VT2400SC2D

1.5W

VIDEO TRANSMITTER MODULE

F.C.C. I.D. NVRVT2400SC2D

SERVICE MANUAL

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1. INTRODUCTION

The VT2400SC2D is inherently a reliable and robust unit, however problems may arise and these are mainly due to accidental misuse as follows: -

1) Prolonged use without an antenna connected or with an antenna having a faulty feeder.

2) The 12v DC supply being connected reverse polarised.

3) A DC supply in excess of 16V being applied to the transmitter.

Occasionally the misuse may lead to just the 2A fuse being blown. Changing the fuse for one of the same rating is a quick way of proving if there is any further damage to the transmitter.

If replacing the fuse does not rectify the fault, then it is likely that as a minimum, the power amplifier FET has suffered catastrophic damage. Replacing the power amplifier FET will in addition require complete re-tuning of the PA strip with the aid of a 12GHz Spectrum Analyser and as such it may be to your advantage to have the transmitter repaired by LMW and returned, working to full specification.

We recognise that you may wish to repair the transmitter "in-house" and as such schematics and printed board diagrams are enclosed to facilitate your repair. We must draw your attention to the fact that this will invalidate your Warranty as specified in the End User Instruction Manual.

CAUTION

These points should be noted when the VT2400SC2D is used on its own without the MDR400S camera outstation.

1. The Antenna should always be connected before the transmitter is switched on. Also the antenna and interconnecting Coax cable should be of a good VSWR. Always use good low loss cable such as RG400, RG213, RG8, and 9913F, etc. And make sure the connectors are terminated correctly.

2. When the VT2400SC2D is used with a stand alone, 12v DC source**. Please select a Power Supply of a suitable standard as to supply a continuous current of 2 Amps, fully regulated, and handle a switch-on current in excess of 5 Amps accurately**. Failure to do this will result in an over-voltage surge, causing the internal PCB fuze to blow. A reverse supply is catered for, with a series diode, but **caution, any voltage in excess of 16V** will cause the internal protection circuit to take out the fuze, protecting the more sensitive circuits in the transmitter. Please refer to the Manufacturer or Agent if you are unsure. If the Internal fuze does blow, or the Transmitter fails to give satisfactory results, the unit should be returned to your Agent, or Authorised Service Engineer.

2. UNIT DESCRIPTION

The Video Transmitter comprises three sub-sections, i.e. the Main Board, PA Strip and Audio Board.

2.1 The Main Board

The synthesiser is referenced to a 4MHz Crystal Oscillator and the PROM is “in-factory” programmed with the permitted frequencies or channels. Channel selection is by means of the small BCD switch.

A voltage controlled oscillator module (VCO) operating at microwave frequencies is fitted on the underside of the PCB and is fed with the output from the synthesiser to give a highly stable RF output at the channel frequency.

The mmic pre-driver and transistor driver amplify the output from the VCO module.

Video via the BNC socket is processed by passive component circuitry and fed to the VCO. The resultant deviation may be adjusted by potentiometer R2 but is set at 4MHz deviation for 1V p-p input.

Five distinct supply voltages are developed on board, these being, 10V approx., 8.5V approx., -3.5V approx. and 2 off 5V regulated supplies. The negative bias voltage is set by potentiometer R35 to a value of approx. –2.1V. The bias generator circuit incorporates a bias fail safety circuit.

2.2 PA Strip

The FET Power Amplifier is fed by matched and tuned lines from the BFG135 Driver. The output is fed via a tuned Low Pass Filter (LPF) to the N socket giving a nominal 1.5W output with low harmonic output.

2.3 Audio Board

This PCB is mounted on 2 standoffs and is connected to the main board via a 10-way plug and socket.

The audio board contains two independent audio amplifiers, sub-carrier oscillators and modulators feeding a combiner circuit, the output of which goes to the VCO module. Each audio amplifier may, by selecting the connections to the 5-pin Lemo plug, have either balanced or unbalanced inputs.

The two sub-carrier oscillators have factory pre-set frequencies which are normally 6.8MHz and 7.5MHz offset from the main carrier. Adjustment of these frequencies is by C31 and C62 respectively.

The level of the two sub-carriers is set at 30dB down from the main carrier, adjustment being by R3 and R31 respectively.

Audio amplifier circuitry includes pre-emphasis circuits, amplifiers, clipping and filtering circuits the output of which feeds the varicap diode on the sub-carrier circuit. The gain setting potentiometers R9 and R36 determine the deviation for a given input level and frequency, this being pre-set at an unbalanced input of 1V p-p across 600Ω at 1KHz giving a resultant deviation of the sub carrier of 15KHz.

3. SERVICE REPAIR PROCEDURE

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INSIDE OF THE VT2400

3.1 Minimum Test Equipment Requirement

Digital Voltmeter 0-15V DC

Current Meter 0-3A DC

DC Power Supply 12.6V at 3A

Signal Generator 2.4GHz to 2.5GHz (for calibration purposes)

Audio Signal Generator 10KHz @ 380mV and 1KHz @ 332mV.

Spectrum Analyser 9KHz to 12.8GHz.

Attenuator for Analyser if required.

3.2 Visual Inspection

a) Remove 2 x M3 pan-head screws securing the audio board and lay the PCB to one side.

b) Check that the 2 jumpers are in place and the prom is secure in its dual in line socket.

c) Ensure that the BCD Channel Switch is in the correct position starting at position “Ø”

d) Check for detached wires and/or components.

e) Ensure BLUE wire is not grounded.

f) Check that the tinned copper wire inductors are not touching the ground plane.

3.3 Preliminary Electrical Check

a) Unsolder Yellow/Red wire at PA Strip and isolate from chassis and other circuitry.

b) Apply 12.6V DC.

c) Check that the green LED next to the PROM initially flashes and then goes out whilst the green LED next to the BNC socket remains on.

d) Check the regulated 10V supply at junction of TR6 Collector and R27 is 10.0V to 10.5V.

e) Check voltage at free end of Yellow/Red wire is in range 8.5V to 9.1V.

f) Check voltage on PCB pad marked VGI is set (by VB2 potentiometer) to –3.5V.

g) Place temporary short across C48 and check that the 8.5V on the Yellow/Red wire reduces immediately to near zero.

3.4 Alignment

a) Connect the output N socket via a calibrated low loss coaxial cable and attenuator to the Spectrum Analyser.

b) Reconnect the Yellow/Red wire to the PA Strip.

c) Apply 12.6V DC and check that current is less than 1.5A and that the output signal is on the expected channel frequency. Adjust the PA Bias Voltage to –2.1V.

d) The procedure now is to place Op5 chip capacitors on the input and output connections to the pre-driver, driver and PA to increase the power output together with a reduction in input DC current and also harmonics which to a level of –30dBm or lower.

e) It may be necessary to add copper shim to the output Low Pass Filter to both increase the output power and also reduce the harmonics.

f) An output power 1.5W (approx., 32dBm) for an input current of less than 1.2A should be achieved on both the permitted channel frequencies.

g) From the Audio Signal Generator, apply 10KHz @ 380mV to the BNC socket. A carrier deviation of 4MHz should be set by adjusting R2 on the main PCB.

h) Plug in the audio board ensuring correct alignment of plug and socket.

i) With an analyser span of 20MHz, check that both 6.8MHz and 7.5MHz sub-carriers are present. Using the analyser Delta marker, adjust the levels of the sub-carriers to 30dB down on the main carrier by means of R3 and R31 on the Audio Board.

j) With an analyser span of 100KHz and using CF steps of 6.8MHz and 7.5MHz in turn, the sub-carrier frequencies are set precisely using C31 and C62.

k) With an analyser span of 100KHz, an unbalanced input of 1KHz and 332mV is injected and the sub-carrier deviations are set to 15KHz using R9 and then R36 for the two channels.

l) At the end of the alignment, the unit should be checked for excessive localised heating.

m) The cover plates should be fitted with the RF sealing strip and the Video Transmitter rechecked as conforming to specification.

n) The unit should preferably be given a 24 hour switched heat run before given the final calibration checks.

4. TYPICAL TEST EQUIPMENT SETUP