MARINE RADAR EQUIPMENT

RADAR1000MK Ⅱ

JMA-1011

FIELD SERVICE MANUAL

JRC Japan Radio Co., Ltd.

CODE No. 7ZPRD0594

CONTENTS

SECTION 1
SPECIFICATIONS

2.1 GENERAL

1. Maximum range — 16 Nautical Miles
2. Minimum range — Less than 25 m on the 0.125 NM range
3. Range scales

Range (NM)	Number of Rings	Range ring Interval (NM)
0.125	2	0.0625
0.25	2	0.125
0.5	2	0.25
0.75	3	0.25
1.5	6	0.25
3.0	6	0.5
6.0	6	1.0
12.0	6	2.0
16.0	4	4.0

4. Range discriminations: — Less than 25 m
5. Range rind accuracy: — Better than ; ± 0.9% of maximum Maximum range of the scale in use, or 8 m, whichever is the greater.
6. Bearing accuracy: — ± 1 degree
7. Display device: — LCD: 115 x 86.4 mm (320 x 240 pixels)
8. Environmental conditions:
   - Scanner unit Temperature — -15℃ to +55℃
   - Humidity — UP to 95% at +35℃
   - Display unit Temperature — -10℃ to +50℃ (Except LCD)
     0℃ to +50℃ (LCD)
     Note: LCD performance will be slightly deteriorated. In response speed and brightness during extreme low temperatures.
   - Humidity — UP to 95% at +35℃
9. Input power — 10.2 V to 16V
10. Power consumption: — Approx. 30 W
11. AVR — Floating AVR system

2.2 SCANNER UNIT

1. Dimensions:
   - Diameter — 318 mm
   - Height — 200 mm
2. Mass: — Approx. 4 Kg
3. Polarization: — Horizontal
4. Beam width:
   - Horizontal — 7° normal
   - Vertical — 30°
5. Side lobes — -20 dB or greater
6. Rotation: — Approx. 32 rpm

7.	Transmitter frequency:	9445 MHz
8.	Peak power output:	1.5 KW
9.	Pulse length/PRF:	0.08us/2250Hz (0.125, 0.25, 0.5 ,0.75 NM) 0.3us/1200Hz (1, 1.5 NM) 0.8us/600Hz (3, 6, 12, 16 NM)
10.	Duplexer:	T-junction with diode Limiter
11.	Mixer:	MIC frontend
12.	IF amplifier:	Center frequency 60 MHz Bandwidth 3/10 MHz
13.	Noise figure:	Less than 10 dB
14.	Characteristic	Linear

2.3 DISPLAY UNIT

1.	Dimensions:		
		Width	187 mm
		Depth	83 mm
		Height	183 mm
2.	Mass:		Approx. 1.2 Kg
3.	Mounting:		Table, Overhead, or Flush mount
4.	Video:		4 levels quantitized
5.	Tuning:		Auto/Manual
6.	Bearing scale:		360° scale graduated at intervals of 5°
7.	VRM:		3 digit readout
8.	EBL:		3 digit readout
9.	Alarm:		Audible alarm with zone mark
10.	Off Center:		1/4 radius
11.	Planned TX:		Rotation period 10, 20 or 30 scans Repetition period 3, 5, 10, 15 min
12.	Language:		English, French, Spanish, Italian, Norwegian, German
13.	Features:		VRM, EBL, Cursor with LL, Interference rejection, Target expansion, Target alarm, LL or TD readout, Waypoint with LL, Offset, Timed TX, Target Trail, Auto tune
14.	External input:		
		NAV-AID	NMEA0183 (RMA, RMB, RMC, GLL, GTD, VTG, BWC) NMEA0182
		Compass	NMEA0183 (HDM, HDT, VHW, HSC)

SECTION 2
TECHNICAL DESCRIPTION

2.1 GENERAL

The theory of operation for the RADAR 1000 MK II is presented here with descriptions following the functional block diagram circuits.

2.2 SCANNER UNIT

The scanner unit consists of the RF PCB radiator, the motor, radiator rotating mechanism, bearing reset assembly, and the transmitter/receiver unit. These components are all housed within the 12.2" radome. The functional Block Diagram appears in Figure 2.

2. 2. 1 RADIATOR

The RF PCB radiator forms the main RF transmitting beam for the radar transmitter and becomes the receiving antenna during the receive cycle. The beam formed by the patched array styled PCB at half power points is 7° horizontally and 30° vertically, be direction of the beam (maximum radiated power) is essentially perpendicular to the radiator surface.

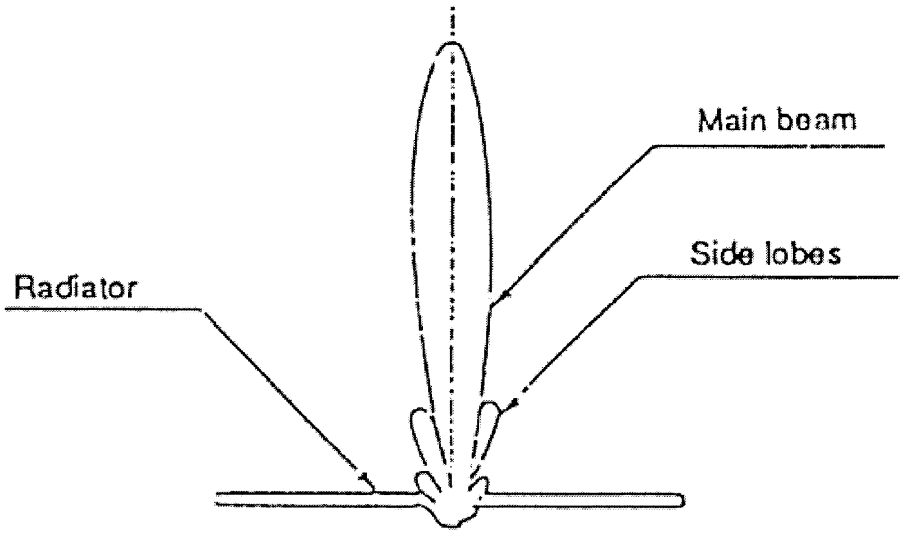


Fig.2-1 RADIATION PATTERN

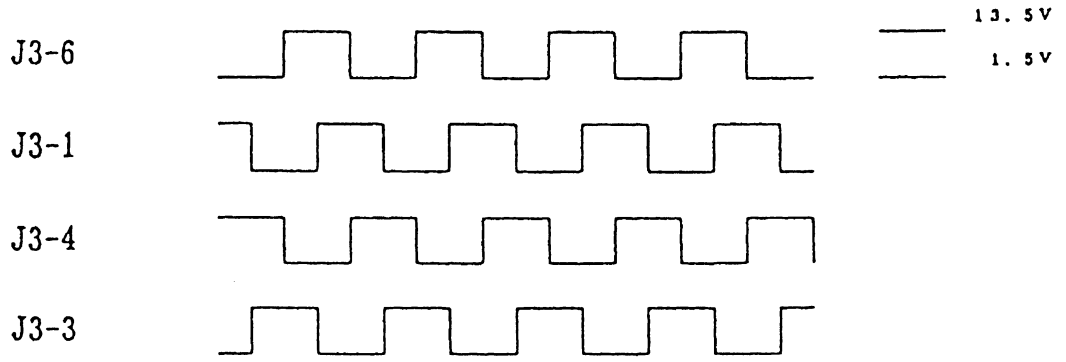
2. 2. 2 RADIATOR ROTATING MECHANISM

The mechanical coupling between the PCB radiator assembly and the motor is effected by a reduction drive gear. The antenna motor normally rotates the radiator at approximately 32 rpm.

2. 2. 3 MOTOR

The antenna drive motor is used stepping motor. When radar is stand-by mode, J3-1, 3, 4, 6 are +12V. When Transmitter mode, output of IC6-12 is changed 136. 5 Hz to 256 Hz at first 7 step. After 7 steps, output of IC6-12 is stable at 250 Hz.

The waveform of J3-1, 3, 4, 6 are as follows:



2. 2. 4 BEARING RESET SWITCH

The bearing reset switch, or otherwise referred to as the "heading reference switch", produces the signal to reset the scan converter circuitry to '0" when the permanent magnet fitted on the main gear passes across the reed switch S101. The reset signal (BZ) is sent down to the bearing reset circuitry in the display unit and synchronizes the scanner position to the display sweep. The BZ signal is sent down to the display together with the Tune indication signal at J2-6.

2.3 TRANSMITTER

The transmitter consists of the solid state modulator circuits, the power supply, and the 1. 5kW magnetron.

A. Modulator

A solid state type pulsar design is used by the modulator and primarily consists of a pulse generator circuit, power MOSF'ET switch, and pulse transformer.

When setting the X-MIT/STBY key on the control panel at the display unit to "ON", the transmitter trigger pulse is sent via the inter unit cable from the transmit trigger generator circuit in the display unit to the J2-2 in the modulator.

The switching regulator power supply provides +250Vdc to charge the capacitor (C39). In addition to the high voltage for the modulator, the power supply also provides the magnetron heater voltage (6Vdc) and the operating l2Vdc for the trigger circuits and display unit.

Generally the pulse width of the pulse generator circuit is controlled by the range key selectors on the front panel at the display unit. Three different pulse lengths: 0.08usec, 0.3usec and 0.8usec (in accordance with the range scale) can be provided. The pulse repetition frequency (PRF) always changes automatically to match the selected operating pulse length (See TABLE 1).

Upon receiving the positive trigger pulse, TR5 generate a differential waveform at C35, R39-R44 setup the discharge period of this waveform to generate a short (80ns), medium (300ns), or long (800ns) gate to IC1-6. The pulse is amplified and applied to the gate of TR14 that will conduct for the selected pulse length drawing current through the primary of the Pulse Transformer (T2) generating a 1. 85kV pulse to the magnetron cathode.

TABLE 1 RANGE, PULSE LENGTH, AND PRF RELATIONSHIPS

Range	Pulse Length	PRF
0.125, 0.25, 0.5, 0.75 nm	0.08us	2250 Hz
1, 1.5 nm	0.3us	1200 Hz
3, 6, 12, 16 nm	0.8us	600 Hz

RECEIVER

The receiver circuit consists of the passive diode limiter, the MIC Front End and the Receiver IF circuit.

The MIC Front End (E101, NJT1967) device consists of the single balanced mixer, and the local oscillator. The received radar echo signals at 9445 MHz are then sent into the single balanced mixer of the MIC. The MIC Local Oscillator, tuned by the adjustment of the operator's Tune control on the display unit front panel to be 60 MHz higher than the magnetron's operating frequency for maximum target detection, is also fed into the single balanced mixer. The single balanced mixer output of 60 MHz echo signals is then coupled into the 60 MHz IF amplifier.

RECEIVER CIRCUIT

The Receiver circuit includes the 60 MHz IF amplifier, bandwidth control circuits, video detector, tune indicator circuitry, the MBS amplifiers and the video output circuit.

IF Amplifier Circuit: The IF amplifier consists of low-noise gain controlled transistor amplifier TR15 and gain controlled IC amplifiers IC9 with bandwidth selector and IC10.

TR15, IC9 and IC10 are controlled by the gain and STC control signals generated by the display unit. Maximum gain is obtained when the voltage level at IC9-5 and IC10-5 reaches 4 volts.

The band width selector IC1 and TR15 enables to change load resistor so the receiver has either a 10 MHz or a 3 MHz bandwidth characteristic. The selection depends on the pulse length selector signal (PW).

When +6V at J2-7 is present, the base voltage of TRl6 and TR25 will be +12V volts. In this condition, the pulse length in operation is 0.08us and the bandwidth of the receiver is widened to 10 MHz. When pulse length are other than 0.08us, the base of TR16 and TR25 will be 0V, the bandwidth will become narrow at 3 MHz.

VIDEO DETECTOR CIRCUIT

The video detector circuit is IC11 operate as a video detector to remove the 60MHz IF component from the incoming signals. The output signals on IC11-12 are inverted to negative going pulses and fed to the video output circuit.

VIDEO OUTPUT CIRCUIT

The video output circuit consists of emitter follower TR18. The emitter follower operates strictly as an impedance transformer to drive the 50 ohms coaxial cable which carries the video signal to the display unit.

TUNING INDICATION CIRCUIT

The tuning indicator circuit consists of amplifier TR19, detector TR20, and emitter follower TR21, 22. TR21 charges C110 to the detected signal voltage. This voltage is sent to the display unit as a tuning indication voltage via buffer amplifier TR22, with bearing reset pulse. The range of the tuning indication voltage varies normally between +5V (detuned) and 1V(tuned in long pulse).

POWER SUPPLY

The power supply converts the ship's mains to necessary DC voltages to operate the radar system. These output voltages include regulated +12VDC, +6VDC, and +250VDC. The AVR converter consists of IC2 and IC3 as well as TR1 and TR2. The RV1 is normally set by monitoring the +12VDC output at TP1 and adjusting for +12VDC±0.1VDC with a volt ohm meter.

2.4 DISPLAY UNIT

The display unit normally contains the Main Control PCB, the Power Supply PCB, the LCD nodule and the Control Panel PCBs.

2.4.1 SIMPLIFIED BLOCK DIAGRAM

FIG. 2 shows the fundamental circuits of the display unit in a simplified functional block diagram. Most system operations within the display unit occur primarily on the Main Control PCB. It is on this PCB that most of the signal processing takes placed. The following is a brief description of the main circuit functions of the display unit.

2.4.2 MAIN CONTROL PCB

2.4.3 VIDEO INPUT CIRCUITRY

The incoming video signals from the receiver in the scanner are first routed through the FTC circuit components consisting of CD2 and C14. The diode CD2 controlled by the voltage supplied from IC10-11 which is determined by the front panel RAIN CLUTTER Control.

2.4.4 A/D CONVERTER

The video signals from CD2 and C14 are fed to an amplifier TR1 and TR1 output video signals are converted to digital pulses by 3 comparator ICs IC12, 13, 14. The digital video output is then sent to the system control LSI 1C6.

2.4.5 SYSTEM CONTROL LSI

The system control LSI 1C6 contains video processor, video buffer memory, scan converter, PPI video memory control circuit, various clock input and output circuit, LCD drive signal generator, and system control signal generator circuit.

2.4.6 PPI MEMORY AND GRAPHIC MEMORY

The processed video signals are stored in the buffer memory of the system control LSI, and then read out on the bearing pulse timing. The buffer memory output is fed to PPI memory 1C9 followed by the scan converter data onto its address pins.

And also graphic data from main CPU and GDC are stored in the graphic memory 1C7 and 1C8. 1C7, 1C8 and 1C9 are 64K x 4 bit DRAM. The output data from DRAM are fed to the LCD drive signal timing are controlled by GDC and LCD drive signal are fed to the LCD unit via output buffer 1C21.

2.4.7 MAIN CPU CIRCUIT

The main CPU circuit consists of CPU IC4, RAM IC2, and ROM IC3. The main CPU control's all of the radar system with GDC and system control LSI according to the front panel key output and the data from the other nay-aid unit. The tuning voltage and gain STC signals are generated by the D/A converter IC10 outputs which are contrived from CPU.

2.4.8 OPTIONAL INPUTS

The RADAR 1000 MK II can receive various input signals from Nay-aids and compass. 10 more than one data type is present at the radar inputs (for examples; compass and NMEA) a system priority has been established in the radar's software to respond to the inputs in driving the features. The assigned priorities are set in this manner:

HEADING:	1. Flux Sensor (NMEA 0183 "HDM, HDT, HSC" sentences) 2. Navaid Data (NMEA 0183 "RMC, RMA, VTG" sentences)
POSITION:	1. Navaid Data (NMEA 0183 "RMC, RMA, GLL, GTD" sentences)
SPEED:	1. Navaid Data (NMEA 0183 "RMC, RMA, VTG, I[7]KW" sentences)
WAYPOINT:	1. Navaid Data (NMEA 0183 "RMB, B1~C" sentences)

2.4.9 POWER SUPPLY

The Power Supply converts the +12V to the necessary DC voltages to operate the radar display unit. These output voltages include regulated +5VDC, +24VDC, -22VDC, 8VDC, and 300VAC. The power switch circuit (TR21) can begin operation when the STBY/OFF switch is pressed on the Control PCB. The STBY signal toggles IC31-1 output and TR21 and TR22 conducts. Then ship's main Voltage fed to the AVR converter circuit on the scanner unit. When the XMJT/0FF key is pressed, IC31-12 operates and TR24 and IC33 to enable the OPE output.

SECTION 3
TROUBLE SHOOTING

3. TROUBLE-SHOOTING GUIDE

Whi1e the RADAR 1000 MK II is highly reliable systems, early signs and detection of component fatigue can sometimes be spotted during regular operational checks.

When a problem is observed, corrective service should be arranged to avoid failure at critical tines at sea. In some cases, problems nay be cleared by a system master reset.

3.1 MASTER RESET

The first step in attempting to clear a problem associated with the general operation of this Radar is to perform a MASTER RESET. This function will clear the Radar's memory and will return it to its factory settings. It may then be necessary to make the INITIAL SETTING and to re-enter the parameters previously established by the operator.

CAUTION
In making checks, be alert to the high voltage points existing throughout the equipment.

3.2 RESET

This reset will clear the radar's memory except INITIAL SETTING. This can be done by pressing the EBL/VRM key and while holding, then turning the power on. This should be performed anytime a component or PCB within the radar is replaced.

3.3 FUSE

A fuse seldom blows out without some cause. Even if a fuse is merely replaced and does not blow again, it still may be necessary to make further checks of the circuits associated with the fuse.
TABLE 3-1 shows a table of fuses employed in the equipment.

TABLE 3-1 FUSES USED

Location	Part No.	Rating Current	Protective Circuit	Type	JRC code
Display	F401	5A	All circuit	Glass tube	6ZXRD00190

3.4 FAULT FINDING PROCEDURE

Often the display on the LCD can help indicate which major circuit is at fault. It may be quicker to check-out the equipment according to the trouble shooting guide that follows TABLE 3-2.

In general, the common causes of trouble frequently encountered include abnormal resistances, intermittent variable resistors, and switches.

In the following fault finding procedure, it is assumed that only a VOM is available; the use of an oscilloscope amplifies the procedures and may prove necessary in some cases.

TABLE 3-3 is the troubleshooting guide and check-out procedure, TABLE 3-4 shows typical voltages and remittances at significant points throughout the equipment. The internal resistance of the tester used in measurements was 20kΩ/VDC, 8 kΩ/VAC.

TABLE 3-2 OPERATION CHECK LIST

Unit to be checked	Check item	Correct condition	Remarks	Measuring point
Scanner Unit	a. Input voltage	12V		CMN-457 J1-1-2
	b. AVR output voltage	12V		CMN-457 TP1
	c. Mag. current	12-20V		CMN-457 TP2
Display Unit	a. Input voltage	Refer to Note		J2-1-2
	b. AVR output voltage	5V		TP1-Ground
	c. Observation of Screen sensitivity, Sweep length, Sweep linearity, Sweep center, Ring and Illumination.			
	c. Check of the operating controls			

NOTE: Allowable variation of input voltage, DC10.2V-16V

TABLE 3-3 TROUBLE SHOOTING GUIDE

	Trouble	Remedy
1.	Does not start at OPERATE switch to STBY.	Check: [DISPLAY] Blown fuse F401. Check input power circuits. Check modulator circuits in scanner. Faults of contact on CCK-773. Fault of power supply contact on CMN-457 Faults of switch contact on CMC-970.
2.	Scanner fails to rotate.	Check: [SCANNER] Fault on contact on terminal boards. Fault of M101 Fault of drive mechanism. Faults of motor control contact on CMN-457
3.	Scanner rotates but rotation of sweep is abnormal.	Fault of connection between M101. Check: [DISPLAY, SCANNER] Fault of main circuit for the Display unit
4.	No picture on the screen.	Fault of LCD display unit or its drive contact. Check: [DISPLAY] Fault of LCD drive contact. Fault of video circuit. Fault of power supply circuit.
5.	Range rings on the screen but no noise and no echoes.	Fault circuit between IF amplifier of receiver unit and input circuit of display unit video amplifier. Check: [DISPLAY] Fault of GAIN, STC control contact. Fault of receiver unit. Fault of MIC
6.	Noise and range the screen but no echoes	If no transmission is present, check the modulator. Check: [SCANNER] Failure of Local Oscillator tuning. If transmission appears to be present, carry out the Local Oscillator tuning procedures and check the MIC. Fault of MIC Mixer. If no transmission is present, Whether the lead wire to magnetron is grounded to chassis. Fault of magnetron.

	Trouble	Remedy
7.	Poor sensitivity. Dim echoes.	Check: [SCANNER, DISPLAY] Reduction of transmitting output power. Fault of magnetron. Fault of MIC Front End. Failure of Local Oscillator tuning. Failure of INTENSITY ADJ. Fault of video amplifier contact on CMC-970 Fault of receiver unit.
8.	No VRM or VRM cannot be controlled	Check: [DISPLAY] Fault of CCK-773. Fault of main contact. (CMC-970)
9.	No EBL or EBL cannot be controlled	Check: [DISPLAY] Fault of CCK-773. Fault of main contact. (CMC-970)
10.	No alarm zone marker, or no alarm sound	Check: [DISPLAY] Fault of CCK-773. Fault of main contact. (CMC-970) Fault of Buzzer BZ1.

TABLE 3-4 shows typical voltage and resistances at significant points throughout the equipment.

(A) Inter-unit terminal board

Resistance Measurements shall be made under the following conditions:
POWER switch-off, S101-on.
Resistance values shall be measured between measuring point and ground unless otherwise specified, and negative terminal of the tester is grounded as a rule.
The tester used for this measurement is 20kΩ/VDC, 8kΩ/VAC.
Voltage measurements shall be made with the following display control conditions:
POWER switch-ON, RAIN CLUTTER -min, GAIN -max, SEA CLUTTER- min.
Ship' s power supply is DC 12V.

STC-------- MIN
FTC-------- MIN
TUNE----- CENTER
GAIN------ MAX
P.S. = 12V(DC)

TABLE 3-4 TYPICAL VOLTAGES AND RESISTANCES
RADOME RADAR [RADAR 1000 MK II] (with Inter-unit cable connected)

Measuring Point	Resistance (Ω)	Voltage (V)			Remarks
		0.25 (nm)	1.5 (nm)	16 (nm)	
J1-1	1M≦	10 .71	10 .6	10 .55	1A
J1-2	∞				2A
J1-3	11	11 .99	11 .99	11 .99	+12V
J2-1	20K	13 .72	13 .60	13 .60	TUNV
J2-2	5K	1 .83	1 .70	1 .71	TI/GS
J2-3	0	0	0	0	TIR
J2-4	55	-0 .23	-0 .23	-0 .23	VD
J2-5	0	2 .5m	2 .5m	2 .5m	VDR
J2-6	12K	4 .4	4 .4	4 .4	BZ/TUNI
J2-7	9K	3 .95	7 .27	10 .7	PW

(B) Remittances at inter-unit connector without connection of cables.

NOTE: Refer to measurement conditions given in item (A)

SCANNER UNIT (Without Inter-unit cable connected)

Measuring Point	Resistance (Ω)	Function
J1-1	∞	1A
J1-2	∞	2A
J1-3	12	+12
J2-1	∞	TUNV
J2-2	∞	TI/GS
J2-3	0	TIR
J2-4	5M≦	VD
J2-5	0	VDR
J2-6	200	BZ/TUNI
J2-7	∞	PW

DISPLAY UNIT (Without Inter-unit cable connected)

Measuring Point	Resistance (Ω)	Function
J1-1	∞	1A
J1-2	2M	2A
J1-3	10K	PW
J1-4	55	VD
J1-5	0	VDR
J1-6	0	TIR/GSR
J1-7	140	TI/GS
J1-8	32K	BZ/TUNI
J1-9	1.2K	TUNV
J1-10	50	+12
J2-1	2M≦	SHIP'S MAIN (+)
J2-2	2M≦	SHIP'S MAIN (-)
J2-3	∞	NAV (+)
J2-4	∞	NAV (-)
J2-5	∞	COMPASS (+)
J2-6	∞	COMPASS (-)
J2-7	0	E

SECTION 4
MAINTENANCE

4.1 GENERAL

It is necessary to perform the maintenance services listed below to keep the RADAR 1000 MK II in good working conditions. Proper maintenance of the RADAR 1000 MK II minimizes the possibility of machine failures. The maintenance operations that are common to all components of the RADAR 1000 MK II is listed below.

(1) Cleaning

Remove dirt, dust, or water-spray from the RADAR 1000 MK II enclosure and keep it as clean as possible. Use a dry lint-free cloth.

(2) Screw inspection

Check the screws used to assemble and secure the components of the RADAR 1000 MK II for loose connection.

(3) Cabling check

Check the cables connecting between the components (between the scanner unit and display unit, display unit and power supply, and display unit and optional devices) for poor connection.

CAUTION

When servicing the RADAR 1000 MK II, be sure to turn it off to prevent electric shock. If a rectifier unit is used, in particular, turn off power to the display unit. Note that voltages from the rectifier unit are always present even if the radar is stopped.

4.2 SCANNER UNIT

When inspecting the scanner unit of the RADAR 1000 MK II, be sure to turn off power to the display unit. Keep watches or magnetic cards away from the modulator block as it contains a magnetron having a strong magnetic force.

4.2.1 Radome Scanner Unit

(1) Radome

A radome surface contaminated by smoke, dust, or paint would cause attenuation or reflections of radio waves, resulting in reduced radar performance. Periodically check the radome scanner unit. If it proves dirty, wipe the radome surface with a soft lint-free cloth moistened with alcohol or damped cloth.

*Never use solvents such as thinner, gasoline, benzene, trichlene, and ketone.

(2) Lubricating gears

Check the mounting bolts for loose connection occasionally.

4.3 DISPLAY UNIT

4.3.1 Cleaning the Screen

Dust on the LCD would reduce the transparency and make the video image dim. Wipe the screen surface with a soft lint-free cloth (made of flannel or cotton). A cloth moistened with an antiseptic agent would cause little problem. When using it, wipe softly; never rub the screen surface with force.

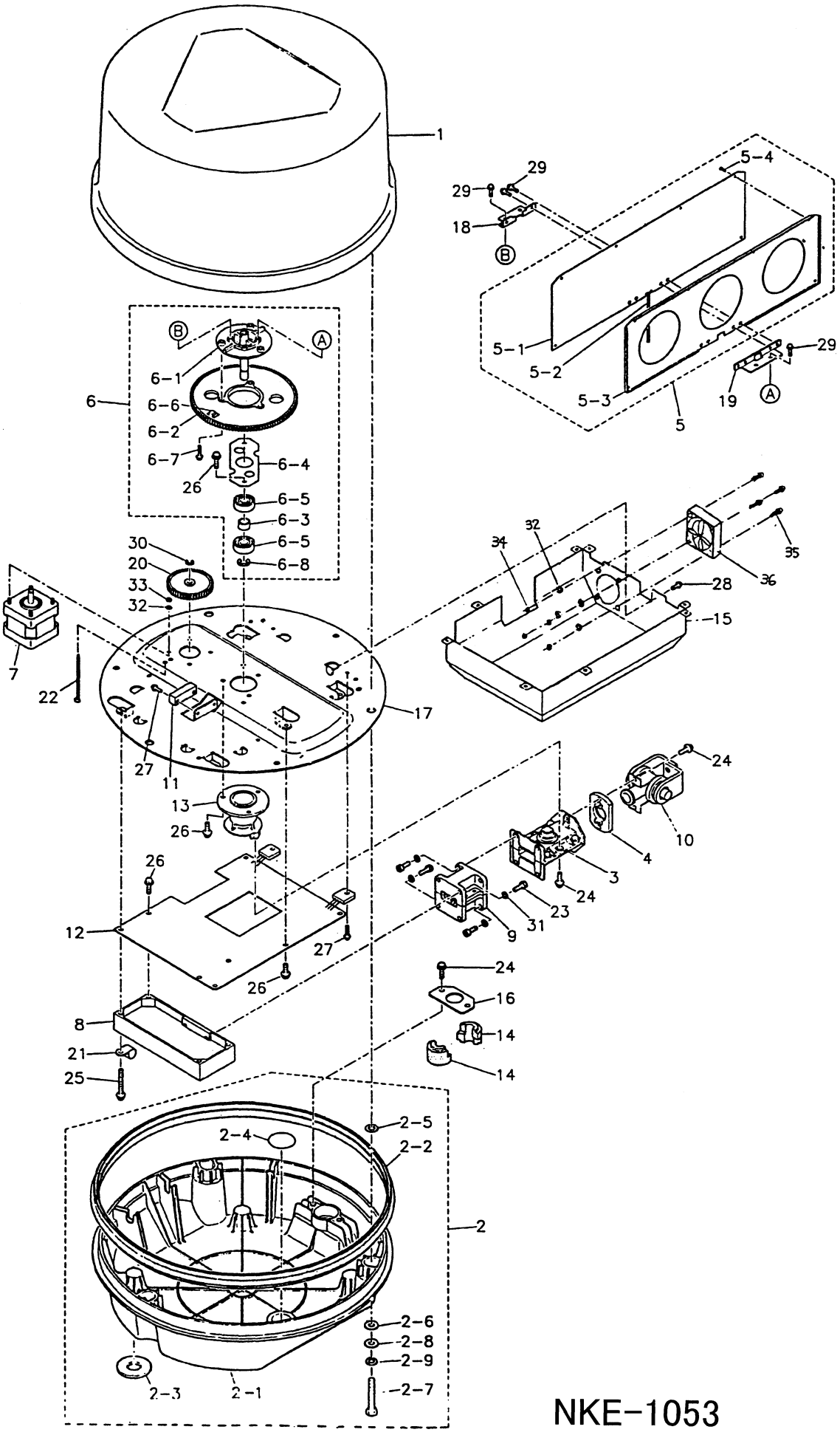
APPENDIX

RADAR 1000 MK II PARTS LIST

Description	Part No.	Drawing Fig. No.
Radome Scanner Unit	NKE-1053	105
Diode Limiter (A101)	5EZAA00033	105
Modulator/Receiver PCB	CMN-457	106
Motor Assy. (M101)	7BDRD0036B	105
Magnetron (V201)	5VMAA00073	105
SHM Switch	5KRAA00058	105
Display Unit	NCD-3717A	107
Main Control PCB	CMC-970	108, 109
Control PCB	CCK-773	110
LCD Module	-	107
Inter-unit Cable	CFQ-8768-15 (15m) CFQ-8571-10 (10m)*Option	- -
Console Mounting Screw	MPTG30380	-

ASSEMBLY DRAWING LIST NKE-1053 SCANNER UNIT		1／2
No.	Part Name	JRC Code No.
1	Upper Redome	MPBX34675
2	Lower Redome	MPBX34676
2-1	Lower Redome	MTV301807
2-2	Packing	MTT304033
2-3	Spacer	MTT304120
2-4	Air Hole Sheet	MPXP31079
2-5	Screw Washer	BRTG03255
2-6	Seal Washer	BRTG02490
2-7	Bolt (M6 x 40)	BRTG00930
2-8	Washer (W6)	BRTG00186
2-9	Spring Lock Washer (5W6)	BSSW06000S
3	Wave Guide	MPAB30674
4	Flange	MPAB30675
5	Radiation Parts	MPAE30161
5-1	Antenna PCB	7PCRD1422
5-2	Antenna Shaft	MTL307473
5-3	Fitting Board for PCB	MTD300768
5-4	Tapping Screw (2.6 x 8)	BRTG02286
6	Main Shaft Parts	MPGK30454
6-1	Main Shaft	MTC300593
6-2	Spur Gear	MTV301808
6-3	Spacer	MTL307435
6-4	Bearing Holding Board	MTD300782
6-5	Bearing	BRGK0S206
6-6	Magnet	5MPAB00001
6-7	Sems Screw (4 x 12) Steel	BSNC04012B
6-8	Snap Ring E—type (ER6)	BSER06000S
7	Motor	7BDRD0036B
8	MIC	5EZAA00031
9	Diode Limiter	5EZAA00033
10	Magnetron	5VMAA00073
11	Read switch	5KRAA00058
12	Modulator/Receiver PCB	CMN-457
13	Housing	MTC300566
14	Packing	MTT304162
15	Shield Cover	MTD300767
16	Holding Board	MTD300765
17	Foundation Bed	MTD300766
18	Holding Board 1 (for PCB)	MTD300780
19	Holding Board 2 (for PCB)	MTD300781
20	Spur Gear 2	MTV301839
21	Cramp	BRBP05336
22	Cramp	BRBP00131

ASSEMBLY DRAWING LIST NKE-1053 SCANNER UNIT		2／2
No.	Part Name	JRC Code No.
23	Bolt (M4xl2)	BRTG02093
24	Sems Screw (C-Type 4 x 12)	BSNC04012B
25	Sems Screw (C-Type 4 x 35)	BSNC04035B
26	Sems Screw (C-Type 4 x 8)	BSNC04008B
27	Sems Screw (C-type 3 x 12)	BSNC03012B
28	Screw With Flange	BRTG06040
29	Sems Screw (C-Type 3 x 6)	BSNC03006S
30	Snap Ring E-type	BSER04000S
31	Spring Lock Washer	BSSW04000S
32	Spring Lock Washer	BSSW03000S
33	Nut	BSLW03000S
34	Nut	BSLN03000B
35	Screw	BSNK03012B
36	Fan	-


1
29
29
18
B
5-4
5-1
5-2
5-3
19
A
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B
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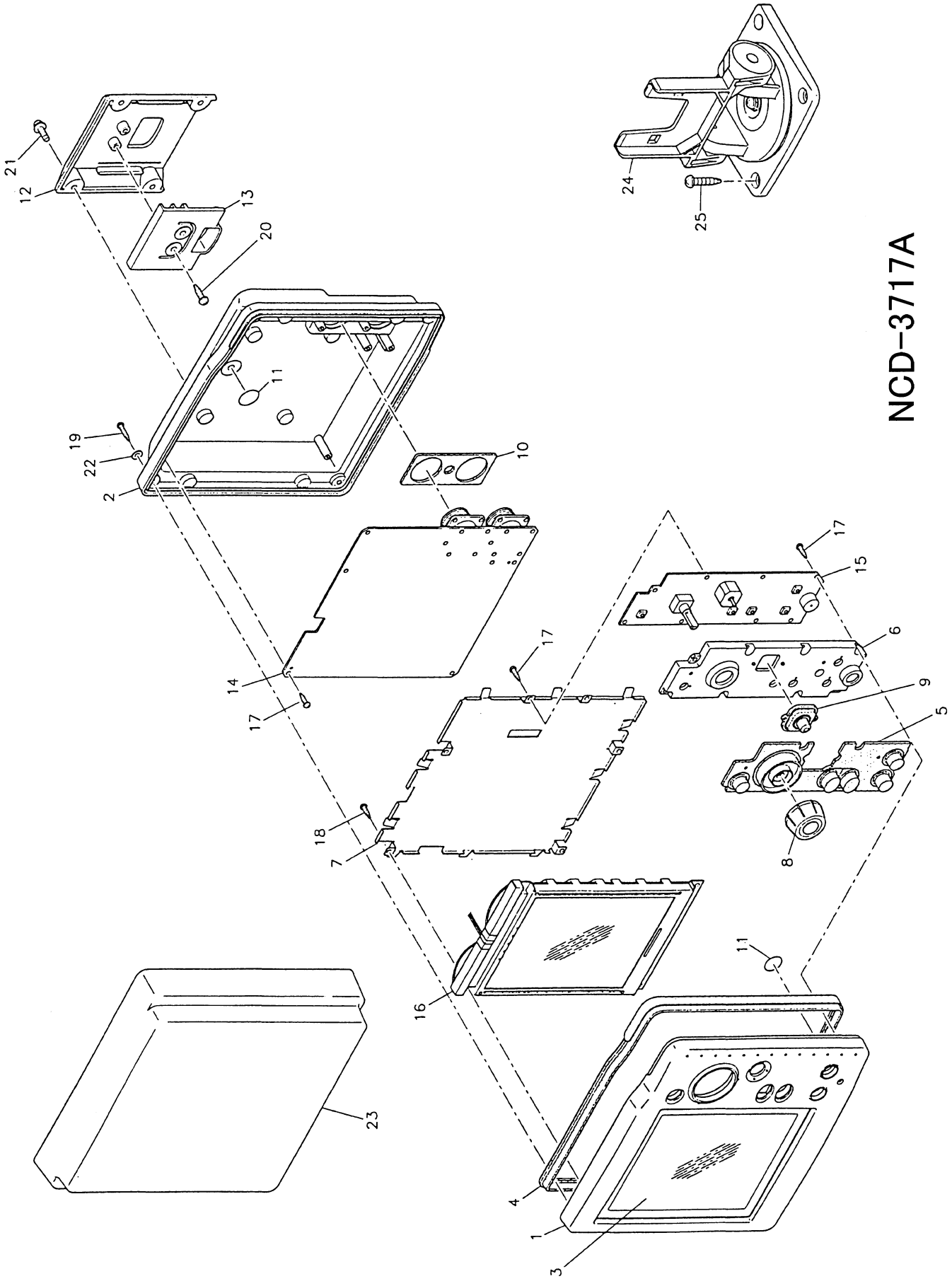
NKE-1053

ASSEMBLY DRAWING LIST NCD-3717A DISPLAY UNIT		1／1
No.	Part Name	JRC Code No.
1	Front Panel	MTV303720
2	Rear Cover	MTV303721
3	Panel Filter	MTT308713
4	Panel Gasket	MTV303723
5	Contact Rubber	MTV303724
6	Light Guide	MTV301799
7	Sealed Case	14TD300753
8	Dial	MPHD30171
9	Cap	MPPK30372
10	Packing	MTT304002
11	Waterproof Sheet	MPXP30307
12	Cover	MTV303727
13	Hook Board	MTV303728
14	PCB	CMC-970
15	PCB	CCK-773
16	LCD Module	-
17	Tapping Screw (3 x 12 BS)	BRTG03233
18	Tapping Screw (3 x 8 BS)	BRTG02970
19	Tapping Screw (3 x 16 SUS)	BRTG04818
20	Tapping Screw (4 x 8 SUS)	BRTG05965
21	Screw (M4 x 8 SW W SUS)	BSNC04008B
22	Rubber Washer	MTT301458A
23	Sun Cover	MTV303722
24	Bracket	MPBX39815
25	Tapping Screw (5 x 20 SUS)	MPTG30149


NCD-3717A
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LIST OF SCHEMATIC DRAWINGS

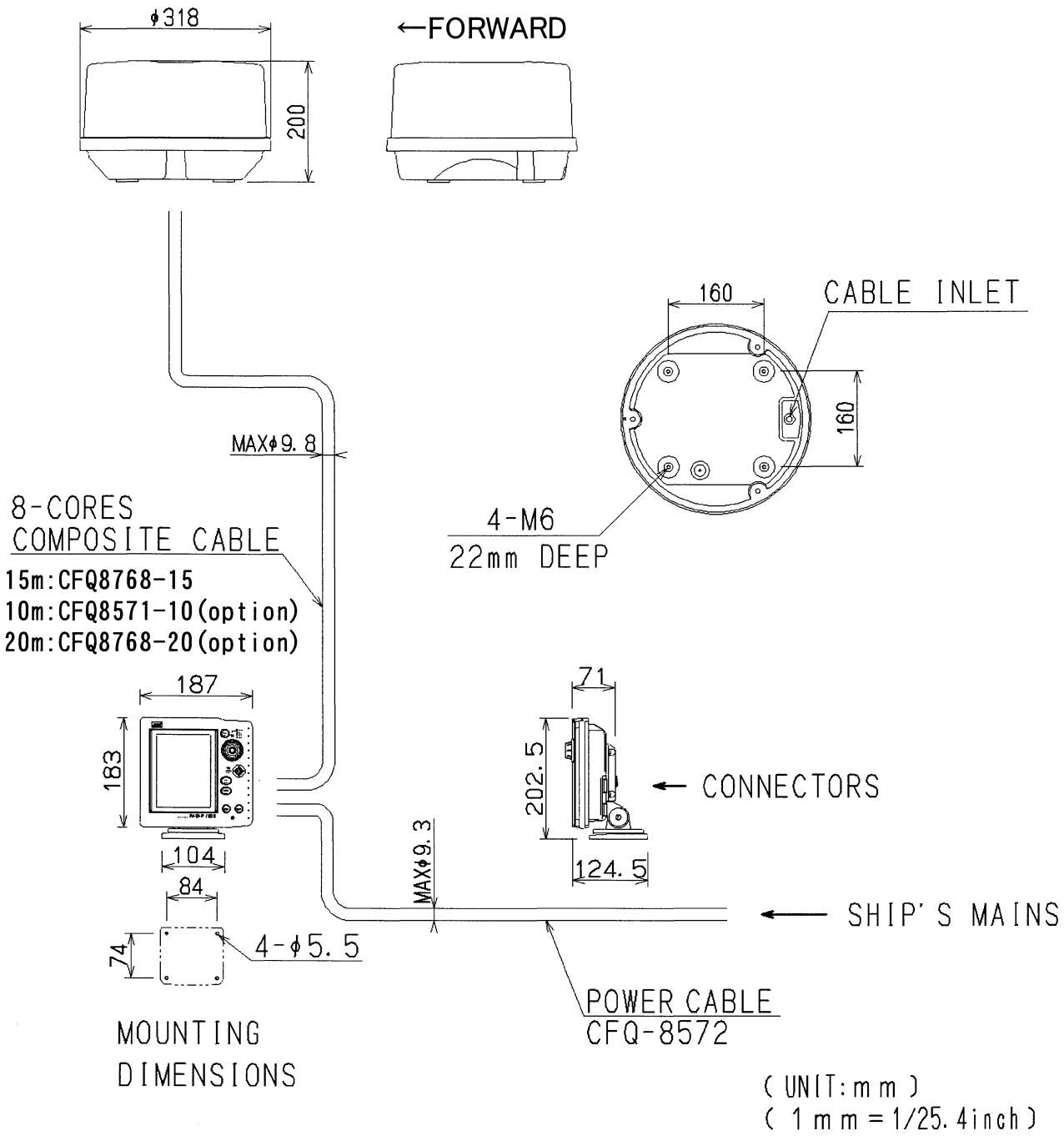


Fig. 101 General System Diagram

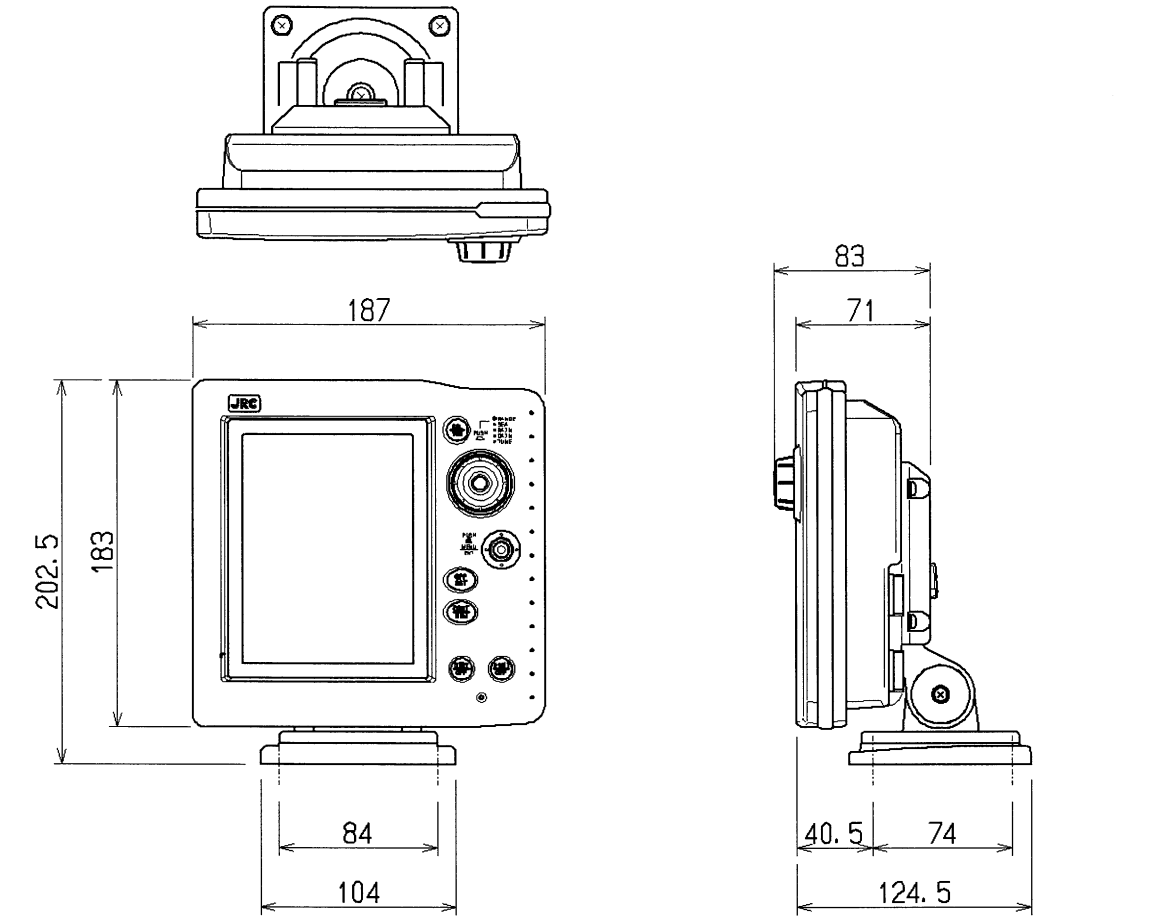


Fig. 102 Display Mounting Dimensions

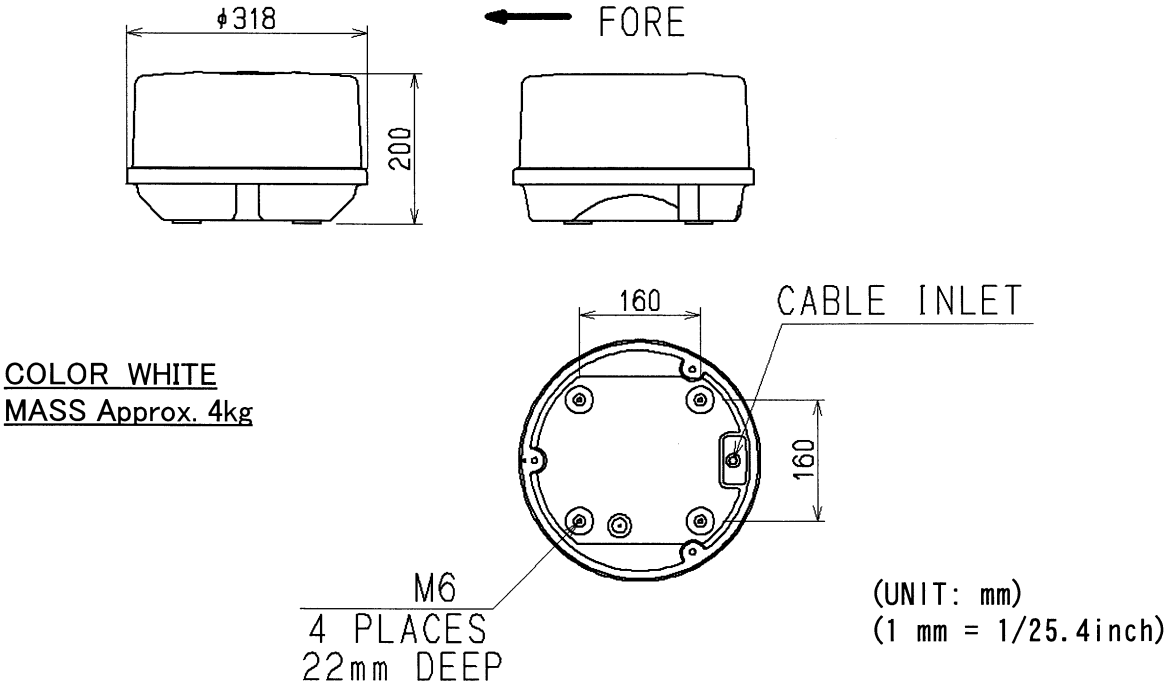


Fig. 103 Scanner Mounting Dimensions

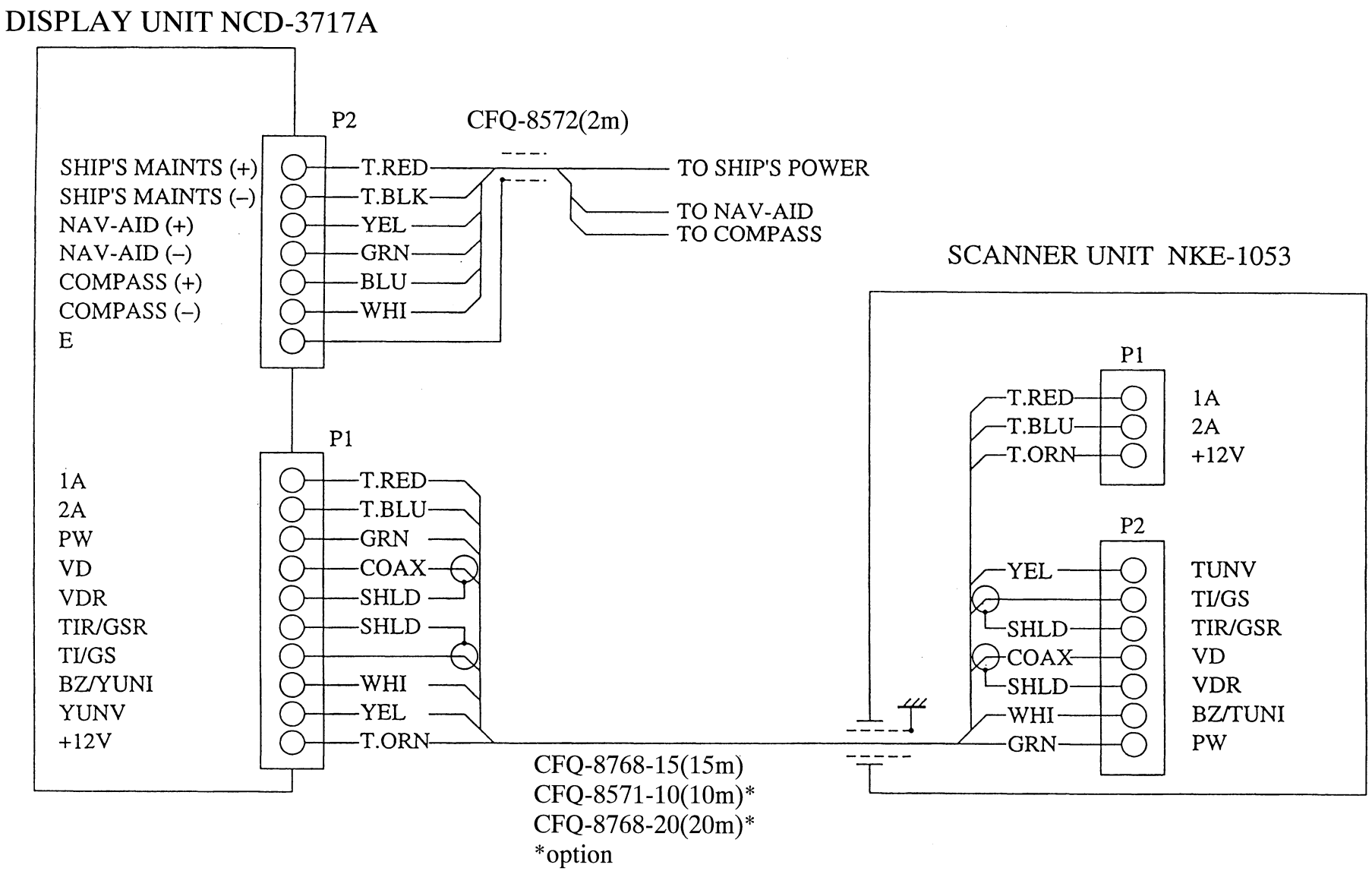


Fig.104 Interconnection Diagram

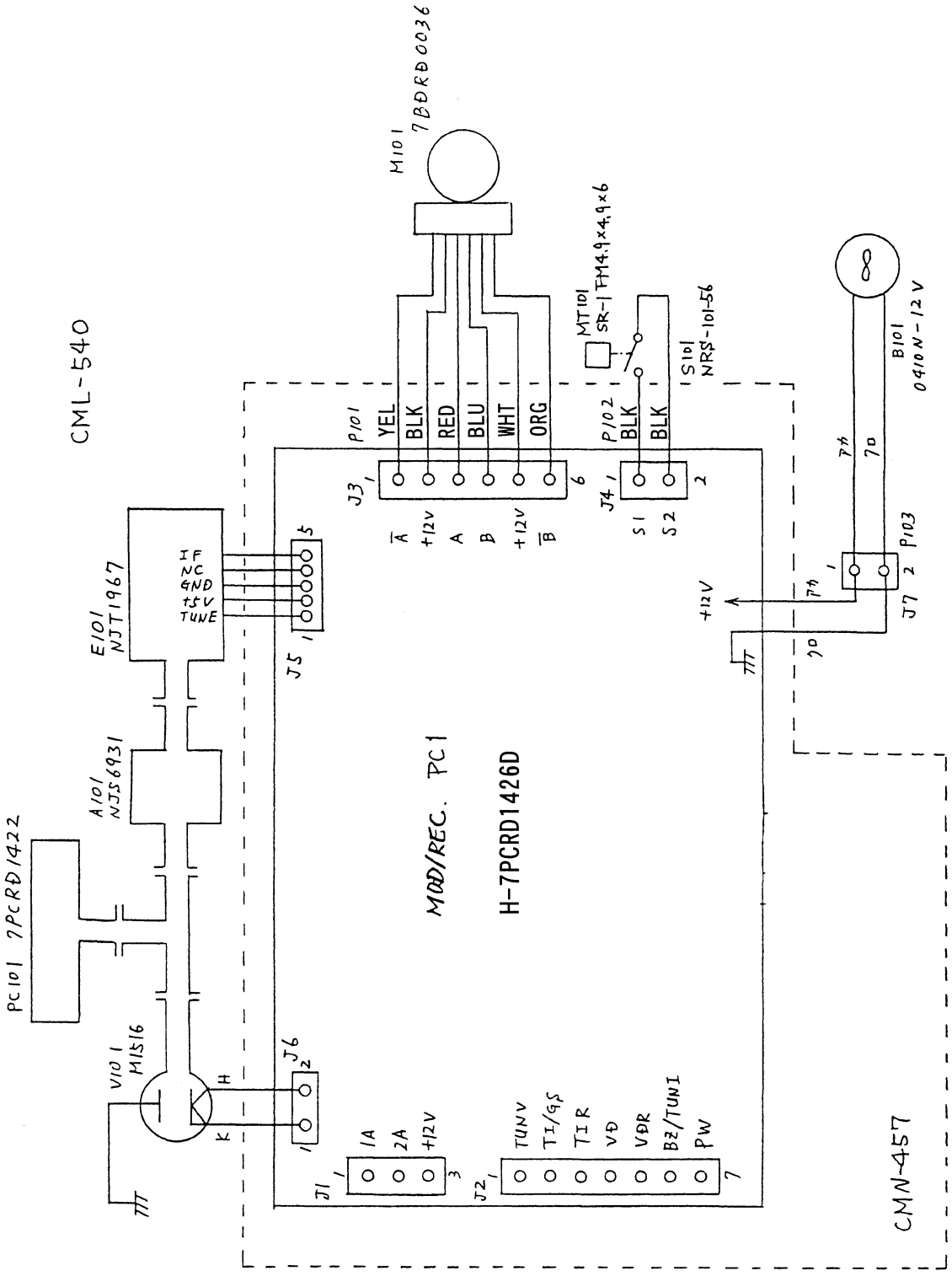


Fig.105 NKE-1053 Scanner Unit
Internal Connection

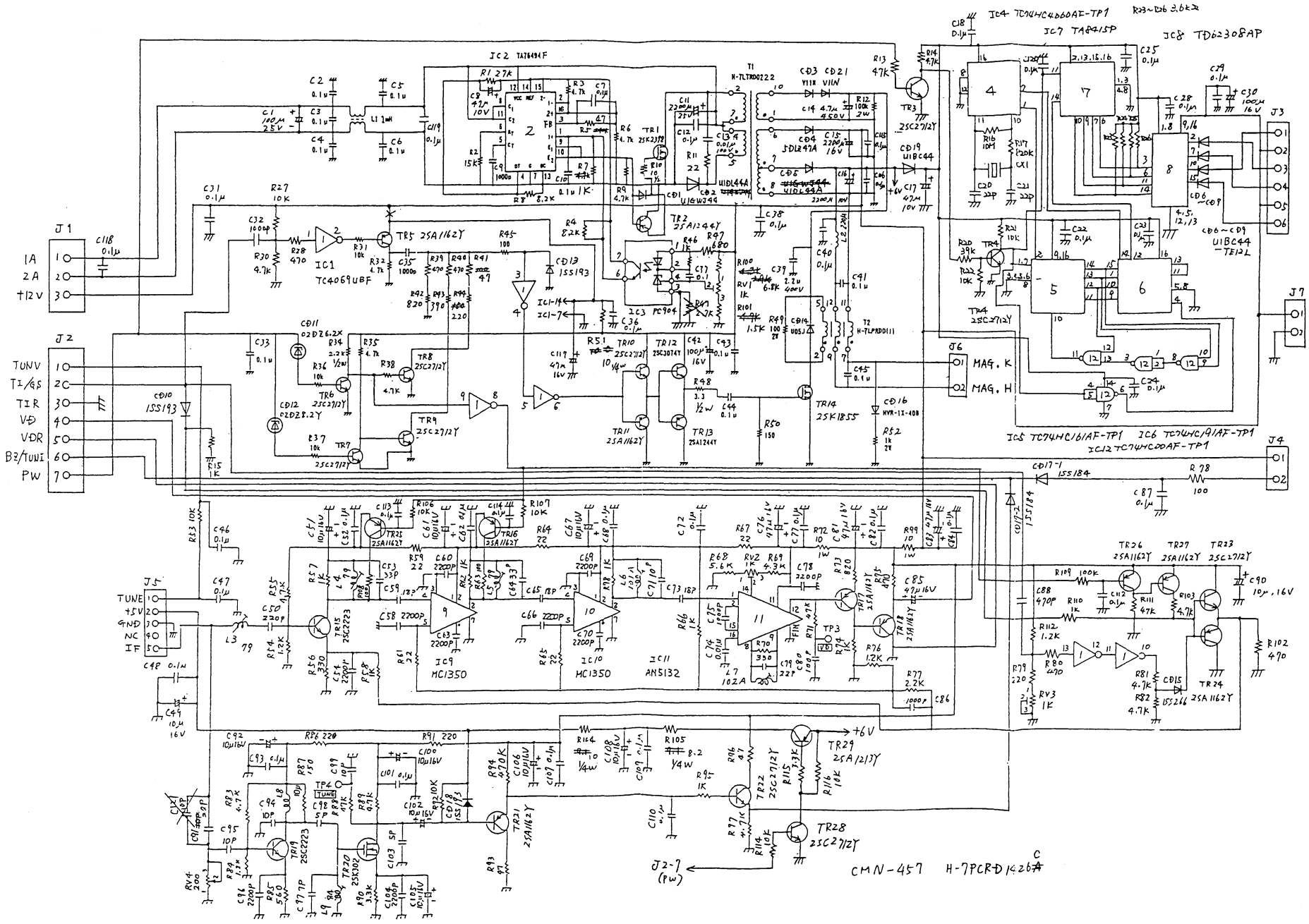


Fig. 106 CMN-457 Modulator/Receiver

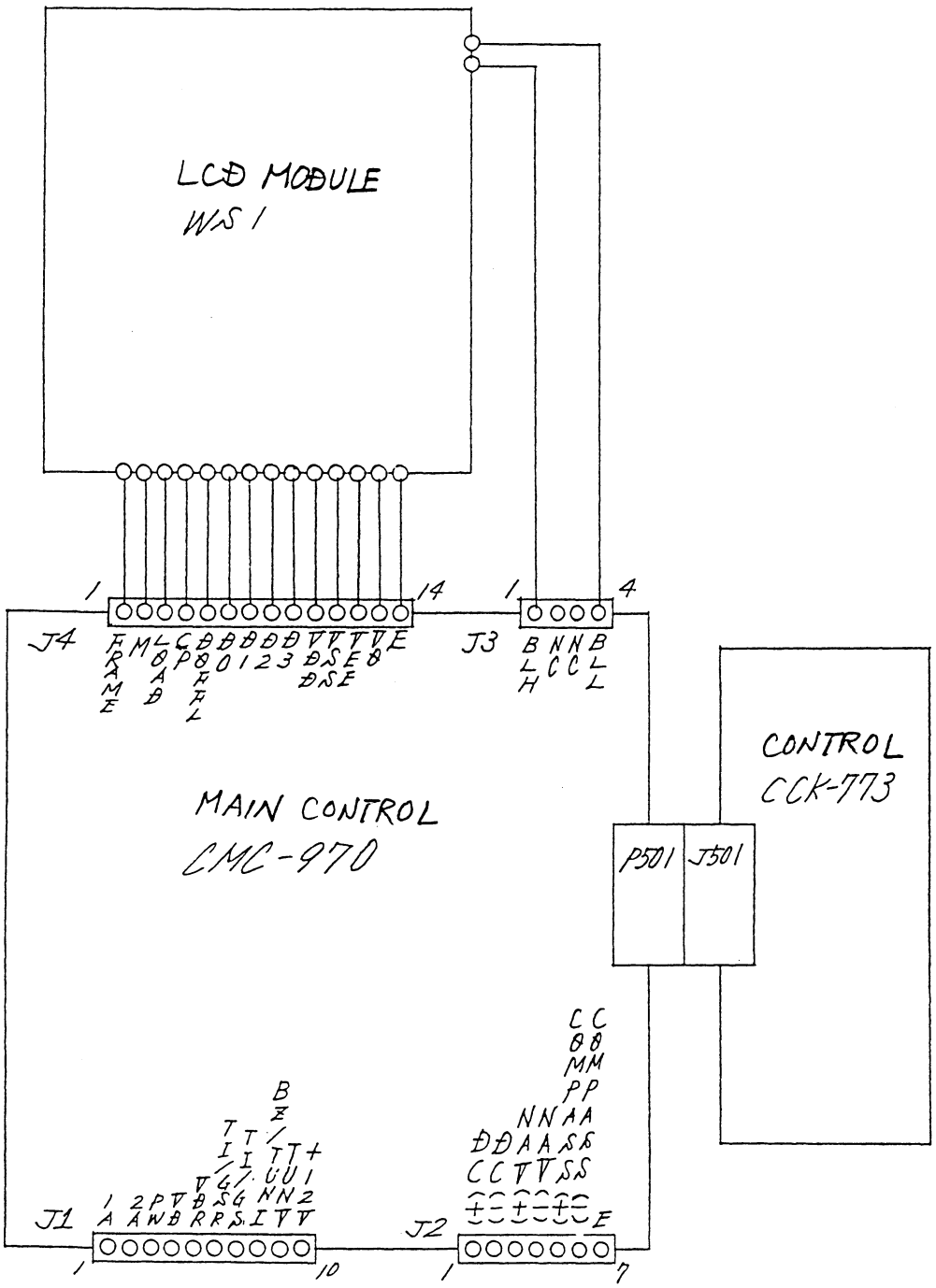
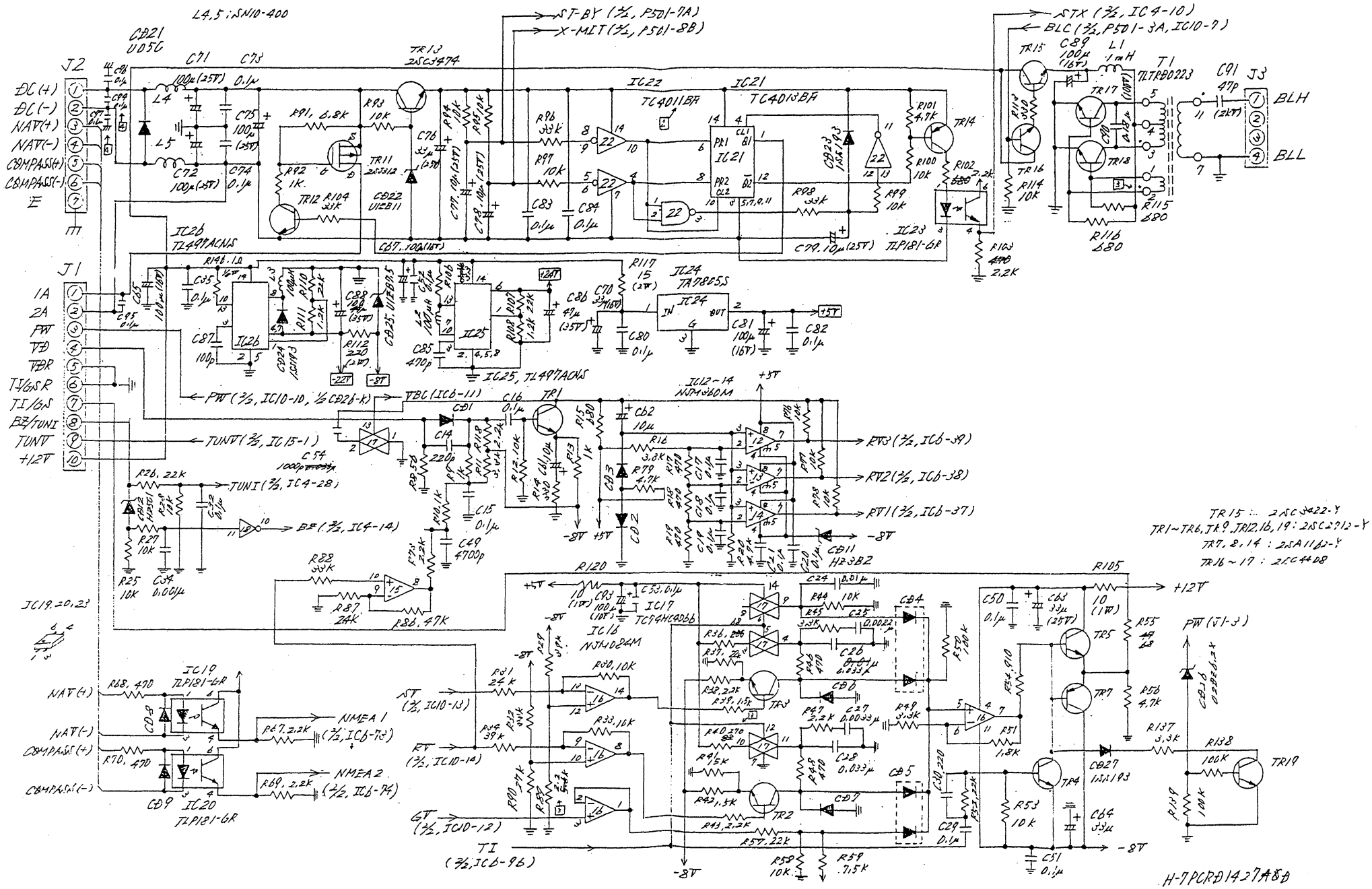


Fig.107 NCD-3717A Display Unit
Internal Connection


L4,5 : SN10-400
ST-BY (3/2, P501-7A)
X-MIT (3/2, P501-8B)
STX (3/2, IC4-10)
BLC (3/2, P501-3A, IC10-9)
J2
J1
J3
BLH
BLL
IC22 TC4011BP
IC21 TC4013BP
IC26 TL497ACNS
IC25, TL497ACNS
IC24 TA78055
IC23 TLP181-GR
IC19 TLP181-GR
IC20 TLP181-GR
IC12-14 NJM4580M
IC16 NJM4024M
IC17 TC74HC4066
IC19,20,23
TR15 : 2SC3422-Y
TR1~TR6, TR9, TR12, 16, 19 : 2SC2712-Y
TR7, 8, 14 : 2SA1162-Y
TR16~17 : 2SC4408
H-7PCRD1427A8B
Fig. 108 CMC-970 Main Control (1/2)

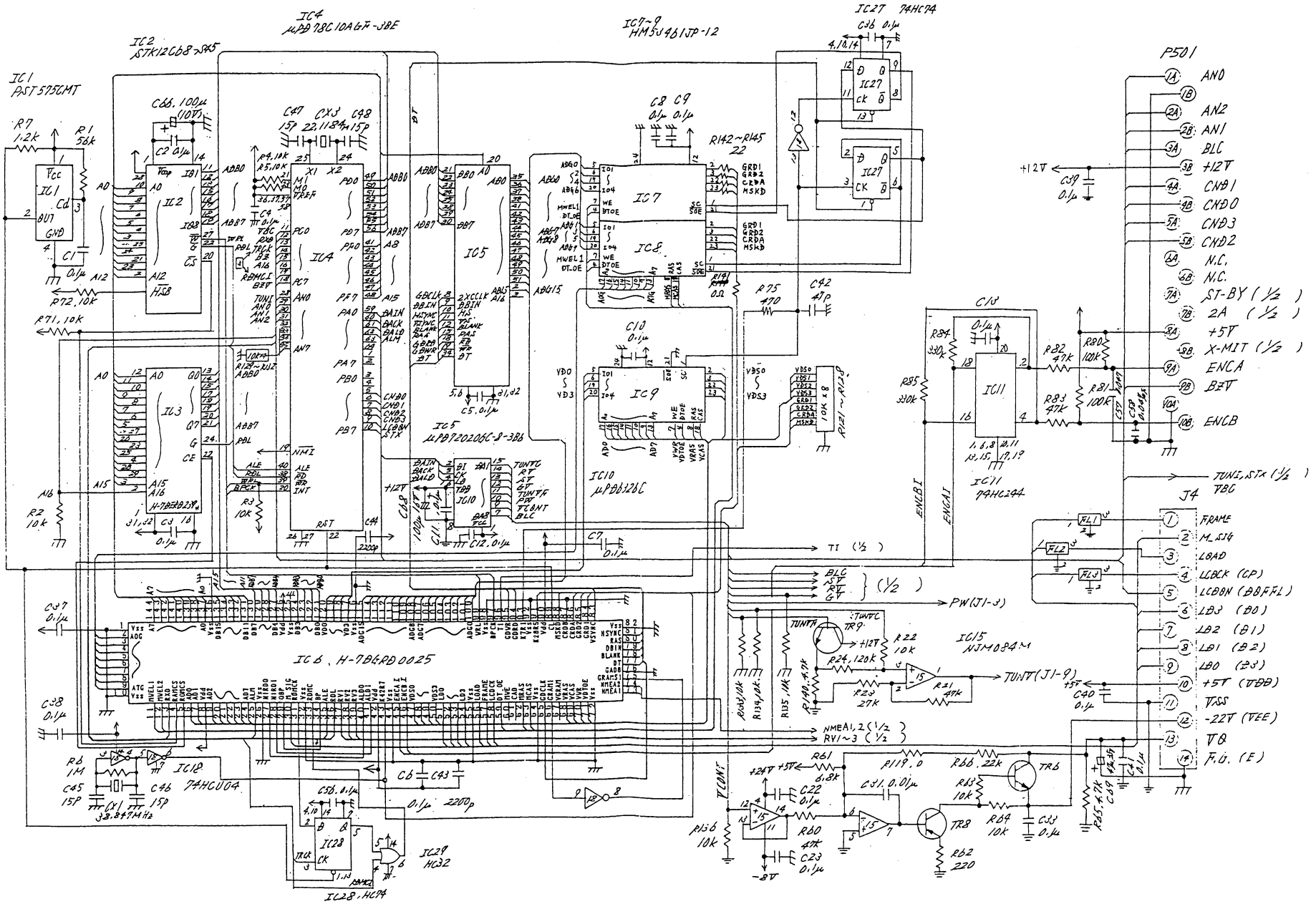
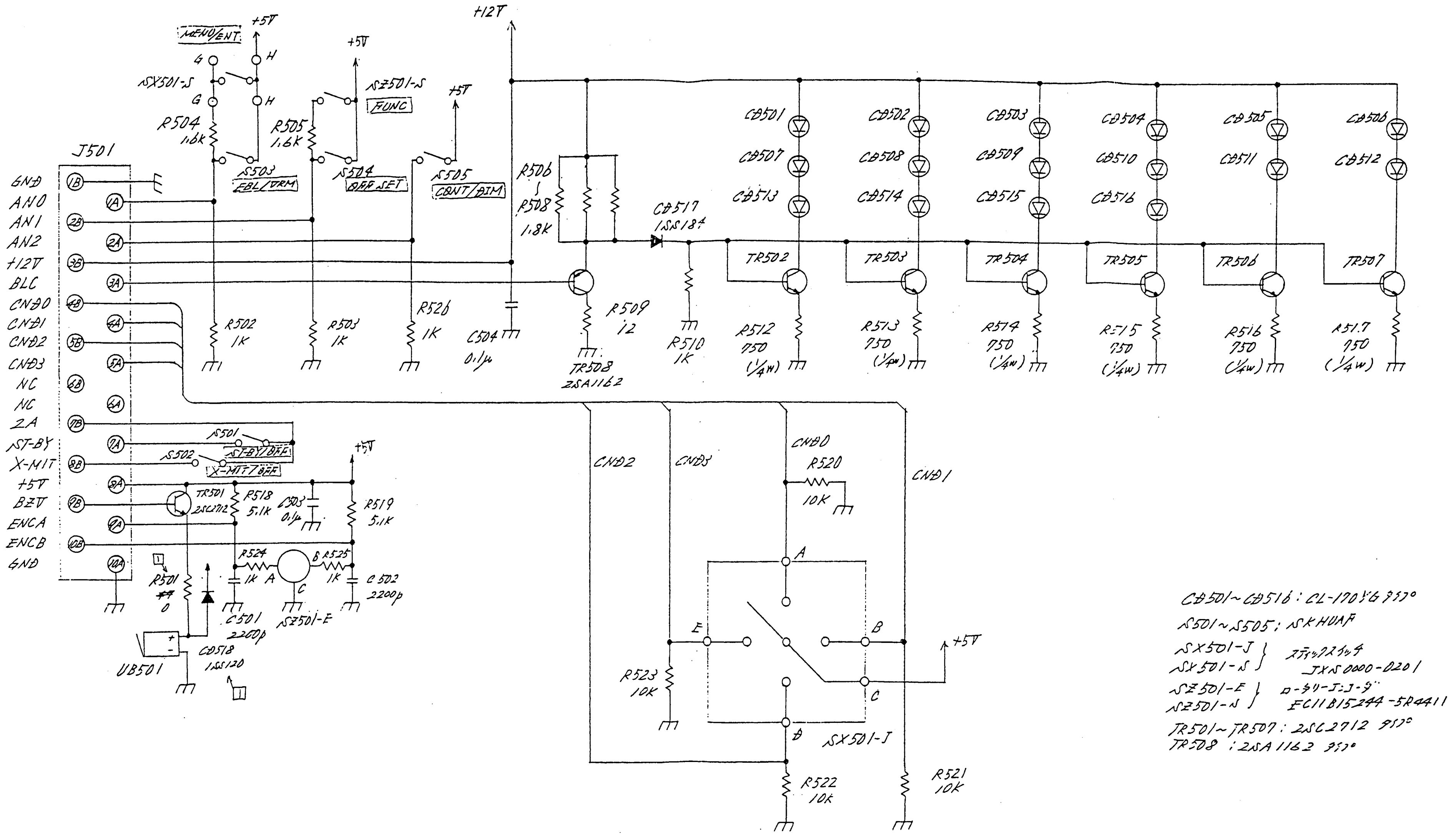


Fig. 109 CMC-970 Main Control (2/2)



H-7PCRD1430A

Fig. 110 CCK-773 Control

For further information contact:

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