WULFSBERG ELECTRONICS, INC.

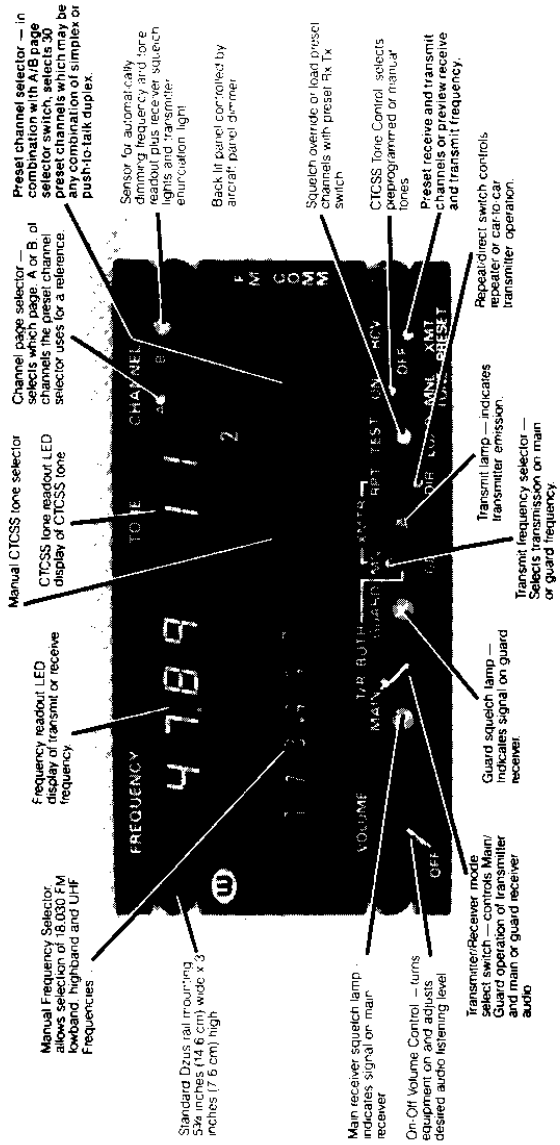
FLEXCOMM

1.5 SYSTEM COMPONENTS

The following are the currently defined components of the FLEXCOMM TRANSCEIVER SYSTEM with their model numbers and Wulfsberg Electronics part numbers. Variations of the basic R/T units are anticipated to provide slightly different frequency bands of operation or slightly different control modes or channel capabilities. Model designations and part numbers will be determined in the future. System interchangeability will be maintained.

1.5.1 FLEXCOMM TRANSCEIVERS

ITEM NUMBER	ITEM DESCRIPTION	WULFSBERG PART NUMBER
RT-30-0	Transceiver, FLEXCOMM Lo Band VHF, 29.70 - 49.99 MHz.	400-0098-000
RT-30-1	Transceiver, FLEXCOMM Lo Band VHF, 29.70 - 49.99 MHz, with Guard Receiver	400-0098-001
RT-30-2	Transceiver, FLEXCOMM Lo Band VHF, 29.70 - 49.99 MHz, with Guard Receiver and Guard Receiver CTCSS Tone.	400-0098-002
RT-138-0	Transceiver, FLEXCOMM Hi Band VHF, 138.0000 - 173.9975 MHz.	400-0102-000
RT-138-1	Transceiver, FLEXCOMM Hi Band VHF, 138.0000 - 173.9975 MHz, with Guard Receiver.	400-0102-001
RT-138-2	Transceiver, FLEXCOMM Hi Band VHF, 138.0000 - 173.9975 MHz, with Guard Receiver and Guard Receiver CTCSS Tone.	400-0102-002
RT-138-3	Transceiver, FLEXCOMM Hi Band VHF, 138.0000 - 173.9975 MHz, with increased sensitivity (precludes Guard).	400-0102-003
RT-450-0	Transceiver, FLEXCOMM UHF Band 450.0000 - 469.9875 MHz.	400-0103-000



CONTROLS AND FUNCTIONS OF THE C-1000
FIGURE 1.7-1

1-30
REV.B

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.1 OPERATIONAL CONTROLS (cont.)

-- PRESET - RCV/XMT Switch: Used in conjunction with the LOAD/TEST Switch, selects either receive or transmit half of channel memory. Activates seven segment frequency and tone display. The frequency display may be enabled for continuous operation by means of an internal switch.

-- MAIN RECEIVER Squelch Lamp: Indicates signal on Main Receiver. Dims automatically.

-- GUARD RECEIVER Squelch Lamp: Indicates signal on Guard Receiver. Dims automatically.

-- ON/OFF/VOLUME Control

-- TONE - ON/OFF/MNL Switch: Allows manual selection of transmitted tone by way of thumbwheel TONE selectors in MNL position allows Main and Guard tone squelches to operate in the ON position, and allows Main and Guard receiver tone squelches to be disabled in either the MNL or OFF positions. In either the MNL or OFF positions the receiver's squelches operate via their noise squelch circuitry.

-- T/R SELECT Switch - MAIN/BOTH/GUARD: In the MAIN position - enables the Main Receiver only and transmits on the main channel selected. In the BOTH position - enables both the Main and Guard Receivers and transmits on either the main or guard channel (dependent on the XMTR-MN/GD switch); in the GUARD position - enables only the Guard Receiver and transmits on the selected guard channel.

-- XMTR - MN/GD Switch: Selects either main channel or guard channel during transmitter operation only if the T/R-MAIN/BOTH/GUARD switch is in the BOTH position.

-- XMTR Lamp: Indicates transmitter operating, dims automatically

-- RPT/DIR Switch: Selects transmitter to operate on different frequency than receiver (RPT) or same frequency as receiver (DIR) during main channel operation. Selects one of two guard channels during guard channel transmitter operation and during guard transmit channel programming.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.1 OPERATIONAL CONTROLS (cont.)

-- FREQUENCY and TONE Selectors: Internally lighted thumbwheels used in manual selection and programming of frequencies and tones. Lighting may be disabled by means of an internal switch.

1.7.2 OPERATIONAL MODE OPTIONS

The C-1000 Control Unit has shop accessible mode of operation selector switches, see Figure 1.7-2. The configuration of the switches alter the operation of the control and the configuration must be known to properly utilize the features of the C-1000. After shop tests and preset channel programming is complete, the unit operational mode selector switches should be configured as desired before installing the unit for service.

The following modes of operation may be altered by the internal switches:

-- THUMBWHEEL LIGHTING
In normal operation the thumbwheels are back lit continuously for night use. To disable the thumbwheel lighting entirely, switch the "Thumbwheel Lights DSBL" switch to the "ON" position.

-- FREQUENCY AND TONE LED DISPLAY
In normal operation, the display is off except when the PRESET RCV/XMT switch is depressed, either to review the preset channel frequency and tone information or to re-program the channel frequency and tone information.

To enable the frequency and tone display for "continuous on" operation, switch the "DISPLAY ENBL (CONT ON)" switch to the "ON" position.

-- CHANNEL MEMORY DISCRETES
The five channel memory discretes provide a user programmable combination of discrete electronic switches for each channel. The five states may differ between transmit and receive on any channel. These electronic switch closure outputs are programmed when the channel information and tone code information are entered into the control unit memory. The shop accessible switches labeled "CHANNEL MEMORY DISCRETES" on the top of the unit are used to program the channel memory discretes for each channel (including the Guard channels).

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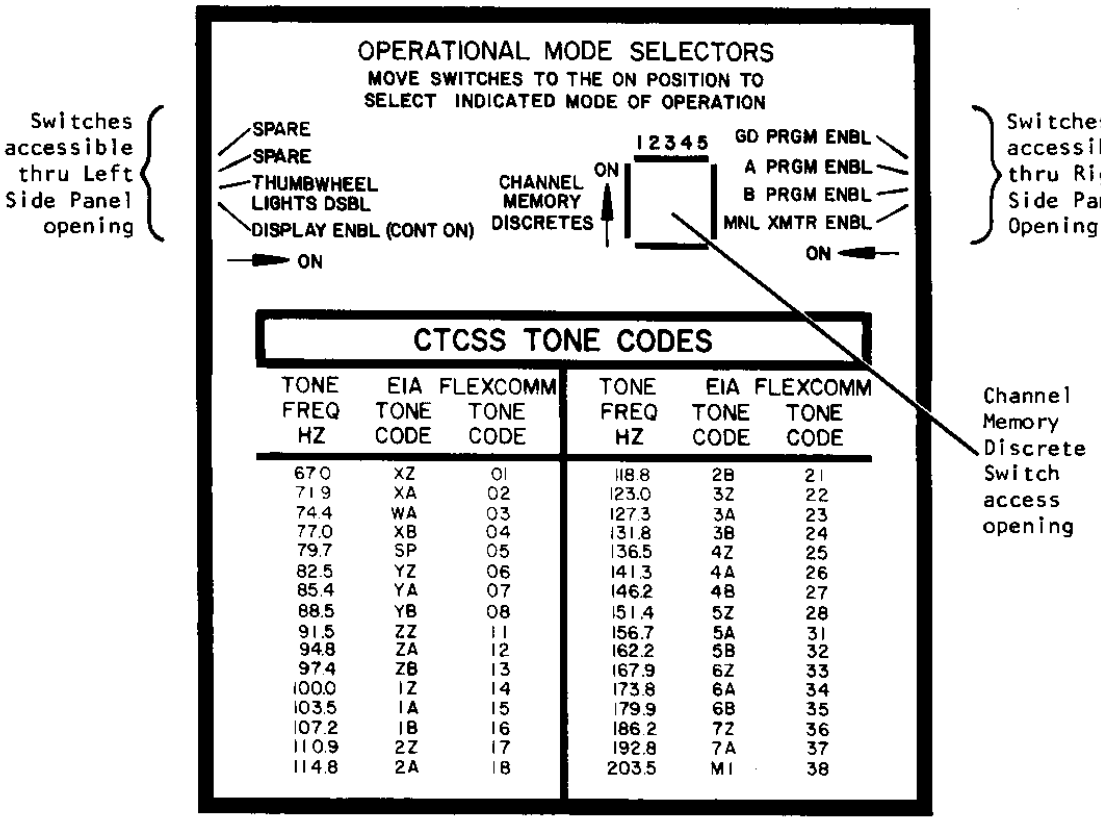
REAR OF UNIT



TONE FREQ HZ	EIA TONE CODE	FLEXCOMM TONE CODE	TONE FREQ HZ	EIA TONE CODE	FLEXCOMM TONE CODE
67.0	XZ	01	118.8	2B	21
71.9	XA	02	123.0	3Z	22
74.4	WA	03	127.3	3A	23
77.0	XB	04	131.8	3B	24
79.7	SP	05	136.5	4Z	25
82.5	YZ	06	141.3	4A	26
85.4	YA	07	146.2	4B	27
88.5	YB	08	151.4	5Z	28
91.5	ZZ	11	156.7	5A	31
94.8	ZA	12	162.2	5B	32
97.4	ZB	13	167.9	6Z	33
100.0	1Z	14	173.8	6A	34
103.5	1A	15	179.9	6B	35
107.2	1B	16	186.2	7Z	36
110.9	2Z	17	192.8	7A	37
114.8	2A	18	203.5	M1	38

C-1000 TOP COVER DECAL

NOTE: Slide the C-1000 partially from Dzus Rail Rack to access Mode Selector switches.

C-1000 TONE SELECTION CHART/INTERNAL SWITCH LOCATION
FIGURE 1.7-2

1-33
REV.B

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.2 OPERATIONAL MODE OPTIONS (cont.)

NOTE: The five memory discrete outputs associated with each channel are preset and programmed to each channel by internal switches not accessible to the operator.

When an operator attempts to reprogram any channel, the memory discretes will also be reprogrammed to the status of the preset internal switches. Consideration should be given to the configuration of the memory discrete programming switches when the unit is returned to service. This note is only applicable if the program enable switches are set to allow operator programming of preset channels.

-- GUARD CHANNEL PROGRAMMING
Changes to the preset Guard channel frequency, tone and memory discretes may be inhibited by setting the "GD PRGM ENBL" switch to the "OFF" position. To allow the operator the ability to alter the preset Guard channel information, set the "GD PRGM ENBL" Switch to the "ON" position. The channel memory discretes will be automatically reprogrammed to the final shop setting of the memory discrete program switches should the operator alter the guard channel memory.

-- PAGE A AND B CHANNEL PROGRAMMING
Changes to the preset channel frequency, tone and memory discretes may be inhibited for either page A, page B or both by setting the "A PRGM ENBL" and/or "B PRGM ENBL" switches to the "OFF" position. To allow the operator the ability to alter the preset channel information, set the "A PRGM ENBL" and/or "B PRGM ENBL" Switch(es) to the "ON" position. The channel memory discretes will be automatically reprogrammed to the final shop setting of the memory discrete program switches should the operator alter the channel memory.

-- MANUAL SIMPLEX CHANNEL FREQUENCY AND TONE SELECTION
Thumbwheels may be used to manually select the frequency and tone of a simplex channel by placing the rotary channel select knob to the "M" position.

The channel selection may be restricted to "receive only" by placing the "MNL XMTR ENBL" Switch to the "OFF" position or the transmitter may be enabled by placing the "MNL XMTR ENBL" Switch to the "ON" position.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.2 OPERATIONAL MODE OPTIONS (cont.)

Channel memory discretes will be configured to the final shop setting of the memory discrete program switches. This setting does not alter the operation of the manual tone selectors.

FCC TYPE ACCEPTANCE AND LICENSING RESTRICTIONS

The operator of a C-1000 Control Unit must hold an FCC Second Class, or higher, commercial operators license to utilize the manual channel frequency selector mode of operation or the operator channel programming feature. Operator inaccessible switches are provided to enable/disable these features. The four (4) switches on the right side of the unit:

- GD PRGM ENBL
- A PRGM ENBL
- B PRGM ENBL
- MNL XMTR ENBL

should all be "OFF" when the unit is to be returned to service with operator restrictions.

1.7.3 OPERATION

-- GENERAL

Turn the equipment on by rotating the VOLUME control clockwise from the OFF position. External power must be available to the unit by operating the appropriate switches and/or circuit breakers.

NOTE: To optimize system performance, allow five minutes for warm-up. Two and one half minutes warm-up is required to insure the transmitter frequency is within the FCC requirements.

The volume control should be set to a comfortable listening level. The volume level can be tested by depressing the TEST/LOAD button. When this is done, either the MAIN or GUARD (or both) yellow squelch light(s) should be lighted depending on the position of the T/R SELECT switch.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

The CTCSS tone operated receiver squelch may be disabled by setting the TONE ON-OFF-MNL switch to TONE OFF. This switch does not affect, or disable, programmed transmit CTCSS tones in the ON or OFF positions. In the MNL (manual) position, the thumbwheel tone selectors may be used to select any one (1) of the 32 CTCSS tones while transmitting regardless of the programmed tone information. The receiver tone operated squelch is disabled in this mode. The yellow MAIN and GUARD Squelch lamps indicate the channel is active even though received audio may be inhibited by the tone switch or the T/R SELECT switch.

-- CHANNEL SELECTION
Channel selection is performed by means of the A/B page selector toggle switch and the rotary channel selector switch. These switches control channel operation of the synthesized transmitter and receiver unless overridden by the T/R SELECT and XMTR switches. The page selector toggle switch selects either page A or page B of the rotary channel selector. The 16 position rotary channel selector may be set to channel 1 through 15 or the M (manual) position. This allows selection of up to 30 preset channels or a manually selected frequency and tone for simplex operation. The transmitter may be disabled in the manual position by an internal mode inhibit switch.

-- MODE OF OPERATION
The mode of operation of the FLEXCOMM system is selected by the T/R SELECT switch.

- MAIN Position: In this position, only the main, synthesized transmitter and receiver will operate. Their operation is totally controlled by the A/B page selector and rotary channel selector switches. The position of the XMTR MN/GD switch has no effect in this mode. The XMTR RPT/DIR switch selects the channel repeat or direct mode of operation on the same channel.

  NOTE: Systems using both simplex and semi-duplex operation on the same channel sometimes use the following terms synonymously: Simplex; direct, car to car, aircraft to car. Semi-duplex; repeater, car to station, aircraft to station.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

- GUARD Position: In this position, only the single channel, crystal controlled Guard Receiver is operational, if included in the system. The operational transmit frequency will then be per the preset guard channel information in Guard channel memory, depending on the position of the XMTR RPT/DIR switch. The A/B page selector, the rotary channel selector knob and the XMTR MN/GD switch have no effect in this mode.

- BOTH Position: In this position, both the Main and Guard Receivers are operational. The main receiver channel is determined by the position of the CHANNEL switches. The guard receiver frequency is determined by the guard crystal installed. The operational transmit channel depends on the position of the XMTR MAIN/GUARD switch. In the MAIN position, the transmitter operates in accordance with the position of the CHANNEL switches and the XMTR RPT/DIR switch. In the GUARD position, the transmitter operates in accordance with the position of the RPT/DIR switch only.

Generally, the mode of selected operation may be summarized as follows:

- T/R SELECT-MAIN, communication on the selected channel without interference from the Guard Receiver.

- T/R SELECT-GUARD, communication (transmit and receive) on the guard channel without interference from the Main Receiver.

- T/R SELECT-BOTH, listening to both the Main and Guard Receiver and communicating on either the main or guard channel as selected by the XMTR MAIN/GUARD switch. In the event that no Guard Receiver is installed, the T/R SELECT switch should normally remain in the MAIN position.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

-- PRESET CHANNEL PROGRAMMING AND THUMBWHEEL CHANNEL SELECTION INSTRUCTIONS

The C-1000 has preset channel capability for up to 30 simplex or semi-duplex channels, each with (or without) tone squelch frequencies. Each channel has associated with it five discrete control outputs (Channel Memory Discretes) that may be programmed. By following the steps outlined below, it is possible to cause the FLEXCOMM Transceivers to transmit on a different frequency than receive and to use a different tone squelch frequency (or none at all) on transmit than receive. Nor do the state of the five Channel Memory Discretes need to be the same on transmit as on receive. Using preset channels, there are no restrictions on transmit and receive frequency spacing, combinations of tone squelch functions, or combinations of Channel Memory Discrete output states.

NOTE: See Figure 1.7-3 for the C-1000 frequency chart.

The programming procedures,described in detail in the following steps, consist of:

1) Slide the C-1000 partially out of the Dzus rack to access the Program Enable switches and the Memory Discrete switches as necessary.

2) Enabling the program mode of operation.

3) Selecting the channel to be programmed

4) Setting up the channel frequency, tone and memory discretes

5) Selecting receive or transmit with the PRESET switch

6) Pressing the TEST/LOAD button while holding the PRESET switch

7) Verification of proper load

8) Returning the internal program enable switches to the desired position and securing the unit in the Dzus rack

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

- MAIN RCV/XMT FREQUENCY PROGRAMMING INSTRUCTIONS

1) Operate the internal switch to enable the page (A or B) of memory to be programmed (A PRGM ENBL or B PRGM ENBL) (See Figure 1.7-2).

2) Select the desired channel (page and number) to be programmed on the channel selectors.

3) Set up the XMT frequency and CTCSS tone on the Thumbwheels. If no tone is desired, set the CTCSS selector to the OFF position. To choose the proper tone code to be used refer to Figure 1.7-2. This tone selection chart should also be on the top cover of the C-1000. Set up channel memory discretes by means of switches accessible through top cover (see Figure 1.7-2) as desired. A memory discrete set to the ON position will initiate an output pulled to ground and will be indicated by a lit lamp next to the chosen switch after completion of the load.

4) Set the T/R - MAIN/BOTH/GUARD to MAIN.

5) Operate the PRESET switch to the XMT position and hold. Push and release the LOAD button. The XMT frequency is now loaded for the selected channel.

6) Set up RCV frequency and CTCSS tone on the thumbwheels, and memory discretes on the top switches.

7) Operate PRESET switch to the RCV position and hold. Push and release LOAD button. The RCV frequency is now loaded for the selected channel.

8) To inhibit further changes to channel information on page A or B or both, operate the appropriate internal "PRGM ENBL" switch to the OFF position as applicable.

- GUARD XMT FREQUENCY PROGRAMMING INSTRUCTIONS

1) Operate the GD PRGM ENBL switch to the ON position. See Figure 1.7-2.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

2) Set the T/R MAIN/BOTH/GUARD Switch to GUARD.

3) Any channel may be selected for the Guard frequency programming operation.

4) Set XMTR RPT/DIR switch to RPT.

5) Set up Guard XMT Repeater frequency and CTCSS tone on the Thumbwheels. Set up Memory Discretes as desired.

6) Operate PRESET switch to XMT position and hold. Push and release LOAD button. The Guard XMT Repeater frequency is now loaded.

7) Change the XMTR RPT/DIR switch to DIR and repeat steps 5 through 6 to load the Guard XMT direct or simplex frequency. If the guard channel is not configured for talk around or Repeat/Direct operation, program the same XMT frequency for both positions of the XMTR RPT/DIR switch.

8) To inhibit further changes to Guard frequencies, operate internal "GD PRGM ENBL" slide switch to the OFF position.

- FREQUENCY REVIEW

To review main channel information, (See Figure 1.7-3 for C-1000 Frequency Chart), set the T/R MAIN/BOTH/GUARD to the MAIN position or if the T/R MAIN/BOTH/GUARD switch is in the BOTH position set the XMTR MN/GD switch to MN. The TONE switch can be in either the ON or OFF position, but should not be in the MNL position. To review the XMT half of the memory, place the PRESET switch to the XMT position. To review the RCV half, place the PRESET switch to the RCV position. The frequency and tone code stored in memory will be displayed. The state of each CHANNEL MEMORY DISCRETE may be viewed through the slot in the top cover.

1.7 C-1000 OPERATORS INSTRUCTIONS (cont.)

1.7.3 OPERATION (cont.)

To review guard channel information, set the T/R MAIN/ BOTH/GUARD switch to the GUARD position or if the T/R MAIN/BOTH/GUARD switch is in the BOTH position set the XMTR MN/GD switch to the GD position. Place the PRESET switch to the XMT position. To select between the repeater (duplex/channel 1) or the direct (simplex/channel 2) guard transmit frequency, use the XMTR RPT/DIR switch.

If the internal switch DISPLAY ENBL (continuous on) is in the ON position, the Frequency and Tone displays will normally be lit and indicate the Frequency and Tone that the FLEXCOMM Transceivers are using, determined by the conditions set on the C-1000 Control and the PTT line.

- MANUAL CHANNEL FREQUENCY AND TONE SELECTION

1) Operate the internal MNL XMTR "ENBL" switch to "ON"

2) Rotate the Channel Selector switch to the M channel.

3) Set the Thumbwheels to the frequency and tone desired. The selected frequency and tone is common to both transmit and receive operation.

4) To inhibit manual XMTR operation, return the "MNL XMTR ENBL" switch to OFF. This does not inhibit manual receiver channel selection.

SECTION 4
MAINTENANCE

4.1 DISASSEMBLY

Disassemble only to the extent necessary to accomplish repair and testing. Reverse the procedure to reassemble the unit.

4.1.1 UNIT DUST COVERS

Remove three pan-head Phillips screws from the top and eight flat-head Phillips screws from the sides. Remove the bottom cover first and then the top cover. If the top cover is difficult to remove, loosen the three pan-head Phillips screws at the top of the Rear Panel. After top cover is removed, re-tighten these three screws.

4.1.2 SYNTHESIZER MODULE

Remove four pan-head Phillips screws from Front and Rear Panels. If necessary, pry up module evenly with a flat-blade screwdriver at front and back ends of module bottom. Avoid scratching the card-edge connectors.

4.1.2.1 SYNTHESIZER LOGIC BOARD

Remove seven flat-head Phillips screws from cover on longer side of Synthesizer and remove cover. Remove five hex spacers. Printed circuit assembly is then removable.

4.1.2.2 SYNTHESIZER MODULATOR BOARD

Remove seven flat-head Phillips screws from cover on smaller side of Synthesizer and remove cover. Remove four hex spacers. Printed circuit assembly is then removable.

4.1.2.3 SYNTHESIZER VCO SUBASSEMBLY

Remove Modulator Board as in 4.1.2.2. Remove Logic subassembly cover as in 4.1.2.1. Remove five pan-head Phillips screws from side opposite the VCO.

4.1 DISASSEMBLY (cont.)

4.1.3 R/T MODULE

Remove four pan-head Phillips screws from Front and Rear Panels. Beneath the Chassis, pull the guard RF cable from connector on R/T and remove.

4.1.3.1 R/T SUBASSEMBLY

Remove twelve flat-head Phillips screws from cover and remove. Remove seven 2-56 flat-head Phillips screws holding case bottom to heatsink. Do not remove larger screws. Remove three hex spacers and five pan-head Phillips screws from the printed circuit assembly and lift out.

4.1.4 AUDIO BOARD

The board pulls straight up out of the Chassis. No screws, use holes at top for prying or pulling.

4.1.5 GUARD MODULE

Remove three pan-head Phillips screws, one from Rear Panel, two from under the Chassis. Pull the connector from the Guard RF input jack, then remove the module. Pushing the module with a screwdriver (inserted through the jack clearance hole) will ease module removal. Be careful not to damage the jack.

4.1.5.1 GUARD SUBASSEMBLY

Remove eleven flat-head Phillips screws and remove the lid. Remove four hex spacers and four pan-head Phillips screws and lift out.

4.1.6 GUARD TONE MODULE (If installed)

Remove two pan-head Phillips screws and module can be lifted for inspection and testing. Unsolder five wires to remove the module.

4.1.7 POWER SUPPLY MODULE

Remove three pan-head Phillips screws, one from Front Panel and two from under the Chassis. Remove module.

4.1 DISASSEMBLY (cont.)

4.1.8 REGULATOR ASSEMBLY (15 VDC)

Remove four pan-head Phillips screws from module cover corners and remove assembly from Rear Panel.

4.2 TEST EQUIPMENT

The following test equipment, or equivalent, is required to properly align the RT-138. All test equipment must be properly calibrated before alignment is started.

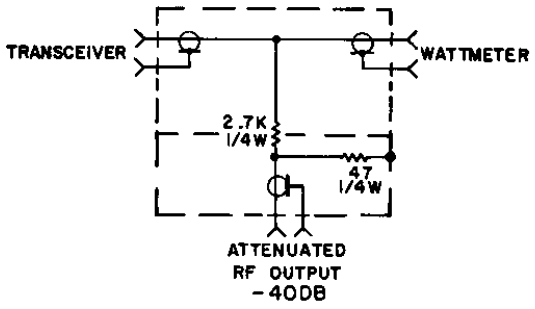
ITEM	DESCRIPTION	CHARACTERISTICS REQUIRED	REPRESENTATIVE TYPE
A.	D.C. Voltmeter	-Input Impedance: 2.0 Megohms or greater -Accuracy: 0.1% full scale	Weston Model 4440 Keithley 178
B.	A.C. Voltmeter	-Input Impedance: 2.0 Megohms or greater -Voltage Range: 1 Millivolt to 100 volts	Triplett Model 801, Type 2
C.	RF Signal Generator	-Freq. Range: 1-200 MHz -Freq. Accuracy: 0.0001% -Modulation: FM (0-10 kHz dev) AM (0-50%) -Output Level: 0-1,000 µV Calibrated	Wavetek Model 3000 Wavetek Model 3001 Wavetek Model 3002 Hewlett Packard 8640A IFR Model 1000S Cushman Model CE-50A-1
D.	Deviation Meter	-Freq. Range: 138-174 MHz -Freq. Accuracy: ±0.0001% -Freq. Set: within 500 Hz of all 10 kHz channels -FM Detector: ±10% from ± 200 Hz to ±10 kHz dev. -FM Detector Output	Boonton 82AD Marconi TF 2300B IFR Model 1000S Cushman Model CE-50A-1
E.	Audio Signal Generator	-Freq. Range: 300 Hz to 10 kHz -Output Level: 0-2.5 VRMS	Hewlett-Packard Model 651A IFR Model 1000S Cushman Model CE-50A-1

4.2 TEST EQUIPMENT (cont.)

ITEM	DESCRIPTION	CHARACTERISTICS REQUIRED	REPRESENTATIVE TYPE
F.	EIA Tone Generator	-Freq. Range: 67.0 (203.5) Hz -Freq. Accuracy: ±0.1 Hz	Automated Industrial Electronics DTG-1 IFR Model 1000S Cushman Model CE-50A-1
G.	RF Power Meter	-Impedance: 50 ohms -Range: 0 to 20 watts	Bird Electronics Corp. Termaline Model 611 Coaxial Dynamics 85
H.	Oscilloscope	-Sensitivity: 5 mVP-P Per div. -Time Base: 0.05 µsec/div. to 5 sec/div. -Dual trace -Horizontal Input	Tektronix, Inc. Type 475 or 465
I.	Audio Distortion Analyzer	-Freq. Range: 300 Hz - 15 kHz -Distortion Levels: 0.1% to 100%	Hewlett-Packard Model 332A Marconi TF 2337A Sinadder No. 3
J.	Frequency Counter	-Freq. Range: 24 to 174 MHz -Sensitivity: 100 mVRMS	Fluke Model 1952A Hewlett-Packard 5382A IFR Model 1000S Cushman Model CE-50A-1
K.	Regulated D.C.	-Volt Range: 0-40 VDC -Volt Regulation: ±0.25VDC from 0.5-10A	Trygon Model HR40-7C
L.	R.F. Isolation Pad	See Figure 4.2-1 for schematic	Wulfsberg Part Number 300-2069-000
M.	FLEXCOMM Test Set or Control Unit		Appropriate WEI Control Unit or PR-200 Test Set
N.	FLEXCOMM Test Harness	See Figure 7.1-2 for the schematic	WEI TSH-200

4.2 TEST EQUIPMENT (cont.)

ITEM	DESCRIPTION	CHARACTERISTICS REQUIRED	REPRESENTATIVE TYPE
O.	Multimeter	-Ohmmeter Function	Triplett Model 630
P.	Head Phones	-Impedance: 600 ohms	Telex Communications Model MR-6
Q.	600 Ohm Load	-Value: ±10% 1 watt	
R.	EC-200 Extender Cable	Power Supply/Guard Module Extender	Wulfsberg Part Number 149-0061-000
S.	EC-202 Extender Cable	Audio Board Extender	Wulfsberg Part Number 149-0063-000
T.	EC-203 Extender Cable	Synthesizer Extender	Wulfsberg Part Number 149-0068-000
U.	EC-1 Test Coax, BNC to 2-Pos Socket		Wulfsberg Part Number 149-0069-000
V.	Coaxial Fuse	50 Ohm DC - 480 MHz Insertion loss ≤ 1 dB	Hewlett-Packard Model 11509A (optional)
W.	Spectrum Analyzer	10 - 512 MHz	IFR Model 1000S Cushman Model CE-50A-1



R.F. ISOLATION PAD SCHEMATIC
FIGURE 4.2-1

4.3 RT-138 OVERALL PERFORMANCE TESTS

The following procedures determine the overall performance of the RT-138. Follow the steps in sequence. Should requirements not be met, refer to the alignment procedures. If alignment specifications cannot be met, refer to the troubleshooting section.

4.4 PERFORMANCE TESTS

Remove the dust cover (Section 4.1.1) and connect the RT-138 to its test harness (WEI TSH-200). Apply power and measure the Power Supply voltages. The test pins are found on the underneath side of the Chassis.

Voltage	Should Be	Test Point
Input Bus Voltage	+27.5 ± 2.0 VDC	A1J2 Pin 5
28 Volt Regulator Output	+28 ± 2.5 VDC	A1J2 Pin 9
-28 Volt Regulator Output	-28 ± 2.5 VDC	A1J2 Pin 8
5 Volt Regulator Output	+5 ± 0.5 VDC	A1J2 Pin 2
15 Volt Regulator Outputs	+14.5 ± 1.5 VDC	A1E5, A1E8

NOTE: All voltage measurements should be made with respect to Chassis ground. The pin numbers refer to the Power Supply connector except for the 15V outputs.

The performance tests will be made under the following conditions. Unless otherwise specified, the Signal Generator will be modulated at ±3 kHz deviation, 1000 Hz modulating frequency. The audio output will be terminated with a 600 ohm load and the receiver volume shall be adjusted to produce 4.5 VRMS TYP with normal modulation.

All tests are configured assuming the use of a TSH-200 Wulfsberg Electronics Custom Test Harness and a FLEXCOMM Control Unit for channeling and tone control. The Transceiver antenna port should be connected through a DB-1 coupler (WEI P/N 300-2069-000) to a power dummy load. The -40 dB coupled output may be used to sample the transmitter output with a spectrum analyzer, frequency counter or modulation meter. The receiver tests may be performed by connecting the signal generator to the -40 dB coupled port of the DB-1.

4.4 PERFORMANCE TESTS (cont.)

CAUTION

Signal generators are subject to costly burnout if the transmitter is inadvertently keyed while the signal generator is connected directly to the Transceiver antenna port. Wulfsberg Electronics recommends the use of a WEI DB-1 40 dB coupler for isolation of the generator or use of a Hewlett-Packard 11509A, 50 ohm coaxial fuse between the signal generator and transceiver.

Unless otherwise specified, the transmitter output will be terminated with a 50 ohm load.

4.4.1 RECEIVER SENSITIVITY

The Main Receiver sensitivity should be tested at three frequencies. When a Test Set or Thumbwheel Control Unit is available, the following frequencies should be checked; 138.000, 156.000 and 173.997 MHz. Set the RF signal generator output level to 0.5 µV with standard modulation. The SINAD ratio should be greater than 12 dB at those channels tested. Repeat the procedure at the Guard Receiver frequency.

NOTE: It may be necessary to disable the squelch during the receiver sensitivity tests.

4.4.2 RECEIVER AUDIO OUTPUT

Using a 1000 µV signal with standard modulation, the audio output shall be typically 4.5 VRMS across 600 ohms. The test should be performed at one channel for the Main Receiver and at one channel for the Guard Receiver.

4.4.3 RECEIVER TIGHT SQUELCH

Make this measurement at one Main Receiver frequency and at one Guard Receiver frequency. Slowly increase the RF signal generator output level until the squelch light glows. Measured "SINAD" shall be between 14 and 18 dB.

4.4 PERFORMANCE TESTS (cont.)

4.4.4 RECEIVER CTCSS SQUELCH

Select a tone number on the Test Set or a preset channel with receiver CTCSS tone. Modulate the RF signal generator at the tone frequency with 300 Hz deviation. Apply 1000 µV level and verify that audio is present.

4.4.5 TRANSMITTER POWER OUTPUT

The transmitter shall produce between 8 and 12 watts. This test should be performed at the same frequencies as that for Section 4.4.1.

4.4.6 TRANSMITTER DEVIATION CAPABILITY

With an input of 0.25 VRMS at 1000 Hz, the transmitter shall produce a deviation greater than ± 3.0 kHz. This test should be performed at the same frequencies as that for Section 4.4.1.

4.4.7 TRANSMITTER DEVIATION LIMITER

A 2.5 VRMS audio input shall produce not greater than ± 5 kHz deviation at all modulation frequencies between 300 and 2500 Hz. This test need be performed at one frequency only.

4.4.8 TRANSMITTER CTCSS

Selection of a tone from either a Test Set or a Control Unit shall produce a tone deviation of between ± 550 and ± 950 Hz (± 750 Hz nominal). The frequency shall be within 0.1 Hz of specified. This test need be performed at only one transmit channel.

4.4.9 FINAL RT-138 SETTINGS

When the following adjustments have been made, or verified, the unit should be ready to return to service.

1. Guard Receiver Frequency: The Guard Receiver local oscillator shall be within ± 750 Hz of the desired frequency. See Section 4.6.10 for the test procedure.

2. Sidetone Output: With an input of 0.25 VRMS at 1000 Hz the sidetone shall produce 1.4 VRMS.

3. CTCSS Frequency: Each CTCSS tone shall be within 0.1 Hz of specified tone frequency.

4. Carrier Frequency: Frequency error shall not exceed ± 0.0005% on any channel.