TW7000F-MSOP

TW7000F

FLYAWAY HF SSB TRANSCEIVER

OPERATOR MANUAL

=DATRON

Datron World Communications Inc.

This manual, as well as the software described in it, is furnished under license and may only be used or copied in accordance with the terms of such license. The information in this manual is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by Datron. Datron assumes no responsibility or liability for any errors or inaccuracies that may appear in this document.

Except as permitted by such license, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, recording, or otherwise without the prior written permission of Datron.

Software License Agreement and Warranty

This software is licensed to the user (licensee) under the express terms and conditions of Datron's software licensing policies and agreement as outlined below. By receiving and installing this software package the user (licensee) has indicated acceptance of the terms and conditions of this agreement presented herewith.

As used in this document, the term "Software" shall mean the application or control software in machine-readable format and the hardware protection key, along with any or all supporting documentation, as well as all updated or enhanced versions of the program supplied to the user at later date(s). This software license does not include source code, and therefore, no license is granted with respect to source code of any kind utilized directly or indirectly in any Datron or Datron-supplied third-party product. Note: In some cases, covered software may be included in Datron products in RAM or ROM, and/or forms of machine-readable code, not readily accessible to the user or licensee.

In consideration of the terms and conditions of this agreement, Datron grants the user a non-exclusive, non-transferable license to install and operate one copy of the program. Licensee agrees not to attempt, aid, authorize, or direct any effort, either directly or indirectly to reverse-engineer or reverse-compile the Software. Licensee further agrees they or their agents are not authorized to make derivative versions or changes to the Software. Title to and ownership of the Software shall at all times remain with Datron and/or its licensors. Further, no license is granted to copy or reproduce in any form whatsoever the Software supplied without the express written permission of Datron, prior to any such contemplated action.

Datron may terminate this agreement and discontinue further warranty coverage at any time due to failure to comply with the terms and conditions of this agreement. In such an event, Datron will provide the user with written notice of such a "failure-to-comply" and the user will have 10 days to demonstrate that a remedy has been implemented. If the user fails to perform, the agreement will be terminated by further written notice

from Datron. Upon termination, the user shall immediately return all original Software, documentation, and any copies of each to Datron.

This Software is licensed "AS IS" and Datron provides a warranty that covers the media upon which the Software is embedded for a period of 30 days from receipt of the product. Under this warranty policy Datron's sole obligation shall be to replace or repair, at Datron's discretion, any such media that in Datron's opinion proves defective. The user is obligated to provide Datron with a detailed description of possible defects along with sample material so that Datron can reproduce the identified defects.

By receipt and use, user (licensee) acknowledges that certain software developed or distributed by Datron is controlled by one or more governmental agencies. The user (licensee) herewith acknowledges that they will take all necessary actions to comply with applicable regulations concerning the use of licensed software. Further, Datron is under no obligation to supply source code or documentation of its software for any reason.

Datron makes no representation, express or implied, with respect to any Software licensed under this document as to its fitness for any particular purpose or intended use. Furthermore, Datron shall have no liability under this agreement for any incidental, special, or consequential damages arising out of the use of any supplied software programs. Datron reserves the right to make periodic changes in its software for any purpose without any obligation to notify users.

One-Year Limited Warranty and Remedies

Datron warrants that its equipment is free from defects in design, materials, and workmanship for a period of 12 months from the date of installation of the equipment, but in no event later than 15 months from the date of shipment. If the equipment does not provide satisfactory service due to defects covered by this warranty, Datron will, at its option, replace or repair the equipment free of charge.

Should it be impractical to return the equipment for repair, Datron will provide replacements for defective parts contained in the equipment for a period of 12 months from the date of installation of the equipment, but in no event later than 15 months from the date of shipment.

This warranty is limited to the original purchaser and is not transferable. Repair service performed by Datron is warranted for the balance of the original warranty or 90 days, whichever is longer.

Exclusive Warranty: There are no other warranties beyond the warranty as contained herein. No agent, employee, or representative of Datron has any authority to bind Datron to any affirmation, representation, or warranty concerning the equipment or its parts that is not in conformity with the warranties contained herein. EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, ARE MADE WITH RESPECT TO THE EQUIPMENT OR THE PARTS CONTAINED

THEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANT-ABILITY AND FITNESS FOR A PARTICULAR PUR-POSE, AND DATRON EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN.

Limitations of Warranty: This warranty does not cover:

Physical damage to the equipment or its parts that does not involve defects in design, material, or workmanship, including damage by impact, liquids, temperature, or gases.

Damage to the equipment or its parts caused by lightning, static discharge, voltage transients, or application of incorrect supply voltages.

Defects or failures caused by unauthorized attempts to repair or modify the equipment.

Defects or failures caused by Buyer abuse or misuse.

Return of Equipment - Domestic: To obtain performance of any obligation under this warranty, the equipment must be returned freight prepaid to the Technical Support Services Group, Datron World Communications Inc., 3030 Enterprise Court, Vista, California 92083. The equipment must be packed securely. Datron shall not be responsible for any damage incurred in transit. A letter containing the following information must be included with the equipment.

a. Model, serial number, and date of installation

b. Name of dealer or supplier of the equipment

c. Detailed explanation of problem

d. Return shipping instructions

e. Telephone or fax number where Buyer may be contacted

Datron will return the equipment prepaid by United Parcel Service, Parcel Post, or truck. If alternate shipping is specified by Buyer, freight charges will be made collect.

Return of Equipment - International: Contact Datron or your local Representative for specific instructions. Do not return equipment without authorization. It is usually not possible to clear equipment through U.S. Customs without the correct documentation. If equipment is returned without authorization, Buyer is responsible for all taxes, customs duties, clearance charges, and other associated costs.

Parts Replacement: The following instructions for the supply of replacement parts must be followed:

a. Return the parts prepaid to "Parts Replacement," Datron World Communications Inc., 3030 Enterprise Court, Vista, California 92083; and

b. Include a letter with the following information:

1. Part number

2. Serial number and model of equipment

3. Date of installation

Parts returned without this information will not be replaced. In the event of a dispute over the age of the replacement part, components date-coded over 24 months previously will be considered out of warranty.

Remedies: Buyer's sole remedies and the entire liability of Datron are set forth above. In no event will Datron be liable to Buyer or any other person for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of use of or inability to use the equipment.

Safety Considerations

This product and manual must be thoroughly understood before attempting installation and operation. To do so without proper knowledge can result in equipment failure and bodily injury.

Caution: Before applying ac power, be sure that the equipment has been properly configured for the available line voltage. Attempted operation at the wrong voltage can result in damage and voids the warranty. See the manual's section on Installation.

Earth Ground: All Datron products are supplied with a standard, 3-wire, grounded ac plug. DO NOT attempt to disable the ground terminal by using 2-wire adapters of any type. Any disconnection of the equipment ground causes a potential shock hazard that could result in personal injury. DO NOT operate any equipment until a suitable ground has been established. Consult the manual section on grounding.

Servicing: Only trained personnel should perform servicing. To avoid electric shock, DO NOT open the case unless qualified to do so.

Various measurements and adjustments described in this manual are performed with ac power applied and the protective covers removed. Capacitors (particularly the large power-supply electrolytics) can remain charged for a considerable time after the unit has been shut off. Use particular care when working around them, as a short circuit can release sufficient energy to cause damage to the equipment and possible injury.

To protect against fire hazard, always replace line fuses with ones of the same current rating and type (normal delay, slow-blow, etc.). DO NOT use higher-value replacements in an attempt to prevent fuse failure. If fuses are failing repeatedly, this indicates a probable defect in the equipment that needs attention.

CONTENTS

Section 4: Servicing

SECTION 1: INTRODUCTION

Description of Equipment

The Datron World Communications Inc. (DWC) TW7000F Flyaway HF SSB Transceiver provides voice and data communications over a 1.6 to 30 MHz range. It is packaged inside a rugged metal suitcase and is small enough to be carried under an aircraft seat. The suitcase meets the requirements for the International Air Transport Association. It comes with a deployable automatic antenna tuner, wire antennas, microphone, and all accessories required for normal operation.

The TW7000F contains a universal ac power supply and a separate cable for direct operation from a 12V source such as a vehicle battery. The built-in automatic antenna tuner permits operation from a variety of whip and wire antennas, as well as dipoles and other 50 ohm antennas. Two output RF connectors allow a BNC connection for the antenna tuner and an SO-239 connection to broadband antennas.

A custom LCD provides channel and frequency data, feedback on other front panel control functions, BITE information, and order-wire text messages. The TW7000F has continuous tuning and up to 1000 memory channels that can be arranged in multiple scan groups. It has simplex and half-duplex capability, and a full alphanumeric keypad for frequency or text entry.
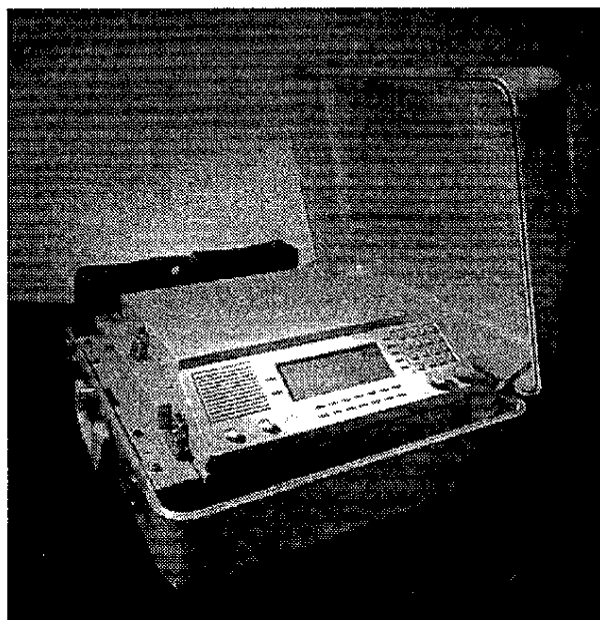
TW7000F HF SSB Transceiver

For complete technical coverage of the transceiver, refer to the TW7000F technical manual (TW7000F-MS).

Internal Options

Several internal options are available for the TW7000F. These include the following:

7000ACH Increases operational channels to 1000.

7000ALE Automatic Link Establishment (ALE) includes link quality analysis, auto linking, sounding, and order-wire message transmission and reception.

7000CLK Internal clock keeps and displays the time, and includes alarm features.

7000ENCR High-level voice encryptor uses Enhanced Domain Transform (EDT) ciphering techniques providing long-term security.

7000HS High-stability reference oscillator allows a 0.1 part per million frequency stability.

7000NB Impulse-type noise blanker used in high-voice environments.

7000RCDR Combines receive and transmit audio, and routes them to **ACCESSORY 2**.

7000RF Internal modem allows remote contact from the TW7201F FSK controller.

7000RI Internal modem allows remote contact from the TW7201I ISDN controller.

7000RS Modem interface board configures a second serial port (RS422/485) to provide data protocol for external control of the radio using a computer. This is in addition to the standard RS232 interface.

7000TC Digital selective calling system includes automatic path evaluation. It combines all functions of Selcall, Transcall, and TransAdapt.

7000VEM DSP-based voice enhancement provides superior voice recognition and signal-quality improvement in noisy environments.

7000WB1 Wideband data filter providing 300 to 3300 Hz with tailored group delay characteristics for data operation.

Technical Specifications

Note: Specifications are subject to change without notice or obligation.

Characteristic	Specification
General	
Frequency Range	1.6 to 30 MHz for TX; .1 to 30 MHz for RX
Channel Spacing	10 Hz, standard
Channels	256 standard, expandable to 1000
Frequency Entry	Keypad controlled
Display	Backlight alphanumeric LCD
Tuning	Up and down push buttons, programmable steps
Scanning	Multiple scan groups; operator selectable scan rates
Dual Antenna Ports	BNC/multiplexed to antenna tuner with single coaxial cable provided SO-239 UHF for 50 ohm broadband antennas
Frequency Stability	±1 ppm -30° to 60°C; optional ±0.1 ppm
Operating Modes	USB, LSB, AME, PCS (standard); simplex or semi-duplex
Duty Cycle	Continuous
Input Power	+13.8 Vdc, nominal; 11 to 15.5 Vdc, operational. 110/220 VAC, ±20%, internal power supply
Input Power Protection	Reverse polarity, transient and under/over-voltage
Size (H x W x D)	8 in. x 21 in. x 17 in. (21.6 cm x 53.5 cm x 43 cm)
Weight	45 lbs. (20 kg)
Fuses	3A for ac, 25A for dc
Transmitter	
Power Output	125W PEP, 100W average; three levels, programmable from front panel
Intermodulation	-32 dB
Harmonics	-65 dB, minimum, 2-30 MHz
Carrier Suppression	-50 dB, minimum

Characteristic	Specification (continued)
Sideband Suppression	-55 dB, minimum
VSWR Protection	Protected against antenna mis-match including open and short circuit; visual indication of high VSWR
Spurious Suppression	-65 dB, minimum
Receiver	
Frequency	100 kHz to 30 MHz
Clarifier	Digital ±600 Hz in 10 Hz steps
Receiver Protection	Can withstand +43 dBm input without damage
Sensitivity	10 dB SINAD minimum, for 0.5 mV input
Image Rejection	-80 dBm, minimum
IF Rejection	-80 dB, minimum
Selectivity	SSB: 300 to 2700 Hz at 3 dB
Spurious	-80 dB
Attenuator	+20 dB switchable
Audio	5W minimum into 4 ohm
High-level Audio	0 dBm into 600 ohm
AGC	Not more than 3 dB change in audio output for input signals from -103 to +13 dBm
Squelch	Syllabic
Environmental	
Operating Temperature	-30° to +60°C
Storage Temperature	-40° to +70°C
Shock and Vibration	Per MIL-STD-810E
Antenna Tuning	
Antennas	Whips, long wires
Mode	Fully automatic
Memory	100 channels (optional)
Usage	Remotable from main body of radio
Control	Single cable (8m supplied)

Manual Conventions

Bold type is used to denote all items that appear in the display and for any button, knob, or connector used on the front or connector panels. For example:

1.   Press **C** and **041** and **E**.

      Display: **CH   FREQ**
      041 13.330,000 MHz
      Rx

2.   Press **ALPHA** and **17**.

3.   Press **STATUS**.

4.   Use **ACCESSORY 1** to make the connection.

Referenced Manuals

- TW7000F HF Transceiver Technical Manual (TW7000F-MS)

- 7000ALE Radio Control Program Operator Manual (7000ALE-MSOP)

- 7000-Series High-Level Encryption Operator Manual (7000ENCR-MSOP)

- TW7201I ISDN Remote Control Head Technical Manual (TW7201I-MS)

- TW7201F FSK Remote Control Head Technical Manual (TW7201F-MS)

SECTION 2: INSTALLATION

Extended Control

The front panel of the TW7000F can easily be removed from the transceiver case and remoted for operational convenience. An extender cable is permanently wired to the side of the unit for this purpose.

Connector Panel

All connectors (other than those for microphones) are located on the aluminum connector panel mounted on top of the transceiver. These include the dc input power connector, three accessory connectors, a remote control connector, RF output connectors, and an ac power cord socket. Access to the dc and ac fuse is also provided on this panel. The internal fan exhaust outlet is immediately above the two RF connectors. The inlet duct is on the rear panel of the TW7000F.
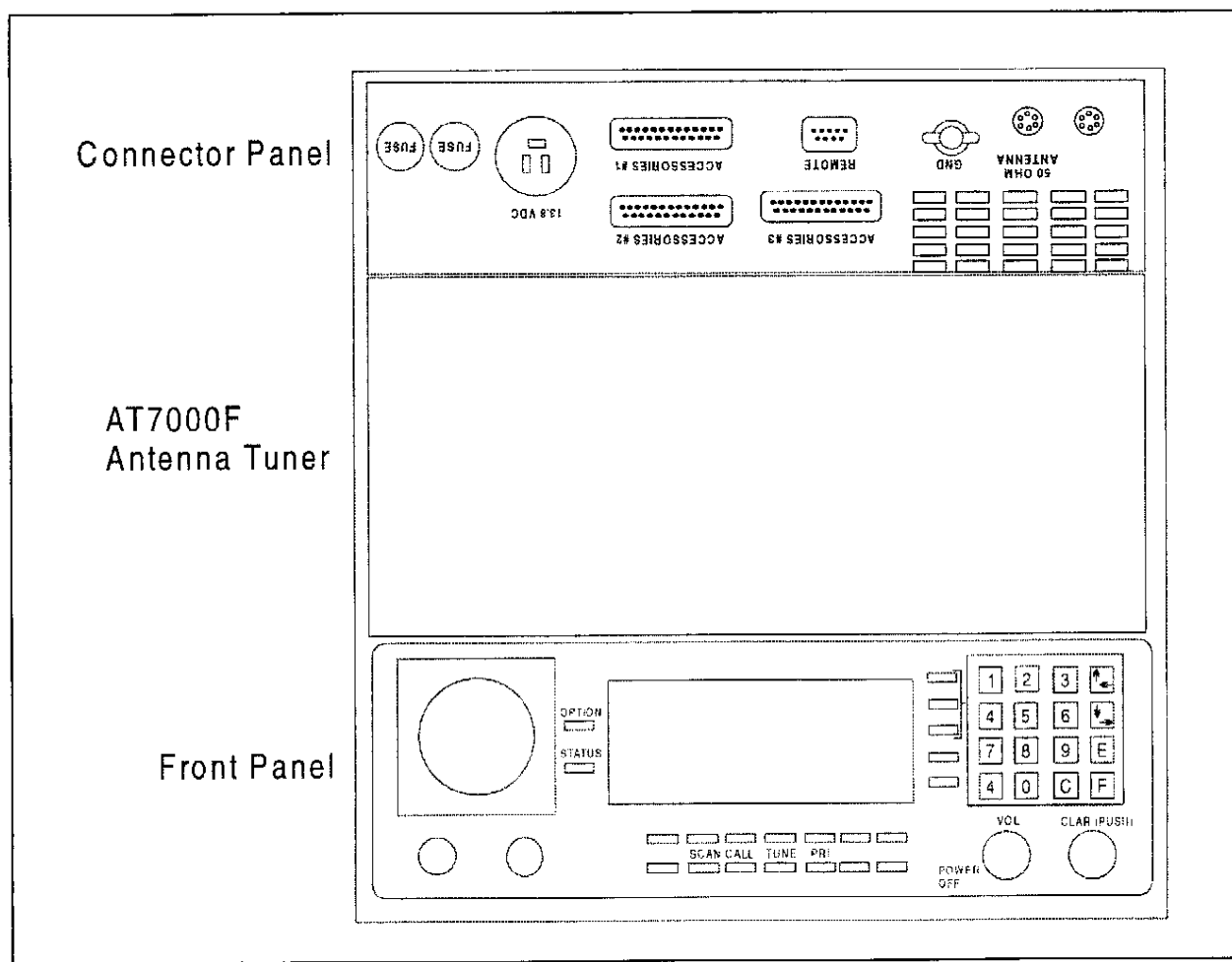
Top View Diagram

Input Power Requirements

Input dc power is nominally 12 Vdc (13.8 Vdc) with a maximum current requirement of approximately 20A. The recommended operational voltage range of the transceiver is 11 to 15.5 Vdc. The dc input connector (12 Vdc input) is a 2 pin, 25A circular receptacle that has a square mounting flange with 2 male pins. The mating plug is attached to the input dc power cable (C991829). This supplied cable has two 12 AWG conductors, is 6.5 feet long, and open-ended for convenient connection to a variety of +12 Vdc sources.

The dc pin assignments are:

Pin	Description
1	12 Vdc return (Ground)
2	12 Vdc

The dc power connection between the TW7000F and its power source should always be made as short as possible. If a DWC power cable is not available, the following cables should be used: 14 AWG for runs to 3 feet, 12 AWG for runs to 9 feet, or 10 AWG for longer runs.

The TW7000F can also be powered from 110/220 VAC. The internal supply has an automatic changeover feature that recognizes and adapts to either 110 or 220 VAC, ±20% mains voltage.

The fuse holders (346877) on the connector panel contain a 25A 3-AG fuse for dc operation and a 3A, 3-AG fuse for ac operation.

Antenna Connections

The TW7000F is designed to work into a 50 ohm RF impedance. The output RF connector (**ANTENNA**) is a PL259 UHF-type connector. Broadband antennas and dipoles can be connected directly to this output, while high-power amplifiers use specially designed DWC cables.

The TW7000F includes an automatic antenna tuner deployable up to 25 feet from the transceiver. Connection to the tuner is made using a single coaxial cable that connects to its port. For information about operating the antenna tuner, see Using the Automatic Antenna Tuner on page 3-23.

CAUTION: Since the cable carries both the RF signal and +12 Vdc power to the tuner, the center conductor is hot.

Antenna tuner control is provided by connecting cable C991945 to the MIL-C 15-pin connector on the tuner, and the DB25 connector to **ACCESSORY 3**. The pin assignments are:

Pin	Description
1	Ground
19	ATURX (tuner RX data)
20	ATUTX (tuner TX data)

Microphone Audio Connection

Low-level audio accessories for use with the TW7000F include the following:

Part Number	Description
PM	Heavy-duty hand microphone
DM	Dynamic disk microphone
KEY	Morse key
EP	Headphones
EPL	Lightweight headphones

Two 6-pin microphone connectors are provided on the front panel. The two connectors are wired alike; either one is suitable for use by these audio accessories. The input impedance is a nominal 150 ohm. Most dynamic, ceramic, or magnetic microphones operate with the TW7000F. All DWC-supplied audio accessories have the correct mating connector on them. To use other low-level audio accessories, the correct mating connector can be obtained from DWC. The pin assignments are:

Pin	Description
1	Ground
2	RX audio (unmuted)
3	PTT (push-to-talk)
4	TX audio
5	CW key line
6	+12 Vdc

A single 6-pin military microphone connector is provided on the side of the front panel. The pin assignments are:

Pin	Description
A	Ground
B	RX Audio
C	PTT (push-to-talk)
D	TX Audio
E	CW key line
F	+12 Vdc

Accessory Connections

The three accessory connectors on the connector panel have different pin assignments. If multiple accessories are required that share one or more of the accessory connectors, an external accessory combiner box (TW7000IOX) may be attached to any of these connectors. It is also possible to substitute a daisy-chain ribbon cable for the combiner box. Each of the three connectors on the panel is a DB25 socket. For more information on cabling requirements, see the Accessory Cabling Diagram on page 2-8.

Pinout for ACCESSORY 1

Pin	Description
1	Ground
2	COM1RXD (RX data)
3	COM1CTS (clear to send)
4	COM1TXD (TX data)
5	COM1RTS (ready to send)
6	BALRXA1 (balanced RX audio)
7	BALRXA2 (balanced RX audio)
8	BALTXA1 (balanced TX audio)
9	BALTXA2 (balanced TX audio)
10	AUXPTT\
11	Select
12	Busy
13	+12V ACC
14	EXTCWKEY (external CW key)
15	Strobe

Pinout for ACCESSORY 1 (continued)

Pin	Description
16	Data 0
17	Data 1
18	Data 2
19	Data 3
20	Data 4
21	Data 5
22	Data 6
23	Data 7
24	ACK (acknowledge)
25	DI/OSEL

Pinout for ACCESSORY 2

Pin	Description
1	Ground
2	Ground
3	PWRON\
4	ATUINIT (tune initiate)
5	ATUKEY (tuner key line)
6	BALRXA1 (balanced RX audio)
7	BALRXA2 (balanced RX audio)
8	BALTXA1 (balanced TX audio)
9	BALTXA2 (balanced TX audio)
10	ATUPTT\
11	COM2RXD - COM2 (RX data)
12	COM2TXD - COM2 (TX data)
13	+12V ACC
14	Ground
15	EXTCWKEY (external CW key)
16	ACHKTUNE (tuner check tune)
17	ADATA (tuner data)
18	ACLOCK (tuner clock)
19	ASTROBE (tuner strobe)
20	TC/SCALM (alarm)

Pinout for ACCESSORY 2 (continued)

Pin	Description
21	RETX\
22	EXTSPKR (speaker audio)
23	SQA (squelch audio)
24	+12V ACC
25	+12V ACC

Pinout for ACCESSORY 3

Pin	Description
1	Ground
2	Ground
3	FILTG\
4	AMPALC (external amplifier in ALC line)
5	AMPPTT\
6	FLTA (low-pass filter select line)
7	FLTB (low-pass filter select line)
8	FLTC (low-pass filter select line)
9	FLTD (low-pass filter select line)
10	FLTE (low-pass filter select line)
11	FLTF (low-pass filter select line)
12	FLTG (low-pass filter select line)
13	+5V
14	Ground
15	Ground
16	KBCLK (keyboard clock)
17	KBRXD (keyboard RX data)
18	KBTXD (keyboard TX data)
19	ATURX (tuner RX data)
20	ATUTX (tuner TX data)
21	ATUSP1
22	ATUSP2
23	ATUSP3
24	+12V ACC
25	+12V ACC

External Encryption

External encryption (7000ENCR) may also be used with the TW7000F and connected to **ACCESSORY 1** or **ACCESSORY 2**. The pin assignments are:

Pin	Description
1	Ground
6	BALRXA1 (balanced RX audio)
7	BALRXA2 (balanced RX audio)
8	BALTXA1 (balanced TX audio)
9	BALTXA2 (balanced TX audio)
10	AUXPTT\
13	+12V ACC

Telephone Couplers

Telephone couplers like the TW5810 or TW5850 use either **ACCESSORY 1** or **ACCESSORY 2**. The pin assignments are:

Pin	Description
1	Ground
6	BALRXA1 (balanced RX audio)
7	BALRXA2 (balanced RX audio)
8	BALTXA1 (balanced TX audio)
9	BALTXA2 (balanced TX audio)
10	AUXPTT\
13	+12V ACC
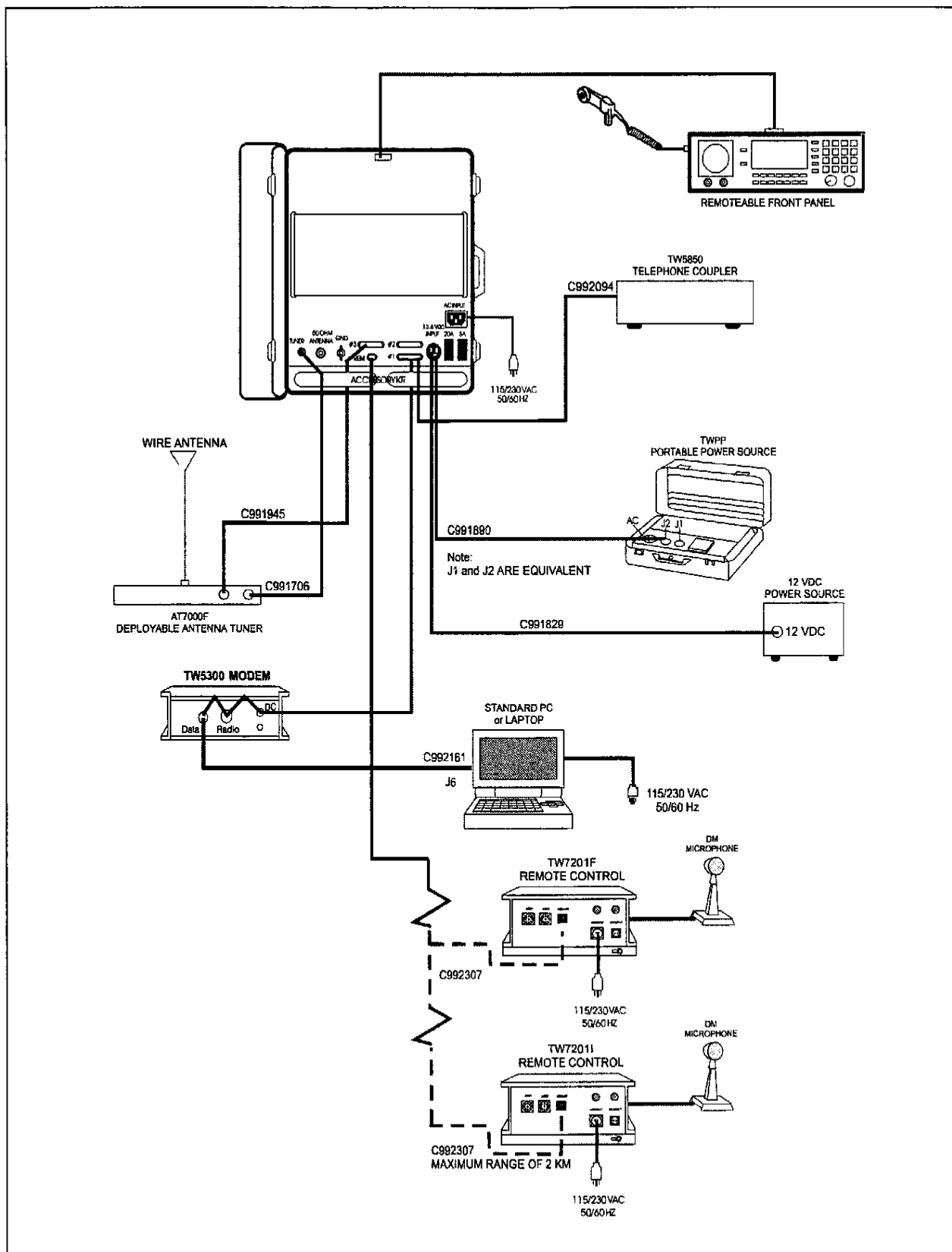
Accessory Cabling Diagram

EIA Data Interface Standards

The TW7000F interfaces with a variety of Data Communications Equipment (DCE) or Data Terminal Equipment (DTE) using EIA Standards RS232, RS422, or RS485. **ACCESSORY 1** is configured to provide the I/O port (COM1) for these interfaces. RS232 protocol is standard, while all others are optional. It is necessary to order the 7000RS option and to specify the required protocol so that the appropriate interface chip is inserted into the processor. The pin assignments are:

Pin	Description
1	Ground
2	COM1RXD (RS422/RS485)
3	COM1CTS (COM1 clear-to-send)
4	COM1TXD (RS422/RS485)
5	COM1RTS (COM1 request-to-send)

Data Terminal Interface

The TW7000F can interface with DWC data terminals (TW9200, DT9400, and RT9300) or other computers using **ACCESSORY 1**. The pin assignments are:

Pin	Description
1	Ground
2	COM1RXD (RS422/RS485)
4	COM1TXD (RS422/RS485)
6	BALRXA1 (balanced RX audio)
7	BALRXA2 (balanced RX audio)
8	BALTXA1 (balanced TX audio)
9	BALTXA2 (balanced TX audio)
10	AUXPTT\
14	EXTCWKEY (external CW key)

External Printers

A parallel printer can be plugged into **ACCESSORY 1**. The pin assignments are:

Pin	Description
1	Ground
11	Select
12	Busy
15	Strobe
16	Data 0
17	Data 1
18	Data 2
19	Data 3
20	Data 4
21	Data 5
22	Data 6
23	Data 7
24	ACK (acknowledge)

A serial printer can be plugged into **ACCESSORY 2**. The pin assignments are:

Pin	Description
11	COM2RXD (COM2 RX data)
12	COM2TXD (COM2 TX data)
13	+12V ACC
14	Ground

Transcall/Selcall Alarm

The standard Transcall/Selcall alarm is a buzzer mounted on the inside of the front panel board. An optional external Transcall/Selcall alarm driver can be found on **ACCESSORY 2**. The pin assignments are:

Pin	Description
14	Ground
20	TC/SCALM (alarm)

External Speaker

An external speaker can be connected to the TW7000F at **ACCESSORY 2**. The pin assignments are:

Pin	Description
14	Ground
22	EXTSPKR (speaker)

External High-Power Amplifiers

The TW7000F interfaces with all existing DWC high-power RF amplifiers using **ACCESSORY 3**. The pin assignments are:

Pin	Description
1	Ground
2	Ground
3	FILTG\
4	AMPALC (external amplifier ALC line)
5	AMPPTT\
6	FLTA (low-pass filter select line)
7	FLTB (low-pass filter select line)
8	FLTC (low-pass filter select line)
9	FLTD (low-pass filter select line)
10	FLTE (low-pass filter select line)
11	FLTF (low-pass filter select line)
12	FLTG (low-pass filter select line)

Remote Control

The TW7000F can be controlled remotely using a computer, an extended front panel, or a remote control head.

Computer Control

The TW7000F can be controlled remotely from a standard computer, using **ACCESSORY 1**. A custom software program is available from DWC that runs on any PC using Windows™. For the connections to use, see EIA Data Interface Standards on page 2-9.

Extended Control Panel

The front panel of the TW7000F can be removed from the body of the transceiver and replaced with a line driver panel (TW7000E). This special version of the radio is used to remotely control operations from distances up to 50 feet.

FSK and ISDN Remote Control

DWC offers two separate remote control heads. The TW7201F and the TW7201I can be used to control the transceiver from longer distances. Both control heads require that modem interface boards (7000RF or 7000RI) be installed into the transceiver. The TW7201F uses FSK and can be used for long-range remote requirements, while the TW7201I uses ISDN and is used for real-time control up to 2 km.

These modem-based remote control units are connected to the TW7000F using the **REMOTE**, DB9 on the connector panel.

Pin	Description	Remote Head
1	Ground	FSK, ISDN
2	+12V UNREG	FSK, ISDN
3	+12V ACC	
4	Spare (REMSP)	
5	ISDN1	ISDN
6	ISDN2	ISDN
7	REMRXA	FSK
8	REMTXA	FSK
9	On/Off (PWRON\)	FSK, ISDN

For a complete description of each of these pins, refer to the TW7201F technical manual (TW7201F-MS) or the TW7201I technical manual (TW7201I-MS). The TW7000F technical manual (TW7000F-MS) also describes these interconnects.

SECTION 3: OPERATION

Powering the TW7000F

The Power/Volume knob is used to turn on the TW7000F. When turned on, the version level of the installed software is displayed.

Display: **TW7000F**
**VER701xx** (where xx is the version level)

The BITE system runs automatically and indicates that everything is functional.

Display: **TW7000F**
MODULES

Front Panel

The TW7000F and TW7000 front panels are identical; a TW7000 is being used for this example. The display indicates if any available options (modules) have been installed. After verification of installed options, the display indicates the channel number in the upper left corner, the channel frequency in the upper center, and the clarifier offset (if any) below the frequency.
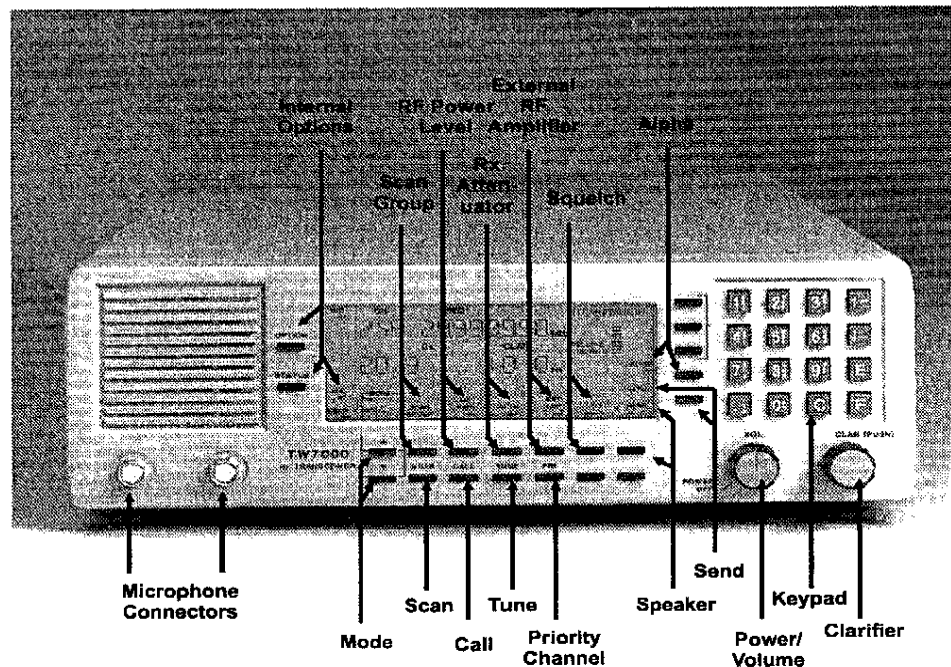
Front Panel Diagram

Power/Volume

The **POWER VOL** knob is rotary actuated with power off in the full counterclockwise position. The speaker volume is increased by turning the knob in a clockwise direction.

Speaker

The speaker can be muted by pressing the **SPKR** button (located beneath the **SPKR** icon on the lower right side of the display). The status of the speaker (**ON** or **OFF**) is displayed under this icon.

Clarifier

Clarifier offset is achieved by turning the **CLAR** knob counterclockwise for negative offset and clockwise for positive offset (USB mode). The knob has continuous rotation and provides a maximum of -600 Hz to +600 Hz offset in 10 Hz steps. This value is shown on the right side of the display and may be nulled by manually turning the knob until the offset reads +000 Hz, or by pressing the knob (off). With the clarifier off, no clarifier information is displayed. Pressing the knob a second time restores the previous offset and refreshes the display.

Keypad

The keypad is used for numeric or alpha character entry. To enter numeric characters, the desired keypad number is pressed. The display has a permanent decimal and comma in the frequency field. If a value is entered that is below 10.000000 MHz, it is necessary to press the decimal button.

Alpha characters (located on the buttons numbered **1** to **9**) and spaces (**SP**) are used to enter text while composing ALE text messages. The three-bracketed buttons to the left of the keypad correspond to the top, middle, and bottom alpha characters located on the numbered buttons of the keypad (**0** to **9**). They also correspond to the left and right arrow buttons. To enter alpha characters, the corresponding bracketed button is pressed followed by the keypad button containing that character.

Examples:

1.   Press the top bracketed button followed by **2**, this enters the letter **D**.

2.   Press the middle bracketed button followed by **6**, this enters the letter **Q**.

3.   Press only **4**, this enters the number **4**.

4.   Press any bracketed button followed by **0**, this enters a space (**SP**).

To delete a character, use the left and right arrows to position the cursor. Press **C**. All trailing characters move to the left.

The up and down arrows are used to scroll through displayed information. These arrows convert to left and right scrolling when editing in the text message mode. The scrolling rate remains constant for the duration of time an arrow button is held down. The arrows remain active until another control function is used.

The **C** button is also used for selecting the channel function while the **F** button selects frequency functions. The **E** button enters supplied information into memory.

Send

The **SEND** button is used to send an ALE call to the last station with an established link. For a more detailed description, see Placing an ALE Call on page 3-19.

Alpha

Pressing **ALPHA** allows access to the Alpha menu. To exit the menu press **ALPHA** again. For information on this menu, see Alpha Menu on page 3-7.

Priority Channel

The **PRI** button adjusts the TW7000F to a channel defined as the priority channel. The priority channel is preset at the factory to channel 001. To change the number of the priority channel:

1. Press **ALPHA 4** and **E**.

    Display: **PRIORITYCHANNEL xxx**
    (where xxx is the existing channel number)

2. Enter the new priority channel number.

3. Press **E**.

    Display: **PRIORITY CHANNEL xxx**
    (where xxx is the new channel number)

The TW7000F reverts to the new priority channel whenever the **PRI** button is pressed.

Tune

If an automatic antenna tuner (AT/RAT100, RAT1000) is attached to the TW7000F, pressing the **TUNE** button activates the tune cycle.

Call

The **CALL** button initiates a call sequence in the ALE option or in the Transcall, Selcall, TransAdapt option. If these options are not installed or if they are turned off, this button is disabled. For information on placing ALE calls, see Placing an ALE Call on page 3-19. For information on placing Transcall, Selcall, or TransAdapt calls, see Placing a TransAdapt, Transcall, or Selcall on page 3-21.

Scan

The **SCAN** button is pressed to begin scanning the channels in the selected scan group. Pressing **SCAN** a second time terminates the scan sequence and the TW7000F reverts to the last channel scanned. For more information, see Scanning on page 3-18.

Mode

An operational mode is selected by pressing the **MODE** buttons located beneath the mode icon on the lower left side of the display. These buttons allow scrolling through the available choices.

Mode	Description
USB	USB voice: Standard voice grade IF filter and voice AGC time constants
LSB	LSB voice: Standard voice grade IF filter and voice AGC time constants
USB DATA	FSK AGC time constants. Optional USB wideband data filter, 300-3000 Hz
LSB DATA	FSK AGC time constants. Optional LSB wideband data filter
USB AME	Same as USB mode with the carrier in transmit mode at a level of -6 dB relative to PEP
LSB AME	Same as LSB mode with the carrier in transmit mode at a level of -6 dB relative to PEP
USB PCS	Same as USB mode with the carrier in transmit mode at a level of -16 dB relative to PEP

These modes are displayed only if the mode option is installed. The mode buttons are disabled if the Lockout or Frequency Blank functions are turned on. For information on these functions, see Changing Settings on page 3-7.

Internal Options

The **OPTION** and **STATUS** buttons allow the status of certain installed options to be changed. The options that can be controlled by these buttons are:

Displayed Icon	Option
ALE	FED-1045 ALE
TC/SC	Transcall/Selcall
TA	TransAdapt
NB	Noise Blanker
OPT	Voice Enhancement
ENCR	Encryption

When an option is installed inside the TW7000F, a corresponding icon is shown on the left side of the display area. The icon and the option's current status (**ON** or **OFF**) is permanently displayed.

To change the status of an installed option:

1. Press **OPTION** or **STATUS**. The icon of the last entered option flashes.

2. If a different option is desired, press **OPTION** until the desired icon flashes.

3. Press **STATUS** to toggle between **ON** and **OFF** (or between **1, 2, 3, 4,** and **OFF** in the case of the Encryption option).

When pressing any button other than **OPTION** and **STATUS**, the icon stops flashing and the function of that button is performed. The icon also stops flashing if no changes are entered after a time-out period of 10 seconds.

Scan Group

A scan group is a collection of channels grouped together. When scan groups have been identified, the **SCAN GROUP** button is used to select a particular scan group. For more information on selecting scan groups, see Selecting a Scan Group on page 3-19.

RF Power Level

The **RF PWR** button allows scrolling through the **L** (low), **M** (medium), and **H** (high) power settings. Default settings for the three RF power levels are listed below:

RF Power Level	Factory Preset	ALPHA 5 Setting
L (low)	10W (average power)	10
M (medium)	25W (average power)	25
H (high)	100W (average power)	200

These values are changed as follows:

1. Connect a power meter to the antenna connector on the rear of the transceiver.

2. Press **RF PWR** until the desired level is displayed (**L, M, or H**).

3. Press **ALPHA 5** and **E**.

   Display: **RF POWER**
   HI SET xxx (if changed to high power)

4. CW key the TW7000F and scroll to the power level indicated on the power meter.

5. Press **E** when the desired power level is achieved.

6. Adjust the other two levels in the same manner.

7. Press **E** twice to exit this mode.

RX Attenuator

The **ATT** button changes the status of the input receiver attenuator from **ON** (+20 dB input RX pad) to **OFF**, or vice versa.

External RF Amplifier

The **EXT AMP** button provides PTT control from **ACCESSORY 3** to an external amplifier. When set to **ON** the RF power is automatically set and locked in the **H** (high-power) position. When set to **OFF**, control is restored and the TW7000F no longer requires an external amplifier.

Squelch

The **SQ** button changes the status of the squelch circuit from **ON** to **OFF**, or vice versa. In the **ON** setting, background noise is muted.

Changing Settings

The TW7000F provides two menus, Alpha and ALE. These menus are used for changing factory default settings. The Alpha menu is used to change settings specific to the 7000TC option (Transcall, Selcall, and TransAdapt). The ALE menu is used to set up and change settings specific to the ALE option.

Alpha Menu

The Alpha menu and its functions are accessed as follows:

1.   Press **ALPHA** and the number of the corresponding function.

2.   Press **E**.

Once a function is selected, the arrows on the keypad are used to scroll through any further options within that function. When a desired option is displayed, press **E** to accept and enter that option.

Note: The functions described here apply only if the 7000TC option is installed in the TW7000F. The exception would be function Alpha 17, which allows access to the 7000ALE option.

Alpha Menu

Function	Description
1	OPTION (not used)
2	SCAN SET CHANNEL (for non ALE)
3	SCAN RATE (for non ALE)
4	PRIORITY CHANNEL
5	RF POWER (TX)
6	FREQ BLANK (blanks LCD frequency, disables mode select buttons)
7	LOCKOUT (disables frequency changes and mode select buttons)
8	RECEIVE SET Rx ONLY (disables TX operation)
9	SET CLOCK (if option installed)
10	ALARM TIMER ON/OFF
11	SET ALARM
12	Time and date display
13	TA/TC/SC Rx ADDR (TransAdapt/Transcall/Selcall receive address)
14	TRANSADAPT BER NUM (TA bit error rate number)
15	SCAN GROUP NUMBER (for non ALE)

Function	Description
16	TA/TC/SC/ Tx ADDR (TransAdapt/Transcall/Selcall TX address)
17	ALE submenu (access to the ALE menu functions)
18	RECEIVE SET Rx/Tx (activated RX/TX operation)
19	RF POWER ATU SET (tune power set)
20	BITE TEST INITIATED
21	OPTION 1 TYPE
22	COM 1 BAUD (COM1 configuration)
23	COM 2 BAUD (COM1 configuration)
24	BACKLITE OUT (ON/OFF)
25	FREQ INC HZ (frequency increment from 1 Hz -10 MHz)
26	TEST REAR PANEL I/O (factory test)
27	ENC PASSWORD (Encryption menu)
28	PTT TIMER SCC (sets maximum PTT time)
29	PRINTER
30	CLONE RADIO
31	GLOBAL POSITION SYSTEM (not available)
32	CW HOLD TIME
33	SPLIT SITE (2 radios: TX and RX)

(1) **OPTION** is not used.

(2) **SCAN SET CHANNEL** allows the selected scan group (selected using **ALPHA 15**) to be customized. For information on customizing a scan group, see Customizing a Scan Group on page 3-18.

(3) **SCAN RATE** sets the rate at which channels within the scan group (selected using **ALPHA 15**) are scanned. 1-30 seconds per channel can be entered.

(4) **PRIORITY CHANNEL** is used to change the number of the priority channel. The factory default is channel 1. For information on changing this channel, see Priority Channel on page 3-3.

(5) **RF POWER** is used to change the settings for the RF power output of the TW7000F. The factory defaults for the three power output levels are 10, 25, and 200.

(6) FREQ BLANK hides the frequency so that only the channel number displays. Every time **ALPHA 6** is pressed the selection is toggled between **ON** and **OFF**. If set to **ON**, the mode select knob is disabled.

(7) LOCKOUT prohibits changing any of the channel frequencies. Every time **ALPHA 7** is pressed the selection is toggled between **ON** and **OFF**. If set to **ON**, the mode select buttons are disabled.

(8) RECEIVE SET Rx ONLY makes the displayed channel a receive-only channel by locking out the PTT. The status is automatically set to **ON** whenever **ALPHA 8** is pressed. **ALPHA 18** reverses the receive-only state to a receive/transmit state.

(9) SET CLOCK sets the internal clock (if installed) starting from the year, down to the second. Enter the year, date, hour, minute, and second pressing **E** after each value.

(10) ALARM TIMER automatically changes from **OFF** to **ON** whenever **ALPHA 10** is pressed. In the **ON** position, the alarm can be set (**ALPHA 11**).

(11) SET ALARM allows the time to be set for the sounding of the internal alarm. Enter the year, date, hour, and minute pressing **E** after each value.

(12) TIME AND DATE automatically displays the setting of the internal clock.

(13) TA/TS/SC Rx ADDR allows identification of the address for your station (001-255). The current address is briefly displayed. This number is usually the last three digits of a serial number.

(14) TRANSADAPT BER NUM provides the ability to set the BER for evaluating channel performance. The higher number corresponds to the better performing channel. The factory default is set to a BER of 70.

(15) SCAN GROUP NUMBER allows selection of a scan group. The scan group entered becomes the one used when accessing **ALPHA 2** and **ALPHA 3**. The default is set to scan group 00.

Note: The SCAN GROUP button on the front panel can also be used to select a 7000TC scan group, provided ALE is OFF or not installed.

(16) TA/TC/SC Tx ADDR allows identification of the address number for the station being called (001-255). The current address is briefly displayed. This number is usually the last three digits of a serial number.

(17) ALE submenu allows for configuration of the ALE system. For information about the ALE submenu and how the system settings are changed, see ALE Submenu on page 3-11.

(18) RECEIVE SET Rx/Tx automatically makes the displayed channel an RX/TX channel. **ALPHA 8** changes the setting back to an RX channel.

(19) RF POWER ATU SET allows entry of an RF power level (0-33) to be used during the tune cycle for an external automatic antenna tuner. The factory default setting is 10.

(20) BITE TEST INITIATED automatically starts the transceiver's BITE system.

(21) OPTION 1 TYPE allows activation of the Voice Enhancement option if the 7000VEM is installed. For more information, see Activating Voice Enhancement on page 3-25.

(22) COM 1 BAUD allows configuration of a COM1 port if working from a computer. Use the arrow keys to scroll through and enter the baud rate, data bits, stop bits, and parity.

(23) COM 2 BAUD allows configuration of a COM2 port if working from a computer. Use the arrow keys to scroll through and enter the baud rate, data bits, stop bits, and parity.

(24) BACKLITE automatically toggles between **ON** and **OFF**.

(25) FREQ INC HZ determines how much a frequency is incremented (1 Hz-10 MHz) or decremented each time an arrow button is pressed to change a frequency value. The default is set to 100 Hz.

(26) TEST REAR PANEL I/O is used to test the control panel accessory connectors. It is for factory use only.

(27) ENC PASSWORD allows access to the Encryption menu for configuration if the 7000ENCR option is installed. For detailed information, refer to the encryption operator manual (7000ENCR-MSOP).

(28) PTT TIMER provides the ability to change the internal PTT time-out. It can be set from one second to one hour. Entering **0** sets it to **OFF** (no time-out).

(29) PRINTER automatically prints complete channel information if an external printer is connected.

(30) CLONE RADIO allows the ability to clone another transceiver by downloading all frequency and channel settings.

(31) GLOBAL POSITION SYSTEM is not available.

(32) CW HOLD TIME allows the CW hold time to be set. Enter the number in ms.

(33) SPLIT SITE allows configuration of two radios; receive only, transmit only. The transceiver controls the transmitter.
1) Polling is set to **1 (OFF)** or **2 (ON)**.
2) Alarm timer sets the interval in minutes between system polling from the receiver to the transmitter.
3) FP alarm activates the internal alarm when loss of communication occurs. Set to **1 (OFF)** or **2 (ON)**.
4) External alarm activates the external alarm when loss of communication occurs. Set to **1 (OFF)** or **2 (ON)**.

ALE Submenu

ALE functions are accessed by selecting **ALPHA 17** from the Alpha menu. There are two ways to move through the ALE menu:

1. Press the desired function number and press **E.**

2. Use the arrow buttons to scroll to the function and press **E.**

Once a function is entered, the arrows are used to scroll through any further options within that function. Pressing **E** accepts any entered information.

ALE Submenu

Function	Description
1	SCAN RATE
2	SCAN GRP (scan group)
3	TUNE GRP (tune group)
4	Rx SELCT (tune select)
5	SELF ADRS (self address)
6	SELF NAME
7	OTHR ADRS (other address)
8	OTHR NAME (other name)
9	MOD GRP (modify scan group)
10	SND SELCT (sound select)
11	SND ADRS (sound address)
12	SND LEN (sound length)
13	SND INT (sound interval)
14	CALL LIM (call limit)

Function	Description
15	SLF TMOUT (self time-out)
16	OTR TMOUT (other time-out)
17	AUTO FILL
18	LQA EXCNG (Link Quality Analysis exchange)
19	LQA DECAY (Link Quality Analysis decay)
20	BER THRSD (Bit Error Rate threshold)
21	GOLAY THD (Golay threshold)
22	ERR THRSD (error threshold)
23	MESSG OUT (message out)
24	NEW MESSG (new message)
25	MESSG IN (message in)
26	HANDSHAKE
27	NET ADRS (network address)
28	NET NAME (network name)
29	NET SLOT (network slot)
30	NET OTHER (network other)
31	EXIT MENU

(1) SCAN RATE allows selection of the rate at which scanning proceeds. The arrow buttons toggle between **2** and **5** channels per second. The number to the left of the scan rate refers to the option. Option 1 is two seconds per channel, option 2 is 5 seconds per channel.

(2) SCAN GRP allows the selection of an ALE scan group (0-9). This becomes the specified scan group when using **(3) TUNE GRP** and **(9) MOD GRP.**

(3) TUNE GRP allows the scan group selected in **(2) SCAN GRP** to be tuned to an external antenna tuner. All the channels in that scan group are tuned.

(4) Rx SELCT allows selection of a receive type: **1** for normal ALE receive/transmit (**Rx/Tx**), **2** for receive only (**Rx ONLY**), or **3** for channel setup (**CH Rx/Tx**) using the 9000RAD or RC2 software.

(5) SELF ADRS is used to select an address number to review, change, or add for your station (00-19). To enter a new self address, enter the number. To change an existing address, scroll to the number and enter a new one.

(6) SELF NAME is used to enter a new self address name for the address number selected in **(5) SELF ADRS**. Any existing address name is briefly displayed. Use the alpha characters on the keypad to enter 3-15 characters (no spaces or punctuation).

(7) OTHR ADRS is used to select and review other addresses where messages are to be sent. Enter a new number (00-99) to be assigned an address or an existing number to review or change.

(8) OTHR NAME allows a new or different name to be entered for the addresses in **(7) OTHR ADRS**. Existing addresses are briefly displayed. Use the alpha characters on the keypad to enter 3-15 characters (no spaces or punctuation).

(9) MOD GRP modifies or defines which channels in a scan group are to be included in the scanning process. Scroll to the channel to be set. To include a channel in a scan group, enter **1 (ON)**. To remove a channel from a group enter **2 (OFF)**.

(10) SND SELCT is used to enable or disable sounding. Enter **1** for sound **OFF** and **2** for sound **ON**.

(11) SND ADRS is used to set the sounding feature to the self address selected in **(5) SELF ADRS**.

(12) SND LEN sets the length of each sounding transmission. The recommended sounding length is 5 or 10 seconds.

(13) SND INT sets the RT7201I to sound in time intervals from 1 minute to 24 hours (0001-1439 minutes).

(14) CALL LIM limits the number of attempts that can be made on each channel when trying to establish an ALE link (00-99).

(15) SLF TMOUT sets the length of time your transceiver remains linked after all outgoing messages are transmitted (000-600 in 15-second intervals).

(16) OTR TMOUT sets the length of time your transceiver remains linked when there are no incoming responses (000-600 in 15-second intervals).

(17) AUTO FILL is used to select whether or not the radio can automatically enter and retain addresses of other radios heard. Enter **1** for **OFF** and **2** for **ON**, or use the arrows to toggle between **OFF** and **ON**.

(18) LQA EXCNG is used to request that a calling or called station exchange a measurement of the link quality received on the other end. Enter **1** for **OFF** (no request) and **2** for **ON** (yes request), or use the arrows to toggle between **OFF** and **ON**.

(19) LQA DECAY allows entry of the time period in which an LQA score linearly decays from a state of perfect (30) to a state of dead (0). Selectable in periods of 0, 1, 2, 4, or 8 hours.

(20) BER THRSD allows entry of the acceptable bit error rate threshold (00-48) for received ALE words. A threshold of 00 would allow for no errors while a threshold of 48 would be the maximum amount of allowable errors. The factory default is set to 48 allowable errors.

(21) GOLAY THD is used to control the error correcting capability threshold (0-4). A value of 0 would allow for no corrections while a value of 4 would be the maximum amount of corrections allowable. The factory default is set to 3 allowable errors.

(22) ERR THRSD controls the number of errors allowed before a word is rejected (0-4). A value of 0 would allow for no errors while a value of 4 would be the maximum amount of errors allowable. The factory default is set to 3 allowable errors.

(23) MESSG OUT assigns a number to an outgoing message (0-9). Enter a new number to be assigned or an existing number to review or change. To enter a new or different message, use **(24) NEW MESSG.**

(24) NEW MESSG is used to enter a new outgoing message for the number assigned in **(23) MESSG OUT.** Any existing message is briefly displayed. Use the alpha characters on the keypad to enter up to 90 characters.

(25) MESSG IN is used to select an incoming message for review (0-9). Previous messages are deleted when a tenth message is received.

(26) HANDSHAKE sets the message exchange compatibility with other radios. Enter 1 for **NO Tx,** or 2 for **NO Rx.**

(27) NET ADRS assigns a number to a network address. Enter a new number to be assigned or an existing number to review or change. To enter a new or different address name, use **(28) NET NAME.**

(28) NET NAME is used to enter a new network address for the number assigned in **(27) NET ADRS.** The last entered address is briefly displayed. Use the alpha characters on the keypad to enter up to 15 characters.

(29) NET SLOT assigns network timing slots to stations for network call responses (01-16). **(27) NET ADRS** and **(28) NET NAME** must be configured first.

(30) NET OTHER determines whether a station is to be part of the network. Scroll to find and display the ID number of the station. Enter **1** for **ON** (part of the network) or **2** for **OFF** (not part of the network).

(31) EXIT MENU exits the ALE submenu.

Customizing Channel and Frequency

The TW7000F associates a frequency, mode, clarifier status, and offset value (if on) to each channel number. These can be different for each channel and are recalled whenever that channel number is entered. Once frequencies are set to channels, channels may be placed in scan groups.

Note: Scan groups are defined by channel number, not by frequency. Changing the frequency of a channel also changes the frequency of that channel within each scan group.

Channel Selection and Scrolling

To select a channel:

1. Press **C**.

2. Enter the desired 3-digit channel number.

3. Press **E**. The channel number with its frequency and clarifier offset is displayed.

4. Use the arrows to scroll through the channel numbers.

Entering Channel Frequency

Acceptable transceiver frequencies range from .100000 MHz to 30.000000 MHz in the receive mode, and 1.6 MHz to 30.000000 MHz in the transmit mode. Simplex operation uses identical RX and TX frequencies and must be in the transmit mode range. Semi-duplex (split frequency) is entered as an RX frequency first, and then as a TX frequency. Out-of-range frequencies produce an error message and the previously entered frequency is restored.

Entry of frequencies must always include the decimal point unless there are all zeros after the decimal point. Entry of leading or trailing zeros is not required.

Entering a frequency between .100000 MHz and 1.6 MHz in the simplex mode causes the radio to be receiver-only (PTT inhibited).

Entering Simplex Frequencies

To select the channel and assign a new frequency:

1. Press **C** and enter the 3-digit channel number.

2. Press **E**.

3. Press **F** and enter the frequency in MHz, including the decimal point.

4. Press **E**. The channel number is updated with the new frequency.

Example: To change the frequency of channel 041 from 13.330,000 MHz to 8.572,000 MHz:

1. Press **C** and **041** and **E**.

   Display: **CH   FREQ**
   041   13.330,000 MHz
   Rx

2. Press **F** and **8.572** and **E**.

   Display: **CH   FREQ**
   041   8.572,000 MHz
   Rx

Entering Semi-duplex Frequencies

To select the channel and assign a new frequency:

1. Press **C** and enter the 3-digit channel number.

2. Press **E** and **F**.

   Display: **xx. xxx, xxx**
   Rx

3. Enter the receive frequency and press **E**.

4. Press **F** twice.

   Display: **xx. xxx, xxx**
   Tx

5. Enter the transmit frequency and press **E**. The new channel frequency is displayed.

6. Press **F** to toggle between the receive and transmit frequencies.

Example: To enter an RX frequency of 21.2 MHz and a TX frequency of 29.3 MHz on channel 41:

1. Press **C** and **41** and **E**.

    Display: **CH   FREQ**
    041   xx.xxx,xxx
    (where xx.xxx,xxx is the existing channel frequency)

2. Press **F** and **21.2** and **E**.

    Display: **041   21.200,000**
    Rx

3. Press **FF** and **29.3** and **E**.

    Display: **041   29.300,000**
    Tx

Note: Entering numbers after pressing F edits the existing frequencies.

Assigning RX Only Channels

To automatically limit a channel to a receive-only operation, enter **ALPHA 8**. To convert the channel back to a standard RX/TX channel, use **ALPHA 18**.

Frequency Scrolling

Displayed frequencies can be changed by pressing **F** and using the up arrow button to increase the frequency and the down arrow button to decrease the frequency. The channel number's initial frequency is maintained in memory unless **E** is pressed. (Pressing **E** stores the new frequency in channel memory.)

Note: The default frequency increment is 100 Hz for scrolling. This increment may be changed by entering ALPHA 25.

Manual Channel

The manual channel allows manipulation of frequencies without the worry of overwriting a frequency on another channel. This channel is defined as channel 000. Settings can then be copied to a fixed channel.

To copy the channel 000 data to another channel:

1. Press **C** and enter the 3-digit channel number to indicate where data is to be stored.

2. Press **C** and **E**. This copies data from the manual channel to the new channel. Data is retained in the manual channel.

Scanning

Scan groups are arranged in the TW7000F according to number. There may be up to 32 different scan groups in the radio at one time, each one having a different scan group number. Each scan group may contain up to 64 channels.

Because the TW7000F scans channels, not frequencies, all desired frequencies in a particular scan group must be given a channel number. Channel numbers are not exclusive to a particular scan group; the same channel may be used in different scan groups. Changing a channel's frequency changes that frequency wherever that channel is specified.

Customizing a Scan Group

Customizing a scan group involves reviewing the contents of a scan group and adding or deleting channels.

1.   Press **ALPHA 2**.

2.   Press **E**.

Display: **SCAN SET CHANNEL x NNN**
            (where x is the channel status and NNN is the 3-digit channel number)

Use the arrow buttons to scroll through the channels in a scan group. Channels are shown in numerical order.   Scan group channels are changed by deleting existing channels and adding new ones.

To delete existing channels from the group:

1.   Use the arrow keys to locate the channel.

2.   Using the alpha characters on the keypad, press **D** (delete).

3.   Press **E**.

To add new channels to the group:

1. Use the up arrow to scroll past the highest numbered channel until **xxx** is displayed.

2. Enter the number of the channel to add and press **E**.

3. When the scan group is configured properly, press **E** to exit this mode.

It is also possible to simultaneously delete and enter a different single digit channel by writing over the contents of an existing channel. This is done by scrolling to the channel, pressing the single digit number of the channel to add, and pressing **E**.

Selecting a Scan Group

1. If ALE is **ON**, press **SCAN GROUP** or select **(2) SCAN GRP** from the ALE submenu.

   If ALE is **OFF**, press **SCAN GROUP** or **ALPHA 15**.

   Display: **SCAN GRP xxx**

2. Use the arrows to scroll to the desired scan group number, or enter the desired number using the keypad.

3. Press **E**. The display momentarily indicates the newly selected scan group. That group is automatically saved in memory.

   Display: **SCAN GRP xxx**
   (where xxx is the new scan group)

This becomes the specified scan group when using the Alpha or ALE menus, until the scan group is changed.

To Start and Stop Scanning

Press **SCAN** to start scanning within the selected scan group. Scanning begins with the first channel in the selected scan group and continues in numerical order with each channel number displayed in turn. Press **SCAN** again to stop the scanning process.

Placing an ALE Call

The ALE option automatically selects frequencies that support communications traffic between stations in a network. This section does not cover the ALE option in detail. For detailed instruction on ALE operations, refer to the 7000ALE operator manual (7000ALE-MSOP).

To initiate an ALE call:

1. Press **CALL**.

2. Scroll to find the desired termination:
   THIS IS: Creates a link, exchanges messages, and remains linked.
   THIS WAS: Creates a link, exchanges messages, and terminates the link.
   POLLING: Causes an LQA exchange on all frequencies with the selected address.

   Press **CALL** to make the selection.

3. Scroll to find the type of call being made: **INDIVIDUAL** or **NET**. Press **CALL** to make the selection.

4. Scroll to find the destination address, press **CALL** to select the address.

   Display: **TO:xx NNN**
   (where xx is the destination address number and NNN is the address name)

5. Scroll to find and display the self address, press **CALL** to select the address.

   Display: **FR:xx** (where xx is the self address number)

6. Scroll to find a previously composed message number or select **NO AMD MSG** if there is no message to send.

   Display: **AMD message** (Automatic Message Display)

7. Press **CALL** to select the AMD message and attempt the ALE call.

   Display: **ALE LINK xxx** (where xxx is the channel selected)

   If **CALL** is pressed immediately after the message is sent, the call is terminated and **CALL TERM** displays.

8. To initiate an ALE call to the last station with an established link, press **SEND**.

Note: In the event of a poor link, press CALL to start the call again.

Placing a TransAdapt, Transcall, or Selcall

The TW7000F is capable of supporting the following selective call systems: TransAdapt (TA), Selcall (SC), and Transcall (TC). Selcall is the basic single-channel calling system. Transcall is a more advanced system that determines the best channel in a scan group for communications. TransAdapt is a faster system that determines if the selected channel is acceptable for voice-quality communications, not necessarily the best.

Before a call can be initiated the appropriate option must be turned on.

1. Press **OPTION** until the correct icon flashes (either **TCSC** or **TA**).

2. Press **STATUS** to turn the option **ON**.

Only one calling system can be selected at a time; the TCSC option cannot be turned on until the TA option is turned off.

Call code: Before initiating TCSC operations, the TW7000F must be assigned a call code (001-225). This is the call code that other stations use to contact your transceiver.

1. Press **ALPHA 13**.

2. Press **E**.

   Display: **TA/TC/SC**
   Rx ADDR xxx

3. Enter the receive call code and press **E**. The number must be from 001-255 and not assigned to another transceiver.

   Display: **xxx** (briefly displays the new receive code)

Selcall: To make a Selcall, the TW7000F must be set to a fixed channel (not scanning).

1. Press **OPTION** until the **TCSC** icon flashes.

2. Press **STATUS** to turn the option **ON**.

3. Press **C** and enter the channel from which to call. Select the appropriate channel on the transceiver.

4. Press **CALL** to initiate the call.

   Display: **Tx ADDR xxx**

5. Enter the Selcall code of the transceiver to call (001-255). A call to all channels (Allcall) is code 000.

6. Press **CALL** again. The TW7000F begins the call sequence. If the call is successful, a link alarm sounds.

   Display: **SC LINK**

If the call is unsuccessful, calling is discontinued and **NO LINK** is briefly displayed.

Transcall: To make a Transcall, the TW7000F must be in scan mode.

1. Press **OPTION** until the **TCSC** icon flashes.

2. Press **STATUS** to turn the option **ON**.

3. Press **SCAN**.

4. Press **CALL** to initiate the call.

5. Enter the Transcall code of the transceiver to call (001-255). A call to all channels (Allcall) is code 000.

6. Press **CALL** again. The TW7000F is now under full control of the Transcall circuit.

   The TW7000F starts transmission on each of the ten channels until it is synchronized with the station being called. When synchronized, both transceivers step through each channel by making a short transmission until the best available channel is reached. Once the best channel is reached, the TW7000F sounds an alarm indicating a successful Transcall connection.

   Display: **TC LINK**

   If the call is unsuccessful, calling is discontinued and **NO LINK** is briefly displayed.

7. To break the connection, press **SCAN**.

8. To stop the call before connecting, press **CALL**.

Note: When scanning in Transcall, the receiving station also responds to a valid Selcall.

TransAdapt: The TW7000F can be on a fixed channel or in scan mode. If on a fixed channel, TransAdapt operates the same as Selcall. If in scan mode, TransAdapt locates the first usable frequency, not the best.

1. Press OPTION until the **TA** icon flashes.

2. Press **STATUS** to turn the option **ON**.

3. Press **SCAN**.

4. Press **CALL** to initiate the call.

5. Enter the code of the transceiver to call (001-255). A call to all channels (Allcall) is code 000.

6. Press **CALL** again. The TW7000F is now under full control of the TransAdapt circuit.

   The TW7000F starts transmission on each of the ten channels until it is synchronized with the station being called.

   Display: **TA LINK**

   If the call is unsuccessful, calling is discontinued and **NO LINK** is briefly displayed.

7. To break the connection, press **SCAN**.

8. To stop the call before connecting, press **CALL**.

Using the Automatic Antenna Tuner

The tuner is designed to provide channel-memory capability. Once the antenna is tuned to a particular channel, it is saved in memory and automatically reverts to its tuned position whenever that channel is selected.

Cabling

Tuner operation requires a coaxial cable connection for both the RF signal and +12 Vdc input power, and a control cable for serial data.

The RF cable (C991535) is a standard coaxial cable length (25 ft.) that goes from the 50 ohm **ANTENNA** port on the TW7000F to the input coaxial connector on the tuner.

The power/data cable (C991922) is a standard cable length and provides serial data to the tuner. The pinout and signal descriptions for this cable are:

TW7000F (ACC3)	Signal Description	Tuner Control
Pins 1,2	Ground	Pins 1,2
Pins 3,4	+12 Vdc	Pins 3,4
Pin 19	RX/TX serial data (A)	Pin 5
Pin 20	RX/TX serial data (B)	Pin 6

Deployment

Initial setup of the TW7000F automatic antenna tuner is as follows:

1. Remove the tuner from the TW7000F by loosening the 2 latches that hold it to the main chassis.

2. Deploy the tuner as far as possible from the body of the TW7000F. Attach the coaxial cable to the **ANTENNA** output of the TW7000F and the RF input of the tuner.

CAUTION: Since this cable carries both the RF signal and +12 Vdc power to the tuner, the center conductor is hot.

---

3. Attach the control cable to **ACCESSORY 3** and the tuner's 14 pin connector.

4. Attach the wire antenna to the ceramic insulated connector on the tuner and stretch it out as long and as high off the ground as possible. Attach the ground braid to the ground lug on the tuner and to an appropriate ground next to the tuner.

5. Attach the ac power cord to the TW7000F and plug it into any appropriate outlet.

6. Attach the handset to the audio connector.

Operation

1. Determine the channels to be scanned.

2. Select each channel in turn and go through an initial tune procedure on the channel by pressing and releasing **TUNE** on the front panel. Tuning is automatic.

3. After each channel has been tuned once, the tuner retains the settings and automatically reverts to them when the channel is selected.

Activating the Noise Blanker

The impulse-type Noise Blanker option (7000NB) suppresses electrical emissions generated by engine ignition systems. To activate the 7000NB, the **NB** icon must be turned on.

1. Press **OPTION** until the **NB** icon flashes.

2. Press **STATUS** to turn the option **ON**.

Activating Voice Enhancement

The DSP-based Voice Enhancement option (7000VEM) suppresses various types of noise and interference on voice communications.

The 7000VEM has two modes of operation. Mode 1 is referred to as adaptive peaking and is useful in reducing atmospheric noise and static inherent in HF signals. Mode 2 adds the ability to remove man-made interferences like ignition and power line noises.

To activate the 7000VEM, the **OPT** icon must be turned on.

1.   Press **OPTION** until the **OPT** icon flashes.

2.   Press **STATUS** to turn the option **ON**.

3.   Press **ALPHA 21** and **E**.

       Display: **OPTION 1**
                 TYPE x (briefly displays last mode entered)

4.   Enter the mode (**1** or **2**) and press **E**.

Note: To verify that the 7000VEM option is installed, look for OPT 1 MODULE to be displayed during start-up.

Activating Encryption

This high-level security Encryption option (7000ENCR) is accessed by activating the **ENCR** icon.

1.   Press **OPTION** until the **ENCR** icon flashes.

2.   Press **STATUS** to toggle between **1** and **OFF**. The **1** position turns the Encryption option on.

For detailed information on this security option, refer to the encryption operator manual (7000ENCR-MSOP).

SECTION 4: SERVICING

General

Detailed servicing information is beyond the scope of this manual and only experienced personnel should make adjustments or attempt any serious service work. Reference to the TW7000F-MS technical manual is essential.

The TW7000F is of modular construction. If spare boards are available, non-technical personnel are able to repair most faults in the field. It is strongly recommended that non-technical personnel receive instruction from experienced technicians in the replacement of boards.

The TW7000F has a BITE system that aids in troubleshooting down to the individual board level. When a fault occurs, BITE fault messages are displayed to indicate the specific board affected. The BITE runs automatically on power up and can be run anytime by entering **ALPHA 20**.

Routine Maintenance

The TW7000F normally requires no periodic maintenance except to check the calibration of the master oscillator. It is often convenient to program an unused channel to a known frequency standard such as WWV (radiates 10,000W on 5, 10, and 15 MHz). This enables regular checks of the frequency calibration.

The exterior of the TW7000F should be kept clean by wiping it with a damp cloth and polishing it with a soft dry cloth. All knobs should be secure and connectors tight. When the TW7000F is opened, coaxial cable connectors should be tight and board connectors firmly in place. Any dirt or dust should be removed using compressed air.

Board Access and Replacement

The top and bottom covers are each retained by six screws. After removal of the retaining screws, the covers can be lifted off the TW7000F. For board locations, see the Board Location Diagram on page 4-2.


CAUTION: When the transmitter is operating, high RF voltages are present on the power amplifier and filter boards. Use caution as these RF voltages can cause burns.

All the boards, with the exception of the power amplifier, filter, and front panel, are plug-in board assemblies and easily accessible from the top of the TW7000F.

The control unit assembly is attached to the transceiver with two retainer clamps.
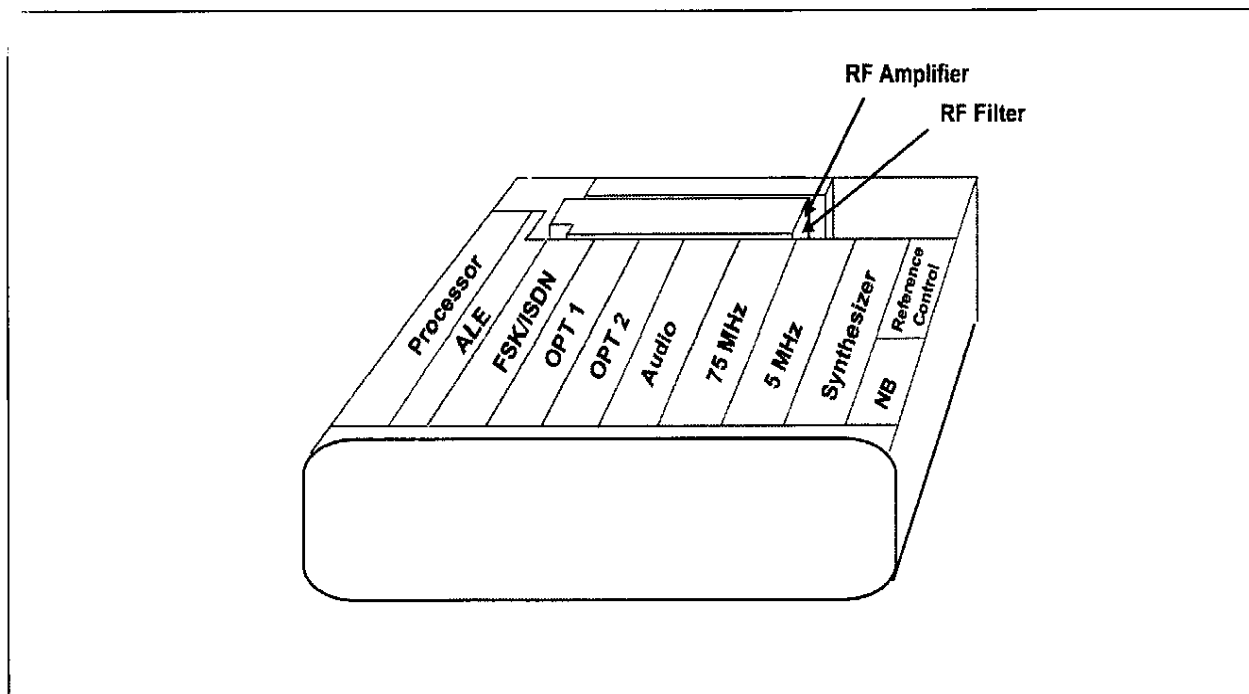
Board Location Diagram

Field-Level Servicing

The transceiver BITE system is designed to identify a faulty board. Feedback is presented on the display. In a matter of minutes the TW7000F can be opened up, the faulty board removed, and a new one inserted. Extender cards are also available to make it easy to test and/or troubleshoot boards.

Part Number	Description
TW7000FTK	Tool kit with card puller
SMTRK	Surface mount technology tool kit
7000EXT	Extender board kit and card puller