FURUNO

SERVICE MANUAL

COLOR VIDEO SOUNDER

MODEL FCV-581/281

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(TAMI) FCV-581/281

Table of Contents

PREFACE

This service manual is applicable to both the FCV-581 and FCV-281 Color Video Sounders. The differences between these two models are as follows.

Model	Display Size & Power Supply	Circuit Board				
		MAIN Board	CON Board	PNL1 Board	PNL2 Board	Color Monitor
FCV-581	8" CRT, 10.5 - 30Vdc (approx. 20W)	02P6127	02P6130	02P6126	02P6129	02P6128
FCV-281	10" CRT, 10.5 - 40Vdc (approx. 40W)	02P6144		02P6145	02P6146	PD582C

CHAPTER 1. CIRCUIT DESCRIPTION

1.1 SYSTEM OVERVIEW

The FCV-581 color video sounder is composed of major blocks shown in the system diagram on page 1-2. The MAIN board includes microprocessor and specially designed Gate Array (1) and (2) for enhanced processing speed.

The Gate Array (1) is designed for E/S data processing. The major functions are reading operator command from the panel keys and controls, arithmetic processing of echo data and acquiring ship's speed and temperature. The flow of echo data processing is modified employing the DMA (Direct Memory Access) devices.

The Gate Array (2) is designed for displaying echoes on the color monitor.

1.2 TRANSMISSION

1.2.1 Keying Pulse (KP) Control Circuit

The KP to drive the transmitter circuit is generated in the KP control circuit contained in the Gate Array (1) as soon as the echo data processing for the preceding transmission is completed. This KP is modulated with the transmission carrier signals and the resultant TX0 and TX1 are output at the port of #73 and #74. The carrier signals on TX0 and TX1 are out of phase 180 degree each other.

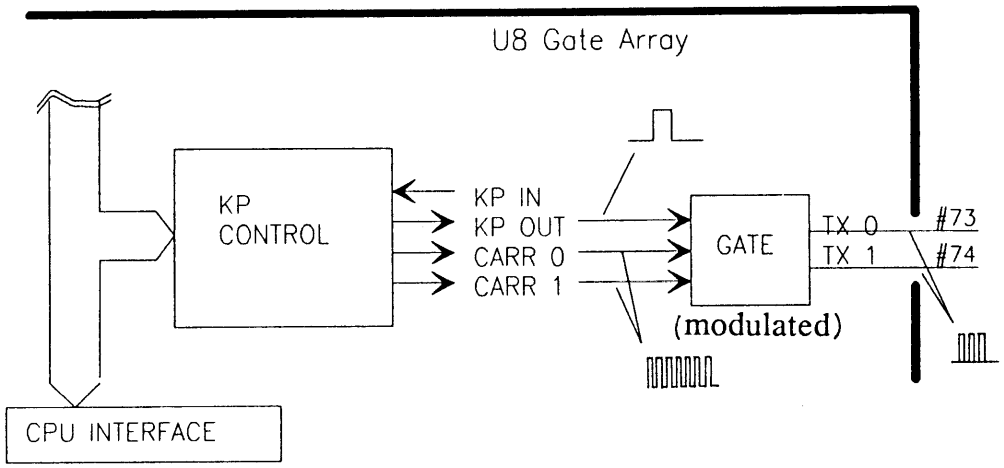


Fig 1.1 KP Control circuit

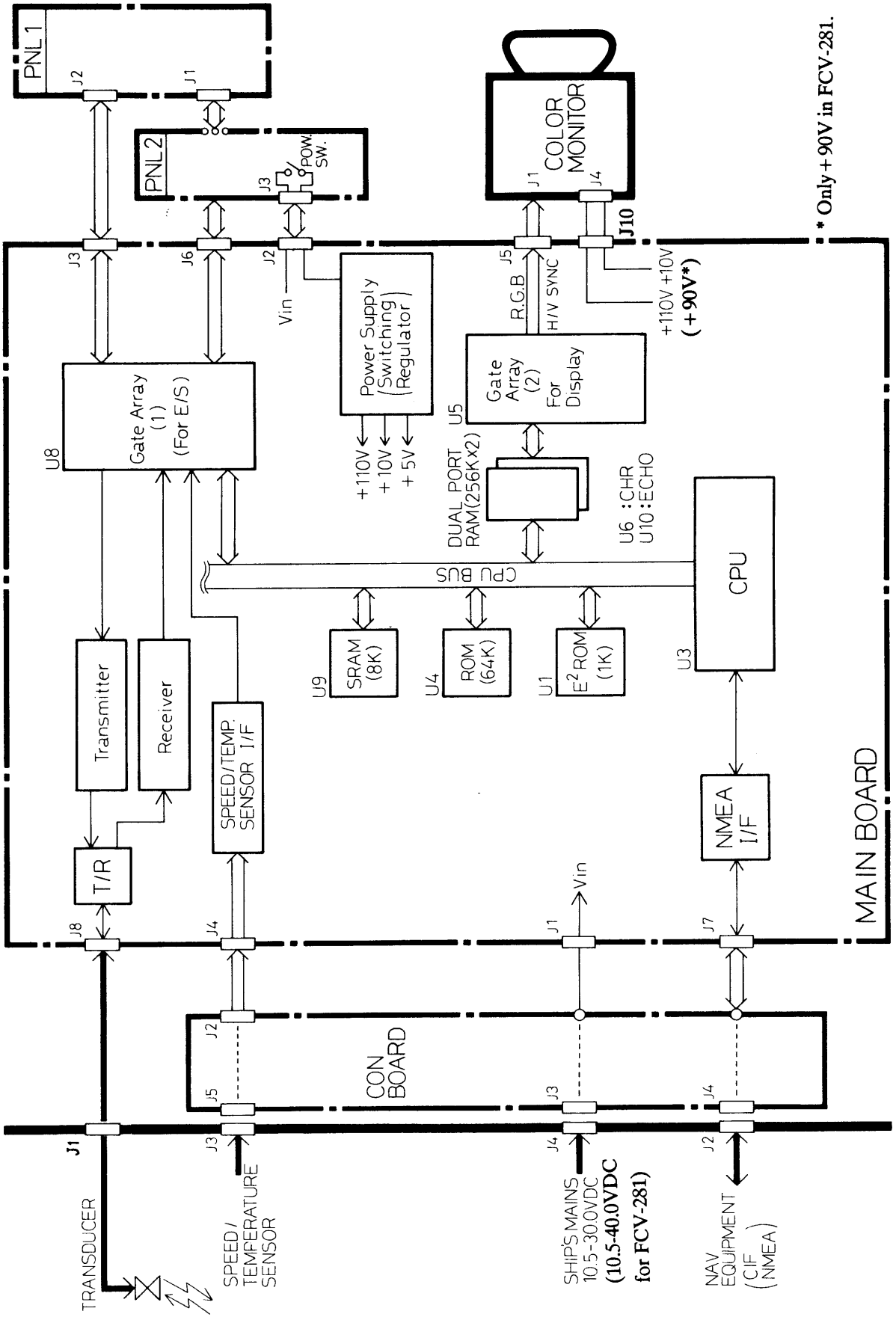


Fig 1.2 FCV-581/281 SYSTEM DIAGRAM

1.2.2 Transmission Circuit

TX0 and TX1 from the Gate Array (1) are amplified in the push-pull power amplifier and applied to the transducer through transformer T3 and the T/R circuit. Dual MOS FET driver U18 functions to drive the succeeding (high capacitive impedance) power amplifier. The output power is CPU-controlled according to the setting on the system menu (MAX, MID and MIN). See figure below.

Output Power Control

	OPC0	OPC1
Max	1	0
Mid	0	1
Min	1	1

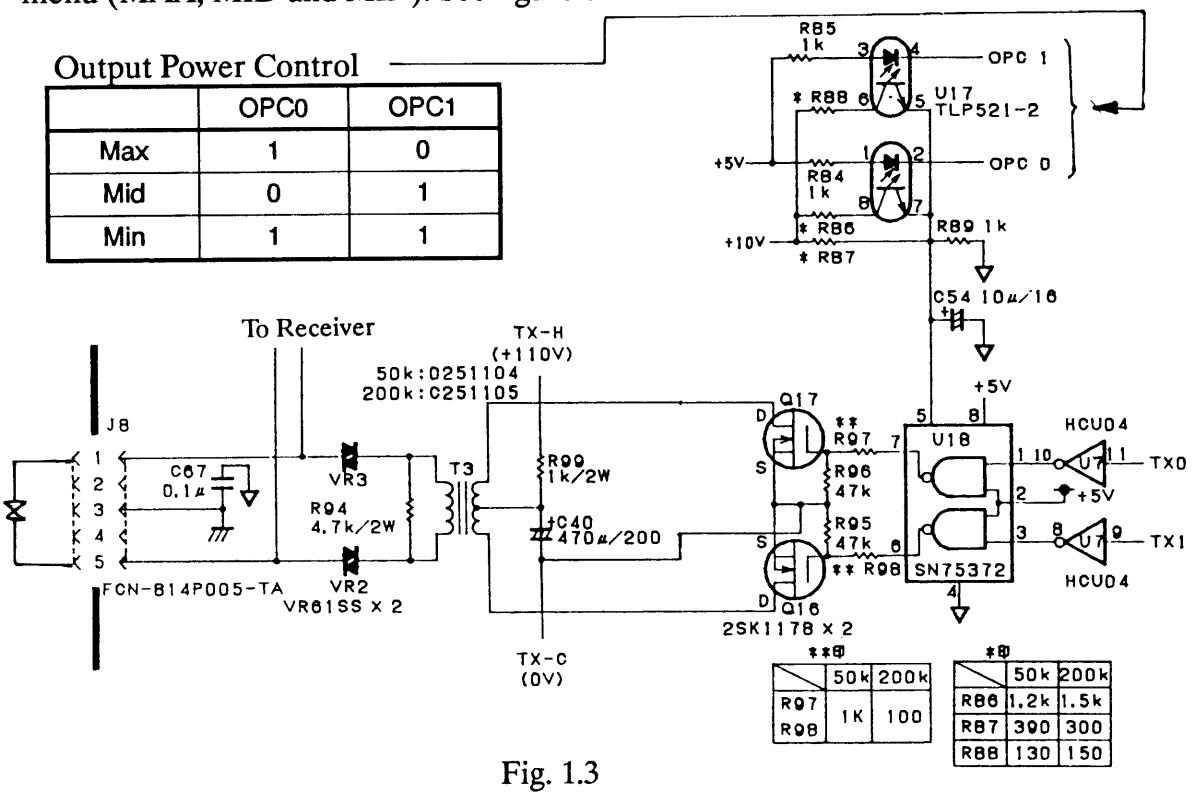
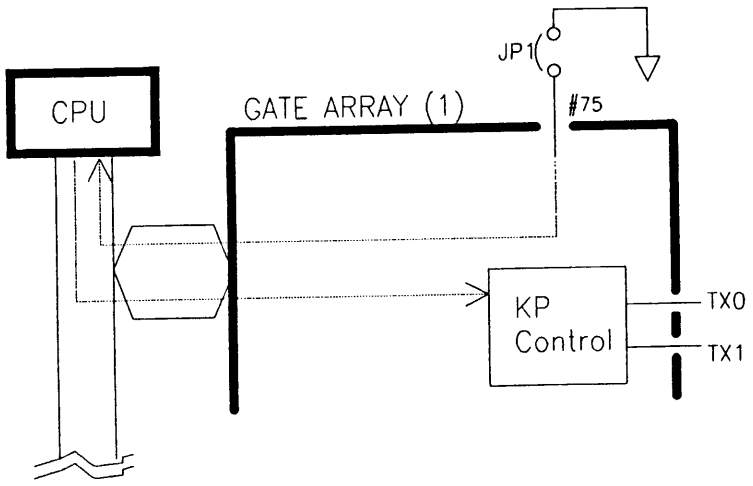


Fig. 1.3

***Recognition of Transceiver Frequency by the CPU**

Jumper JP1 on the MAIN board sets the transceiver frequency as follows. When turning on the equipment, CPU recognizes the frequency from the jumper setting and control program for that frequency starts.



Freq.	JP1
50kHz	Short
200kHz	Open

Fig. 1.4

1.3 RECEPTION

1.3.1 Receiving Circuit

The received signal from the transducer is amplified by preamplifier Q14 and Main amplifier. The main amplifier has a wide dynamic range and the gain of 110dB approx. The amplified signal is fed to the Gate Array (1).

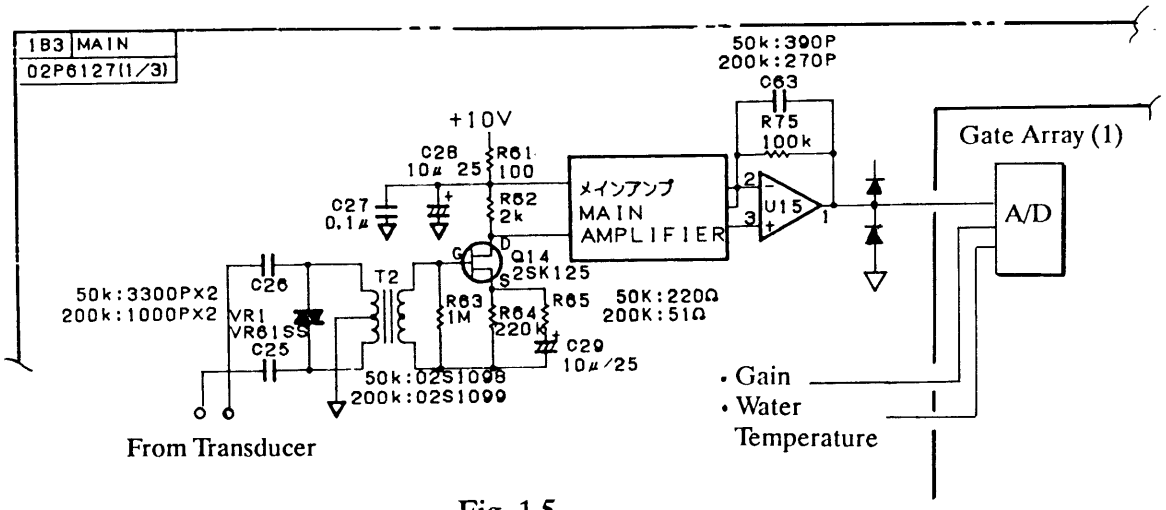


Fig. 1.5

AD Converter/GAIN Control

The amplified echo signals fed to Gate Array (1) are AD converted to 8 bit digital echo data at each sampling point. The AD converter used for this is used also for AD conversion of the gain control voltage and the water temperature data from the sensor.

1.3.2 Echo Data Acquisition

The digital echo data in the output of the AD converter are peak-held at regular intervals, and the resultant data are stored into the CPU's SRAM.

1) Peak-hold

In the peak-hold processing, the peak level of signal is detected at regular intervals. If for example, there is a signal shown in Fig. 1.6 and if the signal is sampled at regular intervals, the level "A" is taken out in the period "1" and level "B" in the period "2" in order to prevent the signal from being missed due to a low signal level at a sampling point.

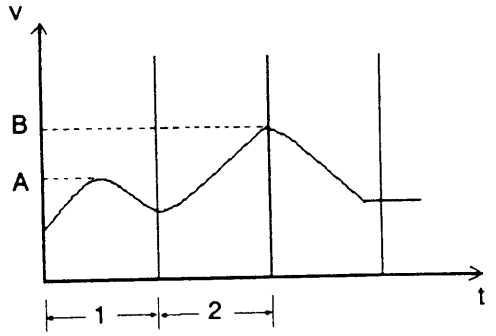


Fig. 1.6

The sampling rate is determined by the number of pixcells on the CRT, the depth range in use and the presentation mode.

The data acquisition control circuit determines how to store echo data considering depth range and range shift setting. With the range shift set at "0", the data acquisition is initiated with the KPI (#70 of Gate Array) signal which is produced at the same timing with KP. With the range shift set other than "0", the data acquisition start timing is delayed by the time equivalent to the shifted range.

For the bottom-lock expansion picture, the start depth from which the echo data is stored in the memory is determined by referring to the seabed depth data obtained in the previous cycle. If the depth and the depth range selection of the bottom-lock picture is known, the start depth is given by

$$\text{Acquisition start depth of bottom-lock expansion picture echo} = \left(\begin{array}{c}\text{Bottom depth obtained}\\ \text{in the last transmission}\end{array}\right) - \left(\begin{array}{c}\text{Bottom-lock}\\ \text{expansion range}\end{array}\right)$$

When the memory is full with data down to the desired depth, all data are transferred to the memory of the CPU for further processing.

1.3.3 Processing and Presentation

The echo data transferred to the memory of the CPU are processed further as follows.

A. Presentation and Seabed Recognition

The string of 8 bit echo data is led to the display data processing and seabed recognition processing circuits independently.

In the display data process, the echo data are converted to 16 presentation colors, where the threshold level of the echo to be displayed is determined by the gain and clutter settings. In the seabed recognition process, the seabed is detected considering propagation attenuation of sound in water, that is, it is detected by comparing target strengthes, not by comparing the levels of the received echoes.

Note: When the seabed can not be recognized because of a poor sensitivity, the change of the bottom recognition threshold level may be required. Refer to the appendix F.

B. Interference Rejection

The interference/noise have a nature to be received at random while echo signal is received consecutively at the same depth. To eliminate interference/noise components, the CPU correlates the new data string with previous ones for 2 to 4 successive transmission cycles.

C. Longitudinal Peak Hold Processing

If, for example, the display advance speed is at "1", the picture advances one line every two transmissions and therefore one string of echo data is necessary every two

transmissions. The computer compares each data in the same depth for two transmission cycles and selects the one with the peak level.

After all necessary processing have been performed, the echo data are transferred into the video RAM(dual port RAM) where all data are stored in the form and order ready for display on the screen.

Data in the video RAM are read out successively by the H/V counter that operates independently of the CPU, converted to the RGB signals in the gate array (1) and then sent to the color monitor display.

1.4 PANEL SWITCH STATUS READING

The switch status is read into the CPU on the MAIN board through Gate Array (1).

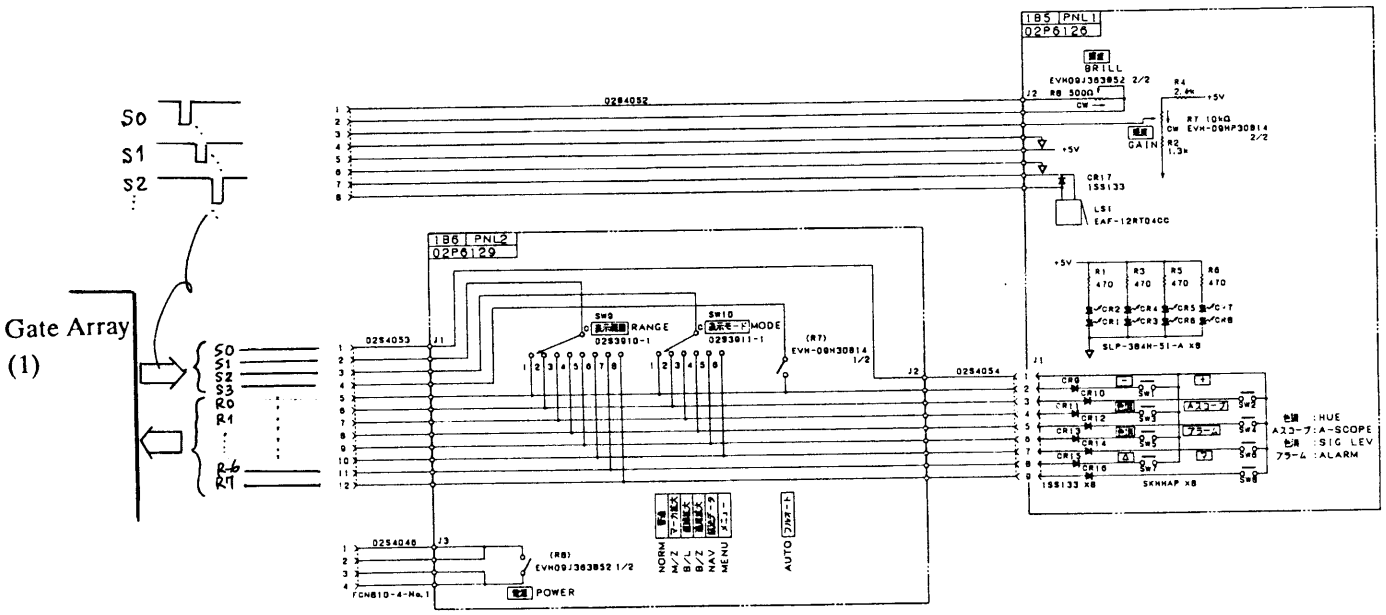


Fig. 1.7

The gate array (1) sends the LOW scan pulse sequentially from S0 - S3. S0 for keyboard scanning; S1 through S3 are for switch settings. The status of the keyboard and switches is recognized by checking the response pulse (R0 to R7). R0 to R3 are HIGH until a key is pressed. When a key is pressed, the output corresponding to the depressed key becomes low, permitting recognition of which contact is closed.

1.5 CIF/NMEA COMMUNICATION LINE

The FCV-581/281 can accept the following navigational data in either CIF or NMEA format. The sentences which can be input are as follows.

Input Data accepted	Output Data
a. $---RMB (Loran C, GPS, Transit, Decca, Omega Data)	a. $SDDBT (Depth of Water below Transducer)
b. $---BWC (Bearing and distance to selected waypoint, Great circle)	b. $YCMTW (Water Temperature in °C)
c. $---RMC (GPS, Transit Data)	c. $VWVHW (Heading and Ship's Speed)
d. $---RMA (Loran C Data)	
e. $---VTG (Actual Track and Ground Speed)	
f. $---GLL (Latitude/Longitude)	
g. $---VHW (Heading and Ship's Speed)	
h. $---MTW (Water Temperature in °C)	
i. $---XTE (Cross Track Error, measured)	

--- : Any Talker Identifier (Wild Card)

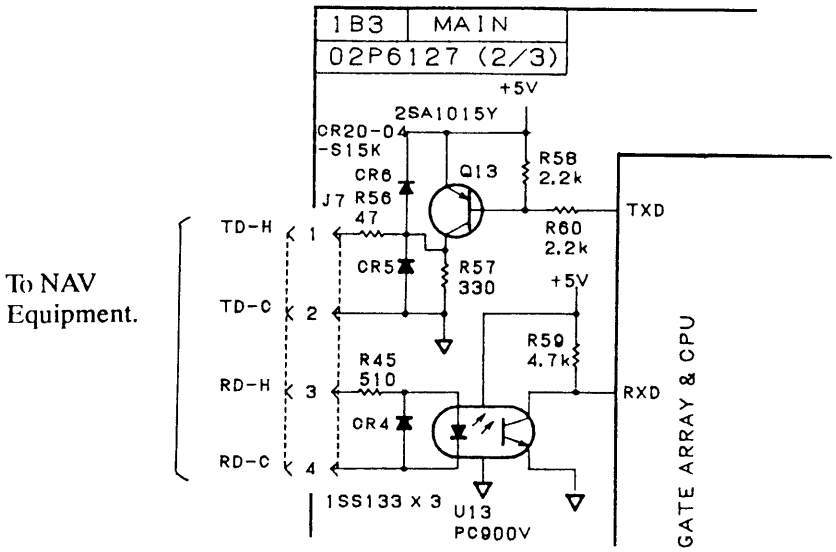


Fig. 1.8

NOTE:

1. CIF or NMEA format may be selected on the system menu.
2. The DTR and DSR lines are not used.

1.5.1 Data Displayed When Connected With Furuno Position Fixing Equipment

NMEA #183 Data Format

	L/L	Ship's Speed	Course	Waypoint ID	Range to Waypoint	Waypoint Bearing	Water temp.	XTE
LC-90MK2	O	O	O	O	O	O		O
LP-1000	O	O		O	O	O		
LP-1300	O	O		O	O	O	O*	
FSN-50	O	O						
GP-70/500	O	O	O	O	O	O		O
GP1500	O	O	O	O	O	O		O

* When LP-1300 is connected to temeperature indicator.

Furuno CIF Data Format

	L/L	Ship's Speed	Course	Waypoint ID	Range to Waypoint	Waypoint Bearing	Water temp.	XTE
LC-90MK2	O	O	O	O	O	O		
LP-1000	O	O	O	O	O	O		
LP-1300	O	O	O	O	O	O	O*	
FSN-50	O	O	O	O	O	O		
GP-70/500	O	O	O	O	O	O		
GP1500	O	O	O	O	O	O		

* When LP-1300 is connected to temperature indicator.

1.6 TEMPERATURE/SPEED SENSOR

Speed data (SPC) is detected as a pulse number and applied to Gate Array U8 via Q2. CPU calculates the speed through the counter and timer in U8. Indication error caused by the variation of the sensor characteristics can be compensated on the menu screen.

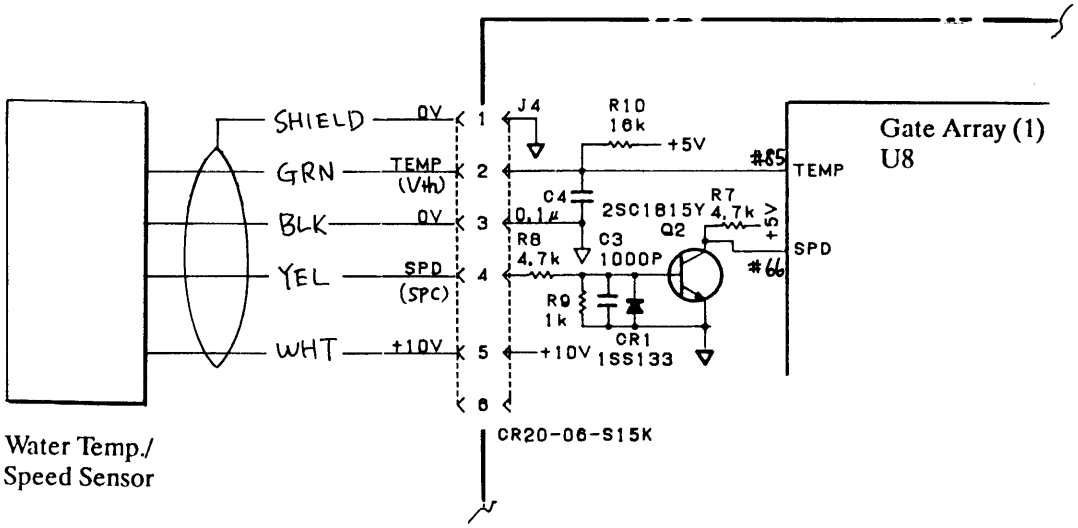


Fig. 1.9

Temperature data (Vth) is detected in resistance and applied to the same Gate Array U8 #85 pin, where it is processed and acknowledged by CPU.

1.7 POWER SUPPLY CIRCUIT

The power supply circuit is made up of a PWM (Pulse Width Modulation) inverter employing switching regulator technique. The PWM inverter universally operates on ship's mains of 10.5 to 30*Vdc. Against the vibration of the mains voltage and load condition, it regulates the dc output line by changing the width of its output pulse. The power supply circuit provides +110V**(for TX/monitor), +10V and +5V.

*(*40Vdc and **+90V for FCV-281)*

1.7.1 Switching Regulator (U11, uPC494C)

The PWM modulation in U11 is done by comparing the control voltage (Vc) and the sawtooth wave produced at the reference osc. terminal Ct (PWM comparator in the Fig.1.20). When the sawtooth wave level exceeds the control voltage, output transistors Q1 and Q2 turn on.

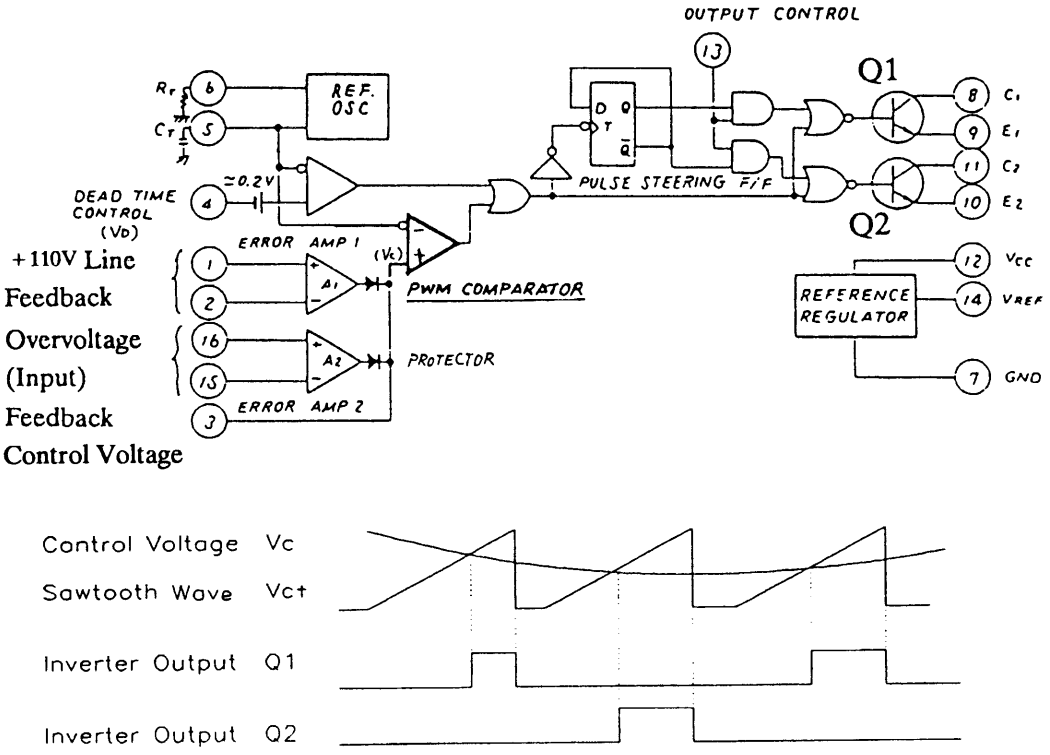
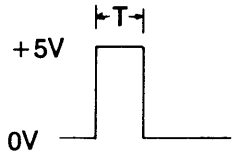
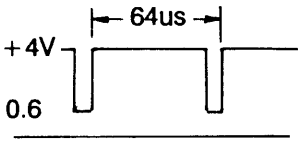


Fig. 1.20

The dc output voltage is regulated by monitoring +110V line voltage. If the +110V line voltage changes, the voltage at " + " input of PWM comparator changes, resulting that the slice level of the sawtooth wave moves as above. As the control voltage increases, the output pulselength decreases. Fig.1.20 illustrates this operation.
If the current is over-consumed in the TX monitor block, the over current protector circuit on the +110V line cuts the regulator output.

CHAPTER 2. TECHNICAL DATA

2.1 MAIN BOARD (02P6127)

Test Point	Ratings	Remarks
+110V (+90V) +10V +5V	100-120V (87-93V) 10.0-10.4V 4.75-5.25V	For FCV-581 monitor (For FCV-281 monitor)
KP (Keying Pulse)		T: Pulselength (0.2-3.6ms) depends on range setting.
SIG		
C-SYN		(Not used.)
H-SYN		
A-GND D-GND P-GND		A(nalog circuit)-GND D(igital circuit)-GND P(ower circuit)-GND

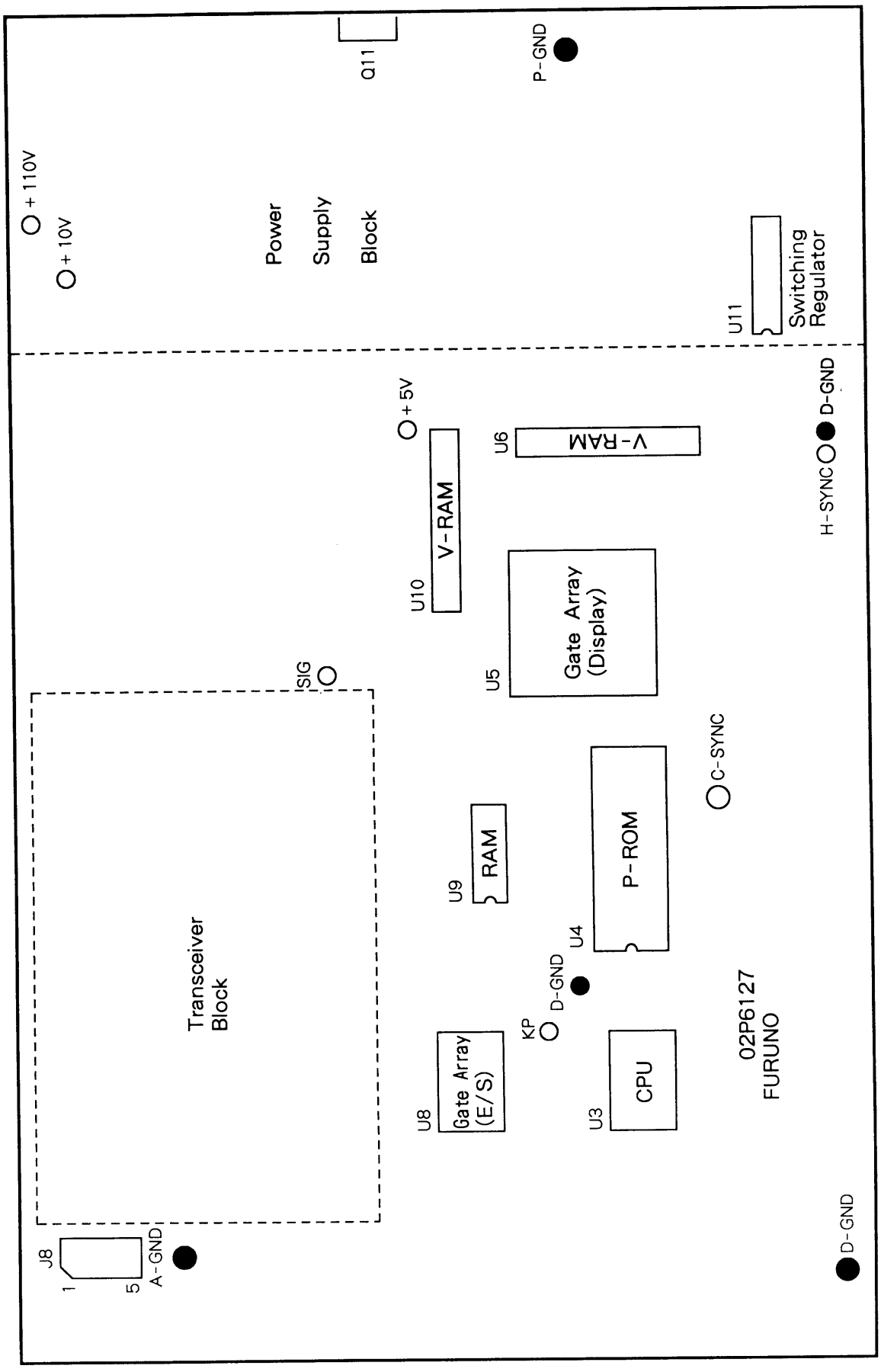
2.2 TRANSMITTER OUTPUT VOLTAGE

The output voltage is tabulated below. The voltage can be checked with or without connecting transducer.

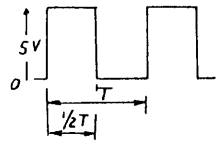
Freq.	Measuring Point	Rated Voltage
50kHz	J1 #3-#5 (J8 #1-#5)	400 - 1150Vp-p* (No power reduction)
200kHz		400 - 1150Vp-p* (No power reduction)

*: Varies with the transducer impedance and the measuring point of the transmission pulse.

Measureing(Test) Point Location



2.3 TEMPERATURE/SPEED SENSOR DATA

Item	Output	Checking method and the reference value
Ship's Speed (SPC)	Pulse 	Connect an oscilloscope or LED between #4 and #1 on the J4 and rotate the sensor wheel by finger or breath. If the pulse wave is observed or the LED lights, the sensor is normal. [Reference Value] 10 knots---55pps approx. 20knots---109 pps approx.
Water Temperature (Vth)	Resistance	Output is checked in resistance. Unplug the 6P connector of the sensor; and then measure the resistance between #2 and #1 by a multimeter. [Reference Value] 0°C---32.7k ohms approx. 10°C---19.9k ohms approx. 25°C---10.0k ohms approx. 30°C---8.05k ohms approx.

2.4 TRANSDUCER DATA

The transducers used in FCV-581/281 are made of barium titanate (Batio3) and equivalent to the capacitor electrically.

2.4.1 Insulation

The insulation resistance between the shield and each conductor of the transducer cable is the first place to check to determine if the transducer itself is defective. A megger (500Vdc) is used for this check.
Rated Value: 10MΩ or more

2.4.2 Capacitance Measurement

This method is based on the fact that the transducers are equivalent to the capacitor electrically. Therefore the checking method is same as that for capacitance check, using a capacitance meter or a multimeter. If the transducer itself is not defective, check the cable for discontinuity. This also can be checked by measuring the capacitance. The normal capacitance for each transducer is given below.

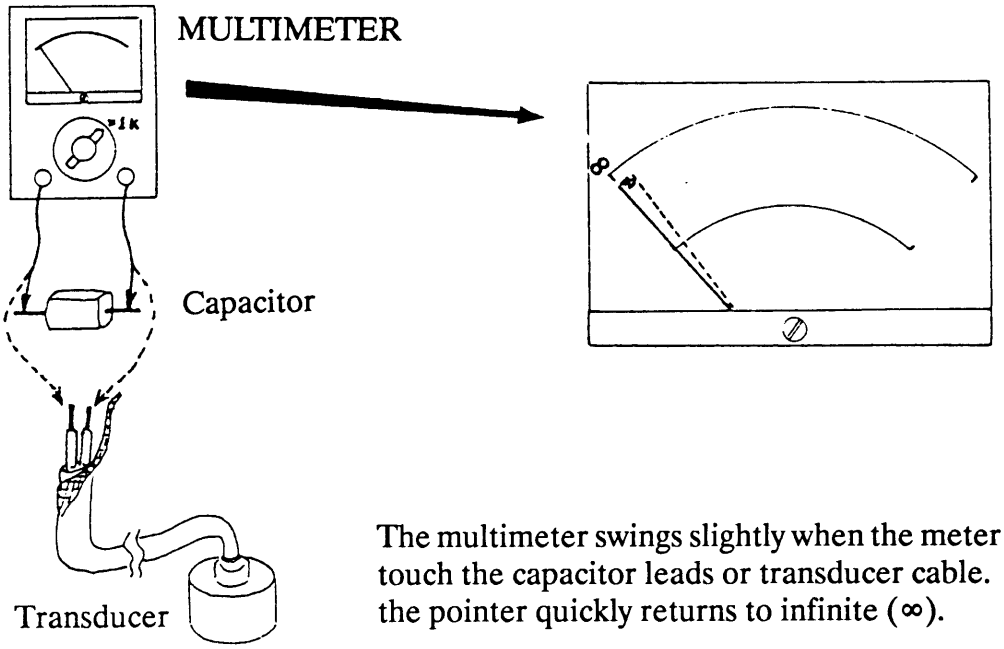
Transducer Type	Constructions	Capacitance	Remarks
520-5MSC	Electro-stricktion Type	3800pF	Standard Supply
50B-6 50B-6G 200B-5S 200B-5		7500pF ± 15% (almost same as above) 2560pF ± 15% (almost same as above)	Option

Capacitance including 10 m cable (100pF/m).

If a capacitance meter is not available, use a ordinary popular multimeter. Prepare a multimeter and two capacitors whose capacitance is equivalent to the transducer capacitance. Set the resistance range of the multimeter to higher than "x 1k".

Refer to the figure below. Touch the leads of the multimeter across the capacitor and read the deflection. Do the same for the transducer and compare the deflections. The deflections will be nearly identical if the transducer cable is normal.

If the transducer is damaged by water penetration, the multimeter swings to zero or some arbitrary value.
If the cable is cut, the multimeter swings slightly or not at all.



The multimeter swings slightly when the meter leads touch the capacitor leads or transducer cable. Then the pointer quickly returns to infinite (∞).

Fig.2.2 Capacitance Test

2.4.3 Impedance Test

To check the transducer in the field without dismounting it, follow the procedure below.

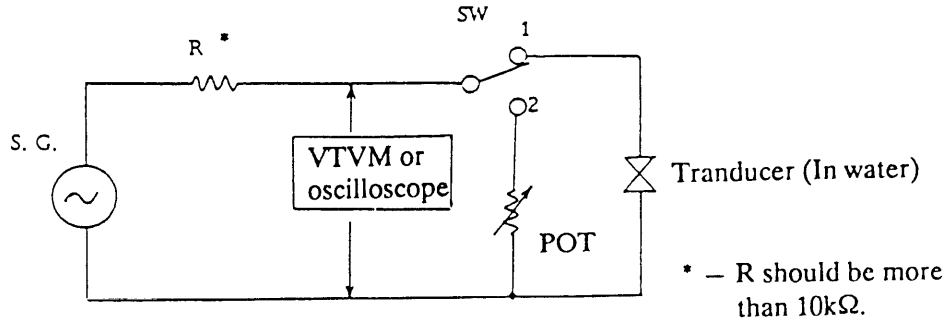


Fig.2.3 Impedance Test

1) Set the SW1 to "1".

2) Set the output frequency of a signal generator at a frequency adjacent to the resonant frequency of that transducer. Measure the voltage across the transducer with a precision voltmeter or oscilloscope.

3) Turn the SW1 to "2" and adjust the potentiometer so that the oscilloscope indicates the same voltage as measured in step 2. Then, measure the resistance of the potentiometer. This resistance may be considered the impedance of transducer at the above frequency.

4) Do the same at other frequencies, then plot the measured resistance.

The resistance curve is thus obtained, the a typical curve is shown in the figure below. Compare it with a curve taken from a properly operating transducer to assess condition. The important point is the ratio of A to B. See the measured data of 520-5MSC1 on the next page. The ratio differs by the type of transducer and measuring condition, i.e., in air or in water.

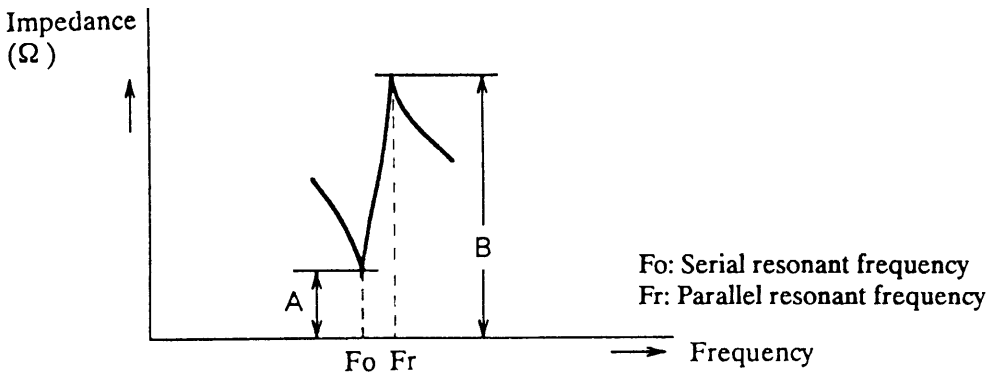
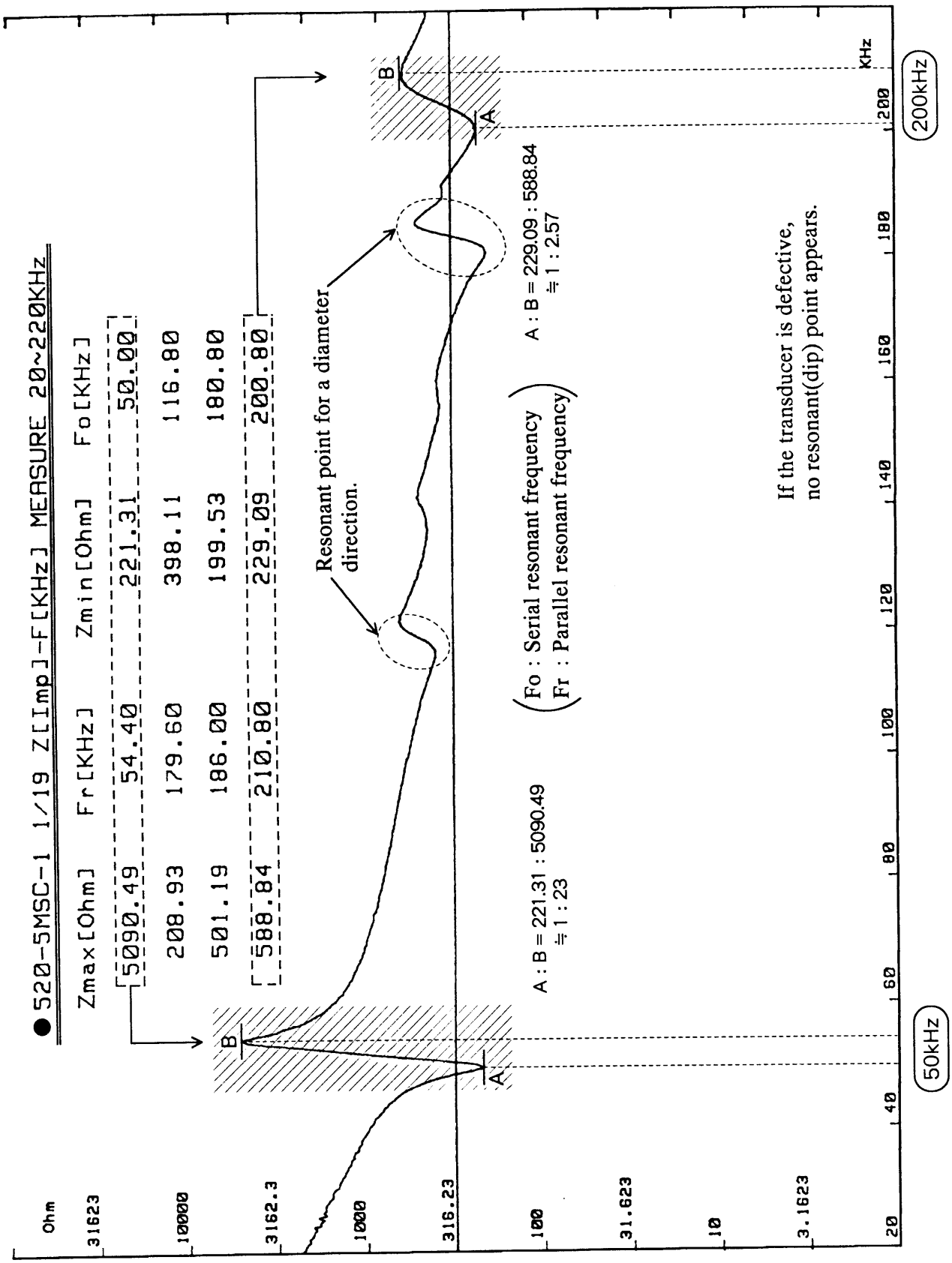


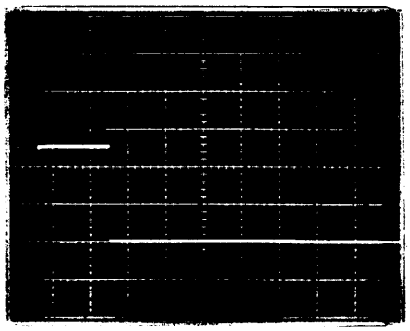
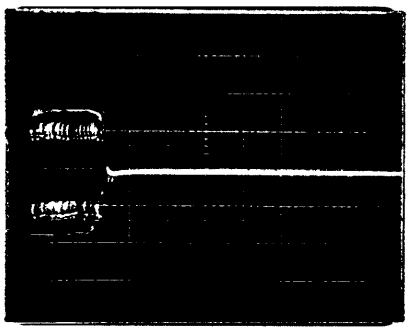
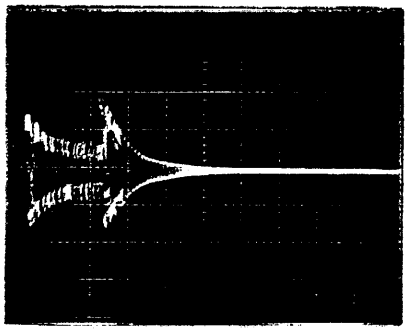
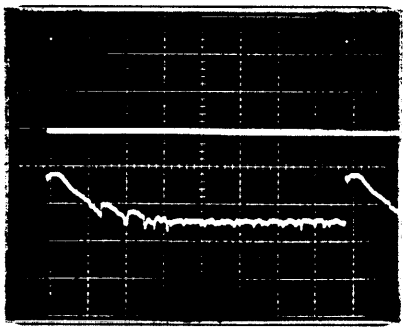
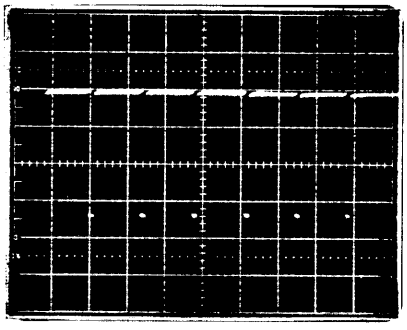
Fig.2.4 Characteristic Curve

DATA (5200-5MSC1 measured in water)



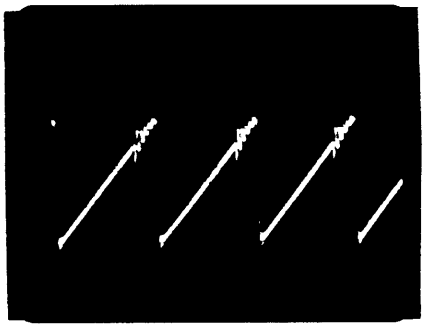
2-5. WAVEFORM

UNIT／BLOCK : MAIN BOARD

1		KP (Keying Pulse) Trigger : X-scale : 0.2ms／div. Y-scale : 2v／div. Range : 40m
2		TX out (J8 # 1 – A GND) Trigger : Internal X-scale : 0.2ms／div. Y-scale : 250v／div. Range : 40m TX out : max. Transducer disconected. Probe 50 : 1
3		TX out (J8 # 1 – A GND) Trigger : Internal X-scale : 0.2ms／div. Y-scale : 250v／div. Range : 40m TX pater : max. Transducer connected. Probe 50 : 1
4 CH1 : KP (U8, # 72) CH2 : SIG (U15, # 1)		SIG (Receiver out) Trigger : CH1 X-scale : 20ms／div. Y-scale : 2v／div. CH2 : rectified signal. The waveform differs with received echoes.
5		H – SYNC Trigger : C – SYNC (Test Point) X-scale : 50 μs／div. Y-scale : 1v／div.

UNIT／BLOCK : MAIN BOARD

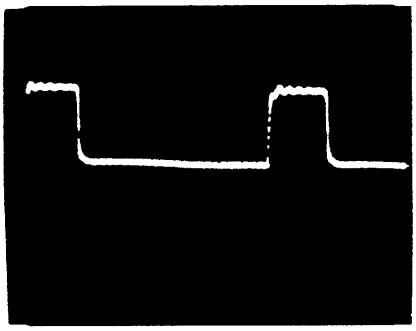
6



Sawtooth

Trigger : Internal
X-scale : 5 μs／div.
Y-scale : 1v／div.
Measuring Point : U11 # 5 – P. GND

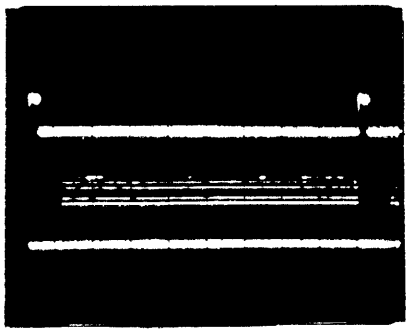
7



U11 out

Trigger :
X-scale : 2 μs／div.
Y-scale : 5v／div.
Measuring Point : U11 # 9 – P. GND

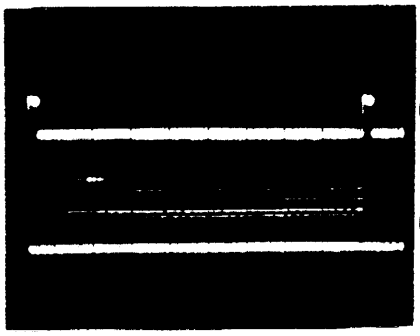
8



R14／R13 Junction (RED)

Trigger : CH1 (KP)
X-scale : 2ms／div.
Y-scale : 2v／div.

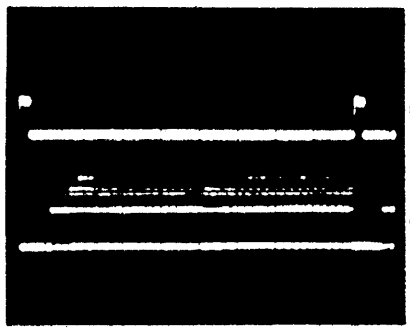
9



R18／R24 Junction (GREEN)

Trigger : CH1 (KP)
X-scale : 2ms／div.
Y-scale : 2v／div.

10

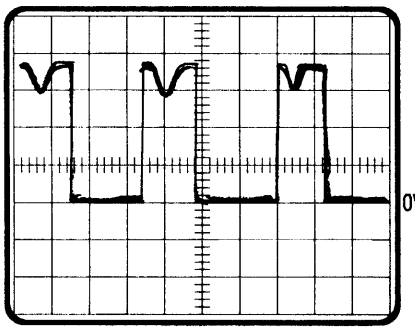


R24／R23 Junction (BLUE)

Trigger : CH1 (KP)
X-scale : 2ms／div.
Y-scale : 2v／div.

UNIT／BLOCK : MONITOR BOARD

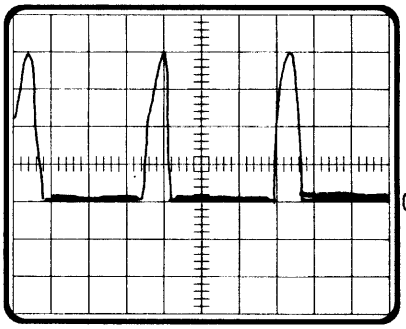
11



H-DRIVE (IC1 # 9)

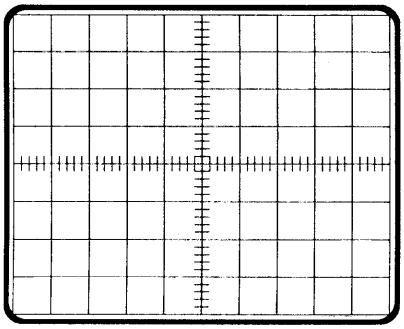
Trigger : Internal
X-scale : 5 μs／div.
Y-scale : 50mv／div.
Measuring Point : IC1 # 9

12

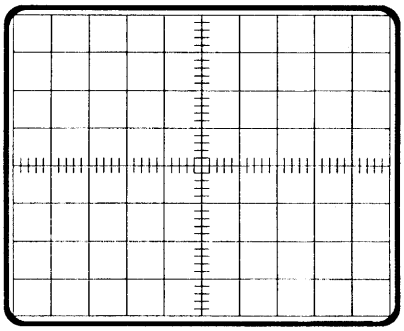


H-OUT (Q2 Corrector)

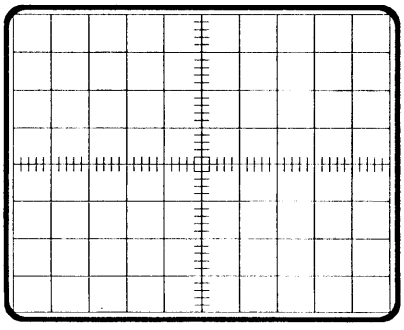
Trigger : Internal
X-scale : 20 μs／div.
Y-scale : 250v／div.
Probe 50 : 1



Trigger :
X-scale : s／div.
Y-scale : v／div.



Trigger :
X-scale : s／div.
Y-scale : v／div.



Trigger :
X-scale : s／div.
Y-scale : v／div.

CHAPTER 3 TROUBLESHOOTING

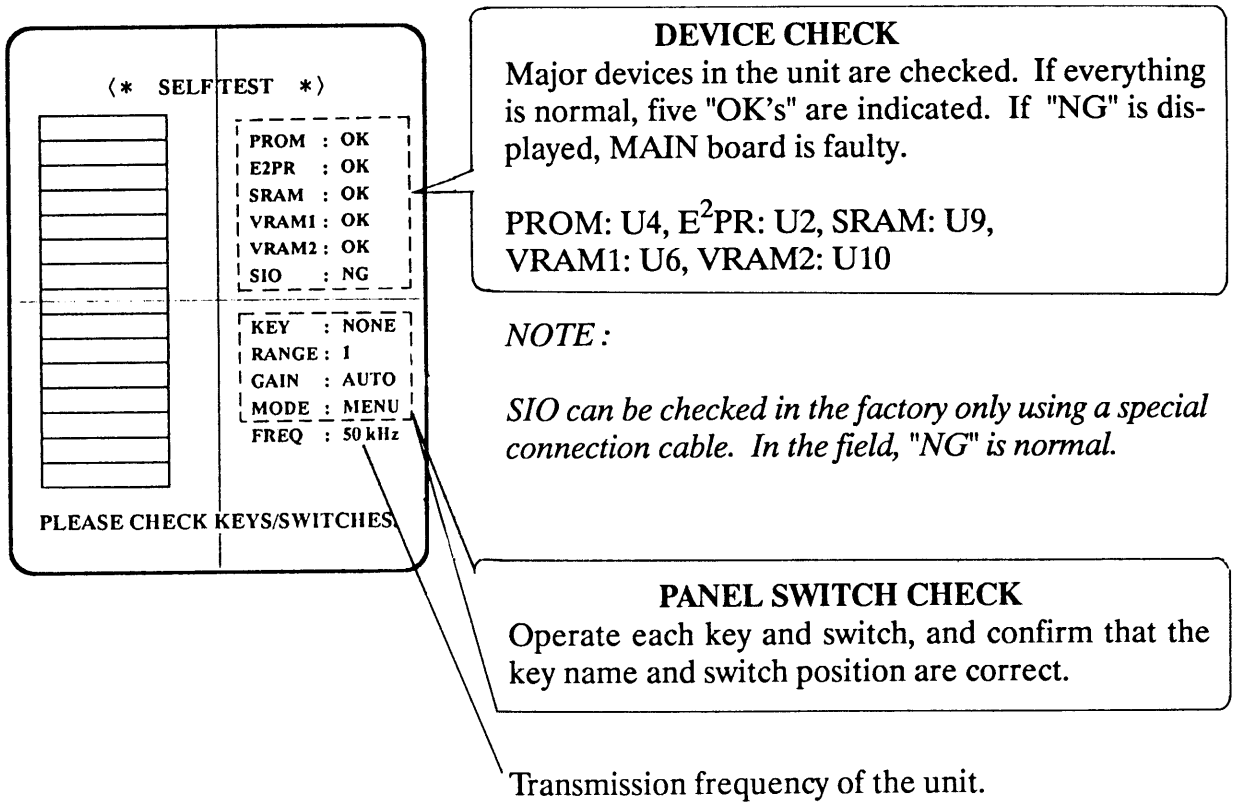
Whenever the unit is not functioning properly, do the self-check to identify the problem. If you cannot run the self-check try to identify the problems by symptom explained in paragraph 3.2 and after.

3.1 DIAGNOSTIC SELF-CHECK

Procedure

(1) Turn the unit on while pressing one of the keys.

(2) Press **MARKER [–]** key.
The self-check screen is displayed and the check results will appear in a few seconds.



(3) To terminate the self-check, turn the unit off.

3.2 POWER CANNOT BE TURNED ON

(1) Confirm that the ship's mains voltage is within 10.5 to 30Vdc (FCV581) or 10.5 to 40Vdc (FCV281).

(2) Check the power supply fuse. If blown, replace it. If the fuse blows again, check the power supply circuit after connecting the dummy loads. See the instructions below.

a. Remove the plastic cover.

b. Disconnect the connector fitted to J9 on the MAIN board and connect the dummy loads.

Voltage	Dummy load	Connect to;
+10V	50Ω, more than 5W (Imax = 250mA)	J9 #9 – #11
+110V	1.5kΩ, more than 30W (Imax = 80mA)	J9 #1 – #3

c. Check the voltage and waveforms referring to the table below.

	Measuring Point	Normal Voltage/Waveform	When the check results are abnormal, the parts below may be defective.
1	Q11 Collector Voltage	+9.5V approx.	Q11, Q12, CR16
2	U11 #14 voltage	5V	U11
3	U11 #5 waveform	See WF-6	U11
4	U11 #9 or #10	See WF-7	U11, Q10, Q9, Q8, T1, CR13-15, CR17

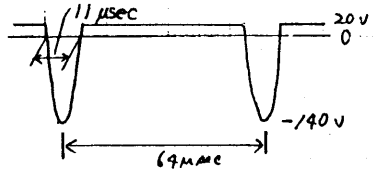
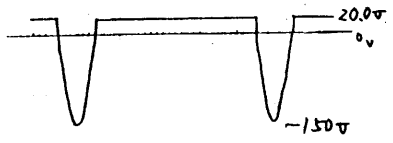
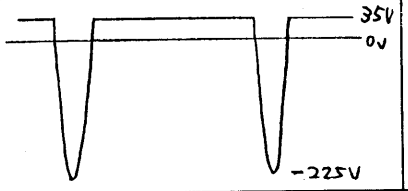
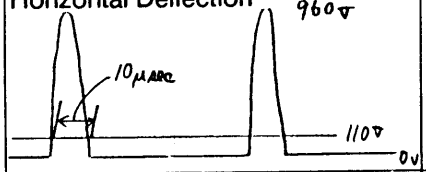
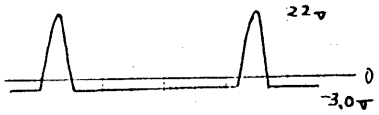
3.3 NOTHING APPEARS ON THE SCREEN

(1) Check the line voltages referring to the table on page 2.1.

(2) Check whether the fly-back trace is visible or not by increasing the brilliance and background color (HUE key).

(3) If the fly-back trace is visible, gate array U5 may be defective.

(4) If the fly-back trace is not visible, check the fly-back transformer T2 and CRT socket referring to the table below.

	Measuring Point	Voltage/Waveforms	Notes
T2 Fly-back Transformer	#1 - #3(GND)		
	#2 - #3	110Vdc	
	#4 - #3	10.0Vdc	
	#5 - #3		
	#6 - #3		
	#7 - #3	Horizontal Deflection 	WP-12
	#9 - #3	Heater Voltage 	
HV	Anode Cap	14.5 - 17.1kV	High tension probe required.

a) If the T2 are all normal, the following parts may be defective.

Brilliance/Automatic Brilliance Limiting circuit (Q4, Q5)
Brilliance POT (R8)
DC level Restore circuit (Q9)
Open circuit of the CRT heater
Open circuit of the anode cap cord

b) When the voltages except the horizontal deflection output are not normal, fly-back transformer T2 may be defective.

c) Check the following waveforms if the horizontal deflection output is not normal.

	Item	Waveform	Possible Cause of Abnormal Waveform
1	IC1 #9 (Horizontal Drive)	WF-11.	IC1
2	Q2 Collector (Horizontal Deflection)	WF-12.	Q2, T1, L1, C19, C16, T2

3.4 SCALE AND MARKER APPEAR BUT NO ECHO

One of the followings may be defective.

1) KP generation circuit (KPO, KPI, TX0, TX1 ----gate array U8)

2) Transmitter circuit (Driver, power amplifier)

3) Receiver circuit (Pre and main amplifiers)

4) Transducer

5) Echo Data Processing circuit (gate array U8)

Check the waveforms referring to the table below.

	Measuring Points	Waveform	Possible Cause of Abnormal Waveform
1)	U8 #72 (KPO)	WF-1	U8 gate array
2)	J8#1, #5 (TX out)	WF-2,WF-3	Q16, Q17, T3, VR2, VR3
3)	U15 - #1 (SIG)	WF-4	Q14 (Pre-amplifier), U14, U16 (Main amplifier), Transducer, CR8, CR10
4)	Transducer	See paragraph 2.3 on page 2-3.	
5)	Echo Data Processing Circuit (gate array U8)	The output of the gate array appears on the bus line of the CPU (U3) but it's impossible to observe the waveform. When waveforms WF-1 to WF-4 are normal, the defective part may be in the echo data processing circuit. Since there are two processing lines, one for the normal recording and the other for Bottom/Zoom recording, select the B/L or zoom presentation mode and check the displayed screen. If something is wrong with either of them, the fault is likely in the processing circuit of the gate array.	

3.5 SCREEN IS LOCKED WITH MOSAIC COLOR PATTERN

If this occurs, CPU U3 has malfunctioned and stopped, or is damaged.

3.6 COLOR IMBALANCE

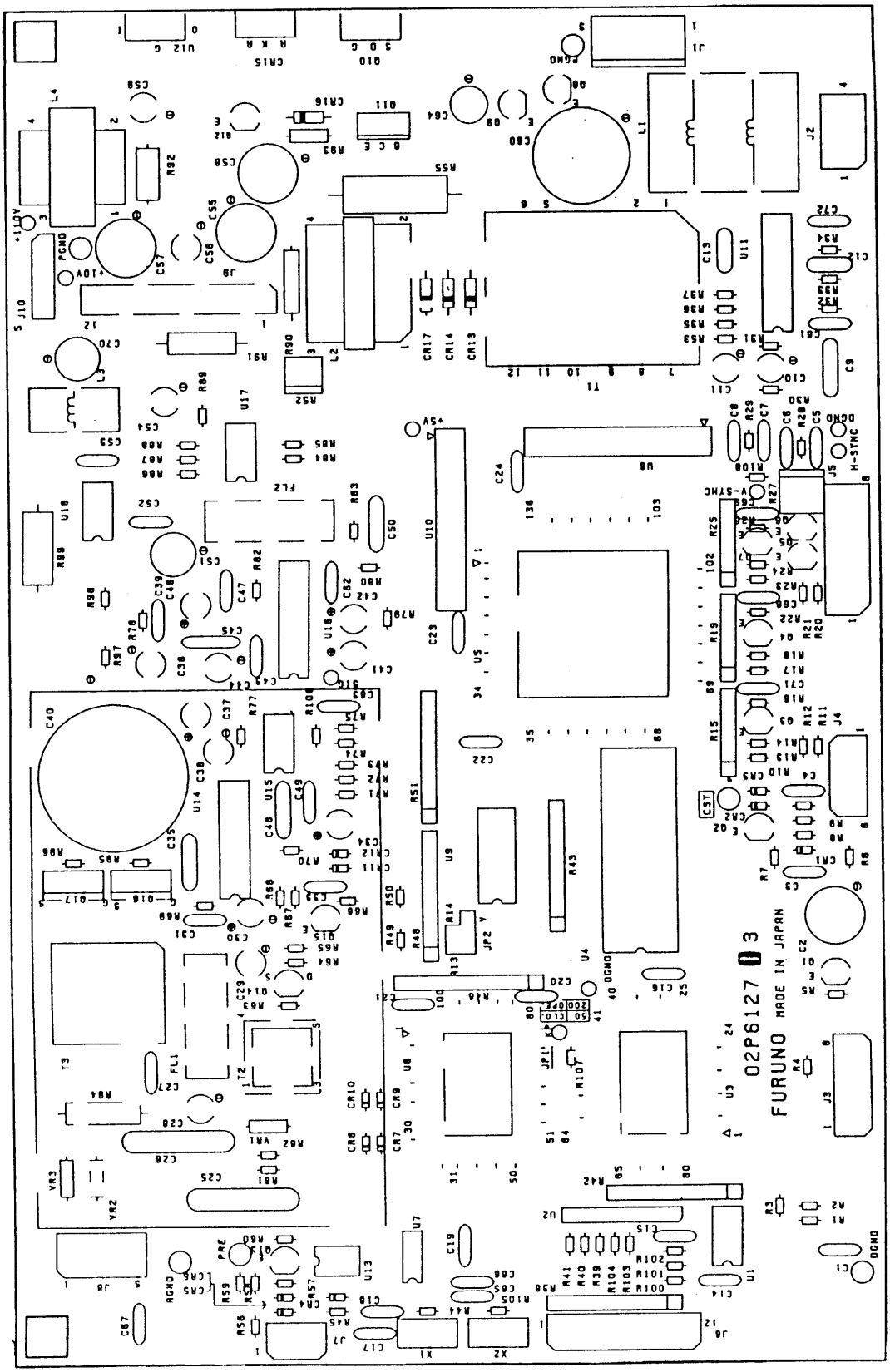
This trouble may be in the following circuits.

Symptom	Defective Circuit	Waveforms; etc.
Improper Red : Reddish screen or pale red screen. Black background color turns red or white character turns cyan. Improper Green: Greenish screen or pale green screen. Black background color turns green or white character turns magenta. Improper Blue : Bluish screen or pale blue screen. Black background color turns blue or white character turns yellow.	Video Amplifier in Color Monitor R : Q6/101 G : Q7/102 B : Q8/103	WF-8 WF-9 WF-10
The color is abnormal on some pixels. If the display is abnormal, the video RAM may be defective. The video RAM can be checked by excuting the self-check. If U6 is defective, character and scale indications are abnormal.	Display RAM (U6, U10)	

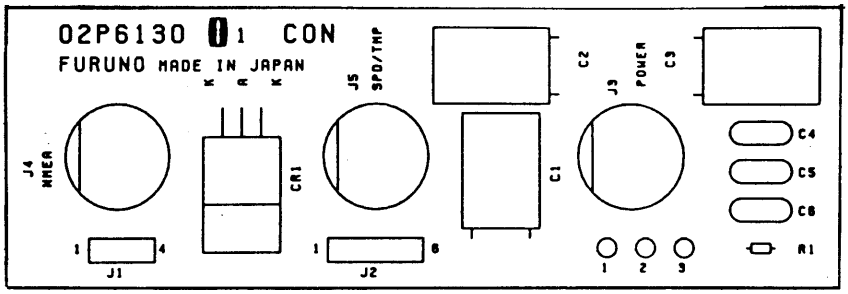
CHAPTER 4. PARTS LOCATION

FCV-581

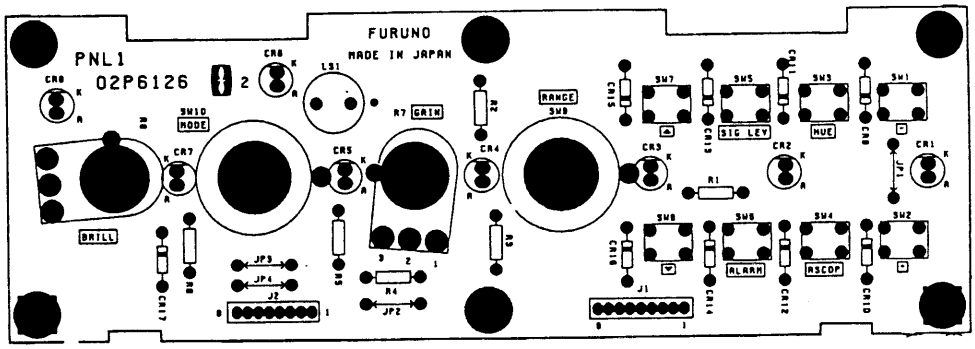
MAIN Board (02P6127)



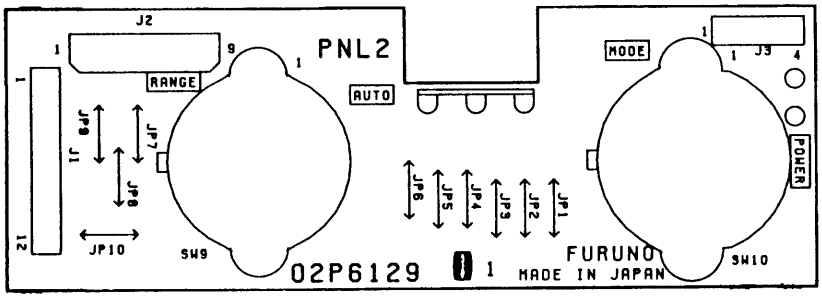
CON Board (02P6130)



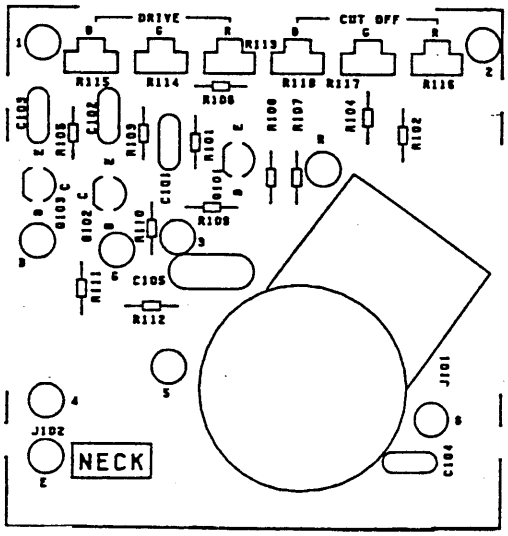
PNL1 Board (02P6126)



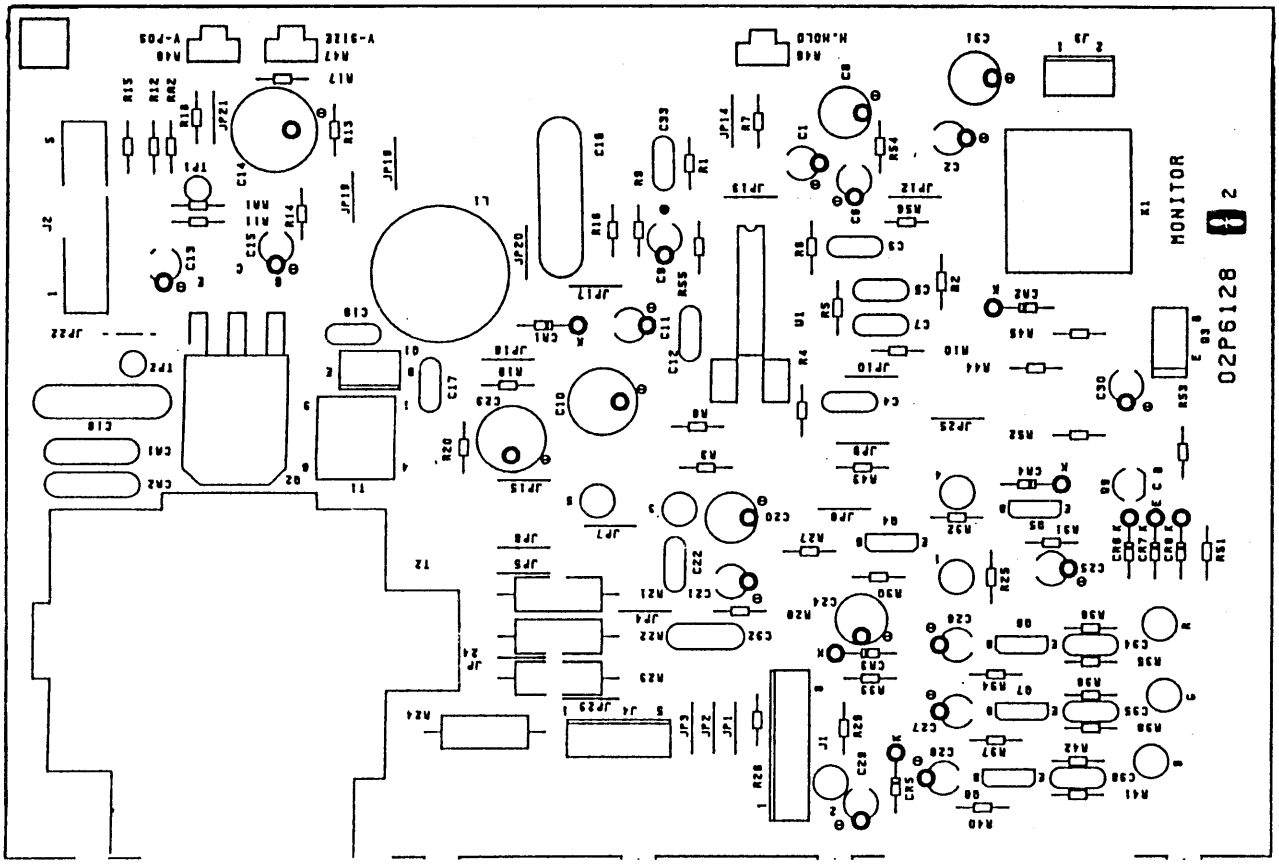
PNL2 Board (02P6129)



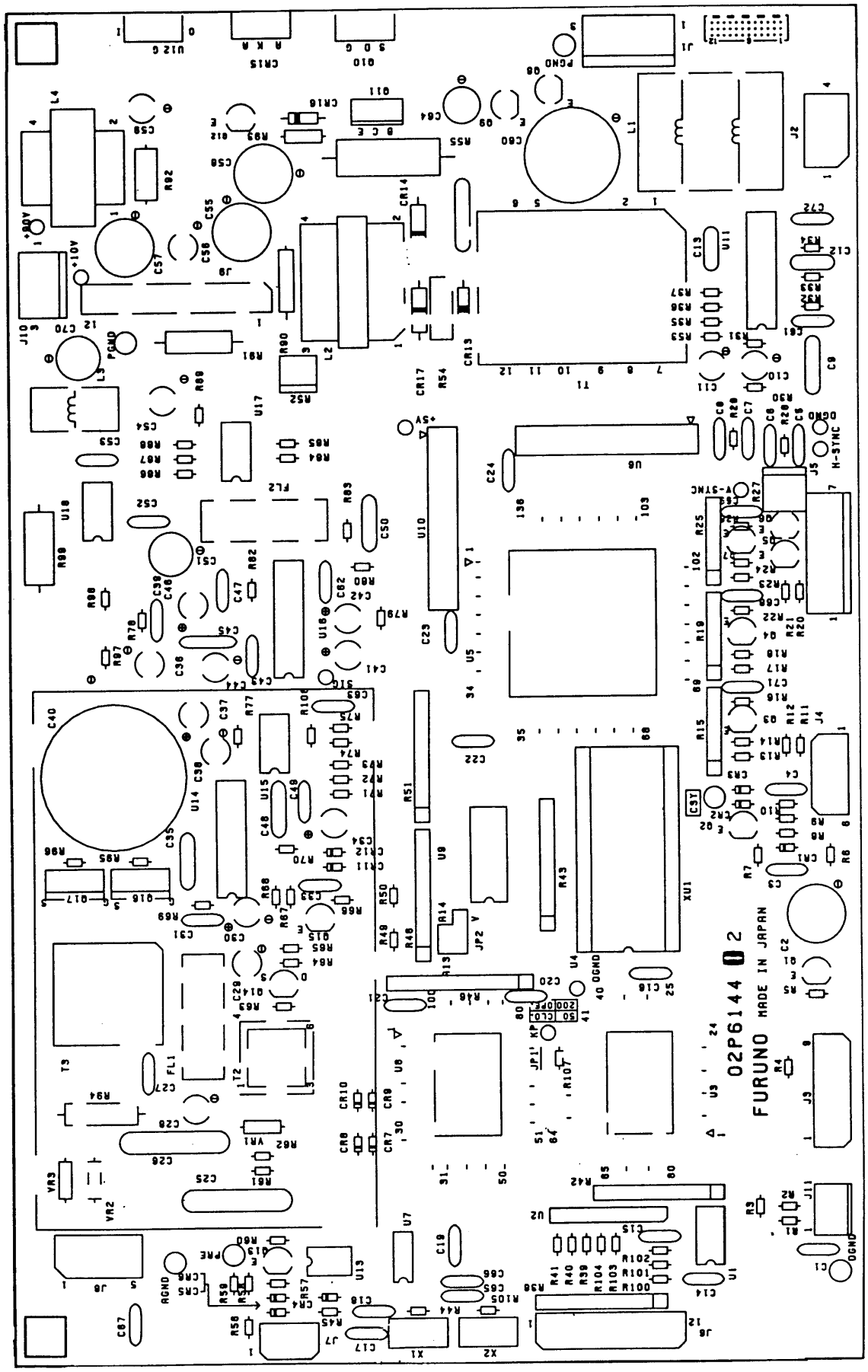
CRT Monitor NECK Board



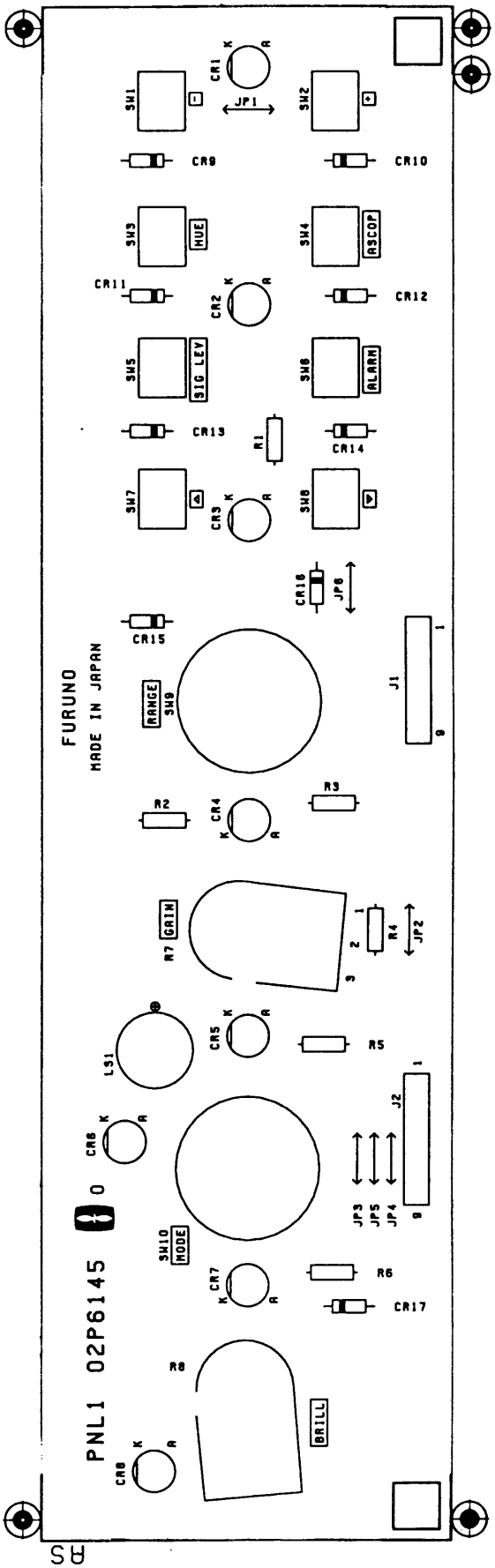
CRT MONITOR Board (02P6128)

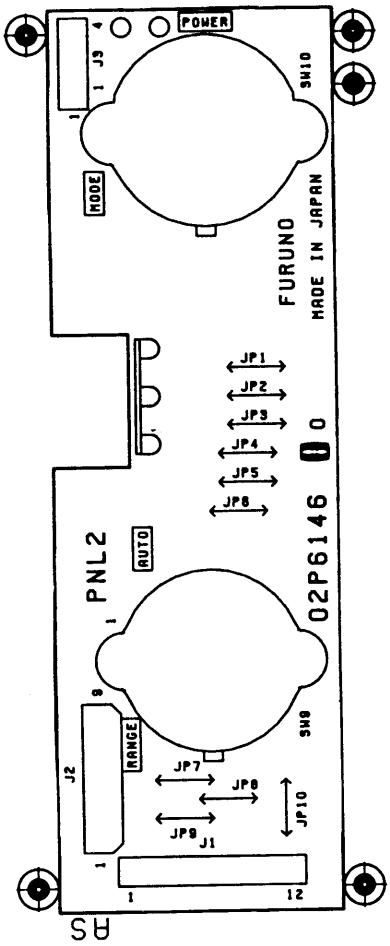


MAIN Board (02P6144)



PNL1/2 (02P6145/02P6146)





FCV-581 SPECIFICATIONS

1. Display

8" diagonal CRT

2. Echo Color

8 or 16 colors depending on echo intensity. Monochrome presentation is also available. The background color is selectable from blue, light blue and black.

3. Basic Range

Range No.	1	2	3	4	5	6	7	8
Meters	5	10	20	40	80	150	300	500
Feet	15	30	50	120	200	400	1000	1500
Fathoms	3	5	10	20	40	80	150	250
Passi/Braza	3	5	10	30	50	100	200	300

4. Range Shift

Display start depth can be shifted in 1m (FT, FA) steps up to 500m (1500FT, 250FA, 300P/B). The range shift function is disabled while the AUTO mode is selected.

5. Zoom Range

Range No.	1	2	3	4	5	6	7	8
Meters	1	2	5	10	20	30	50	100
Feet	3	5	10	30	50	100	200	300
Fathoms	1	1	2	5	10	20	30	50
Passi/Braza	1	1	2	5	10	20	50	50

6. Bottom Lock Expansion Range

Meters	Feet	Fathoms	Passi/Braza
5	10	2	2

7. Auto Mode

Automatically switches depth range and sensitivity depending on the depth of the water.

8. Presentation Mode

NORM	Normal
B/L	Normal + Bottom-Lock Expansion (1/2 + 1/2)
B/Z	Normal + Bottom Zoom (1/2 + 1/2)
M/Z	Normal + Marker Zoom
NAV	Graphical and digital displays of water depth, water temperature, ship's speed, L/L data, etc.

* A-scope presentation is also available.

9. Picture Advance Speed

Setting	0	1	2	3
Lines/TX	Freeze	1/2	1/1	2/1

10. Transmit Frequency/Output Power

50 or 200kHz, 500Wrms

11. Pulselength/TX Rate

Display End Depth	Pulselength (ms)	TX Rate (Pulse/Min)
5m	0.2	600
10m	0.2	600
20m	0.2	600
40m	0.4	375
80m	0.8	187
150m	1.5	100
300m	3.0	50
500m	3.6	42
1000m	3.6	42

12. Interference Rejector

Rejects unwanted signals by comparing last and present echoes in strength

13. Alarm

Alarm sounds when bottom echo comes into the alarm zone.

14. Input/Output Data (NMEA #0183 or CIF Format)

The FCV-581 permits data communication with navigational equipment and temperature indicator which have I/O port for NMEA0183, or Furuno CIF.

NMEA 0183 Format Input/Output Sentence

Input:	RMB, BWC, RMC, RMA, GLL, VTG, VHW, MTW
Output:	SDDBT (depth), YCMTW* (water temperature) VWVHW* (ship's speed)

* When speed/temperature sensor is connected.

15. Equipment to be connected

LC-90MK2, LP-1000/1300, FSN-70/50, GP-500/70/1500/1250, T-2000, TI-20

16. Environmental Condition

Temperature: 0 - 50°C (Splash proof structure)

17. Power Supply

10.5Vdc to 30Vdc, approx. 20W.

FCV-281 SPECIFICATIONS

1. Display

10" diagonal CRT

2. Echo Color

8 or 16 colors depending on echo intensity. Monochrome presentation is also available. The background color is selectable from blue, light blue and black.

3. Basic Range

Range No.	1	2	3	4	5	6	7	8
Meters	5	10	20	40	80	150	300	500
Feet	15	30	50	120	200	400	1000	1500
Fathoms	3	5	10	20	40	80	150	250
Passi/Braza	3	5	10	30	50	100	200	300

4. Range Shift

Display start depth can be shifted in 1m (FT, FA) steps up to 500m (1500FT, 250FA, 300P/B). The range shift function is disabled while the AUTO mode is selected.

5. Zoom Range

Range No.	1	2	3	4	5	6	7	8
Meters	1	2	5	10	20	30	50	100
Feet	3	5	10	30	50	100	200	300
Fathoms	1	1	2	5	10	20	30	50
Passi/Braza	1	1	2	5	10	20	50	50

6. Bottom Lock Expansion Range

Meters	Feet	Fathoms	Passi/Braza
5	10	2	2

7. Auto Mode

Automatically switches depth range and sensitivity depending on the depth of the water.

8. Presentation Mode

NORM	Normal
B/L	Normal + Bottom-Lock Expansion (1/2 + 1/2)
B/Z	Normal + Bottom Zoom (1/2 + 1/2)
M/Z	Normal + Marker Zoom
NAV	Graphical and digital displays of water depth, water temperature, ship's speed, L/L data, etc.

* A-scope presentation is also available.

9. Picture Advance Speed

Setting	0	1	2	3
Lines/TX	Freeze	1/2	1/1	2/1

10. Transmit Frequency/Output Power 50 or 200kHz, 500Wrms

11. Pulselength/TX Rate

Display End Depth	Pulselength (ms)	TX Rate (Pulse/Min)
5m	0.2	600
10m	0.2	600
20m	0.2	600
40m	0.4	375
80m	0.8	187
150m	1.5	100
300m	3.0	50
500m	3.6	42
1000m	3.6	42

12. Interference Rejector Rejects unwanted signals by comparing last and present echoes in strength

13. Alarm Alarm sounds when bottom echo comes into the alarm zone.

14. Input/Output Data (NMEA #0183 or CIF Format) The FCV-281 permits data communication with navigational equipment and temperature indicator which have I/O port for NMEA0183, or Furuno CIF.

NMEA 0183 Format Input/Output Sentence

Input:	RMB, BWC, RMC, RMA, GLL, VTG, VHW, MTW, XTE
Output:	SDDBT (depth), YCMTW* (water temperature) VWVHW* (ship's speed)

* When speed/temperature sensor is connected.

15. Equipment to be connected LC-90MK2, LP-1000, FSN-70/50, GP-500/70/1500/1250, T-2000, TI-20

16. Environmental Condition Temperature: 0 - 50°C (Splash proof structure)
Humidity: 85% or less

17. Power Supply 10.5Vdc to 40.0Vdc, approx. 40W.

FURUNO

ELECTRICAL PARTS LIST
電気部品表

1992- 8

MODEL	FCV-581			
UNIT				PAGE
REF. DWG.	C2334-K01-A	BLOCK NO.		1

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
PRINTED CIRCUIT BOARD		プリントキバン		
	02P6127A	MAIN,50KHZ	001-380-520	50KHZ JAPANESE
	02P6127B	MAIN,50KHZ	001-380-530	50KHZ ENGLISH
	02P6127A	MAIN,200KHZ	001-380-600	200KHZ JAPANESE
	02P6127B	MAIN,200KHZ	001-380-610	200KHZ ENGLISH
	02P6128	MONITOR	001-380-510	
	02P6130 CON	FCV-581	001-380-560	
	02P6126/6129	PNL	001-380-660	
ASSEMBLY		クミヒン		
	PROM0252095100		001-380-580	JAPANESE
	PROM0252094100		001-380-590	ENGLISH
CRT UNIT		CRTユニット		
	A18JHC30X01		001-124-894	

UNIT | REF. DWG. C2334-K02/6/3 | BLOCK NO. | 2

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	02P6127A	MAIN,50KHZ	001-380-520	JAPANESE
	02P6127B	MAIN,50KHZ	001-380-530	ENGLISH
	02P6127A	MAIN,200KHZ	001-380-600	JAPANESE
	02P6127B	MAIN,200KHZ	001-380-610	ENGLISH
	CAPACITOR コンデンサー			
C 1	RPE132F104Z50	0.1UF 50V	000-104-501	
C 2	ECE-A1CU102	1000UF,16V	000-201-647	
C 3	DD104-69B102K50V	1000PF 50V	000-253-806	
C 4	RPE132F104Z50	0.1UF 50V	000-104-501	
C 9	ECQ-P1H104JZW	W5.0	000-117-303	
C 10	ECE-A1VU220E	W5.0 22MF 35V	000-201-823	
C 11	ECE-A1HU010E	1UF 50V	000-206-115	
C 12	ECQ-P1H222GZW	2200PF 50V	000-115-715	
C 13	ECQ-P1H223JZ	N7.5	000-262-729	
C 25	ECW-H12H102JR	1000PF 1.2KV	000-101-698	FOR 200KHZ
C 25	ECW-H12H332JR	3300PF 1.2KV	000-101-697	FOR 50KHZ
C 26	ECW-H12H102JR	1000PF 1.2KV	000-101-698	FOR 200KHZ
C 26	ECW-H12H332JR	3300PF 1.2KV	000-101-697	FOR 50KHZ
C 27	RPE132F104Z50	0.1UF 50V	000-104-501	
C 28	ECE-A1EU100E	10UF 25V	000-201-812	
C 29	ECE-A1EU100E	10UF 25V	000-201-812	
C 40	ECQ-S2EP471D		000-124-924	
C 54	ECE-A1EU100E	10UF 25V	000-201-812	
C 55	ECE-A2CU100E		000-124-859	
C 56	ECE-A1AU101E	100UF 10V	000-206-113	
C 57	ECE-A1CU102E	1000UF 16V	000-201-809	
C 58	ECE-A2CU220E		000-124-860	
C 59	ECE-A1HU010E	1UF 50V	000-206-115	
C 60	ECA-1HFQ681E		000-124-861	
C 61	RPE132F103Z50	0.01UF 50V	000-107-039	
C 63	RPE132CH391J50	390PF 50V	000-112-528	FOR 50KHZ
C 63	PRE132CH271J50	270PF 50V	000-105-392	FOR 200KHZ
C 64	ECE-A1EU101E	100UF 25V	000-206-105	
C 67	RPE132F104Z50	0.1UF 50V	000-104-501	
	DIODE ダイオード			
CR 1	1SS133		000-103-097	
CR 4	1SS133		000-103-097	
CR 5	1SS133		000-103-097	
CR 6	1SS133		000-103-097	
CR 13	RU2C		000-112-137	
CR 14	RU2C		000-112-137	
CR 15	5CL2C41A		000-124-857	
CR 16	05AZ10Y		000-106-180	
CR 17	RU2C		000-112-137	

UNIT | REF. DWG. C2334-K02/6/3 | BLOCK NO. | 3

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	COIL コイル			
L 1	SC-05-100	1UH 5A	000-424-972	
L 2	02S1116-0	02S1116-0	000-124-871	
L 4	02S1115-0	02S1115-0	000-124-872	
	TRANSISTOR トランジスター			
Q 1	2SC2120-Y		000-101-822	
Q 2	2SC1815-Y		000-125-631	
Q 3	2SC1815-Y		000-125-631	
Q 4	2SC1815-Y		000-125-631	
Q 5	2SC1815-Y		000-125-631	
Q 6	2SC1815-Y		000-125-631	
Q 7	2SC1815-Y		000-125-631	
Q 8	2SA1020-Y		000-118-050	
Q 9	2SC2655-Y		000-126-250	
Q 10	IRF540		000-118-521	
Q 11	2SB595Y		000-121-104	
Q 12	2SC1815-Y		000-125-631	
Q 13	2SA1015-Y		000-118-041	
Q 14	2SK125		000-129-359	
Q 16	2SK1178		000-124-874	
Q 17	2SK1178		000-124-874	
	RESISTOR テイコウ			
R 5	ERD-16TJ220	0.16W 22	000-330-847	
R 6	JPW01		000-106-007	
R 7	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 8	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 9	ERD-16TJ102	0.16W 1K	000-330-801	
R 10	ERD-16TJ163	00S0095-0	000-329-060	
R 13	ERD-16TJ471	0.16W 470	000-329-029	
R 14	ERD-16TJ221	0.16W 220	000-329-021	
R 17	ERD-16TJ471	0.16W 470	000-329-029	
R 18	ERD-16TJ221	0.16W 220	000-329-021	
R 20	ERD-16TJ471	0.16W 470	000-329-029	
R 21	ERD-16TJ331	0.16W 330	000-329-025	
R 23	ERD-16TJ471	0.16W 470	000-329-029	
R 24	ERD-16TJ221	0.16W 220	000-329-021	
R 30	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 31	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 32	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 33	AF1/4S1KF	1K,0.25W	000-108-328	
R 34	AF1/4S6.2K4-6F	02S0942-0	000-123-355	
R 35	ERD-16TJ101	0.16W 100	000-329-013	
R 36	ERD-16TJ820	0.16W 82	000-329-011	
R 37	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 38	MRG-C09X10K4-6J	02S0943-0	000-117-860	
R 45	ERD-16TJ511	0.16W 510	000-329-030	
R 52	EVM-MCGA01B15	1K	000-105-595	

UNIT | REF. DWG. C2334-K02/6/3 | BLOCK NO. | 4

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RESISTOR テイコウ			
R 53	AF1/4S3.0K F	0.25W 3.0K	000-113-120	
R 55	ERF-2AKR47	2W 0.47	000-370-809	
R 56	ERD-16TJ470	0.16W 47	000-329-005	
R 57	ERD-16TJ331	0.16W 330	000-329-025	
R 58	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 59	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 60	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 61	ERD-16TJ101	0.16W 100	000-329-013	
R 62	ERD-16TJ202	0.16W 2K	000-330-807	
R 63	ERD-16TJ105	0.16W 1M	000-330-804	
R 64	ERD-16TJ221	0.16W 220	000-329-021	
R 65	ERD-16TJ221	0.16W 220	000-329-021	FOR 50KHZ
R 65	ERD-16TJ510	0.16W 510	000-329-006	FOR 200KHZ*
R 75	ERD-16TJ104	0.16W 100K	000-330-803	
R 84	ERD-16TJ102	0.16W 1K	000-330-801	
R 85	ERD-16TJ102	0.16W 1K	000-330-801	
R 86	ERD-16TJ122	0.16W 1.2K	000-329-037	FOR 50KHZ
R 86	ERD-16TJ152	0.16W 1.5K	000-329-039	FOR 200KHZ
R 87	ERD-16TJ391	0.16W 390	000-329-027	FOR 50KHZ
R 87	ERD-16TJ301	00S0095-0	000-329-024	FOR 200KHZ
R 88	ERD-16TJ131	0.16W 130	000-329-016	FOR 50KHZ
R 88	ERD-16TJ151	0.16W 150	000-329-017	FOR 200KHZ
R 89	ERD-16TJ102	0.16W 1K	000-330-801	
R 90	EF1/2 150K*-4F		000-124-878	
R 91	ERG-2SJ153P	00S0102-0	000-375-489	
R 92	ERG-1SJ301		000-124-879	
R 93	ERD-25PJ103	0.25W 10K	000-330-381	
R 94	ERG-2SJ472P	00S0102-0	000-375-482	
R 95	ERD-16TJ473	0.16W 47K	000-330-814	
R 96	ERD-16TJ473	0.16W 47K	000-330-814	
R 97	ERD-16TJ102	0.16W 1K	000-330-801	FOR 50KHZ
R 97	ERD-16TJ101	0.16W 100	000-329-013	FOR 200KHZ
R 98	ERD-16TJ101	0.16W 100	000-329-013	FOR 200KHZ
R 98	ERD-16TJ102	0.16W 1K	000-330-801	FOR 50KHZ
R 99	ERG-2SJ102P	2W 1K	000-375-474	
R 107	ERD-16TJ103	0.16W 10K	000-330-802	
R 108	ERD-16TJ561	0.16W 560	000-329-031	
	TRANSFORMER トランス			
T 1	02S1114-0	02S1114-0	000-124-880	
T 2	02S1099-0		000-124-882	FOR 200KHZ
T 2	02S1098-0		000-124-881	FOR 50KHZ
T 3	02S1105-0		000-124-884	FOR 200KHZ
T 3	02S1104-0		000-124-883	FOR 50KHZ
	INTEGRATED CIRCUIT シュウセキカイロ			
U 7	TC74HCU04AF		000-118-512	
U 11	UPC494C		000-161-057	

UNIT | REF. DWG. C2334-K02/6/3 | BLOCK NO. | 5

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	INTEGRATED CIRCUIT シュウセキカイロ			
U 12	UPC7805H	5V	000-161-149	
U 13	PC900V		000-134-277	
U 15	UPC842C		000-117-517	
U 17	TLP521-2GB		000-135-825	
U 18	SN75372		000-115-497	
	POTENTIOMETER ポテンショメーター			
VR 1	VR-61SS		000-124-892	
VR 2	VR-61SS		000-124-892	
VR 3	VR-61SS		000-124-892	

UNIT		REF. DWG.	C2334-K04-A	BLOCK NO.	6

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	02P6126/6129	PNL	001-380-660	
	DIODE ダイオード			
CR 1	SLP-384H-51-A		000-132-875	
CR 3	SLP-384H-51-A		000-132-875	
CR 4	SLP-384H-51-A		000-132-875	
CR 5	SLP-384H-51-A		000-132-875	
CR 6	SLP-384H-51-A		000-132-875	
CR 7	SLP-384H-51-A		000-132-875	
CR 8	SLP-384H-51-A		000-132-875	
CR 9	1SS133		000-103-097	
CR 10	1SS133		000-103-097	
CR 11	1SS133		000-103-097	
CR 12	1SS133		000-103-097	
CR 13	1SS133		000-103-097	
CR 14	1SS133		000-103-097	
CR 15	1SS133		000-103-097	
CR 16	1SS133		000-103-097	
CR 17	1SS133		000-103-097	
	LOUDSPEAKER スピーカー			
LS 1	EAF-12RT04CC	19S0100-0	000-108-215	
	RESISTOR テイコウ			
R 1	ERD-16TJ471	0.16W 470	000-329-029	
R 2	ERD-16TJ132	0.16W 1.3K	000-329-038	
R 3	ERD-16TJ471	0.16W 470	000-329-029	
R 4	ERD-16TJ242	0.16W 2.4K	000-329-042	
R 5	ERD-16TJ471	0.16W 470	000-329-029	
R 6	ERD-16TJ471	0.16W 470	000-329-029	
R 7	EVH-09HP30B14		000-125-345	
R 8	EVH-09J363B52		000-125-346	
	SWITCH スイッチ			
SW 1	SKHHAP	22S0064	000-110-966	
SW 2	SKHHAP	22S0064	000-110-966	
SW 3	SKHHAP	22S0064	000-110-966	
SW 4	SKHHAP	22S0064	000-110-966	
SW 5	SKHHAP	22S0064	000-110-966	
SW 6	SKHHAP	22S0064	000-110-966	
SW 7	SKHHAP	22S0064	000-110-966	
SW 8	SKHHAP	22S0064	000-110-966	

UNIT		REF. DWG.	C2334-K04-A	BLOCK NO.	7

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	SWITCH スイッチ			
SW 9	02S3910-1	02S3910-1	000-124-908	
SW 10	02S3911-1	02S3911-1	000-124-909	

UNIT		REF. DWG.	C2334-K05-A	BLOCK NO.	8

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	02P6128	MONITOR	001-380-510	
	DIODE ダイオード			
CR 2	1SS133		000-103-097	
CR 3	1SS133		000-103-097	
CR 4	1SS133		000-103-097	
CR 5	RD5.1JSB2		000-123-478	
CR 6	1SS133		000-103-097	
CR 7	1SS133		000-103-097	
CR 8	1SS133		000-103-097	
	RELAY リレー			
K 1	JS1 F-12V	AJS1211	000-124-015	
	COIL コイル			
L 1	02S1118-0	02S1118-0	000-124-921	
	TRANSISTOR トランジスター			
Q 1	2SD1450-R		000-124-013	
Q 2	2SD1729		000-124-922	
Q 3	2SA937		000-124-014	
Q 4	2SA933SS	00S0098-0	000-118-022	
Q 5	2SA933SS	00S0098-0	000-118-022	
Q 6	2SC1740SS	00S0099-0	000-125-575	
Q 7	2SC1740SS	00S0099-0	000-125-575	
Q 8	2SC1740SS	00S0099-0	000-125-575	
Q 9	2SA1015-Y		000-118-041	
Q 101	2SC1473NC TM-111F/(M	TX1403KA CRT	000-124-983	
Q 102	2SC1473NC TM-111F/(M	TX1403KA CRT	000-124-983	
Q 103	2SC1473NC TM-111F/(M	TX1403KA CRT	000-124-983	
	TRANSFORMER トランス			
T 1	22S0222-0	22S0222-0	000-124-016	
T 35	RPE132F102Z50	1000PF 50V	000-107-135	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 1	UPC1379C		000-124-017	

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ELECTRICAL PARTS LIST
電気部品表

1992- 8

MODEL	FCV-281			
UNIT				PAGE
REF. DWG.	C2338-K01-A	BLOCK NO.		1

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
	02P-6144A	MAIN,50KHZ	001-390-390	50KHZ JAPANESE
	02P6144B	MAIN,50KHZ	001-390-400	50KHZ ENGLISH
	02P-6144A	MAIN,200KHZ	001-390-410	200KHZ JAPANESE
	02P6144B	MAIN,200KHZ	001-390-420	200KHZ ENGLISH
	PD582C MONITOR		001-125-627	
	02P6130A CON	FCV-281	001-390-450	
	02P6145/6146 PNL	FCV-281	001-390-440	
	ASSEMBLY	クミヒン		
	PROM0252095100		001-380-580	JAPANESE
	PROM0252094100		001-380-590	ENGLISH
	COIL	コイル		
1B04L0301	DL-594	QA1005/7/8	000-123-343	DEGAUSS
	TRANSFORMER	トランス		
1B04T0001	DT-299	QA1005/1007	000-123-344	
1B04T0002	DH-1515	QA1005/1007	000-123-345	FBT
	CRT UNIT	CRTユニット		
	270ALB22(W).D	QA1005/1007	000-123-342	

UNIT | REF. DWG. C2338-K02/3/4 | BLOCK NO. | 2

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	02P6144A	MAIN,50KHZ	001-390-390	JAPANESE
	02P6144B	MAIN,50KHZ	001-390-400	ENGLISH
	02P6144A	MAIN,200KHZ	001-390-410	JAPANESE
	02P6144A	MAIN,200KHZ	001-390-420	ENGLISH
	CAPACITOR コンデンサー			
C 1	RPE132F104Z50	0.1UF 50V	000-104-501	
C 2	ECE-A1CU102	1000UF,16V	000-201-647	
C 3	DD104-69B102K50V	1000PF 50V	000-253-806	
C 4	RPE132F104Z50	0.1UF 50V	000-104-501	
C 9	ECQ-P1H104JZW	W5.0	000-117-303	
C 10	ECE-A1VU220E	W5.0 22MF 35V	000-201-823	
C 11	ECE-A1HU010E	1UF 50V	000-206-115	
C 12	ECQ-P1H222GZW	2200PF 50V	000-115-715	
C 13	ECQ-P1H223JZ	N7.5	000-262-729	
C 25	ECW-H12H332JR	3300PF 1.2KV	000-101-697	FOR 50KHZ
C 25	ECW-H12H102JR	1000PF 1.2KV	000-101-698	FOR 200KHZ
C 26	ECW-H12H332JR	3300PF 1.2KV	000-101-697	FOR 50KHZ
C 26	ECW-H12H102JR	1000PF 1.2KV	000-101-698	FOR 200KHZ
C 27	RPE132F104Z50	0.1UF 50V	000-104-501	
C 28	ECE-A1EU100E	10UF 25V	000-201-812	
C 29	ECE-A1EU100E	10UF 25V	000-201-812	
C 40	ECQ-S2EP471D		000-124-924	
C 54	ECE-A1EU100E	10UF 25V	000-201-812	
C 55	ECE-A2CU100E		000-124-859	
C 56	ECE-A1AU101E	100UF 10V	000-206-113	
C 57	ECE-A1CU102E	1000UF 16V	000-201-809	
C 58	ECE-A2CU220E		000-124-860	
C 59	ECE-A1HU010E	1UF 50V	000-206-115	
C 60	ECA-1HFQ681E		000-124-861	
C 61	RPE132F103Z50	0.01UF 50V	000-107-039	
C 63	PRE132CH271J50	270PF 50V	000-105-392	FOR 200KHZ
C 63	RPE132CH391J50	390PF 50V	000-112-528	FOR 50KHZ
C 64	ECE-A1EU101E	100UF 25V	000-206-105	
C 67	RPE132F104Z50	0.1UF 50V	000-104-501	
	DIODE ダイオード			
CR 1	1SS133		000-103-097	
CR 4	1SS133		000-103-097	
CR 5	1SS133		000-103-097	
CR 6	1SS133		000-103-097	
CR 13	RU2C		000-112-137	
CR 14	RG4C		000-128-382	
CR 15	SCL2C41A		000-124-857	
CR 16	05AZ10Y		000-106-180	
CR 17	RG4C		000-128-382	

UNIT | REF. DWG. C2338-K02/3/4 | BLOCK NO. | 3

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	COIL コイル			
L 1	SC-05-100	1UH 5A	000-424-972	
L 2	02S1126-0	02S1126-0	000-125-030	
L 4	02S1115-0	02S1115-0	000-124-872	
	TRANSISTOR トランジスター			
Q 1	2SC2120-Y	FM2510	000-101-822	
Q 2	2SC1815-Y		000-125-631	
Q 3	2SC1815-Y		000-125-631	
Q 4	2SC1815-Y		000-125-631	
Q 5	2SC1815-Y		000-125-631	
Q 6	2SC1815-Y		000-125-631	
Q 7	2SC1815-Y		000-125-631	
Q 8	2SA1020-Y		000-118-050	
Q 9	2SC2655-Y		000-126-250	
Q 10	IRF540		000-118-521	
Q 11	2SB595Y		000-121-104	
Q 12	2SC1815-Y		000-125-631	
Q 13	2SA1015-Y		000-118-041	
Q 14	2SK125		000-129-359	
Q 16	2SK1178		000-124-874	
Q 17	2SK1178		000-124-874	
	RESISTOR テイコウ			
R 5	ERD-16TJ220	0.16W 22	000-330-847	
R 6	JPW01		000-106-007	
R 7	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 8	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 9	ERD-16TJ102	0.16W 1K	000-330-801	
R 10	ERD-16TJ163	00S0095-0	000-329-060	
R 13	ERD-16TJ471	0.16W 470	000-329-029	
R 14	ERD-16TJ221	0.16W 220	000-329-021	
R 17	ERD-16TJ471	0.16W 470	000-329-029	
R 18	ERD-16TJ221	0.16W 220	000-329-021	
R 20	ERD-16TJ471	0.16W 470	000-329-029	
R 21	ERD-16TJ471	0.16W 470	000-329-029	
R 23	ERD-16TJ471	0.16W 470	000-329-029	
R 24	ERD-16TJ221	0.16W 220	000-329-021	
R 30	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 31	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 32	AF1/4S 6.8K F	02S0942-0	000-117-301	
R 33	AF1/4S1KF	1K,0.25W	000-108-328	
R 34	AF1/4S6.2K4-4F	02S0942-0	000-123-355	
R 35	AF1/4S100F	0.25W 100	000-108-376	
R 36	AF1/4S22 F	02S0942-0	000-108-336	
R 37	AF1/4S 5.1KOHM F	0.25W 5.1K	000-116-470	
R 38	MRG-C09X10K4-GJ	02S0943-0	000-117-860	
R 45	ERD-16TJ511	0.16W 510	000-329-050	
R 52	LVM-MCGA01B13	1K	000-103-593	

UNIT | REF. DWG. C2338-K02/3/4 | BLOCK NO. | 4

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RESISTOR テイコウ			
R 53	AF1/4S3.6K4-4		000-120-692	
R 54	ERX-2SJ5R6P	00S0102-0	000-375-446	
R 55	ERF-2AKR33		000-111-098	
R 56	ERD-16TJ470	0.16W 47	000-329-005	
R 57	ERD-16TJ331	0.16W 330	000-329-025	
R 58	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 59	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 60	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 61	ERD-16TJ101	0.16W 100	000-329-013	
R 62	ERD-16TJ202	0.16W 2K	000-330-807	
R 63	ERD-16TJ105	0.16W 1M	000-330-804	
R 64	ERD-16TJ221	0.16W 220	000-329-021	
R 65	ERD-16TJ221	0.16W 220	000-329-021	FOR 50KHZ
R 65	ERD-16TJ510	0.16W 51	000-329-006	FOR 200KHZ
R 75	ERD-16TJ104	0.16W 100K	000-330-803	
R 84	ERD-16TJ102	0.16W 1K	000-330-801	
R 85	ERD-16TJ102	0.16W 1K	000-330-801	
R 86	ERD-16TJ122	0.16W 1.2K	000-329-037	FOR 50KHZ
R 86	ERD-16TJ152	0.16W 1.5K	000-329-039	FOR 200KHZ
R 87	ERD-16TJ301	00S0095-0	000-329-024	FOR 200KHZ
R 87	ERD-16TJ391	0.16W 390	000-329-027	FOR 50KHZ
R 88	ERD-16TJ131	0.16W 130	000-329-016	FOR 50KHZ
R 88	ERD-16TJ151	0.16W 150	000-329-017	FOR 200KHZ
R 89	ERD-16TJ102	0.16W 1K	000-330-801	
R 90	EF-1/2-150K,J	0.5W 150K	000-374-109	
R 91	ERG-2SJ103P	2W 10K	000-375-487	
R 92	ERG-1SJ301		000-124-879	
R 93	ERD-25PJ103	0.25W 10K	000-330-381	
R 94	ERG-2SJ472P	00S0102-0	000-375-482	
R 95	ERD-16TJ473	0.16W 47K	000-330-814	
R 96	ERD-16TJ473	0.16W 47K	000-330-814	
R 97	ERD-16TJ101	0.16W 100	000-329-013	FOR 200KHZ
R 97	ERD-16TJ102	0.16W 1K	000-330-801	FOR 50KHZ
R 98	ERD-16TJ101	0.16W 100	000-329-013	FOR 200KHZ
R 98	ERD-16TJ102	0.16W 1K	000-330-801	FOR 50KHZ
R 99	ERG-2SJ102P	2W 1K	000-375-474	
R 107	ERD-16TJ103	0.16W 10K	000-330-802	
	TRANSFORMER トランス			
T 1	02S1125-0	02S1125-0	000-125-031	
T 2	02S1098-0		000-124-881	FOR 50KHZ
T 2	02S1099-0		000-124-882	FOR 200KHZ
T 3	02S1105-0		000-124-884	FOR 200KHZ
T 3	02S1104-0		000-124-883	FOR 50KHZ
	INTEGRATED CIRCUIT シュウセキカイロ			
U 7	TC74HCU04AF		000-118-512	
U 11	UPC494C		000-161-057	

UNIT | REF. DWG. C2338-K02/3/4 | BLOCK NO. | 5

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	INTEGRATED CIRCUIT シュウセキカイロ			
U 12	UPC7805H	5V	000-161-149	
U 13	PC900V		000-134-277	
U 15	UPC842C		000-117-517	
U 17	TLP521-2GB		000-135-825	
U 18	SN75372		000-115-497	
	POTENTIOMETER ポテンショメーター			
VR 1	VR-61SS		000-124-892	
VR 2	VR-61SS		000-124-892	
VR 3	VR-61SS		000-124-892	

UNIT		REF. DWG. C2338-K05-A	BLOCK NO.	6

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
	02P6145/6146 PNL	FCV-281	001-390-440	
	DIODE	ダイオード		
CR 1	SLP-384H-51-A		000-132-875	
CR 2	SLP-384H-51-A		000-132-875	
CR 3	SLP-384H-51-A		000-132-875	
CR 4	SLP-384H-51-A		000-132-875	
CR 5	SLP-384H-51-A		000-132-875	
CR 6	SLP-384H-51-A		000-132-875	
CR 7	SLP-384H-51-A		000-132-875	
CR 8	SLP-384H-51-A		000-132-875	
CR 9	1SS133		000-103-097	
CR 10	1SS133		000-103-097	
CR 11	1SS133		000-103-097	
CR 12	1SS133		000-103-097	
CR 13	1SS133		000-103-097	
CR 14	1SS133		000-103-097	
CR 15	1SS133		000-103-097	
CR 16	1SS133		000-103-097	
CR 17	1SS133		000-103-097	
	LOUDSPEAKER	スピーカー		
LS 1	EAF-12RT04CC	19S0100-0	000-108-215	
	RESISTOR	テイコウ		
R 1	ERD-16TJ471	0.16W 470	000-329-029	
R 2	ERD-16TJ132	0.16W 1.3K	000-329-038	
R 3	ERD-16TJ471	0.16W 470	000-329-029	
R 4	ERD-16TJ242	0.16W 2.4K	000-329-042	
R 5	ERD-16TJ471	0.16W 470	000-329-029	
R 6	ERD-16TJ471	0.16W 470	000-329-029	
R 7	EVH-09HP30B14		000-125-345	
R 8	RK1631111-100KB	02S4965-0	000-125-625	
	SWITCH	スイッチ		
SW 1	SKHHAP	22S0064	000-110-966	
SW 2	SKHHAP	22S0064	000-110-966	
SW 3	SKHHAP	22S0064	000-110-966	
SW 4	SKHHAP	22S0064	000-110-966	
SW 5	SKHHAP	22S0064	000-110-966	
SW 6	SKHHAP	22S0064	000-110-966	
SW 7	SKHHAP	22S0064	000-110-966	
SW 8	SKHHAP	22S0064	000-110-966	

UNIT		REF. DWG. C2338-K05-A	BLOCK NO.	7

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	SWITCH	スイッチ		
SW 9	02S3910-1	02S3910-1	000-124-908	
SW 10	02S3911-1	02S3911-1	000-124-909	

- END -

FURUNO

S-1

1B1 CHASSIS

1B3 MAIN
02P6127

1B2 CON
02P6130

航法装置
NAV. EQUIPMENT
NMEA #0183
OR
CIF

J2 J4 J1 02S4050 J7
TD-H 1 1
TD-C 2 2
RD-H 3 3
RD-C 4 4
CR20-04-S15K

NMEA I/F

CPU
HD64180ZF-8

E² ROM
(1K)

RAM
8KBYTE

ROM
64KBYTE

水温/スピードセンサー
SPEED/TEMPERATURE
SENSOR

22S 0193

J3 J5 J2 02S4051 J4
0V 1 1
VTH-H 2 2
VTH-C 3 3
SP 4 4
+10V 5 5 ← +10V
N.C 6 6
CR20-06-S15K

DUAL PORT
RAM(256K)

水温/スピードセンサーI/F
SPEED &
TEMPERATURE
SENSOR I/F

ゲートアレイ
GATE ARRAY
μPD65034GD
(DISPLAY)

船内電源
SHIP'S MAINS

10.5~30.0VDC

22S 0194

J4 J3 J1
1 1 1 → Vin
2 2 2
3

22S 0192

VHR-3N

B3P-VH

30MHz

ゲートアレイ
GATE ARRAY
μPD65031GF
(ECHO SOUNDER)

送受波器
TRANSDUCER

J1 J8
1 1
2 2
3 3
4 4
5 5
6
7
8

FM-214-9S

TRAP

TX AMP

RX AMP

FCN-814P005-TA

+110V
+10V
+5V

スイッチング レギュレータ
SWITCHING
POWER SUPPLY

J9
12 11 10 9 8 7 6 5 4 3 2 1

FCN810-12-No.1
02S4048

FCN-814P012-TA

FCN-814P004-TA

FCN810
-4-No.1

1B4 MONITOR
02P6128

A18JHC30X01
02S5067

CRT

F.B.T.

モニター
MONITOR

ER COIL

J10 FCN810 -5-No.1 02S4045 J4
+110V 1
+10V 2 3
FCN -814P005-TA 4
FCN -814P-008-TA J5 5

FCN810 -8-No.1 02S4044 J1
V.SYNC 1
H.SYNC 2
B VIDEO 3
G VIDEO 4
R VIDEO 5
6
7
8

J2
1
2
3
4

J3
1
2

1B5 PNL1
02P6126

J2 02S4052
CR20-8 -S15K
J3
1
2
3
4
5
6
7
8

輝度 BRILL
感度 GAIN

+5V
+10V
BUZZ

ブザー
BUZZER

1B6 PNL2
02P6129

J6 02S 4053 J1 J2 02S 4054 J1 CR20-09-S15K
S0 1
S1 2
S2 3
S3 4
R0 5
R1 6
R2 7
R3 8
R4 9
R5 10
R6 11
R7 12

CR20-12-S12K

1 NORM AUTO
2 M/Z
3 B/L
4 B/Z
5 NAV
6 MENU
7
8

2 −
3 +
4 色調 HUE
5 Aスコープ A SCOPE
6 色消 SIG LEV
7 アラーム ALARM
8 ▲
9 ▼

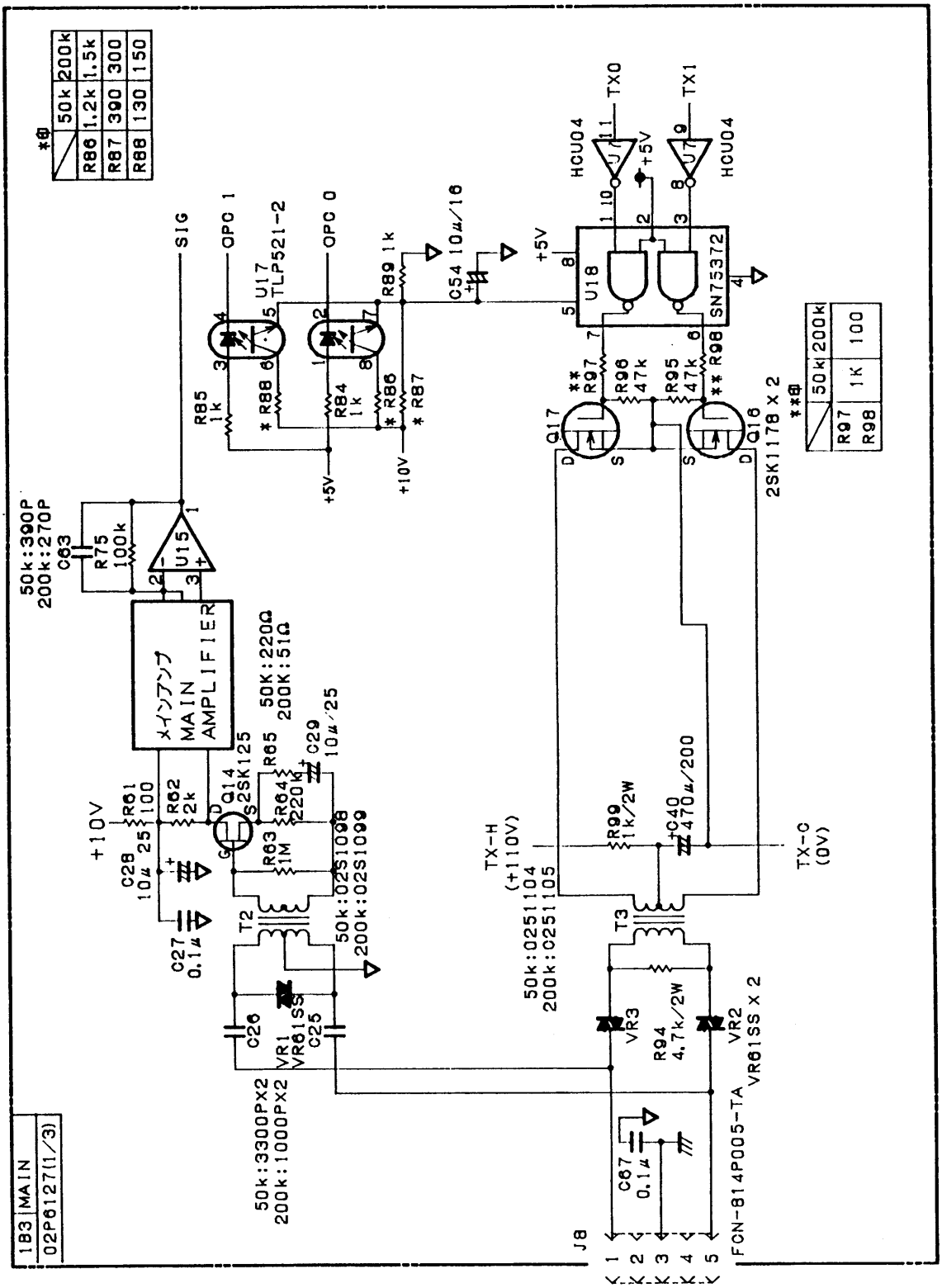
J2 02S 4046 J3
Vin 1
2
3
4

電源
POWER

NORM : 普通	AUTO : フルオート
M/Z : マーカ拡大	
B/L : 直線拡大	
B/Z : 追尾拡大	
NAV : 航法データ	
MENU : メニュー	

承認 APPROVED	SEP.13.'91	名称 TITLE	FCV-581 指示器 DISPLAY UNIT
検図 CHECKED	SEP.13.'91		
製図 DRAWN	SEP.13.'91 TOMITA	図番 DWG. NO.	C2334-K01-A

FURUNO ELECTRIC CO., LTD.



*印

	50k	200k
R86	1.2k	1.5k
R87	390	300
R88	130	150

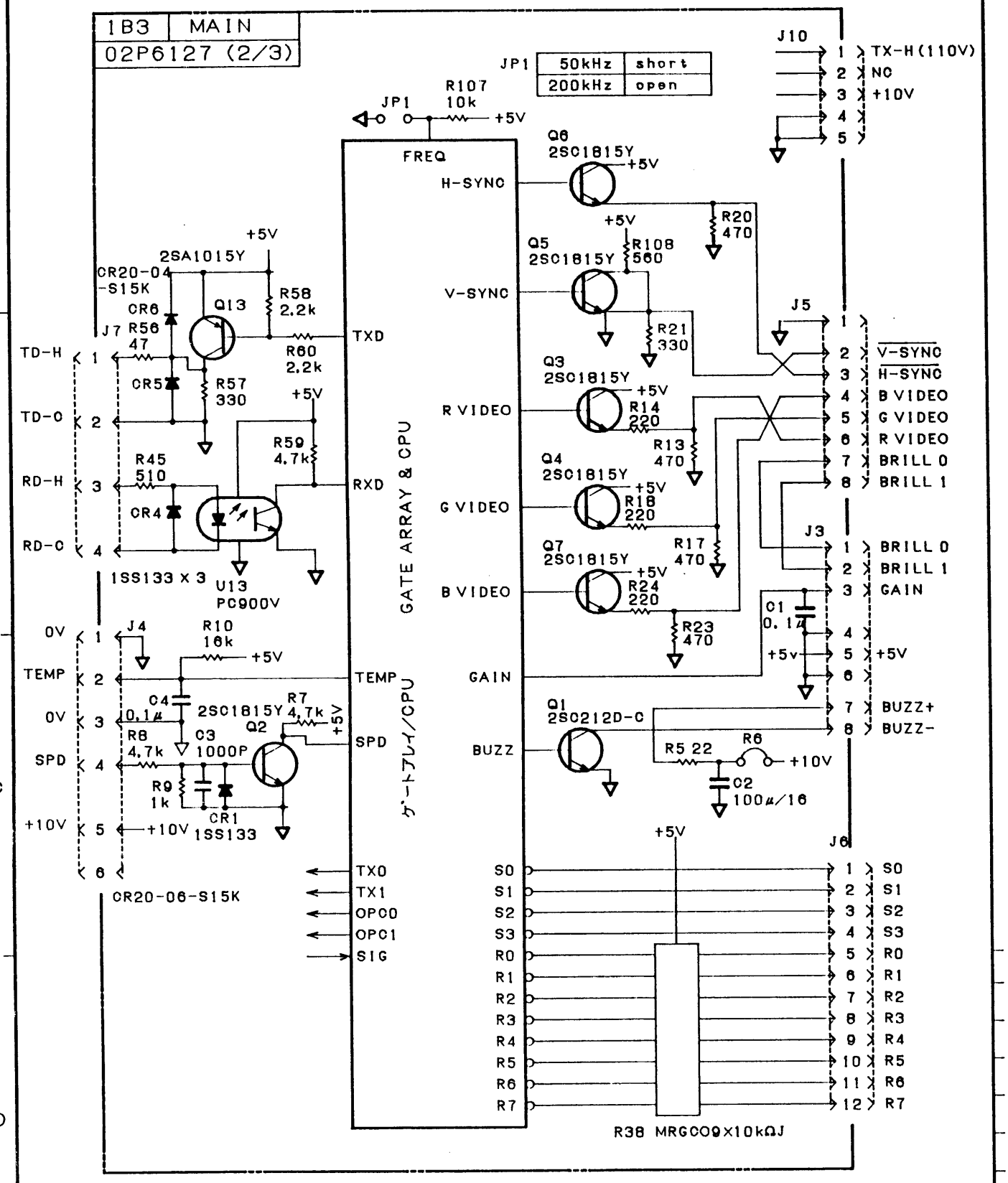
**印

	50k	200k
R97	1K	100
R98		

ITEM	NAME	MATERIAL	Q'TY	DWG. NO.	REMARKS
	FCV-581				

承認 APPROVED	SEP.13.'91 TANAKA	三角法 THIRD ANGLE PROJECTION	名称 TITLE 02P6127 MAIN 基板 MAIN BOARD (1/3)
検図 CHECKED	SEP.13.'91 [illegible]	尺度 SCALE	
製図 DRAWN	SEP.13.'91 TOMITA	重量 WEIGHT kg	図番 DWG. NO. C2334-K02-A

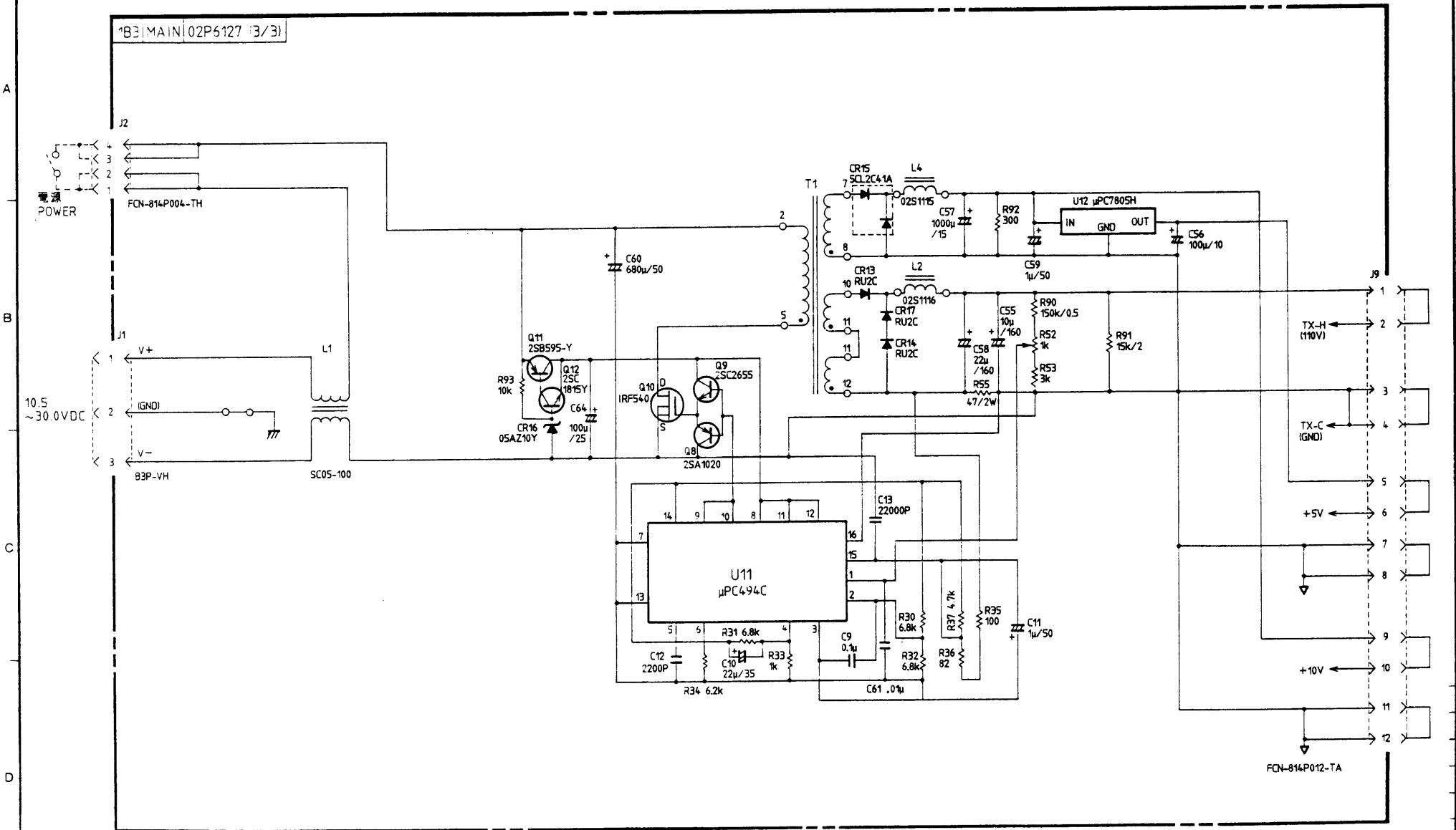
FURUNO ELECTRIC CO., LTD.



FCV-581	品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	SEP・13・'91 TKAWAUCHI	三角法 THIRD ANGLE PROJECTION		名称 TITLE	02P6127 MAIN 基板 MAIN BOARD (2/3)
検図 CHECKED	SEP・13・'91 M. USHIDA	尺度 SCALE	/		
製図 DRAWN	SEP・13・'91 TOMITA	重量 WEIGHT	kg	図番 DWG. NO.	C2334-K06-A

FURUNO

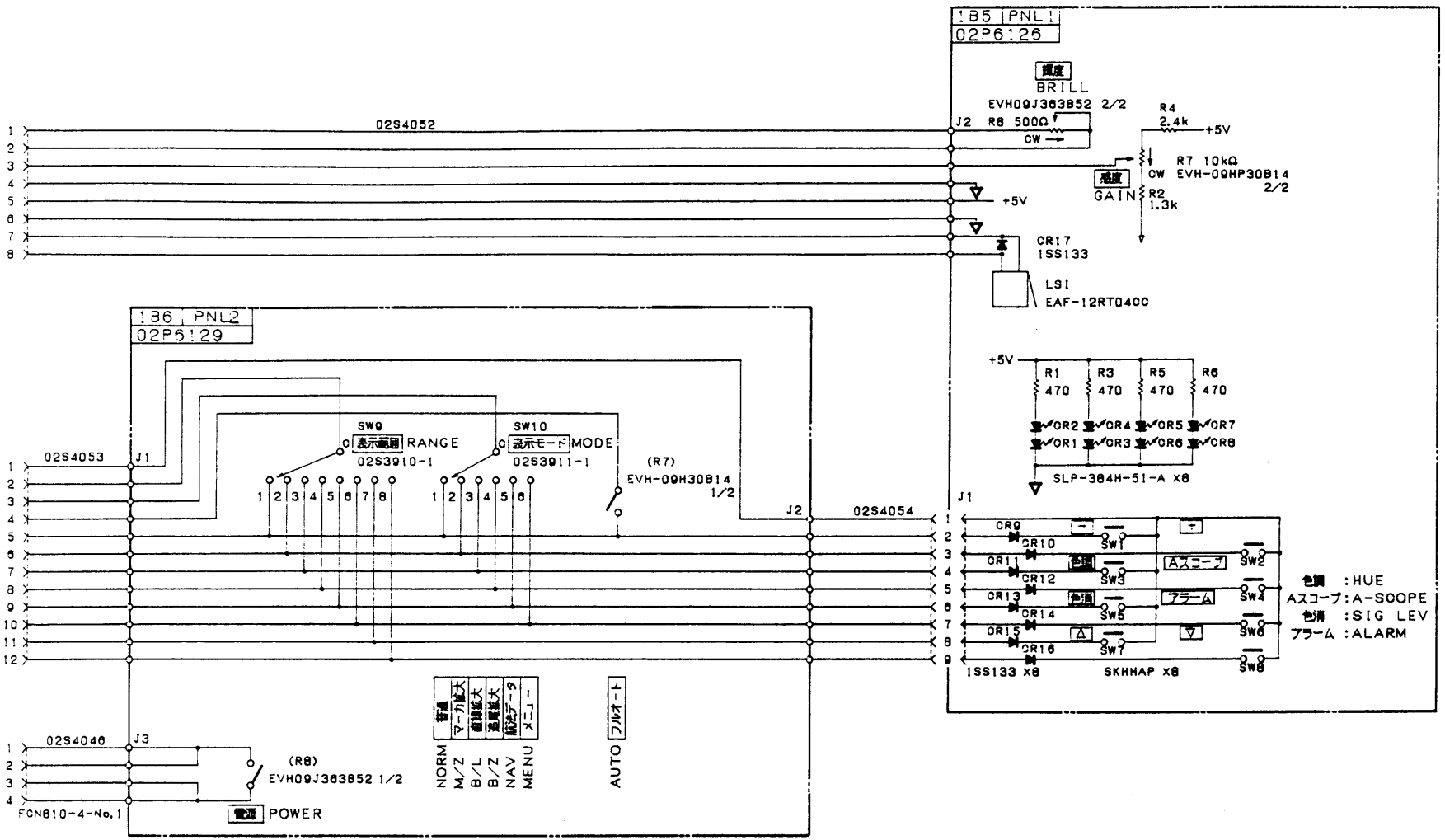


承認 APPROVED	SEP. 5 '91 T.NAKANO	名称 TITLE	02P6127 MAIN 基板 MAIN BOARD (3/3)
検図 CHECKED	SEP. 6 '91 U. ISHIDA		
製図 DRAWN	Sep. 6 '91 TOMITA	図番 DWG. NO.	C2334-K03-A

FCV-581

FURUNO ELECTRIC CO., LTD.

FURUNO



承認 APPROVED	SEP・6・'91 T.YAKAU C	名称 TITLE	02P6126/6129 PNL1/PNL2
検図 CHECKED	SEP・6・'91 M. ISHIDA		
製図 DRAWN	SEP 6 '91 TOMITA	図番 DWG. NO.	C2334-K04-A

FCV-581

FURUNO ELECTRIC CO., LTD.

FURUNO

S - 6

1B4	MONITOR
02P6128	

承認 APPROVED	SEP. 6. '91 T. NAKANO	名称 TITLE	カラーモニター COLOR MONITOR
検図 CHECKED	SEP. 6. '91 M. USUDA		
製図 DRAWN	SEP. 6. '91 TOMITA	図番 DWG. NO.	C2334-K05-A

FCV-581

FURUNO ELECTRIC CO., LTD.

FURUNO

S-7

1B1 CHASSIS

航法装置
NAV. EQUIPMENT
(NMEA #0183
OR
CIF)

水温 スピードセンサー
SPEED/TEMPERATURE
SENSOR

船内電源
SHIP'S MAINS
10.5~40.0VDC

送受波器
TRANSDUCER

1B2 CON
02P6130

J2 J4 J1 02S4057
TD-H 1
TD-C 2
RD-H 3
RD-C 4
22S 0193

J3 J5 J2 02S4058
0V 1
VTH-H 2
VTH-C 3
SP 4
+10V 5
N.C 6
22S 0194

J4 J3
+ 1
- 2
22S 0192
VHR-3N

J1 02S4055
1 2 3 4 5 6 7 8
FM-214-8S

1B3 MAIN
02P6144

J7
1 2 3 4
CR20-04-S15K
NMEA I/F

J4
1 2 3 4 5 6
CR20-06-S15K
水温/スピードセンサーI/F
SPEED &
TEMPERATURE
SENSOR I/F
+10V

J1
1 2 3
Vin
B3P-VH

J8
1 2 3 4 5
FCN-814P005-TA
TRAP
TX AMP
RX AMP

30MHz

RAM
8KBYTE
ROM
64KBYTE
E² ROM
(1K)
CPU
HD64180ZF-8

DUAL PORT
RAM(256K)
ゲートアレイ
GATE ARRAY
μPD65034GD
(DISPLAY)

ゲートアレイ
GATE ARRAY
μPD65031GF
(ECHO SOUNDER)

スイッチング レギュレータ
SWITCHING
POWER SUPPLY
+90V
+10V
+5V

J9
1 2 3 4 5 6 7 8 9 10 11 12
FCN-814P012-TA
FCN810-12-No.1
02S4048

1B4 MONITOR
QA1007

B3P-VH J10
+90V 1
NC 2
3

87P-SHF-1AA-K J5
V.SYNC 2,4
H.SYNC 1
R VIDEO 3
G VIDEO 5
B VIDEO 6
7

F.B.T.
CRT
モニター
MONITOR

J11
1 2 3
02S4059

1B5 PNL1
02P6145

J3
1 2 3 4 5 6 7 8 9
CR20-9 S15K
+5V
+10V
BUZZ

J2
輝度 BRILL
感度 GAIN
ブザー
BUZZER

1B6 PNL2
02P6146

J6
S0 1
S1 2
S2 3
S3 4
R0 5
R1 6
R2 7
R3 8
R4 9
R5 10
R6 11
R7 12
CR20-12-S12K

02S 4060
J1 J2
02S 4054

1 NORM AUTO
2 M/Z
3 B/L
4 B/Z
5 NAV
6 MENU
7
8

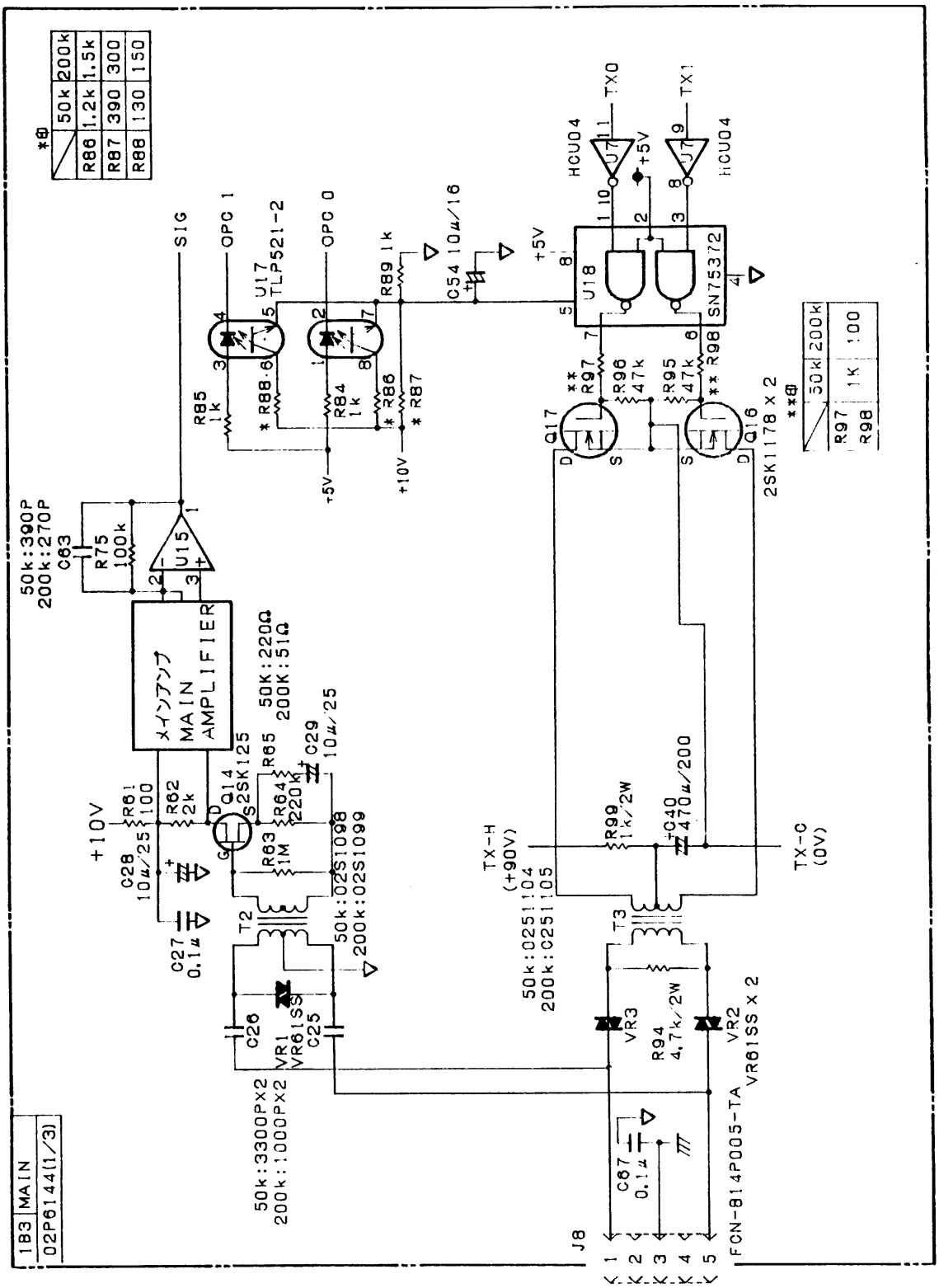
J1 CR20-09-S15K
2 −
3 +
4 色調 HUE
5 Aスコープ A SCOPE
6 色消 SIG LEV
7 アラーム ALARM
8 ▲
9 ▼

J2 02S 4056 J3
Vin 1
2
3
4
FCN-814P004-TA
FCN810-4-No.2
電源
POWER

NORM : 普通
M/Z : マーカ拡大
B/L : 直線拡大
B/Z : 追尾拡大
NAV : 航法データ
MENU : メニュー
AUTO : フルオート

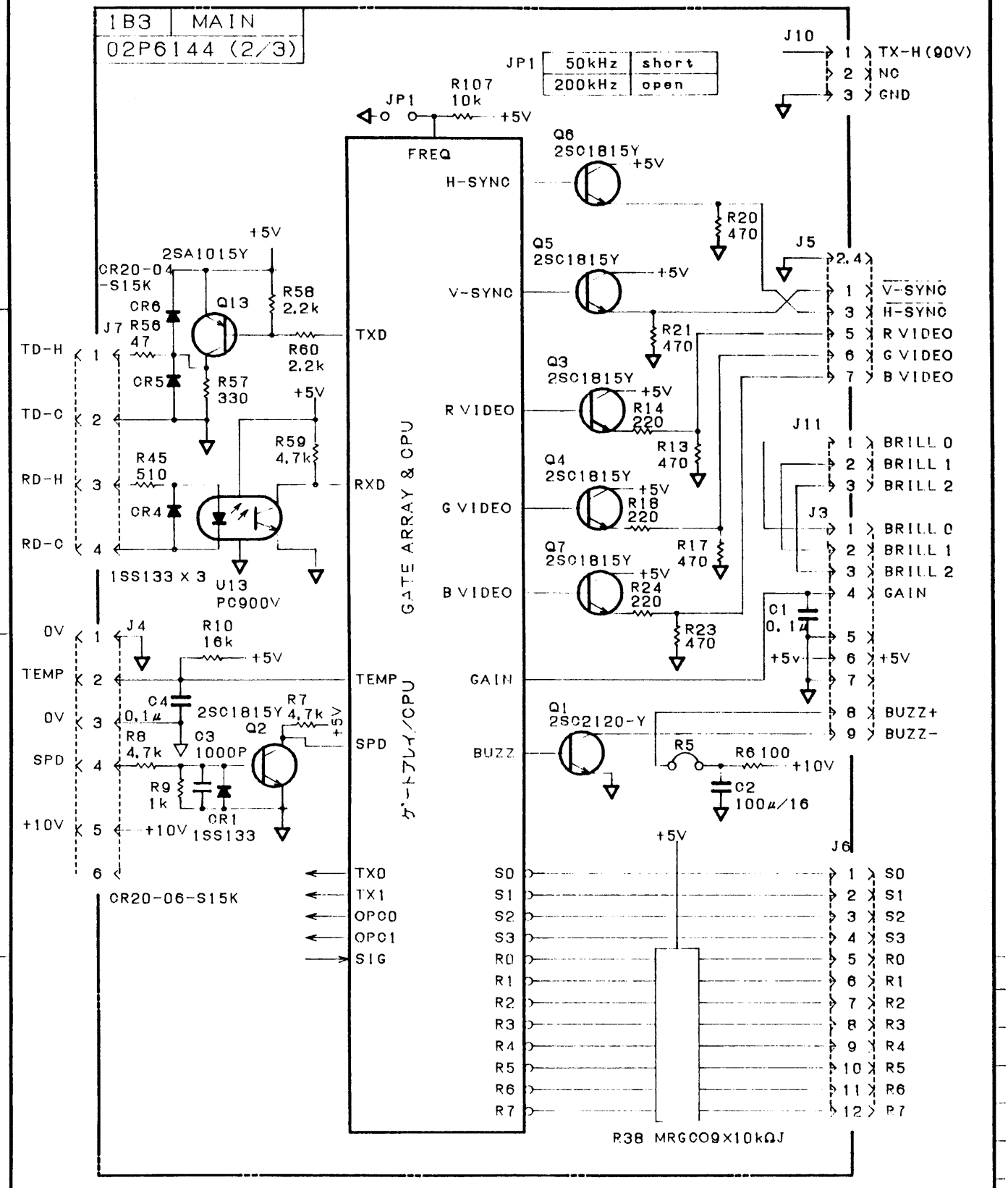
承認 APPROVED	OCT.23.'91 T.KAWAGUCHI	名称 TITLE	FCV-281 指示器 DISPLAY UNIT
検図 CHECKED	OCT.23.'91 M.USUDA		
製図 DRAWN	OCT.23.'91 TOMITA	図番 DWG. NO.	C2338-K01-A

FURUNO ELECTRIC CO., LTD.



FCV-281	品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	OCT·23·'91 TSUKADA	三角法 THIRD ANGLE PROJECTION		名称 TITLE	MAIN 基板 MAIN BOARD (1/3)
検図 CHECKED	OCT·23·'91 M. USUDA	尺度 SCALE	~~X~~	02P6144	
製図 DRAWN	OCT·23·'91 T. MIKA	重量 WEIGHT	kg	図番 DWG. NO.	C2338-K02-A

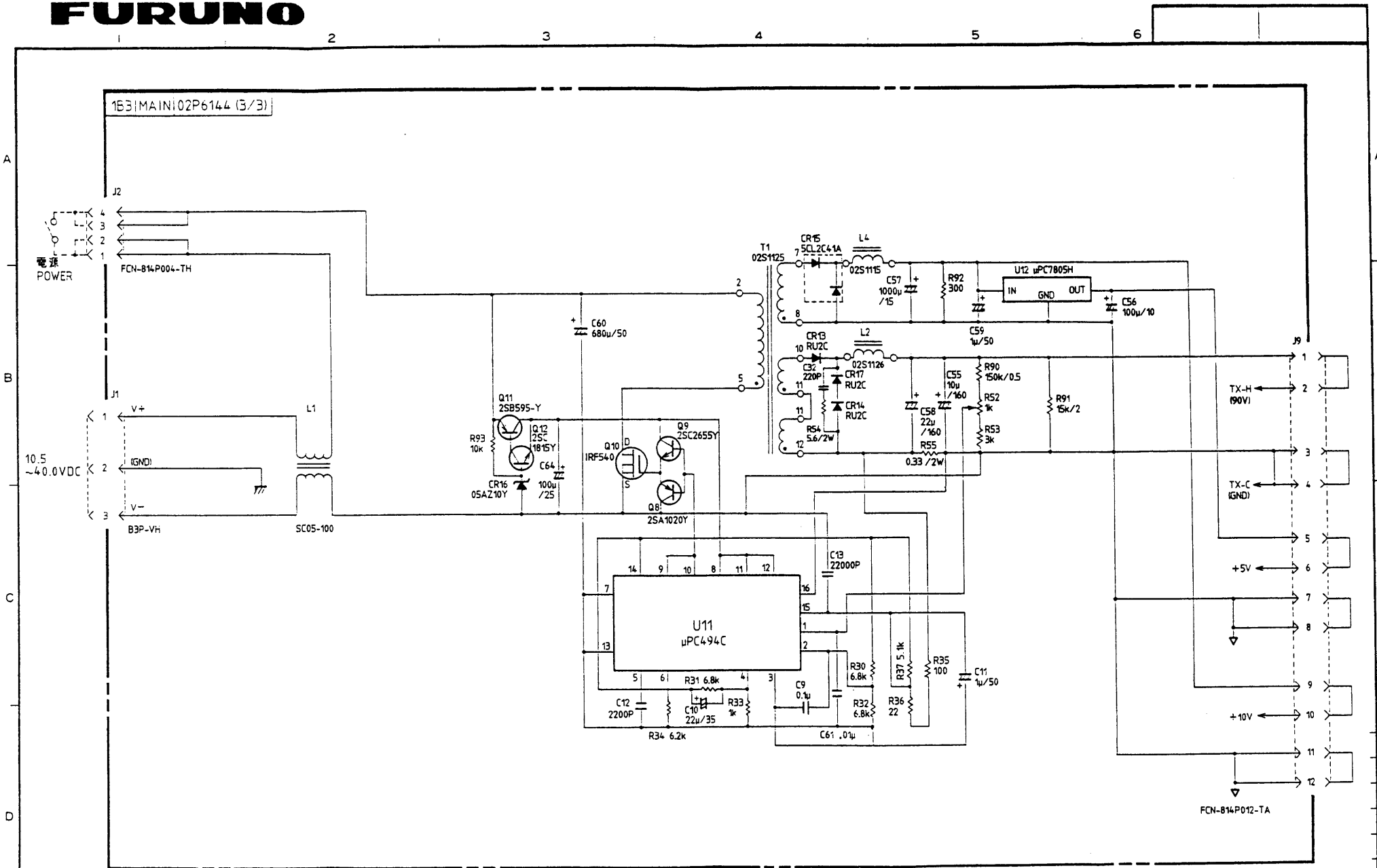


ITEM 品番	NAME 品名	MATERIAL 材質	Q'TY 数量	DWG. NO. 図番	REMARKS 摘要
FCV-281					

承認 APPROVED	OCT.23.'91 TANAKA	三角法 THIRD ANGLE PROJECTION	名称 TITLE 02P6144 MAIN 基板 MAIN BOARD (2/3)
検図 CHECKED	OCT.23.'91 M.NISHI	尺度 SCALE	
製図 DRAWN	OCT.23.'91 TOMITA	重量 WEIGHT kg	図番 DWG. NO. C2338-K03-A

FURUNO ELECTRIC CO., LTD.

FURUNO

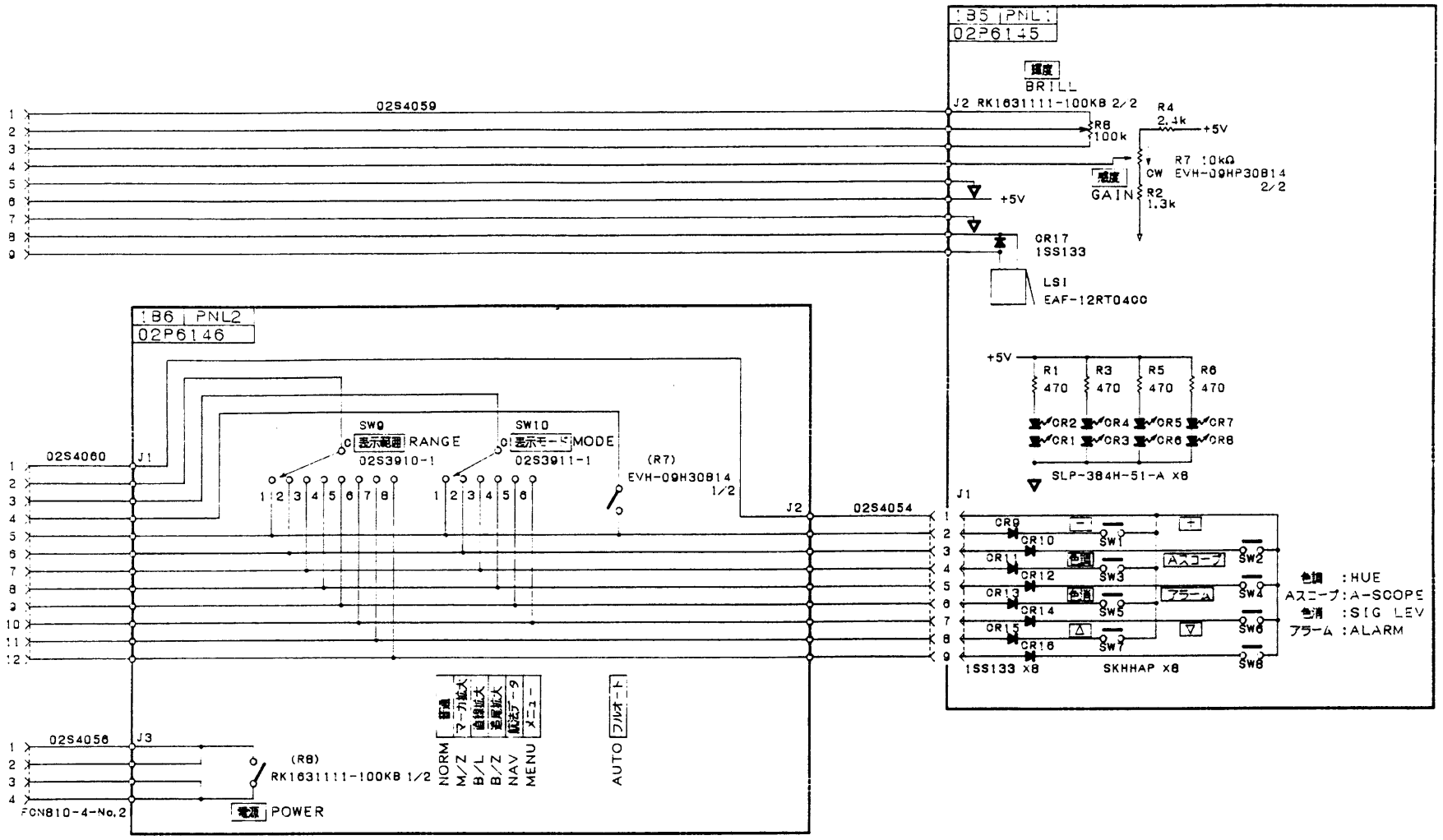


承認 APPROVED	OCT 23 '91 T.NAKAJO	名称 TITLE	02P6144 MAIN 基板 MAIN BOARD (3/3)
検図 CHECKED	OCT 23 '91 M. IISHIDA		
製図 DRAWN	OCT.23 '91 TOMITA	図番 DWG.NO.	C2338-K04-A

FCV-281

FURUNO ELECTRIC CO., LTD.

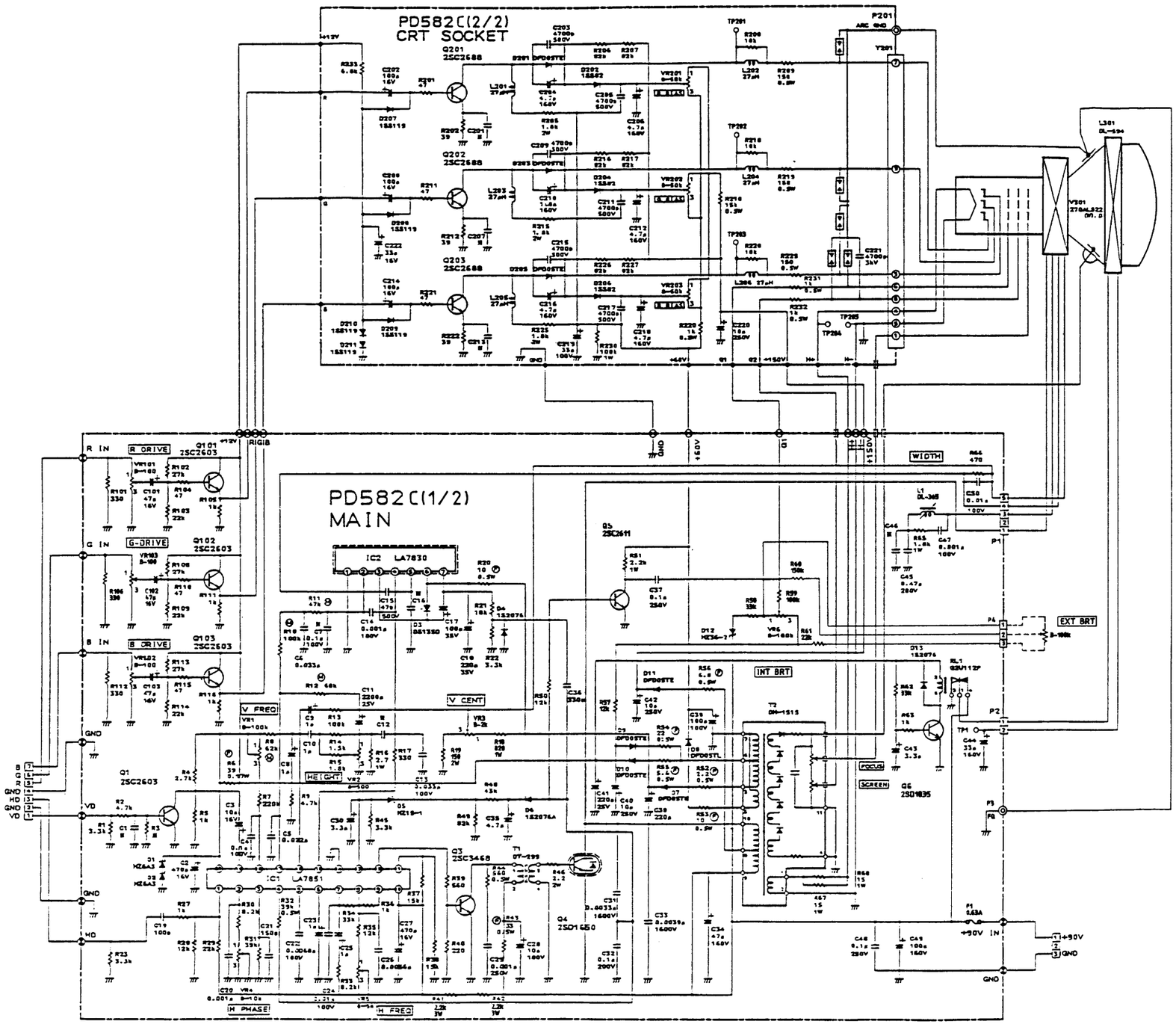
FURUNO



承認 APPROVED	OCT·23·'91 T. AKAGI	名称 TITLE	02P6145/6146 PNL1/PNL2
検図 CHECKED	OCT·23·'91 M. MISUDA		
製図 DRAWN	OCT·23·'91 T. NAKATA	図番 DWG. NO.	02338-K05-A

FCV-281

FURUNO ELECTRIC CO., LTD.



注 ： 1．特記なき抵抗の単位は全てΩ，0.25W
又コンデンサーはF，50WV。
2．Ⓜ：金属皮膜抵抗器
3．Ⓕ：熔断抵抗器

NOTE: 1. ALL RESISTANCES IN OHMS. 0.25W,
CAPACITANCE IN FARADS, 50WV
UNLESS NOTED OTHERWISE.
2. Ⓜ : FIXED METAL FILM RESISTOR.
3. Ⓕ : FUSING RESISTOR.

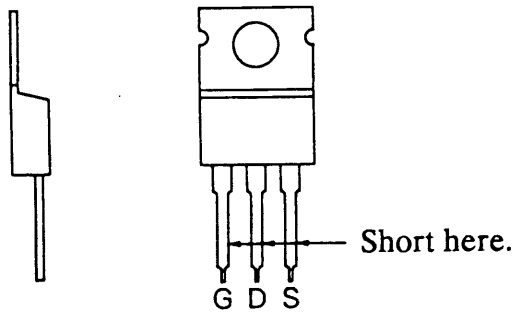
承認 APPROVED	OCT. 23. '91 T.NAKAJO	名称 TITLE	QA1007 CRT 表示部 CRT DISPLAY
検図 CHECKED	OCT. 23. '91 M. USUDA		
製図 DRAWN	OCT. 23. 91 TOMITA	図番 DWG. NO.	C2338-K06-A

FURUNO ELECTRIC CO., LTD.

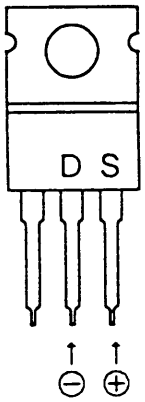
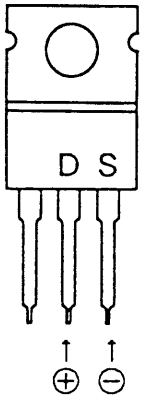
APPENDIX A CHECKING POWER MOS FET

A power MOS FET is employed in the output stages of the inverter and the transmitter. It can be checked for proper functioning with a multimeter as follows.

1) Make shortcircuit (discharging) between gate (G), drain (D) and source (S) with the lead of the multimeter.



2) Measure the resistance between drain (D) and source (S) on the [x1k Ω] range.

Measuring Points / Normal Resistance Value [x1kΩ]		
After discharging	Infinite. (∞)	7kΩ approx
After charging	0 Ω	0 Ω

3) Select [x1kΩ] range, and charge between gate and drain for 10 seconds. (Positive lead to drain and negative lead to gate)

4) Measure the resistance between drain and source on the [x1kΩ] range.

If the measured value agrees with the ratings in the above table the MOS FET is normal.

APPENDIX B MOUNTING TEMPERATURE SENSOR (OPTION)

Mounting Location

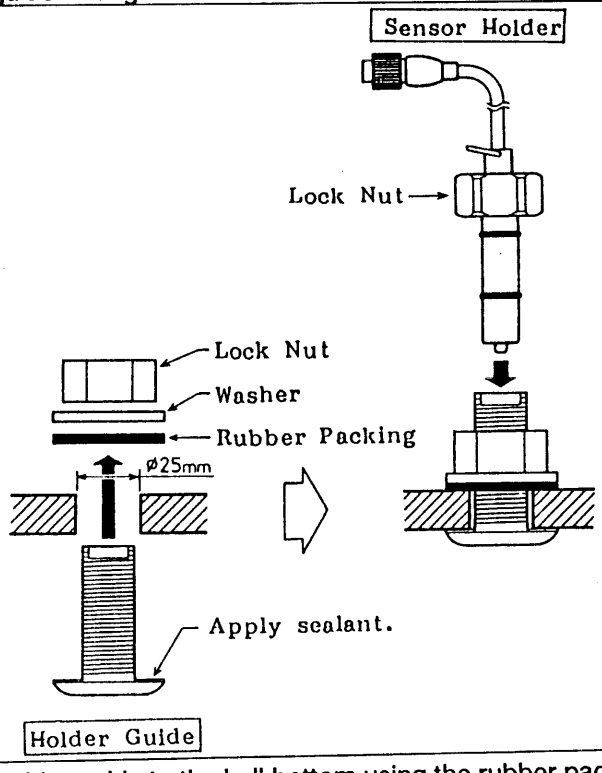
Select a mid-boat, flat position. Where the sensor is not damaged by dry-docking operation. The sensor does not have to be installed perfectly perpendicular.

Select a place apart from the equipment generating heat.

Select a place in forward direction viewing from the drain hole for cooling water.

Select a place free from vibration.

Mounting Procedure

T-03MSB	
1)	Dry-dock the boat.
2)	Make a hole of approx. 25mm (1") dia. on the hull bottom.
3)	Apply high-grade sealant to the holder guide flange and pass the holder guide through the hole.
	
4)	Fix the holder guide to the hull bottom using the rubber packing, the washer and the lock nut. Do not tighten the nut excessively. (600kg-cm max.)
5)	Insert the sensor holder to the holder guide and tighten by the nut.
6)	After the launching, check for water leakage around the sensor.
	Note: **1)** For the boat of more than 25mm hull plate, this sensor is impossible to install. **2)** When the sensor seems to be deteriorated, the check, cleaning or replacement can be carried out without dry-docking.

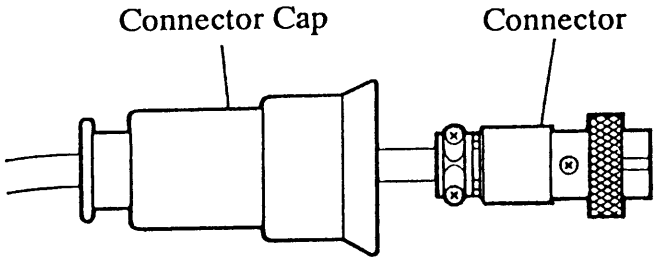
APPENDIX C WATERPROOFING TRANSDUCER CABLE CONNECTOR (FCV-581 ONLY)

Overview

An ordinary connector has been fitted to the transducer cable. To make it waterproof, attach the connector cap supplied as an installation material.

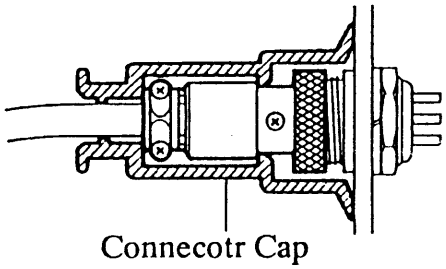
Procedure

1. Unsolder the connector FM-148P from the transducer cable.



2. Pass the cable through the connector cap and refit the connector.

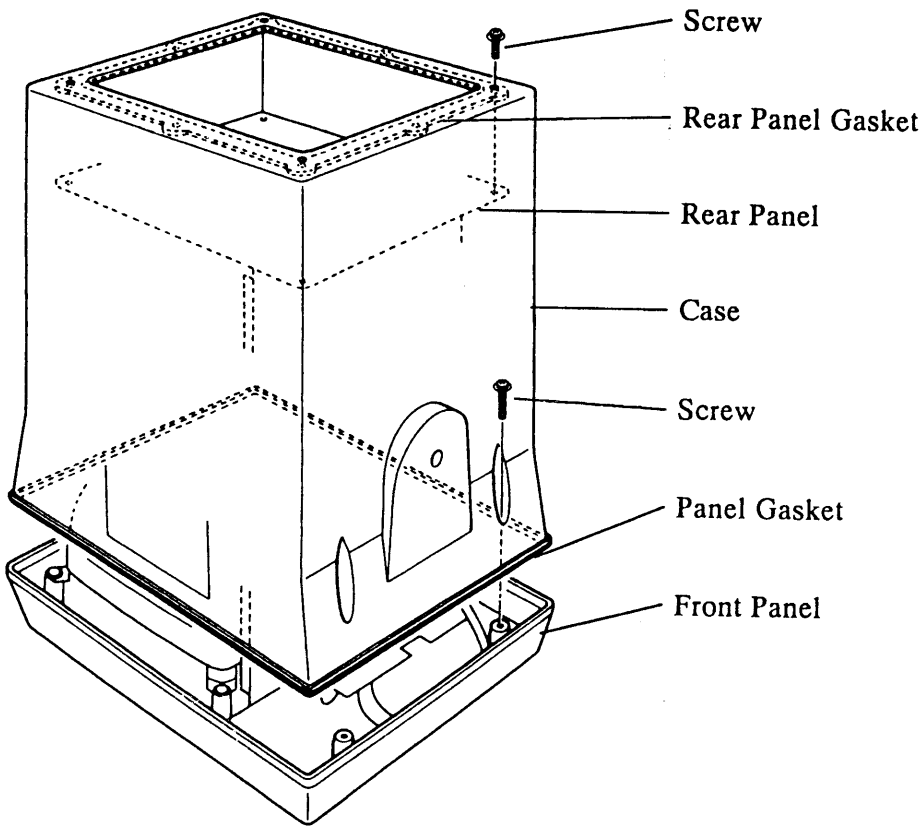
3. Plug the connector into the receptacle on the FCV-581. Slide the connector cap over the connector and press it onto the chassis of the FCV-581.



■ **NOTE:**
The power, NMEA and temperature/speed sensor cables have been fitted with waterproof connectors. The display unit is splashproof.

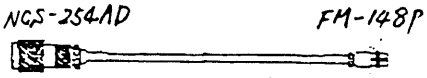
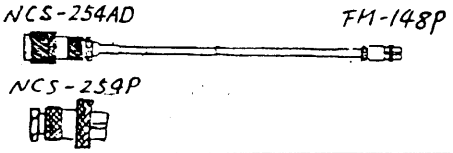
APPENDIX D HANDLING PRECAUTION OF DISPLAY UNIT CASE (FCV-581 ONLY)

The display unit is made splashproof by gaskets on the unit case. When putting back the case after maintenance and service, make sure that the two gaskets are in position.



APPENDIX E CABLE/CONNECTOR ASSEMBLY FOR OPTIONAL TRANSDUCER

Cable/connector assemblies for connecting the FCV-281/581 with optional transducers 50B-6, 200B-5, etc. are available with the following types and code numbers. Connector FM-148P in the standard installation materials does not fit the cable diameter of these transducers.

Name	Type	Code No.	Used for:
Cable/Connector Assembly A	OP02-68	001-380-950	Transducer already installed. 
Cable/Connector Assembly B	OP02-69	001-380-960	Transducer to be newly installed. 

APPENDIX F REMARKS ON OPERATING WITH ECHO GENERATOR EG-1000/EG-1200

When the SHALLOW/DEEP switch of the EG-1000/1200 is set to "SHALLOW", the FCV-581/281 can not recognize bottom echoes generated by EG-1000/1200, resulting that the bottom-lock (B/L) and bottom zoom (B/Z) modes do not work.

Reason

In the FCV-581/281, threshold level for recognition of bottom echoes is automatically changed with depth ranges, considering propagation attenuation of sound in water, while the EG-1000/1200 output bottom echoes with the same level in both SHALLOW and DEEP. This causes that the level of the bottom echo does not reach the bottom recognition threshold level of FCV-581/281 in the SHALLOW setting.

Using FCV-581/281 for Demonstration/Exhibition

It is recommended that the built-in "DEMONSTRATION" mode of FCV-581/281 be used. When the EG-1000/1200 are used, set the SHALLOW/DEEP switch to "DEEP".

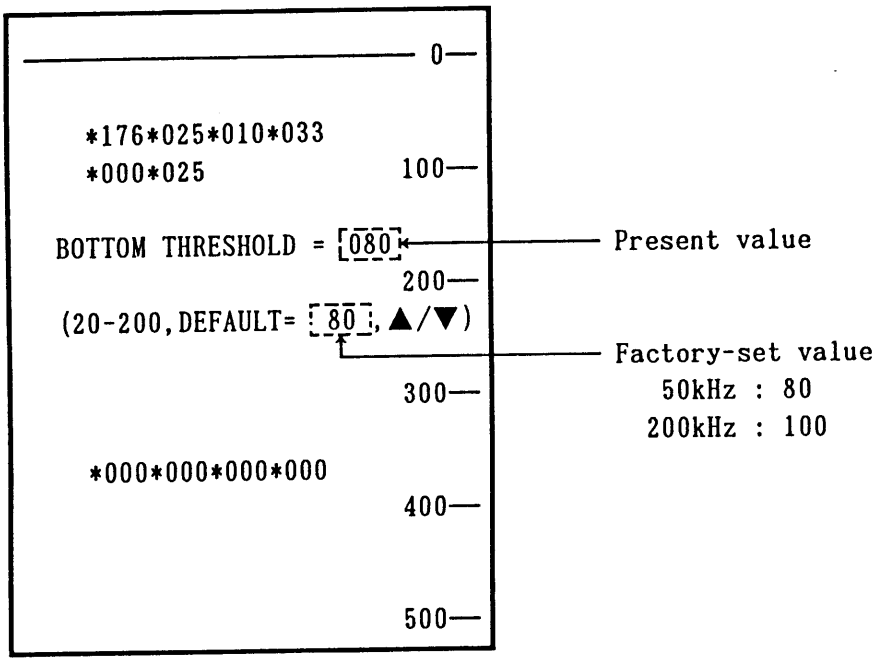
Using EG-1000/1200 for Operation Check of FCV-581/281

To check overall operations of FCV-581/281 including transceiver circuit, use the EG-1000/1200. In this case, change the bottom recognition threshold level of FCV-581/281 as shown on the following page, so the FCV-581/281 will work normally in both SHALLOW and DEEP settings of SHALLOW/DEEP switch.

CHANGING BOTTOM RECOGNITION THRESHOLD LEVEL

1. Turn the unit on while pressing any key to display the "OPTION MODE" screen.

2. Press the **ALARM** key five times at short intervals. The bottom threshold screen as shown below appears.



3. Press the **MARKER** [▲] [▼] key to change the bottom threshold value to approximately 60. Do not set too small value, or fish echoes may be recognized as bottom.

4. Turn off and on the unit to store the value.

Note: When the FCV-581/281 are tested with the transducer exposed to air, decrease the threshold value as described above, and the bottom recognition will work normally.

IMPORTANT

After checking FCV-581/281, do not forget to reset the threshold value to 80 by using the above procedure or as follows.

1. Turn the unit on while pressing any key.

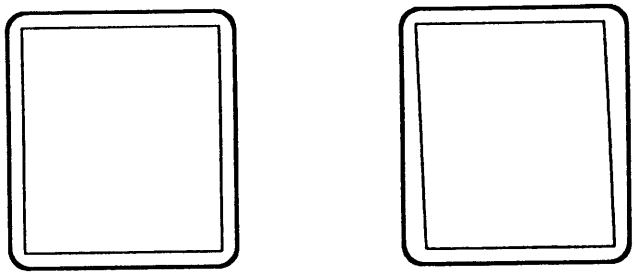
2. Press MARKER [▲] key, and the factory-set data are restored.

APPENDIX G CORRECTING TILTED PICTURE (FCV-581)

When you encounter the tilted picture on the FCV-581, do the remedy which follows.

Symptom

The picture is tilted 1/8 inch from top to bottom: the picture frame should be rectangular but it is a paralellogram.



(Normal) (Tilted)

Cause

Magnetic force emitted from coil L01 on monitor board affects the CRT.

Remedy

Widen horizontal size of picture.
1) Adjust V-SIZE (R47) to widen the horizontal size.
2) Adjust V-POS (R48) to adjust the picture position.
Polarity mark " + " of water temperature readout on upper left and the alarm bar on lower right of screen should be discernable.

Correction at Factory

For ser. no. 8830-0894, 0899, 1067 to 1072, 1101 and after