

## Parts List/Tune Up Information

### MARINE RADAR RA53

Technical description that is not described on FCC Form 731 and an attached instruction book for Type RA53.

#### 1. Function of each electron tube, semiconductor or other active circuit device Rule's No.2.983 (d) - (6)

##### 1.1 Electron tubes

| Symbol No. | Description | Type     | Function          |
|------------|-------------|----------|-------------------|
| V101       | Magnetron   | MSF1422B | Transmitting tube |

##### 1.2 Semiconductor in the chassis of the scanner unit

| Symbol No. | Description                     | Type    | Function                                 |
|------------|---------------------------------|---------|------------------------------------------|
| U101       | Front end with X-band amplifier | NJT1973 | RF amplifier, local oscillator and mixer |
| U1         | Limiter diode                   | NJS6930 | Receiver protector at X-band             |

##### 1.3 Semiconductor on E41-100\*(Modulator)

| Symbol No.                          | Description | Type             | Function                |
|-------------------------------------|-------------|------------------|-------------------------|
| CR1, CR3                            | Diode       | 1SS123-L         | Rectifier               |
| CR2, CR4, CR5, CR6, CR7, CR10, CR14 | Zener Diode | HZM5.1NB2TL      | Voltage limiter         |
| CR8                                 | Zener Diode | HZM9.1NB1TL      | Voltage limiter         |
| CR9                                 | Zener Diode | HZM6.2NB2TL      | Voltage limiter         |
| CR11, CR15                          | Diode       | SB90-05J         | Voltage limiter         |
| CR12                                | Diode       | DCB010TA         | Rectifier               |
| CR13                                | Diode       | V06G             | Rectifier               |
| Q1, Q6                              | Transistor  | 2SA1182-Y-TE 85L | Video/Trigger amplifier |
| Q2                                  | Transistor  | 2SD1005-T1       | Video amplifier         |

| Symbol No.            | Description      | Type               | Function                 |
|-----------------------|------------------|--------------------|--------------------------|
| Q3                    | Transistor       | 2SA1213-TE12<br>L  | Video amplifier          |
| Q4, Q8                | Transistor       | 2SA1462-T1BY<br>34 | Trigger buffer amplifier |
| Q5, Q7, Q9            | Transistor       | 2SC3735-T1BB<br>35 | Pulse amplifier          |
| Q10, Q28              | Transistor       | 2SC3736-T10L       | Pulse amplifier          |
| Q11, Q29, Q31         | Transistor       | 2SA1463-T1IL       | Pulse amplifier          |
| Q18                   | FET              | 2SK738-Z-E1        | Pulse amplifier          |
| Q19                   | FET              | 2SJ132-Z-T1        | Pulse amplifier          |
| Q14                   | Transistor       | 2SC3631-Z          | Pulse amplifier          |
| Q21, Q22,<br>Q23, Q24 | FET              | 2SK1450            | Pulse switch             |
| Q16                   | Transistor       | 2SA1413-Z-T2<br>K  | Buffer amplifier         |
| Q25, Q27              | Transistor       | 2SC2712-YTE8<br>5L | Voltage regulator        |
| Q26                   | Transistor       | 2SB596-0           | Voltage regulator        |
| Q30                   | FET              | IRFP150N           | Motor driver             |
| U1                    | IC Regulator     | LM350K             | Magnetron heater driver  |
| U2                    | IC               | TC74HC14AF         | Hex-inverter             |
| U3                    | IC Regulator     | HA17815V           | Voltage regulator        |
| U4                    | IC Regulator     | HA17805V           | Voltage regulator        |
| U5                    | IC               | TC74HC00AF-E<br>L  | Quad- 2input NAND gate   |
| U6                    | IC               | MC14046BCF         | Azimuth PLL              |
| U7                    | Transistor Array | TD62004F           | Signal buffer            |
| U8, U9                | IC               | TC74HC4040AF       | 12 bit binary counter    |
| U10                   | IC Custom        | AC235AFP           | Transceiver controller   |
| U11                   | IC               | TC74HC11AF-T<br>P2 | Triple 3 input AND gate  |

| Symbol No.            | Description   | Type        | Function                      |
|-----------------------|---------------|-------------|-------------------------------|
| U12, U13              | A/D converter | TC35095AF   | System check interface        |
| U14                   | Ope-amplifier | UPC324G2-E2 | Analog interface              |
| U15, U16,<br>U17, U19 | Photo coupler | TLP181GB    | Ground isolator               |
| U18                   | IC            | UPC494GS-E2 | Motor Power supply controller |

#### 1.4 Semiconductor on E41-200\*(IF amplifier)

| Symbol No.            | Description            | Type           | Function                   |
|-----------------------|------------------------|----------------|----------------------------|
| CR1, CR2,<br>CR5, CR7 | Diode                  | 1SS123-L       | Switch, Bias control       |
| CR3                   | Vari-capacitance diode | MA360-TX       | Tuning frequency control   |
| CR4                   | Zener diode            | HZM5.1NB2TL    | Voltage offset control     |
| CR6                   | Diode                  | DCB010TA       | Switch                     |
| Q1                    | Transistor             | 2SD1005        | Video amplifier            |
| Q2                    | Transistor             | 2SA1213        | Video amplifier            |
| Q3                    | Transistor             | 2SA1462        | Video amplifier            |
| Q4, Q5                | Transistor             | 2SC3735        | Video amplifier, switch    |
| Q6                    | Transistor             | 2SC3356-T1B    | IF pre-amplifier           |
| U1                    | IC regulator           | TA7808F-TE16L  | Power supply               |
| U2, U3, U4            | IC custom              | AA209ASP       | Log-IF amplifier           |
| U5                    | IC regulator           | TA78L05F-TE12R | Front-end power supply     |
| U6                    | IC                     | TC74HC4066AF   | Analog switch              |
| U7                    | IC Ope-amp.            | UPC324G2-T2    | Auto/Manual tuning control |
| U8                    | IC custom              | AA231BFP       | AFC control                |
| U9                    | IC Ope-amp.            | UPC803G2-E2    | Auto/Manual tuning control |
| U10                   | IC regulator           | HA17805V       | IF amp. power supply       |

### 1.5 Semiconductor in the chassis of the display unit

| Symbol No. | Description | Type                  | Function          |
|------------|-------------|-----------------------|-------------------|
| H1         | LCD module  | LQ150V1DG12           | Color LCD display |
| U1         | Encoder     | RECW20D-50-20<br>1-1D | Encoder           |

### 1.6 Semiconductor of E43-700\*(Logic control)

| Symbol No.      | Description | Type             | Function                         |
|-----------------|-------------|------------------|----------------------------------|
| D1-D2, D24, D26 | IC          | 74HC541F         | Octal 3-state buffer             |
| D3              | IC          | AC233CFP         | Graphic memory controller        |
| D4              | IC          | uPD72020GC-8-3B6 | Graphic controller               |
| D5-D8, D13-D14  | IC          | VRAM2M70J        | 256kX8 VRAM                      |
| D9-D12          | IC          | 74HC166F         | 8-bit shift register             |
| D15             | IC          | SRAM32KX8-12CF   | 32kX8 SRAM                       |
| D16             | IC          | HD6413003TF16    | 16bit CPU                        |
| D17-D18         | IC          | 74HC138F         | Decoder                          |
| D19, D28        | IC          | 74HC273F         | Octal D-flip-flop                |
| D20             | IC          | EPROM256kX16-12C | 256kX16 EPROM                    |
| D21             | IC          | 24LC04B/SN       | 512kX8FRAM                       |
| D22             | IC          | 74HC74F          | Dual D-flip-flop                 |
| D23, D39        | IC          | 74HC14F          | Schmitt-trigger inverter         |
| D25, D33        | IC          | 74HC245F         | Octal bus transceivers           |
| D27             | IC          | 74HC05F          | Hex. Inverter                    |
| D29-D30         | IC          | 74HC595F         | 8-bit shift register             |
| D31             | IC          | MB89251A-PF      | Serial data transmitter/Receiver |
| D32             | IC          | 74HC123F         | Dual Multi vibrators             |

| Symbol No.                   | Description   | Type          | Function                |
|------------------------------|---------------|---------------|-------------------------|
| D34                          | IC            | TC35095AF     | 8ch A/D converter       |
| D35                          | IC            | AC232CFP      | Video signal processor  |
| D36                          | IC            | HM62832HJP-25 | 32kX8 SRAM              |
| D37                          | IC            | MC14046BF     | Phase locked loop       |
| D38                          | IC            | uPD485505G-25 | Line buffer             |
| D40                          | IC            | 74HC74F       | Dual D-flip-flop        |
| K1-2,4-6                     | Photo coupler | TLP181BL      | Isolator                |
| K3                           | Photo coupler | PC356T        | Isolator                |
| N1                           | IC            | TL7759CPS     | Voltage detector        |
| N2-5                         | IC            | THS124        | Hole IC                 |
| N6, N9                       | IC            | uPC451G2      | Quadruple Op-amp        |
| N7                           | IC            | 78L05F        | Voltage regulator       |
| N8                           | IC            | MB88346BPF    | 12ch 8bit D/A converter |
| N10                          | IC            | AA239BFP      | Video controller        |
| V1                           | FET           | 2SK1419       | Switch                  |
| V2                           | Thyristor     | 03P2J         | Over current protector  |
| V3                           | Zener diode   | RD10MB2       | Voltage regulator       |
| V4                           | Diode         | DF10LC20U     | Voltage protector       |
| V5, V36                      | Transistor    | UN211F        | Buffer amplifier        |
| V6-V7, V39-V40, V43          | Diode         | 1SS123        | Switching diode         |
| V8, V10-V11, V17-V18, V25    | Diode         | 1SS184        | Switching diode         |
| V9, V34                      | Transistor    | uPA2003GR     | Transistor array        |
| V12                          | Zener diode   | RD5.1MB2      | Voltage regulator       |
| V13, V19, V22, V26, V38, V42 | Transistor    | UN221L        | Buffer amplifier        |
| V14                          | Transistor    | 2SA1213       | CFL amplifier           |

| Symbol No.  | Description | Type    | Function                |
|-------------|-------------|---------|-------------------------|
| V15-V16     | Transistor  | 2SD1000 | CFL amplifier           |
| V20-V21     | Transistor  | 2SC2712 | Buffer amplifier        |
| V23,V27-V33 | LED         | TLG260  | Illuminator             |
| V24         | Transistor  | 2SA1213 | Buffer amplifier        |
| V35         | Transistor  | 2SD1000 | Trigger amplifier       |
| V37         | Transistor  | 2SB799  | Output buffer for video |
| V41         | FET         | 2SK2158 | Switch                  |

### 1.7 Semiconductor of E43-600\*(Power Supply)

| Symbol No.          | Description   | Type             | Function               |
|---------------------|---------------|------------------|------------------------|
| D1                  | IC            | TC4011BF(N)      | Quadruple 2 input NAND |
| K1                  | Photo coupler | TLP181BL         | Isolator               |
| K2                  | Photo coupler | PC356T           | Isolator               |
| N1-2                | IC            | uPC494G          | Switching controller   |
| N3                  | IC            | uPC1093T         | Voltage regulator      |
| V1                  | Transistor    | 2SC2873          | Voltage regulator      |
| V2,V19-V20,         | Transistor    | 2SC2712          | Buffer amplifier       |
| V3,V8               | Diode         | DE5SC6M-406<br>1 | Rectifier              |
| V4-V5               | Diode         | D1FL20U-406<br>3 | Rectifier              |
| V6-V7               | Diode         | RU4A             | Rectifier              |
| V9,V11              | Zener diode   | RD20MB2          | Voltage protector      |
| V10                 | Zener diode   | RD10MB2          | Voltage regulator      |
| V12,V14,V17<br>,V22 | Transistor    | 2SA1213          | Buffer amplifier       |
| V13,V15,V18<br>,V26 | Diode         | D1FS4-4063       | Switching diode        |
| V16,V25,V28         | FET           | 2SK1419          | Switch                 |
| V21                 | Transistor    | 2SC2873          | Buffer amplifier       |

| Symbol No. | Description | Type               | Function          |
|------------|-------------|--------------------|-------------------|
| V23-V24    | FET         | 2SK2010            | Switch            |
| V27        | Transistor  | 2SA1162            | Switch            |
| V29        | Transistor  | 2SB1097            | Voltage regulator |
| V30-V31    | Transistor  | 2SC2712            | Voltage regulator |
| V32, V42   | Zener diode | RD5.1MB2           | Voltage regulator |
| V33        | Transistor  | UN221L             | Buffer amplifier  |
| V34-V36    | Diode       | DF10LC20U-4<br>062 | Voltage protector |
| V37        | Transistor  | 2SC3631-Z          | Switch of H.T.    |
| V38        | Transistor  | UN2113             | Buffer amplifier  |
| V39        | Diode       | A1SS123            | Switching diode   |
| V40        | Transistor  | 2SA1413-Z          | Switch of H.T.    |
| V41        | Transistor  | 2SA1213            | Switch of H.T.    |

#### 1.8 Semiconductor of E43-900\*(Panel Key Control)

| Symbol No.                                      | Description   | Type    | Function                   |
|-------------------------------------------------|---------------|---------|----------------------------|
| DS1, DS2,<br>DS3, DS4,<br>DS5, DS6,<br>DS7, DS8 | LED           | TLG260  | Light Emission Diode       |
| Q1, Q2                                          | Transistor    | 2SC2712 | LED Driver                 |
| U1, U2, U3, U4                                  | Hole IC       | THS124  | Magnetic Sensor for Cursor |
| U5                                              | Ope-Amplifier | uPC324  | Magnetic sensor buffer     |

2. Tune up procedure over the power range or at specific operating power levels.  
Rule's No. 2.983(d)-(9)

### 2.1 Transmitter

Pulse radars employ a pulse-excited magnetron as the transmitter tube. The magnetron used in this radar has a fixed cavity resonator which determines the oscillating frequency. Accordingly, this radar transmitter has no more frequency-adjust circuitry.

### 2.2 Receiver

Pulse radars receive the reflected signal from targets, therefore receiving signal has the same frequency as the transmitter power output. Thus, the radar receiver is tuned to the transmitting frequency. This radar has a super heterodyne type receiver with a Front-End module. The Front-End module consists of a GaAs FET low noise amplifier, a double balanced mixer and a FET local oscillator. Tuning of the receiver is accomplished by controlling the local oscillator frequency. The local oscillator consists of a FET and a varactor diode. Its oscillating frequency is controlled by the voltage across the varactor diode. Tuning is made by an automatic tuning circuit controlling the voltage, so that the signal frequency from the mixer coincide with intermediate frequency of the receiver.