC (supplied from transceiver), 0.6 A max.
Ambient Temperature	- 30°C to + 60°C at 95% RH
Construction	Weather-proof plastic cabinet, stainless steel mount
Coating Color	White
Dimensions	267 mm (W) × 390 mm (H) × 90 mm (D) (10.5" × 15.4" × 3.5")
Weight	Approx. 2.9 kg (6.4 lbs.)

## MAINTENANCE PARTS LIST FOR FS1550

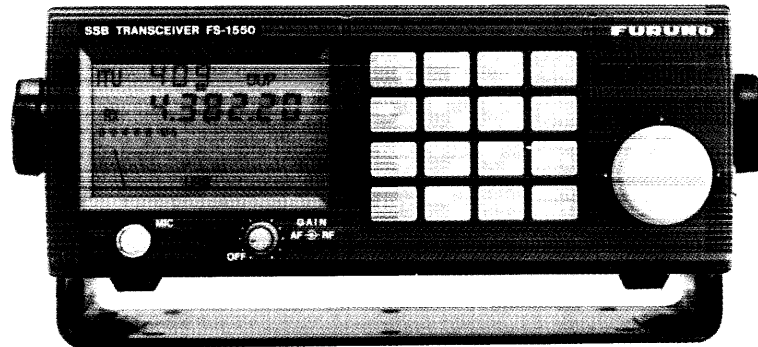
\*1:DEPOT MAINTENANCE PARTS FOR 10 SETS IN 2 YEARS  
\*2:SHIPBORNE RUNNING PARTS FOR 1 SET IN 2 YEARS

CODE NO.	NAME OF PARTS	TYPE	SPECIFICATIONS	QUANTITY		REMARKS
				#1	#2	
000-113-440	TRANSISTOR	2SC3240		6	2	PAIR
000-118-083	TRANSISTOR	2SA1315-Y		3	1	PAIR
000-126-340	TRANSISTOR	2SC3133		6	2	
000-127-940	TRANSISTOR	2SD667A		3	1	
000-128-069	TRANSISTOR	2SD1271A-P		3	1	
000-113-449	FET	2SK751A		6	2	PAIR
000-129-359	FET	2SK125		6	2	
000-107-973	DIODE	MA649		3	1	
000-110-984	IC	UPC1242H		3	1	
000-112-744	IC	SQ	05S0393-0	3	1	
000-113-353	IC	VOX	05S0397-0	3	1	
000-113-391	IC	IF	05S0392-0	3	1	
000-113-393	IC	NB	05S0394-0	3	1	
000-113-394	IC	AGC	05S0396-0	3	1	
000-113-395	IC	ALC	05S0395-0	3	1	
000-113-448	IC	NJM7805A		3	1	
000-103-544	RELAY	G6B-1114P-US	DC12V	10	3	
000-113-428	RELAY	G6B-2114P-DC12V		1	2	
000-113-485	RELAY	G4W-2212PU5V5-DC12V		3	1	
000-549-017	FUSE GLASS TUBE TYPE	FGB0 30A AC125V	00S0081	20	3	
000-113-465	LOUDSPEAKER	SI008047	05S0391-0	3	1	
000-112-622	MICROPHONE WITH CURL CORD	DM1620FZ1 W/FM10PS6H	FM-2510	3	1	
005-592-270	PRINTED CIRCUIT BOARD	05P0274*PA	FS-1500/1550	1		
005-592-310	PRINTED CIRCUIT BOARD	05P0276*SW REG	FS-1500/1550	1		
005-592-370	PRINTED CIRCUIT BOARD	05P0278*COUP	AT-1500	1		
005-592-440	FRONT PANEL ASSEMBLY	FRONT PANEL	FS-1550	1		
005-592-490	PRINTED CIRCUIT BOARD	05P0273A*TX/FIL	FS-1500/1550	1		
005-593-600	PRINTED CIRCUIT BOARD	05P0326*RELAY	FS-1500/1550	1		
005-593-620	PRINTED CIRCUIT BOARD	05P0328A*TX/RX	FS-1550	1		
000-287-502	MODULE CAPACITOR	EXF-P4103ZW	0.01UF 50V	6		
000-375-524	METAL OXIDE FILM RESISTOR	ERG-3SJS60P	00S0102-0	6		
000-375-538	METAL OXIDE FILM RESISTOR	ERG-3SJR21P	00S0102-0	6		
000-375-539	METAL OXIDE FILM RESISTOR	ERG-3SJJ102P	3W 1K	6		

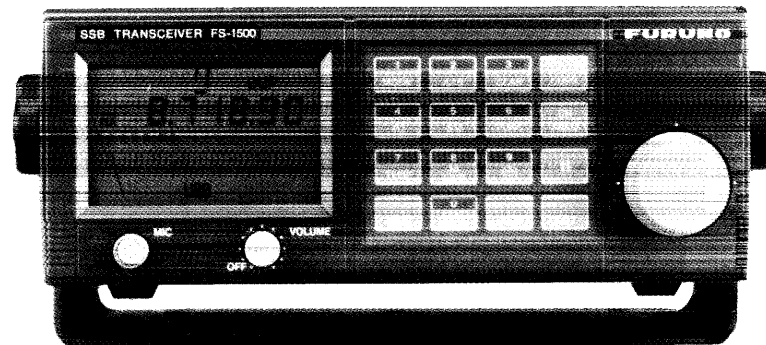
## CHAPTER 1 CIRCUIT DISCRIPTION

### 1.1 Major Difference Between FS-1550 and FS-1500 Series

FUNCTION	FS-1550	FS-1500 Series
Display of TX Frequency	Enable	Disable
RF GAIN Control Knob	Provided	Not provided
AGC Control Knob	Provided	Not provided
Setting Different Channel Numbers for TX and RX (Cross Band Operation) on ITU Ch. and/or User Ch.	Enable	Disable
Baud Rate of RS-232C Data	Fixed (4800)	Selectable (9600 OR 4800)



Front View of FS-1550



Front View of FS-1500



## 1.2 Transceiver Unit

The FS-1550 radiotelephone set is a modern, 2-unit design. The 2 units are transceiver unit and antenna coupler unit. The transceiver unit contains 6 printed circuit boards; the CPU board, TX/RX board, TX FIL board, PA board, RELAY board and the SW REG board.

### 1. Transmitter Section

Refer to the Transmitter Block Diagrams on page 1-17.

An audio signal applied to the microphone is amplified by U10 of the TX/RX board. U10 also compresses excessive level of speech to achieve proper modulation level.

The compressed audio signal is switched by Hybrid IC U12 and applied to Double Balanced Modulator (DBM) CR28. The DBM modulates the audio signal with the 3rd local oscillation frequency 456.5kHz (USB) and outputs a Double Side Band (DSB) signal with suppressed carrier.

The DSB signal is amplified by Buffer Amplifier Q12 and passed to Crystal Filter FL3 where unwanted Upper Side Band (USB) component is rejected and only Lower Side Band (LSB) component is selected.

In order to inject the carrier for class of emission R3E and H3E, the 3rd local oscillation frequency 456.5kHz is injected at the output of FL3 and carrier level for R3E and H3E is adjusted by potentiometer R85 and R87, respectively.

The LSB signal is mixed with the 2nd local oscillation frequency 54MHz by the 2nd Mixer CR27 DBM, resulting in the output of a 54.455MHz LSB signal.

The 54.455MHz LSB signal is amplified by Buffer Amplifier Q10 and passes through Crystal Filter FL1 (54.455MHz) where unwanted components are deleted.

The 1st Mixer CR26 DBM mixes the LSB signal with the 1st local oscillation frequency ( $f + 54.4565\text{MHz}$ ) to generate a transmit frequency ("f") from 1.6 to 23 MHz. As the Mixer outputs the difference frequency, the LSB signal is converted to a USB signal.

The USB signal output goes to a combination of a Low Pass Filter (LPF) and a High Pass Filter (HPF) consisting of coils L7 to L10 and capacitors C48 to C57 which delete unwanted components.

The USB signal is amplified by Wideband Amplifier IC U2 and Buffer Amplifiers Q7 and Q5 to a level required to drive the B04 Power Amplifier (P.A.).

In the PA section an input from the TX/RX board is amplified by two push-pull amplifiers, consisting of Q1 and Q2, and Q3 and Q4, to a level of nominal output power.

The Power Amplifier incorporates Temperature Detector, comprised of RT2 and U1, which monitors the temperature of the power amplifier transistors. When the temperature at the top of the transistors exceeds approx. 80°C, the Temperature Detector outputs DC voltage which is recognized as "over-temp" by MPU, resulting that the gain of Wideband Amplifier U2 of the TX/RX board is decreased "LOW POWER".

The output of the PA passes through an LPF in the B03 TX FIL board where harmonics of the signal are deleted. Spurious components contained in the signal output from the LPF are attenuated by at least 65 dB relative to the wanted signal.

LPF	Cut-off Frequency
B1	2.4 MHz
B2	3.6 MHz
B3	6.0 MHz
B4	10.0 MHz
B5	18.0 MHz
B6	30.0 MHz

L14, CR1, CR2 and U1 of the TX FIL board form the SWR Detector which detects excessive Standing Wave due to antenna matching failure or open-circuited or short-circuited antenna terminal. Should one of these occur, the SWR detector reduces the gain of the Wideband Amplifier U2 in the B02 TX/RX board to protect the PA from damage. U2 also controls power reduction with DC voltage sent by the CPU.

If the PA is driven to produce output power exceeding the rated power, the DC voltage of the ALC signal is increased, gain at U2 is decreased and the drive level (output level of the TX/RX board) is decreased so as not to exceed the rated output power.

## 2. Local Oscillator Section

Refer to the Local Oscillator Block Diagram on Page 1-18.

All local oscillation frequencies are generated by the VCO (Voltage Controlled Oscillator) section of the TX/RX board.

Table 1.2 Local Oscillation Frequency

	USB/R3E	LSB	TLX	CW	AM
1st LO (kHz)	F+54456.5	F+54453.5	F+54455.0	F+54455.0	F+54455.0
2nd LO (kHz)	54000.0	54000.0	54000.0	54000.0	54000.0
3rd LO (kHz)	456.5	453.5	456.7	(TX)455.0 (RX)455.8	455.0

49.5 MHz is oscillated by crystal Y1 in the oven and U9. 49.5 MHz is divided by 11 by U10, becoming 4.5 MHz, which is used as the reference frequency for the Phase Lock Loops.

The 1st local oscillation frequency is generated by 2 Phase Lock Loops, Loop-1 and Loop-2. A frequency between 50.500 and 51.499 MHz in 1 kHz steps is produced by PLL IC U2 and VCO Q1. The resultant frequency is divided by 100 by U3 and mixed with 49.5 MHz by U4 resulting in the generation of a frequency between 50.00500 and 50.01499 MHz in 10 Hz increments.

Loop-1 generates, with PLL IC U5 and VCO Q7, 1st local oscillation frequency ( $f+54.455\text{MHz}$  in 10Hz steps). Mixer U8 outputs a frequency from 4.55 to 34.44MHz in 10kHz steps by mixing a frequency between 50.500 to 51.499MHz with the output frequency of the Loop-2.

The 2nd local oscillation frequency (54.0MHz) is synthesized with the crystal oscillation frequency (49.5 MHz) and the reference frequency (4.5MHz).

Loop-3 consisting of PLL IC U11 and VCO Q15 generates a frequency between 45.35 and 45.68MHz in 10kHz steps. This is divided by 100 by U12 to generate the 3rd local oscillation frequency (453.5 to 456.8kHz) depending on class of emission.

### 3. Receiver Section

Refer to the Receiver Block Diagram on page 1-19.

A received frequency ("f"), passes through the antenna matching network in the antenna coupler unit, and is sent to an LPF in B03 TX FIL board. The signal then passes through the BC rejection filter which deletes incoming broadcasting signal in the BC band and an LPF which protects local frequency signals from passing through the antenna system. The received signal is passed through Induction Rejector CR1 and CR2, amplified by RF Amplifier Q1 and Q2 and supplied to the 1st Mixer CR26 DBM.

1st mixer mixes the received signal with the 1st local oscillation frequency ( $f + 54.455\text{ MHz}$ ). The 1st IF (54.455 MHz) passes through filter FL4 ( $\pm 4\text{kHz}$  bandwidth) for rejection of unwanted components and then is amplified by U1.

The amplified 1st IF signal is mixed with the 2nd local oscillation frequency (54.0 MHz) by the 2nd Mixer CR27 DBM resulting in the output of the 455 kHz 2nd IF signal. CR16, CR17 and the hybrid IC U4 cut spike noise in the 2nd IF signal. The 2nd IF signal is applied to a bandpass filter FL3, FL4 or FL5 in accordance with the class of emission selected. It is then amplified by hybrid IC U7 and supplied to Detector CR28 thru a BPF and Buffer Amplifier Q13.

CR28 mixes the 2nd IF signal with the 3rd local oscillation frequency (456.5MHz, for USB), which results in the output of an audio frequency signal.

For reception of an H3E signal, Detectors CR19 and CR20 are used to obtain the audio signal which is amplified by hybrid IC U8.

U8 also generates an AGC signal to control with voltage gain of the 1st IF Amplifier U1 and the 2nd IF Amplifier U7.

The audio signal is applied to hybrid IC U12 and then fed to Line Amplifier U15. The output of the Line Amplifier is used as "LINE OUTPUT" signal, but also is applied to Squelch Control U11. The squelch control mutes audio output in the absence of a signal.

The audio signal is finally amplified by AF Power Amplifier U13 to drive a loudspeaker. The level of audio output is adjustable by a volume control on the front panel.

#### 4. Panel/CPU Section

Refer to the General Block Diagram on page 1-16.

MPU U1 of the B01 CPU board receives and processes key and channel selector operations. Received signal strength or antenna current is converted into a digital signal by Analog-to-Digital Converter U3 and processed by the MPU. Signal strength or antenna current (or 50 ohm line current) is graphically indicated on the LCD.

ITU channel data is stored in the ROM section of the MPU. User-programmed channel data (2 x 64 channels) is stored in the Electrically Erasable PROM U4.

When a frequency is selected through the keyboard or a rotary knob, the MPU displays the frequency on the LCD and sends necessary data to each PLL on the TX/RX board.

For dimmer adjustment, the MPU controls the amount of current supplied to each illumination lamp in accordance with instructions received through the keyboard.

The following descriptions provide more detailed information about the devices employed by the B01 CPU board. The Schematic Diagram on page S-2 should also be referred to.

<< U1 >>

System Control

Front panel key or dial operation is received by the MPU U1 and after it is judged to be valid or invalid, required data are synchronized by the clock and sent to each circuit block.

The figure below shows the outline block diagram of U1.

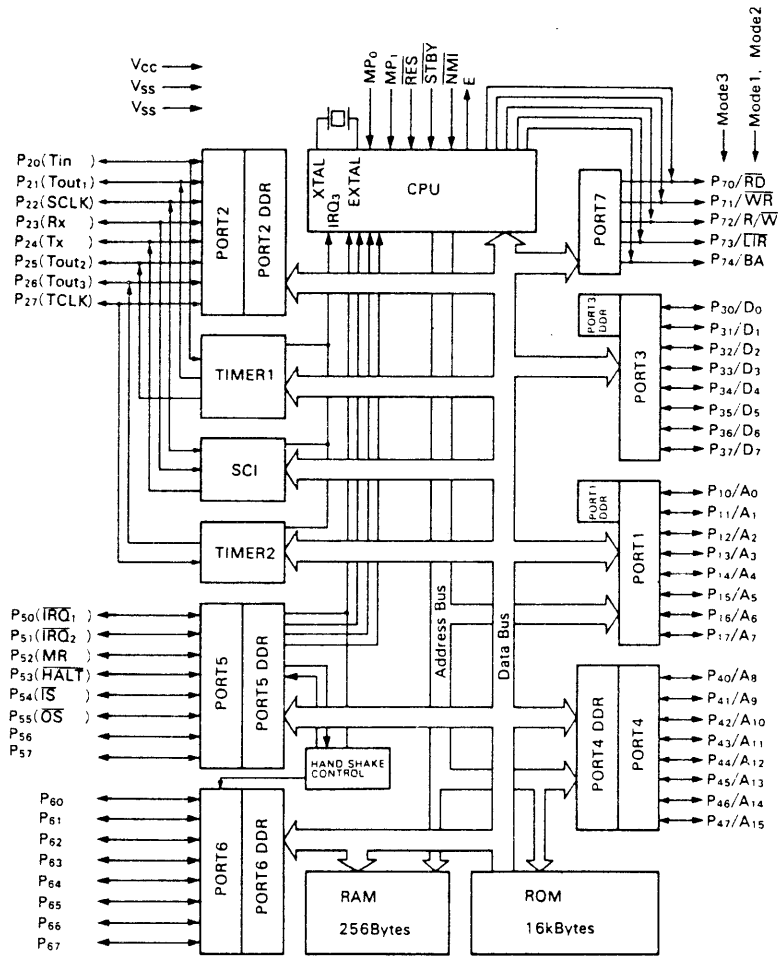


Fig. 1-1 Block Diagram of U1 of CPU Board

U1 is a one chip microprocessor comprised of an 8 bit CPU, 256 Byte RAM, 16k Byte ROM, timers, serial and parallel interfaces, etc. Because it is of one chip construction, no external ROM/RAM is used. Consequently, data loaded on the data bus or the address bus is not directly sent to external circuits but is passed through a parallel or series I/O port where external events (key operation, etc.) are monitored and control signals are sent to external circuits.

The ROM preserves, when the power is removed or reset, system control program, test program, ITU channel frequencies and corresponding data and other fixed data.

The RAM temporarily stores key operations, last-selected channel frequency and channel data (Simp/Dup/Class of Emission). Channel frequency and channel data are preserved by this RAM when the power is removed.

## << U2 >>

U2, a LCD Control IC, drives the LCD display according to data/commands serially sent from the MPU.

### Transmission of Command/Data

Serial data input and clock from pin SCK are sent out via pin SI to an internal shift register.

Transmission data; i.e., command or display data, are differentiated by the C/D pin. The MPU monitors the BUSY output of the LCD Control, and if "READY" transmits data.

### Driving the LCD

The LCD is made up of 4 common lines and 32 segment lines. An area on the LCD is blackened by voltage applied to its corresponding segment.

## << U3 >>

A/D Converter U3 digitally converts receive signal strength or antenna current and sends it to the MPU as synchronous serial data. The address data to determine which one of four analog inputs should be A/D converted is sent from the MPU as synchronous serial data. After A/D conversion is completed, the EOC (End Of Conversion) terminal goes into "L" state. The CPU reads EOC terminal status and outputs a clock signal to SCK (shift clock) terminal of U3. Then, U3, in synchronization with the shift clock, returns converted data to the CPU via pin SO. Note that in actual practice only two of four channels are used; A0 (receive signal strength) and A1 (antenna current or 50 ohm line current).

## << U4 >>

U4 stores user channel data (Simp/Dup/Class of Emission) which has been memorized by channel programming.

<< U5 >>

Chip Selection (Address Decoder)

U5 is partially comprised of two 2-to 4-line decoders; one reads key operation and the other is used for controlling LCD driver U2 and A/D Converter U3.

Reading of Key Operation

As shown in the figure below, the keyboard is arranged in 4 rows X 4 columns of keys (16 keys total). Which one of the four rows of keys should be binarily converted is determined by the MPU's two bit address P54/55. Each column has a pull-up resistor and whenever a key is pressed the corresponding column goes into "L" state. Data sent from a column is read by Input Ports P10-13 and compared with address (row) information to determine which key has been pressed. Note that the entire operation is not initiated as soon as a key is pressed; the MPU continually reads key status in fixed intervals.

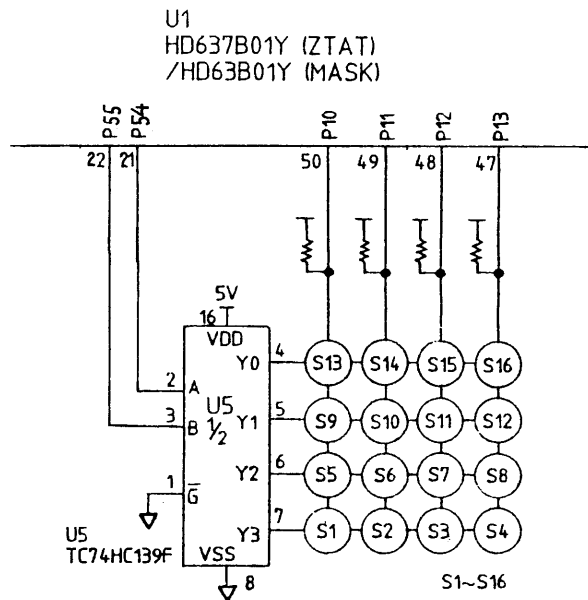


Fig. 1-2 Keyboard Matrix

<< U6 >>

Analog Multiplexer U6 reads DIP Switch status. As shown below, U6 is an 8-contact rotary switch. The setting selected is binarily converted at the terminals A, B and C for output to the MPU. Since a pull-up resistor is connected to the COM terminal, the switch selected goes into "L" state when ON and "H" state when OFF.

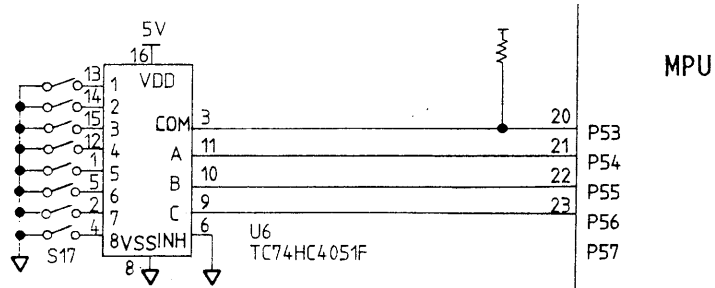


Fig. 1-3 Analog Multiplexer U6

<< U7 >>

Lamp Status

Parallel Input/Series Output Shift Register U7 controls lamp ON/OFF status. When the DIM key is pressed, the CPU serially loads shift clock and data onto P35/36, respectively, and sends them to U7. When updating of data is completed, the contents of U7 are latched by a latch pulse output from P37 to the open-drain output.



## 5. Power Supply Section

Refer to the Power Supply Block Diagram on page 1-20.

The power supply section consists of RELAY and SW REG boards.  
The operating range of this section is 12V +30%, -10%.

A regulated power supply (model PR-270) is prepared for AC ship's mains and a DC-DC converter (model PC-220), for 24V/32VDC. When external power supply unit is prepared locally, use a unit whose able current output is from 2A to max. 30A with minimum voltage fluctuation. An ordinary rectifier can not be used.

A 2m power cable with two 30A fuses in snap-in holders is supplied as standard. If another type of cable is used, ensure that it is properly "fused."

The negative terminal of the battery is floating. Input voltage is always applied to the relay K1, overvoltage detector consisting of Q1, U1, and an oven even if the power is off.

When the power switch is turned on, the relay K1 is driven and input voltage is applied to the switching regulator and a PA circuit.

The PA circuit operates with the input voltage, but other circuits operate with internal +15V provided by the switching regulator or +5V produced from the +15V.

The antenna coupler is also powered with +15V. A 1A breaker is provided in the coupler. +5V for the coupler is produced internally.

## 1.3 Antenna Coupler Unit

### 1. Block Description of Coupler

Refer to the Antenna Coupler Block Diagram on page 1-21.

When the PTT switch or [TUNE] key is depressed, "tune" signal is applied to the Antenna Coupler, Relay K1 and K2 are energized and CW signal of approx. 10W is fed from the transceiver 50 ohm antenna terminal to the reactive antenna through a Phase Detector, VSWR Detector (T2), the Matching Network consisting of C1-C18 and L1-L10 and Antenna Current Detector (T3).

MPU U8 selects, according to signals sent from T1 and T2, suitable constants through a combination of capacitors and coils. The initial constants are automatically defined by the MPU depending on the frequency which is read out by a counter consisting of Q1 and U1. The suitable value is stored in the memory of U8 as initial value, for use when the same frequency is selected later. This stored data is held for about one week by super capacitor C42.

The function of DIP switches S3 to S6 is to enable manual matching on 2182kHz. An LED is provided for each relay to indicate switching on or off capacitors and coils. LED CR53 and CR54 are lighted when the matching L-C network is in circuit. LED's CR33 through CR52 are lighted when the relevant coil or capacitor is connected.

S1 "TUNE" is provided to enable manual tuning.

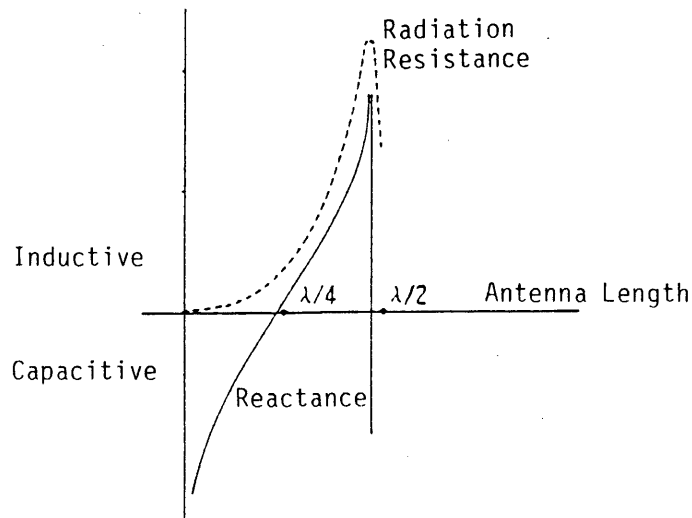
A 50 ohm dummy composed of R25 thru R27 is incorporated for adjusting the VSWR detector. Shunt capacitor C16 thru C18 is normally connected between antenna line and ground to reduce the antenna impedance. Connectors are provided to disconnect the shunt capacitor when only low frequencies are used.

### 2. Tuning Sequence of Coupler

The basic function of the coupler is to check matching condition whenever there is a change in frequency. If data for a matching condition are available (stored in memory), the coupler reads such data and immediately makes matching.

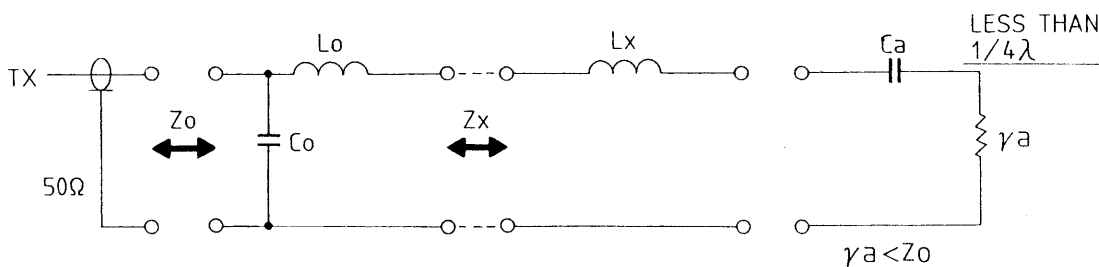
Fig. 1.4 shows impedance characteristics of vertical grounding type antenna used for ships. When the length of the antenna is shorter than  $1/4\lambda$ , the characteristic of the antenna is "capacitive". When the length is  $1/4\lambda$ , it shows a pure resistance of approx. 36 ohms.

When the length is longer than that, "inductive" characteristic is obtained. Then the value of radiation resistance becomes from several hundred ohms to several kilo ohms depending on the size of wire, environmental conditions, and structure. A peak value is obtained at  $1/2\lambda$ . For example, in a 7m-long antenna, the characteristic is capacitive for the frequency range from 1.6 to 12 MHz and inductive for over 12MHz.



**Fig. 1-4 Impedance Characteristics of Vertical Grounding Antenna**

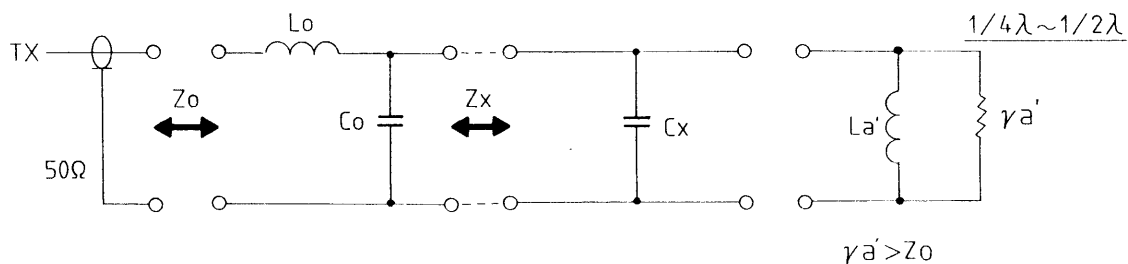
In the case of a "capacitive antenna" (Fig. 1-5), a coil "Lx" to cancel the capacitance "Ca" is connected. When viewed from the left side of the matching network, the impedance "Zx" on the right side becomes "ra". The circuits of "Lo" and "Co" converts the impedance viewed from the cable connection side "Zo" (50 ohm) and "Zx" from the antenna side.



**Fig. 1-5 Capacitive Antenna**

In the case of an "inductive antenna" (Fig. 1-6), a capacitor "Cx" to cancel the inductance "La'" is connected. Conversion is made by "Lo" and "Co".

The positions for inserting capacitor and coil are different between capacitive and inductive antennas.



**Fig. 1-6 Inductive Antenna**

Fig. 1.7 shows the matching circuit of AT-1500. A matching circuit of L and C according to the antenna condition mentioned earlier is made by switching a number of coils and capacitors with relays. An optimum L-C combination is automatically selected by the control of the CPU.

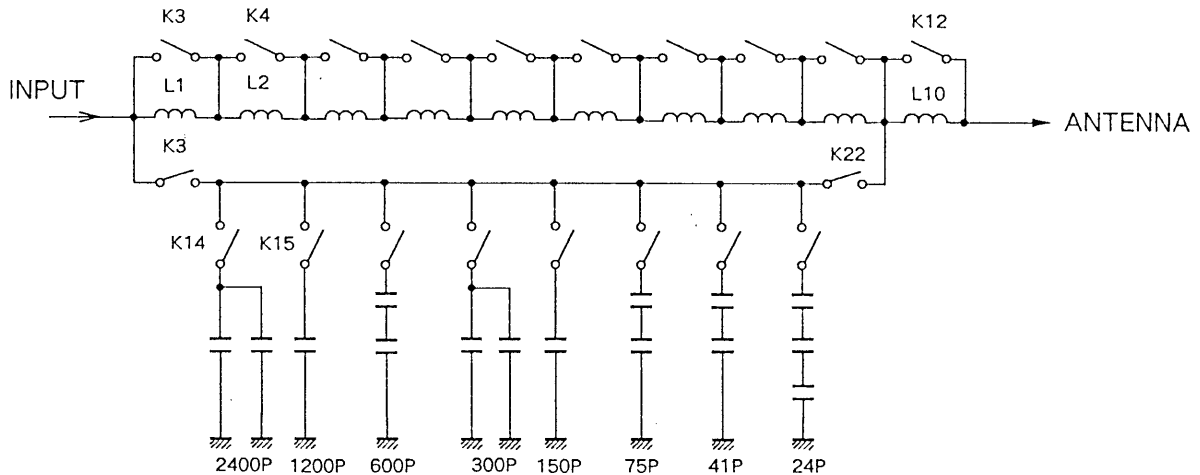
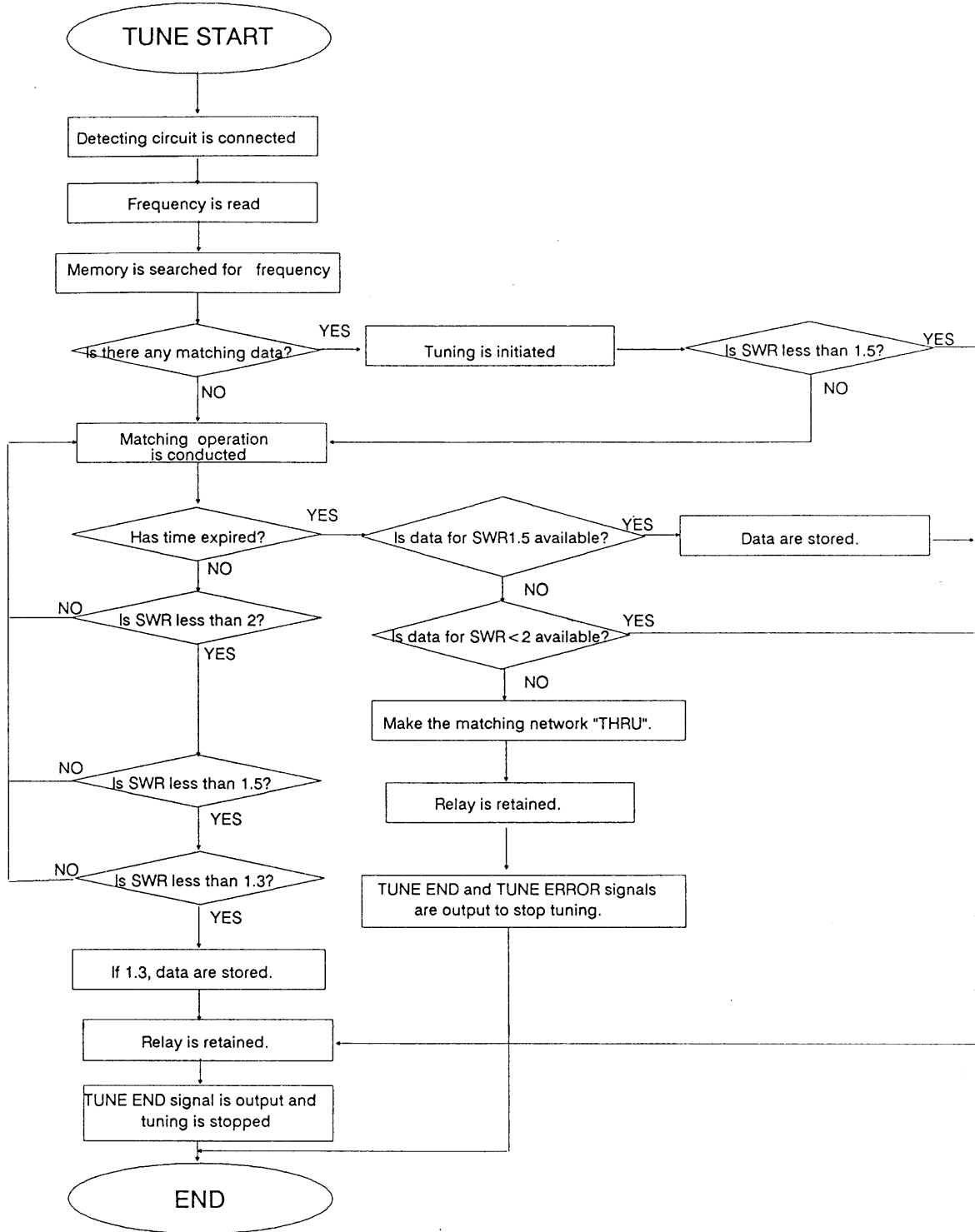


Fig. 1-7 Matching Circuit

The matching procedure is basically as follows;

1. When TUNE switch or PTT switch of FS-1550 is pressed, AT-1500 will automatically start controlling.
2. FS-1550 is set to the "CW" mode and ready for transmission. The power is set to approx. 10W.
3. AT-1500 starts to select matching points. In order to make matching, phase and SWR value are detected for use as data. L-C combination is selected using a CPU-stored program.
4. When the optimum condition is detected, tuning is stopped and L-C combination is stored in the RAM.
5. Transmission is stopped by a BUSY signal from AT-1500 and the last-used mode is restored.

These procedures are shown in the flow chart on the next page.



## Operations of L-C matching network

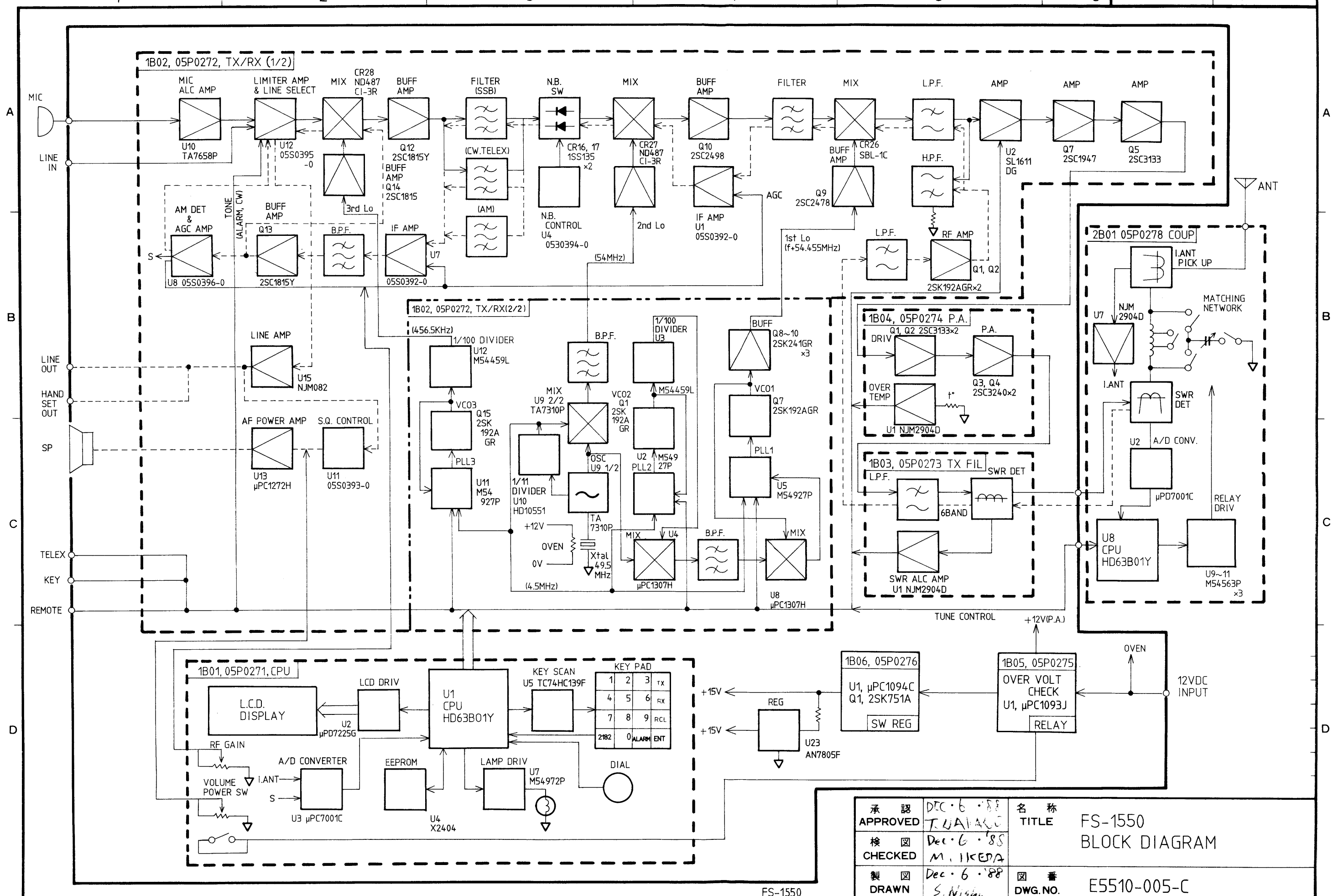
The matching operation starts by conducting the "phase check" to estimate the approximate values of L and C. Then, the best SWR value is found by increasing/decreasing "C".

### [Capacitive antenna]

1. "Phase Check" is conducted.
2. "L" is increased to find the point where the phase changes from "capacitive" to "inductive".
3. While observing SWR value, "L" is increased slightly and then "C" is increased.
4. Step 3 is repeated until the point where SWR is less than 1.3 is found.
5. When a combination of L and C which satisfies "SWR 1.3" is found, the data is stored in the RAM.
6. If time has expired before a combination of L and C which satisfies "SWR 1.3" is found and SWR is less than 1.5, the data is stored in the RAM.

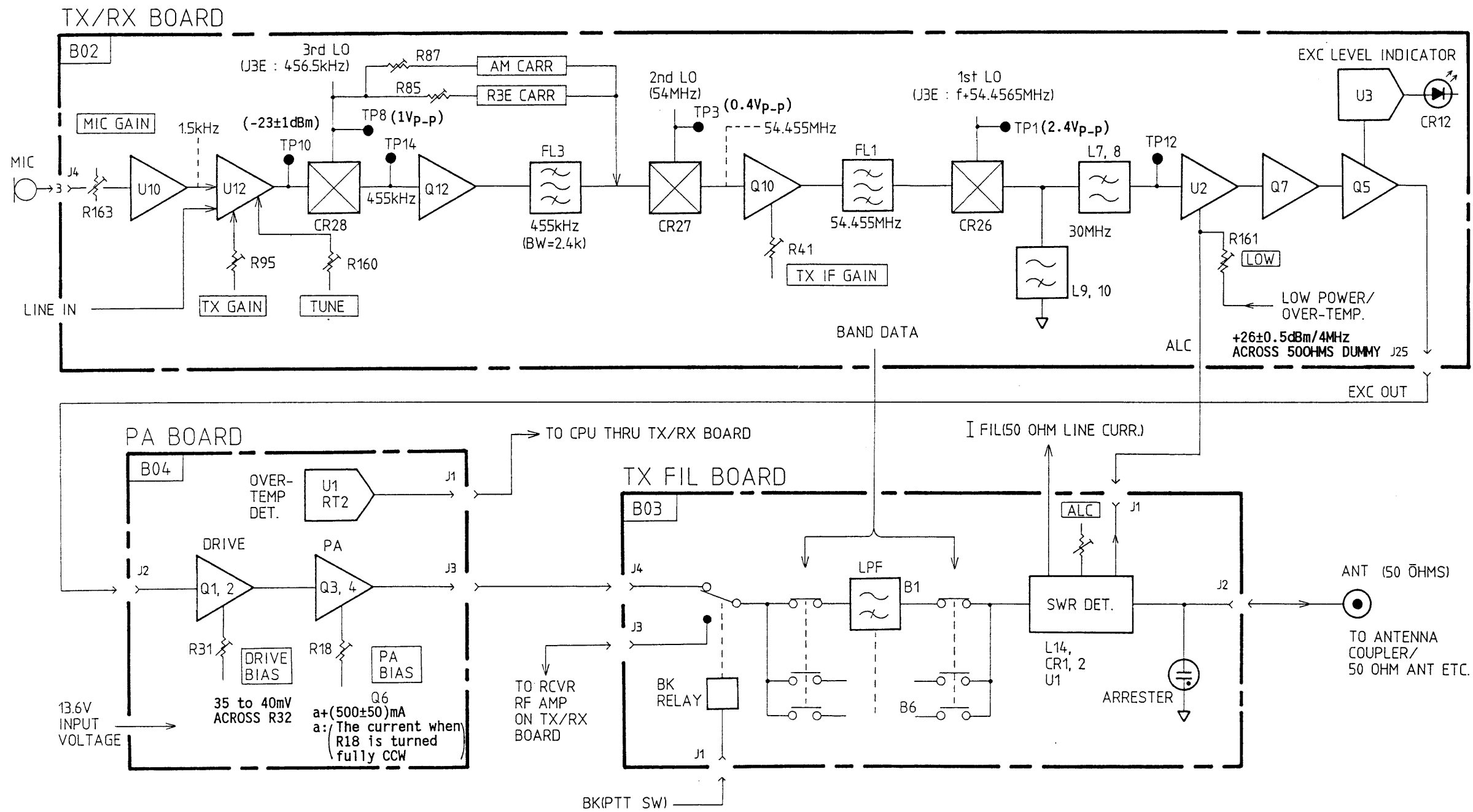
### [Inductive antenna]

1. "Phase Check" is conducted.
  2. "C" is increased to find the point where the phase changes from "inductive" to "capacitive".
  3. While observing SWR value, "C" is increased slightly and then "L" is increased.
  4. Step 3 is repeated until the point which satisfies "SWR 1.3" is found.
  5. Same as steps 5 and 6 for "capacitive antenna".
- \* If a data which satisfies "SWR 2" is not found from the data obtained by the latest matching sequence, the matching network is made "THROUGH" and tuning is stopped.  
(Time out = 15 sec. In this condition "TUNE OK" is not indicated but some of the power can be emitted in spite of mismatching.)



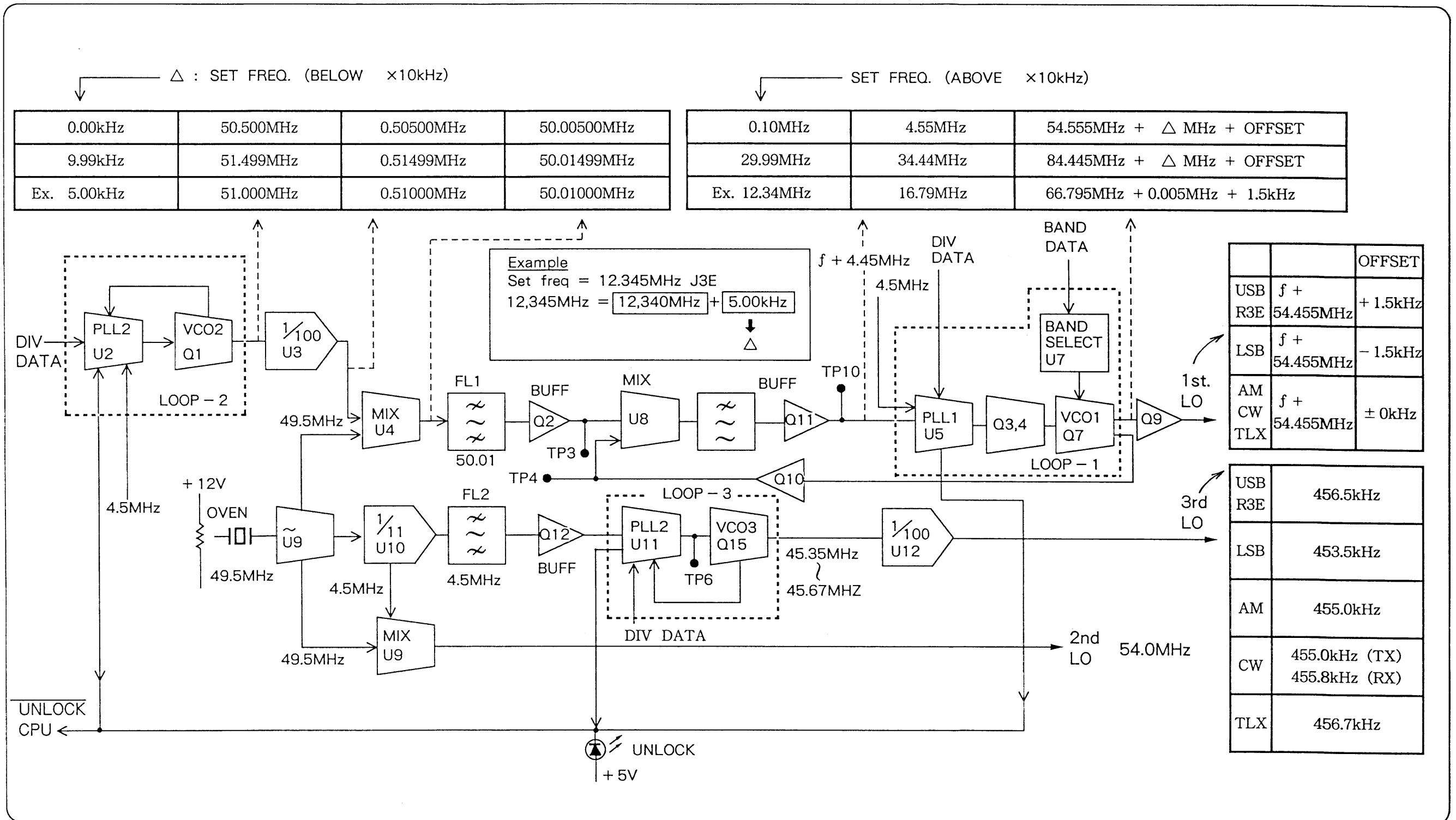
承認 APPROVED	DEC. 6 '88 T. UAIAGC	名称 TITLE	FS-1550 BLOCK DIAGRAM
検図 CHECKED	Dec. 6 '88 M. IKEDA	製図 DRAWN	S. NISHI
製図 DRAWN	Dec. 6 '88 S. NISHI	図番 DWG. NO.	E5510-005-C

FS-1550



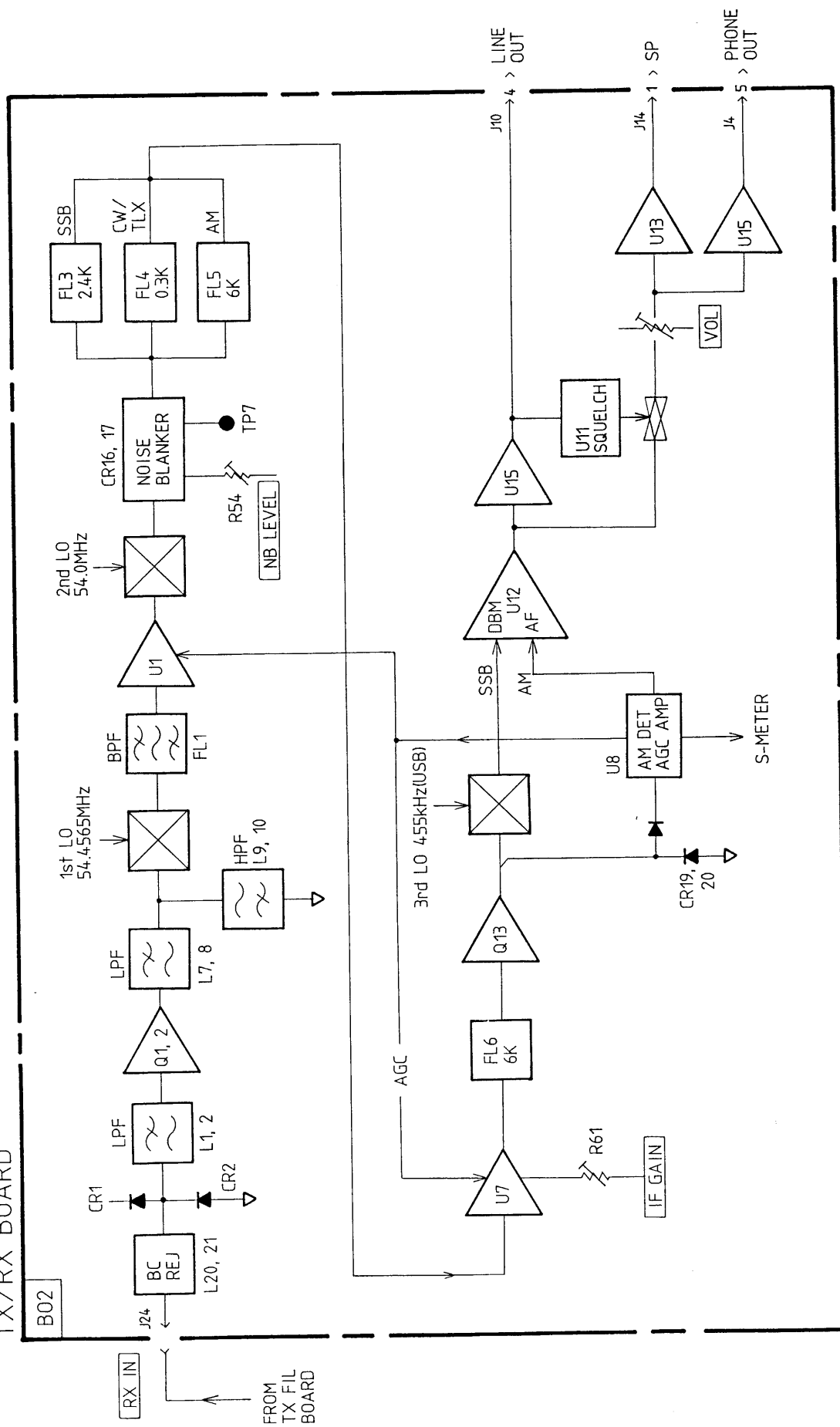
FS-1550 TRANSMITTER SECTION



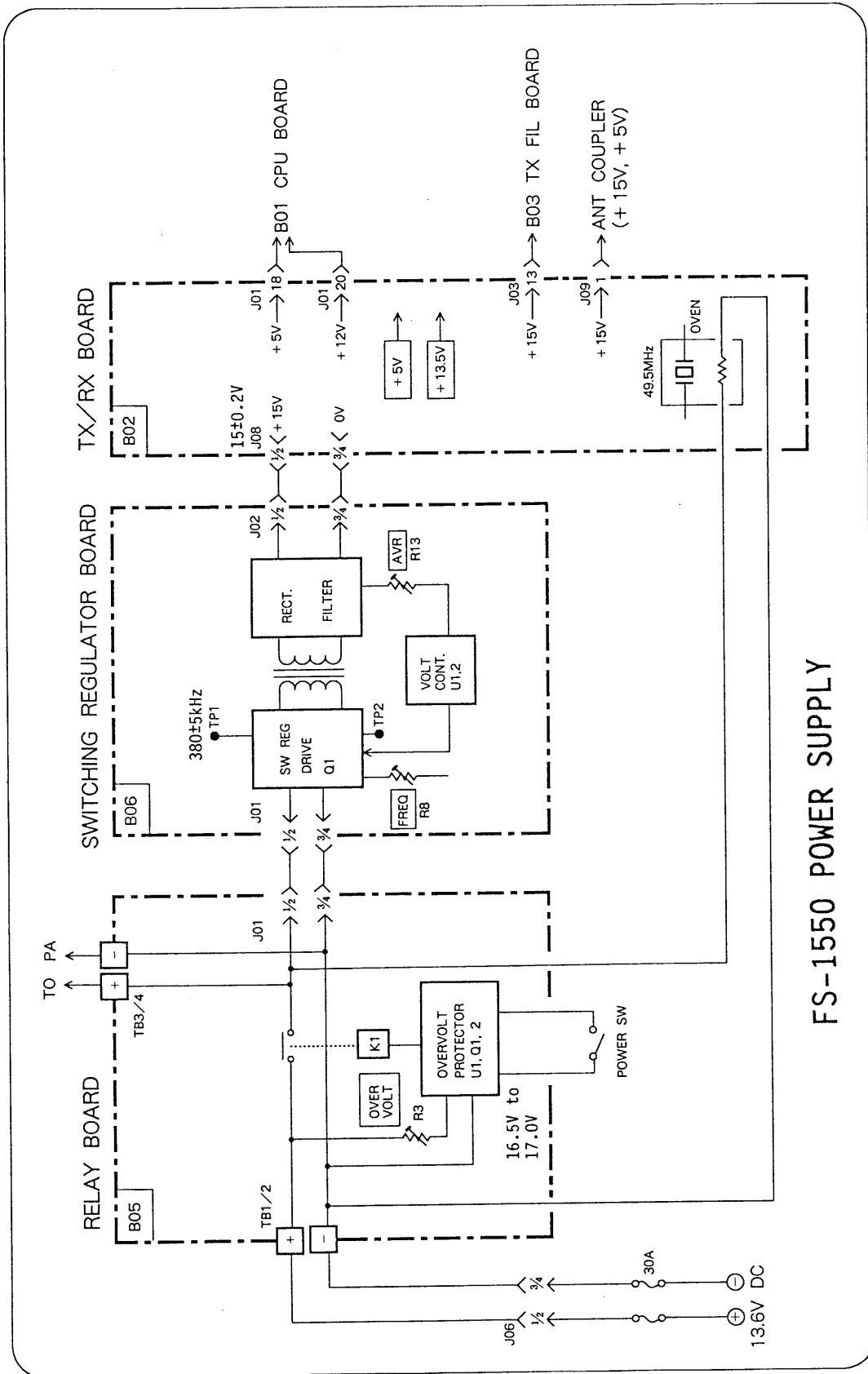


### FS-1550 LOCAL OSC

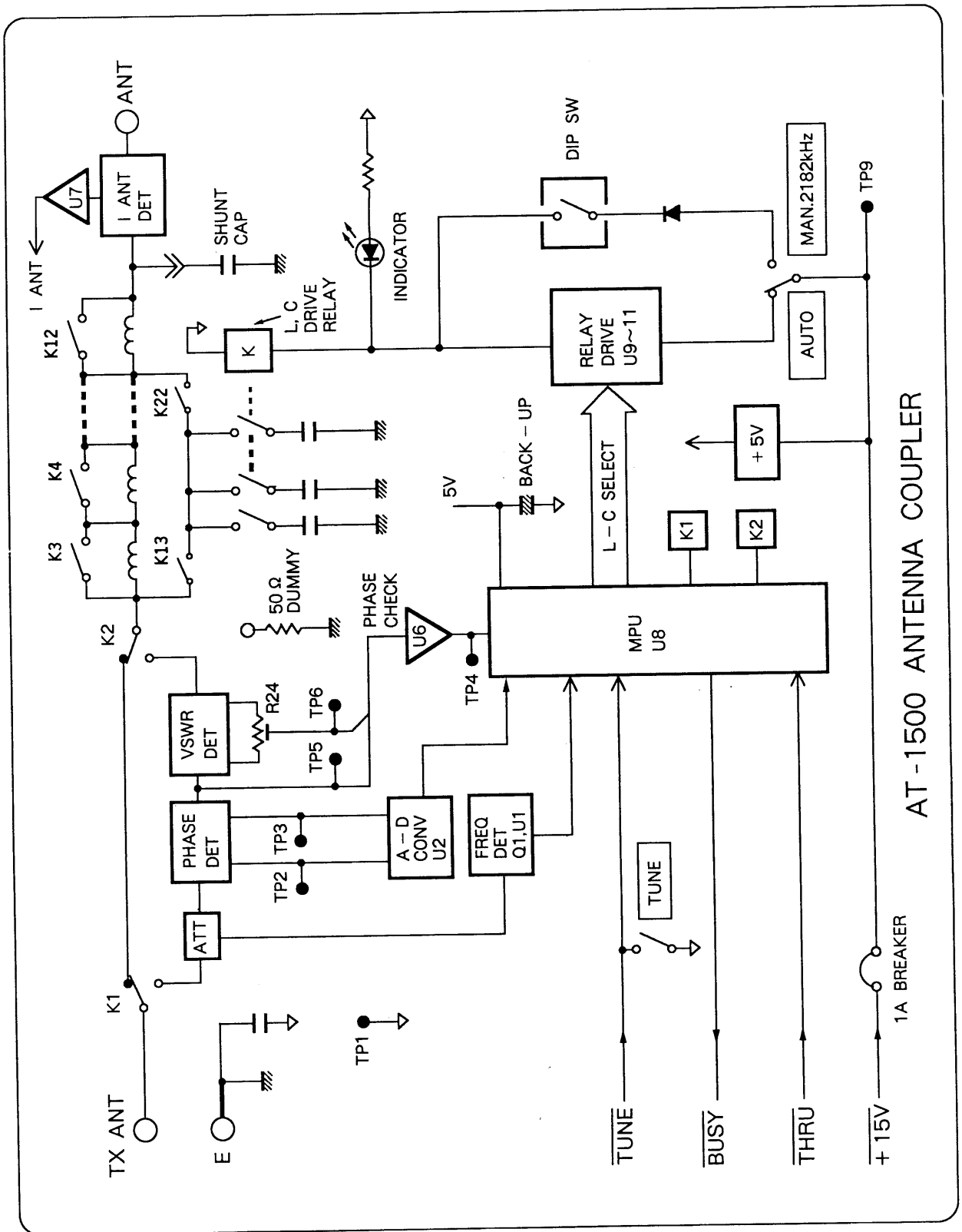
**TX/RX BOARD**



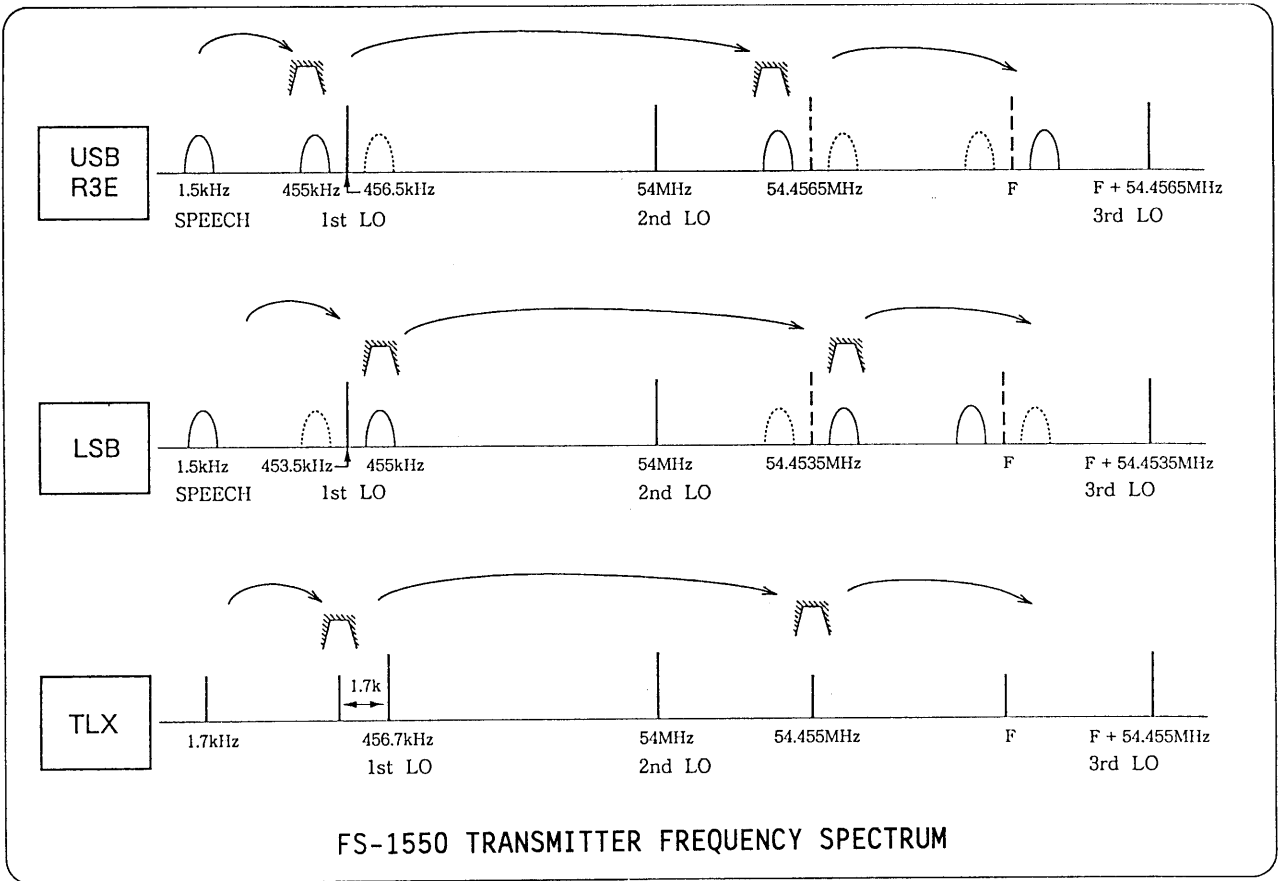
**FS-1550 RECEIVER SECTION**



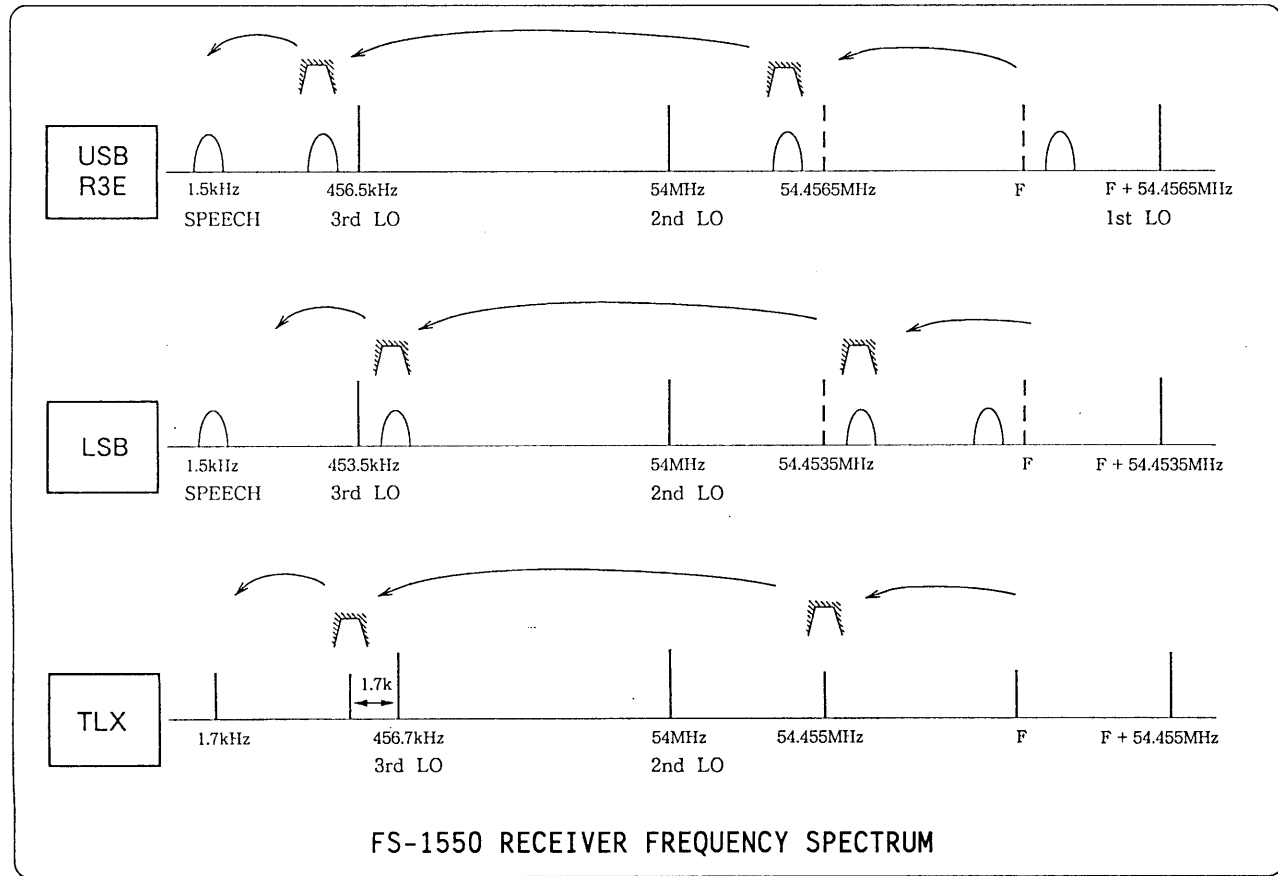
FS-1550 POWER SUPPLY



AT-1500 ANTENNA COUPLER



FS-1550 TRANSMITTER FREQUENCY SPECTRUM



FS-1550 RECEIVER FREQUENCY SPECTRUM

## CHAPTER 2 SETTING-UP

This FS-1550 radiotelephone is provided with DIP switches to tailor it according to local regulations and user's requirements.

### CAUTION

This instruction is prepared for use by authorized FURUNO agents or dealers to preset the equipment to comply with the local regulations of the user of this radiotelephone. Please carefully read the instructions and follow the recommended procedures for presetting the equipment.

FURUNO will assume no responsibility for the inconvenience or disturbance to communications due to inadequate or unlawful presetting of the equipment.

Please note again that the preset must be carried out by an authorized agent or dealer, not by the operator or owner of the equipment.

### 2.1 Function Of DIP Switches

Refer to the "CHAPTER 5 PARTS LOCATION" for location of the switches.

Table 2-1 DIP Switch and Corresponding Function

No. of DIP SW.	FUNCTION	S17-1	S17-2
S17-1	FREE TX/RX + ITU (TX/RX) + CUSTOM TX/RX	ON	ON
&	FREE RX + ITU (TX/RX) + CUSTOM TX/RX	OFF	ON
S17-2	FREE RX + ITU (RX) + CUSTOM TX/RX	ON	OFF
	CUSTOM TX/RX	OFF	OFF

	FUNCTION	ON	OFF
S17-3	Initial class of emission at 2182kHz	J3E (USB)	H3E
S17-4	Usage of CW and TELEX	ENABLE	DISABLE
S17-5	Channelizing custom frequencies	TX and RX	RX only
S17-6	Sending "TUNE" signal to Antenna Coupler	ENABLE	DISABLE
S17-7	Receiving of 100kHz to 1,600kHz	ENABLE	DISABLE
S17-8	Display of the class of emission	ALL	Other than USB

\*1: When a 50 ohm antenna such as doublet antenna, trap vertical, solid antenna matching device, etc. is directly connected to the transceiver unit, S17-6 should be turned to "OFF".

Table 2-2 DIP Switch and Corresponding Function

No. of DIP SW.	FUNCTION	I <sub>ANT</sub>	I <sub>FIL</sub>
S19	Indication of I <sub>ANT</sub> or I <sub>FIL</sub>	I <sub>ANT</sub>	I <sub>FIL</sub> *2

No. of DIP SW.	FUNCTION	ON	OFF
S20	Propagation Standard for RS-232C Port	T-BUS for TT-1600	FURUNO I/F

\*2: For "I<sub>FIL</sub>", refer to 2.2.

## Standard Setting

Table 2-3 Standard Setting

No. of DIP SW.	ON/OFF
S17-1	OFF
S17-2	ON
S17-3	OFF
S17-4	OFF
S17-5	OFF
S17-6	ON
S17-7	ON
S17-8	ON
S19	I <sub>ANT</sub>
S20	OFF

## 2.2 Alternation of I<sub>ANT</sub> and I<sub>FIL</sub>

Some licensing authorities require an indication of transmitter antenna current in amperes. The FS-1550 is factory set to display this. If not required by law, some users may prefer the meter to indicate power on the filter output line, which will be more uniform over the various frequencies and with various antenna configurations. This is accomplished by switching S19 to I<sub>FIL</sub>.

## 2.3 Writing a Frequency into Memory

- 1) Turn on the power while pressing and holding [RCL]. Release [RCL] after "MEMO" appears on the LCD display.
- 2) Select a desired channel number by the tuning dial. (Rotate the tuning dial to reach desired TX channel. If you are channelizing a RX frequency, rotate it one click further to reach RX channel.)
- 3) Define the class of emission by selecting a desired one such as J3E(USB) through the [MODE] key.
- 4) Press [TX] or [RX] and enter desired frequency to the digit of 10Hz (i.e., 2182.00 - the decimal point is not necessary to enter, but do not neglect entry of 00).
- 5) Press [ENT].
- 6) Repeat steps 2 to 5 for other channels as many as necessary.

### NOTE :

1. After TX frequencies are channelized, never fail to set segment No. 5 of DIP switch S17 to the OFF position.
2. How to channelize the RX frequencies is described in the Operator's Manual, but the method to channelize the TX frequencies is not disclosed to operators. Precaution should be taken to prevent users from channelizing unauthorized transmitting frequencies.



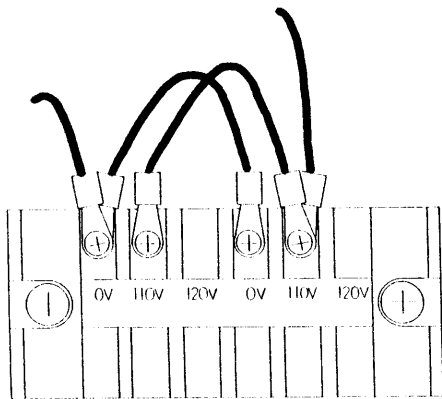
## 2.4 Alternation of Input Voltage for RECTIFIER UNIT PR-270

The input voltage of the model PR-270 Rectifier Unit can be set to 110/120/220/230/240VAC.

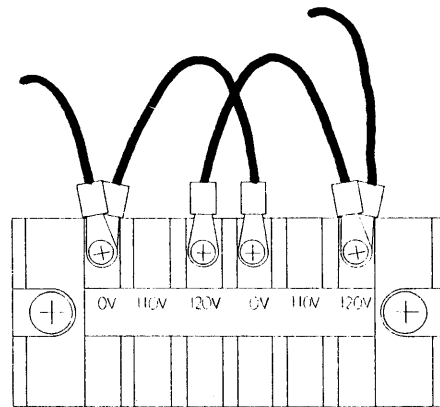
Remove the top cover of the rectifier and change the lead connection on the input terminal of power transformer. Also change the fuse if necessary.

Supply voltage
110/120VAC
220/230/240VAC

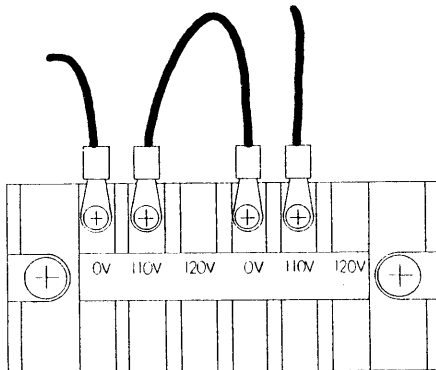
Type of fuse
10A
5A



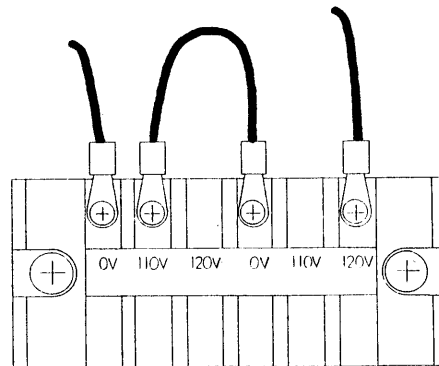
For 110VAC



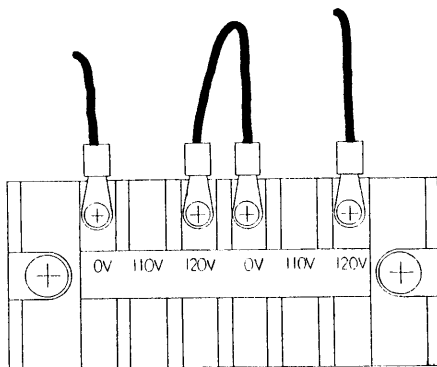
For 120VAC



For 220VAC  
(Factory setting)



For 230VAC



For 240VAC

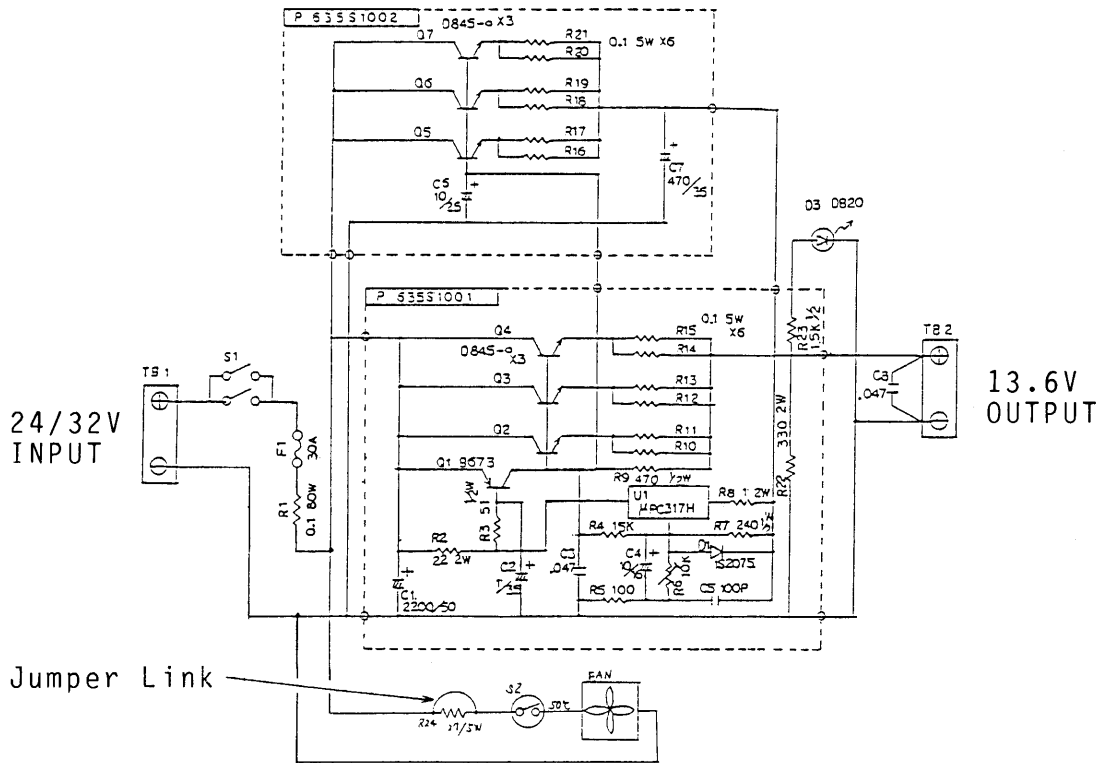
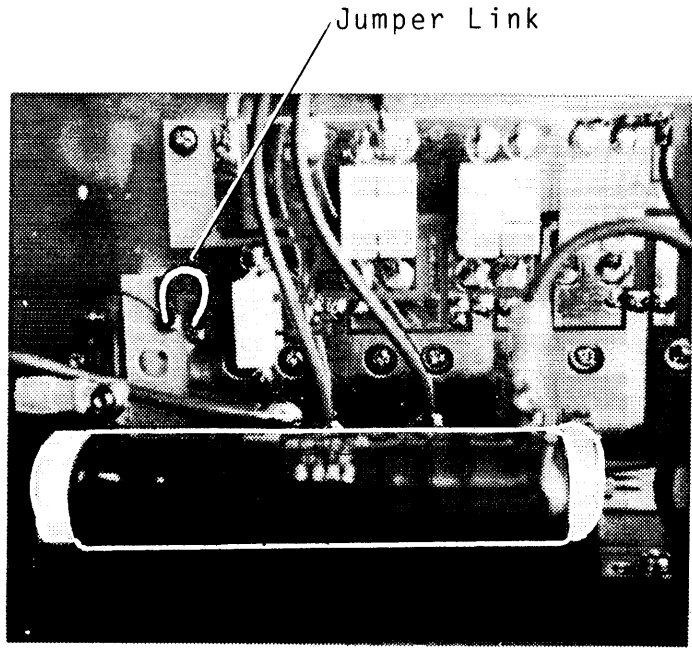
### -CAUTION-

To alterate the supply voltage, move only blue-lugged white wires. Leave the two yellow-lugged gray wires on 0V and 110V terminal, as they are connected to the fan.

For 110V and 120V connection, use the jumper wire connected to the first 120V terminal from the right.

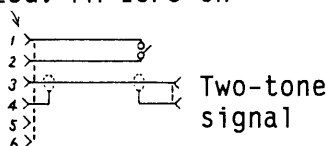
## 2.5 Alterating of Input Voltage for DC-DC CONVERTER PC-220

The input voltage of the DC-DC converter can be set for either 24VDC (factory setting) or 32VDC. To enable 32VDC operation, remove the jumper link (see figure below).



## CHAPTER 3. ADJUSTMENT

### 3.1 Necessary Test Instruments

Test Instrument	Minimum Requirement	Use
Multimeter	10k ohms/VDC	Voltage check
DC Ammeter	30A, 2A	Input current check
Frequency Counter	100MHz	Frequency check
Precision AC Voltmeter (VTVM) with RF Probe	Volt Range: 1mV to 3V dB Range: -50 to +20dBm	Level check Sensitivity check
Standard Signal Generator with 50 ohm Adaptor	Freq. Range: 100kHz to 30MHz Output Level: -10 to +110dBu Output Impedance: 50 ohms	Sensitivity check
Distortion Meter		Sensitivity check
Audio Dummy	8 ohm, 10W Enamelled Resistor with EXT. Sp. Plug.	Sensitivity check
Oscilloscope	Freq. Response: 50MHz	Waveform check
RF Power Meter	Dummy Terminated Type, Impedance: 50 ohms Capacity: 100W average Freq. Range: 50MHz	Power check
Dummy Ant. for Coupler	10 ohms +250pF (for 1.6-4MHz) 50 ohms (for 6-23MHz)	Performance check
SSB Two-tone Generator or 2 AF Oscillators	Freq. Range: 1 to 3kHz Impedance: 600 ohms Output Level: 0dBm(0.77Vrms) Attenuator: 60dB/1dB step	Power check
Two-tone Mixing Network	See section 3.5.	Not necessary when two-tone gen. is available.
AF Signal Cable w/Switch	MIC PLUG: FM-10PS-6h  * Prepare locally.	Transmitter adjustment.
Regulated DC Power Supply	13.6VDC/30A or greater	

### 3.2 Line Voltage Check

Prior to the adjustment, check the following.

No	Check Item	Check Point		Ratings	Adjust;	Condition/Remarks
		PCB	Point			
1	Input Voltage	RELAY 05P0275	TB1(+) TB4(-)	13.6V (12V-10% +30%)	_____	_____
2	+15V	SW REG. 05P0276	J2-1 J2-3	15±0.2V	[AVR] R13	If not, check sw reg. frequency.
3	SW REG. Frequency		TP1 TP2	380±5kHz	[FREQ] R8	_____
4	Over-voltage Protector	RELAY 05P0275	TB3(+) TB4(-)	16.5-17.0V	OVERVOLT R3	Disconnect PA and SW REG.

### 3.3 Local OSC Frequency/Level Check

No	Check Item	Check Point	Ratings		Condition/Remarks
			Freq.	Level	
1	2nd LO	TP3(+)-TP4(-) on TX/RX Board	54MHz ±5Hz	0.4Vp-p or greater	_____
2	3rd LO	TP8(+)-TP9(-) on TX/RX Board	456.5kHz	1.0Vp-p or greater	USB, 4MHz
			455kHz		H3E, 4MHz
3	1st LO	TP1(+)-TP6(-) on TX/RX Board	f+54.455MHz +1.5kHz	2.4Vp-p or greater	USB, 4MHz
			f+54.455MHz		H3E, 4MHz

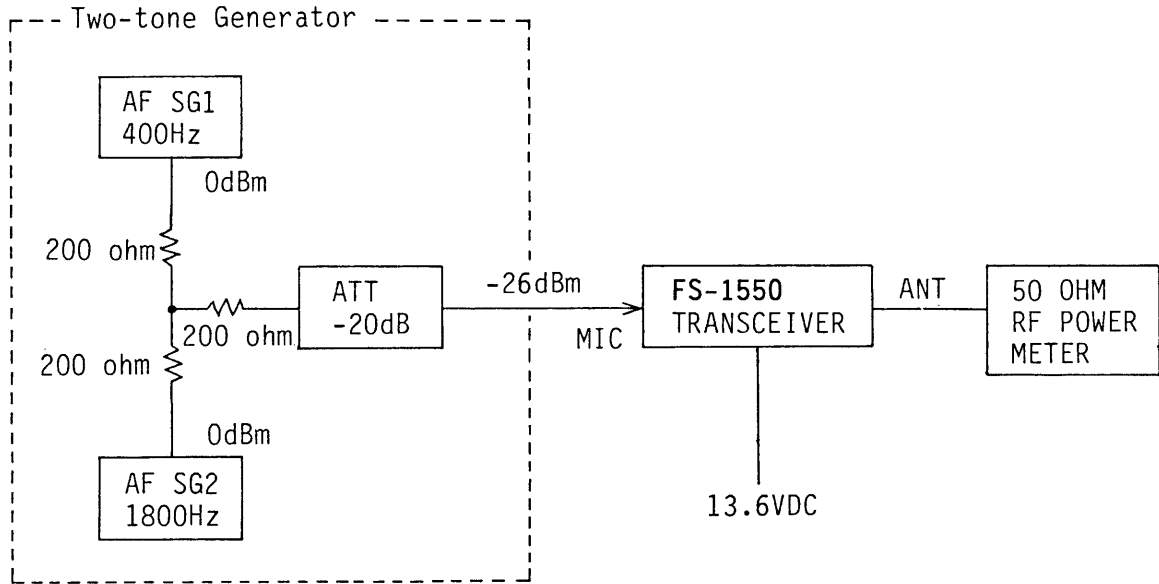
### 3.4 PA Bias Adjustment

No	Check Item	Check Point	Ratings	Adjust;	Condition/Remarks
1	Drive Bias	Across R32	35-40mV	R31	No AF signal to MIC input.
2	PA Bias	Input Current	$\alpha + (500 \pm 50)\text{mA}$ (See note below.)	R18	Terminate transceiver with 50 ohm dummy.

#### NOTE

- 1) BIAS ADJUSTMENT: Turn R18 fully counterclockwise and adjust DRIVE BIAS R31 for 35 to 40mV across R32 (0.22 ohms). Then adjust PA BIAS R18 so that the input current is  $500 \pm 50\text{mA}$  higher than the one ( $\alpha$ ) obtained by DRIVE BIAS adjustment.
- 2) When the components of the PA board are replaced, above check should be done.
- 3) If bias for PA stage is incorrectly adjusted, spurious emission may increase.

## 3.5 Transmitter Output Level Adjustment

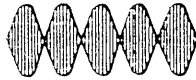


No.	Check Item	Ratings	Adjust;	Conditions/Remarks
1	Max. Power	90W	R41 [TX IF GAIN]	J3E, 4MHz MIC Input: 2-tone, -26dBm R5(ALC) fully CCW
2	ALC Level	75W	R5 [ALC]	J3E, 4MHz MIC Input: -26dBm
3	Output Power	60-90W	R95 [TX GAIN]	
4	Low Power	20W	R161 [LOW]	
5	TUNE Power	15W	R160 [TUNE]	J3E, 4MHz Press [TUNE] key
6	H3E Power	40-50W	R87 [AM]	H3E, (2182kHz) Press PTT switch with no audio input
7	R3E Power	1.5-4W	R85 [R3E]	R3E, 4MHz Press PTT switch with no audio input

W: Average power

**NOTE**

- 1) Before performing the adjustment, the output level of SG1 should be adjusted so that the "100% modulation wave" is observed at the ANT terminal.



← 100% modulation wave.

- 2) Before beginning the adjustment, the PA and TX FIL boards should be covered with a "shield plate".
- 3) Power difference of max. 30W (max. 90W, min. 60W) may be observed between the highest power band and lowest power band (not the highest frequency and the lowest frequency). This is due to the frequency response of the power amplifier. Disregard the difference.
- 4) When the waveforms shown below are observed when the oscilloscope is coupled to the PA stage, readjustment of transmitter circuit may be required.

Waveform	Cause/Remedy
<p>Clipped at peak level</p>	Excessive drive. Check the MIC GAIN pot. R163.
<p>Unstable</p>	Incorrect amplifier bias. Readjust BIAS adj.

- 5) Peak output power of approx. 100W will be observed on the power meter when you whistle into microphone.
- 6) When the output power is far less than the rated power with proper AF input signal, check the TX younger stage.

No	Check Item	Ratings	Adjust;	Condition/Remarks
1	MIC Amp Level	-23±1dBm /600 ohms	R95 [TX GAIN]	R163 [MIC GAIN] fully clockwise. USB, 4MHz. Mic input: -26dBm/600 ohms 2-tone.
2	Exciter Output	+26±0.5dBm /50 ohms	R41 [TX IF GAIN]	As above. Disconnect coax. from PA board; then check the level by precision AC voltmeter, coupled with 50 ohm dummy and attenuator.

\* The EXC OUTPUT LEVEL INDICATOR CR12 is provided to check the output level. However, if the level detect level is set high, the indicator may not light on some bands due to frequency response.

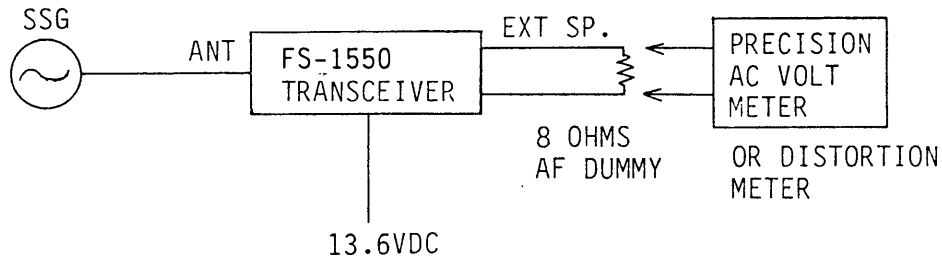
## Procedure for Power Adjustment

- 1) Connect a 50 ohm power meter to the ANT connector and select J3E on any frequency of 4MHz band.
- 2) Rotate R5 (ALC) fully counterclockwise.
- 3) Confirm R163 (MIC GAIN) is turned fully clockwise.
- 4) Apply 2-tone signal 400Hz and 1800Hz into MIC terminal at a level of -26dBm.
- 5) Adjust R41 (TX IF GAIN) for reading of approx. 90W (average power) on the power meter.
- 6) Decrease output power to 75W by adjusting R5 (ALC).
- 7) Adjust R95 (TX GAIN) for 60 to 90W on all bands.



## 3.6 Receiver Adjustment

CAUTION: Before beginning the adjustment, MIC plug (PTT switch) should be disconnected to prevent SSG from being damaged due to accidental emission.

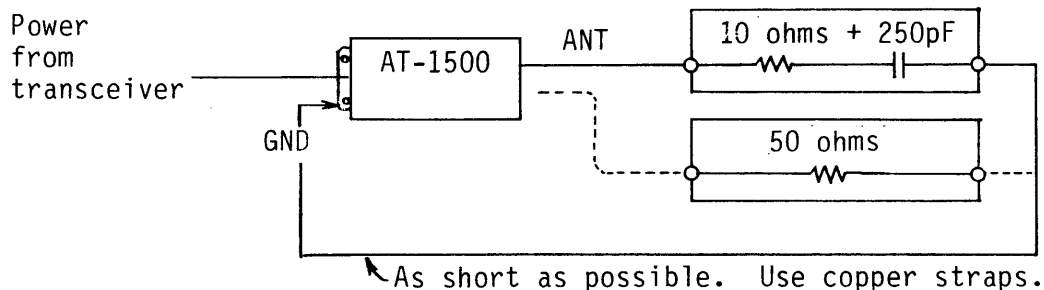


No	Check Item	Ratings	Adjust;	Condition/Remarks
1	IF Gain	S = 0 ↔ 1	R61 [IF GAIN] on TX/RX Board	Input signal: 4MHz, 6dBu. S-meter respond gradually so adjust slowly.
2	S-meter	S = 5 ± 1 S = 8 ± 1	— —	20dBu 40dBu
3	Overall Sensitivity	-3 ± 3dBu	—	The input level to obtain AF output of 1W.
4	J3E Sensitivity	+3dBu or better	—	SINAD 20dB, J3E, 4MHz

### Quick Check of Receiver Sensitivity

- 1) Select J3E on any frequency of 4MHz band.
- 2) Connect SSG (standard signal generator), set to receive frequency and output of approx. 30dB, to the ANT connector of transceiver unit.
- 3) Adjust SSG frequency precisely for maximum audio output.
- 4) Gradually decrease the SSG output until noise is slightly present.
- 5) Read out the SSG attenuator reading. If the reading is 0dB or less (-6dB), the receiver sensitivity is satisfactory.

## 3.7 Check of Antenna Coupler



No	Check Item	Check Point	Ratings	Condition/Remarks
1	Tuning Detector Output Level			USB, 4MHz LOW. ( $10 \pm 0.5W$ ... temporarily adjust by R161 [LOW] on TX/RX board.)
		TP6(+) - TP5	-40 to -100mV	R24 fully CCW.
			180 to 140mV	R24 fully CW.
			$0 \pm 1mV$	Adjust by R24.
		TP3(+) - TP1(-)	1350 - 1650mV	
		TP2(+) - TP1(-)	5mV or less	
2	Automatic Tuning	Status of relays and LCD window (TUNE OK)	Tuning is conducted.	10 ohm + 250pF dummy for 1.6 to 4.5MHz. 50 ohm dummy for 6 to 23MHz.
3	"THRU" function	Status of LED	CR33, 34, 51, 52 and 42 are lit when tuning is completed. (Matching network is shorted to pass received signal.)	10 ohm + 250pF dummy. 3MHz, DUP. Repeat TX and RX. * Check if S2-4 is "off" when this function is suspected.
4	Antenna Current	LCD window	1.5 - 2A	10 ohm + 250pF dummy. 2MHz Input power to be 50W (average).

**CHAPTER 4 TROUBLESHOOTING****4.1 Self-test**

The AT-1500 antenna coupler is equipped with self-test facility for checking the performance.

**CHECK OF RELAY**

The function of the relays which select capacitor and coil may be checked for proper operation as shown below.

- 1) Open the shield cover inside the coupler. Locate DIP switch S2.
- 2) Set No.2 of S2 to "ON".
- 3) Press "TUNE" switch S1.
- 4) Then each LED (CR33 to CR52) will light one by one for 1 sec. if the corresponding relay is energized, and they all blink at once upon completion of the test.

**LED and corresponding relay**

CR 33 - K 3	CR 38 - K 8	CR 43 - K 14	CR 48 - K 19
CR 34 - K 4	CR 39 - K 9	CR 44 - K 15	CR 49 - K 20
CR 35 - K 5	CR 40 - K 10	CR 45 - K 16	CR 50 - K 21
CR 36 - K 6	CR 41 - K 11	CR 46 - K 17	CR 51 - K 13
CR 37 - K 7	CR 42 - K 12	CR 47 - K 18	CR 52 - K 22

Note : For the location of the LED's see "CHAPTER 5 PARTS LOCATION".

- 5) Now the tuner is returned to normal operating status.
- 6) Re-set No.2 of DIP switch S2 to "OFF" otherwise transmission will be impossible.
- 7) Ensure that all switches of DIP switch S2 are set to "OFF" before you close the cover.

#### 4.2 Replacement of Major Parts

##### 1. Final Transistor Q3, Q4 (P.A. board)

- 1) Loosen two fixing bolts and unsolder four pins to release the defective transistor.
- 2) Orientate the new transistors as shown below.
- 3) Tighten the fixing bolts and solder the transistors.

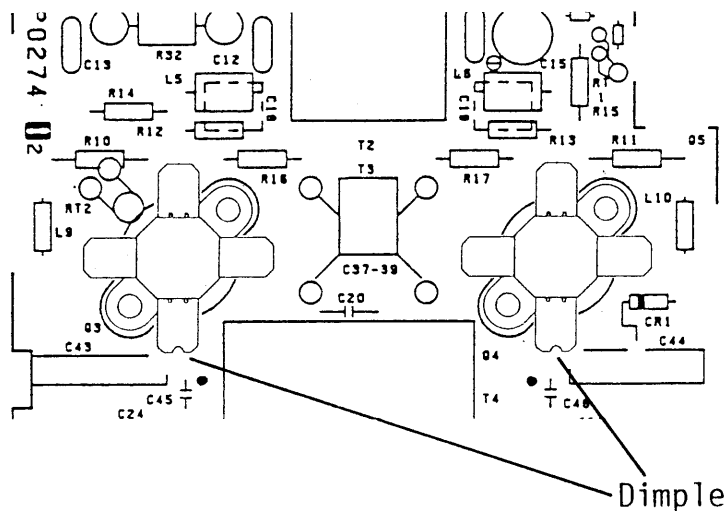
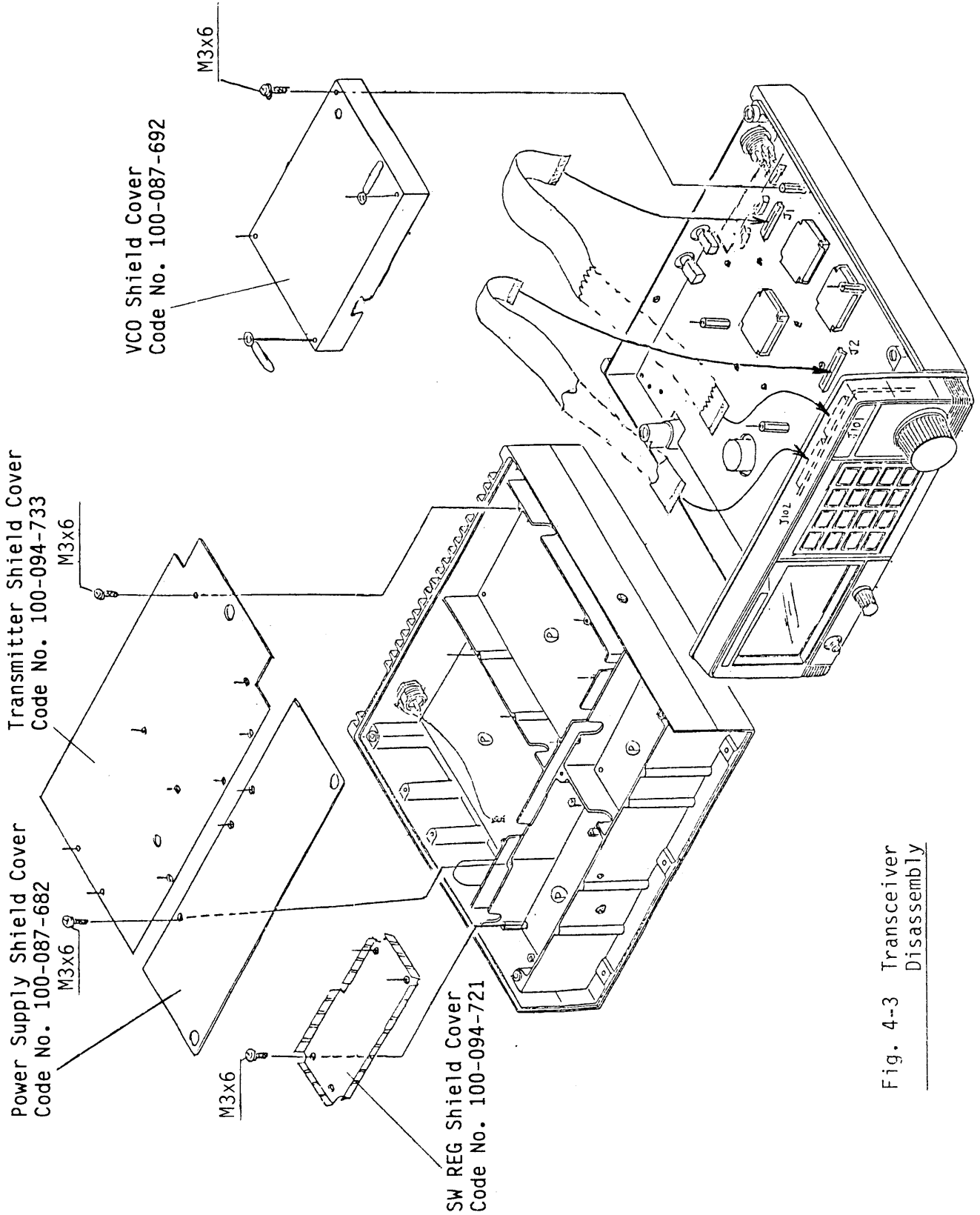


Fig. 4-2 Direction of the transistor

## 2. Replacement of P.C. Board



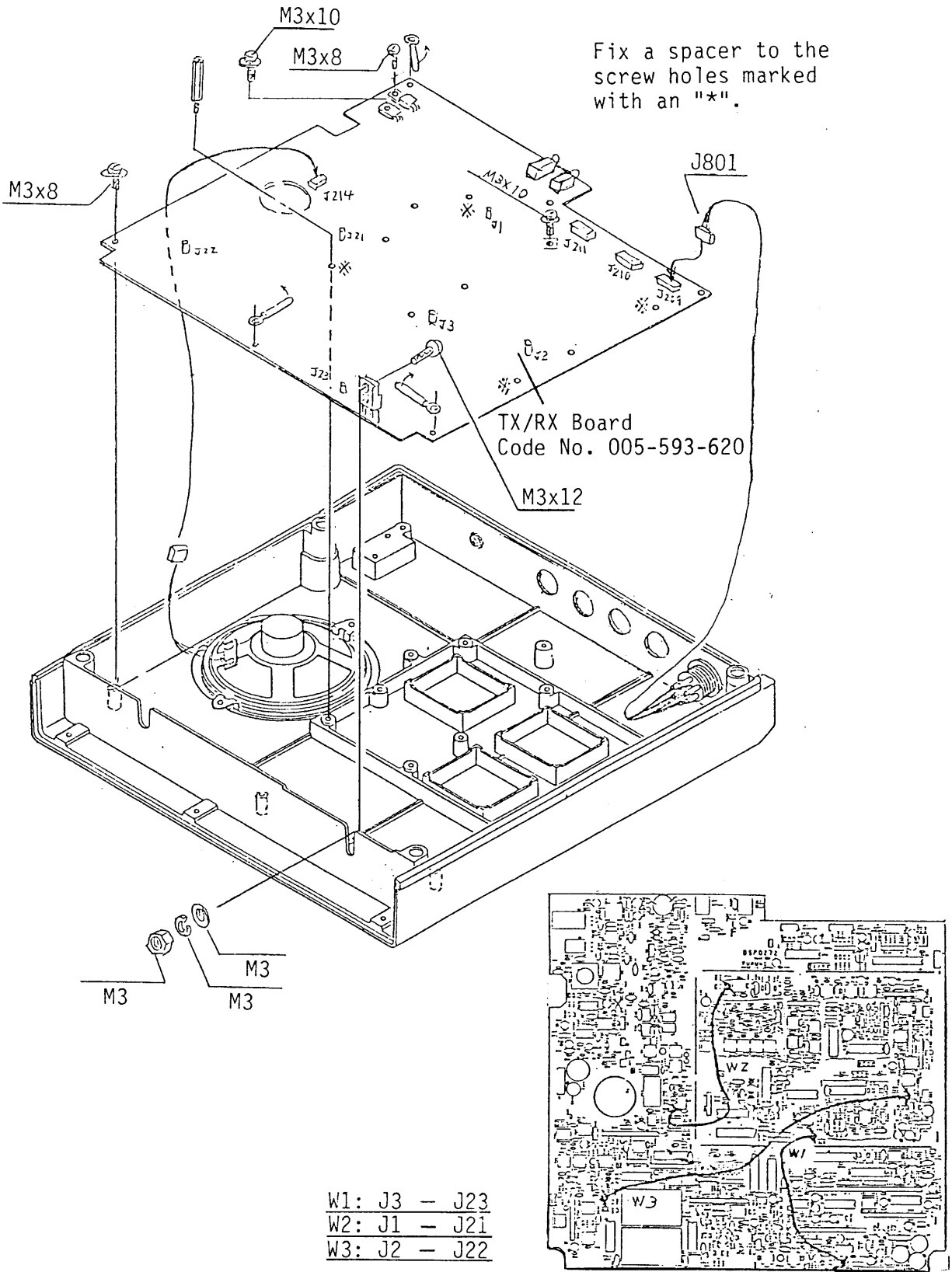


Fig. 4-4 TX/RX Board Disassembly

M3x8 screws are used to fix printed circuit boards.

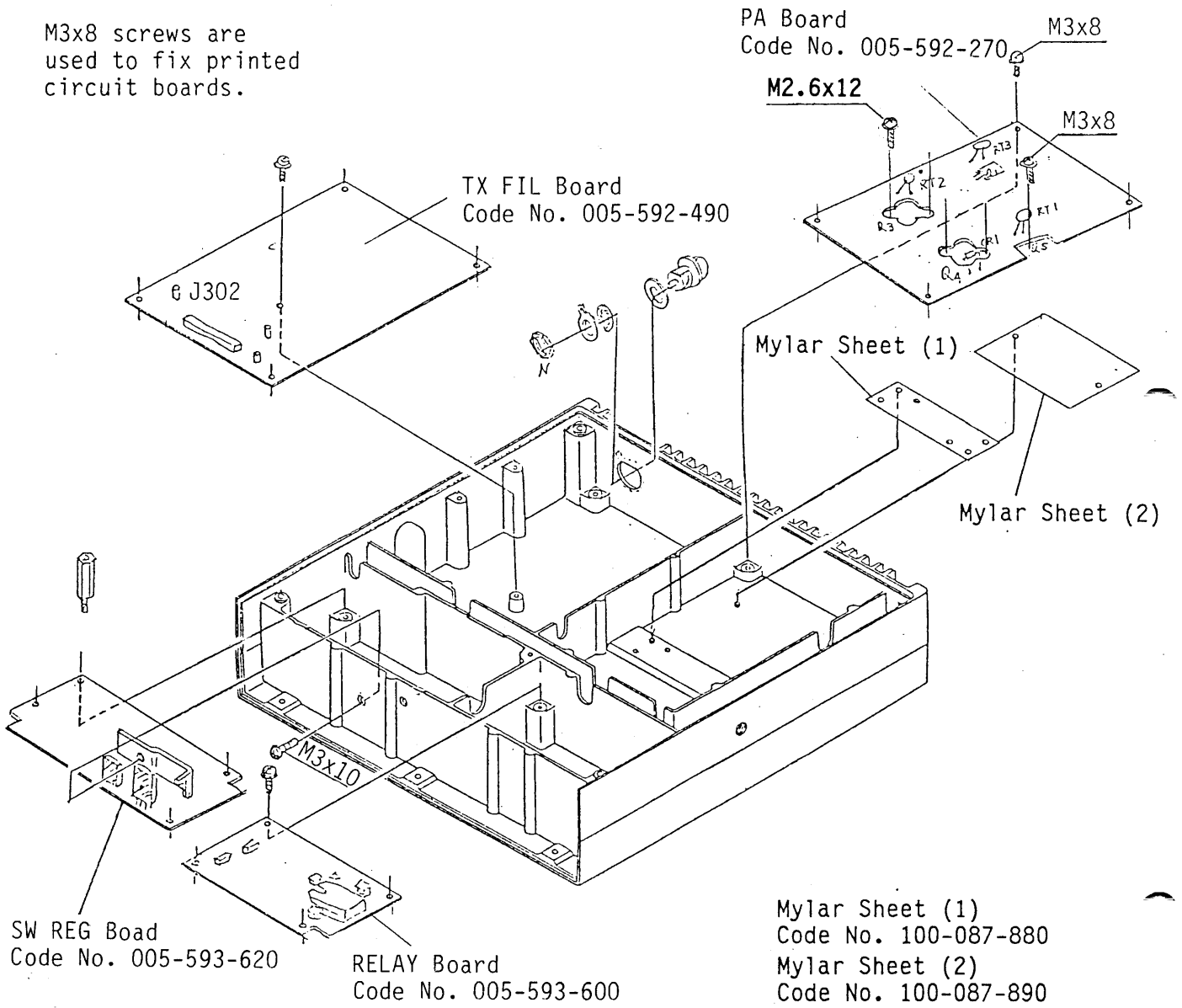


Fig. 4-5 Disassembly of P.C. Boards from Top Chassis

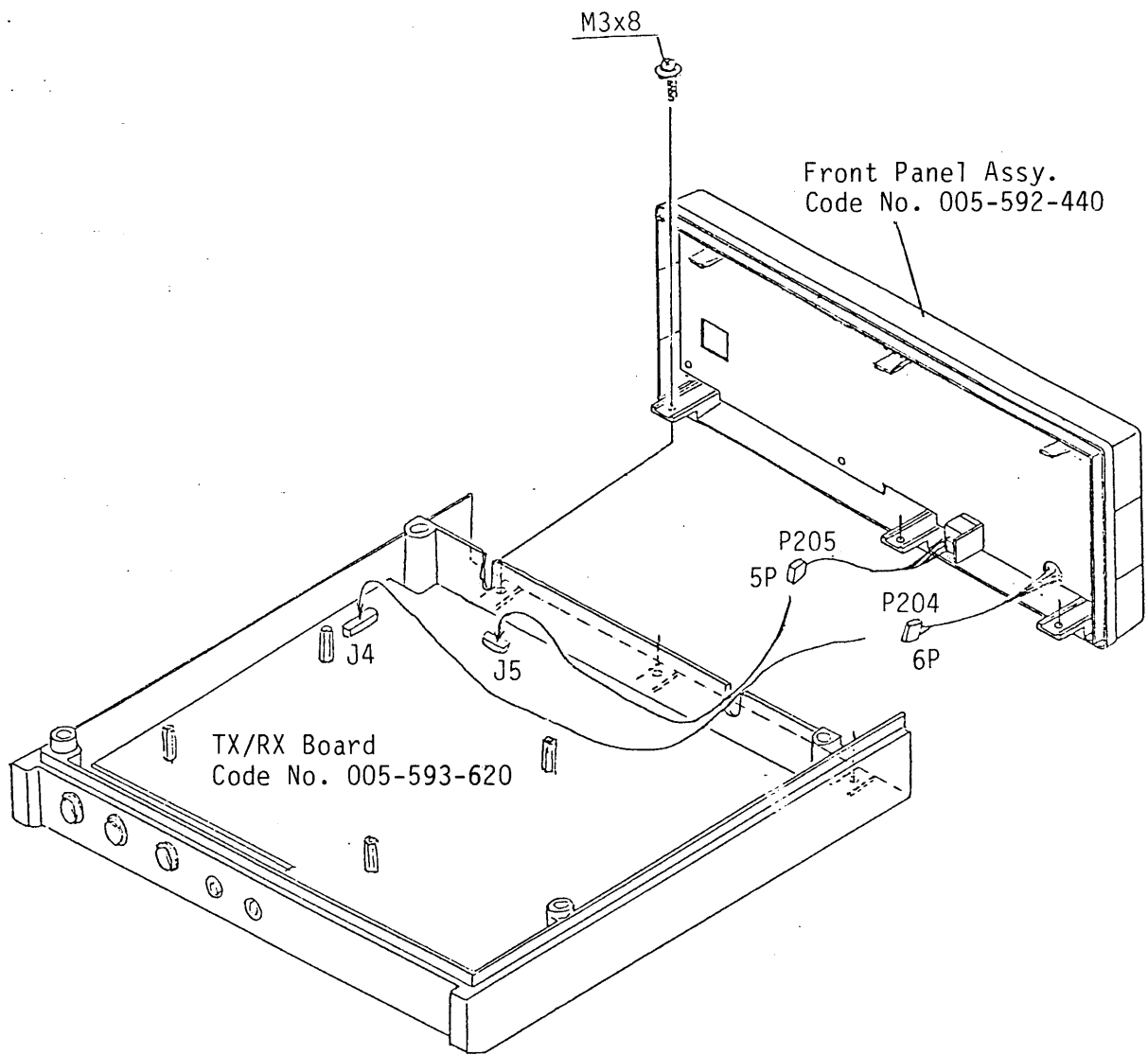


Fig. 4-6 Front Panel Disassembly



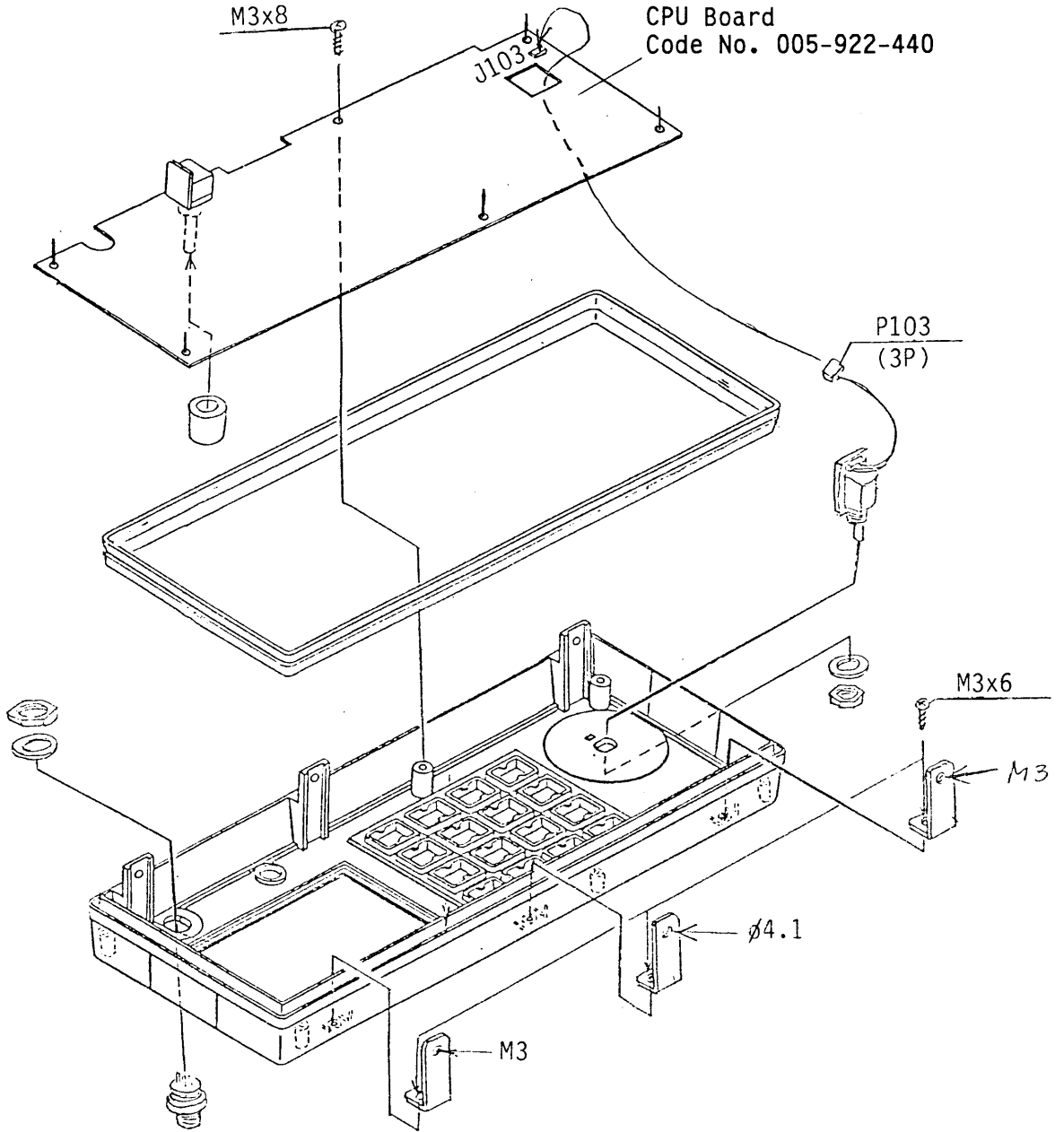
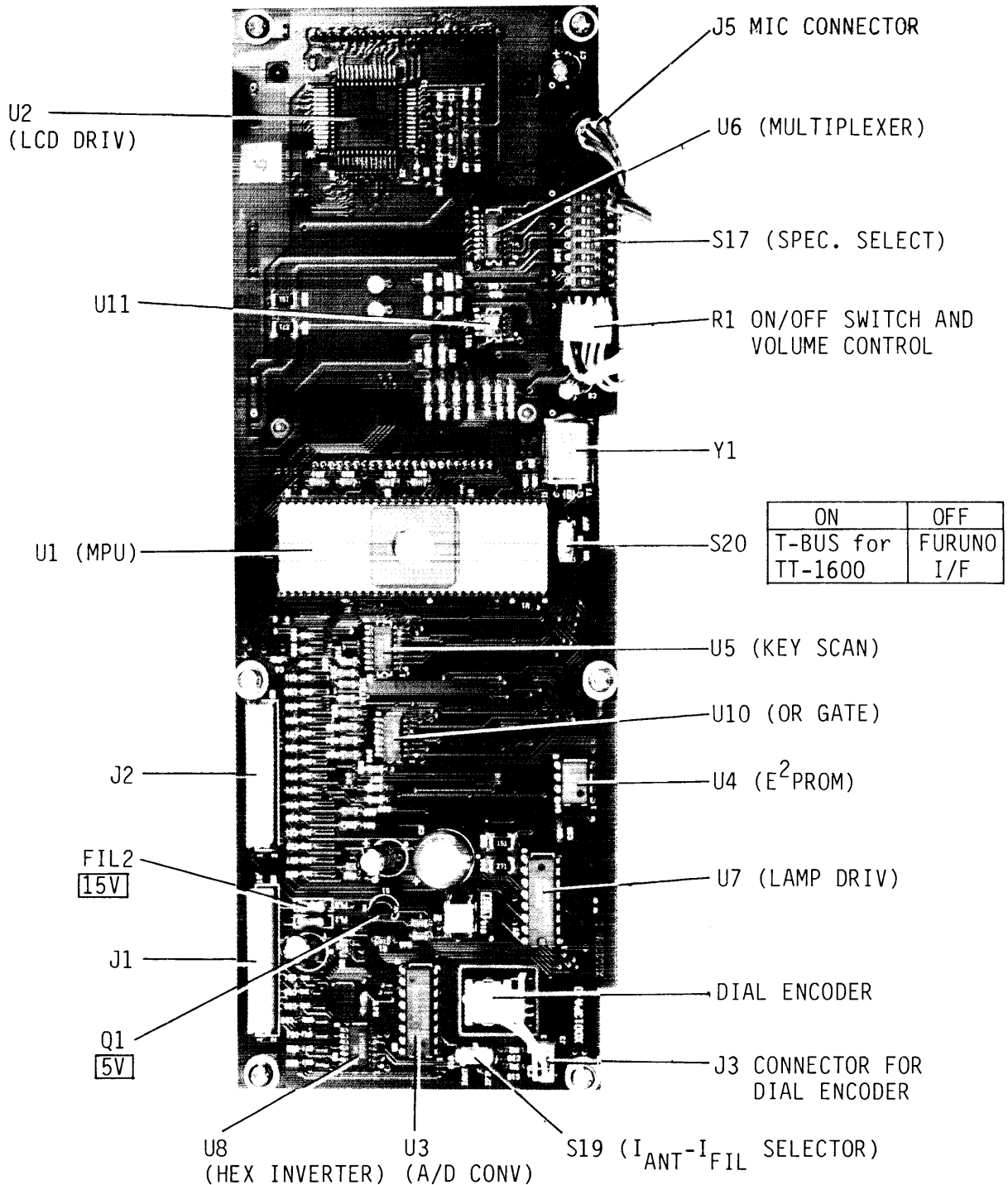


Fig. 4-7 Front Panel Disassembly

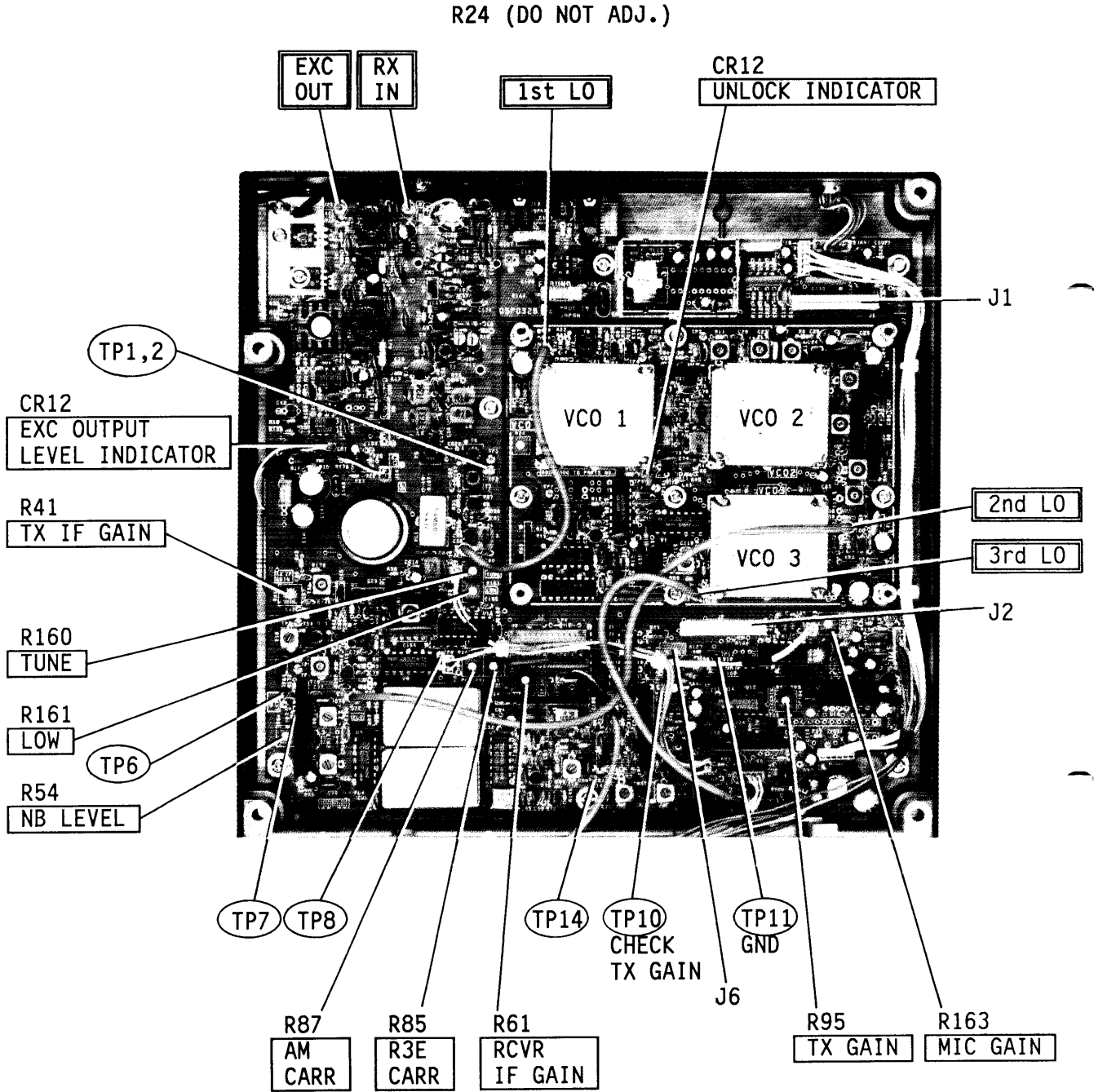
## CHAPTER 5 PARTS LOCATION

### 5.1 TRANSCEIVER UNIT

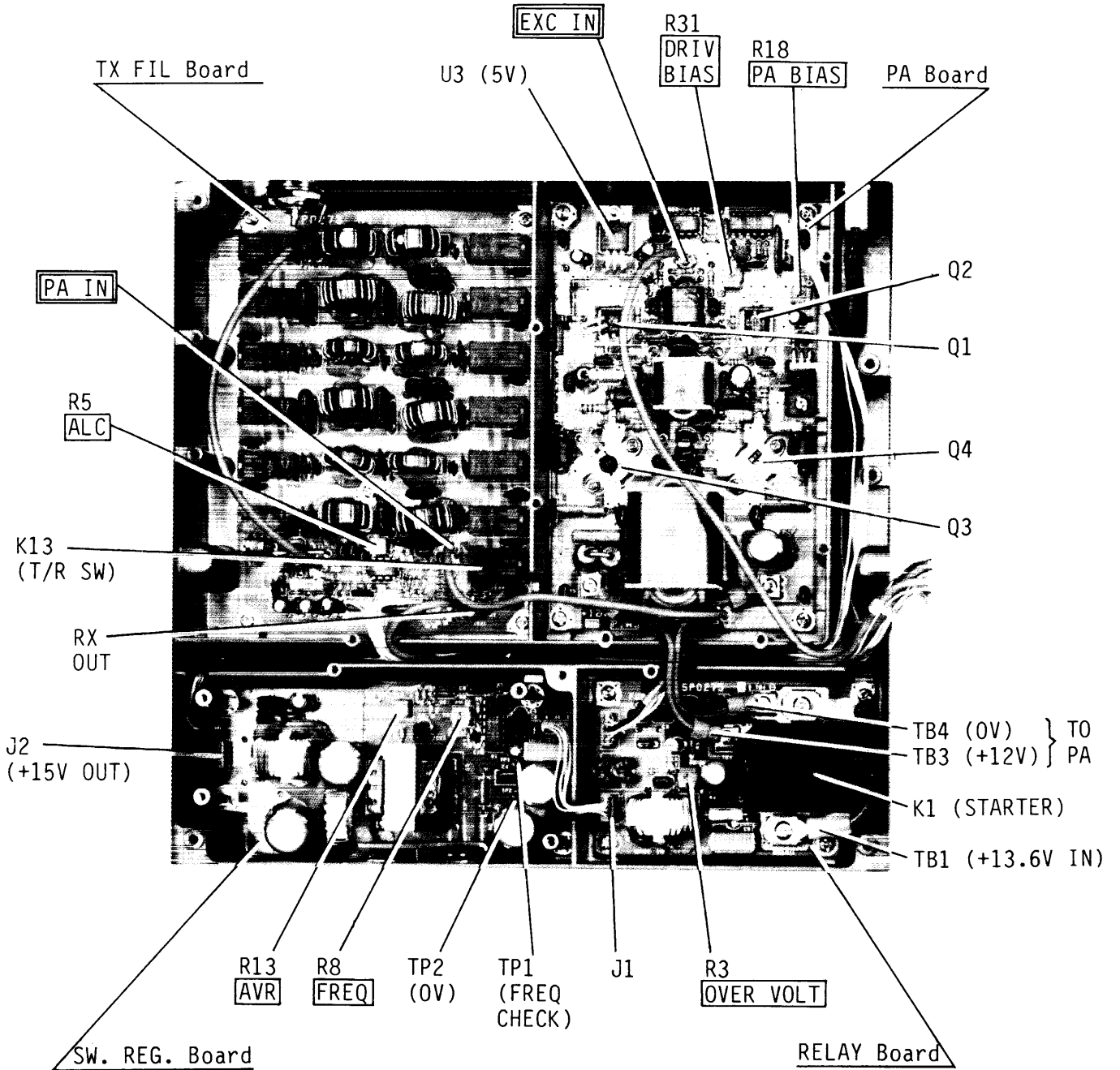
#### 1. 05P0271 CPU Board



2. 05P0328 TX/RX Board

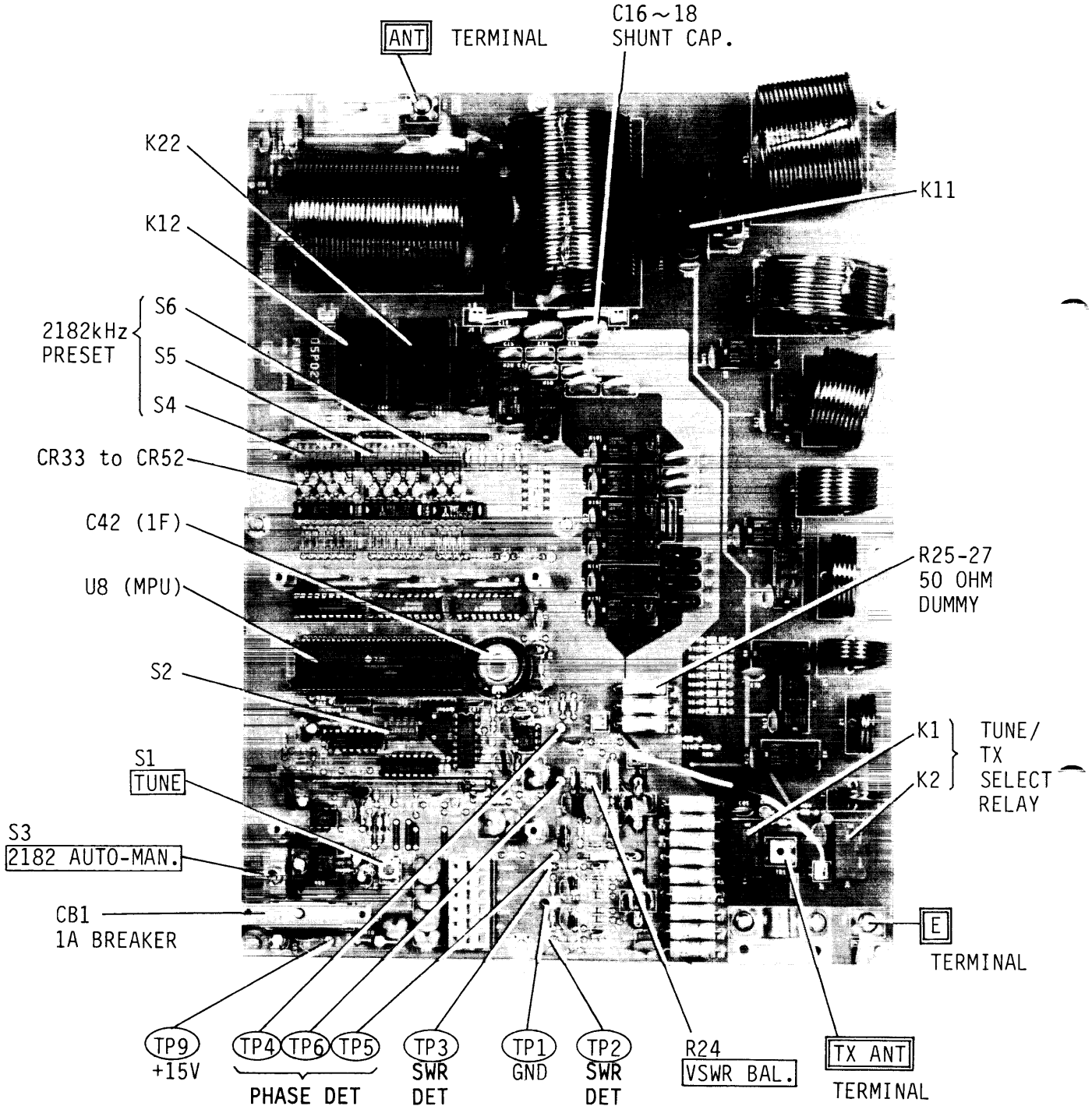


- 3. 05P0273A TX FIL Board
- 05P0274A PA Board
- 05P0326 RELAY Board
- 05P0276 SW REG Board



## 5.2 ANTENNA COUPLER

### 1. 05P0278 COUPLER Board



## CHAPTER 6 SPECIFICATIONS OF MAJOR COMPONENTS

### 6.1 Specifications of IC's

DEVICE	FUNCTION	MANUFACTURER
MSM4051RS	Single 8-channel Multiplexer/Demultiplexer	OKI
05S0392	IF AMP	FURUNO
05S0393	SQ DET	FURUNO
05S0394	NB DET	FURUNO
05S0395	ALC AMP	FURUNO
05S0396	AGC AMP	FURUNO
HD637B01Y	Microprocessor	HITACHI
NJM082	Operational Amplifier	JRC
NJM2904D	operational Amplifier	JRC
LT1080CN	Quad Diff Line (RS232C) Driver Receiver	LINEAR
M54459	1/100 High Speed Divider	MITSUBISHI
M54563P	8-unit 500mA Source Type Darlington Transistor Assy.	MITSUBISHI
M54581P	8-unit 500mA Source Type Darlington Transistor Assy.	MITSUBISHI
M54927P	Serial Input PLL Frequency Synthesizer	MITSUBISHI
M54972P	8-bit Serial-Input Latched Driver	MITSUBISHI
UPC1037H	Audio Power Amplifier	NEC
UPC1094C	Switching Regulator Control	NEC
UPC1242H	Audio Power Amplifier	NEC
UPD7001C	A/D Converter	NEC
UPD7225G	Programmable LCD Controller/Driver	NEC
AN7805F	Regulator	PANASONIC
SL1611C/DG	VIDEO, IF and RF Amplifier	PLESSEY
SN74HC139	Dual 2-line to 4-line Decoders	TEXAS INST.
TA7658P	Built-in ALC, Dual Pre-amplifier	TOSHIBA
TC4013BAP	FLIP-FLOP	TOSHIBA
TC4066BP	Analog Switch	TOSHIBA
TC74HC14P	Hex Schmitt Inverter	TOSHIBA
TC74HC390P	Dual Decade Counter	TOSHIBA
X2402	Electrically Erasable PROM	XICOR

SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS	SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS
記号	型名	規格	コード番号	備考	記号	型名	規格	コード番号	備考
TRANSCEIVER UNIT									
PARTS ON CHASSIS					PARTS ON FRONT PANEL				
	PRINTED CIRCUIT BOARD*	プリント基板				JACK	ジャック		
05P0328A, TX/RX	FS-1550		005-593-620		1B07J0005	FM10RS(1)-6HA		000-113-456	
05P0273A, TX/FIL	FS-1500/1550		005-592-490			RESISTOR	抵抗		
05P0274, PA	FS-1500/1550		005-592-270		1B07R0001	RK0972211	05S0556-0	000-115-252	
05P0326, RELAY	FS-1500/1550		005-593-600			SWITCH	スイッチ		
05P0276, SW REG	FS-1500/1550		005-592-310		1B07S0001	05S0517-0	05S0517-0	000-114-134	
ASSEMBLY	アセンブリ					INTEGRATED CIRCUIT	インテグレイテッド回路		
FRONT PANEL	FS-1550		005-592-440		1B07U0001	HD637H01Y0P		000-113-481	
JACK	ジャック					LCD DISPLAY	液晶ディスプレイ		
1B08J0001	FM14-6SM		000-113-528		1B07V1001	A10A7LCF07	05S-0573-0	000-116-368	LCD PANEL
1B08J0002	FM214-7SM		000-113-463						
1B08J0003	FM214-5SM(1)		000-113-464						
1B08J0004	M-BR-H#B5*		000-505-495						
1B08J0006	05S0415-1		000-113-469						
LOUDSPEAKER	スピーカー								
1B08LS0001	SI008047	05S0391-0	000-113-465						

NOTE:  
備考:







SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS	SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS
記号	型名	規格	コード番号	備考	記号	型名	規格	コード番号	備考
1802R0110	FRD-16TJ102	0.16W 1K	000-330-801			INTEGRATED CIRCUIT	22274410		
1802R0111	FRD-16TJ150	0.050095-0	000-330-843						
1802R0112	FRD-16TJ470	0.16W 47	000-329-005		1802U0001	IF	0550392-0	000-113-391	
1802R0113	FRD-16TJ470	0.16W 47	000-329-005		1802U0002	SL1611C/PG		000-169-138	
1802R0114	FRD-16TJ470	0.16W 47	000-329-005		1802U0003	NJM2904		000-113-392	
1802R0115	FRD-16TJ470	0.16W 47	000-329-005		1802U0004	4R	0550394-0	000-113-393	
1802R0116	FRD-16TJ101	0.16W 100	000-329-013		1802U0005	TC4066BP		000-163-264	
1802R0117	FRD-16TJ101	0.16W 100	000-329-013		1802U0006	TC4066BP		000-163-264	
1802R0118	FRD-16TJ101	0.16W 100	000-329-013		1802U0007	IF	0550392-0	000-113-391	
1802R0119	FRD-16TJ101	0.16W 100	000-329-013		1802U0008	AGC	0550396-0	000-113-394	
					1802U0009	TC4066BP		000-163-264	
1802R0120	FRD-16TJ102	0.16W 1K	000-330-801		1802U0010	TA7658P		000-106-200	
1802R0121	FRD-16TJ102	0.16W 1K	000-330-801		1802U0011	S9	0550393-0	000-112-744	
1802R0122	FRD-16TJ102	0.16W 1K	000-330-801		1802U0012	ALC	0550395-0	000-113-395	
1802R0123	FRD-16TJ102	0.16W 1K	000-330-801		1802U0013	HPC1242H		000-110-984	
1802R0124	FRD-16TJ472	0.16W 4.7K	000-330-812		1802U0014	TC4066BP		000-163-264	
1802R0125	FRD-16TJ103	0.16W 10K	000-329-015		1802U0015	NJM082	0550397-0	000-113-396	
1802R0126	FRD-16TJ101	0.16W 100	000-329-013		1802U0016	V0X		000-113-353	
1802R0127	FRD-16TJ101	0.16W 100	000-329-013		1802U0017	M54972P		000-113-380	
1802R0128	FRD-16TJ101	0.16W 100	000-329-013		1802U0018	M54972P		000-113-380	
1802R0129	FRD-16TJ101	0.16W 100	000-329-013		1802U0019	M54972P		000-113-380	
1802R0130	FRD-16TJ101	0.16W 100	000-329-013		1802U0021	M54581P		000-196-229	
1802R0131	FRD-16TJ101	0.16W 100	000-329-013		1802U0022	LT1680CA		000-111-479	
1802R0132	FRD-16TJ101	0.16W 100	000-329-013		1802U0023	AN7605F		000-113-496	
1802R0133	FRD-16TJ101	0.16W 100	000-329-013						
1802R0134	FRD-16TJ101	0.16W 100	000-329-013			POTENTIOMETER	4*デジコンメータ		
1802R0135	FRD-16TJ101	0.16W 100	000-329-013		1802VR0002	HZ12A-1L	ZENER	000-113-383	
1802R0136	FRD-16TJ101	0.16W 100	000-329-013						
1802R0137	FRD-16TJ103	0.16W 10K	000-329-015			CABLE WITH CONNECTOR	コネクタケーブル		
1802R0138	FRD-16TJ101	0.16W 100	000-329-013		1802W0001	L-140	0750046-0	000-522-074	
1802R0139	FRD-16TJ102	0.16W 1K	000-330-801		1802W0002	L-250	0750046-0	000-522-004	
					1802W0003	L-170	0750046-0	000-522-076	
1802R0140	EXE-F5E472J	0.125W 4.7KX4	000-379-073						
1802R0141	EXB-F5E472J	0.125W 4.7KX4	000-379-073						
1802R0142	EXA-F5E472J	0.125W 4.7KX4	000-379-073						
1802R0143	EXB-F5E472J	0.125W 4.7KX4	000-379-073						
1802R0144	FKG-35J180P	0.050102-0	000-375-517						
1802R0145	FRD-16TJ392	0.16W 3.9K	000-329-047						
1802R0146	FRD-16TJ102	0.16W 1K	000-330-801						
1802R0154	FRD-16TJ152	0.16W 1.5K	000-329-039						
1802R0155	FRD-16TJ222	0.16W 2.2K	000-330-809						
1802R0156	FRD-16TJ331	0.16W 330	000-329-025						
1802R0157	FRD-16TJ331	0.16W 330	000-329-025						
1802R0158	FRD-16TJ101	0.16W 100	000-329-013						
1802R0159	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0160	EVM-MCGA01R53	5K (00S0119)	000-103-631						
1802R0161	EVM-MCGA01R14	10K	000-103-632						
1802R0162	FRD-16TJ221	0.16W 220	000-329-021						
1802R0163	EVM-MCGA01R52	0.050119-1	000-103-592						
1802R0164	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0165	FRD-16TJ102	0.16W 1K	000-330-801						
1802R0166	FRD-16TJ103	0.16W 10K	000-329-015						
1802R0167	FRD-16TJ150	0.050095-0	000-330-845						
1802R0168	FRD-16TJ102	0.16W 1K	000-330-801						
1802R0169	FRD-16TJ681	0.16W 680	000-330-813						
1802R0170	FRD-16TJ102	0.16W 1K	000-330-801						
1802R0171	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0172	FRD-16TJ103	0.16W 10K	000-329-015						
1802R0173	FRD-16TJ331	0.16W 330	000-329-025						
1802R0174	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0175	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0176	FRD-16TJ470	0.16W 47	000-329-005						
1802R0178	FRD-16TJ681	0.16W 680	000-330-813						
1802R0179	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0180	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0181	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0182	FRD-16TJ473	0.16W 47K	000-330-814						
1802R0183	FRD-16TJ103	0.16W 10K	000-330-802						
1802R0184	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0185	FRD-16TJ101	0.16W 100	000-329-013						
1802R0186	FRD-16TJ472	0.16W 4.7K	000-330-812						
1802R0187	FRD-16TJ102	0.16W 1K	000-330-801						
1802R0188	FRD-16TJ332	0.16W 3.3K	000-329-045						
1802R0190	FRD-16TJ100	0.16W 10	000-330-839						
1802R0191	FRD-16TJ683	0.16W 68K	000-329-071						
1802R0192	FRD-16TJ103	0.16W 10K	000-330-802						
	THERMISTOR	サーミスタ							
1802RT0001	D-33A		000-180-625						
1802RT0002	D-33A		000-180-625						
1802RT0003	D-33A		000-180-625						
1802RT0004	D-33A		000-180-625						
	TRANSFORMER	トランス							
1802T0001	ST460	0550355-0	000-109-054						
1802T0002	ST476	0550420-0	000-113-389						
1802T0003	ST460	0550355-0	000-109-054						
1802T0004	ST476	0550420-0	000-113-389						
1802T0007	ST460	0550355-0	000-109-054						
1802T0011	ST474	0550417-0	000-113-390						
1802T0012	ST475	0550419-0	000-113-369						
1802T0013	ST460	0550355-0	000-109-054						
1802T0014	ST460	0550355-0	000-109-054						
1802T0015	ST475	0550419-0	000-113-369						

NOTE:  
備考:





SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考	SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
1803C0040	DB05CH150J50V	13PF 500V	000-113-423			RESISTOR	510Ω		
1803C0041	DB12CH181J50V	120PF 500V	000-106-130						
1803C0042	DB07CH160J50V	36PF 500V	000-113-424						
1803C0043	DB10CH190J50V	91PF 500V	000-113-425						
1803C0044	ECC-F1H470JC	47PF 500VDC	000-251-526		1803R0001	FRD-25PJ332	0.25x 3.3x	000-330-369	
1803C0045	DB05CH150C50V	51PF 500V	000-113-426		1803R0002	FRG-25J6750	0.05x102-3	000-375-460	
1803C0046	DB10CH190J50V	100PF 500V	000-106-130		1803R0003	FRD-16TJ103	0.16x 10K	000-330-302	
1803C0048	ECR-V1H104JZ	0.1UF 50V	000-261-524		1803R0005	FRD-16TJ103	0.16x 10K	000-330-302	
					1803R0006	FRD-16TJ102	0.16x 1K	000-330-301	
1803C0050	ECF-A1FU100E	10UF 25V	000-201-812		1803R0007	FRD-16TJ471	0.16x 470	000-329-029	
1803C0051	FCQ-V1H104JZ	0.1UF 50V	000-261-524		1803R0008	FRD-16TJ473	0.16x 47K	000-330-814	
1803C0052	FCQ-V1H104JZ	0.1UF 50V	000-261-524		1803R0009	FRD-16TJ471	0.16x 470	000-329-029	
1803C0053	FCQ-V1H104JZ	0.1UF 50V	000-261-524						
1803C0054	FCQ-V1H104JZ	0.1UF 50V	000-261-524		1803R0010	FRD-16TJ473	0.16x 47K	000-330-814	
1803C0055	FAC-FHT103DC	0.530μ72-1	000-107-904		1803R0011	FRD-16TJ473	0.16x 47K	000-330-814	
1803C0057	ECF-A1FU220E	22UF 25V	000-211-813		1803R0012	FRD-16TJ473	0.16x 47K	000-330-814	
1803C0058	FCQ-V1H104JZ	0.1UF 50V	000-261-524		1803R0013	FRD-16TJ101	0.16x 100	000-329-013	
1803C0059	FCQ-V1H104JZ	0.1UF 50V	000-261-524		1803R0014	FRD-16TJ103	0.16x 10K	000-330-802	
					1803R0015	FRD-16TJ103	0.16x 10K	000-330-802	
1803C0060	ECQ-R1H103JZ	0.01UF 50V	000-100-125			INTEGRATED CIRCUIT	51281100		
1803C0061	ECE-A1A0101E	100UF 10V	000-206-113		1803U0001	NJ22040		000-113-434	
1803C0062	ECQ-R1H102JZ	1000PF 50V	000-100-753						
	DIODE	ダイオード							
1803CR0001	1S582		000-114-021						
1803CR0002	1S582		000-114-021						
1803CR0003	1S5133		000-103-097						
1803CR0004	1S5133		000-103-097						
1803CR0005	1S582		000-114-021						
1803CR0006	1S582		000-114-021						
1803CR0007	1S582		000-114-021						
1803CR0008	1S582		000-114-021						
1803CR0009	1S582		000-114-021						
1803CR0010	1S582		000-114-021						
1803CR0011	1S532		000-114-021						
1803CR0012	1S532		000-114-021						
	ARRESTER	避雷器							
1803E0001	T04-3503		000-113-427						
	JACK	ジャック							
1803J0001	IL-S-13P-S2T2-FF	1950077-0	000-113-404						
1803J0002	TMP-J01X-V6	0550455	000-509-359						
1803J0003	TMP-J01X-V6	0550455	000-509-359						
1803J0004	TMP-J01X-V6	0550455	000-509-359						
	RELAY	リレー			1804	05P0274	P.A.	005-592-270	
1803K0001	G6R-1114P-US-AP-12V		000-114-405			CAPACITOR	コンデンサ		
1803K0002	G6R-1114P-US-AP-12V		000-114-405						
1803K0003	G6R-1114P-US-AP-12V		000-114-405		1804C0001	FCQ-R1H472JZ	4700PF 50V	000-102-493	
1803K0004	G6R-1114P-US-AP-12V		000-114-405		1804C0002	FCQ-R1H472JZ	4700PF 50V	000-102-493	
1803K0005	G6R-1114P-US-AP-12V		000-114-405		1804C0003	FCQ-R1H103JZ	0.01UF 50V	000-100-125	
1803K0006	G6R-1114P-US-AP-12V		000-114-405		1804C0004	FCQ-R1H103JZ	0.01UF 50V	000-100-125	
1803K0007	G6R-1114P-US-AP-12V		000-114-405		1804C0005	ECF-A1A0101E	100UF 10V	000-206-113	
1803K0008	G6R-1114P-US-AP-12V		000-114-405		1804C0006	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
1803K0009	G6R-1114P-US-AP-12V		000-114-405		1804C0007	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
1803K0010	G6R-1114P-US-AP-12V		000-114-405		1804C0008	ECC-F1H101JC	100PF, 50V	000-258-910	
1803K0011	G6R-1114P-US-AP-12V		000-114-405		1804C0009	DM15C511K1	510PF, 100V	000-222-285	
1803K0012	G6R-1114P-US-AP-12V		000-114-405						
1803K0013	G6R-2114P-DC12V		000-113-424						
	COIL	コイル			1804C0012	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
1803L0001	5T508	0550472-0	000-113-429		1804C0013	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
1803L0002	5T023	0554075-1	000-732-573		1804C0014	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
1803L0003	5T024	0554075-0	000-732-574		1804C0015	ECF-A1A0471E	470UF 10V	000-206-113	
1803L0004	5T025	0554075-3	000-732-575		1804C0016	DB109E103P50V	0.01UF 50V	000-253-436	
1803L0005	5T026	0554076-0	000-732-576		1804C0017	ECF-A1A0101E	100UF 10V	000-206-113	
1803L0006	5T027	0550463-0	000-113-430		1804C0018	C5450SL1H082K	6800PF	000-113-436	
1803L0007	5T027	0554077-0	000-732-577		1804C0019	C5450SL1H082K	6800PF	000-113-436	
1803L0008	5T028	0554078-0	000-732-578						
1803L0009	5T029	0554079-0	000-732-579		1804C0020	DM19C122K5	1200PF, 500V	000-222-448	
1803L0010	5T505	0550469-0	000-113-431		1804C0021	ECF-A1E0102E	1000UF, 25V	000-201-318	
1803L0011	5T506	0550470-0	000-113-432		1804C0022	MD-2-2F-224K	0.22UF 2500WV	000-262-187	
1803L0012	5T507	0550471-0	000-113-433		1804C0023	GR44-145R104M100	0.1UF 100V	000-254-000	
1803L0013	LAL03WAR22M	0.22UF	000-424-134		1804C0024	MD-2-2F-224K	0.22UF 2500WV	000-262-187	
1803L0014	5T031	0554081-0	000-732-581		1804C0025	ECF-A1FU100E	100UF 25V	000-201-812	
					1804C0026	ECF-A1FU100E	100UF 25V	000-201-812	
					1804C0027	DB109E103P50V	0.01UF 50V	000-253-436	
					1804C0028	DB109E103P50V	0.01UF 50V	000-253-436	
					1804C0029	DB109E103P50V	0.01UF 50V	000-253-436	
					1804C0030	DB109E103P50V	0.01UF 50V	000-253-436	
					1804C0031	DB109E103P50V	0.01UF 50V	000-253-436	
					1804C0032	FXF-P41022W	1000PF 50V	000-106-078	
					1804C0033	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
					1804C0034	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
					1804C0035	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
					1804C0036	FCQ-V1H104JZ	0.1UF 50V	000-261-524	
					1804C0037	G461SL102K50	1000PF 50V	000-253-490	
					1804C0038	DM15C471K5	470PF, 500V	000-222-282	
					1804C0040	DM19C472K5	4700PF 500V	000-113-438	
					1804C0041	C95AF2A2247	0.22MF 100V	000-254-992	
					1804C0042	C95AF2A2247	0.22MF 100V	000-254-392	
					1804C0043	MD-2-2F-104M	0.1UF 2500WV	000-262-183	
					1804C0044	MD-2-2F-104M	0.1UF 2500WV	000-262-183	
					1804C0045	DM16C331K1	330PF, 100V	000-222-120	
					1804C0046	DM16C331K1	330PF, 100V	000-222-120	

NOTE:

備考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考	SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
1B04C0001	DIODE SV92Y5	ダイオード	000-106-176						
1B04J0001	JACK TL-5-4P-52T2-1F	ジャック	000-108-091		1B05	05P0326	RELAY	005-593-600	
1B04J0002	IMP-J01X-V6	1950079-0	000-593-359						
1B04J0003	IMP-J01X-V6	0550455	000-599-359						
1B04L0001	CAPACITOR LALH3A100K	コンデンサ	000-428-144						
1B04L0002	LALU34A100F	100H	000-428-144		1B05C0001	H32562-E1155J	1.50UF 100V	000-101-171	
1B04L0003	2C3H15X5-2	100H	000-424-149		1B05C0002	H32562-E1155J	1.50UF 100V	000-101-171	
1B04L0004	2C3H15X5-2		000-424-149		1B05C0003	H32562-E1155J	1.50UF 100V	000-101-171	
1B04L0005	FD-225		000-428-990		1B05C0004	EGF-A1EJ471r	470UF 25V	000-201-817	
1B04L0006	FD-225		000-428-990		1B05C0005	D0109E103P50V	0.01UF 50V	000-253-436	
1B04L0007	FD-201		000-428-950		1B05C0006	FCG-V1H104JZ	0.1UF 50V	000-261-524	
1B04L0008	FD-201		000-428-950		1B05C0007	D0109E103P50V	0.01UF 50V	000-253-436	
1B04L0009	FD-201		000-428-950		1B05C0008	FCG-V1H104JZ	0.1UF 50V	000-261-524	
1B04L0010	FD-201		000-428-950		1B05C0009	FCG-V1H104JZ	0.1UF 50V	000-261-524	
					1B05C0010	D55310-750223550V	0454163-0	000-103-745	
					1B05C0011	D55310-750223550V	0454163-0	000-103-745	
					1B05C0012	D55310-750223550V	0454163-0	000-103-745	
1B04R0001	TRANSISTOR 2SC5133	トランジスタ	000-126-340						
1B04R0002	2SC5133		000-126-340		1B05C0001	DIODE V06C	ダイオード	000-136-005	
1B04R0003	2SC5240		000-113-440		1B05C0002	V06C		000-136-005	
1B04R0004	2SC5240		000-113-440						
1B04R0005	2SD1271A-P		000-128-069						
1B04R0006	2SA1315-Y		000-113-093						
1B04R0001	RESISTOR FRD-25TJ651	抵抗	000-330-553						
1B04R0002	FRD-25PJ100	0.25W 680	000-330-509						
1B04R0003	FRD-25TJ681	0.25W 10	000-330-553		1B05K0001	RELAY G4F-11123T-0C12V	リレー	000-113-446	
1B04R0004	FRD-25PJ2R2	0.25W 2.2	000-330-227						
1B04R0005	FRD-25PJ2R2	0.25W 2.2	000-330-227						
1B04R0006	FRD-25PJ470	0.25W 47	000-330-325						
1B04R0007	FRD-25PJ470	0.25W 47	000-330-325						
1B04R0008	FRD-25PJ330	0.25W 33	000-330-321						
1B04R0009	FRD-25PJ330	0.25W 33	000-330-321						
1B04R0010	ERG-25J470P	2W 47	000-375-657		1B05Q0001	TRANSISTOR HN4211	トランジスタ	000-108-963	
1B04R0011	ERG-25J470P	2W 47	000-375-657		1B05Q0002	2SD667A		000-127-940	
1B04R0012	ERX-15J132P	0.5W 1.2 5%	000-375-372						
1B04R0013	ERX-15J132P	0.5W 1.2 5%	000-375-372						
1B04R0014	FRD-50TJ100	0.5W 10	000-330-009						
1B04R0015	FRD-50TJ100	0.5W 10	000-330-009						
1B04R0016	FRX-15J3P3P	3.3, 1W	000-375-377		1B05R0001	RESISTOR ERG-25J220P	抵抗	000-375-453	
1B04R0017	FRX-15J3R3P	3.3, 1W	000-375-377		1B05R0002	ERD-16TJ102	2W 22	000-330-801	
1B04R0018	EV4-MCGA01B12	100	000-103-628		1B05R0003	EV4-MCGA01B53	5K (00S0119)	000-103-631	
1B04R0019	ERD-16TJ271	0.16W 270	000-329-023		1B05R0004	ERD-16TJ102	0.16W 1K	000-330-801	
1B04R0020	ERX-35J497P	0.050102-0	000-375-509		1B05R0005	ERD-16TJ102	0.16W 1K	000-330-801	
1B04R0021	ERD-16TJ102	0.16W 1K	000-330-801		1B05R0006	ERD-16TJ102	0.16W 1K	000-330-801	
1B04R0022	ERD-16TJ102	0.16W 1K	000-330-801		1B05R0007	ERD-16TJ101	0.16W 100	000-329-013	
1B04R0023	ERD-16TJ102	0.16W 1K	000-330-801		1B05R0008	ERD-16TJ101	0.16W 100	000-329-013	
1B04R0024	ERD-16TJ102	0.16W 1K	000-330-801						
1B04R0025	ERD-16TJ222	0.16W 2.2K	000-330-809						
1B04R0026	ERD-16TJ271	0.16W 270	000-329-023						
1B04R0027	ERD-16TJ222	0.16W 2.2K	000-330-809		1B05R0001	TERMISTOR D-22A	サーミスタ	000-180-617	
1B04R0028	ERD-16TJ222	0.16W 2.2K	000-330-809						
1B04R0029	ERD-16TJ122	0.16W 1.2K	000-329-037						
1B04R0030	ERD-16TJ102	0.16W 1K	000-330-801						
1B04R0031	EV4-MCGA01B12	100	000-103-628						
1B04R0032	FRX-25JR22	2W 0.22	000-102-635		1B05U0001	INTEGRATED CIRCUIT MPC1093J	集積回路	000-113-445	
1B04R0033	ERD-16TJ680	0.16W 68	000-329-009						
1B04R0034	FRD-16TJ100	0.16W 10	000-330-339						
1B04R0035	ERD-16TJ101	0.16W 100	000-329-013						
1B04RT0001	THERMISTOR D-22A	サーミスタ	000-180-617						
1B04RT0002	D-33A		000-180-625						
1B04RT0003	D-91A		000-180-650						
1B04T0001	TRANSFORMER ST018A	変圧器	000-750-772						
1B04T0002	ST523	0550473-0	000-113-442						
1B04T0003	ST525	0550475-0	000-113-443						
1B04T0004	ST524	0550474-0	000-113-444						
1B04U0001	INTEGRATED CIRCUIT NJM2904D	集積回路	000-113-434						
1B04U0002	PCR37		000-134-274						
1B04U0003	NJM7805A		000-113-448						

NOTE:

備考:

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考	SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
1B06	05P0276	SW REG	005-592-310		ANTENNA COUPLER UNIT				
CAPACITOR コンデンサ					MISCELLANEOUS ソッド				
1B06C0001	B32562-E1155J	1.5UF 100V	000-101-171		2B02 0000	Ss-03		000-113-498	ANT. INSULATOR
1B06C0002	ECE-A1EFS102F	1000UF 25V	000-113-451		PRINTED CIRCUIT BOARD 印刷基板				
1B06C0003	ECE-A1EFS102F	1000UF 25V	000-113-451		2B02A0001	05P0276, COUP	AT-1500	005-592-370	
1B06C0004	FCQ-P1101J7	100PF 1004V	000-261-801						
1B06C0005	FCQ-P1152J2	45.5	000-261-128						
1B06C0006	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0007	ECQ-A1FU470E	47UF 25V	000-201-815						
1B06C0008	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0009	ECQ-A1H0010E	1UF 50V	000-296-115						
1B06C0010	PRF132CH102J50	1000PF 50V	000-105-395						
1B06C0011	ECQ-V1H105JZ	0.01UF 50V	000-100-125						
1B06C0012	ECQ-A1EFS102F	1000UF 25V	000-113-451						
1B06C0013	ECQ-A1EFS102F	1000UF 25V	000-113-451						
1B06C0014	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0015	ECQ-A1EJ101F	45.0 100MF 25V	000-206-105						
1B06C0016	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0017	DSS310-750223550V	0454163-0	000-103-745						
1B06C0018	DSS310-750223550V	0454163-0	000-103-745						
1B06C0019	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0020	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0021	ECQ-V1H104JZ	0.1UF 50V	000-261-524						
1B06C0022	ECQ-P1101J7	100PF 1004V	000-261-801						
DIODE ダイオード					2B01 05P0278 COUP 005-922-750				
1B06C0001	MA649		000-107-973		CAPACITOR コンデンサ				
FILTER フィルタ					2B01C0001 DM19C122K5 1200PF, 500V 000-222-448				
1B06FL0001	SC-05-100	10H 5A	000-424-972		2B01C0002 DM19C122K5 1200PF, 500V 000-222-448				
COIL コイル					2B01C0003 DM19C122K5 1200PF, 500V 000-222-448				
1B06L0001	HP-032		000-106-776		2B01C0004 DM19C122K5 1200PF, 500V 000-222-448				
TRANSISTOR トランジスタ					2B01C0005 DM19C122K5 1200PF, 500V 000-222-448				
1B06G0001	2SK751A		000-113-449		2B01C0006 DE1207SL151J3KV 150PF 3KV 000-106-212				
RESISTOR 抵抗					2B01C0007 DE1207SL151J3KV 150PF 3KV 000-106-212				
1B06R0001	ERN-50TJ4K7	0.5W 4.7	000-330-001		2B01C0008 DE1207SL151J3KV 150PF 3KV 000-106-212				
1B06R0002	ERN-50TJ561	0.5W 560	000-330-051		2B01C0009 DE1207SL151J3KV 150PF 3KV 000-106-212				
1B06R0003	ERN-50TJ100	0.5W 10	000-330-009		2B01C0010 DE1207SL151J3KV 150PF 3KV 000-106-212				
1B06R0004	ERN-16TJ220	0.16W 22	000-330-247		2B01C0011 DE0907SLR20J3KV 82PF 3KV 000-106-211				
1B06R0005	ERN-16TJ273	0.16W 27K	000-330-311		2B01C0012 DE0907SLR20J3KV 82PF 3KV 000-106-211				
1B06R0006	ERN-16TJ103	0.16W 10K	000-330-302		2B01C0013 DE0807SL680J3KV 68PF 3KV 000-113-482				
1B06R0007	ERN-16TJ103	0.16W 10K	000-330-302		2B01C0014 DE0807SL680J3KV 68PF 3KV 000-113-482				
1B06R0008	FVM-HCGA01R14	10K	000-103-632		2B01C0015 DE0807SL680J3KV 68PF 3KV 000-113-482				
1B06R0009	ERN-16TJ102	0.16W 1K	000-330-801		2B01C0016 DE1510SL151J6KV 150PF 6KV 000-113-483				
1B06R0010	ERN-16TJ102	0.16W 1K	000-330-801		2B01C0017 DE1510SL151J6KV 150PF 6KV 000-113-483				
1B06R0011	ERN-16TJ151	0.25W 150	000-329-017		2B01C0018 DE1510SL151J6KV 150PF 6KV 000-113-483				
1B06R0012	ERN-16TJ472	0.16W 4.7K	000-330-812		2B01C0019 DD109E103P50V 0.01UF 50V 000-253-436				
1B06R0013	FVM-HCGA01R13	1K	000-103-593		2B01C0020 ECQ-V1H104JZ 0.1UF 50V 000-261-524				
1B06R0014	ERN-16TJ102	0.16W 1K	000-330-301		2B01C0021 DD109E103P50V 0.01UF 50V 000-253-436				
1B06R0015	ERN-15J101P	100,14	000-375-397		2B01C0022 DD109E103P50V 0.01UF 50V 000-253-436				
TRANSFORMER トランス					2B01C0023 ECC-F1H150JC 15PF 50V 000-256-902				
1B06T0001	ST4A1	0550416-0	000-113-450		2B01C0024 RPE132CH331J50 330PF 50V 000-105-389				
INTEGRATED CIRCUIT 集積回路					2B01C0025 ECC-F1H150JC 15PF 50V 000-256-902				
1B06U0001	UPC1094C	0550476-0	000-113-460		2B01C0026 RPF132CH331J50 330PF 50V 000-105-389				
1B06U0002	PC-17A	1454043-1	000-134-273		2B01C0027 DD109E103P50V 0.01UF 50V 000-253-436				
1B06U0003	UPC1093J		000-113-445		2B01C0028 ECC-F1H170JC 17PF 50V0C 000-255-212				
					2B01C0029 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0030 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0031 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0032 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0033 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0034 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0035 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0036 DSS310-750223550V 0454163-0 000-103-745				
					2B01C0037 DD109E103P50V 0.01UF 50V 000-253-436				
					2B01C0038 ECE-A1FU100E 100UF 25V 000-201-812				
					2B01C0039 DD109E103P50V 0.01UF 50V 000-253-436				

NOTE:  
備考:

Table with 5 columns: SYMBOL, TYPE, SPECIFICATIONS, CODE NO., REMARKS. It lists various electronic components like capacitors, resistors, transistors, and coils with their specifications and part numbers.

NOTE:
備考:



SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS	SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS
記号	型名	規格	コード番号	備考	記号	型名	規格	コード番号	備考
2801R0010	FRD-16TJ103	0.16W 10K	000-330-302			INTEGRATED CIRCUIT	22224510		
2801R0011	FRD-25PJ101	0.25W 100	000-330-333		2801U0001	TC74HC390P		000-100-838	
2801R0012	FRD-25PJ101	0.25W 100	000-330-333		2801U0002	UPD7001C		000-112-375	
2801R0013	FRD-25PJ101	0.25W 100	000-330-333		2801U0005	TC74HC14P		000-163-421	
2801R0014	FRD-25PJ101	0.25W 100	000-330-333		2801U0004	751953L		000-103-052	
2801R0015	FRD-16TJ103	0.16W 10K	000-330-302		2801U0005	NJM7805A		000-113-448	
2801R0016	FRD-16TJ471	0.16W 470	000-329-079		2801U0006	NJM24030		000-113-480	
2801R0017	FRG-15J101P	100.1W	000-375-397		2801U0007	NJM29040		000-113-434	
2801R0018	FRG-15J390P	1W 39	000-375-391		2801U0008	HU63R01Y0E76P	0550522-0	000-114-315	
2801R0019	FRG-15J390P	1W 39	000-375-391		2801U0009	M54563P		000-106-278	
2801R0020	FRD-16TJ152	0.16W 1.5K	000-329-039		2801U0010	M54563P		000-106-278	
2801R0021	FRD-16TJ152	0.16W 1.5K	000-329-039		2801U0011	M54563P		000-106-278	
2801R0022	FRD-16TJ392	0.16W 3.9K	000-329-047		2801U0012	EXR-R09-472J		000-379-055	
2801R0023	FRD-16TJ392	0.16W 3.9K	000-329-047		2801U0013	EXR-R09-472J		000-379-055	
2801R0024	FRG-MC6A01853	5V (00S0119)	000-103-631		2801U0014	EXR-R09-472J		000-112-256	
2801R0025	FRG-35J151P	0050102-0	000-375-529			POTENTIOMETER	4*70303A-7		
2801R0026	FRG-35J151P	0050102-0	000-375-529		2801V0001	05A22.7Z	ZENER	000-104-424	
2801R0027	FRG-35J151P	0050102-0	000-375-529		2801V0002	05A23.3Z	ZENER	000-111-882	
2801R0028	FRD-16TJ273	0.16W 27K	000-330-411			CRYSTAL	29129W		
2801R0029	FRD-16TJ273	0.16W 27K	000-330-411		2801Y0001	4MHZ 05S0594-0		000-116-696	
2801R0030	FRG-25J101P	2W 100	000-375-462						
2801R0031	FRD-16TJ222	0.16W 2.2K	000-330-309						
2801R0032	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0033	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0034	FRD-16TJ223	0.16W 22K	000-330-310						
2801R0035	FRD-16TJ223	0.16W 22K	000-330-310						
2801R0036	FRD-16TJ101	0.16W 100	000-329-013						
2801R0037	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0038	FRD-16TJ470	0.16W 47	000-329-005						
2801R0039	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0040	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0041	FRD-16TJ101	0.16W 100	000-329-013						
2801R0042	FRD-16TJ104	0.16W 100K	000-330-303						
2801R0043	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0044	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0045	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0046	FRD-16TJ471	0.16W 470	000-329-079						
2801R0047	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0048	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0049	EXR-F5F103J	10KX4	000-379-082						
2801R0050	EXR-F5F103J	10KX4	000-379-082						
2801R0051	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0052	FRD-16TJ101	0.16W 100	000-329-013						
2801R0053	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0054	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0055	FRD-16TJ273	0.16W 27K	000-330-411						
2801R0056	EXR-F9E103J	0.125W 10K	000-378-901						
2801R0057	FRD-16TJ101	0.16W 100	000-329-013						
2801R0058	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0059	FRD-16TJ101	0.16W 100	000-329-013						
2801R0060	FRG-25J100P	2W 10	000-375-449						
2801R0061	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0062	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0063	FRD-25PJ220	0.25W 22	000-330-317						
2801R0064	FRD-25PJ220	0.25W 22	000-330-317						
2801R0065	FRD-25PJ220	0.25W 22	000-330-317						
2801R0066	FRD-25PJ220	0.25W 22	000-330-317						
2801R0067	FRD-25PJ220	0.25W 22	000-330-317						
2801R0068	FRD-25PJ220	0.25W 22	000-330-317						
2801R0069	FRD-25PJ220	0.25W 22	000-330-317						
2801R0070	FRD-25PJ220	0.25W 22	000-330-317						
2801R0071	FRD-25PJ220	0.25W 22	000-330-317						
2801R0072	FRD-16TJ220	0.16W 22	000-330-347						
2801R0073	FRD-16TJ220	0.16W 22	000-330-347						
2801R0074	FRD-16TJ220	0.16W 22	000-330-347						
2801R0075	FRD-16TJ220	0.16W 22	000-330-347						
2801R0076	FRD-16TJ220	0.16W 22	000-330-347						
2801R0077	FRD-16TJ220	0.16W 22	000-330-347						
2801R0078	FRD-16TJ220	0.16W 22	000-330-347						
2801R0079	FRD-16TJ220	0.16W 22	000-330-347						
2801R0080	FRD-16TJ220	0.16W 22	000-330-347						
2801R0081	FRD-16TJ220	0.16W 22	000-330-347						
2801R0082	FRD-16TJ220	0.16W 22	000-330-347						
2801R0083	FRD-16TJ220	0.16W 22	000-330-347						
2801R0084	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0085	FRD-16TJ220	0.16W 22	000-330-347						
2801R0086	FRD-16TJ472	0.16W 4.7K	000-330-312						
2801R0087	FRD-16TJ102	0.16W 1K	000-330-301						
2801R0088	FRD-16TJ103	0.16W 10K	000-330-302						
2801R0089	FRD-16TJ562	0.16W 5.6K	000-329-050						
2801R0090	FRD-15TJ103	0.16W 10K	000-330-802						
2801R0091	FRD-16TJ562	0.16W 5.6K	000-329-050						
2801R0092	FRD-16TJ103	0.16W 10K	000-330-302						
	SWITCH	スイッチ							
2801S0001	62T-14		000-106-104						
2801S0002	51D-0491		000-106-105						
2801S0003	M-20128		000-474-344						
2801S0004	51D-0491		000-106-194						
2801S0005	51D-0491		000-106-194						
2801S0006	51D-0491		000-106-105						
	TERMINAL BOARD	端子板							
2801T00001	P-97		000-108-797						
2801T00002	236-106M(1-6)		000-104-340						
2801T00003	P-97		000-108-797						
2801T00004	P-97		000-108-797						

NOTE:  
備考: