

Description of circuitry and Devices

Circuit explanation of display unit type SMR-3600

The display unit type SMR-3600 is composed of the following circuit block.

- 1) Main CPU circuit'
- 2) Power supply circuit
- 3) Key control panel circuit

The input power supply range of display unit is between DC+10V and +36V, and the signal composition between the display unit and scanner unit is as mention in the following.

- 1) Power supply : Between DC+10V and +36V.
- 2) Transmitting trigger : 5Vp-p, Frequency depends on radar range.
- 3) Radar video : Approx 5Vp-p.
- 4) Rotation pulses : 1200pulses/rev, 5Vp-p.
- 5) Bearing signal : 1 pulses/rev, 5Vp-p.

1. Power supply circuit(R-595)

This circuit is the DC-DC converter power supply of the fly-back form, and supplies various voltage to each circuit inner the display unit.

Input voltage range is between **DC+10V** and **DC+36V**, and when the input voltage is less than 10V or more than 36V, the oscillation of the converter is stopped to protect the circuit by the over-voltage, low voltage protection circuit. Furthermore, when connection of the input power supply is reverse, the circuit is protection diode **D4** and the fuse **CN1**.

The output voltage of +24V is adjusted in the precision of $\pm 0.5V$ using the volume VR1. The switching frequency is 50KHz, Which is controlled by the oscillator IC(U4), and the regulation of the output voltage is made using feedback of the output of +24V.

And the output voltage of **+12V(U9)**, **+5V(U6)** are adjusted in the precision of $\pm 0.005V$ using the volume **VR2(+12V)**, **VR3(+5V)**.

And the output voltage of -5V is made by regulator **IC(U11)**.

This circuit provide various voltage from Main CPU to scanner unit for adjusting to be required scanner thru IC(U7, U8, U13, U10, U12).

2. Main CPU circuit(R-654)

This circuit controls the main system of the radar with the micro-chip(**U3**) which the program memory is **U8, U12**, and with the work memory(U9).

The main function of this circuit are radar signal processing, screen drawing and an interface with the outside.

Almost all the radar signal processing is done by the signal processing ASIC(**U4**) with digital style. After adjustment of reference level, the radar video signal sent from the scanner unit is inputted to **U15, U19, U21, U22** as an analog signal. The inputted video signal is changed into the digital signal by the 8bit A/D converter included inside at the sampling rate of about 50MHz.

In the interference rejection processing, a rank filter technique is done with three sweep video signals stored in memories with built-in **U3**, and the rejection level, when strong is **IR2,IR3**, weak is **IR1**, is selectable by soft key on the operation panel.

The **IR1** is suitable to reject of comparatively weak interference signals, it works as median filter which outputs the middle level signal in the data of three sweep.

On the other hand, the **IR2** is suitable to reject of comparatively strong interference signals, it outputs the minimum level signal in the data of three sweep.

The video signal stored in the buffer memory inside **U4** is sent to **U3** for screen drawing, and processing of scan correlation and the echo trail are done on the XY coordinate.

Key control of Soft Key Panel is input at A/D converter(**U2**), FPGA(**U4**) and also digital potentiometers(**U17, U18**) by digital signal, which is generated control voltage to be needed at scanner unit.

3. Key control panel(R-598)

The key control panel circuit is composed of 4 volumes, 28 switches and 48 LEDs for lighting.

A volume output voltage is taken into the A/D converter(**U2**) of R-652 by sampling.

Circuit explanation of Scanner unit type RSU-3600

1. Circuit explanation of Modulator circuit(R-716)

+24V from display is input regular IC(**U4, U5, U7**) that make +5V, +7V voltage and +330V by oscillator IC(**U6**) with push-pull method.

+12V : Mainly, for power supply of motor, buffer IC, and video detector

+7V : Mainly, for the Magnetron heater voltage

+5V : Mainly, for power supply of IF amplifier and front end

+330V : High voltage for modulator

P_WDT0~1 signal from receiver unit forms pulse width(4 pulse) in transmitting pulse forming circuit(**VR1~4, U1~3 etc**). Voltage of this pulse passes through transmitting pulse drive circuit(**Q1~5 etc**) and is increased by pulse transformer(**T1**). After that, it is supplied to magnetron.

+12V is supplied from voltage regulator to motor and photo-coupler(**IC1**), for the purpose of the number of antenna rotation which became stable. The power supply of motor is turned on or off by **MT_ON** signal that is supplied from receiver unit to modulator unit.

2. Circuit explanation of Receiver circuit(R-715)

IF signal(60MHz) that was outputted from MIC(**FE360**) is divided into two at terminal of IF signal output line.

The first signal is amplified by IF amplifier(**U1 U2**) and inputted to pulse width selection circuit that is changed two band width by selection signal(**BW0 BW1**).

After that, the signal pass through bandwidth filter and is inputted to IF amplifier(**U3 U4**). After that, the signal pass through IF amplifier and is inputted to video detector. After that, the signal pass through buffer circuit(**Q1 etc**) and is send to display unit as video signal.

The second signal is input to tuning indication circuit and amplifies IF signal at Q3, Q5 and adjusts center frequency bandwidth of IF signal at VC1, VC2.

That signal's peak is held by D1 and C53 etc and is inputted to A/D converter inside of CPU as tuning indicating signal(A-TUNE-M).

In addition that, D/A converter output MIC's tuning voltage(TUNE) and control local frequency of MIC.

In the STC, the gain of radar IF signal is restrained as low as near distance which sea clutter signal is contained, with position of the SEA CL knob on the operation panel.

STC generation makes trigger input at FPGA(U4) to STC curve thru U8, VR1, C75 and input dc lever which is generated at op amplifier(U9) to IF amplifier(U1, U2). Then VR5 adjusts power of STC.

VR3 adjusts the Length of MBS, VR4 does the power of MBS.

In addition that, D/A converter output GAIN_CTL and control Gain of IF amplifier(U3, U4)