

FURUNO

SERVICE MANUAL

SSB RADIOTELEPHONE

MODEL FS-1500/1501/1500P



FURUNO ELECTRIC CO., LTD.

NISHINOMIYA, JAPAN

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FIRST EDITION : JAN 1989

(SHNI)

PUB. No. SME-54850-A
FS-1500 SERIES

FURUNO

Information

No. : FQ5-89-016

Date : 1989 - 11

Issued by : FURUNO ELECTRIC CO., LTD.
QUALITY CONTROL DEPARTMENT

Addenda No.1 to FS-1500 Service Manual SM-E5485-0A
Addenda No.1 to FS-1550 Service Manual SM-E5510-0A
Supplement to FS-1501 Operator's Manual OM-E5485-1D
Supplement to "Instructions for Presetting SSB Radiotelephone" TM-E5485-0A

FS-1500/FS1550 Series Radiotelephone Connection with T & T A/S made Telex Terminal

To operate TT-1600 with the FS-1500/FS-1550 series radiotelephone, the RX/TX interface of TT-1600 should be preset as follows.

- 1) Operate TT-1600 on "System Generating Mode".
- 2) Select "#2-RX/TX interface".
- 3) Change the default setting as shown below.

RX 1- mark = 1617 Hz
RX 1- space = 1785 Hz
TX 1- mark = 1615 Hz
TX 1- space = 1785 Hz

Receiver Post-Mute = 0 x 1.25ms
Transmitter Pre-key = 45 x 1.25ms (To be changed)
Transmitter Post-key = 5 x 1.25ms (To be changed)
Slave Delay = 45 x 1.25ms (To be changed)

For Reference

The maximum communication distance on the ARQ mode is about 7500km.

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Information

No. : FQ5-89-020

Date : 1989 - 12

Issued by : FURUNO ELECTRIC CO., LTD.
QUALITY CONTROL DEPARTMENT

ADDENDA NO.1 TO FS-1500 SERIES SERVICE MANUAL SM-E5485-0A

FS-1500/1501/1500P
Errata for Service Manual

Wrong description were found in the above manual. Please amend the description as below.

<p>Page 1-3 line 5</p> <p>Wrong:V2</p> <p>Correct:U2</p>																								
<p>Page 1-3 Table 1.2</p> <p>Wrong</p> <table border="1"> <thead> <tr> <th></th> <th>USB/R3E</th> <th>LSB</th> <th>TLX</th> <th>CW</th> <th>AM</th> </tr> </thead> <tbody> <tr> <td>1st LO (kHz)</td> <td>54456.5</td> <td>54453.5</td> <td>54455.0</td> <td>54455.0</td> <td>54455.0</td> </tr> </tbody> </table> <p>Correct</p> <table border="1"> <thead> <tr> <th></th> <th>USB/R3E</th> <th>LSB</th> <th>TLX</th> <th>CW</th> <th>AM</th> </tr> </thead> <tbody> <tr> <td>1st LO (kHz)</td> <td>F+54456.5</td> <td>F+54453.5</td> <td>F+54455.0</td> <td>F+54455.0</td> <td>F+54455.0</td> </tr> </tbody> </table>		USB/R3E	LSB	TLX	CW	AM	1st LO (kHz)	54456.5	54453.5	54455.0	54455.0	54455.0		USB/R3E	LSB	TLX	CW	AM	1st LO (kHz)	F+54456.5	F+54453.5	F+54455.0	F+54455.0	F+54455.0
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<p>Page 1-4 line 6 to line 9</p> <p>Wrong</p> <p>Loop-1 generates, with PLL IC U5 and VCO Q7, a frequency from 4.55 to 34.44MHz in 10kHz steps. Mixer U8 outputs 1st local oscillation frequency (F + 54.455MHz in 10Hz steps) by mixing a frequency between 4.55 and 34.44MHz with the output frequency of the Loop-2.</p> <p>Correct</p> <p>Loop-1 generates, with PLL IC U5 and VCO Q7, 1st local oscillation frequency (F+54.455MHz 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.</p>																								

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	Wrong	Correct
<p><u>Page 1-9</u></p>		
<p><u>Page 3-5</u> Note 6) No.2</p>	<p>26±0.5dBm/600 ohms</p>	<p>+26±0.5dBm/50 ohms</p>
<p><u>Page 3-8</u> No.1</p>	<p>Add the following words to the remarks</p> <p>Connect J1 and J3 on the COUPLER board, or terminate the antenna with 50 ohm dummy.</p>	
<p><u>Page 5-2</u> R85 R87</p>	<p>AM CARR R3E CARR</p>	<p>R3E CARR AM CARR</p>
<p><u>Page 5-4</u> TP 2 /TP 3 TP 4 /TP 5 /TP 6</p>	<p>PHASE DET SWR DET</p>	<p>SWR DET PHASE DET</p>
<p><u>Page 6-1</u> HD637B01Y</p>	<p>TOSHIBA</p>	<p>HITACHI</p>
<p><u>Page 1-16</u> CR26</p>	<p>ND487CI-3R</p>	<p>SBL-1C</p>

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SPECIFICATIONS OF FS-1500

GENERAL

Communication System	Simplex or semi-duplex
Frequency Range	1.6 to 23MHz
Type of Oscillation	10Hz resolution PLL synthesizer
Class of Emission	J3E: (USB) R3E: (USB with pilot carrier) H3E: (AM Compatible)
Number of Channels	<u>Transmit/Receive</u> Factory preset 64 semi-duplex or 128 simplex channels. 2182kHz (H3E, single action key) <u>Receive only</u> Free synthesis in 10Hz resolution 192 ITU SSB and 338 ITU TELEX channels
Frequency Stability	Better than ± 40 Hz at 0°C to +40°C (After 15 minutes warm up)
Ambient Temperature Range	-20°C to +55°C
Power Supply and Power Consumption	12VDC -10/+30% (Nominal 13.6V) Receive 1.2A Transmit 18A (peak 30A)
Frequency Selection	Touchpad key and/or dial knob
Dimmer	Illumination for touchpad key panel and LCD panel (4 steps)
Display	Channel number, Frequency, Class of emission, Status of controls, Signal strength, Antenna current or 50 ohm output line current
I/O Connections	Microphone, External Antenna Coupler

SPECIFICATIONS OF FS-1500P

GENERAL

Communication System	Simplex or semi-duplex
Frequency Range	1.6 to 23MHz
Type of Oscillation	10Hz resolution PLL synthesizer
Class of Emission	J3E: (USB) R3E: (USB with pilot carrier) H3E: (AM Compatible)
Number of Channels	<u>Transmit/Receive</u> Factory preset max. 64 semi-duplex or 128 simplex channels Single action 2182kHz (H3E)
Frequency Stability	Better than ± 40 Hz at 0°C to +40°C (After 15 minutes warm up)
Ambient Temperature Range	-20°C to +55°C
Power Supply and Power Consumption	12VDC -10/+30% (Nominal 13.6V) Receiving 1.2A Transmit 18A (peak 30A)
Frequency Selection	Touchpad key and/or dial knob
Dimmer	Illumination for touchpad key panel and LCD panel (4 steps)
Display	Channel number, Frequency, Class of emission, Status of controls, Signal strength, Antenna current or 50 ohm output line current

Coating Color Cabinet : 2.5GY 5/1.5
 Front Panel : N-3.0

Dimensions and Weight 100mm x 250mm x 280mm (3.9" x 8.9" x 11.0")
 5.8kg (12.8 lbs.)

RECEIVER

Frequency Range 1.6 to 23MHz

Receiving System Double conversion superheterodyne
 IF: 54.455MHz and 455kHz

Sensitivity Input level to produce SINAD 20dB
 J3E/R3E: 6dBuV
 H3E: 20dBuV

Selectivity 2.4kHz at -6dB (J3E)
 4.5kHz at -60dB (J3E)

Audio Output Internal speaker: 1W
 External 4 ohm speaker: 5W max.
 Handset: 50mW

Controls Fine tuning by dial, Squelch ON/OFF, Scanning
 ON/OFF, Speaker ON/OFF, Volume control

TRANSMITTER

Output Impedance 50 ohms

RF Output Power J3E/R3E 100Wpep
 H3E 25W
 TUNE 10W

Power Reduction Less than 60Wpep

Controls Output HI/LOW, Test/send of Two-tone Alarm,
 2182kHz single action key

SPECIFICATIONS OF FS-1501

GENERAL

Communication System	Simplex or semi-duplex
Frequency Range	1.6 to 23MHz
Type of Oscillation	10Hz resolution PLL synthesizer
Class of Emission	J3E: (USB/LSB) R3E: (USB with pilot carrier) H3E: (AM Compatible) F1B: (Radioteletype) A1A: (Telegraph)
Number of Channels	1) Free synthesis in 10Hz resolution 2) User preset 64 semi-duplex or 128 simplex channels 3) Factory Preset 192 ITU SSB channels 4) Factory preset 338 ITU TELEX channels 5) 2182kHz (J3E, single action)
Frequency Stability	Better than ± 20 Hz at -20°C to $+55^{\circ}\text{C}$ (After 15 minutes warm up)
Ambient Temperature Range	-20°C to $+55^{\circ}\text{C}$
Power Supply and Power Consumption	12VDC $-10/+30\%$ (Nominal 13.6V) Receiving 1.2A Transmit 18A (peak 30A) CW(keyed) 20A
Frequency Selection	Touchpad Key and/or Dial Encoder
Dimmer	Illumination for touchpad key panel and LCD panel (4 steps)
Display	Channel number, Frequency, Class of emission, Status of controls, Signal strength, Antenna current or 50 ohm output line current
I/O Connections	Microphone, External Antenna Coupler, Telegraph key, Radioteletype terminal (option)

Coating Color Cabinet : 2.5GY 5/1.5
Front Panel : N-3.0

Dimensions and Weight 100mm x 250mm x 280mm (3.9" x 8.9" x 11.0")
5.8kg (12.81bs.)

RECEIVER

Receiving System Double conversion superheterodyne
IF : 54.455MHz and 455kHz

Sensitivity Input level to produce SINAD 20dB
J3E/R3E: 6dBuV
H3E : 20dBuV

Selectivity 2.4kHz at -6dB (J3E)
4.5kHz at -60dB (J3E)

Audio Output Internal speaker: 1W
External 4 ohm speaker: 5W max.
Handset: 50mW

Controls Fine tuning by dial, Squelch ON/OFF, Scanning
ON/OFF, Speaker ON/OFF, Volume control

TRANSMITTER

Output Impedance 50 ohms

RF Output Power J3E/R3E 150Wpep
H3E 37.5W
F1B/A1A 75W
TUNE 10W

Power Reduction Less than 60Wpep

Controls Output HI/LOW, Test/send of Two-tone Alarm
Generator, 2182kHz single action key

MAINTENANCE PARTS LIST FOR FS1500/1501/1500P

*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	
000-126-340	TRANSISTOR	2SC3133		6	2	PAIR
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	G68-1114P-US DC12V		10	3	
000-113-428	RELAY	G68-2114P-DC12V		1	2	
000-113-485	RELAT	G4W-2212PUSTV5-DC12V		3	1	
000-549-017	FUSE GLASS TURE TYPE	FG80 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	
005-592-250	PRINTED CIRCUIT BOARD	05P0273,TX FIL	FS-1500	1		
005-592-270	PRINTED CIRCUIT BOARD	05P0274A, P.A.	FS-1500	1		
005-592-290	PRINTED CIRCUIT BOARD	05P0275,RELAY	FS-1500 SERIES	1		
005-592-310	PRINTED CIRCUIT BOARD	05P0276,SW REG	FS-1500	1		
005-592-330	PRINTED CIRCUIT BOARD	05P0272,TX/RX	FS-1500 SERIES	1		
005-592-370	PRINTED CIRCUIT BOARD	05P0278,COUP	AT-1500	1		
005-922-440	PRINTED CIRCUIT BOARD	05P0271,LCD		1		
000-287-502	MODULE CAPACITOR	EXF-P4103ZW	0.01UF 50V	6		
000-375-524	METAL OXIDE FILM RESISTOR	ERG-3SJ560P	00S0102-0	6		
000-375-538	METAL OXIDE FILM RESISTOR	ERG-3SJ821P	00S0102-0	6		
000-375-539	METAL OXIDE FILM RESISTOR	ERG-3SJ102P	00S0102-0	6		

CHAPTER 1 CIRCUIT DESCRIPTION

1.1 Differences Among Models

This manual describes the three models of the Furuno FS-1500 Series Radiotelephone: FS-1500/1500P/1501. The differences among the three models are tabulated below;

Table 1.1 Differences Among Models

Item		FS-1500	FS-1500P	FS-1501
Designed for;		The countries where the use of free synthesizer set is prohibited.	Philippines, Thailand	USA
Class of Emission and Output Power	J3E	150Wpep	100Wpep	150Wpep
	J3E(LSB)			150Wpep
	R3E	150Wpep		150Wpep
	H3E	37.5W	25W	37.5W
	F1B			75W
	A1A			75W
	TUNE	10W	10W	10W
	2182kHz, single key stroke	H3E 37.5W	H3E 25W	J3E 150Wpep
Channels	RX free synthesis	Yes	—	Yes
	TX free synthesis	—	—	Yes
	Max. 64 semi-duplex or 128 simplex	Yes (Factory preset)	Yes (Factory preset)	Yes (User preset)
	192 ITU SSB	Receive only	—	Yes
	338 ITU Telex	Receive only	—	Yes
Other Facilities	Connection of telex terminal	Yes, where permitted. (optional connector kit required.)	—	Yes (optional connector kit required)
	Display of assigned telex frequency	Yes, when the setting is changed.	—	Yes

1.2 Transceiver Unit

The FS-1500 series radiotelephone set is of 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 V2 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.

<u>LPF</u>	<u>Cut-off Frequency</u>
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)	54456.5	54453.5	54455.0	54455.0	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, a frequency from 4.55 to 34.44MHz in 10kHz steps. Mixer U8 outputs 1st local oscillation frequency ($f + 54.455\text{MHz}$ in 10 Hz steps) by mixing a frequency between 4.55 and 34.44MHz 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.

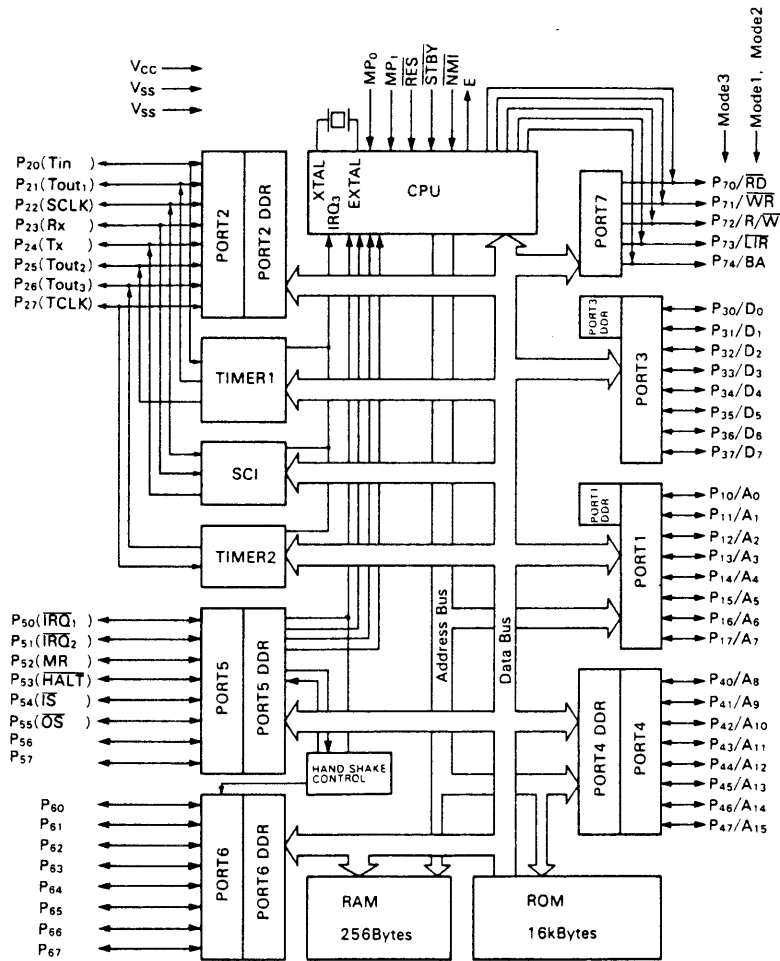


Fig. 1-1 Block Diagram of U1 of CPU Board

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 S0. 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.

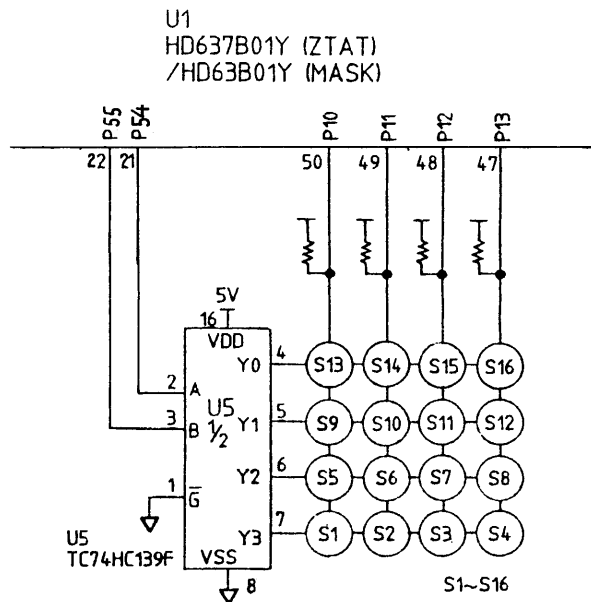


Fig. 1-2 Keyboard Matrix

<< 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.

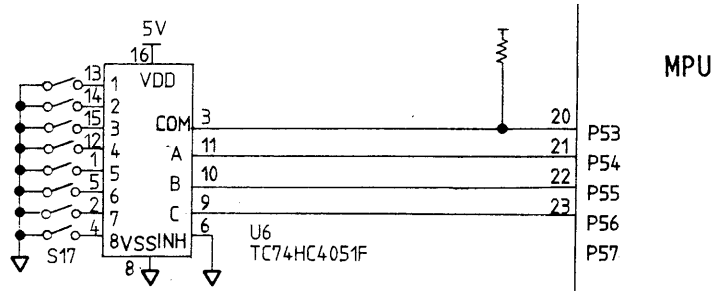


Fig. 1-3 Analog Multiplexer U6

<< 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.

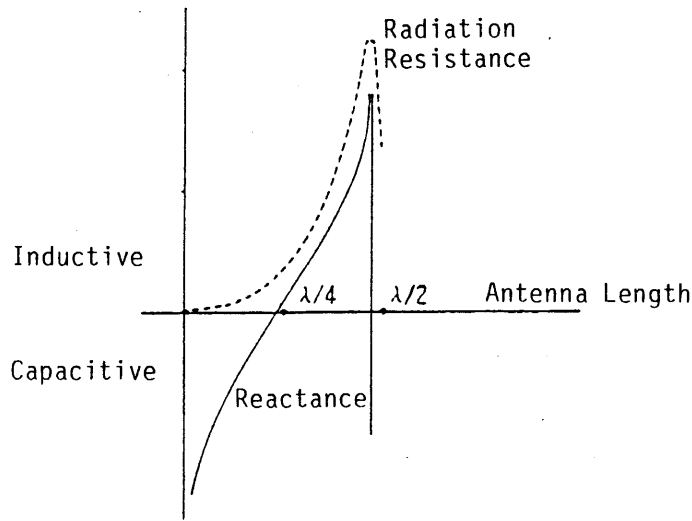


Fig. 1-4 Impedance Characteristics of Vertical Grounding Antenna

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.

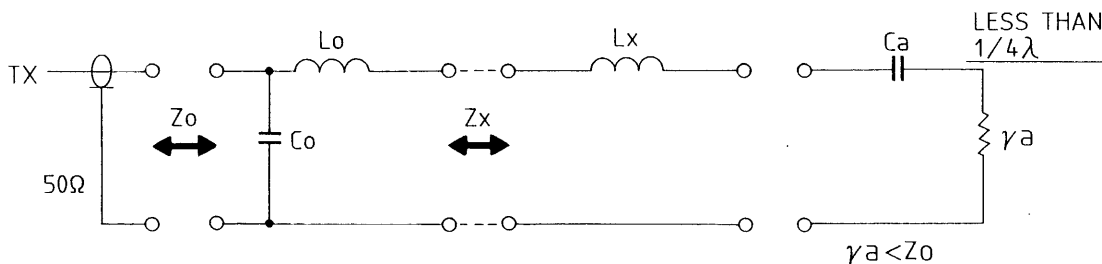


Fig. 1-5 Capacitive Antenna

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.

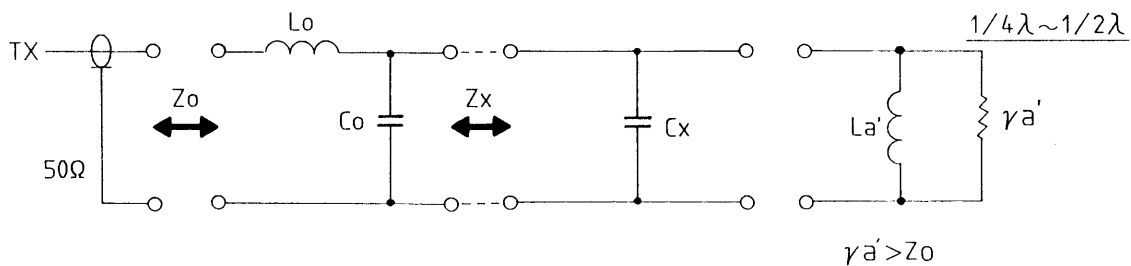


Fig. 1-6 Inductive Antenna

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.

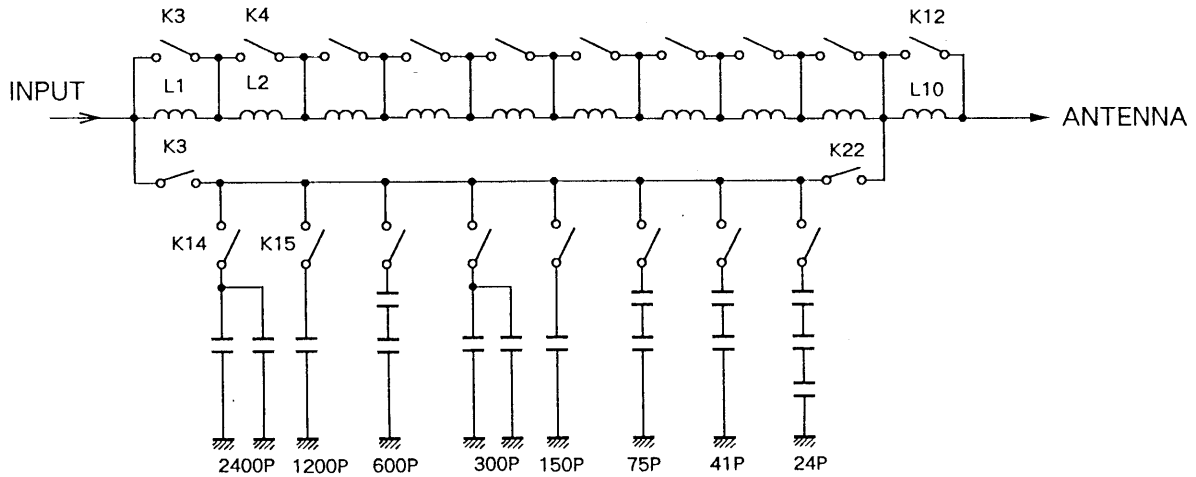
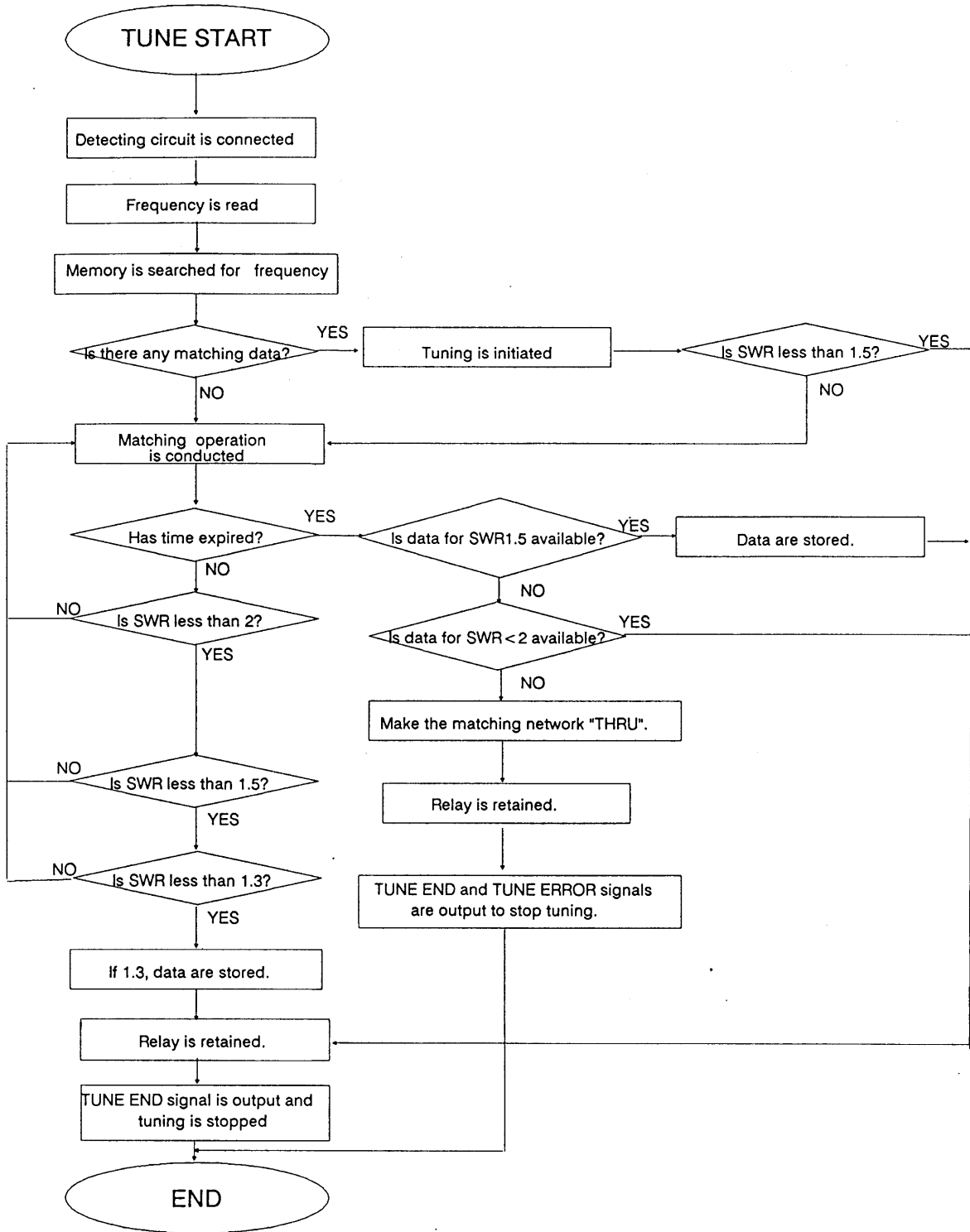


Fig. 1-7 Matching Circuit

The matching procedure is basically as follows;

1. When TUNE switch or PTT switch of FS-1500 is pressed, AT-1500 will automatically start controlling.
2. FS-1500 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

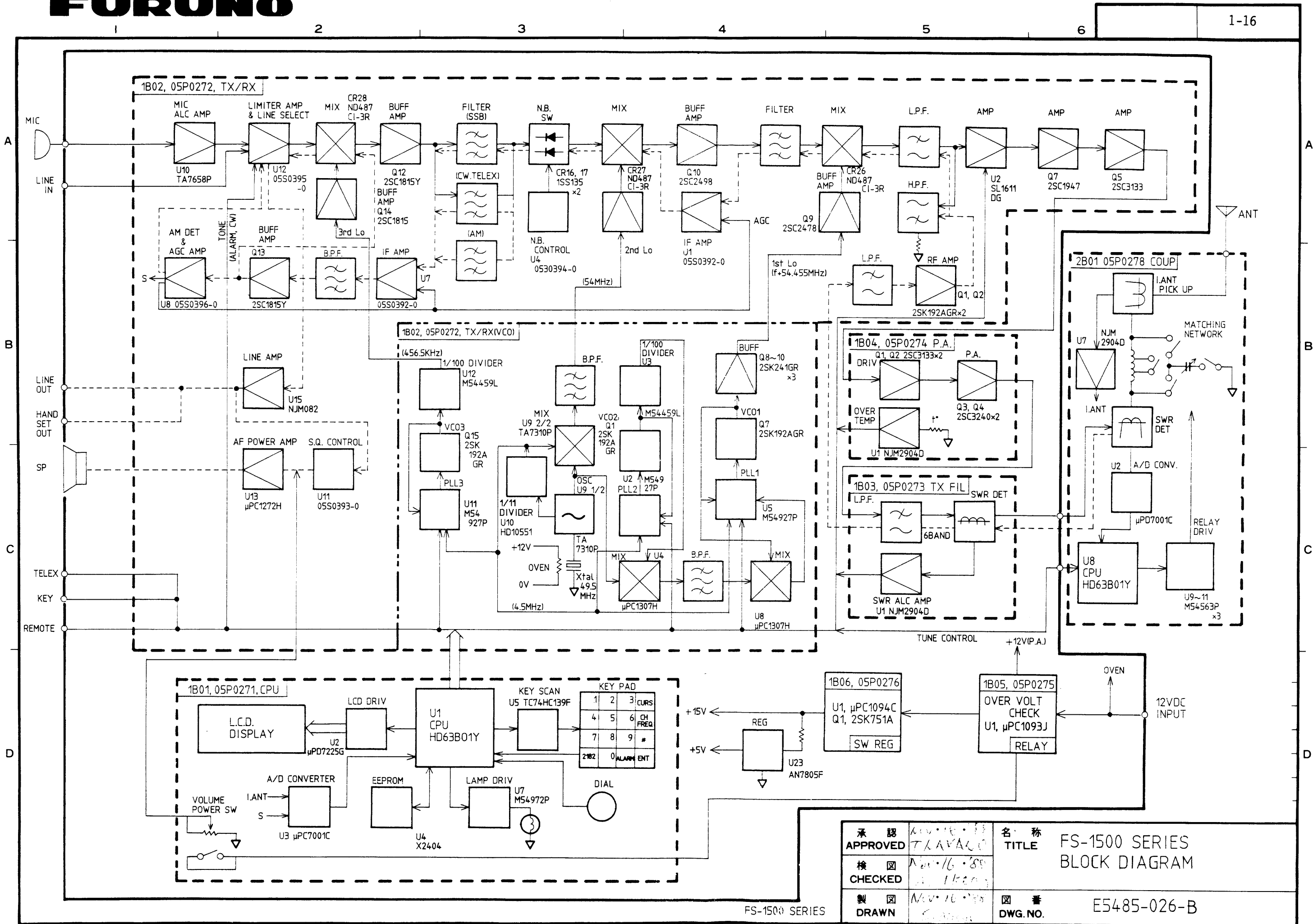
The matching operation starts by conducting the "phase check" to estimate the approximate values of L and C. Then, the best SWR value is found by increasing/decreasing "C".

[Capacitive antenna]

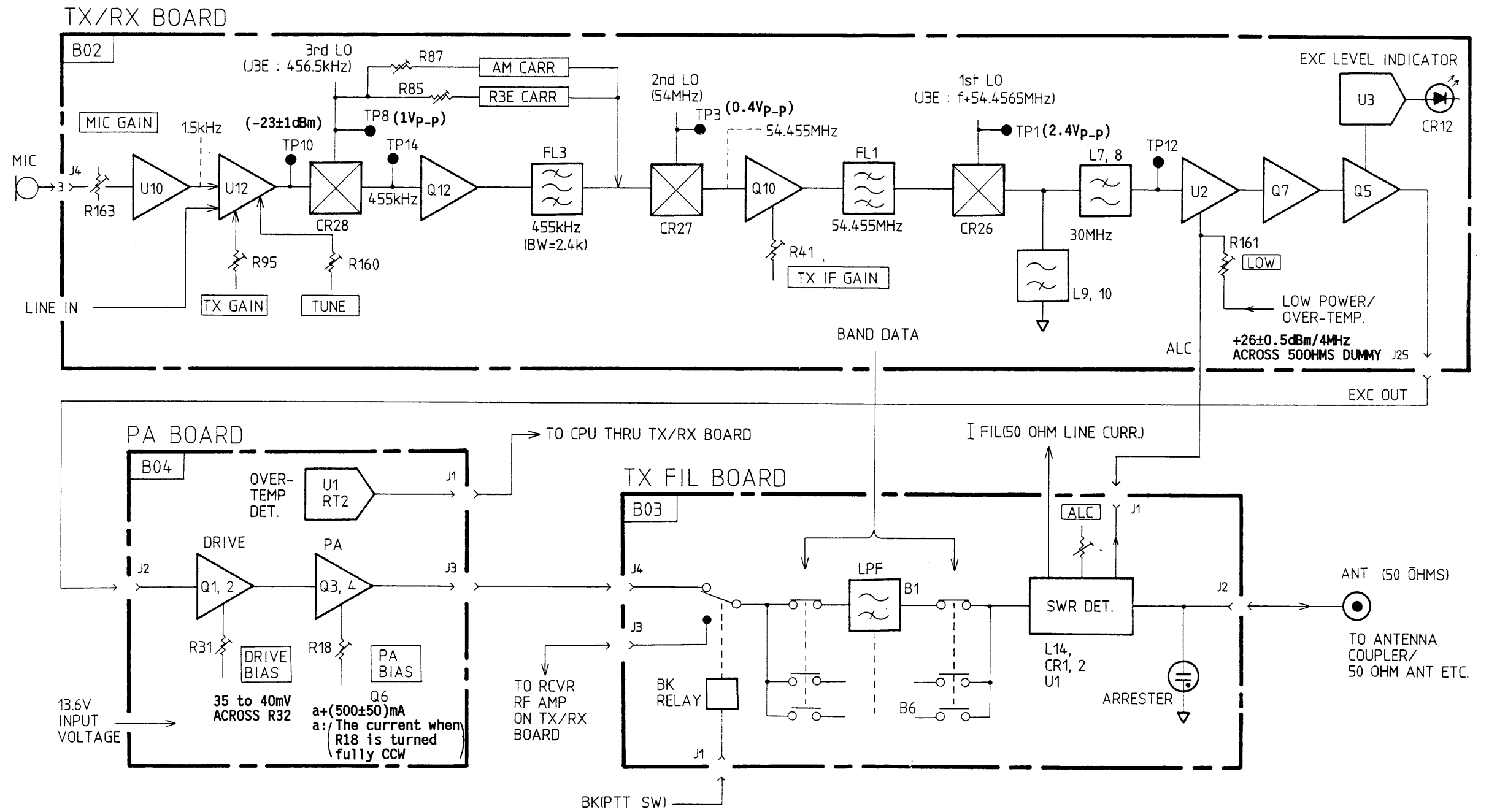
1. "Phase Check" is conducted.
2. "L" is increased to find the point where the phase changes from "capacitive" to "inductive".
3. While observing SWR value, "L" is increased slightly and then "C" is increased.
4. Step 3 is repeated until the point where SWR is less than 1.3 is found.
5. When a combination 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]

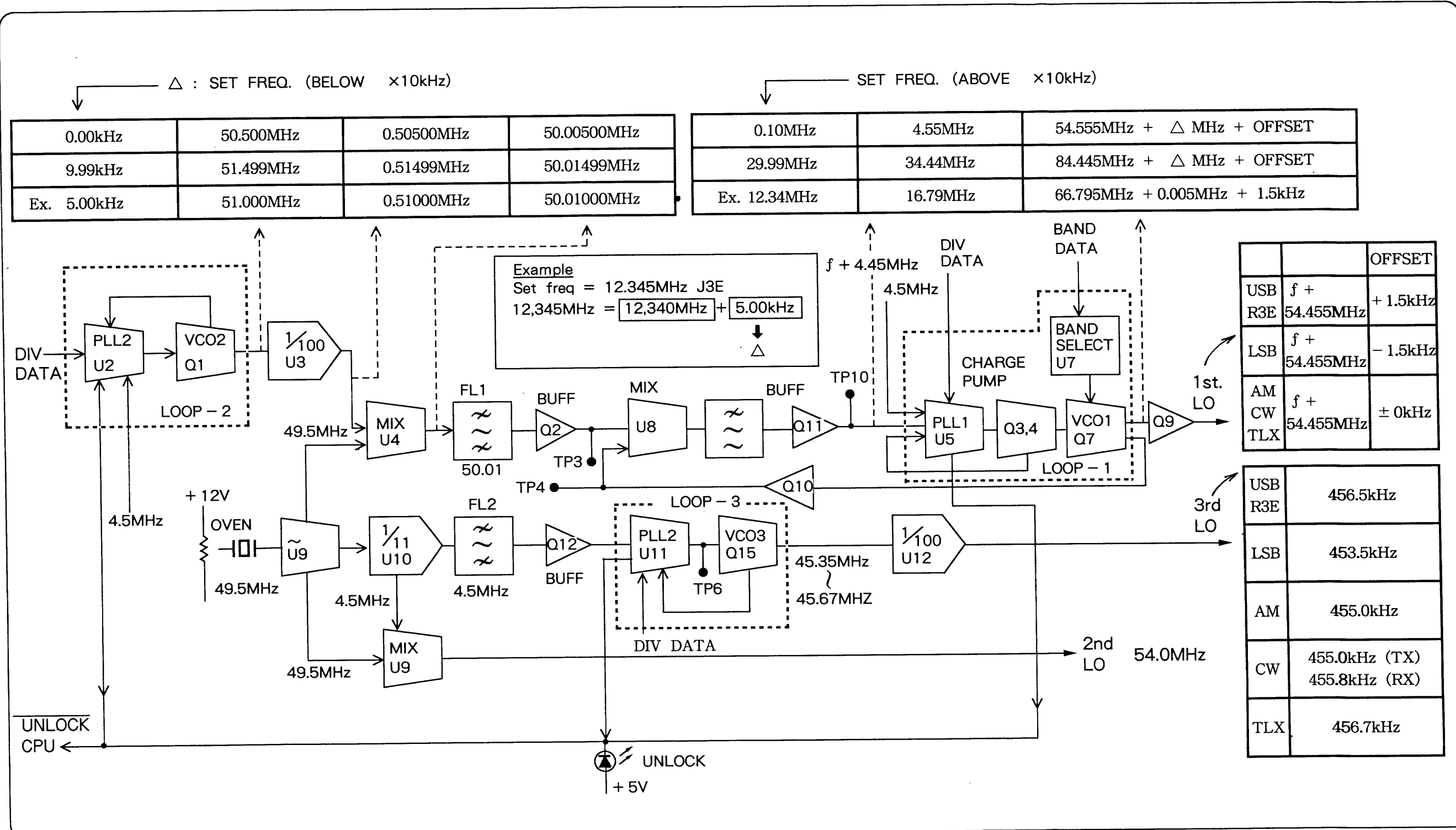
1. "Phase Check" is conducted.
 2. "C" is increased to find the point where the phase changes from "inductive" to "capacitive".
 3. While observing SWR value, "C" is increased slightly and then "L" is increased.
 4. Step 3 is repeated until the point which satisfies "SWR 1.3" is found.
 5. Same as steps 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.)



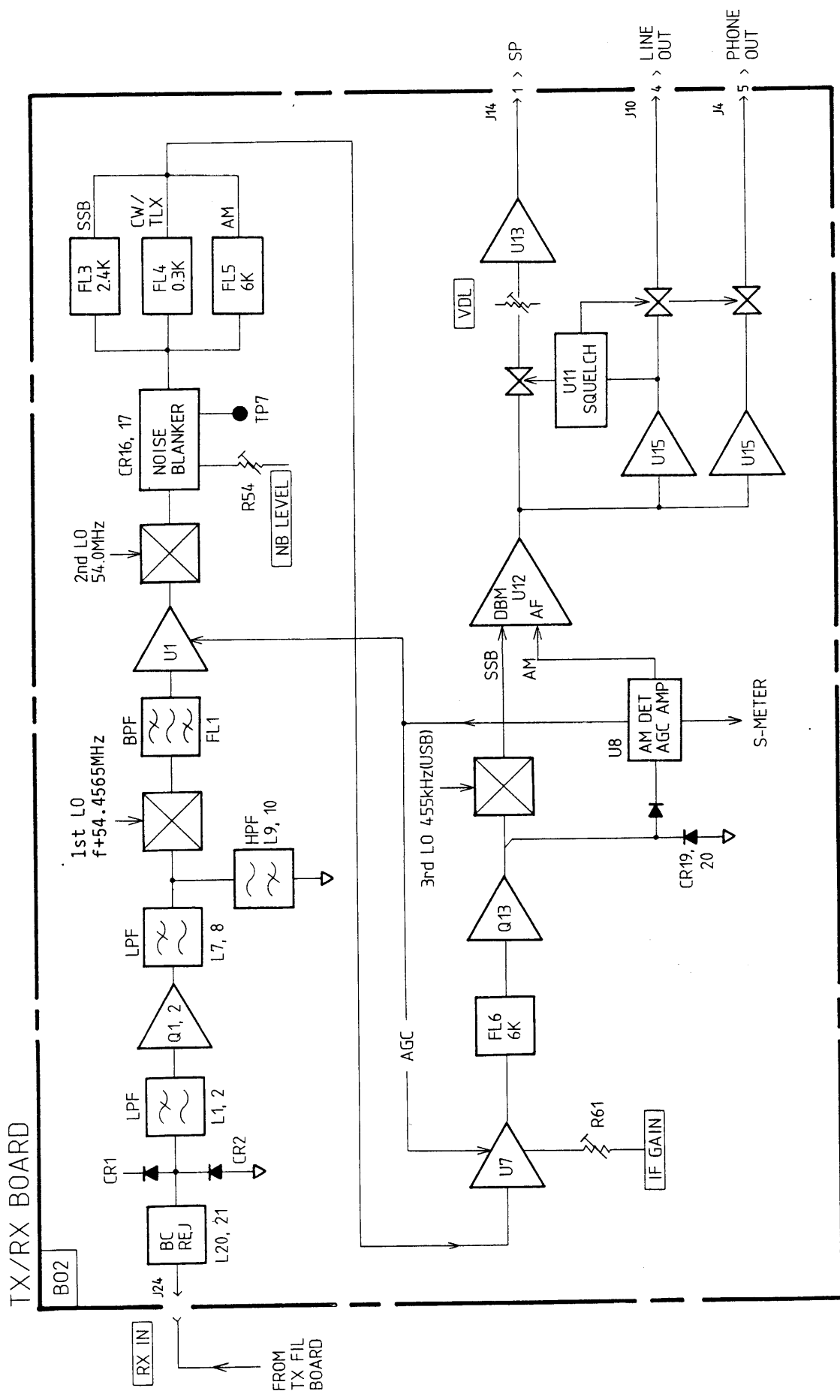
承認 APPROVED	16.10.85 TXAVAC	名称 TITLE	FS-1500 SERIES BLOCK DIAGRAM
検図 CHECKED	16.10.85 16.10.85	製図 DRAWN	図番 DWG. NO.
			E5485-026-B



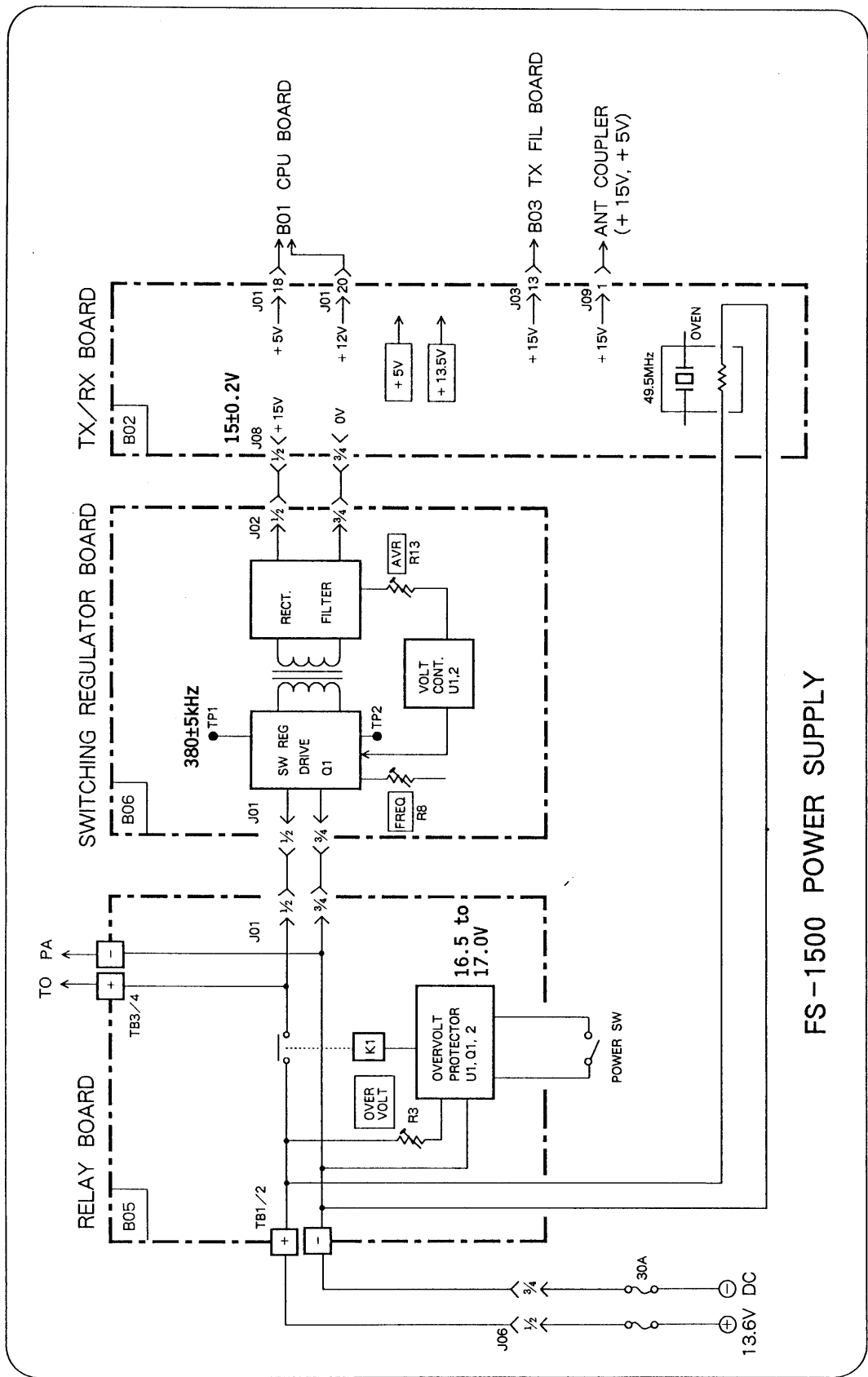
FS-1500 TRANSMITTER SECTION



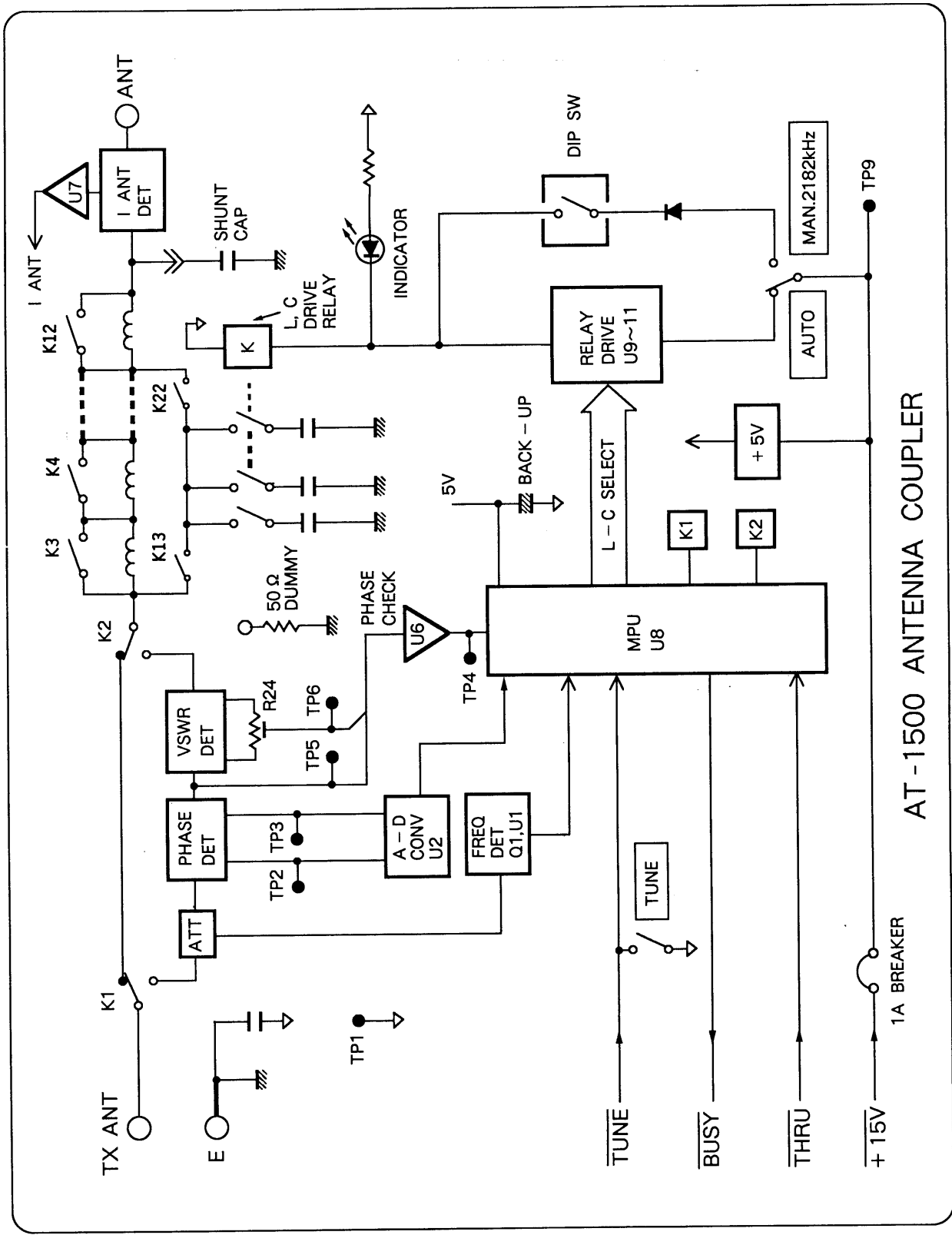
FS-1500 LOCAL OSC



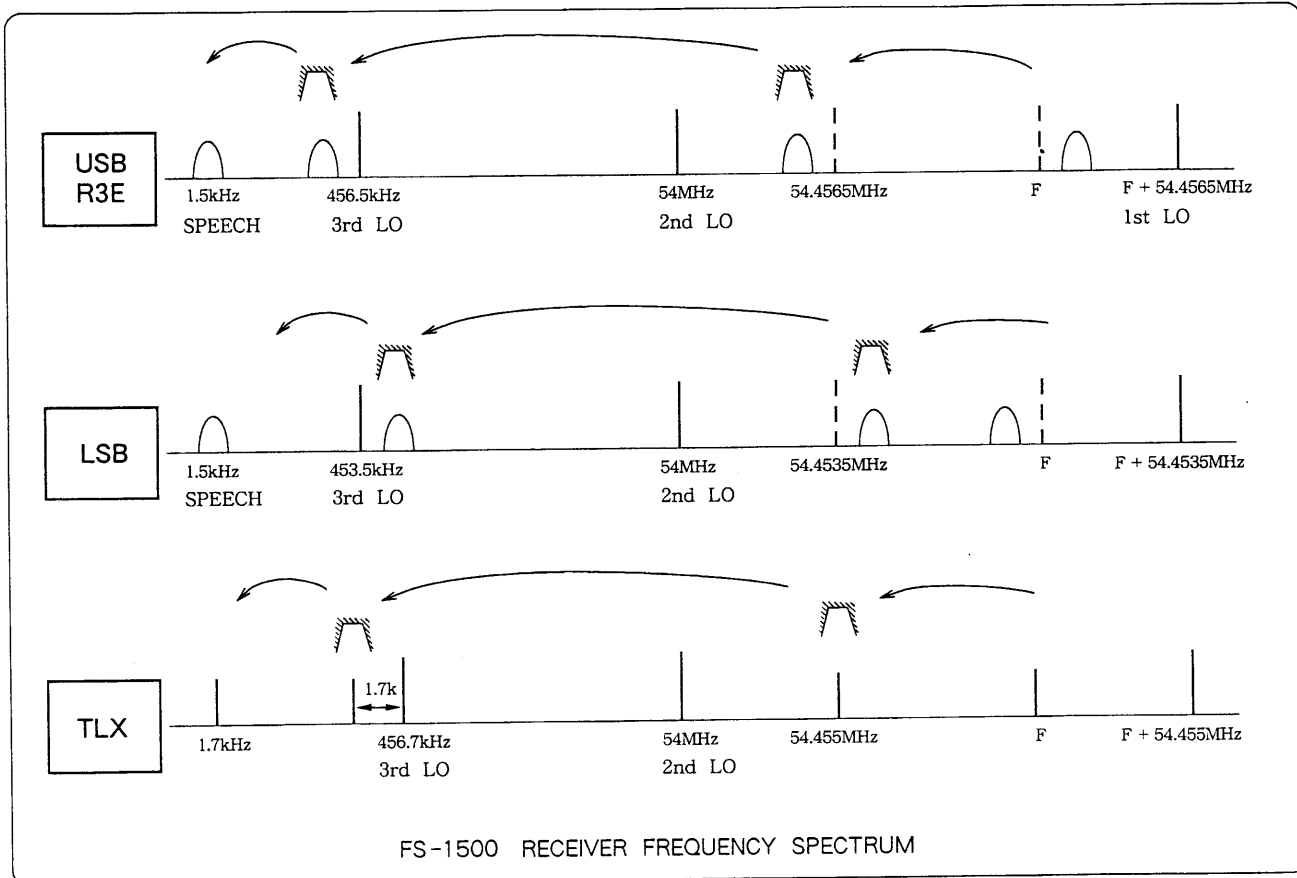
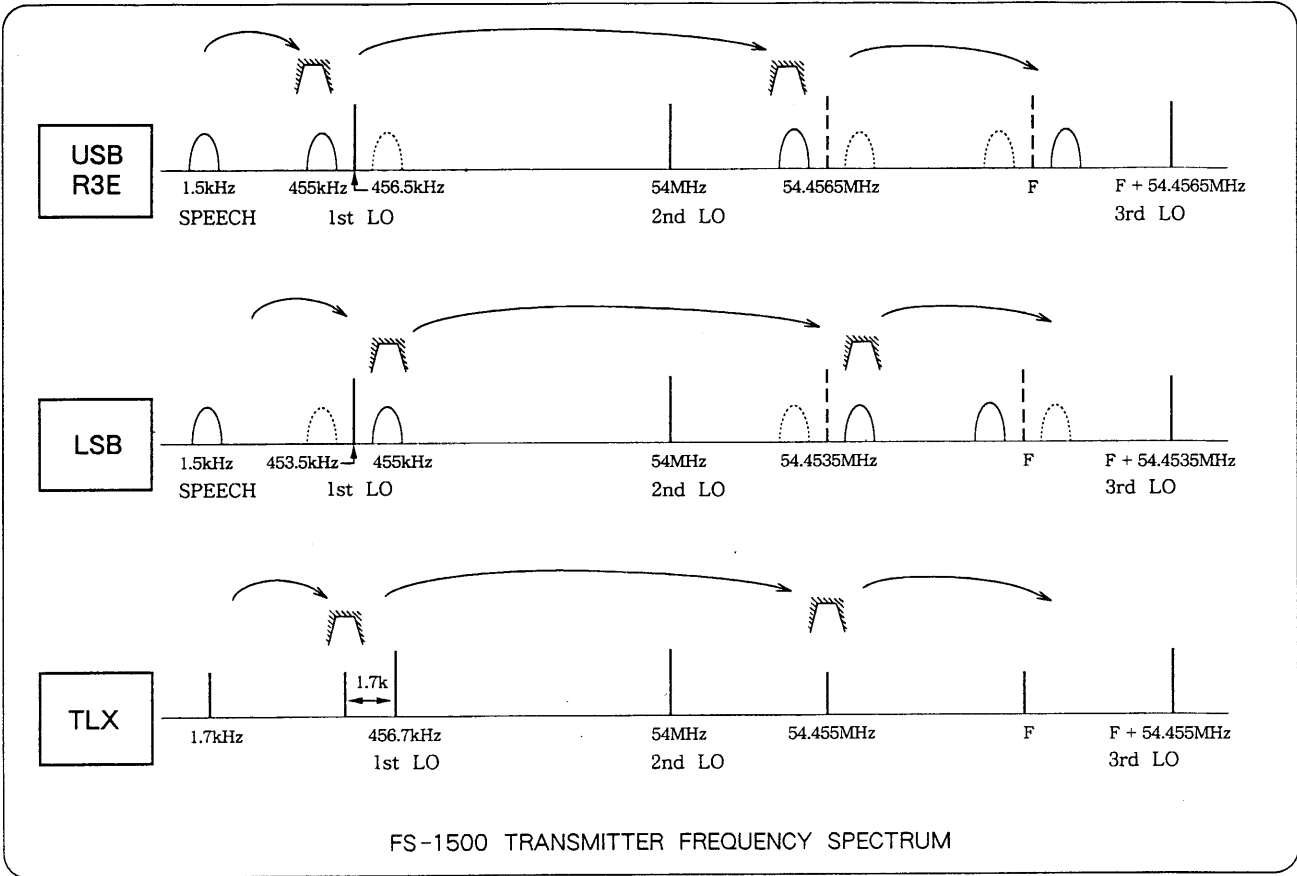
FS-1500 RECEIVER SECTION



FS-1500 POWER SUPPLY



AT-1500 ANTENNA COUPLER



CHAPTER 2 SETTING-UP

Each model of the FS-1500 series 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

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

No. of DIP SW.	FUNCTION	ON	OFF
S17-3	Initial class of emission on 2182kHz	J3E (USB)	H3E
S17-4	Usage of CW and TELEX	ENABLE	DISABLE
S17-5	Channelizing custom frequencies	ENABLE	DISABLE
S17-6	Sending "TUNE" signal to Antenna Coupler	ENABLE	DISABLE *1
S17-7	Baud rate for RS-232C port	9600	4800
S17-8	Usage of LSB	ENABLE	DISABLE

*1: When a doublet antenna, trap vertical, antenna matching network, etc. is substituted for the antenna coupler, S17-6 should be "OFF".

Table 2-2 DIP Switch and Corresponding Function

No. of DIP SW.	FUNCTION	ON	OFF
S19	Meter indication during transmission	I _{ANT}	I _{FIL} *2
S20	Data for [REMOTE] connector	T-BUS for TT-1600	FURUNO I/F

*2: For "I_{FIL}", refer to 2.2 below.

Standard Setting

Table 2-3 Standard Setting of Each Model

No. of DIP SW.	FS-1501	FS-1500	FS-1500P
S17-1	ON	ON	OFF
S17-2	ON	OFF	OFF
S17-3	ON	OFF	OFF
S17-4	ON	OFF	OFF
S17-5	ON	OFF	OFF
S17-6	ON	ON	ON
S17-7	ON	ON	ON
S17-8	ON	OFF	OFF
S19	I _{ANT}	I _{ANT}	I _{ANT}
S20	OFF	OFF	OFF

2.2 Alternation of I_{ANT} and I_{FIL}

Some licensing authorities require an indication of transmitter antenna current in amperes. The FS-1500 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_{FIL}.

2.3 Channel Programming (FS-1501 only)

This radio contains memory banks for storing frequencies and corresponding class of emission. The contents of the memory may be read out by specifying the memory number, i.e., channel number.

1. Writing a Frequency into Memory

- 1) Hold down [#] key and turn on the power.
- 2) Confirm that "MEMO" is displayed on the LCD display, then release [#] key. If not, turn off the transceiver and try again.
- 3) Select desired channel number and memory (ex. 1A, 1B) by the dial encoder.
- 4) Press [#] key, enter frequency number then press [ENT] key.
- 5) Press [MODE] to choose class of emission.
- 6) Press [A/B] key to select either Simplex or Duplex.
- 7) Repeat steps 3 to 6 for further channel memory write-in.

*To erase a frequency, recall the frequency that you don't need, press "0" followed by [ENT].

To escape from the Memory-write mode, simply turn off the transceiver.

2. Examples

[EXAMPLE 1] Assign 12345.60kHz, USB, simplex, to channel 40, memory-A.

- 1) Hold down [#] key and turn on the power. Release [#] key when "MEMO" is displayed on the LCD.
- 2) Select "channel 40 A" by the dial encoder.
- 3) Press [#][1][2][3][4][5][6][0][ENT] for 12345.60kHz.
- 4) Press [MODE] key until "USB" is displayed.
- 5) Confirm "A SIMP" is displayed. If not, press [A/B] key.

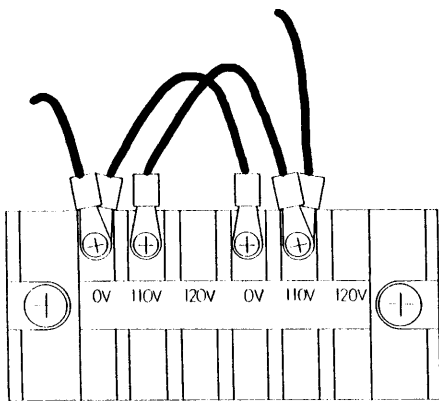
2.4 Alternation of Input Voltage for RECTIFIER UNIT PR-270

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

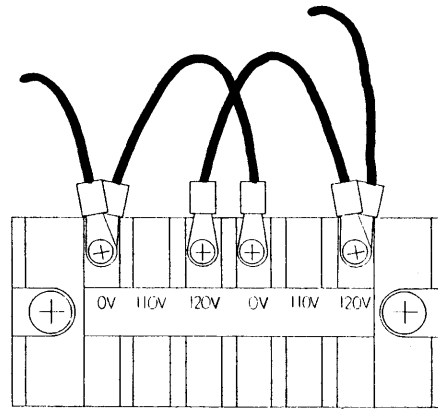
Remove the top cover of the rectifier and change the lead connection on the input terminal of power transformer. Also change the fuse if necessary.

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

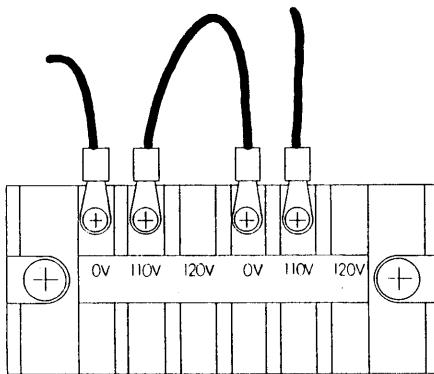
Type of fuse
10A
5A



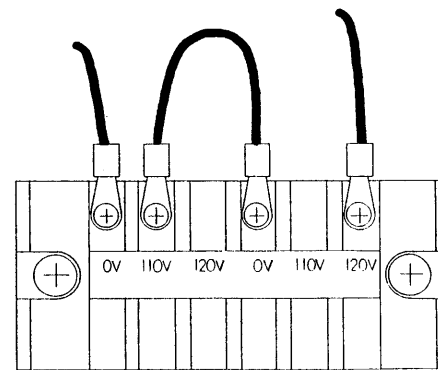
For 110VAC



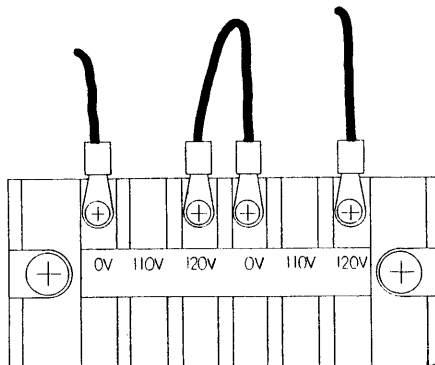
For 120VAC



For 220VAC
(Factory setting)



For 230VAC



For 240VAC

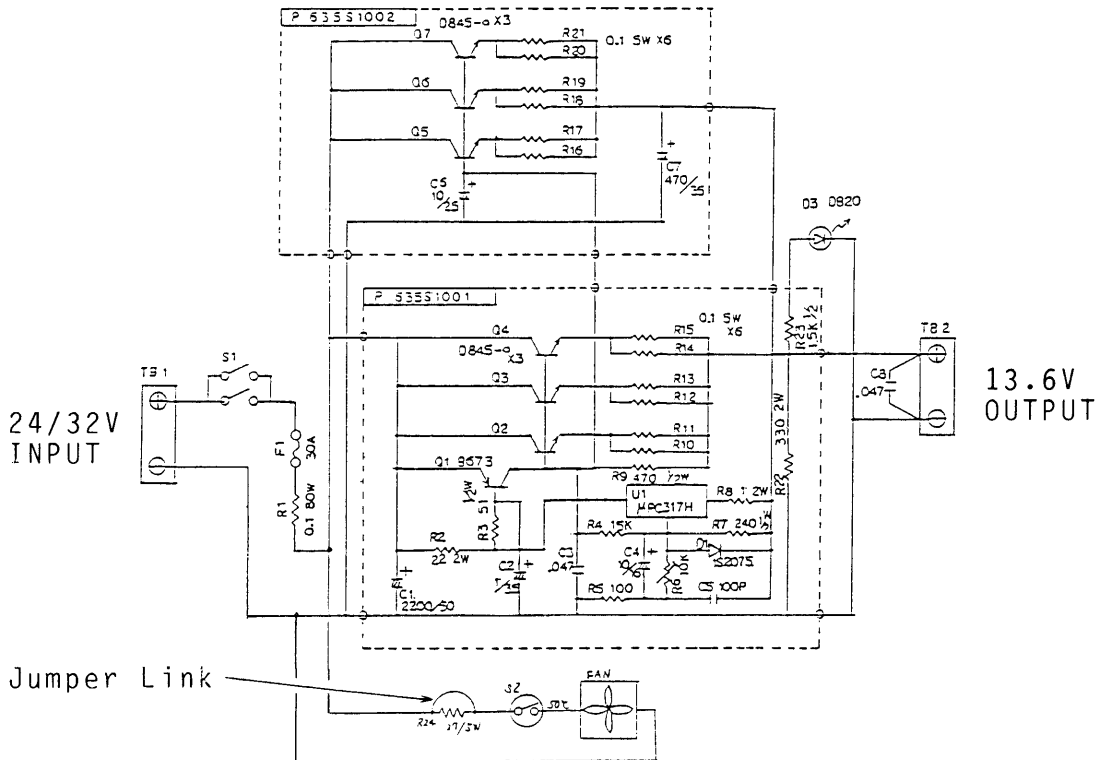
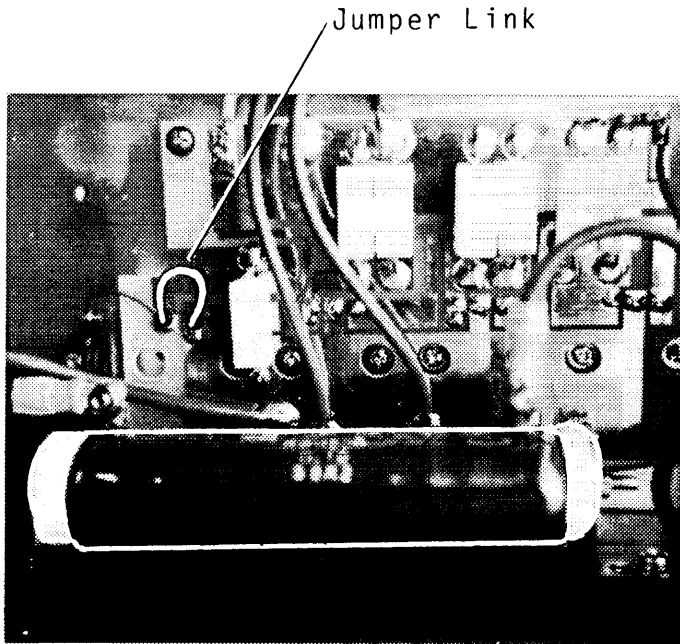
-CAUTION-

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.

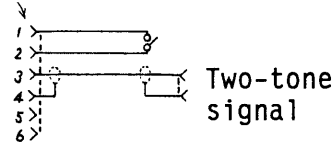
2.5 Alterating of Input Voltage for DC-DC CONVERTER PC-220

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) 500 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

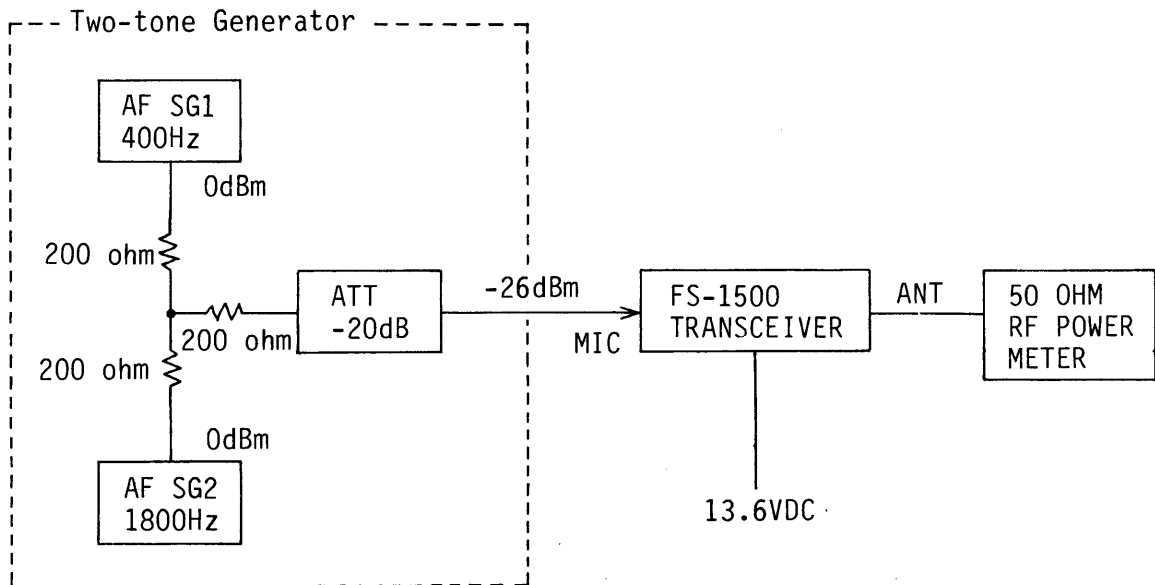
3.4 PA Bias Adjustment

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	α +(500 \pm 50)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 50mA higher than the one (α) 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.

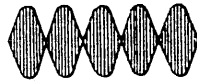
3.5 Transmitter Output Level Adjustment



No.	Check Item	Ratings		Adjust;	Condition/Remarks
		FS-1500 FS-1501	FS-1500P		
1	Max. Power (ALC off)	90W	90W	R41 [TX IF GAIN]	J3E, 4MHz MIC Input: 2-tone, -26dBm R5(ALC) fully CCW.
2	ALC Level	75W	50W	R5 [ALC]	J3E, 4MHz MIC Input: -26dBm
3	Output Power	60-90W	40-60W	R95 [TX GAIN]	
4	Low Power	20W	13W	R161 [LOW]	
5	TUNE Power	15W	15W	R160 [TUNE]	J3E, 4MHz. Press [TUNE] key.
6	H3E Power	40-50W	27-33W	R87 [AM]	H3E, (2182kHz) Press PTT SW with no audio input.
7	R3E Power	1.5-4W	1-2.7W	R85 [R3E]	R3E, 4MHz. Press PTT SW with no audio input.

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
 Clipped at peak level	Excessive drive. Check the MIC GAIN pot. R163.
 Unstable	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 colckwise. USB, 4MHz. Mic input: -26dBm/600 ohms 2-tone.
2	Exciter Output	-26±0.5dBm /600 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.

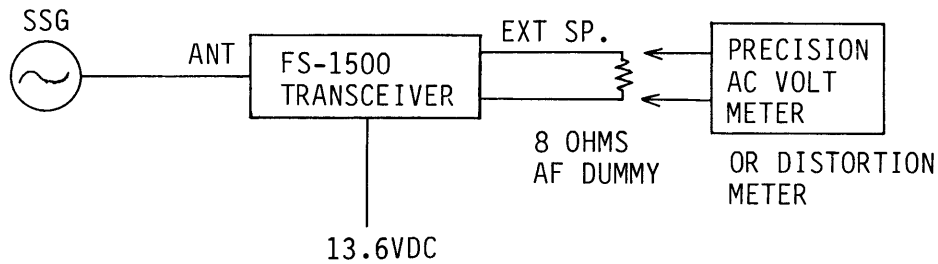
* The EXC OUTPUT LEVEL INDICATOR CR12 is provided to check the output level. However, if the level detect level is set high, the indicator may not light on some bands due to frequency response.

Procedure for Power Adjustment (FS-1500/1501)

- 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.

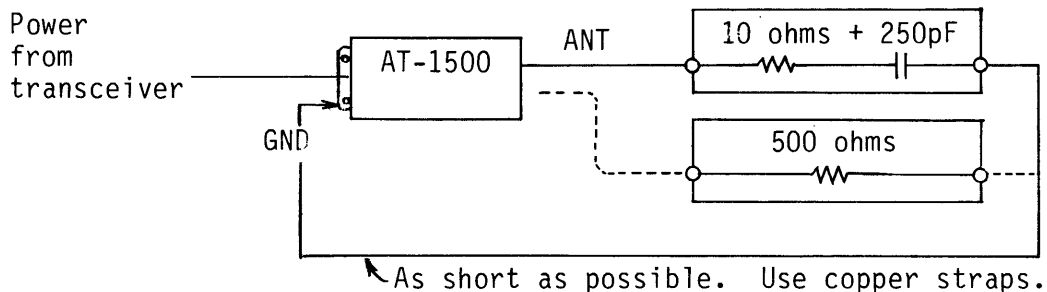


No	Check Item	Ratings	Adjust;	Condition/Remarks
1	IF Gain	$S = 0 \leftrightarrow 1$	R61 [IF GAIN] on TX/RX Board	Input signal: 4MHz, 6dBu. S-meter respond gradually so adjust slowly.
2	S-meter	$S = 5 \pm 1$	—	20dBu
		$S = 8 \pm 1$	—	40dBu
3	Overall Sensitivity	$-3 \pm 3\text{dBu}$	—	The input level to 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±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 ± 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. 500 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 FS-1500 series radiotelephone are equipped with self-test facilities --LCD, touchpad keys and relay--for checking unit performance.

To actuate the self-test function for the check of LCD and touchpad keys, press and hold [ENT] while turning on the transceiver. Release [ENT] when "-" is displayed. The unit is now ready to accept a self-test. Press the key corresponding to the test desired. (This procedure is not required for the relay test.)

You may escape from a self-test at any time by turning off the unit.

LCD TEST

The LCD can be checked for proper functioning with the following procedure.

1. Press [2182] to begin the LCD test.
2. The LCD shows all display annunciators one by one in the following order. "ITU", "A", "B", "DUP", "SIMP", "TX", "RX", ".", ".", scales(S), scales(ANT), "LOW", "TUNE", "OK", "MEMO", "VOX", "SQ", speaker off, "SCAN", "LSB", "USB", "R3E", "CW", "H3E" and "TLX."
3. Numbers are counted up from "0000000" to "9999999." When an even number is displayed, seven cursors should be presented.
4. After all segments of the display have been presented, "-" is displayed, indicating completion of the LCD test.
5. You may proceed to the touchpad key test, or escape from the self-test by turning off the transceiver.

TOUCHPAD TEST

Touchpad keys can be checked for proper operation.

1. Press [SEND] to begin the touchpad key test.
2. The LCD shows the number "2-1."
3. Press each key one by one in the sequence shown in the right-hand figure below.

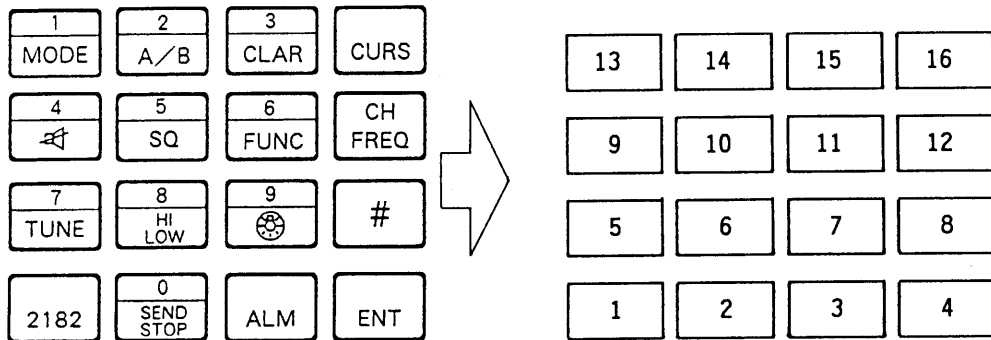


Fig. 4-1 Key Matrix

4. If the key is functioning properly, a beep is emitted, the number corresponding to the key pressed extinguishes and the next sequential number is displayed. If the touchpad key is defective, the number does not extinguish.
5. After all keys have been pressed, "--" is displayed, indicating completion of the test.

RELAY TEST

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

1. Open the shield cover inside the antenna coupler. Locate DIP switch S2.
2. Set No. 2 of S2 to "ON."
3. Press "TUNE" switch S1.
4. Then, each LED (CR33-52) 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 LEDs, 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.

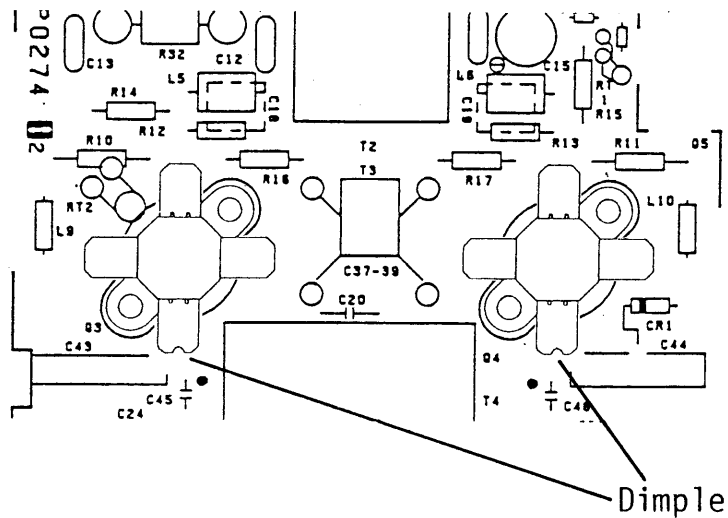


Fig. 4-2 Direction of the transistor

2. Replacement of P.C. Board

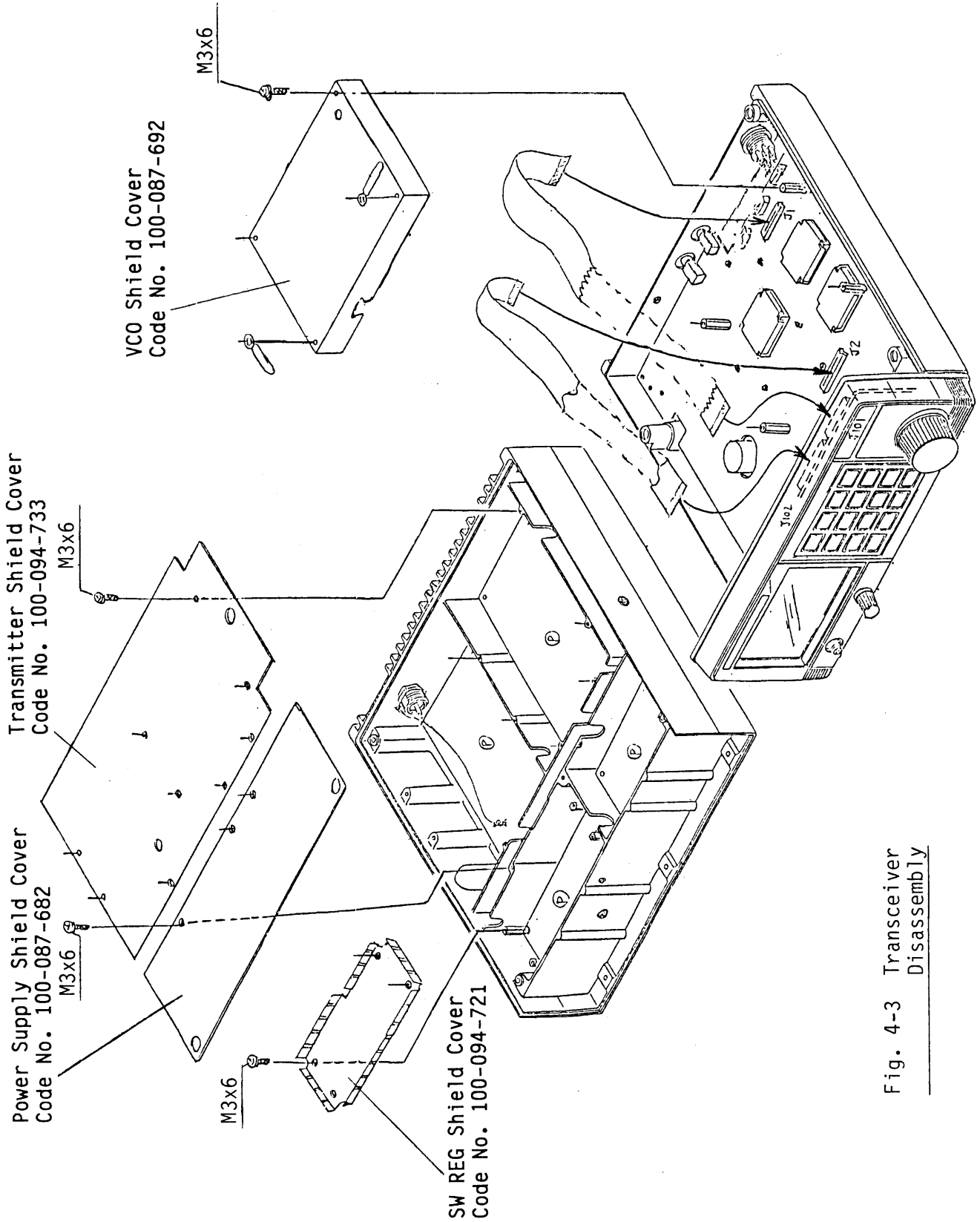


Fig. 4-3 Transceiver Disassembly

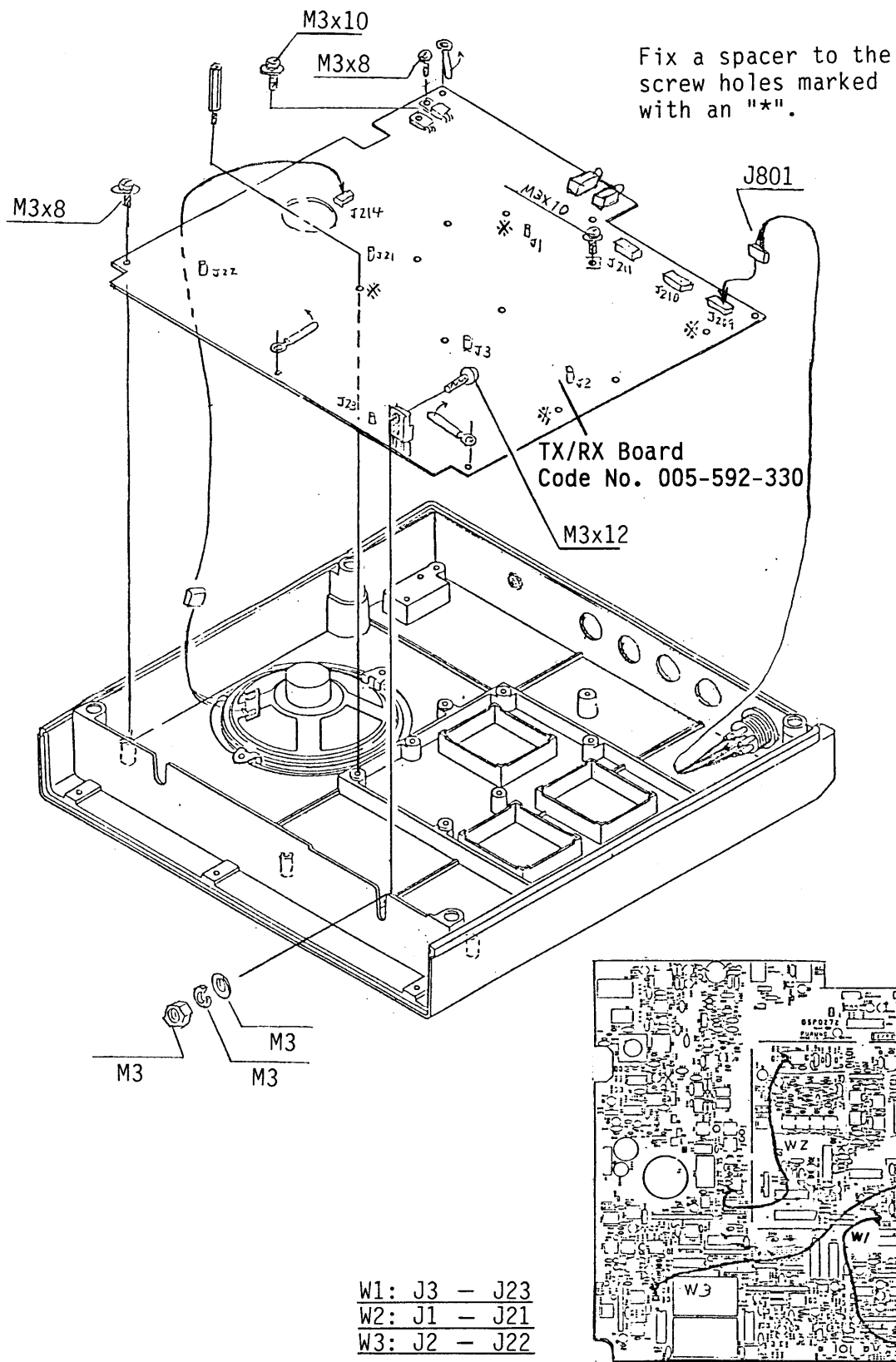


Fig. 4-4 TX/RX Board Disassembly

M3x8 screws are used to fix printed circuit boards.

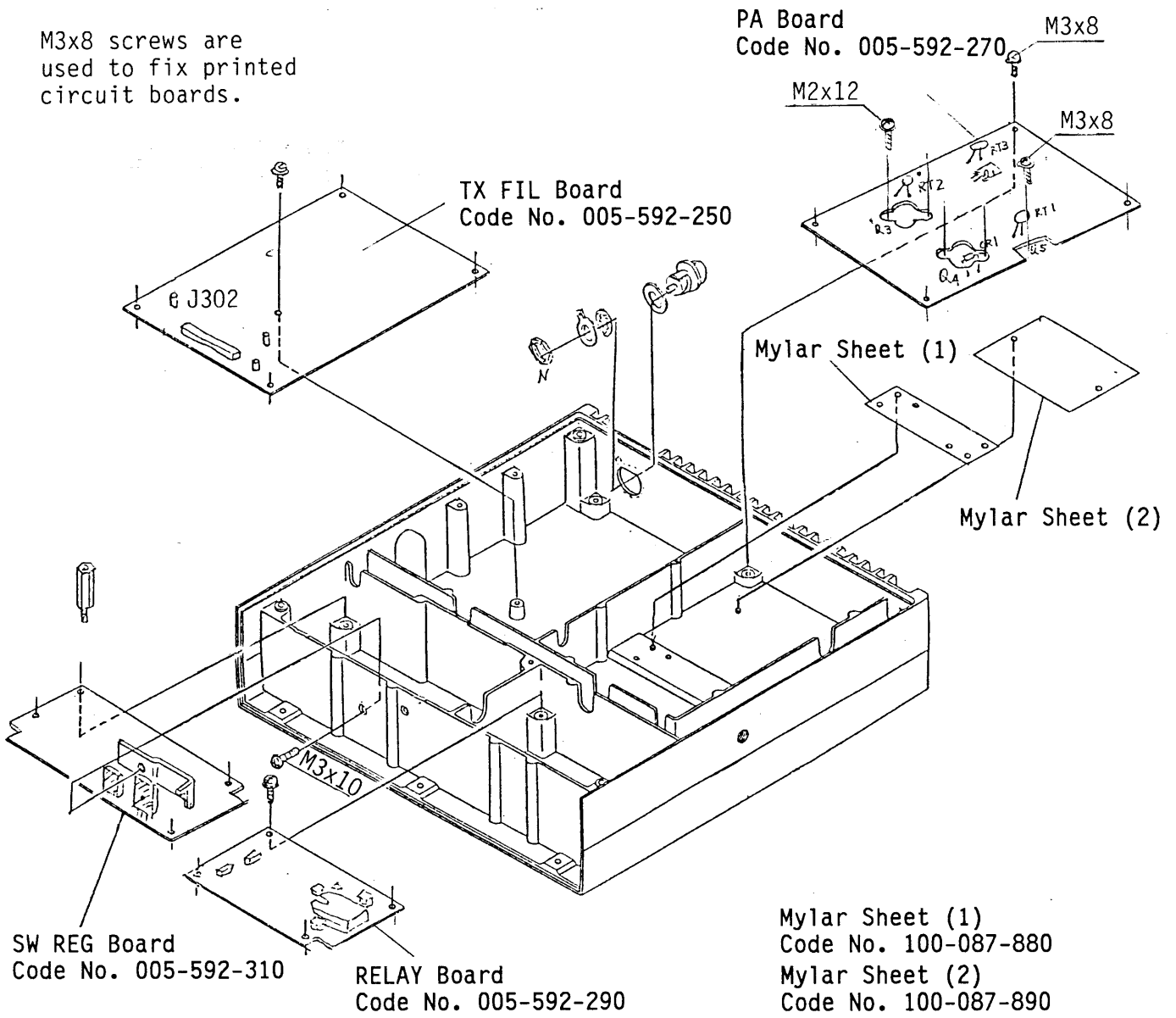


Fig. 4-5 Disassembly of P.C. Boards from Top Chassis

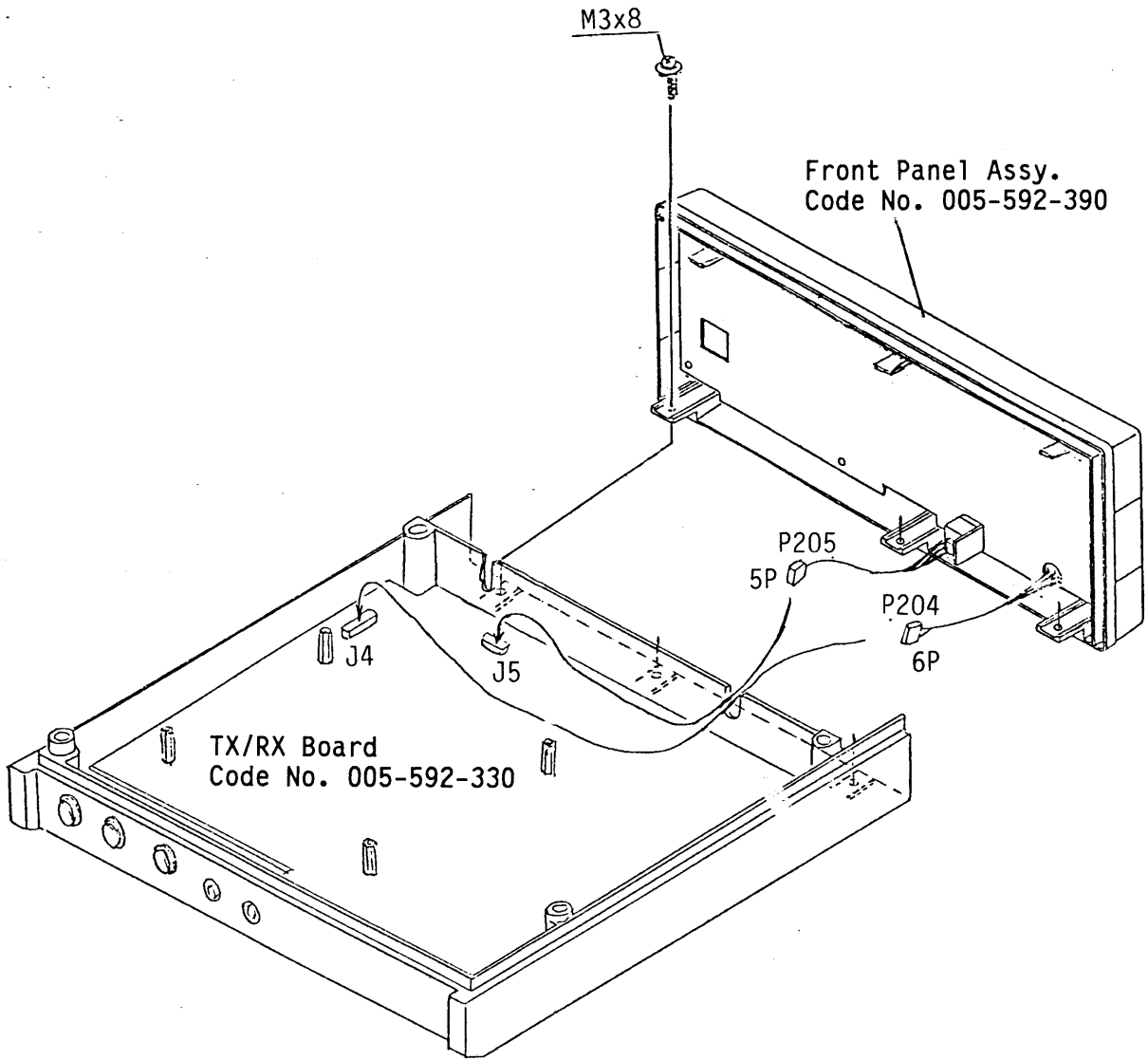


Fig. 4-6 Front Panel Disassembly

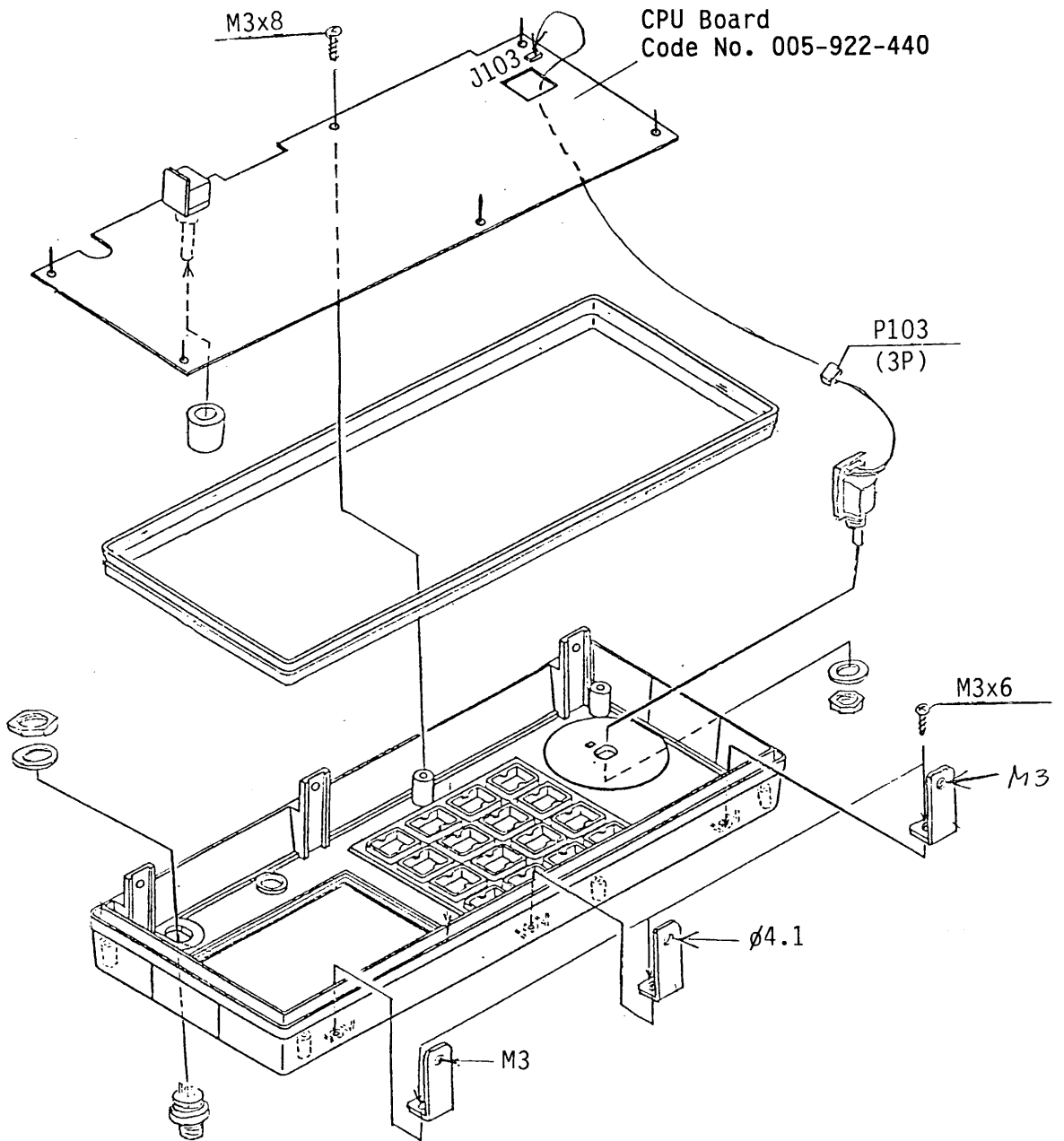
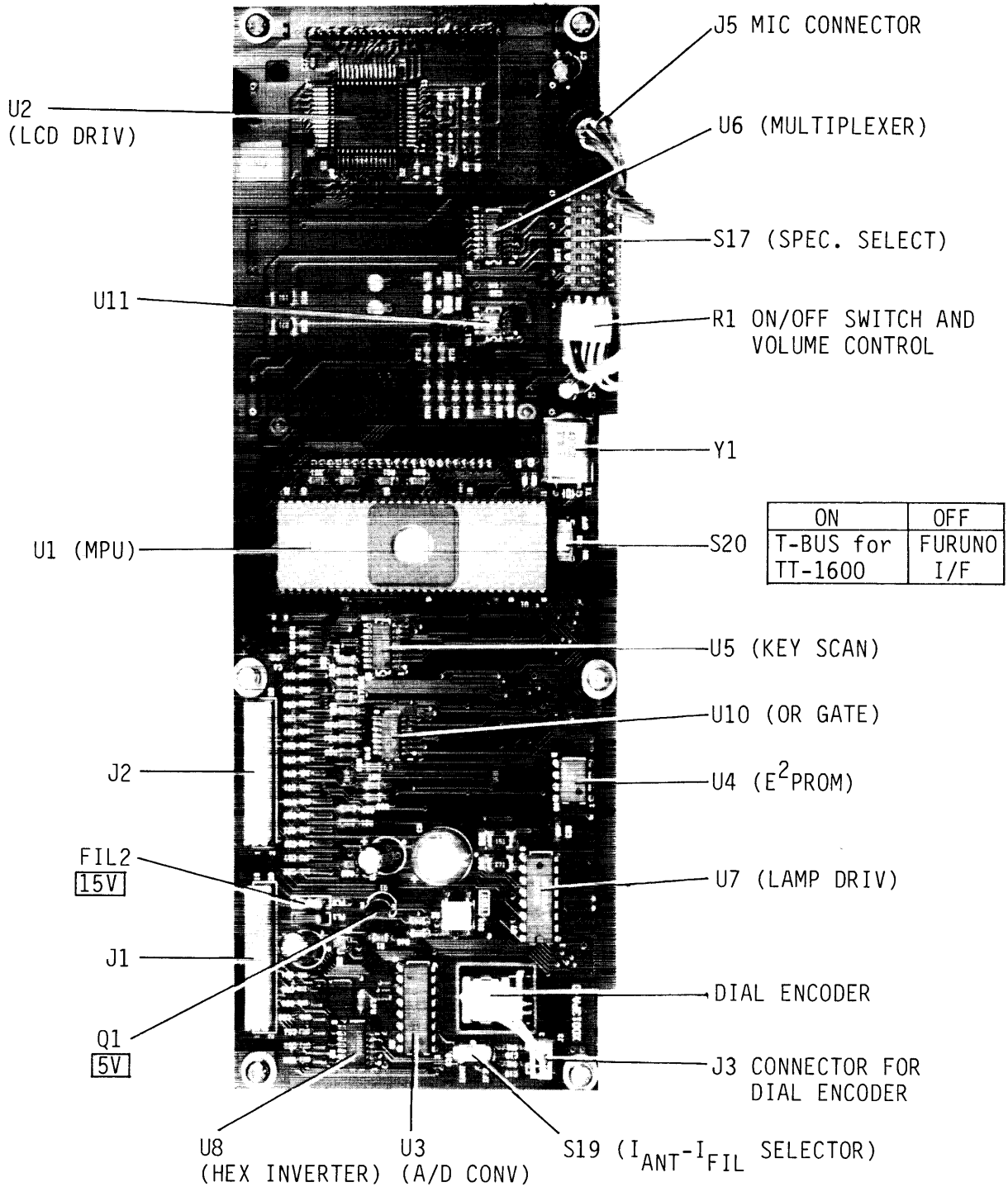


Fig. 4-7 Front Panel Disassembly

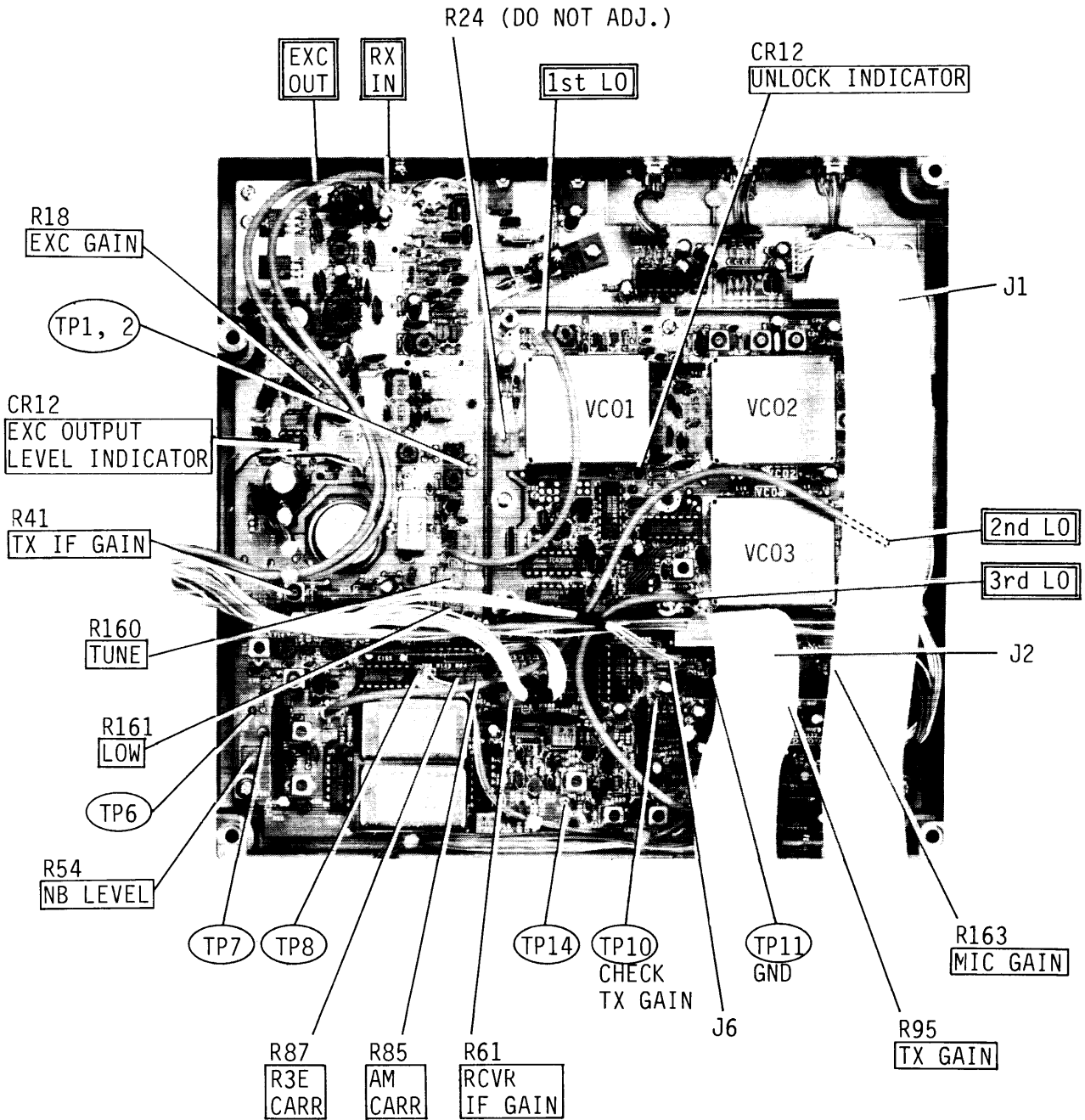
CHAPTER 5 PARTS LOCATION

5.1 TRANSCEIVER UNIT

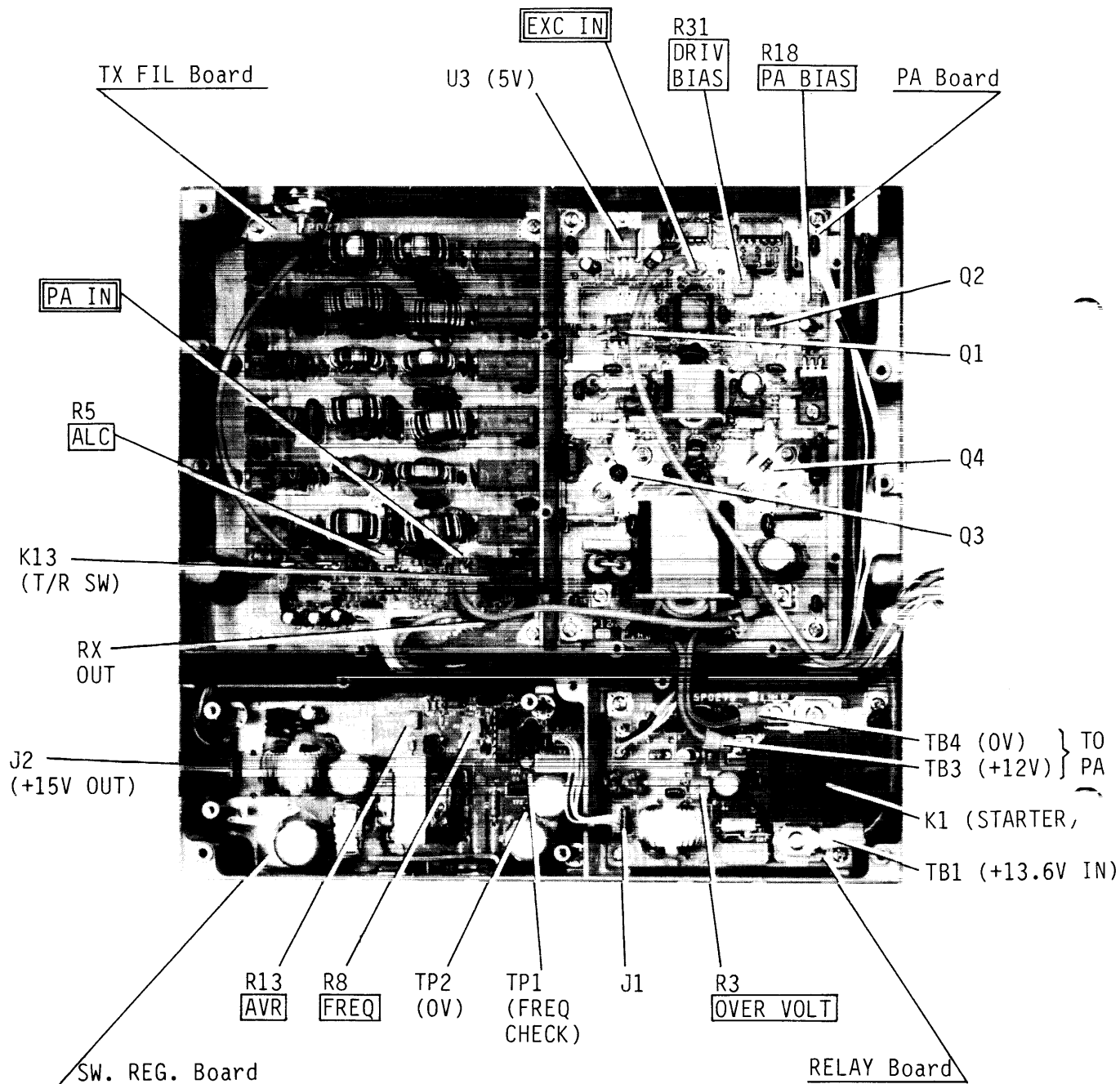
5.1.1 05P0271 CPU Board



5.1.2 05P0272 TX/RX Board

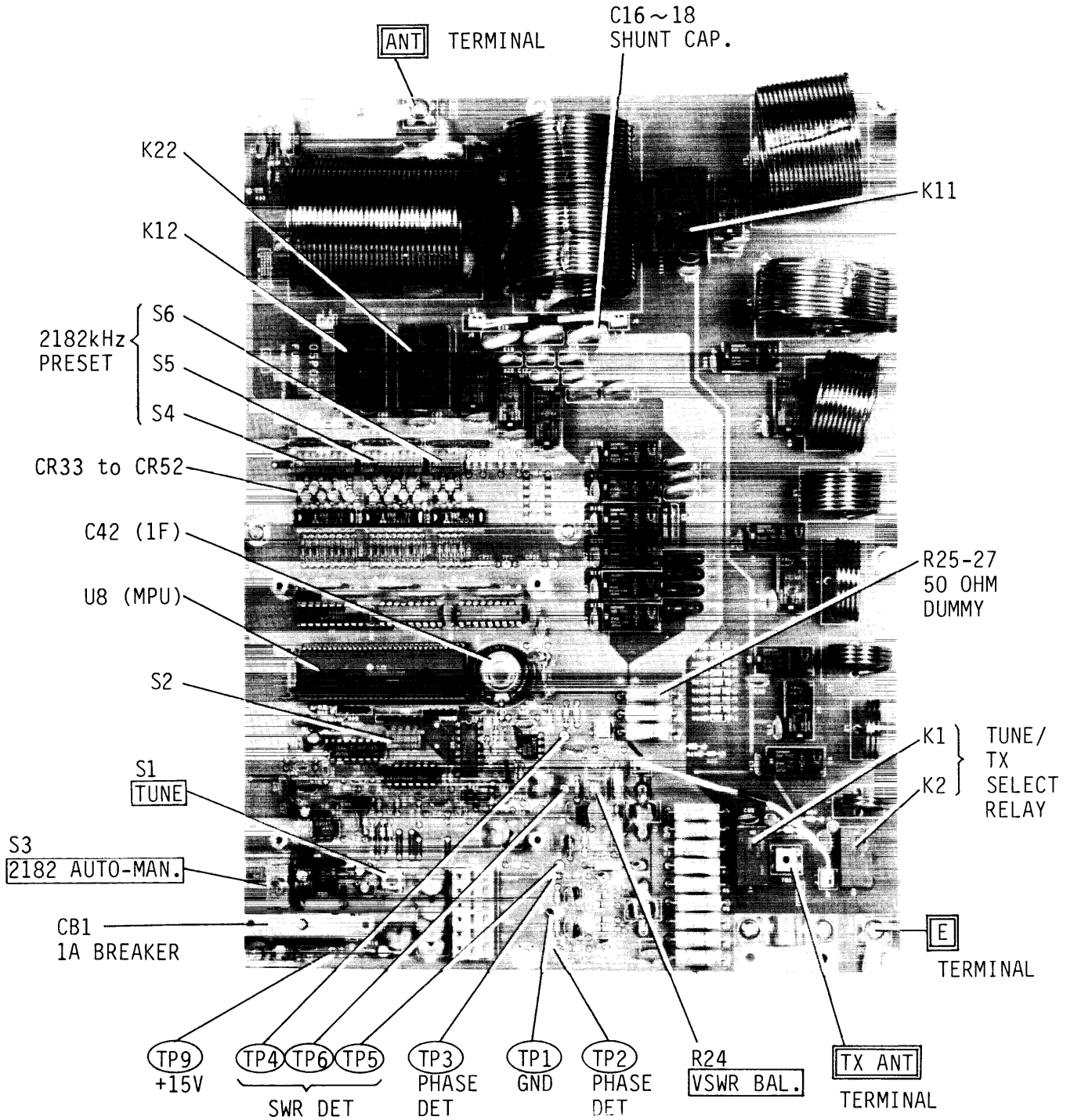


- 5.1.3 05P0273 TX. FIL Board
- 05P0274 PA Board
- 05P0275 RELAY Board
- 05P0276 SW REG Board



5.2 ANTENNA COUPLER

5.2.1 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
NJM082	Operational Amplifier	JRC
NJM2904D	Operational Amplifier	JRC
NJM7805A	Regulator	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
HD637B01Y	Microprocessor	TOSHIBA
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 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
RESISTOR 抵抗					1802R0110 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0001 ERD-16TJ103 0.16W 10K 000-330-802					1802R0111 ERD-16TJ150 0.050095-0 000-330-843				
1802R0002 ERD-16TJ103 0.16W 10K 000-330-802					1802R0112 ERD-16TJ470 0.16W 47 000-329-005				
1802R0008 ERD-16TJ470 0.16W 47 000-329-005					1802R0113 ERD-16TJ470 0.16W 47 000-329-005				
1802R0009 ERD-16TJ102 0.16W 1K 000-330-801					1802R0114 ERD-16TJ470 0.16W 47 000-329-005				
1802R0010 ERD-16TJ470 0.16W 47 000-329-005					1802R0115 ERD-16TJ470 0.16W 47 000-329-005				
1802R0011 ERD-16TJ150 0.050095-0 000-330-843					1802R0116 ERD-16TJ101 0.16W 100 000-329-013				
1802R0012 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0117 ERD-16TJ101 0.16W 100 000-329-013				
1802R0013 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0118 ERD-16TJ101 0.16W 100 000-329-013				
1802R0014 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0119 ERD-16TJ101 0.16W 100 000-329-013				
1802R0015 ERD-16TJ103 0.16W 10K 000-330-802					1802R0120 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0016 ERD-16TJ102 0.16W 1K 000-330-801					1802R0121 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0017 ERD-16TJ470 0.16W 47 000-329-005					1802R0122 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0019 ERD-16TJ103 0.16W 10K 000-330-802					1802R0123 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0020 ERD-16TJ331 0.16W 330 000-329-025					1802R0124 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0021 ERD-16TJ680 0.16W 68 000-329-009					1802R0125 ERD-16TJ103 0.16W 10K 000-329-013				
1802R0022 ERD-16TJ102 0.16W 1K 000-330-801					1802R0126 ERD-16TJ101 0.16W 100 000-329-013				
1802R0023 ERD-16TJ220 0.16W 22 000-330-847					1802R0127 ERD-16TJ101 0.16W 100 000-329-013				
1802R0024 ERD-16TJ220 0.16W 22 000-330-847					1802R0128 ERD-16TJ101 0.16W 100 000-329-013				
1802R0025 ERG-15J391P 0.050102-0 000-375-404					1802R0129 ERD-16TJ101 0.16W 100 000-329-013				
1802R0026 ERD-16TJ220 0.16W 2.2 000-330-823					1802R0130 ERD-16TJ101 0.16W 100 000-329-013				
1802R0027 ERD-16TJ470 0.16W 47 000-329-005					1802R0131 ERD-16TJ101 0.16W 100 000-329-013				
1802R0028 ERD-16TJ101 0.16W 100 000-329-013					1802R0132 ERD-16TJ101 0.16W 100 000-329-013				
1802R0029 ERD-16TJ103 0.16W 10K 000-330-802					1802R0133 ERD-16TJ101 0.16W 100 000-329-013				
1802R0030 ERD-16TJ103 0.16W 10K 000-330-802					1802R0134 ERD-16TJ101 0.16W 100 000-329-013				
1802R0031 ERD-16TJ470 0.16W 47 000-329-005					1802R0135 ERD-16TJ101 0.16W 100 000-329-013				
1802R0032 ERD-16TJ470 0.16W 47 000-329-005					1802R0136 ERD-16TJ101 0.16W 100 000-329-013				
1802R0033 ERD-16TJ223 0.16W 22K 000-330-810					1802R0137 ERD-16TJ103 0.16W 10K 000-330-802				
1802R0034 ERD-16TJ103 0.16W 10K 000-330-802					1802R0138 ERD-16TJ101 0.16W 100 000-329-013				
1802R0035 ERD-16TJ102 0.16W 1K 000-330-801					1802R0139 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0036 ERD-16TJ102 0.16W 1K 000-329-013					1802R0140 EXR-F5E472J 0.125W 4.7KX4 000-379-073				
1802R0037 ERD-16TJ102 0.16W 1K 000-329-013					1802R0141 EXR-F5E472J 0.125W 4.7KX4 000-379-073				
1802R0038 ERD-16TJ101 0.16W 100 000-329-013					1802R0142 EXR-F5E472J 0.125W 4.7KX4 000-379-073				
1802R0039 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0143 EXR-F5E472J 0.125W 4.7KX4 000-379-073				
1802R0040 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0144 ERG-35J180P 0.050102-0 000-375-517				
1802R0041 EVM-MCGA01B12 100 000-103-628					1802R0145 ERD-16TJ392 0.16W 3.9K 000-329-047				
1802R0042 ERD-16TJ221 0.16W 220 000-329-021					1802R0154 ERD-16TJ152 0.16W 1.5K 000-329-039				
1802R0043 ERD-16TJ103 0.16W 10K 000-330-802					1802R0155 ERD-16TJ222 0.16W 2.2K 000-330-809				
1802R0044 ERD-16TJ103 0.16W 10K 000-330-802					1802R0156 ERD-16TJ330 0.16W 33 000-329-001				
1802R0045 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0157 ERD-16TJ331 0.16W 330 000-329-025				
1802R0046 ERD-16TJ332 0.16W 3.3K 000-329-045					1802R0158 ERD-16TJ101 0.16W 100 000-329-013				
1802R0047 ERD-16TJ331 0.16W 330 000-329-025					1802R0159 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0048 ERD-16TJ223 0.16W 22K 000-330-810					1802R0160 EVM-MCGA01P53 5K (00S0119) 000-103-631				
1802R0049 ERD-16TJ470 0.16W 47 000-329-005					1802R0161 EVM-MCGA01B14 10K 000-103-632				
1802R0050 ERD-16TJ103 0.16W 10K 000-330-802					1802R0162 ERD-16TJ221 0.16W 220 000-329-021				
1802R0051 ERD-16TJ101 0.16W 100 000-329-013					1802R0163 EVM-MCGA01B52 0.050119-1 000-103-592				
1802R0052 ERD-16TJ102 0.16W 1K 000-330-801					1802R0164 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0053 ERD-16TJ472 0.16W 4.7K 000-330-812					1802R0165 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0054 EVM-MCGA01B13 1K 000-103-593					1802R0166 ERD-16TJ103 0.16W 10K 000-330-802				
1802R0055 ERD-16TJ472 0.16W 4.7K 000-330-812					1802R0167 ERD-16TJ150 0.050095-0 000-330-843				
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1802R0057 ERD-16TJ103 0.16W 10K 000-330-802					1802R0169 ERD-16TJ681 0.16W 680 000-330-813				
1802R0058 ERD-16TJ102 0.16W 1K 000-330-801					1802R0170 ERD-16TJ102 0.16W 1K 000-330-801				
1802R0059 ERD-16TJ562 0.16W 5.6K 000-329-050					1802R0171 ERD-16TJ472 0.16W 4.7K 000-330-812				
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1802R0061 EVM-MCGA01B14 10K 000-103-632					1802R0173 ERD-16TJ331 0.16W 330 000-329-025				
1802R0062 ERD-16TJ562 0.16W 5.6K 000-329-050					1802R0174 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0063 ERD-16TJ331 0.16W 330 000-329-025					1802R0175 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0064 ERD-16TJ331 0.16W 330 000-329-025					1802R0176 ERD-16TJ470 0.16W 47 000-329-005				
1802R0065 ERD-16TJ103 0.16W 10K 000-330-802					1802R0178 ERD-16TJ681 0.16W 680 000-330-813				
1802R0066 ERD-16TJ103 0.16W 10K 000-330-802					1802R0179 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0067 ERD-16TJ102 0.16W 1K 000-330-801					1802R0180 ERD-16TJ472 0.16W 4.7K 000-330-812				
1802R0068 ERD-16TJ103 0.16W 10K 000-330-802					THERMISTOR 熱電阻				
1802R0069 ERD-16TJ101 0.16W 100 000-329-013					1802T0001 D-33A 000-180-625				
1802R0070 ERD-16TJ101 0.16W 100 000-329-013					1802T0002 D-33A 000-180-625				
1802R0071 ERD-16TJ473 0.16W 47K 000-330-814					1802T0003 D-33A 000-180-625				
1802R0072 ERD-16TJ103 0.16W 10K 000-330-802					1802T0004 D-22A 000-180-617				
1802R0073 ERD-16TJ472 0.16W 4.7K 000-330-812					TRANSFORMER 変圧器				
1802R0074 ERD-16TJ331 0.16W 330 000-329-025					1802T0001 5T460 05S0355-0 000-109-054				
1802R0075 ERD-16TJ681 0.16W 680 000-330-813					1802T0002 5T476 05S0420-0 000-113-389				
1802R0076 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0003 5T460 05S0355-0 000-109-054				
1802R0077 ERD-16TJ102 0.16W 1K 000-330-801					1802T0004 5T476 05S0420-0 000-113-389				
1802R0078 ERD-16TJ103 0.16W 10K 000-330-802					1802T0005 5T460 05S0355-0 000-109-054				
1802R0079 ERD-16TJ103 0.16W 10K 000-330-802					1802T0006 5T460 05S0355-0 000-109-054				
1802R0080 ERD-16TJ470 0.16W 47 000-329-005					1802T0007 5T460 05S0355-0 000-109-054				
1802R0081 ERD-16TJ273 0.16W 27K 000-330-811					1802T0011 5T474 05S0417-0 000-113-390				
1802R0082 ERD-16TJ330 0.16W 33 000-329-001					1802T0012 5T475 05S0419-0 000-113-369				
1802R0083 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0013 5T460 05S0355-0 000-109-054				
1802R0084 ERD-16TJ103 0.16W 10K 000-330-802					1802T0014 5T460 05S0355-0 000-109-054				
1802R0085 EVM-MCGA01P14 10K 000-103-632					1802T0015 5T475 05S0419-0 000-113-369				
1802R0086 ERD-16TJ103 0.16W 10K 000-330-802					1802T0016 5T460 05S0355-0 000-109-054				
1802R0087 EVM-MCGA01B53 5K (00S0119) 000-103-631					1802T0017 5T460 05S0355-0 000-109-054				
1802R0088 ERD-16TJ332 0.16W 3.3K 000-329-045					1802T0018 5T460 05S0355-0 000-109-054				
1802R0090 ERD-16TJ471 0.16W 470 000-329-029					1802T0019 5T460 05S0355-0 000-109-054				
1802R0091 ERD-16TJ223 0.16W 22K 000-330-810					1802T0020 5T460 05S0355-0 000-109-054				
1802R0092 ERD-16TJ152 0.16W 15K 000-329-059					1802T0021 5T460 05S0355-0 000-109-054				
1802R0093 ERD-16TJ103 0.16W 10K 000-330-802					1802T0022 5T460 05S0355-0 000-109-054				
1802R0094 ERD-16TJ224 0.16W 220K 000-329-080					1802T0023 5T460 05S0355-0 000-109-054				
1802R0095 EVM-MCGA01P15 5K (00S0119) 000-103-631					1802T0024 5T460 05S0355-0 000-109-054				
1802R0096 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0025 5T460 05S0355-0 000-109-054				
1802R0097 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0026 5T460 05S0355-0 000-109-054				
1802R0098 ERD-16TJ153 0.16W 15K 000-329-059					1802T0027 5T460 05S0355-0 000-109-054				
1802R0099 ERD-16TJ471 0.16W 470 000-329-029					1802T0028 5T460 05S0355-0 000-109-054				
1802R0100 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0029 5T460 05S0355-0 000-109-054				
1802R0101 ERD-16TJ104 0.16W 100K 000-330-803					1802T0030 5T460 05S0355-0 000-109-054				
1802R0102 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0031 5T460 05S0355-0 000-109-054				
1802R0103 ERD-16TJ331 0.16W 330 000-329-025					1802T0032 5T460 05S0355-0 000-109-054				
1802R0104 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0033 5T460 05S0355-0 000-109-054				
1802R0105 ERD-16TJ473 0.16W 4.7K 000-330-814					1802T0034 5T460 05S0355-0 000-109-054				
1802R0106 ERD-16TJ330 0.16W 33 000-329-001					1802T0035 5T460 05S0355-0 000-109-054				
1802R0107 ERG-75J180P 2K 10 000-375-449					1802T0036 5T460 05S0355-0 000-109-054				
1802R0108 ERD-16TJ472 0.16W 4.7K 000-330-812					1802T0037 5T460 05S0355-0 000-109-054				
1802R0109 ERD-16TJ102 0.16W 1K 000-330-801					1802T0038 5T460 05S0355-0 000-109-054				

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
1802C1090	DD104B102K50V	1000PF 50V	000-252-171						
1802C1091	DD104B102K50V	1000PF 50V	000-252-171						
1802C1092	DD104B102K50V	1000PF 50V	000-252-171						
1802C1093	ECE-A1E010E	WS.0 100MF 25V	000-206-105						
1802C1094	DD104B102K50V	1000PF 50V	000-252-171						
1802C1095	DD104B102K50V	1000PF 50V	000-252-171						
1802C1096	ECC-F1H040C	4PF 50VDC	000-255-204						
1802C1098	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1099	DD104B102K50V	1000PF 50V	000-252-171						
1802C1100	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1101	DD104B102K50V	1000PF 50V	000-252-171						
1802C1102	EC0-B1H223J	0.01UF 50V	000-100-127						
1802C1103	EC0-V1H104J	0.1UF 50V	000-261-524						
1802C1104	EC0-B1H103J	0.01UF 50V	000-100-125						
1802C1105	ECE-A1C0471E	470UF 16V	000-201-808						
1802C1106	DD104B102K50V	1000PF 50V	000-252-171						
1802C1107	ECC-F1H330JC	33PF 50VDC	000-255-222						
1802C1108	ECC-F1H220JC	22PF 50V	000-255-905						
1802C1109	ECC-F1H330JC	33PF 50VDC	000-255-222						
1802C1110	DD104B102K50V	1000PF 50V	000-252-171						
1802C1111	DD104B102K50V	1000PF 50V	000-252-171						
1802C1112	ECC-F1H010CC	1PF 50VDC	000-255-201						
1802C1113	ECC-F1H010CC	1PF 50VDC	000-255-201						
1802C1114	DD104B102K50V	1000PF 50V	000-252-171						
1802C1115	DD104B102K50V	1000PF 50V	000-252-171						
1802C1116	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1117	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1118	DD104B102K50V	1000PF 50V	000-252-171						
1802C1119	DD306F104225	00S0130-0	000-108-968						
1802C1120	EXC-EMT103DC	08S0078-1	000-107-994						
1802C1121	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1122	ECE-A1C0471E	470UF 16V	000-201-808						
1802C1123	ECE-A1E010E	10UF 25V	000-201-812						
1802C1124	EXC-EMT103DC	08S0078-1	000-107-994						
1802C1125	ECE-A1A0471E	470UF 10V	000-206-118						
1802C1126	DD109E103P50V	0.01UF 50V	000-253-436						
1802C1127	DD306F104225	00S0130-0	000-108-968						
1802C1128	DD104B102K50V	1000PF 50V	000-252-171						
	DIODE	ダイオード							
1802CR1001	1SV68	VARI.CAP.	000-114-120						
1802CR1002	1SS135		000-108-075						
1802CR1003	1SS135		000-108-075						
1802CR1004	1SS135		000-108-075						
1802CR1005	1SS135		000-108-075						
1802CR1006	1SV68	VARI.CAP.	000-114-120						
1802CR1007	1SV68	VARI.CAP.	000-114-120						
1802CR1008	1SV68	VARI.CAP.	000-114-120						
1802CR1009	1SV68	VARI.CAP.	000-114-120						
1802CR1010	1SS133		000-103-097						
1802CR1011	1SV68	VARI.CAP.	000-114-120						
1802CR1012	LN28 RPH		000-108-071						
	FILTER	フィルタ							
1802FL1001	50M14A	50.01MHZ	05S0399-1						
1802FL1002	SFE4.5MB	4.5MHZ	05S0404-0						
	COIL	コイル							
1802L1001	LAL03NA100K	10UH	000-428-144						
1802L1002	LAL03NA100K	10UH	000-428-144						
1802L1003	LAL03NA100K	10UH	000-428-144						
1802L1004	LAL03NA100K	10UH	000-428-144						
1802L1005	LAL03NA100K	10UH	000-428-144						
1802L1006	LAL03NA100K	10UH	000-428-144						
1802L1007	R24 05S4059-0	0.24UH	000-428-297						
1802L1008	R18 05S4056-0	0.18UH	000-428-295						
1802L1009	05S4055-0 R15	15UH	000-428-294						
1802L1010	R18 05S4056-0	0.18UH	000-428-295						
1802L1011	LAL03NA101K	100UH	000-428-133						
1802L1012	LAL03NA100K	10UH	000-428-144						
1802L1013	LAL03NA100K	10UH	000-428-144						
1802L1014	LAL03NA100K	10UH	000-428-144						
	TRANSISTOR	トランジスタ							
1802Q1001	2SK192A-GR		000-129-375						
1802Q1002	2SK241-GR		000-110-986						
1802Q1003	2SK30ATH-0		000-129-263						
1802Q1004	2SC1000GTM-BL		000-124-481						
1802Q1005	UN4211		000-108-963						
1802Q1006	UN4211		000-108-963						
1802Q1007	2SK192A-GR		000-129-375						
1802Q1008	2SK241-GR		000-110-986						
1802Q1009	2SK241-GR		000-110-986						
1802Q1010	2SK241-GR		000-110-986						
1802Q1011	2SK241-GR		000-110-986						
1802Q1012	2SK192A-GR		000-129-375						
1802Q1013	2SC1815-Y		000-125-631						
1802Q1014	UN4211		000-108-963						
1802Q1015	2SK192A-GR		000-129-375						
1802Q1016	UN4122		000-113-381						
1802Q1017	2SD9660		000-113-382						
	RESISTOR	抵抗							
1802R1001	ERD-16TJ102	0.16W 1K	000-330-801						
1802R1002	ERD-16TJ472	0.16W 4.7K	000-330-812						
1802R1003	ERD-16TJ102	0.16W 1K	000-330-801						
1802R1004	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1005	ERD-16TJ101	0.16W 100	000-329-013						
1802R1006	ERD-16TJ102	0.16W 1K	000-330-801						
1802R1007	ERD-16TJ472	0.16W 4.7K	000-330-812						
1802R1008	ERD-16TJ221	0.16W 220	000-329-021						
1802R1009	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1010	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1011	ERD-16TJ221	0.16W 220	000-329-021						
1802R1012	ERD-16TJ472	0.16W 4.7K	000-330-812						
1802R1013	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1014	ERD-16TJ471	0.16W 470	000-329-029						
1802R1015	ERD-16TJ621	0.16W 680	000-330-813						
1802R1016	ERD-16TJ152	0.16W 1.5K	000-329-039						
1802R1017	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1018	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1019	ERD-16TJ222	0.16W 2.2K	000-330-809						
1802R1020	ERD-16TJ101	0.16W 100	000-329-013						
1802R1021	ERD-16TJ101	0.16W 100	000-329-013						
1802R1022	ERD-16TJ101	0.16W 100	000-329-013						
1802R1023	ERD-16TJ101	0.16W 100	000-329-013						
1802R1024	EVM-MCGA01F53	5K (0050119)	000-105-631						
1802R1025	ERD-16TJ392	0.16W 3.9K	000-329-047						
1802R1026	ERD-16TJ272	0.16W 2.7K	000-329-043						
1802R1027	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1028	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1029	ERD-16TJ332	0.16W 3.3K	000-329-045						
1802R1030	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1031	ERD-16TJ101	0.16W 100	000-329-013						
1802R1032	ERD-16TJ471	0.16W 470	000-329-029						
1802R1033	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1034	ERD-16TJ221	0.16W 220	000-329-021						
1802R1035	ERD-16TJ473	0.16W 47K	000-330-814						
1802R1036	ERD-16TJ221	0.16W 220	000-329-021						
1802R1037	ERD-16TJ101	0.16W 100	000-329-013						
1802R1038	ERD-16TJ221	0.16W 220	000-329-021						
1802R1039	ERD-16TJ103	0.16W 10K	000-330-802						
1802R1040	ERD-16TJ221	0.16W							

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
	INTEGRATED CIRCUIT	シロツキカイロ			1B03C0050	ECE-A1EU100E	10UF 25V	000-201-812	
1B02U1001	TC4013RAP		000-104-336		1B03C0051	ECQ-V1H104JZ	0.1UF 50V	000-261-524	
1B02U1002	M54927P		000-113-378		1B03C0052	ECE-A1AU101E	100UF 10V	000-206-113	
1B02U1003	M54459L		000-150-912		1B03C0053	ECQ-V1H104JZ	0.1UF 50V	000-261-524	
1B02U1004	E1-PC1037H		000-113-379		1B03C0054	ECQ-V1H104JZ	0.1UF 50V	000-261-524	
1B02U1005	M54927P		000-113-378		1B03C0055	EXC-EMT103DC	0.850078-1	000-107-994	
1B02U1006	TC4066BP		000-163-264		1B03C0057	ECE-A1EU220E	22UF 25V	000-201-813	
1B02U1007	M54927P		000-113-378		1B03C0058	ECQ-V1H104JZ	0.1UF 50V	000-261-524	
1B02U1008	E1-PC1037H		000-113-379		1B03C0059	ECQ-V1H104JZ	0.1UF 50V	000-261-524	
1B02U1009	TA7310P		000-101-337		1B03C0060	ECE-A1EU100E	10UF 25V	000-201-812	
1B02U1010	HD10551		000-162-270						
1B02U1011	M54927P		000-113-378			DIODE	ダイオード		
1B02U1012	M54459L		000-150-912		1B03CR0001	1SS82		000-114-021	
1B02U1013	TC4066BP		000-163-264		1B03CR0002	1SS82		000-114-021	
	POTENTIOMETER	*マツシヨメータ			1B03CR0003	1SS133		000-103-097	
1B02VR1001	HZ12A-1L		000-113-383		1B03CR0004	1SS133		000-103-097	
1B02VR1002	HZ6A2L		000-133-227		1B03CR0005	1SS82		000-114-021	
1B02VR1003	HZ12C-3L		000-113-384		1B03CR0006	1SS82		000-114-021	
	CRYSTAL	クリスタル			1B03CR0007	1SS82		000-114-021	
1B02Y1001	05S0402-0	49.5MHZ 05S0402-0	000-113-376		1B03CR0008	1SS82		000-114-021	
					1B03CR0009	1SS82		000-114-021	
					1B03CR0010	1SS82		000-114-021	
					1B03CR0011	1SS82		000-114-021	
						ARRESTER	アレスター		
					1B03E0001	T0R-3503		000-113-427	
						JACK	ジャック		
					1B03J0001	IL-S-13P-S2T2-EF	19S0079-0	000-113-404	
					1B03J0002	TMP-J01X-V6	05S0455	000-509-859	
					1B03J0003	TMP-J01X-V6	05S0455	000-509-859	
					1B03J0004	TMP-J01X-V6	05S0455	000-509-859	
						RELAY	リレー		
					1B03K0001	G6R-1114P-12V		000-103-544	
					1B03K0002	G6R-1114P-12V		000-103-544	
					1B03K0003	G6B-1114P-12V		000-103-544	
					1B03K0004	G6B-1114P-12V		000-103-544	
					1B03K0005	G6B-1114P-12V		000-103-544	
					1B03K0006	G6B-1114P-12V		000-103-544	
					1B03K0007	G6B-1114P-12V		000-103-544	
					1B03K0008	G6B-1114P-12V		000-103-544	
					1B03K0009	G6B-1114P-12V		000-103-544	
					1B03K0010	G6B-1114P-12V		000-103-544	
					1B03K0011	G6B-1114P-12V		000-103-544	
					1B03K0012	G6R-1114P-12V		000-103-544	
					1B03K0013	G6R-2114P-DC12V		000-113-428	
						COIL	コイル		
					1B03L0001	5T508	05S0472-0	000-113-429	
					1B03L0002	5T023	05S4023-0	000-732-573	
					1B03L0003	5T024	05S4024-0	000-732-574	
					1B03L0004	5T025	05S4025-0	000-732-575	
					1B03L0005	5T026	05S4026-0	000-732-576	
					1B03L0006	5T503	05S0468-0	000-113-430	
					1B03L0007	5T027	05S4027-0	000-732-577	
					1B03L0008	5T028	05S4028-0	000-732-578	
					1B03L0009	5T029	05S4029-0	000-732-579	
					1B03L0010	5T505	05S0469-0	000-113-431	
					1B03L0011	5T506	05S0470-0	000-113-432	
					1B03L0012	5T507	05S0471-0	000-113-433	
					1B03L0013	LAL03NAR22H	0.220H	000-428-134	
					1B03L0014	5T031	05S4031-0	000-732-581	
						RESISTOR	レジスタ		
					1B03R0001	ERD-25PJ332	0.25W 3.3K	000-330-369	
					1B03R0002	ERG-25J630P	00S0102-0	000-375-460	
					1B03R0003	ERD-16TJ103	0.16W 10K	000-330-802	
					1B03R0004	ERD-16TJ103	0.16W 10K	000-330-802	
					1B03R0005	FVM-MCGA01B13	1K	000-103-593	
					1B03R0006	ERD-16TJ102	0.16W 1K	000-330-801	
					1B03R0007	ERD-16TJ471	0.16W 470	000-329-029	
					1B03R0008	ERD-16TJ473	0.16W 47K	000-330-814	
					1B03R0009	ERD-16TJ471	0.16W 470	000-329-029	
					1B03R0010	ERD-16TJ473	0.16W 47K	000-330-814	
					1B03R0011	ERD-16TJ473	0.16W 47K	000-330-814	
					1B03R0012	ERD-16TJ473	0.16W 47K	000-330-814	
					1B03R0013	ERD-16TJ101	0.16W 100	000-329-013	
					1B03R0014	ERD-16TJ103	0.16W 10K	000-330-802	
					1B03R0015	ERD-16TJ103	0.16W 10K	000-330-802	
						INTEGRATED CIRCUIT	シロツキカイロ		
					1B03U0001	NJM2904D		000-113-434	

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
1B04	05P0274	P.A.	005-592-270			RESISTOR	抵抗		
DWG. No. E5485-017-B									
	CAPACITOR	コンデンサ							
1B04C0001	ECQ-R1H472JZ	4700PF 50V	000-102-493		1B04R0001	ERD-25PJ681	0.25W 680	000-330-353	
1B04C0002	ECQ-R1H472JZ	4700PF 50V	000-102-493		1B04R0002	ERD-25PJ100	0.25W 10	000-330-309	
1B04C0003	ECQ-R1H103JZ	0.01UF 50V	000-100-125		1B04R0003	ERD-25PJ681	0.25W 680	000-330-353	
1B04C0004	ECQ-R1H103JZ	0.01UF 50V	000-100-125		1B04R0004	ERD-25PJ2R2	0.25W 2.2	000-330-297	
1B04C0005	ECE-A1AU101E	100UF 10V	000-206-113		1B04R0005	ERD-25PJ2R2	0.25W 2.2	000-330-297	
1B04C0006	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0006	ERD-25PJ470	0.25W 47	000-330-325	
1B04C0007	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0007	ERD-25PJ470	0.25W 47	000-330-325	
1B04C0008	ECC-F1H101JC	100PF, 50V	000-256-910		1B04R0008	ERD-25PJ330	0.25W 33	000-330-321	
1B04C0009	DM15C511K1	510PF, 100V	000-222-285		1B04R0009	ERD-25PJ330	0.25W 33	000-330-321	
1B04C0012	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0010	ERG-25J470P	2W 47	000-375-457	
1B04C0013	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0011	ERG-25J470P	2W 47	000-375-457	
1B04C0014	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0012	ERD-50TJ1R2	0.5W 1.2 \times -6 5%	000-330-134	
1B04C0015	ECE-A1AU471E	470UF 10V	000-206-118		1B04R0013	ERD-50TJ1R2	0.5W 1.2 \times -6 5%	000-330-134	
1B04C0016	DD109E103P50V	0.01UF 50V	000-253-436		1B04R0014	ERD-50TJ100	0.5W 10	000-330-009	
1B04C0017	ECE-A1AU101E	100UF 10V	000-206-113		1B04R0015	ERD-50TJ100	0.5W 10	000-330-009	
1B04C0018	C5650SL1H682K	Q5.6	000-113-436		1B04R0016	ERD-50TJ3R3	0.5W 3.3	000-330-000	
1B04C0019	C5650SL1H682K	Q5.6	000-113-436		1B04R0017	ERD-50TJ3R3	0.5W 3.3	000-330-000	
1B04C0020	DM19C122K5	1200PF, 500V	000-222-448		1B04R0018	EVM-MCGA01B12	100	000-103-628	
1B04C0021	ECE-A1EU102E	1000UF, 25V	000-201-818		1B04R0019	ERD-16TJ271	0.16W 270	000-329-023	
1B04C0022	MD-2-2E-224K	0.22UF 250WV	000-262-187		1B04H0020	ERX-35J4R7P	00S0102-0	000-375-509	
1B04C0023	GR44-1H5R104M100	0.1UF 100V	000-254-000		1B04H0021	ERD-16TJ102	0.16W 1K	000-330-801	
1B04C0024	MD-2-2E-224K	0.22UF 250WV	000-262-187		1B04H0022	ERD-16TJ102	0.16W 1K	000-330-801	
1B04C0025	ECE-A1EU100E	10UF 25V	000-201-812		1B04H0023	ERD-16TJ102	0.16W 1K	000-330-801	
1B04C0026	ECE-A1EU100E	10UF 25V	000-201-812		1B04H0024	ERD-16TJ102	0.16W 1K	000-330-801	
1B04C0027	DD109E103P50V	0.01UF 50V	000-253-436		1B04H0025	ERD-16TJ222	0.16W 2.2K	000-330-809	
1B04C0028	DD109E103P50V	0.01UF 50V	000-253-436		1B04H0026	ERD-16TJ271	0.16W 270	000-329-023	
1B04C0029	DD109E103P50V	0.01UF 50V	000-253-436		1B04H0027	ERD-16TJ222	0.16W 2.2K	000-330-809	
1B04C0030	DD109E103P50V	0.01UF 50V	000-253-436		1B04H0028	ERD-16TJ222	0.16W 2.2K	000-330-809	
1B04C0031	DD109E103P50V	0.01UF 50V	000-253-436		1B04H0029	ERD-16TJ122	0.16W 1.2K	000-329-037	
1B04C0032	EXF-P4102Z4	1000PF 50V	000-106-078		1B04R0030	ERD-16TJ102	0.16W 1K	000-330-801	
1B04C0033	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0031	EVM-MCGA01B12	100	000-103-628	
1B04C0034	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0032	ERX-25JR22	2W 0.22	000-102-435	
1B04C0035	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0033	ERD-16TJ680	0.16W 68	000-329-009	
1B04C0036	ECQ-V1H104JZ	0.1UF 50V	000-261-524		1B04R0034	ERD-16TJ100	0.16W 10	000-330-839	
1B04C0037	GR415L102K50	1000PF 50V	000-253-990			THERMISTOR	サーミスタ		
1B04C0038	DM15C471K5	470PF, 500V	000-222-282		1B04RT0001	D-22A		000-180-617	
1B04C0039					1B04RT0002	D-33A		000-180-625	
1B04C0040	DM19C472K5	4700PF 500V	000-113-438		1B04RT0003	D-91A		000-180-650	
1B04C0041	C95AE2A224Z	0.22MF 100V	000-254-892			TRANSFORMER	トランス		
1B04C0042	C95AE2A224Z	0.22MF 100V	000-254-892		1B04T0001	5T018A	05S4018-1	000-750-772	
1B04C0043	MD-2-2E-104M	0.1UF 250WV	000-262-183		1B04T0002	5T523	05S0473-0	000-113-442	
1B04C0044	MD-2-2E-104M	0.1UF 250WV	000-262-183		1B04T0003	5T525	05S0475-0	000-113-443	
1B04C0045	DM10C331K1	330PF, 100V	000-222-120		1B04T0004	5T524	05S0474-0	000-113-444	
1B04C0046	DM10C331K1	330PF, 100V	000-222-120			INTEGRATED CIRCUIT	インテグレート		
	DIODE	ダイオード			1B04U0001	NJM2904D		000-113-434	
1B04CR0001	SV02Y5		000-106-176		1B04U0002	PC837		000-134-274	
	JACK	ジャック			1B04U0003	NJM7805A		000-113-448	
1B04J0001	IL-S-4P-S2T2-EF	19S0079-0	000-108-081						
1B04J0002	TMP-J01X-V6	05S0455	000-509-859						
1B04J0003	TMP-J01X-V6	05S0455	000-509-859						
	COIL	コイル							
1B04L0001	LAL03NA100K	10UH	000-428-144						
1B04L0002	LAL03NA100K	10UH	000-428-144						
1B04L0003	2C3R15X5-2		000-424-149						
1B04L0004	2C3R15X5-2		000-424-149						
1B04L0005	F β -225		000-428-900						
1B04L0006	F β -225		000-428-900						
1B04L0007	F β -801		000-428-950						
1B04L0008	F β -801		000-428-950						
1B04L0009	F β -801		000-428-950						
1B04L0010	F β -801		000-428-950						
	TRANSISTOR	トランジスタ							
1B04Q0001	2SC3133		000-126-340						
1B04Q0002	2SC3133		000-126-340						
1B04Q0003	2SC3240		000-113-440						
1B04Q0004	2SC3240		000-113-440						
1B04Q0005	2SD1271A-P		000-128-069						
1B04Q0006	2SA1315-Y		000-118-093						

NOTE:

備考:

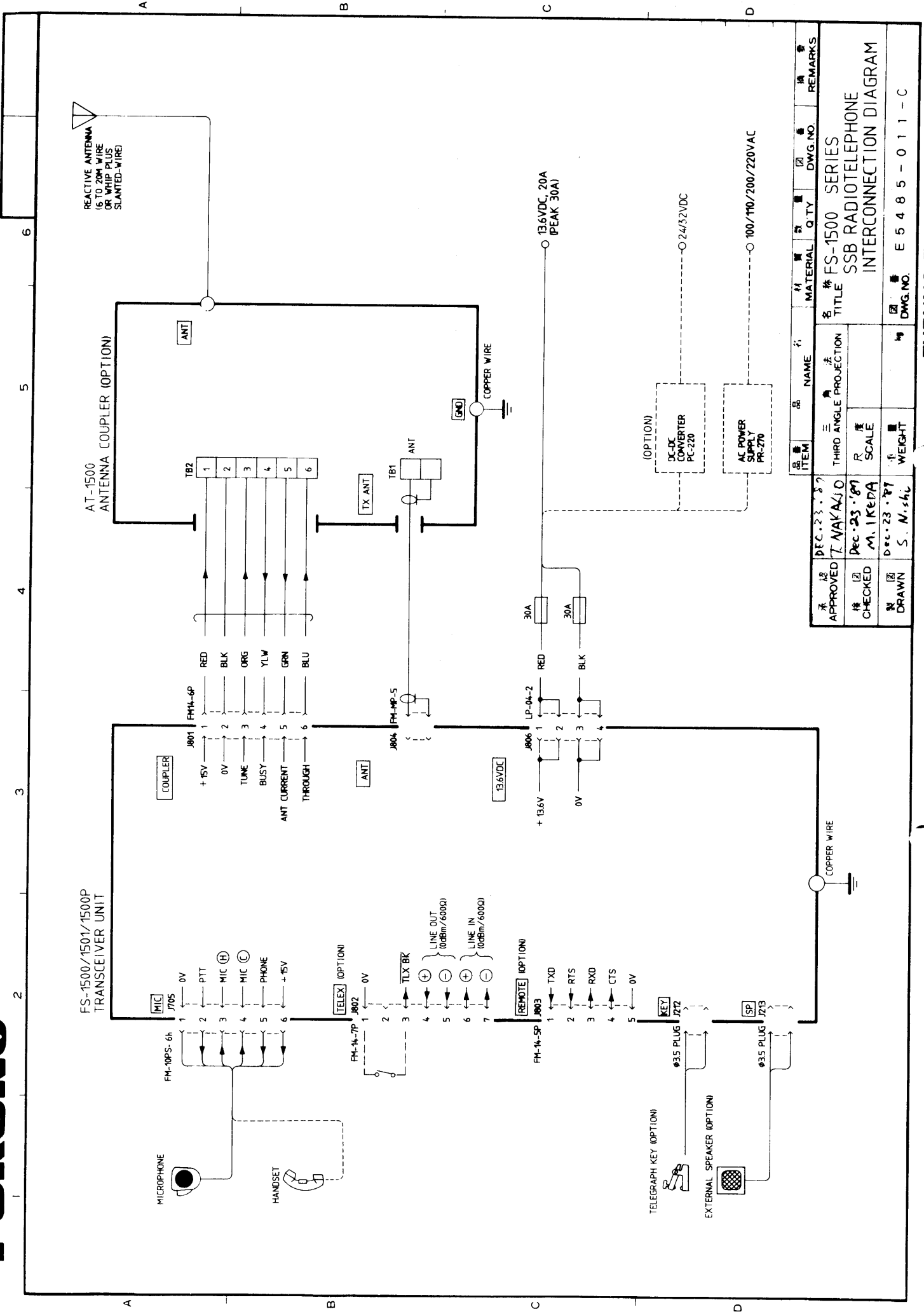
SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS	SYMBOL	TYPE	SPECIFICATIONS	CODE NO.	REMARKS
記号	型名	規格	コード番号	備考	記号	型名	規格	コード番号	備考
ANTENNA COUPLER UNIT					2B01C0040	DD109E103P50V	0.01UF 50V	000-253-436	
PARTS ON CHASSIS					2B01C0041	DD306F104Z25	00S0130-0	000-108-968	
MISCELLANEOUS ソツ					2B01C0042	ECC-F5R5U10E	1F 5.5V	000-113-484	
2B02 0000	SB-03		000-113-488	ANT. INSULATOR	2B01C0043	DSS310-750223550V	04S4163-0	000-103-745	
PRINTED CIRCUIT BOARD プリント基板					2B01C0044	DSS310-750223550V	04S4163-0	000-103-745	
2B02A0001	05P0278-COUP		005-592-370		2B01C0045	ECC-F1H470JC	47PF 50VDC	000-255-226	
					2B01C0046	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0047	DD104-102K50V	1000PF 50V	000-252-171	
					2B01C0048	DD104-102K50V	1000PF 50V	000-252-171	
					2B01C0049	DD104-102K50V	1000PF 50V	000-252-171	
					2B01C0050	ECE-A1HU3R3E	W5.0 3.3MF 50V	000-201-831	
					2B01C0051	ECC-V1H104JZ	0.1UF 50V	000-261-524	
					2B01C0052	ECC-A1FU100E	10UF 25V	000-201-812	
					2B01C0053	ECC-A1EU100E	10UF 25V	000-201-812	
					2B01C0054	DD306F104Z25	00S0130-0	000-108-968	
					2B01C0055	DD306F104Z25	00S0130-0	000-108-968	
					2B01C0056	DD306F104Z25	00S0130-0	000-108-968	
					2B01C0057	ECC-F1H330JC	33PF 50VDC	000-255-222	
					2B01C0058	ECC-F1H330JC	33PF 50VDC	000-255-222	
					2B01C0059	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0060	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0061	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0062	DSS310-750223550V	04S4163-0	000-103-745	
					2B01C0063	DSS310-750223550V	04S4163-0	000-103-745	
					2B01C0064	DSS310-750223550V	04S4163-0	000-103-745	
					2B01C0065	DSS310-750223550V	04S4163-0	000-103-745	
					2B01C0066	DSS310-750223550V	04S4163-0	000-103-745	
					2B01C0067	ECC-A1EU101E	W5.0 100MF 25V	000-206-105	
					2B01C0068	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0069	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0070	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0071	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0072	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0073	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0074	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0075	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0076	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0077	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0078	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0079	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0080	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0081	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0082	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0083	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0084	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0085	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0086	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0087	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0088	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0089	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0090	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0091	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0092	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0093	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0094	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0095	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0096	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0097	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0098	EXF-P4103ZV	0.01UF 50V	000-287-502	
					2B01C0099	DD109E103P50V	0.01UF 50V	000-253-436	
					2B01C0100	DD306F104Z25	00S0130-0	000-108-968	
					2B01C0101	DD306F104Z25	00S0130-0	000-108-968	
					2B01C0102	ECC-A1EU100E	10UF 25V	000-201-812	
					2B01C0103	ECC-F1H100JC	10PF 50V	000-255-210	
					CIRCUIT BREAKER		サーキットブレーカー		
2B01	05P0278	COUP	005-922-750		2B01CB0001	T9C5101-01-0411	125V 1A	000-106-265	
DWG. No.	E5485-020-B				CHOKE COIL		チョークコイル		
CAPACITOR コンデンサ					2B01CH0001	5T031	05S4031-0	000-732-581	
2B01C0001	DM19C122K5	1200PF, 500V	000-222-448		2B01CH0002	5T031	05S4031-0	000-732-581	
2B01C0002	DM19C122K5	1200PF, 500V	000-222-448		2B01CH0003	5T383	05S4383-0	000-107-636	
2B01C0003	DM19C122K5	1200PF, 500V	000-222-448		DIODE ダイオード				
2B01C0004	DM19C122K5	1200PF, 500V	000-222-448		2B01CR0001	1SS82		000-114-021	
2B01C0005	DM19C122K5	1200PF, 500V	000-222-448		2B01CR0002	1SS82		000-114-021	
2B01C0006	DE1207SL151J3KV	150PF 3KV	000-106-212		2B01CR0003	1SS82		000-114-021	
2B01C0007	DE1207SL151J3KV	150PF 3KV	000-106-212		2B01CR0004	1SS82		000-114-021	
2B01C0008	DE1207SL151J3KV	150PF 3KV	000-106-212		2B01CR0005	1SS82		000-114-021	
2B01C0009	DE1207SL151J3KV	150PF 3KV	000-106-212		2B01CR0006	1SS133		000-103-097	
2B01C0010	DE1207SL151J3KV	150PF 3KV	000-106-212		2B01CR0007	1SS133		000-103-097	
2B01C0011	DE0907SL820J3KV	82PF 3KV	000-106-211		2B01CR0008	1SS133		000-103-097	
2B01C0012	DE0907SL820J3KV	82PF 3KV	000-106-211		2B01CR0009	1SS133		000-103-097	
2B01C0013	DE0607SL680J3KV	68PF 3KV	000-113-482		2B01CR0010	3H261		000-129-920	
2B01C0014	DE0607SL680J3KV	68PF 3KV	000-113-482		2B01CR0011	1SS82		000-114-021	
2B01C0015	DE0607SL680J3KV	68PF 3KV	000-113-482		2B01CR0012	1SS82		000-114-021	
2B01C0016	DE1510SL151J6KV	150PF 6KV	000-113-483		2B01CR0013	1SS82		000-114-021	
2B01C0017	DE1510SL151J6KV	150PF 6KV	000-113-483		2B01CR0014	1SS82		000-114-021	
2B01C0018	DE1510SL151J6KV	150PF 6KV	000-113-483		2B01CR0015	1SS82		000-114-021	
2B01C0019	DD109E103P50V	0.01UF 50V	000-253-436		2B01CR0016	1SS82		000-114-021	
2B01C0020	ECC-V1H104JZ	0.1UF 50V	000-261-524		2B01CR0017	1SS82		000-114-021	
2B01C0021	DD109E103P50V	0.01UF 50V	000-253-436		2B01CR0018	1SS82		000-114-021	
2B01C0022	DD109E103P50V	0.01UF 50V	000-253-436		2B01CR0019	1SS82		000-114-021	
2B01C0023	ECC-F1H150JC	15PF 50V	000-256-902		NOTE:				
2B01C0024	RPE132CH331J50	330PF 50V	000-105-389		備考:				
2B01C0025	ECC-F1H150JC	15PF 50V	000-256-902						
2B01C0026	RPE132CH331J50	330PF 50V	000-105-389						
2B01C0027	DD109E103P50V	0.01UF 50V	000-253-436						
2B01C0028	ECC-F1H120JC	12PF 50VDC	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	04S4163-0	000-103-745						
2B01C0037	DD109E103P50V	0.01UF 50V	000-253-436						
2B01C0038	ECC-A1FU100E	10UF 25V	000-201-812						
2B01C0039	DD109E103P50V	0.01UF 50V	000-253-436						

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	
2B01CR0020	1SS82		000-114-021		2B01R0010	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0021	1SS82		000-114-021		2B01R0011	ERD-25PJ101	0.25W 100	000-330-333		
2B01CR0022	1SS82		000-114-021		2B01R0012	ERD-25PJ101	0.25W 100	000-330-333		
2B01CR0023	1SS82		000-114-021		2B01R0013	ERD-25PJ101	0.25W 100	000-330-333		
2B01CR0024	1SS82		000-114-021		2B01R0014	ERD-25PJ101	0.25W 100	000-330-333		
2B01CR0025	1SS82		000-114-021		2B01R0015	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0026	1SS82		000-114-021		2B01R0016	ERD-16TJ471	0.16W 470	000-329-029		
2B01CR0027	1SS82		000-114-021		2B01R0017	ERG-1SJI01P	100-1W	000-375-397		
2B01CR0028	1SS82		000-114-021		2B01R0018	ERG-1SJI50P	1W 15 (00S0102)	000-375-391		
2B01CR0029	1SS82		000-114-021		2B01R0019	ERG-1SJI50P	1W 15 (00S0102)	000-375-391		
2B01CR0030	1SS82		000-114-021		2B01R0020	ERD-16TJ152	0.16W 1.5K	000-329-039		
2B01CR0031	1SS82		000-114-021		2B01R0021	ERD-16TJ152	0.16W 1.5K	000-329-039		
2B01CR0032	1SS82		000-114-021		2B01R0022	ERD-16TJ392	0.16W 3.9K	000-329-047		
2B01CR0033	LN28 RPH		000-108-071		2B01R0023	ERD-16TJ392	0.16W 3.9K	000-329-047		
2B01CR0034	LN28 RPH		000-108-071		2B01R0024	EVM-MCGA01B53	5K (00S0119)	000-103-631		
2B01CR0035	LN28 RPH		000-108-071		2B01R0025	ERG-3SJI51P	00S0102-0	000-375-529		
2B01CR0036	LN28 RPH		000-108-071		2B01R0026	ERG-3SJI51P	00S0102-0	000-375-529		
2B01CR0037	LN28 RPH		000-108-071		2B01R0027	ERG-3SJI51P	00S0102-0	000-375-529		
2B01CR0038	LN28 RPH		000-108-071		2B01R0028	ERD-16TJ273	0.16W 27K	000-330-811		
2B01CR0039	LN28 RPH		000-108-071		2B01R0029	ERD-16TJ273	0.16W 27K	000-330-811		
2B01CR0040	LN28 RPH		000-108-071		2B01R0030	ERG-2SJI01P	2W 100	000-375-462		
2B01CR0041	LN28 RPH		000-108-071		2B01R0031	ERD-16TJ222	0.16W 2.2K	000-330-809		
2B01CR0042	LN28 RPH		000-108-071		2B01R0032	ERD-16TJ102	0.16W 1K	000-330-801		
2B01CR0043	LN28 RPH		000-108-071		2B01R0033	ERD-16TJ102	0.16W 1K	000-330-801		
2B01CR0044	LN28 RPH		000-108-071		2B01R0034	ERD-16TJ223	0.16W 22K	000-330-810		
2B01CR0045	LN28 RPH		000-108-071		2B01R0035	ERD-16TJ223	0.16W 22K	000-330-810		
2B01CR0046	LN28 RPH		000-108-071		2B01R0036	ERD-16TJ101	0.16W 100	000-329-013		
2B01CR0047	LN28 RPH		000-108-071		2B01R0037	ERD-16TJ102	0.16W 1K	000-330-801		
2B01CR0048	LN28 RPH		000-108-071		2B01R0038	ERD-16TJ470	0.16W 47	000-329-005		
2B01CR0049	LN28 RPH		000-108-071		2B01R0039	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0050	LN23 RPH		000-108-071		2B01R0040	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0051	LN28 RPH		000-108-071		2B01R0041	ERD-16TJ101	0.16W 100	000-329-013		
2B01CR0052	LN28 RPH		000-108-071		2B01R0042	ERD-16TJ104	0.16W 100K	000-330-803		
2B01CR0053	LN28 RPH		000-108-071		2B01R0043	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0054	LN28 RPH		000-108-071		2B01R0044	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0055	NAL8AS-1		000-106-231		2B01R0045	ERD-16TJ103	0.16W 10K	000-330-802		
2B01CR0056	NAL8AS-1		000-106-231		2B01R0046	ERD-16TJ471	0.16W 470	000-329-029		
2B01CR0057	NAL8AS-1		000-106-231		2B01R0047	ERD-16TJ472	0.16W 4.7K	000-330-812		
2B01CR0058	1S5133		000-103-097		2B01R0048	ERD-16TJ472	0.16W 4.7K	000-330-812		
2B01CR0059	1S5133		000-103-097		2B01R0049	EXB-F5E103J	10KX4	000-379-082		
	RELAY	リレー			2B01R0050	EXB-F5E103J	10KX4	000-379-082		
2B01K0001	G6B-2114P-DC12V		000-113-428		2B01R0051	ERD-16TJ102	0.16W 1K	000-330-801		
2B01K0002	G6B-2114P-DC12V		000-113-428		2B01R0052	ERD-16TJ101	0.16W 100	000-329-013		
2B01K0003	G6B-1114P-12V		000-103-544		2B01R0053	ERD-16TJ472	0.16W 4.7K	000-330-812		
2B01K0004	G6B-1114P-12V		000-103-544		2B01R0054	ERD-16TJ472	0.16W 4.7K	000-330-812		
2B01K0005	G6B-1114P-12V		000-103-544		2B01R0055	ERD-16TJ273	0.16W 27K	000-330-811		
2B01K0006	G6B-1114P-12V		000-103-544		2B01R0056	EXB-F9E103J	10KX8	000-378-901		
2B01K0007	G6B-1114P-12V		000-103-544		2B01R0057	ERD-16TJ101	0.16W 100	000-329-013		
2B01K0008	G6B-1114P-12V		000-103-544		2B01R0058	ERD-16TJ102	0.16W 1K	000-330-801		
2B01K0009	G6B-1114P-12V		000-103-544		2B01R0059	ERD-16TJ101	0.16W 100	000-329-013		
2B01K0010	G6B-1114P-12V		000-103-544		2B01R0060	ERG-2SJI00P	2W 10	000-375-449		
2B01K0011	G4W-2212PUSTV5-DC12V		000-113-485		2B01R0061	ERD-16TJ103	0.16W 10K	000-330-802		
2B01K0012	G4W-2212PUSTV5-DC12V		000-113-485		2B01R0062	ERD-16TJ103	0.16W 10K	000-330-802		
2B01K0013	G6B-1114P-12V		000-103-544		2B01R0063	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0014	G6B-1114P-12V		000-103-544		2B01R0064	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0015	G6B-1114P-12V		000-103-544		2B01R0065	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0016	G6B-1114P-12V		000-103-544		2B01R0066	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0017	G6B-1114P-12V		000-103-544		2B01R0067	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0018	G6B-1114P-12V		000-103-544		2B01R0068	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0019	G6B-1114P-12V		000-103-544		2B01R0069	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0020	G6B-1114P-12V		000-103-544		2B01R0070	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0021	G6B-1114P-12V		000-103-544		2B01R0071	ERD-25PJ220	0.25W 22	000-330-317		
2B01K0022	G4W-2212PUSTV5-DC12V		000-113-485		2B01R0072	ERD-16TJ220	0.16W 22	000-330-847		
	COIL	コイル			2B01R0073	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0001	5T331	05S4331-1	000-106-218		2B01R0074	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0002	5T332	05S4332-1	000-106-219		2B01R0075	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0003	5T333	05S4333-1	000-106-220		2B01R0076	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0004	5T334	05S4334-1	000-106-221		2B01R0077	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0005	5T335	05S4335-0	000-106-222		2B01R0078	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0006	5T585	05S0511-0	000-114-126		2B01R0079	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0007	5T546	05S0512-0	000-114-127		2B01R0080	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0008	5T547	05S0513-0	000-114-128		2B01R0081	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0009	5T588	05S0514-0	000-114-129		2B01R0082	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0010	5T593	05S0516-0	000-114-131		2B01R0083	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0011	LAL034A101K	100UH	000-428-133		2B01R0084	ERD-16TJ472	0.16W 4.7K	000-330-812		
2B01L0012	LAL034A101K	100UH	000-428-133		2B01R0085	ERD-16TJ220	0.16W 22	000-330-847		
2B01L0013	LAL034A101K	100UH	000-428-133		2B01R0086	ERD-16TJ472	0.16W 4.7K	000-330-812		
	TRANSISTOR	トランジスタ			2B01R0087	ERD-16TJ102	0.16W 1K	000-330-801		
2B01W0001	25C2478		000-126-200		2B01R0088	ERD-16TJ102	0.16W 1K	000-330-801		
2B01W0002	25A1315-Y		000-118-083		2B01R0089	ERD-16TJ103	0.16W 10K	000-330-802		
2B01W0003	25C1815-Y		000-125-631		2B01R0090	ERD-16TJ103	0.16W 10K	000-330-802		
	RESISTOR	抵抗			2B01R0091	ERD-16TJ562	0.16W 5.6K	000-329-050		
2B01R0001	ERG-3SJI321P	00S0102-0	000-375-538		2B01R0092	ERD-16TJ103	0.16W 10K	000-330-802		
2B01R0002	ERG-3SJI321P	00S0102-0	000-375-538							
2B01R0003	ERG-3SJI192P	00S0102-0	000-375-539							
2B01R0004	ERG-3SJI560P	00S0102-0	000-375-524							
2B01R0005	ERG-3SJI560P	00S0102-0	000-375-524							
2B01R0006	ERG-3SJI560P	00S0102-0	000-375-524							
2B01R0007	ERG-3SJI321P	00S0102-0	000-375-538							
2B01R0008	ERG-3SJI321P	00S0102-0	000-375-538							
2B01R0009	ERG-3SJI102P	00S0102-0	000-375-539							
	TERMINAL BOARD	端子板								
2B01TH0001	P-77		000-108-797		2B01S0001	62T-14		000-106-104		
2B01TH0002	236-106M(1-5)		000-104-840		2B01S0002	51D-0401		000-106-105		
2B01TH0003	P-97		000-108-797		2B01S0003	M-7012R		000-474-344		
2B01TH0004	P-97		000-108-797		2B01S0004	51D-0801		000-106-194		
					2B01S0005	51D-0501		000-106-194		
					2B01S0006	51D-0401		000-106-105		

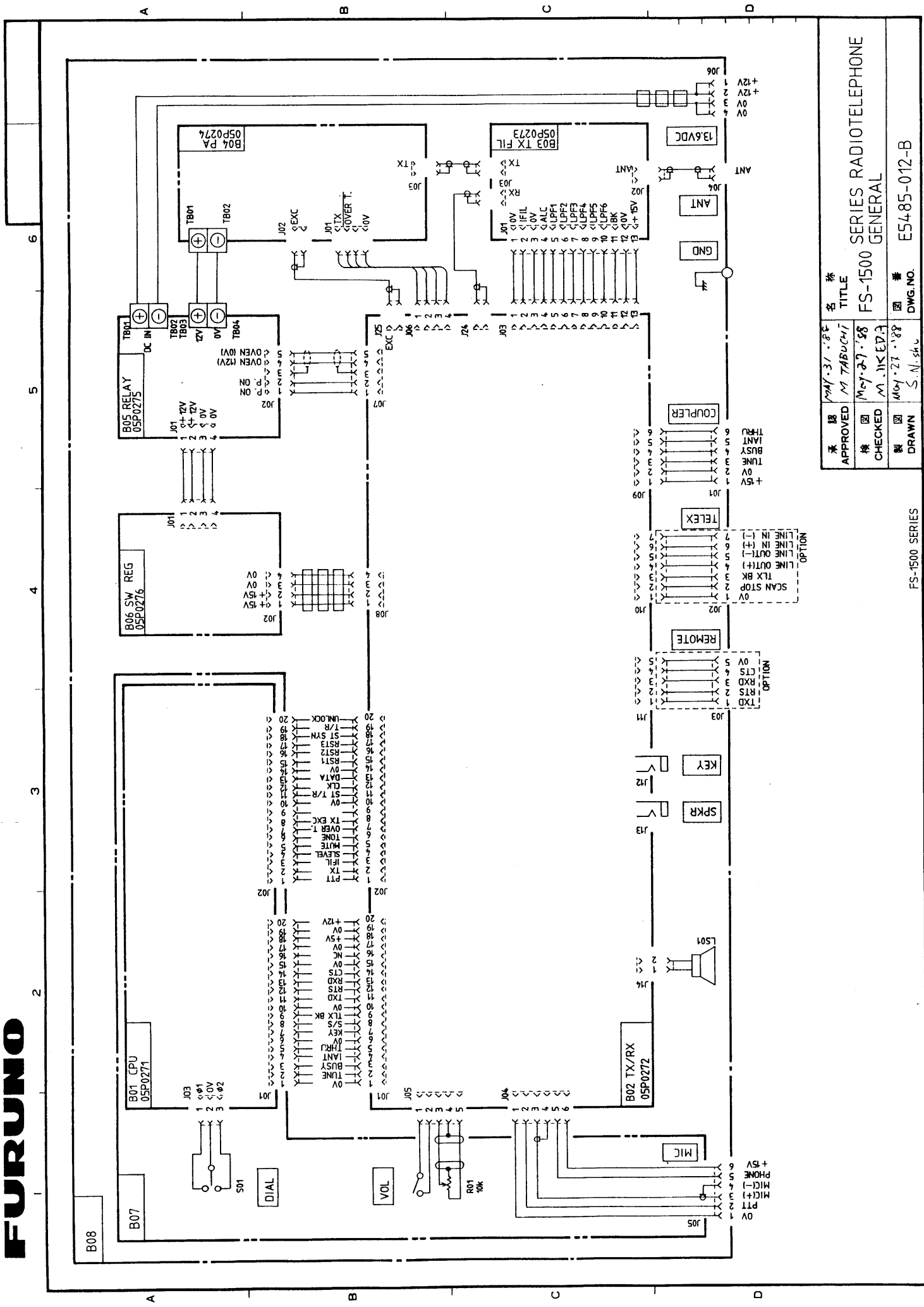
NOTE:
備考:

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
	INTEGRATED CIRCUIT	シロキキカド							
2B01U0001	TC74HC390P		000-100-838						
2B01U0002	エーPD7001C		000-112-375						
2B01U0003	TC74HC14P		000-163-421						
2B01U0004	M51953BL		000-108-052						
2B01U0005	NJM7805A		000-113-448						
2B01U0006	NJM2403D		000-113-480						
2B01U0007	NJM2904D		000-113-434						
2B01U0008	HD63B01Y0E76P	05S0522-0	000-114-315						
2B01U0009	M54563P		000-106-228						
2B01U0010	M54563P		000-106-228						
2B01U0011	M54563P		000-106-228						
2B01U0012	EXB-RB8-472J		000-379-055						
2B01U0013	EXB-RB8-472J		000-379-055						
2B01U0014	EXB-RB7-472J		000-112-256						
	POTENTIOMETER	ポテンシヨメーター							
2B01VR0001	05AZ2.7Z		000-104-424						
2B01VR0002	05AZ3.3Z		000-111-882						
	CRYSTAL	クリスタル							
2B01Y0001	05S0480-0	4MHZ 05S0480-0	000-113-486						

NOTE:
備考:

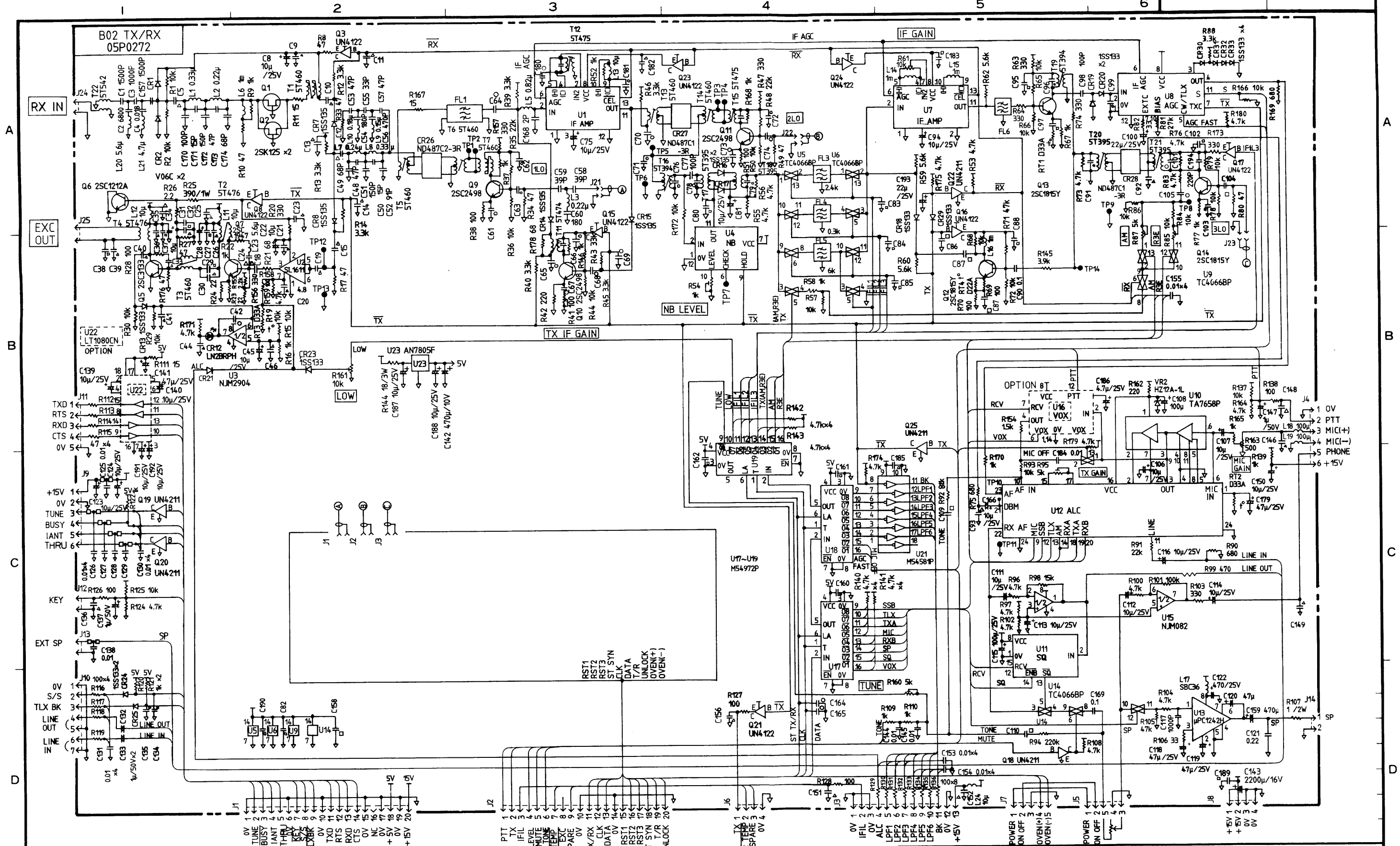


承認 APPROVED	検査 CHECKED	製図 DRAWN	承認 DATE	検査 DATE	製図 DATE	品名 ITEM NAME	材質 MATERIAL	数量 QTY	国番 DWG. NO.	備考 REMARKS
T. NAKAJO	M. IKEDA	S. N. SUGI	DEC. 23. '87	DEC. 23. '87	DEC. 23. '87	FS-1500 SERIES SSB RADIOTELEPHONE INTERCONNECTION DIAGRAM				
THIRD ANGLE PROJECTION							SCALE		WEIGHT	
E 5 4 8 5 - 0 1 1 - C										



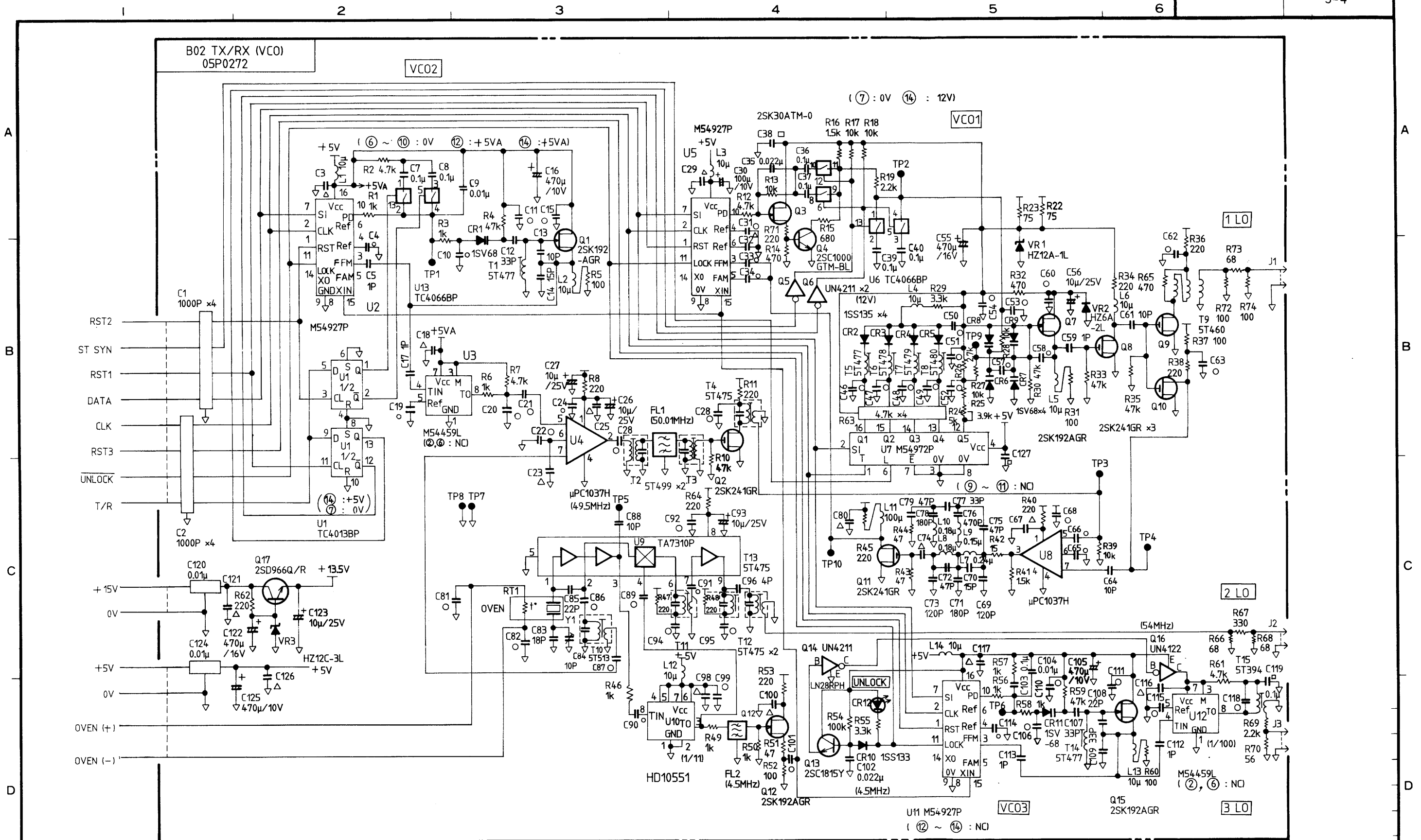
承認 APPROVED	MAF-31.85 M TABUCHI	名称 TITLE	FS-1500 GENERAL
検閲 CHECKED	May-27-88 M. IKEDA	製図 DRAWN	S. NISHI
製図 DRAWN	May-27-88 S. NISHI	図番 DWG. NO.	E5485-012-B

FS-1500 SERIES



NOTE (1) RESISTORS ARE IN Ω (1/6W), CAPACITORS ARE IN F.
 INDUCTORS ARE IN H, UNLESS OTHERWISE NOTED.
 (2) MARKS ○ ARE 1000PF/50WV CAPACITORS,
 △ ARE 0.01μF/50WV CAPACITORS AND
 □ ARE 0.1μF/25WV CAPACITORS.

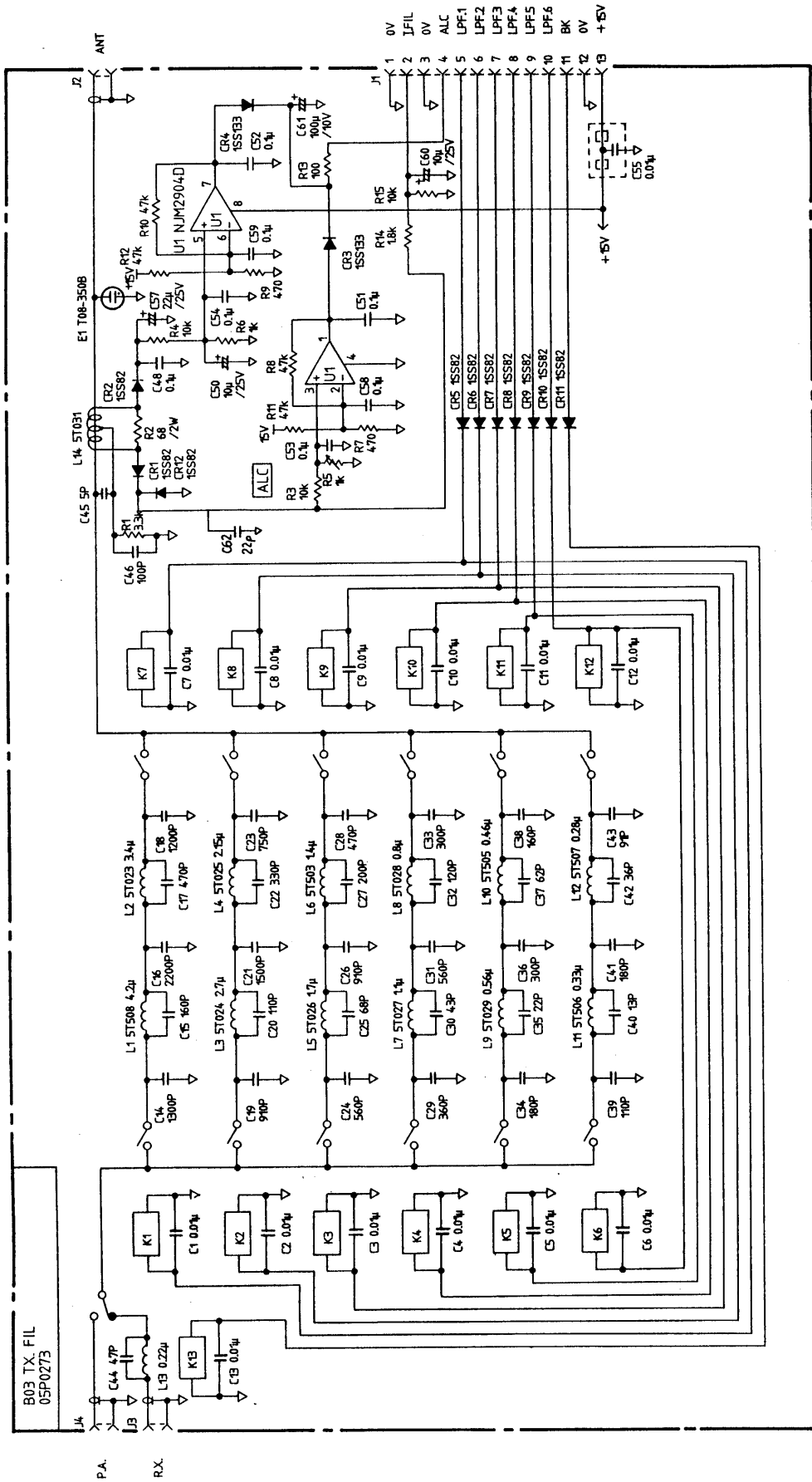
承認 APPROVED	MAY 31 '88 M. TABUCHI	名称 TITLE	B02 05P0272 TX/RX
検図 CHECKED	MAY 27 '88 M. IKEDA	製図 DRAWN	S. NISHI
FS-1500 SERIES		図番 DWG. NO.	E5485-014-C



NOTE : (1) RESISTORS ARE IN Ω(1/6W), CAPACITORS ARE IN F.
INDUCTORS ARE IN H, UNLESS OTHERWISE NOTED.
(2) MARKS ○ ARE 1000PF/50WV CAPACITORS.
△ ARE 0.01μF/50WV CAPACITORS AND
□ ARE 0.1μF/25WV CAPACITORS.

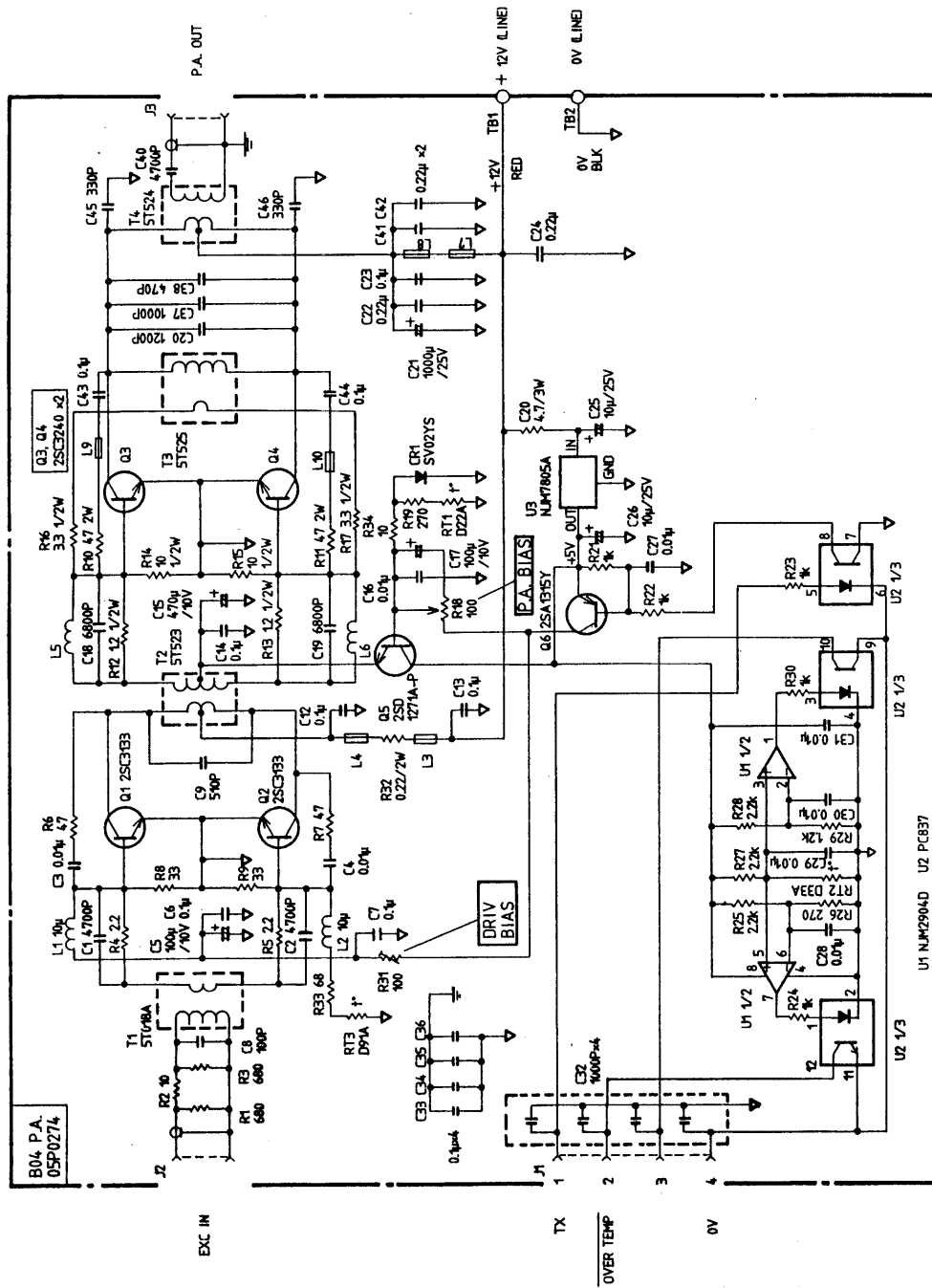
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検 CHECKED	May. 27. '88 M. IKEDA	製 DRAWN	製 DWG. NO. E5485-015-C
製 DRAWN	May. 27. '88 S. NISHII		

FS-1500 SERIES



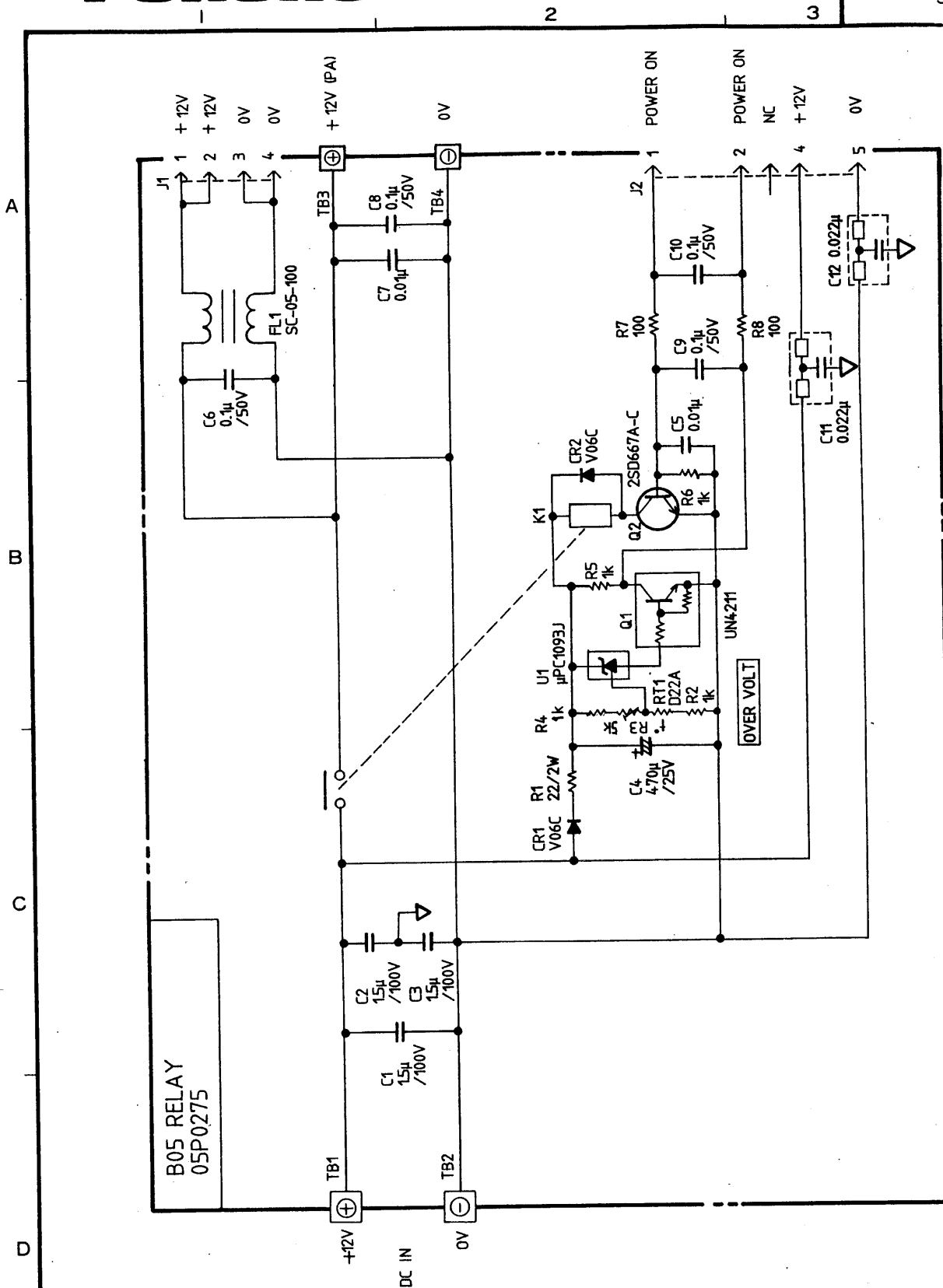
承認	May 31 '88	名称	
APPROVED	M. TABUCHI	TITLE	
検図	May 29 '88	図番	B03
CHECKED	M. IKEDA	DWG. NO.	05P0273 TX.FIL
製図	May 27 '88	圖番	
DRAWN	S. N. S. L. V.	DWG. NO.	E5485-016-C

FS-1500 SERIES



承認	MAY 31 '88	名称	B04 05P0274 P.A.
APPROVED	M. TABUCHI	TITLE	
検閲	MAY 27 '88	製図	S. N. S. L.
CHECKED	M. IKEGA	DWG. NO.	E5485-017-C
製図	MAY 27 '88		
DRAWN	S. N. S. L.		

FS-1500 SERIES



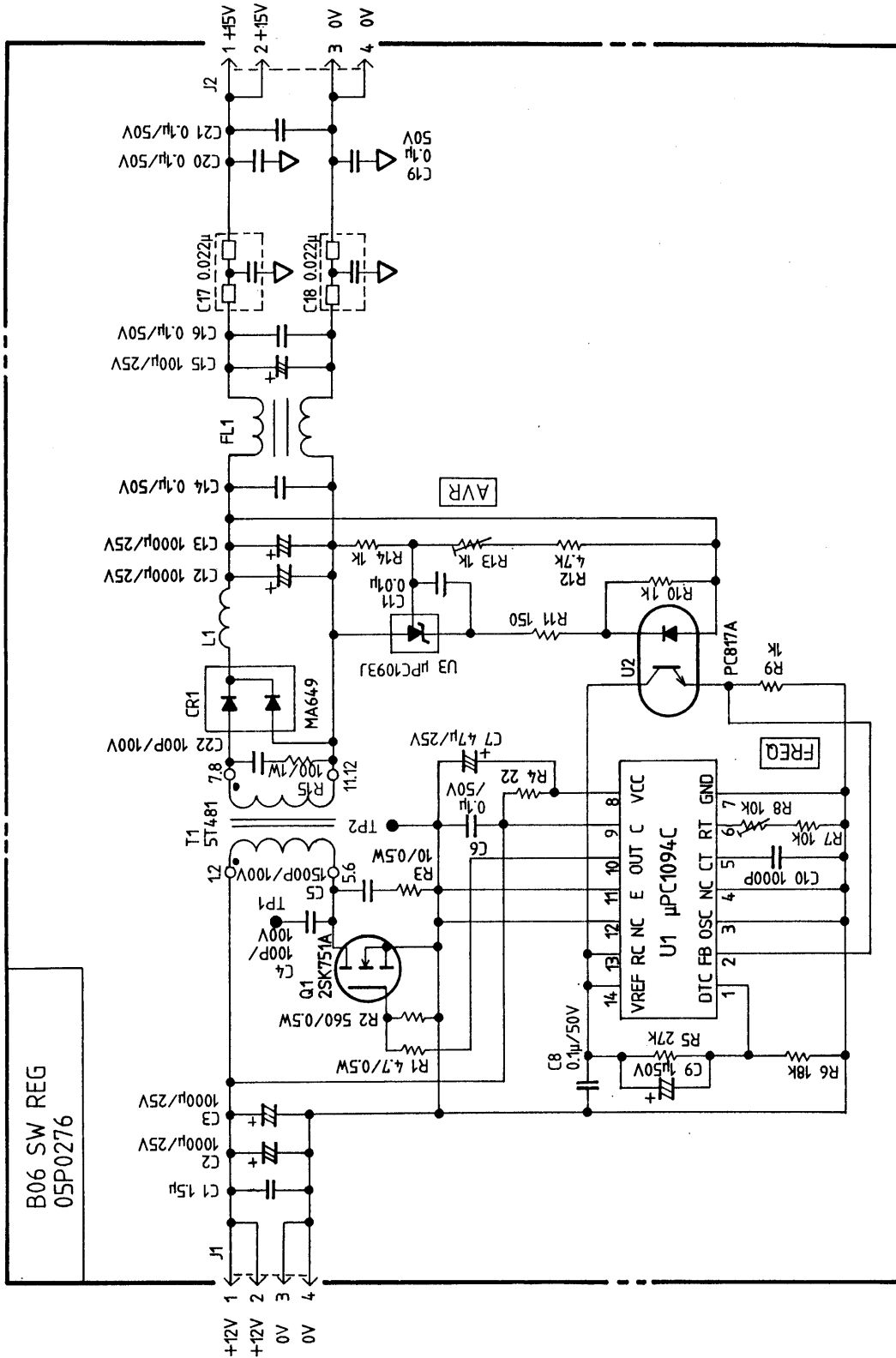
FS-1500 SERIES		品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
承認 APPROVED	MAY.31.88 M. TABUCHI		三角法 THIRD ANGLE PROJECTION	名称 TITLE			
検図 CHECKED	MAY.27.88 M. IKEDA		尺度 SCALE	B05 05P0275 RELAY			
製図 DRAWN	MAY.27.88 S. WISHI		重量 WEIGHT	kg	図番 DWG.NO. E5485-018-C		

A

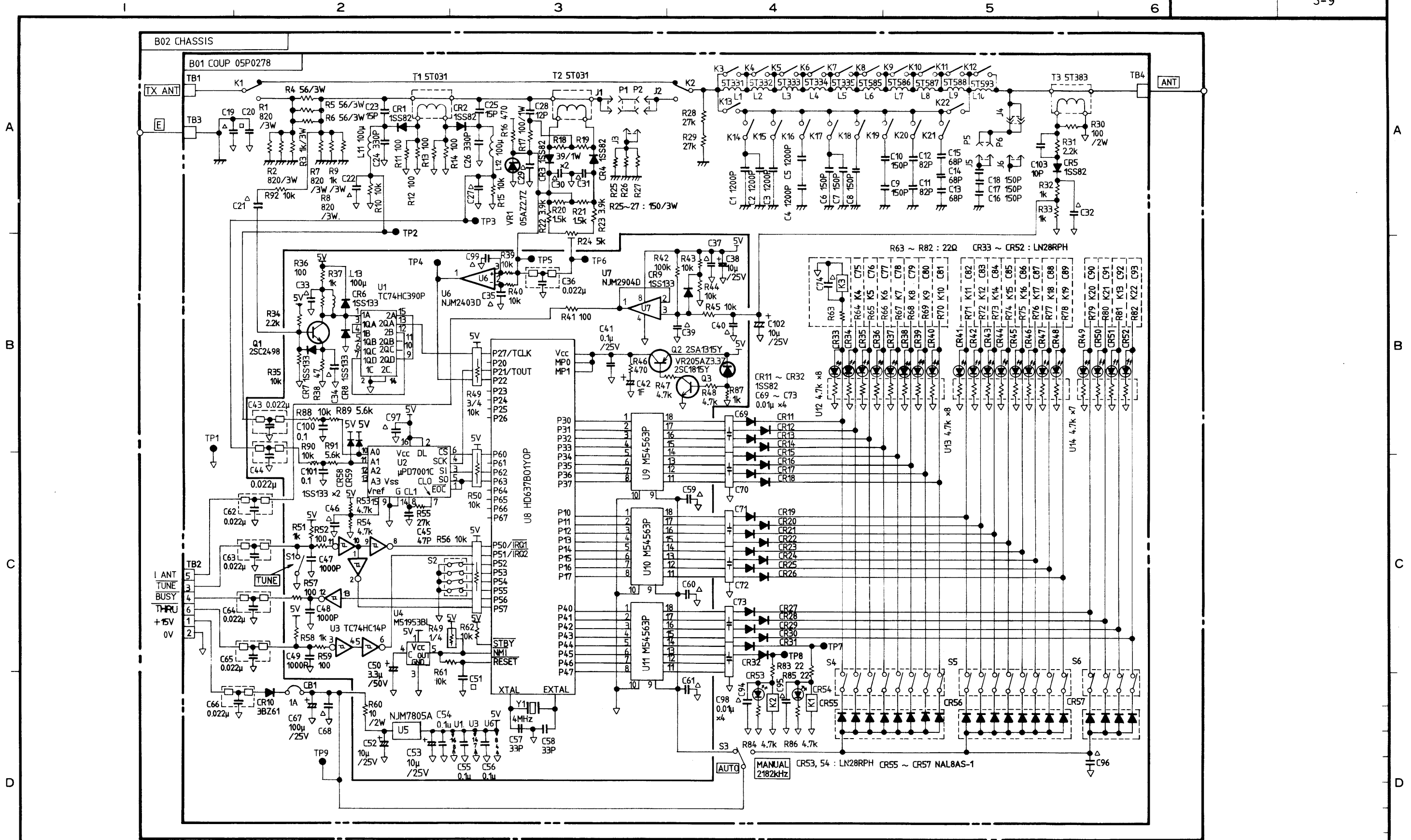
B

C

D



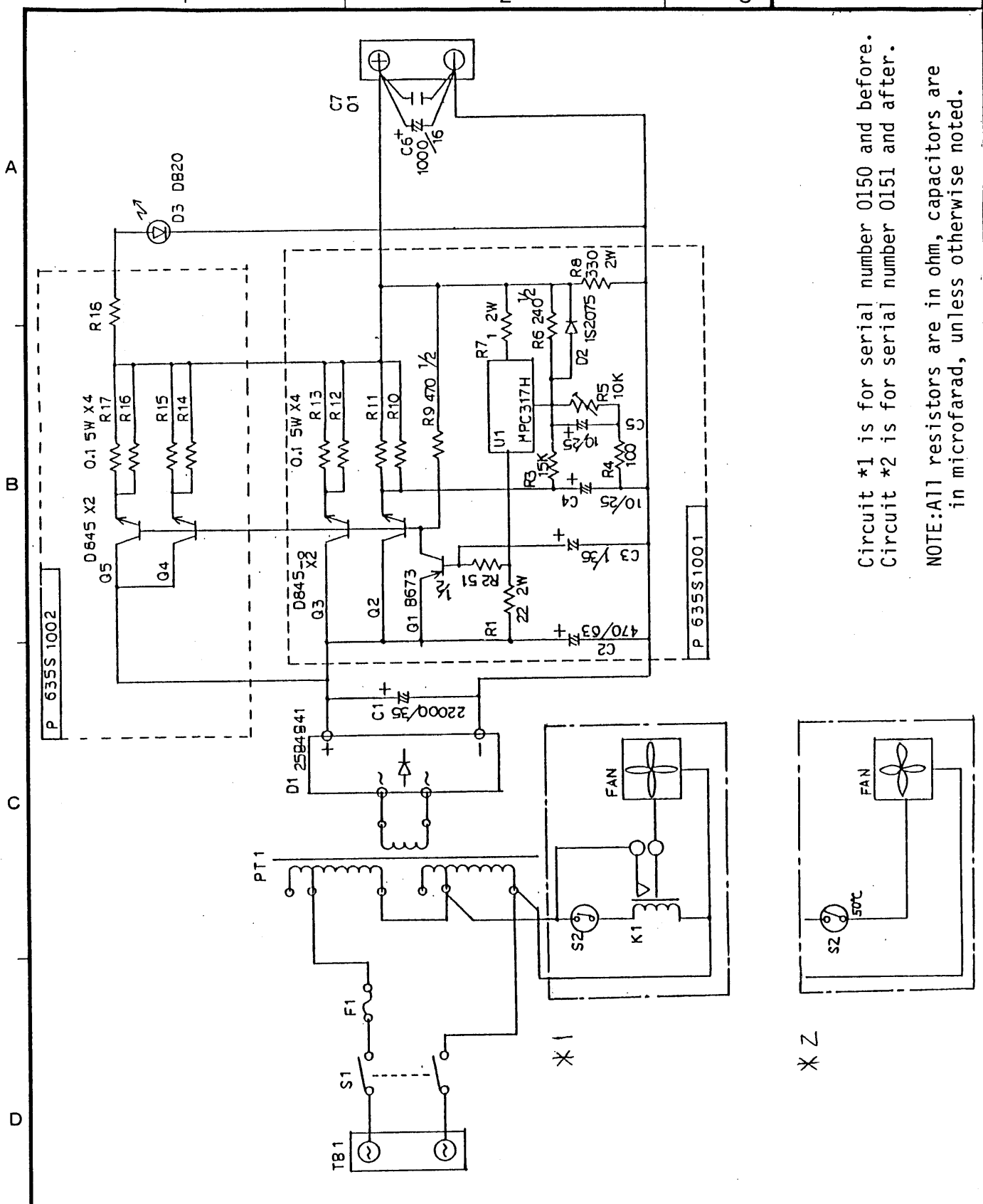
FS-1500 SERIES		品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
承認 APPROVED	MAY.31.88 M.TABUCHI		三角法 THIRD ANGLE PROJECTION	名称 TITLE			
検 CHECKED	May.27.88 M. IKEDA		尺 SCALE			B06 05P0276 SW. REG	
製 DRAWN	May.27.88 S.Nishi		重 WEIGHT	kg		図番 DWG.NO. E5485-019-B	



NOTE : (1) RESISTORS ARE IN Ω (1/6W), CAPACITORS ARE IN F, INDUCTORS ARE IN H, UNLESS OTHERWISE NOTED.
 (2) MARKS ○ ARE 1000PF/50WV CAPACITORS
 △ ARE 0.01μF/50WV CAPACITORS AND
 □ ARE 0.1μF/25WV CAPACITORS.

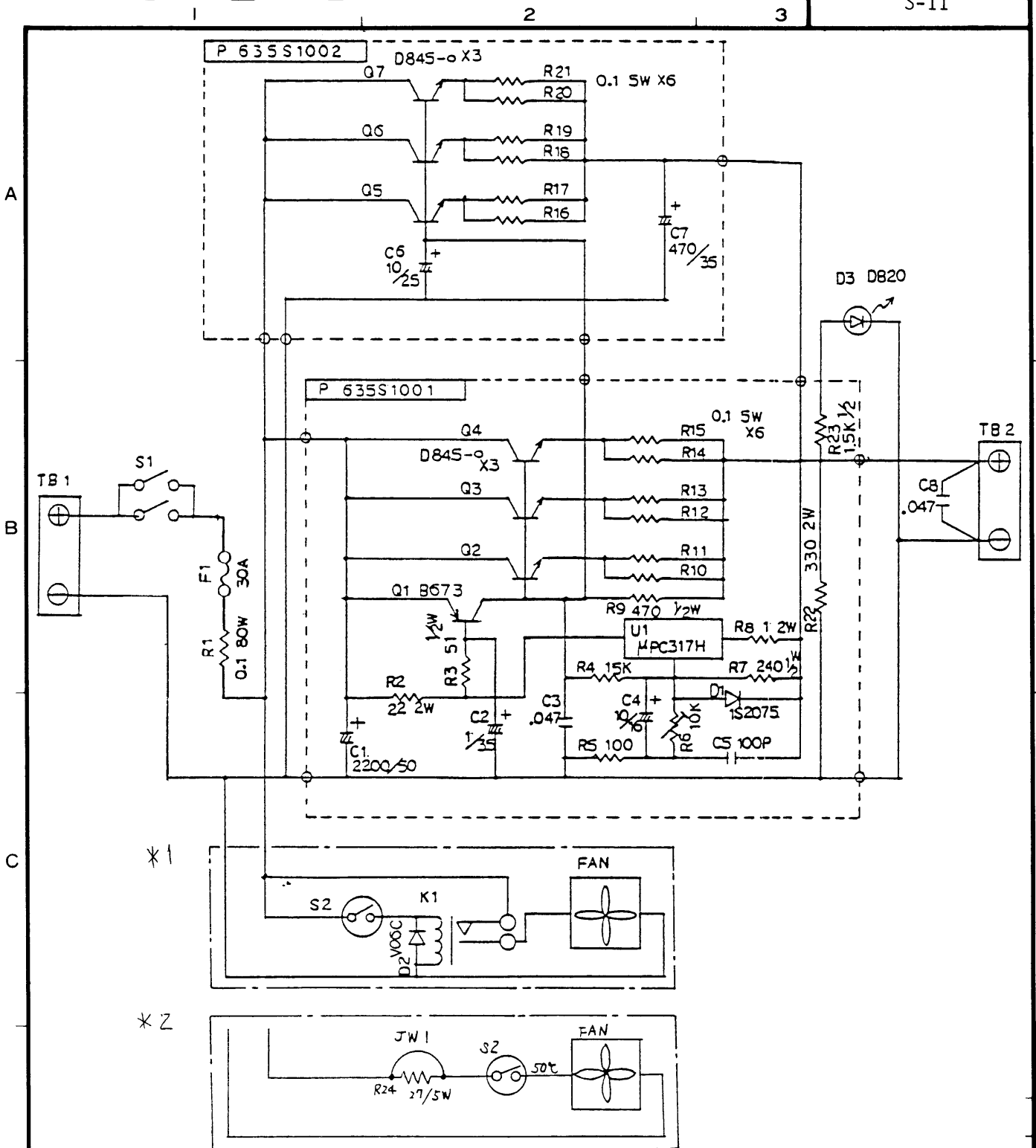
承認 APPROVED	MAY. 31. '88 M. TABUCHI	名称 TITLE
検図 CHECKED	MAY. 27. '88 M. IKEDA	AT-1500 ANTENNA COUPLER
製図 DRAWN	MAY. 28. '88 S. YAMAGUCHI	図番 DWG. NO. E5485-020-C

FS-1500 SERIES



Circuit #1 is for serial number 0150 and before.
 Circuit #2 is for serial number 0151 and after.
 NOTE: All resistors are in ohm, capacitors are in microfarad, unless otherwise noted.

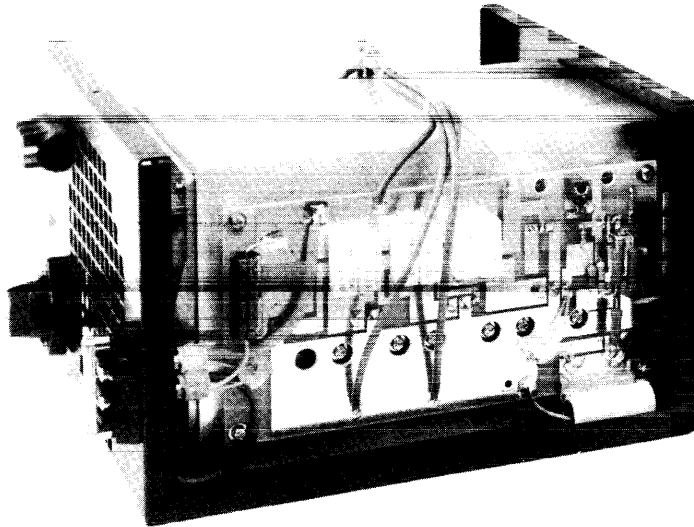
品番 ITEM	品名 NAME	材質 MATERIAL	數量 Q'TY	圖番 DWG.NO.	摘要 REMARKS
承認 APPROVED	DEC. 14. '88 T. NAKAUD	三角法 THIRD ANGLE PROJECTION	名稱 TITLE	AC 電源 POWER SUPPLY	
檢圖 CHECKED	Dec. 14. '88 M. IKEDA	尺 度 SCALE	PR-270		
製 圖 DRAWN	Dec. 14. '88 S. Nishi	重 量 WEIGHT	kg	圖 番 DWG.NO.	C5485-032-A



Circuit *1 is for serial number 0150 and before.
 Circuit *2 is for serial number 0151 and after.

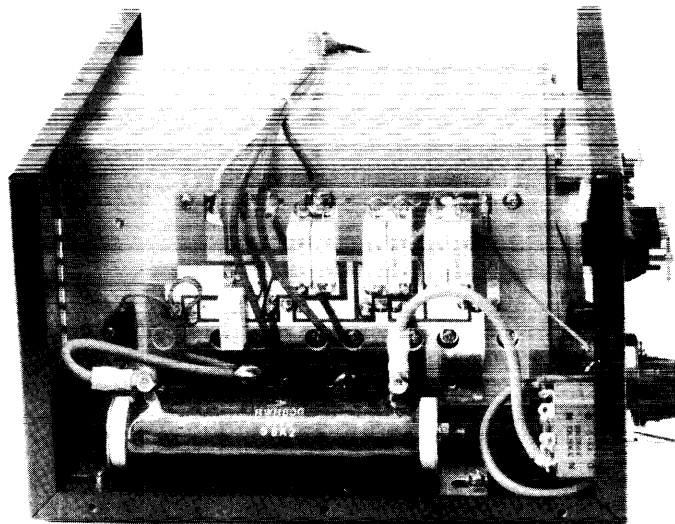
NOTE: All resistors are in ohm, capacitors are in microfarad, unless otherwise noted.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
承認 APPROVED	DEC. 14. '88 T. KAKI	三角法 THIRD ANGLE PROJECTION	名称 TITLE	DC-DC コンバータ DC-DC CONVERTER	
検図 CHECKED	DEC. 14. '88 M. IICEDA	尺度 SCALE	PC-220		
製図 DRAWN	DEC. 14. '88 S. NISHI	重量 WEIGHT	kg	図番 DWG.NO.	C5485-030-A



Left Side View

T Photo No.1026



Right Side View

T Photo No.1027

DC-DC CONVERTER PC-220

APPENDIX A Connection of TELEX Terminal

§1 GENERAL

When automatic telex communication is required, it is recommended to use the Thrane-Thrane Model 1600 system, comprising Radiotelex Modem TT-1585, Keyboard-processor TT-1601A and Video Monitor TT-1602A. The scanning function of the Radiotelex Modem enables fully-automatic telex communication.

Description

The TT-1600 System is an integrated Radiotelex Package including the Model TT-1585 Radiotelex Modem with 256 k character text editing facility, a detached keyboard and video display unit with full soft-key operation of system commands, a hard-copy printer for multicopying of received and transmitted messages, and all necessary interface cables between the TT-1600 System parts and the radio equipment.

The intelligence provided by the TT-1600 System enables fully automatic control of the complete radio station: start the transmitter, tune it, establish the connection and transmit and/or receive messages. It can even scan the receiver, search for incoming calls, adjust the transmitter frequency and handle the traffic without any operator intervention.

The TT-1600 System has storage capacity for 105 user programmable frequency pairs and call codes.

Characteristics

Communication protocol: CCIR 476-3, Rec. 491, Rec. 492, and the new Rec. 625.

Line signal: Two tone keyed with 7-unit code. Constant 4B/3Y ratio in accordance with CCIR Rec. 476-3, 100 Baud synchronous.

Modulation: Phase-continuous AFSK keying.

Tone frequencies: Fully programmable between 1 kHz and 3 kHz with 1 Hz resolution.

Frequency stability: < 0.1 Hz.

Filter tracking: Adaptive tracking within +/- 100 Hz.

Decision filtering: Bit-slicing with multipath correction.

Threshold control: Software controlled dynamic threshold.

Demodulator sensitivity: - 1.2 dB signal/noise ratio at 10% block error rate (1 kHz noise bandwidth).

RX-tone output: + 10 dBm to - 60 dBm, 600 ohm balanced, strap selectable.

TX-tone output: + 10 dBm to - 21 dBm, 600 ohm balanced, continuous adjustable.

The built-in, comprehensive screen-oriented text editor adds powerful dimensions to Telex handling. No more difficulties with message preparation, editing and transmission. The text editor becomes familiar to any user with a minimum of training.

A large number of different messages can be stored in the text memory for later transmission (separately or in groups).

The TT-1600 System can operate in a number of automatic modes, including unprotected/protected remote mode, public/secret save mode, operator programmable group command mode, and scan mode with automatic call controlled by the reception of "Free" signals.

Software controlled channel quality evaluation and frequency tracking ensures optimum selection of frequency channels.

Radio control input: RS-410 type N.

Radio control output RS-410 type N (open collector, Darlington drive).

Remote control: CCITT Rec. V. 10 SPECIAL (RS-423).

Character storage capacity: 256 kbyte shared between output buffer and text memory.

Soft-key commands: All editing and operational commands.

Keyboard programming: Full EEPROM programming of installation set-up, 105 user programmable frequency pairs and scanning tables.

System power source: 220 Vac/110 Vac, +/- 25%, 46-400 Hz, 100 VA max.

DC power source: 10-30 Vdc, 35 W (TT-1585 and TT-1601A only).

Ambient temperature: 0°C to 55°C operating, - 20°C to 70°C storage.

Relative humidity: 95 % non-condensing.

Vibration: IEC, CEPT and MPT 1204.

Features

- Unattended transmission and reception of telex messages, 24 hours a day.
- Simple operation by use of soft-keys.
- Screen-oriented word processor with 256 kbyte text memory.
- File packing for optimum usage of memory space.
- Storage capacity for 105 user programmable frequency pairs and call codes.
- Built-in High security Telex cipher.
- Automatic control of communication equipment with "Free" signal scanning and automatic power-up.
- Automatic channel quality evaluation and frequency tracking for optimum channel selection.
- IBM-PC/XT Communications Software.

Ordering Information

TT-1600, Integrated Radiotelex System, comprising:

TT-1585 Radiotelex Modem, C or E model
TT-1601A, Keyboard-Processor
TT-1602A, Video Monitor
TT-1608A, Hard-Copy Printer
TT-16101A, Cable Kit
TT-16102A, Mounting Kit

Option 001, Text Memory Battery Back-Up.
TT-10201A, IBM-PC Communications Support Software.

Specify 1585C or E:

TT-1585C: Standard speed (50 Baud) Radiotelex Modem with 256 kbyte text memory, compact cabinet version.
TT-1585E: Standard speed (50 Baud) Radiotelex Modem with 256 kbyte text memory, 19" rack version.

Options

Option 002: Integrated 3.5" Microfloppy Disc Drive, 720 kbyte formatted (for 1585E only).

Option 003: Remote Panel Interface (for 1585E only).

Option 004: Free-Signal Generation for Base- and Coast Stations (CCIR Rec. 492).

Option 005: Adds double speed (100 Baud) Twinplex operation (CCIR Rec. 346-1).

Option 006: Space/frequency diversity.
Option 007: High Security Telex Cipher.

From the product guide of Thrane-Thrane

§2 Modification of FS-1500

Prepare the "Telex Connection Kit" (OP05-14 Code No. 005-923-670).

Table 1. Contents of Telex Connection Kit

NO.	NAME	TYPE	CODE NO.	Q'TY
1	5-pin Jack	FM14-5P	000-111-537	1
2	5-pin Plug Assy.	05S4487-0	000-113-471	1
3	7-pin Jack	FM14-5P	000-113-345	1
4	6-pin Plug Assy.	05S4488-0	000-113-472	1
5	Connector Cover	05S4426-0	000-113-346	2
6	7-pin Plug	FM214-7SM	000-113-463	1
7	5-pin Plug	FM214-5SM	000-113-464	1
8	IC	LT1080CN	000-111-479	1
9	Gasket	05-029-0122-2	100-087-842	2

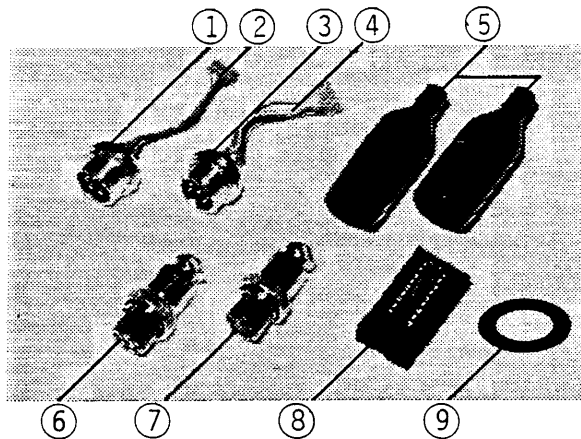


Fig 1. Telex Connection Kit

Installing the connector jacks

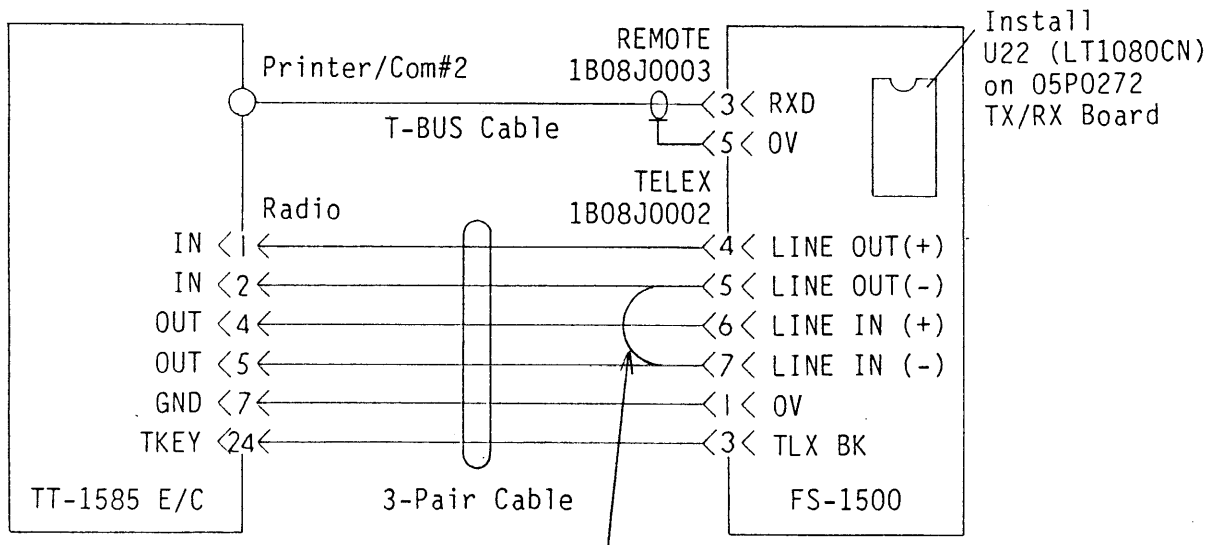
- 1) Peel off the rubber seals on the rear of the transceiver.
- 2) Solder "plug assys." to proper plugs.
- 3) Fix connector plugs to the chassis.
- 4) Connect lead wires to the respective connector on the TX/RX board.

§3 Connection

Table 2. Connections for Telex Communication

CONNECTOR	NO.	COLOR	SIGNAL	FUNCTION
TELEX (1B08J0002)	1.	BRN	0V	connected to ground
	2.	RED	SCAN STOP	not used
	3.	ORG	TLX BK	readies the transceiver for TX
	4.	YEL	LINE OUT(+)	0dBm/600 ohms audio output
	5.	GRN	LINE OUT(-)	
	6.	BLU	LINE IN (+)	0dBm/600 ohms audio input
	7.	*1	LINE IN (-)	
REMOTE (1B08J0003)	1.	BRN	TXD	Transmit Data (Not used)
	2.	RED	RTS	Request to Send (Not used)
	3.	ORG	RXD	Receive Data (Cont. Sig.)
	4.	YEL	CTS	Clear to Send (Not used)
	5.	GRN	0V	Common

*1: Connect a jumper wire to pin No.5.



Connect a jumper wire here.
(This jumper wire is not needed for
Serial No. 5586-0426 and after.)

Fig. 2 Connecting of FS-1500 to TT-1585

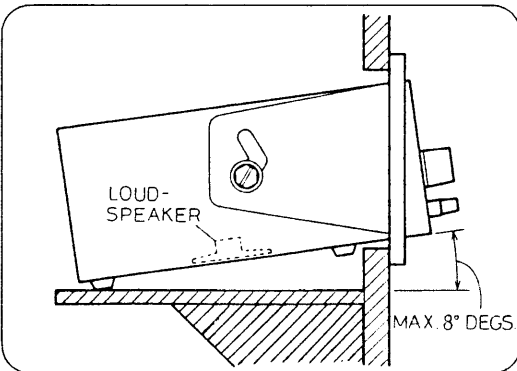
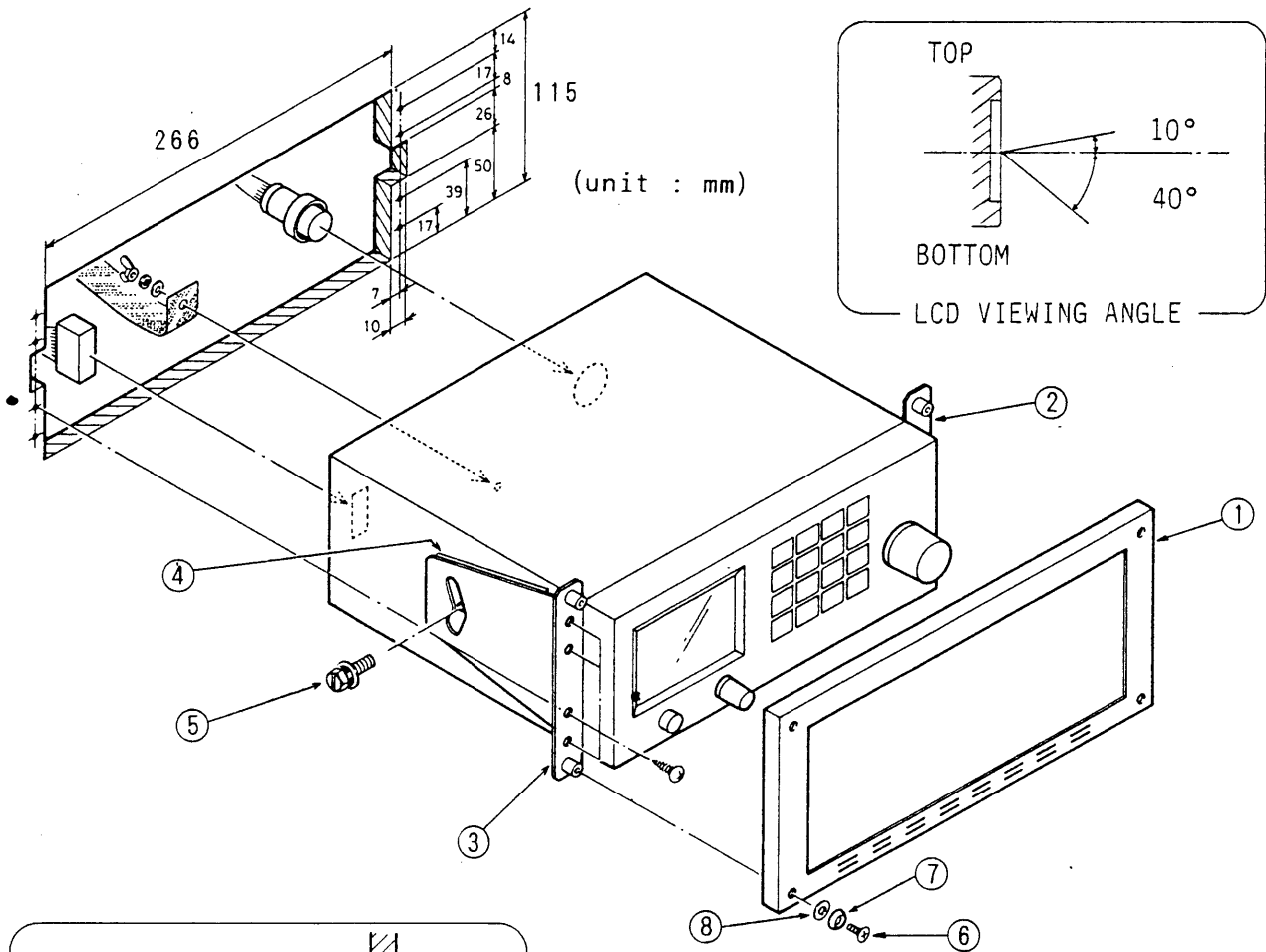
§4 MODIFICATION FOR CW OPERATION

To operate in CW, connect a telegraph key to "CW" jack on the the rear of the FS-1500. If the plug of the telegraph key does not fit the jack, connect plug supplied.

APPENDIX B Notes for Flush Mount Installation

NOTES FOR FLUSH MOUNT INSTALLATION OF FS-1500 SERIES RADIOTELEPHONE

1. Select a place where the LCD can be easily viewed, keeping in mind that the LCD viewing angle is as illustrated below. Where required the unit may be tilted a maximum of 8°.
2. Ensure the mounting location is strong enough to support the weight of the unit (6kg approx.). If necessary fix the unit to a suitable reinforcement plate.
3. Two mounting brackets are supplied for flush mounting, one for right hand side and one for left hand side. Be careful not to interchange them when mounting.
4. Screws for bulkhead mounting (M4 bolts and nuts for $\phi 4$ screws : 8 pieces) and a reinforcement plate (where required) must be supplied locally.



Parts supplied

No.	NAME	TYPE	CODE No.	QUANTITY
1	FLUSH MOUNT PANEL		100-105-470	1
2	RIGHT MOUNTING BRACKET		100-105-480	1
3	LEFT MOUNTING BRACKET		100-105-490	1
4	FLUSH MOUNT LINER		100-105-500	2
5	HEX. WASHERHEAD SCREW	M8X16	000-882-160	2
6	PANHEAD SCREW	M3X8	000-861-495	4
7	ROSETTE WASHER	M3	000-864-900	4
8	NYLON WASHER	2.8X7X0.5	000-800-728	4

APPENDIX C ITU/TELEX Frequency List

ITU SSB CHANNEL/FREQUENCY LIST (1/2)

CH. NO.	4MHz		CH. NO.	6MHz		CH. NO.	8MHz	
	TX	RX		TX	RX		TX	RX
401	4063.0*	4357.4*	601	[6200.0]*	[6506.4]*	801	8195.0*	8718.9*
402	4066.1	4360.5	602	6203.1	6509.5	802	8198.1	8722.0
403	4096.2	4363.6	603	6206.2	6512.6	803	8201.2	8725.1
404	4072.3	4366.7	604	6209.3	6516.7	804	8204.3	8728.2
405	4075.4	4369.8	605	6212.4	6518.8	805	8207.4	8731.3
406	4078.5	4372.9	606	6215.5	6521.9	806	8210.5	8734.4
407	4081.6	4376.0	607	(6218.6)	(6218.6)	807	8213.6	8737.5
408	4084.7	4379.1	608	(6221.6)	(6221.6)	808	8216.7	8740.6
409	4087.8	4382.2				809	8219.8	8743.7
410	4090.9	4385.3				810	8222.9	8746.8
411	4094.0	4388.4				811	8226.0	8749.9
412	4097.1	4391.5				812	8229.1	8753.0
413	4100.2	4394.6				813	8232.2	8756.1
414	4103.3	4397.7				814	8235.3	8759.2
415	4106.4	4400.8				815	8238.4	8762.3
416	4109.5	4403.9				816	[8241.5]	[8765.4]
417	4112.6	4407.0				817	8244.6	8768.5
418	4115.7	4410.1				818	8247.7	8771.6
419	4118.8	4413.2				819	8250.8	8774.7
420	4121.9	4416.3				820	8253.9	8777.8
421	4125.0	4419.4				821	8257.0	8780.9
422	4128.1	4422.5				822	8260.1	8784.0
423	4131.2	4425.6				823	8263.2	8787.1
424	[4134.3]	[4428.7]				824	8266.3	8790.2
425	4137.4	4431.8				825	8269.4	8793.3
426	4140.5	4434.9				826	8272.5	8796.4
427	(4143.6)	(4143.6)				827	8275.6	8799.5
						828	8278.7	8802.6
						829	8281.8	8805.7
						830	8284.9	8808.8
						831	8288.0	8811.9
						832	(8292.5)	(8291.1)
						833	(8295.6)	(8295.6)

NOTE: * J3E mode only
 Calling channel
 () Ship-to-ship simplex channel
 [] USCG AMVER channel

ITU SSB CHANNEL/FREQUENCY LIST (2/2)

CH. NO.	12MHz		CH. NO.	16MHz		CH. NO.	22MHz	
	TX	RX		TX	RX		TX	RX
1201	12330.0*	13100.8*	1601	16460.0*	17232.9*	2201	22000.0*	22596.0*
1202	12333.1	13103.9	1602	16463.1	17236.0	2202	22003.1	22599.1
1203	12336.2	13107.0	1603	16466.2	17239.1	2203	22006.2	22602.2
1204	12339.3	13110.1	1604	16469.3	17242.2	2204	22009.3	22605.3
1205	[12342.4]	[13113.2]	1605	16472.4	17245.3	2205	22012.4	22608.4
1206	12345.5	13116.3	1606	16475.5	17248.4	2206	22015.5	22611.5
1207	12348.6	13119.4	1607	16478.6	17251.5	2207	22018.6	22614.6
1208	12351.7	13122.5	1608	16481.7	17254.6	2208	22021.7	22617.7
1209	12354.8	13125.6	1609	16484.8	17257.7	2209	22024.8	22620.8
1210	12357.9	13128.7	1610	16487.9	17260.8	2210	22027.9	22623.9
1211	12361.0	13131.8	1611	16491.0	17263.9	2211	22031.0	22627.0
1212	12364.1	13134.9	1612	16494.1	17267.0	2212	22034.1	22630.1
1213	12367.2	13138.0	1613	16497.2	17270.1	2213	22037.2	22633.2
1214	12370.3	13141.1	1614	16500.3	17273.2	2214	22040.3	22636.3
1215	12373.4	13144.2	1615	16503.4	17276.3	2215	22043.4	22639.4
1216	12367.5	13147.3	1616	16506.5	17279.4	2216	22044.5	22642.5
1217	12379.6	13150.4	1617	16509.6	17282.5	2217	22049.6	22645.6
1218	12382.7	13153.5	1618	16512.7	17285.6	2218	22052.7	22648.7
1219	12385.8	13156.6	1619	16515.8	17288.7	2219	22055.8	22651.8
1220	12388.9	13159.7	1620	16518.9	17291.8	2220	22058.9	22654.9
1221	12392.0	13162.8	1621	16522.0	17294.9	2221	22062.0	22658.0
1222	12395.1	13165.9	1622	16525.1	17298.0	2222	22065.1	22661.1
1223	12398.2	13169.0	1623	16528.2	17301.1	2223	22068.2	22664.2
1224	12401.3	13172.1	1624	16531.3	17304.2	2224	22071.3	22667.3
1225	12404.4	13175.2	1625	[16534.4]	[17307.3]	2225	22074.4	22670.4
1226	12407.5	13178.3	1626	16537.5	17310.4	2226	22077.5	22673.5
1227	12410.6	13181.4	1627	16540.6	17313.5	2227	22080.6	22676.6
1228	12413.7	13184.5	1628	16543.7	17316.6	2228	22083.7	22679.7
1229	12416.8	13187.6	1629	16546.8	17319.7	2229	22086.8	22682.8
1230	12419.9	13190.7	1630	16549.9	17322.8	2230	22089.9	22685.9
1231	12423.0	13193.8	1631	16553.0	17325.9	2231	22093.0	22698.0
1232	12426.1	13196.9	1632	16556.1	17329.0	2232	22096.1	22692.1
1233	(12430.6)	(12430.6)	1633	16559.2	17332.1	2233	22099.2	22695.2
1234	(12433.7)	(12433.7)	1634	16562.3	17335.2	2234	22102.3	22698.3
1235	(12436.8)	(12436.8)	1635	16565.4	17338.3	2235	22105.4	22701.4
			1636	16568.5	17341.4	2236	22108.5	22704.5
			1637	16571.6	17344.5	2237	22111.6	22707.6
			1638	16574.7	17347.6	2238	22114.7	22710.7
			1639	16577.8	17350.7	2239	22117.8	22713.8
			1640	16580.9	17353.8	2240	22120.9	22716.9
			1641	16584.0	17356.9	2241	(22125.4)	(22125.4)
			1642	(16588.5)	(16588.5)	2242	(22128.5)	(22128.5)
			1643	(16591.6)	(16591.6)	2243	(22131.6)	(22131.6)
			1644	(16594.7)	(16594.7)	2244	(22134.7)	(22134.7)
						2245	(22137.8)	(22137.8)

NOTE: * J3E mode only
 Calling channel
 () Ship-to-ship simplex channel
 [] USCG AMVER channel

ITU TELEX CHANNEL/FREQUENCY LIST (1/3)

CH. NO.	4MHz		CH. NO.	6MHz		CH. NO.	8MHz	
	TX	RX		TX	RX		TX	RX
401	4170.5	4350.0	601	6256.5	6494.5	801	8344.0	8705.0
402	4171.0	4350.5	602	6257.0	6495.0	802	8344.5	8705.5
403	4171.5	4351.0	603	6257.5	6495.5	803	8345.0	8706.0
404	4172.0	4351.5	604	6258.0	6496.0	804	8345.5	8706.5
405	4172.5	4352.0	605	6258.5	6496.5	805	8346.0	8707.0
406	4173.0	4352.5	606	6259.0	6497.0	806	8346.5	8707.5
407	4173.5	4353.0	607	6259.5	6497.5	807	8347.0	8708.0
408	4174.0	4353.5	608	6260.0	6498.0	808	8347.5	8708.5
409	4174.5	4354.0	609	6260.5	6498.5	809	8348.0	8709.0
410	4175.0	4354.5	610	6261.0	6499.0	810	8348.5	8709.5
411	4175.5	4355.0	611	6261.5	6499.5	811	8349.0	8710.0
412	4176.0	4355.5	612	6262.0	6500.0	812	8349.5	8710.5
413	4176.5	4356.0	613	6262.5	6500.5	813	8350.0	8711.0
414	4177.0	4356.5	614	6263.0	6501.0	814	8350.5	8711.5
			615	6263.5	6501.5	815	8351.0	8712.0
			616	6264.0	6502.0	816	8351.5	8712.5
			617	6264.5	6502.5	817	8352.0	8713.0
			618	6265.0	6503.0	818	8352.5	8713.5
			619	6265.5	6503.5	819	8353.0	8714.0
			620	6266.0	6504.0	820	8353.5	8714.5
			621	6266.5	6504.5	821	8354.0	8715.0
			622	6267.0	6505.0	822	8354.5	8715.5
			623	6267.5	6505.5	823	8355.0	8716.0
						824	8355.5	8716.5
						825	8356.0	8717.0
						826	8356.5	8717.5
						827	8357.0	8718.0

ITU TELEX CHANNEL/FREQUENCY LIST (2/3)

CH. NO.	12MHz		CH. NO.	16MHz		CH. NO.	22MHz	
	TX	RX		TX	RX		TX	RX
1201	12491.5	13071.5	1601	16660.5	17197.5	2201	22192.5	22561.5
1202	12492.0	13072.0	1602	16661.0	17198.0	2202	22193.0	22562.0
1203	12492.5	13072.5	1603	16661.5	17198.5	2203	22193.5	22562.5
1204	12493.0	13073.0	1604	16662.0	17199.0	2204	22194.0	22563.0
1205	12493.5	13073.5	1605	16662.5	17199.5	2205	22194.5	22563.5
1206	12494.0	13074.0	1606	16663.0	17200.0	2206	22195.0	22564.0
1207	12494.5	13074.5	1607	16663.5	17200.5	2207	22195.5	22564.5
1208	12495.0	13075.0	1608	16664.0	17201.0	2208	22196.0	22565.0
1209	12495.5	13075.5	1609	16664.5	17201.5	2209	22196.5	22565.5
1210	12496.0	13076.0	1610	16665.0	17202.0	2210	22197.0	22566.0
1211	12496.5	13076.5	1611	16665.5	17202.5	2211	22197.5	22566.5
1212	12497.0	13077.0	1612	16666.0	17203.0	2212	22198.0	22567.0
1213	12497.5	13077.5	1613	16666.5	17203.5	2213	22198.5	22567.5
1214	12498.0	13078.0	1614	16667.0	17204.0	2214	22199.0	22568.0
1215	12498.5	13078.5	1615	16667.5	17204.5	2215	22199.5	22568.5
1216	12499.0	13079.0	1616	16668.0	17205.0	2216	22200.0	22569.0
1217	12499.5	13079.5	1617	16668.5	17205.5	2217	22200.5	22569.5
1218	12500.0	13080.0	1618	16669.0	17206.0	2218	22201.0	22570.0
1219	12500.5	13080.5	1619	16669.5	17206.5	2219	22201.5	22570.5
1220	12501.0	13081.0	1620	16670.0	17207.0	2220	22202.0	22571.0
1221	12501.5	13081.5	1621	16670.5	17207.5	2221	22202.5	22571.5
1222	12502.0	13082.0	1622	16671.0	17208.0	2222	22203.0	22572.0
1223	12502.5	13082.5	1623	16671.5	17208.5	2223	22203.5	22572.5
1224	12503.0	13083.0	1624	16672.0	17209.0	2224	22204.0	22573.0
1225	12503.5	13083.5	1625	16672.5	17209.5	2225	22204.5	22573.5
1226	12504.0	13084.0	1626	16673.0	17210.0	2226	22205.0	22574.0
1227	12504.5	13084.5	1627	16673.5	17210.5	2227	22205.5	22574.5
1228	12505.0	13085.0	1628	16674.0	17211.0	2228	22206.0	22575.0
1229	12505.5	13085.5	1629	16674.5	17211.5	2229	22206.5	22575.5
1230	12506.0	13086.0	1630	16675.0	17212.0	2230	22207.0	22576.0
1231	12506.5	13086.5	1631	16675.5	17212.5	2231	22207.5	22576.5
1232	12507.0	13087.0	1632	16676.0	17213.0	2232	22208.0	22577.0
1233	12507.5	13087.5	1633	16676.5	17213.5	2233	22208.5	22577.5
1234	12508.0	13088.0	1634	16677.0	17214.0	2234	22209.0	22578.0
1235	12508.5	13088.5	1635	16677.5	17214.5	2235	22209.5	22578.5
1236	12509.0	13089.0	1636	16678.0	17215.0	2236	22210.0	22579.0
1237	12509.5	13089.5	1637	16678.5	17215.5	2237	22210.5	22579.5
1238	12510.0	13090.0	1638	16679.0	17216.0	2238	22211.0	22580.0
1239	12510.5	13090.5	1639	16679.5	17216.5	2239	22211.5	22580.5
1240	12511.0	13091.0	1640	16680.0	17217.0	2240	22212.0	22581.0
1241	12511.5	13091.5	1641	16680.5	17217.5	2241	22212.5	22581.5
1242	12512.0	13092.0	1642	16681.0	17218.0	2242	22213.0	22582.0
1243	12512.5	13092.5	1643	16681.5	17218.5	2243	22213.5	22582.5
1244	12513.0	13093.0	1644	16682.0	17219.0	2244	22214.0	22583.0
1245	12513.5	13093.5	1645	16682.5	17219.5	2245	22214.5	22583.5
1246	12514.0	13094.0	1646	16683.0	17220.0	2246	22215.0	22584.0
1247	12514.5	13094.5	1647	16683.5	17220.5	2247	22215.5	22584.5
1248	12515.0	13095.0	1648	16684.0	17221.0	2248	22216.0	22585.0
1249	12515.5	13095.5	1649	16684.5	17221.5	2249	22216.5	22585.5
1250	12516.0	13096.0	1650	16685.0	17222.0	2250	22217.0	22586.0

ITU TELEX CHANNEL/FREQUENCY LIST (3/3)

CH. NO.	12MHz		CH. NO.	16MHz		CH. NO.	22MHz	
	TX	RX		TX	RX		TX	RX
1251	12516.5	13096.5	1651	16685.5	17222.5	2251	22217.5	22586.5
1252	12517.0	13097.0	1652	16686.0	17223.0	2252	22218.0	22587.0
1253	12517.5	13097.5	1653	16686.5	17223.5	2253	22218.5	22587.5
1254	12518.0	13098.0	1654	16687.0	17224.0	2254	22219.0	22588.0
1255	12518.5	13098.5	1655	16687.5	17224.5	2255	22219.5	22588.5
1256	12519.0	13099.0	1656	16688.0	17225.0	2256	22220.0	22589.0
1257	12519.5	13099.5	1657	16688.5	17225.5	2257	22220.5	22589.5
			1658	16689.0	17226.0	2258	22221.0	22590.0
			1659	16689.5	17226.5	2259	22221.5	22590.5
			1660	16690.0	17227.0	2260	22222.0	22591.0
			1661	16690.5	17227.5	2261	22222.5	22591.5
			1662	16691.0	17228.0	2262	22223.0	22592.0
			1663	16691.5	17228.5	2263	22223.5	22592.5
			1664	16692.0	17229.0	2264	22224.0	22593.0
			1665	16692.5	17229.5	2265	22224.5	22593.5
			1666	16693.0	17230.0	2266	22225.0	22594.0
			1667	16693.5	17230.5	2267	22225.5	22594.5
			1668	16694.0	17231.0			
			1669	16694.5	17231.5			