

# TW7000-MSOP

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**TW7000**  
**HF TRANSCEIVER**  
**OPERATOR MANUAL**



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Datron World Communications Inc.  
Manual Part No. TW7000-MSOP  
Release Date: June 2001  
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3030 Enterprise Court  
Vista, CA 92083, U.S.A  
Phone: (760) 597-1500 Fax: (760) 597-1510  
E-mail: [sales@dtwc.com](mailto:sales@dtwc.com)  
[www.dtwc.com](http://www.dtwc.com)



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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, 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.

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- 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.

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## 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 manuals section on installation. DO NOT operate equipment with cover removed.

**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:** Trained personnel should only carry out 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 in 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.

Use only genuine Datron factory parts for full performance and safety of this product.



**Made in the USA**

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# CONTENTS

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## Section 1: Introduction

General .....	1-1
Scope .....	1-1
TW7000 HF SSB Transceiver .....	1-1
Description of Equipment .....	1-2
TW7000 Technical Specifications .....	1-2
TW7000 Variations .....	1-4
Conventions .....	1-6
Referenced Manuals .....	1-6

## Section 2: Installation

Introduction .....	2-1
Type of Installation .....	2-1
Input Power .....	2-1
Antenna Connection .....	2-2
Microphone Audio Connection .....	2-2
Accessory Connections .....	2-3
Accessory Connector 1 Pinouts .....	2-3
Accessory Connector 2 Pinouts .....	2-4
Accessory Connector 3 Pinouts .....	2-5
Power Cabling Accessories .....	2-10
RF Cabling Accessories .....	2-11
Control Cabling Accessories .....	2-12
Remote Control .....	2-13
TW7000 Back Panel .....	2-15

## Section 3: Operation

Powering the TW7000 .....	3-1
TW7000 Front Panel .....	3-1
Knobs, Buttons, and Indicators .....	3-2
Alpha Menu .....	3-7
Alpha Menu .....	3-7
ALE Submenu .....	3-11
ALE Submenu .....	3-12

---

Customizing Channel and Frequency . . . . .	3-16
Scanning . . . . .	3-18
Placing an ALE Call . . . . .	3-20
Placing a TransAdapt, Transcall, or Selcall . . . . .	3-21
Activating the Noise Blanker . . . . .	3-24
Activating Voice Enhancement . . . . .	3-24
Activating Encryption . . . . .	3-24

## **Section 4: Servicing**

General . . . . .	4-1
Routine Maintenance . . . . .	4-1
Board Access and Replacement . . . . .	4-1
Board Locations . . . . .	4-2
Field Level Servicing . . . . .	4-2

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# SECTION 1: INTRODUCTION

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## *General*

The Datron World Communications Inc. (DWC) TW7000 HF SSB Transceiver is an advanced transceiver that provides a complete range of both voice and data operation over the entire 1.6 to 30 MHz HF spectrum. The TW7000 is microprocessor-controlled and features a state-of-the-art DDS-based synthesizer for extremely fast switching applications. A custom LCD is used to provide channel and frequency data, feedback on other front panel control functions, BITE information, and order-wire text messages. The TW7000 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.

## *Scope*

This manual describes the TW7000, its installation, operation, and features. For complete technical coverage of the transceiver, refer to the TW7000 HF Transceiver Technical Manual (TW7000-MS).



**Figure 1-1**  
**TW7000 HF SSB Transceiver**

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## ***Description of Equipment***

The TW7000 includes the basic receiver/transmitter unit and accessories. The accessories are a dc power cable (C991829), an operator manual (TW7000-MSOP), and two spare dc 25A fuses (550011).

The TW7000 is powered from any dc source that provides 13.8V at a maximum of 25A. Good performance is achieved when the input voltage is in the range of 11 to 15.5V.

The 50 ohm, UHF, female, RF output connector is meant to be used with broadband antennas, power amplifiers, and narrowband antenna tuners.

The TW7000 can be programmed and operated from its front panel, or from an external computer utilizing a wide variety of interface standards including RS232, 422, and 485.

TW7000 audio accessories include a heavy-duty hand microphone, a dynamic desk microphone, a Morse key, and headphones.

**Table 1-1  
TW7000 Technical Specifications**

<b>Characteristic</b>	<b>Specification</b>
<b>General</b>	
Frequency Range	1.6 to 30 MHz for TX; .1-30 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
Antenna Impedance	50 ohm
Frequency Stability	$\pm 1$ ppm $-30^{\circ}$ to $60^{\circ}$ C; optional $\pm 0.1$ 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, optional

**Table 1-1  
TW7000 Technical Specifications**

<b>Characteristic</b>	<b>Specification</b>
Input Power Protection	Reverse polarity, transient and under/over voltage
Size (H x W x D)	4 in. x 13 in. x 17 in. (10.2 cm x 33 cm x 43 cm)
Weight	21 lbs. (9.5 kg)
<b>Transmitter</b>	
Power Output	125W PEP, 100W average; three levels, programmable from front panel
Intermodulation	-32 dB, typical
Harmonics	-60 dB, typical, 2-30 MHz
Carrier Suppression	-50 dB, typical
Sideband Suppression	-55 dB, typical
VSWR Protection	Protected against antenna mismatch including open and short circuit
<b>Receiver</b>	
Frequency	100 kHz to 30 MHz
Clarifier	Digital $\pm 600$ Hz in 10 Hz steps
Receiver Protection	Can withstand +43 dBm input without damage
Sensitivity	10 dB SINAD min., for 0.5 $\mu$ V input (2-30 MHz)
IF Rejection	-80 dB
Selectivity	SSB: 300 to 2700 Hz at 3 dB
Attenuator	+20 dB switchable
Audio	5W 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
<b>Environmental</b>	
Operating Temperature	-30° to +60°C

**Table 1-1**  
**TW7000 Technical Specifications**

Characteristic	Specification
Storage Temperature	-40° to +70°C
Shock and Vibration	Per MIL-STD-810E

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

### ***TW7000 Variations***

This manual includes the information necessary to operate any variations of the TW7000. Options described in this manual may not be available on your transceiver. For more information about TW7000 variation, contact DWC.

**TW7000C:** The TW7000C is designed for computer control. The standard front panel is replaced with a blank front panel.

**TW7000E:** The TW7000E is designed for extended control. The standard front panel is replaced with a line driver panel. For remote operation up to 15m (50 ft.), use with TW7201E control head.

**TW7000PP:** The TW7000PP has connections that allow the TW5830 Pre/Postselector and TW5830INST Installation Kit to be added for co-sited operation.

*Note: The TW5830 requires the radio have both the TW7000PP and the TW5830INST. The TW7000 cannot be upgraded to a TW7000PP in the field.*

**TW7000RF:** The TW7000RF is designed for long distance (beyond 2 km) remote-only control. The standard front panel is replaced with a blank front panel. An internal modem card (7000RF) is installed. For full function FSK remote control, use with a TW7201F.

**TW7000RI:** The TW7000RI is designed for remote-only control up to 2 km. The standard front panel is replaced with a blank front panel. An internal modem card (7000RI) is installed. For full function, real time, ISDN remote control, use with a TW7201I.

**TW7000RX:** The TW7000RX is a receiver only. It includes the full receiver functions of the TW7000, excluding the transmit features.

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**TW7000TX:** The TW7000TX is a transmitter only. It includes the full transmitter functions of the TW7000, excluding the receiver features.

### ***TW7000 Internal Options***

Several internal options are available for the TW7000. 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 enables the alarm features.

**7000ENCR:** High-level voice encryption 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 through 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 Trans-Adapt.

**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.

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## *Conventions*

This manual uses the following typographical conventions:

Bold type is used to denote all items that display on the front panel and for any button that is pressed. For example:

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

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

2. Press **ALPHA** and **17**.
3. Press **STATUS**.

## *Referenced Manuals*

- TW7000 HF Transceiver Technical Manual (TW7000-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)

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# SECTION 2: INSTALLATION

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## ***Introduction***

This section contains information necessary to install the TW7000 in its operating environment. Power, antenna, and accessory connections are discussed. System diagrams are provided to show the proper connections to a variety of accessories.

## ***Type of Installation***

The TW7000 can be installed in a variety of different ways. Proper installation is particularly important in marine and vehicular installations; mounting and power source connections can make a difference to transceiver performance.

## ***Fixed Station***

Unless otherwise specified when ordered, the TW7000 is shipped ready for operation. The TW7000 uses an on-demand fan for cooling the internal heat sink during periods of prolonged transmit operation.

*Note: Supply adequate ventilation around the back of the TW7000 to allow for proper air flow.*

## ***Vehicular or Marine***

Mobile mounts should be used to mount the transceiver. On occasion it may be necessary to fabricate special supplementary brackets to complement a particular vehicle or shipboard location. DWC offers rack, mobile, and shock mount kits for the TW7000, suitable for most installations.

## ***Input Power***

Input power for the TW7000 is 13.8 Vdc, nominally, with a maximum current requirement of 25A. The recommended operational voltage range of the transceiver is 11 to 15.5 Vdc. The dc input connector (12 Vdc input) on the back panel 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 cable, supplied with the TW7000, has a convenient connection to a variety of +12 Vdc sources. For specific connections, refer to the Power Cabling Accessories figure on page 2-10.

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The pin assignments for the input power connector are as follows:

Pin Number	Description
1	Return (ground)
2	12 Vdc

The dc power connection between the TW7000 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 fuse holder (pin 346877) on the back panel contains a 25A, 3-AG fuse, and a spare fuse of the same value.

### ***Antenna Connection***

The TW7000 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 and antenna tuners use DWC specially designed 50 ohm cables. For specific connections, refer to the RF Cabling Accessories figure on page 2-11.

### ***Microphone Audio Connection***

Low-level audio accessories for use with the TW7000 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 of the TW7000. The two connectors are wired in parallel and are suitable for use by these audio accessories. The input impedance is a nominal 150 ohm. Most dynamic, ceramic, and magnetic microphones operate with the TW7000. All DWC-supplied audio accessories have the cor-

rect mating connector. To use other low-level audio accessories, the correct mating connector can be obtained from DWC. The pin assignments for the two connectors are as follows:

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

### ***Accessory Connections***

DWC has a variety of external accessories for use with the TW7000. For some of these accessories and their control cabling, refer to the Control Cabling Accessories figure on page 2-12. For more information on any individual accessory, refer to the manual for that piece of equipment.

### ***Connector Pinouts***

There are three accessory connectors on the back panel, each with different pin assignments. If multiple accessories are required that share one or more of the accessory connectors, an external accessory combiner box (TW7000IOX) can be attached to any of these connectors. All of the connectors on the back panel are a D-submini socket with 25 pins. For the location of these connectors, refer to the TW7000 Back Panel figure on page 2-15.

**Table 2-1**  
**Accessory Connector 1 Pinouts**

Pin Number	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)

**Table 2-1**  
**Accessory Connector 1 Pinouts**

<b>Pin Number</b>	<b>Description</b>
10	AUXPTT\
11	Select
12	Busy
13	+12V ACC
14	EXTCWKEY (external CW key)
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)
25	DI/OSEL

**Table 2-2**  
**Accessory Connector 2 Pinouts**

<b>Pin Number</b>	<b>Description</b>
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	AUXPTT\
11	COM2RXD - COM2 (RX data)
12	COM2TXD - COM2 (TX data)

**Table 2-2**  
**Accessory Connector 2 Pinouts**

<b>Pin Number</b>	<b>Description</b>
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)
21	RETX\ (retransmit)
22	EXTSPKR (speaker audio)
23	SQA (squelch audio)
24	+12V ACC
25	+12V ACC

**Table 2-3**  
**Accessory Connector 3 Pinouts**

<b>Pin Number</b>	<b>Description</b>
1	Ground
2	Ground
3	FILTG\
4	AMPALC (external amplifier ALC line)
5	AMPPTT\ (external amplifier PTT line)
6	FLTA (low-pass filter select lines)
7	FLTB (low-pass filter select lines)
8	FLTC (low-pass filter select lines)
9	FLTD (low-pass filter select lines)
10	FLTE (low-pass filter select lines)
11	FLTF (low-pass filter select lines)
12	FLTG (low-pass filter select lines)
13	+5V
14	Ground
15	Ground

**Table 2-3**  
**Accessory Connector 3 Pinouts**

Pin Number	Description
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

### ***Connector Pinouts for Accessories***

This section discusses the individual accessories that can be used with the TW7000 including their pinouts.

### ***External Encryption***

An embedded encryption board (7000ENCR option) can be installed into the TW7000. External encryption can also be used with the transceiver and connected to **Accessory 1** or **Accessory 2** using the following pins:

Pin Number	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

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### *Telephone Couplers*

Telephone couplers like the TW5810 or TW5850, use either **Accessory 1** or **Accessory 2**. The appropriate pins are as follows:

Pin Number	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

### *EIA Data Interface Standards*

The TW7000 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 standard I/O port (COM1) for these interfaces. The RS232 protocol is standard, all others are optional. It is necessary to order the 7000RS option and to specify the required protocol so the appropriate interface chip is inserted into the processor. Pins used on **Accessory 1** are as follows:

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

### *Automatic Antenna Tuners*

The TW7000 interfaces with the complete line of DWC automatic antenna tuners. This includes the older AT/RAT100 and RAT1000, as well as the newer AT/RAT7000B.

The AT/RAT100 and RAT1000 tuners must be connected to **Accessory 2** using the following pins:

Pin Number	Description
1	Ground
2	Ground

Pin Number	Description
4	ATUINIT (tune initiate)
5	ATUKEY\
16	ACHKTUNE (tuner check tune)
17	ADATA (tuner data)
18	ACLOCK (tuner clock)
19	ASTROBE (tuner strobe)
24	+12V ACC (1.8A peak)

The new AT/RAT7000B tuners must use **Accessory 3** with the following pins:

Pin Number	Description
14	Ground
15	Ground
19	ATURX (tuner RX data)
20	ATURX (tuner RX data)
24	+12V ACC
25	+12V ACC

#### *Data Terminal Interface*

The TW7000 can interface with its own line of computers (TW9200, DT9400, and RT9300) or to other external units using **Accessory 1** with the following connections:

Pin Number	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)

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### *External Printers*

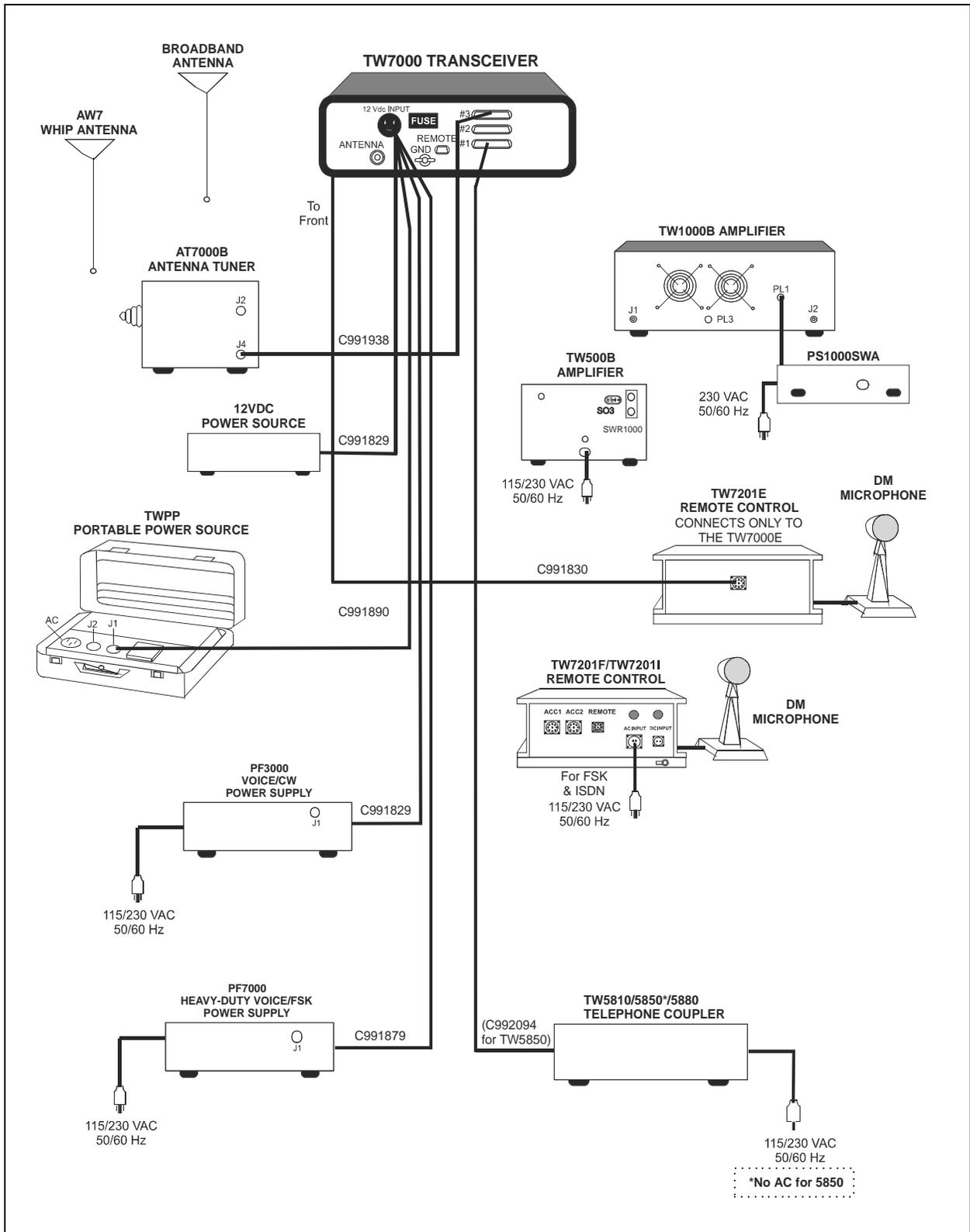
A standard parallel printer is plugged into **Accessory 1** and used to obtain a hard copy of text messages stored in the transceiver. Pins used on **Accessory 1** are as follows:

<b>Pin Number</b>	<b>Description</b>
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)

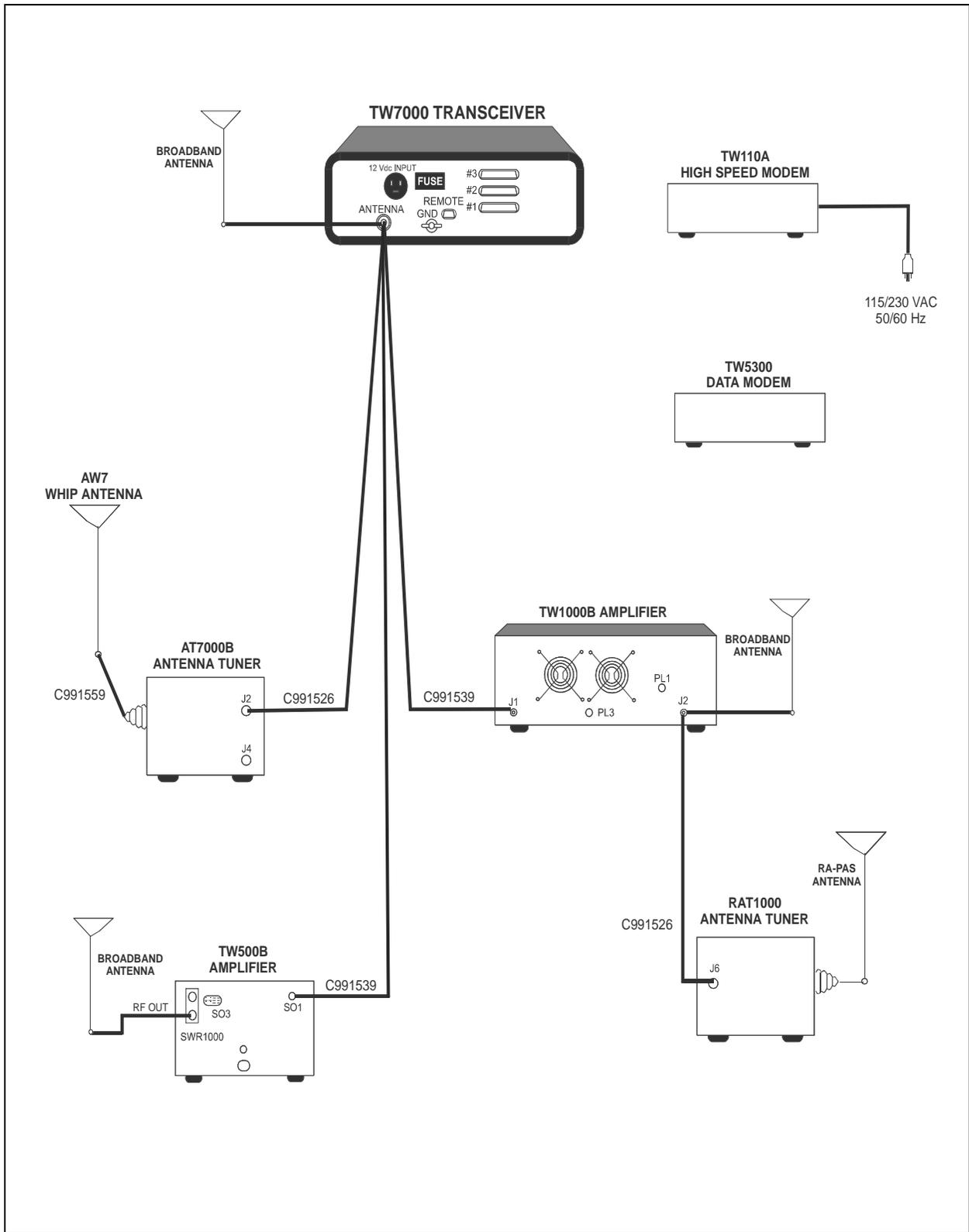
### *ALE/Transcall/Selcall Alarm*

The external ALE/Transcall/Selcall alarm driver is available on **Accessory 2** using the following pins:

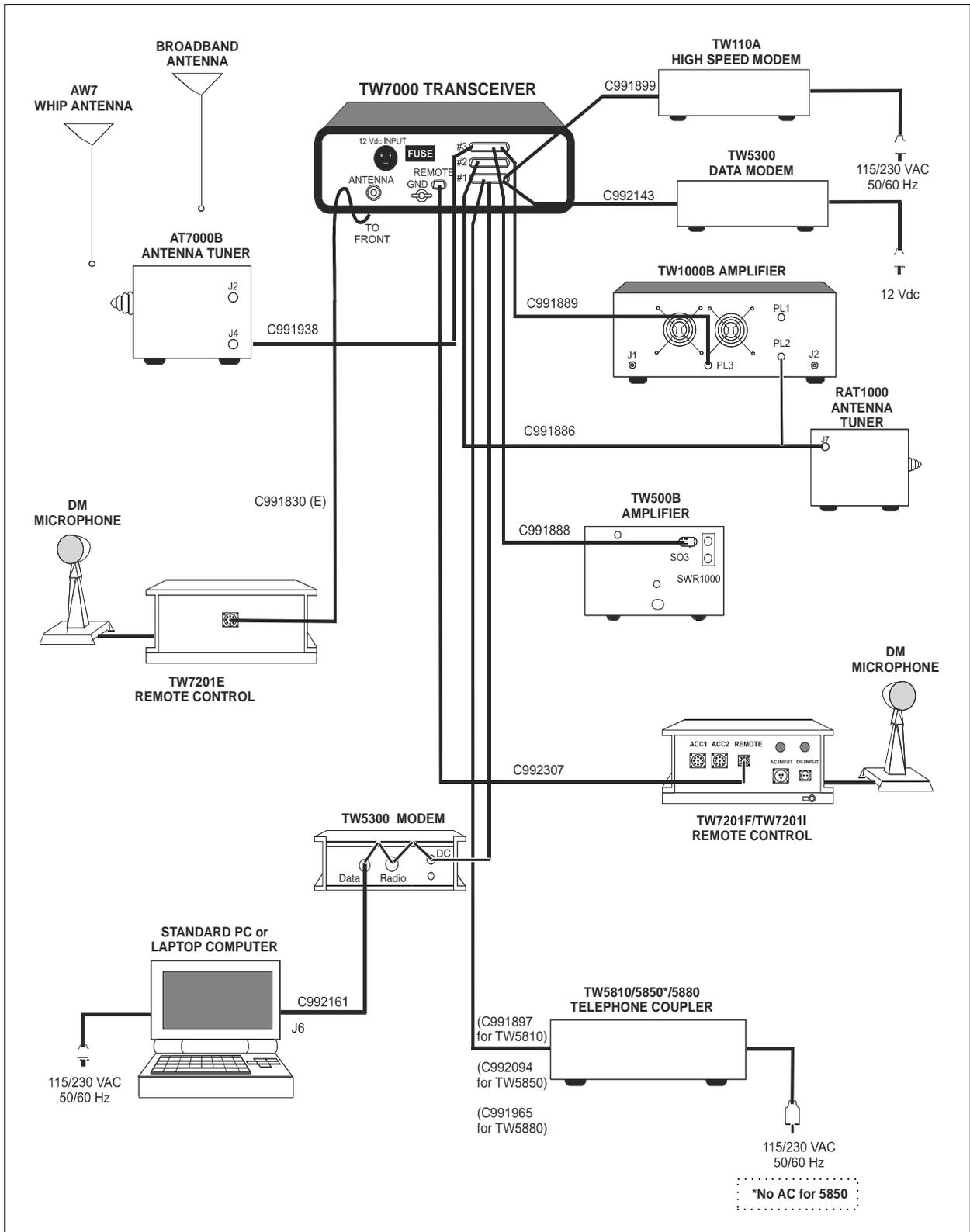
<b>Pin Number</b>	<b>Description</b>
14	Ground
20	TC/SCALM (alarm)



**Figure 2-1**  
**Power Cabling Accessories**



**Figure 2-2**  
**RF Cabling Accessories**



**Figure 2-3**  
Control Cabling Accessories

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### *External Speaker*

An external loudspeaker can be attached to the transceiver at **Accessory 2** using the following pins:

Pin Number	Description
14	Ground
22	EXTSPKR (speaker audio)

### *External High-Power Amplifiers*

The TW7000 interfaces with all existing DWC high-power RF amplifiers at **Accessory 3** using the following pins:

Pin Number	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 TW7000 can be controlled remotely using a computer, an extended front panel, or a remote control head.

### *Computer Control*

The TW7000 can be controlled remotely from a standard computer using **Accessory 1** on the back panel. A custom software program is available from DWC that runs on any PC using Windows™. For the connections to use, refer to the EIA Data Interface Standards section on page 2-7.

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### ***Extended Front Panel Control***

The front panel of the TW7000 can be removed from the body of the transceiver and replaced with a line driver panel (TW7000E). This variation of the radio is used to remotely control operations from distances up to 50 feet.

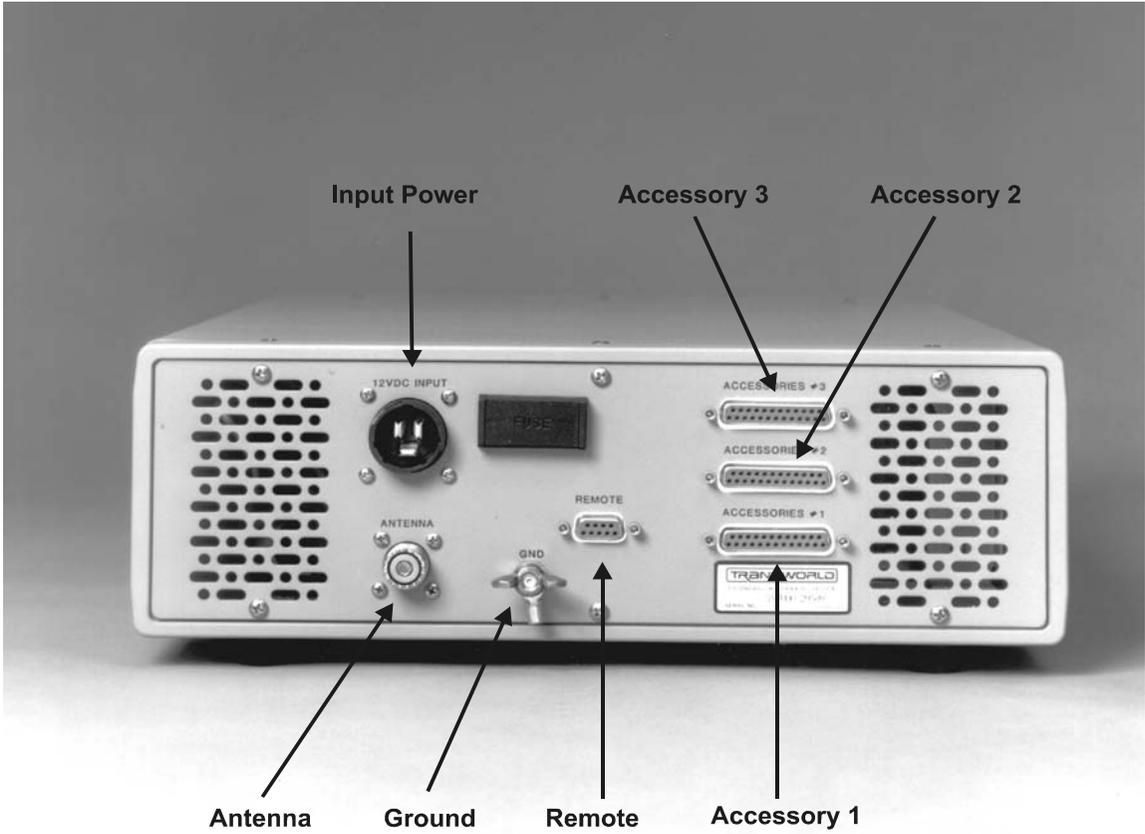
### ***FSK and ISDN Remote Control***

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 inside the transceiver. The TW7201F uses FSK and can be used for long-range remote requirements; 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 TW7000 via the remote connector on the back panel. This connector is a D-submini socket with 9 pins.

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

For a complete description of each of these pins, refer to the TW7201F FSK Remote Control Head Technical Manual (TW7201F-MS) or the TW7201I ISDN Remote Control Head Technical Manual (TW7201I-MS). The TW7000 HF Transceiver Technical Manual (TW7000-MS) also describes these interconnects.



**Figure 2-4**  
**TW7000 Back Panel**

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# SECTION 3: OPERATION

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## *Powering the TW7000*

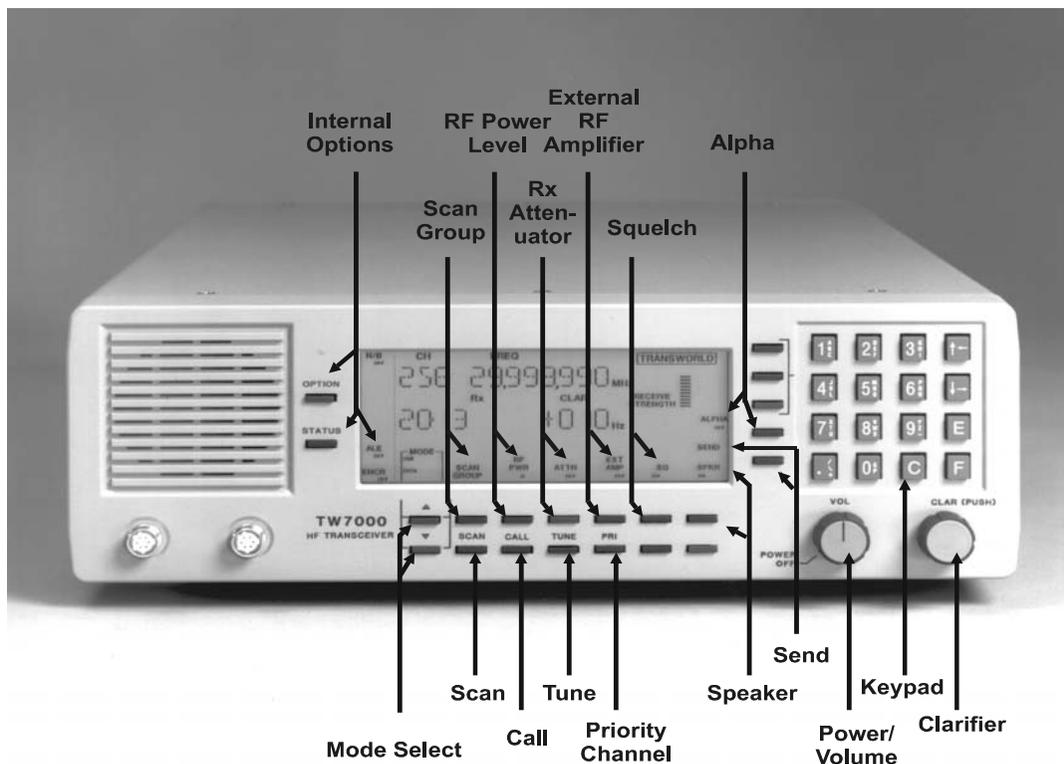
The Power/Volume knob is used to turn on the TW7000. When the radio is on, the version level of the software displays.

Display: **TW7000**  
**VER701xx** (where xx is the version level)

The BITE system runs automatically and verifies that the boards are functional.

Display: **TW7000**  
**MODULES**

The BITE system searches for any installed options. After verifying installed options are installed, the options display, as well as the channel number (in the upper left corner), the channel frequency (in the upper center), and the clarifier offset (if any, below the frequency).



**Figure 3-1**  
**TW7000 Front Panel**

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## ***Knobs, Buttons, and Indicators***

The front panel of the TW7000 is designed to be easy to use. Knobs, buttons, and indicators on the display are used to guide operation. Advanced features are easily accessed from menus.

### ***Power/Volume Knob***

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

### ***Speaker Button***

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**) displays under this icon.

### ***Clarifier Knob***

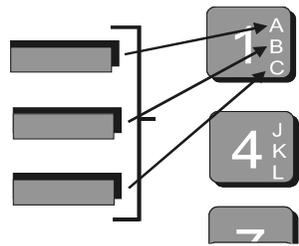
Clarifier offset is achieved by turning the **CLAR** knob counterclockwise for negative offset and clockwise for positive offset (USB mode). The knob has continuous rotation and provides a maximum of -600 Hz and +600 Hz offset in 10-Hz steps. This value is shown on the right side of the display and can 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 displays. 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.

When composing a messages or entering address names, alpha characters are entered from the keypad using a combination of two keys.

Examples:

<p>Press the top bracketed button and <b>1</b> to get character <b>A</b>.</p> <p>Press the middle bracketed button and <b>1</b> to get character <b>B</b>.</p> <p>Press the bottom bracketed button and <b>1</b> to get character <b>C</b>.</p>	
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To enter a space, press any bracketed key followed by **0**.

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

The up and down arrows are used to scroll through the menu selections. 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 used for selecting the channel function, while the **F** button selects frequency functions. The **E** button enters supplied information into memory.

### ***Send Button***

The **SEND** button is used to send an ALE call to the last station with an established link. For a more detailed description, refer to the Placing an ALE Call section on page 3-20.

### ***Alpha Button***

Immediately to the right of the display are five buttons. The **ALPHA** button is the fourth from the top. Pressing it allows access to the Alpha menu. To exit the menu, press **ALPHA** again.

### ***Mode Buttons***

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.

<b>Mode</b>	<b>Description</b>
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 BW
LSB DATA	FSK AGC time constants, optional LSB wideband data filter, 300-3000 Hz BW
USB AME	Same as USB mode with addition of the carrier in transmit mode at a level of -6 dB relative to PEP
LSB AME	Same as LSB mode with addition of the carrier in transmit mode at a level of -6 dB relative to PEP

Mode	Description
USB PCS	Same as USB mode with addition of the carrier in transmit mode at a level of -16 dB relative to PEP

The modes display if the option is installed. The mode buttons are disabled if the Lockout or Frequency Blank functions are turned on. For information on these functions, refer to the Alpha Menu section on page 3-7.

### ***Scan Group Button***

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 scan groups, refer to the Scanning section on page 3-18.

### ***Scan Button***

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 TW7000 reverts to the last channel scanned. For more information, refer to the Scanning section on page 3-18.

### ***RX Attenuator Button***

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

### ***Squelch Button***

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.

### ***External RF Amplifier Button***

The **EXT AMP** button provides push-to-talk (PTT) control from **Accessory 3** of the TW7000 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 TW7000 no longer requires an external amplifier.

### ***Tune Button***

If automatic antenna tuners, like the AT/RAT100, RAT1000, and AT7000, are attached to the transceiver, the **TUNE** button activates the tune cycle.

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## ***Call Button***

The **CALL** button initiates a call sequence in the ALE option or in the Transcall, Selcall, or TransAdapt option. If these options are not installed or if they are turned off, this button is disabled. For information on placing ALE calls, refer to the Placing an ALE Call section on page 3-20. For information on placing Transcall, Selcall, or TransAdapt calls, refer to the Placing a TransAdapt, Transcall, or Selcall section on page 3-21.

## ***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:

<b>Icon</b>	<b>Option</b>
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 TW7000, a corresponding icon is shown on the left side of display area. The icon and the option's current status (**ON** or **OFF**) displays permanently.

To change the status of an installed option:

1. Press the **OPTION** or **STATUS** button. The icon of the last entered option flashes.
2. If a different option is desired, press the **OPTION** button until the desired icon flashes.
3. Press the **STATUS** button 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

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period of 10 seconds. For more information on these internal options, refer to the TW7000 HF Transceiver Technical Manual (TW7000-MS).

### ***RF Power Level***

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

<b>RF Power Level</b>	<b>Default Settings</b>	<b>Alpha 5 Setting</b>
L (low)	10W (average power)	10
M (medium)	25W (average power)	25
H (high)	100W (average power)	200

Use the following instructions to change these values.

1. Connect a power meter to the antenna connector on the back of the transceiver.
2. Press **RF PWR** until the desired level displays (**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 TW7000 and scroll to the power level indicated on the power meter.
5. When the desired power level is achieved, press **E**.
6. Adjust the other two levels in the same manner.
7. To exit this mode, press **E** twice.

### ***Priority Channel***

The **PRI** button adjusts the TW7000 to a channel defined as the priority channel. The default priority channel is 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 and press **E**.

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

The TW7000 reverts to the new priority channel whenever the **PRI** button is pressed.

### *Alpha Menu*

The Alpha menu is used to set and adjust the TW7000 default parameters specific to the 7000TC option (Transcall, Selcall, and Trans-Adapt). The Alpha menu includes the ALE submenu, it is used to change settings specific to the ALE option (7000ALE).

To access the Alpha menu, follow these steps:

1. Press **ALPHA** and enter the number of the corresponding function.
2. To enter the function, press **E**.

Once a function is selected and entered, use the arrows on the keypad to scroll through the settings within that function. When a desired setting displays, press **E** to accept the setting and return to the Alpha menu. To exit a function without saving the changes, press **ALPHA**. To exit the Alpha menu, press **ALPHA** again.

**Table 3-1**  
**Alpha Menu**

<b>Function</b>	<b>Description</b>
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

**Table 3-1  
Alpha Menu**

<b>Function</b>	<b>Description</b>
11	SET ALARM
12	Time and date display
13	TA/TC/SC Rx ADDR (TransAdapt/Transcall/Selcall RX address)
14	TRANSADAPT BER NUM (TA bit error rate number)
15	SCAN GROUP NUMBER (for non-ALE)
16	TA/TC/SC/ Tx ADDR (TransAdapt/Transcall/Selcall TX address)
17	ALE submenu
18	RECEIVE SET Rx/Tx (activated TX operation)
19	RF POWER ATU SET (tune power set)
20	BITE TEST INITIATED
21	OPTION 1 TYPE
22	COM 1 BAUD (comport 1 configuration)
23	COM 2 BAUD (comport 2 configuration)
24	BACKLITE OUT (ON/OFF)
25	FREQ INC HZ (frequency increment from 1 Hz-1 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 radio: TX and RX)

- 
- (1) **OPTION** is not used.
  - (2) **SCAN SET CHANNEL** selects the scan group (selected using Alpha 15) to be customized. For information on customizing a scan group, refer to the Customizing a Scan Group section on page 3-19.
  - (3) **SCAN RATE** sets the rate at which channels within a selected scan group (selected using Alpha 15) are scanned. A speed between 1 and 30 seconds per channel can be entered.
  - (4) **PRIORITY CHANNEL** changes the channel number of the priority channel. The default setting is channel 001. For information on changing this channel, refer to the Priority Channel section on page 3-6.
  - (5) **RF POWER** changes the settings for the RF power output. The default settings for the three power output levels are 10 (L), 25 (M), and 200 (H). For information on changing these settings, refer to the RF Power Level section on page 3-6.
  - (6) **FREQ BLANK** conceals the frequency so that only the channel number displays. Every time **ALPHA, 6,** and **E** are pressed, the selection is toggled between **ON** and **OFF**. If set to **ON**, the mode select buttons are disabled.
  - (7) **LOCKOUT** prohibits changing any of the channel frequencies. Every time **ALPHA, 7,** and **E** are pressed, the selection is toggled between **ON** and **OFF**. If set to **ON**, the mode select buttons are disabled.
  - (8) **RECEIVE SET Rx ONLY** locks out the PTT on the displayed channel, making it a receive-only channel. The status is automatically set to **ON** whenever **ALPHA, 8,** and **E** are pressed. Alpha 18 reverses the receive-only state to a receive and 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,** and **E** are pressed. In the **ON** position, the alarm can be set (Alpha 11).
  - (11) **SET ALARM** sets the time 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.

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**(13) TA/TS/SC Rx ADDR** identifies the address for your station. The current address displays briefly. Numbers from 001 to 255 are available. This number is usually the last three digits of the serial number.

**(14) TRANSADAPT BER NUM** sets the bit error rate (BER) for evaluating channel performance. The higher number corresponds to the better performing channel. The default BER setting is 70.

**(15) SCAN GROUP NUMBER** selects a particular scan group. The scan group entered becomes the one used when accessing Alpha 2 and Alpha 3. The default scan group is 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** identifies the address number for the station being called. The current number displays briefly. Numbers from 001 to 255 are available. This number is usually the last three digits of the serial number.

**(17) ALE** submenu allows for configuration of the ALE system. For information about the ALE submenu and how the system is configured, refer to the ALE Submenu section on page 3-11.

**(18) RECEIVE SET Rx/Tx** changes the displayed channel to an RX and TX channel. Entering **ALPHA, 8, and E** changes the setting back to an RX channel.

**(19) RF POWER ATU SET** controls the RF power level to be used during the tune cycle for an external, automatic, antenna tuner. The default setting is 10. Levels from 0 to 33 can be entered.

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

**(21) OPTION 1 TYPE** activates the Voice Enhancement option if the 7000VEM is installed. For more information, refer to the Activating Voice Enhancement section on page 3-24.

**(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 increments or decrements each time an arrow button is pressed. This is used when the frequency value is being changed. Available increments are between 1 Hz and 10 MHz. The default setting is 100 Hz.

**(26) TEST REAR PANEL I/O** tests the back-panel accessory connectors. This is for factory use only.

**(27) ENC PASSWORD** accesses the Encryption menu if the 7000ENCR option is installed. For detailed information, refer to the 7000-Series High-Level Encryption Technical Manual (7000ENCR-MSOP).

**(28) PTT TIMER** changes 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. The printer connection requires an interface box, a serial data control device, and a standard printer cable. The printer must be Epson® FX-80 compatible. For more information, contact DWC.

**(30) CLONE RADIO** clones another transceiver by downloading all frequency and channel settings. Enter **1** to clone and **2** to cancel cloning. Cloning requires interconnecting technology, such as a modem line or microwave link.

**(31) GLOBAL POSITION SYSTEM** is not available.

**(32) CW HOLD TIME** sets the continuous wave (CW) hold time. Enter the number in msec.

**(33) SPLIT SITE** controls the configuration of two radios: one is receive only, the other 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 the Alpha 17 submenu. For information on placing an ALE call, see Placing an ALE Call on page 3-20. For detailed operating instructions, refer to the ALE operator manual (7000ALE-MSOP).

1. To access the ALE submenu, press **ALPHA**, **17**, and **E**.

There are two ways to move through the ALE submenu:

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 settings within that function. Pressing **E** accepts any entered information.

**Table 3-2**  
**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)
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 THRS (BER threshold)
21	GOLAY THD (Golay threshold)

**Table 3-2**  
**ALE Submenu**

Function	Description
22	ERR THRS (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** controls 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** selects the ALE scan group (from 0 to 9). This becomes the specified scan group when using **(3) TUNE GRP** and **(9) MOD GRP**.

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

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

**(5) SELF ADRS** selects an address number to review, change, or add for your station (from 00 to 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** enters a new self address name for the address number selected in **(5) SELF ADRS**. Any existing address name displays briefly. Use the alpha characters on the keypad to enter from 3 to 15 characters (no spaces or punctuation).

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**(7) OTHR ADRS** selects and reviews other addresses (where messages are to be sent). Enter a number (from 00 to 99) to be assigned an address or an existing number to review or change.

**(8) OTHR NAME** allows a new or different name, for the other address selected in **(7) OTHR ADRS**, to be entered. Any existing other address name displays briefly. Use the alpha characters on the keypad to enter from 3 to 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** enables or disables sounding. Enter **1** for sound **OFF** and **2** for sound **ON**.

**(11) SND ADRS** sets 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 TW7000 to sound in time intervals from 1 minute to 24 hours (0001 to 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 to 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** selects 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** requests 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** (request), or use the arrows to toggle between **OFF** and **ON**.

**(19) LQA DECAY** controls 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.

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**(20) BER THRS**D controls the 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 default setting is 48 errors.

**(21) GOLAY THD** controls 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 default setting is 3 errors.

**(22) ERR THRS**D 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 default setting is 3 errors.

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

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

**(25) MESSG IN** selects an incoming message for review (from 0 to 9). Only 10 message can be stored. When message 11 is received, the oldest stored message is deleted.

**(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** enables the user to enter a new network address for the number assigned in **(27) NET ADRS**. The last entered address displays briefly. 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 set 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 TW7000 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 can 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***

Selection of a channel is done as follows:

1. Press **C**.
2. Enter the desired 3-digit channel number or use the arrow buttons to scroll through the channels.
3. To select the channel, press **E**. The channel number with its frequency and clarifier offset displays.

### ***Assign a Frequency to a Channel***

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).

### ***Assigning Simplex Frequencies***

To select the channel and assign a new frequency:

1. Press **C** and enter the 3-digit channel number and press **E**.
2. Press **F** and enter the frequency in MHz, including the decimal point and 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**, **041**, and **E**.

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

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

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

### *Assigning Semi-duplex Frequencies*

To select the channel and assign a new frequency:

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

2. Press **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 displays.

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 041:

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

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

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

Display: **041 21.200,000**  
**Rx**

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

---

Display: **041 29.300,000**  
**Tx**

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

### ***RX-Only Channels***

To automatically limit a channel to receive-only operation, use 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 can be changed by using Alpha 25.*

### ***Manual Channel***

The manual channel allows manipulation of frequencies without the worry of over-writing 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 TW7000 according to number. There are 32 scan groups available in the radio at one time, each one having a different scan group number. Each scan group can contain up to 64 channels.

Because the TW7000 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 can be used in different scan groups. Changing a channel's frequency changes that frequency wherever that channel is specified.

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## *Selecting a Scan Group*

A scan group must be selected before customizing can be performed. Use the following procedure to select the scan group:

1. Do one of the following:

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**, and **E**.

Display: **SCAN GRP xxx**

2. Use the arrow keys to scroll to the desired scan group number or use the keypad to enter the scan group number.
3. Press **E**. The newly selected scan group briefly displays.

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

This becomes the scan group that is modified when using other menus, until the scan group is changed.

## *Customizing a Scan Group*

Customizing a scan group involves reviewing the contents of a scan group, adding and deleting channels from a scan group, and selecting which of the channels in that group are to be scanned. To customize a scan group

1. Press **ALPHA, 2**, and **E**.

Display: **SCANSET CHANNEL x NNN**

(where x is the channel status and NNN is the 3-digit channel number)

Channels in a scan group are reviewed, use the arrow buttons to scroll through the channels. Channels are shown in numerical order. Scan groups 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 to delete.
2. Using the alpha characters on the keypad, press **D** (delete).
3. Press **E** to accept the deletion.

To add new channels to the group:

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

- 
2. Enter the number of the channel to add and press **E**.
  3. When the scan group is configured properly, press **E** to accept the changes and exit this menu.

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**.

### ***To Start and Stop Scanning***

Press **SCAN** to start scanning within the selected scan group. Scanning begins with the first channel in the 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 Radio Control Program Operator Manual (7000ALE-MSOP).

To initiate an ALE call:

1. Press **OPTION** until the **ALE** icon flashes.
2. Press **STATUS** to turn the option **ON**.
3. Press **CALL**.
4. Scroll to find the desired calling option:  
**THIS IS**: Creates a link, exchanges messages, and remains linked.  
**THIS WAS**: Creates a link, exchanges messages, and then terminates the link.  
**RE-LINK**: Automatically chooses the best possible channel using the information from a prior **THIS IS** call.  
**POLLING**: Automatically completes a **THIS WAS** call on each of the scan group channels. Link quality information is recorded for each channel.
5. Press **CALL** to make the selection.
6. Scroll to find the type of call being made: **INDIVIDUAL** or **NET**. Press **CALL** to make the selection.

Display: **To:xx nnnn** (where xx is the destination address number and nnnn is the address name)

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7. Scroll to find the destination address and press **CALL**.  
Display: **FR-xx** (where xx is the self address number)
  8. Scroll to find and display the self address and press **CALL**.  
Display: **AMD message** (automatic message display)
  9. Scroll to find a previously composed message number, or select **NO AMD MSG** if there is no message to send.
  10. Press **CALL** to 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.
  11. To initiate an ALE call to the last station with an established link, press **SEND**.

Before attempting another call, the previous link must be terminated.

*Note: **RE-LINK** is chosen in the event of poor link quality on a **THIS IS** call. As soon as the link is established as being poor, press **CALL** to terminate the link. Press **CALL** again and select **RE-LINK**. Press **CALL** a third time and the TW7000 attempts the link again using the second best channel. This can be repeated for subsequent channels until the link quality is acceptable.*

### ***Placing a TransAdapt, Transcall, or Selcall***

The TW7000 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.

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Before initiating TCSC operations, the TW7000 must be assigned a call code (001-225). This is the call code that other stations use to contact this transceiver.

1. Press **ALPHA**, **13**, and **E**.

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

2. 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 start a call with Selcall, the TW7000 must be set to a fixed channel (not scanning) and a call initiated.

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 TW7000 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** displays briefly.

**Transcall:** The TW7000 must be in scan mode before a call is initiated.

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.

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6. Press **CALL** again. The TW7000 is now under full control of the Transcall circuit.

The TW7000 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 TW7000 sounds an alarm indicating a successful Transcall connection.

Display: **TC LINK**

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

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 TW7000 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 TW7000 is now under full control of the TransAdapt circuit.

The TW7000 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** displays briefly.

7. To break the connection, press **SCAN**.
8. To stop the call before connecting, press **CALL**.

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## ***Activating the Noise Blanker***

The Noise Blanker option (7000NB) is an impulse-type used in high-noise environments. To activate the Noise Blanker, the appropriate 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 this option, the appropriate 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**) for this transceiver and press **E**.

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

## ***Activating Encryption***

This high-level security 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 more detailed information on this security option, refer to the 7000-Series High-Level Encryption Operator Manual (7000ENCR-MSOP).

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# SECTION 4: SERVICING

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## *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 TW7000 HF Transceiver Technical Manual (TW7000-MS) is essential.

The TW7000 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 TW7000 has a BITE system that aids in troubleshooting down to the individual board level. When a fault occurs, a BITE fault message displays indicating the specific board affected. The BITE runs automatically on power up or whenever Alpha 20 is entered.

## *Routine Maintenance*

The TW7000 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 TW7000 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 TW7000 is opened, coaxial 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 TW7000. For board locations, refer to the Board Locations section on page 4-2.

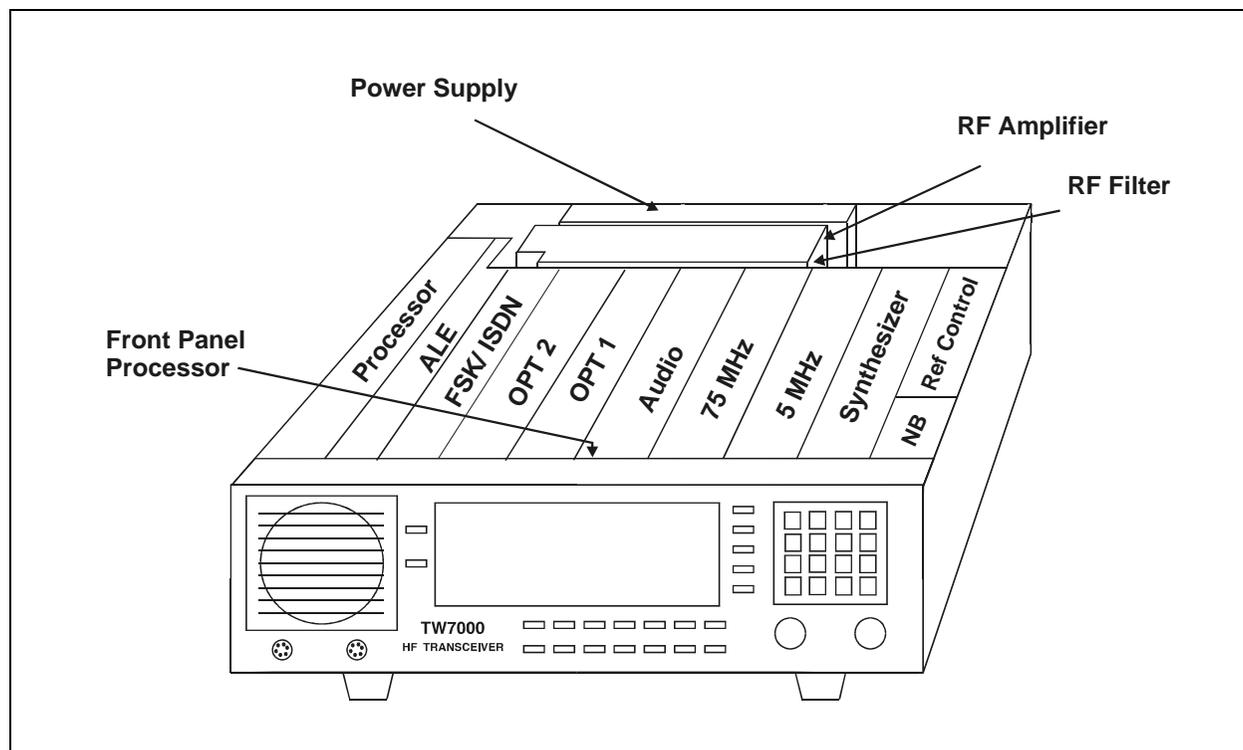
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**CAUTION: When the transmitter is operating, high RF voltages are present on the power amplifier and filter boards. Use caution as these RF voltages can cause burns.**

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

The front panel assembly is attached to the TW7000 with two screws and a single-ribbon cable.



**Figure 4-1**  
**Board Locations**

### ***Field Level Servicing***

The transceiver BITE system is designed to identify a faulty board. Feedback is presented on the front panel display. In a matter of minutes, the radio can be opened up, the faulty board removed, and a new one inserted. For detailed technical information, refer to the TW7000 technical manual (TW7000-MS).

<b>Part Number</b>	<b>Description</b>
001-00143	Front Panel Processor
001-00201	VSWR Detector
001-00203	Reference and Control Board
001-00311	RF Amplifier

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<b>Part Number</b>	<b>Description</b>
001-00320	RF Filter Board
001-00410	Power Supply
001-00600	Audio Board
001-00710	75 MHz IF Board
001-00800	5 MHz IF Board
001-00901	Synthesizer Board
001-01100	Processor Board
001-01200	Squelch Board

DWC offers the following maintenance tools to facilitate servicing the TW7000.

<b>Part Number</b>	<b>Description</b>
TW7000TK	Tool kit with card puller
SMTRK	Surface mount technology tool kit
7000EXT	Extender board kit and card puller

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