

MODEL DBU2516 DESKTOP BASE STATION

INSTRUCTION MANUAL



RELM Communications, Inc.
7707 Records St.
Indianapolis, IN 46226

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You may remember us as Symmetrics, or Wilson, or as Regency Land Mobile. Your first experience with us may have been with crystal based mobile and portable radios. We were pioneers in the development of synthesized radios, incorporating built-in tone signalling options such as CTCSS, DCS and Two-Tone Sequential and a host of user friendly operational features, like scanning and keyboard control. Our innovation in commercial radio continues today with the introduction of an *INSTANT PRIORITY*™ button, a reversible display and area grouping of channels.

We are truly a commercial communications company with a dedicated commitment to two-way radio design, manufacturing, sales and service. We have selected a new name — a name which bolsters our position as a communications company and symbolizes our steadfast commitment to the land mobile industry.



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DESCRIPTION

The DBU2516 is a state-of-the-art desktop 16-channel transceiver for base station operation in the Land Mobile UHF (406-520 MHz) frequency band. The band is covered in four ranges, with each range assigned a specific model. See Specifications on page 3 for more details.

The Base Station operates in the UHF band with a 25 Watt RF output. Low power operation of 2 Watts is also available (Dealer programmable). The built-in power supply can be selected to operate from 120 VAC or 240 VAC.

The Unit features built-in DCS* and standard CTCSS tone squelch, a Priority Channel, Busy Channel Lockout and all-channel scanning. A programmable CW Identifier (see Options 17 and 18 on page 12) is also included.

The Unit has provisions for being interfaced with a Remote Control device and an Interconnect and/or Tone panel. In addition, RS-232 Data can be transmitted.

The Radio has been programmed by the Dealer. A list of items determining the Radio's configuration should be available from the Dealer. See page 11 and 12 for a list of Dealer Programming Options and page 13 for a blank form for recording the Unit's configuration. The Radio's program is stored in non-volatile memory, which does not require a battery back-up.

NOTE: In this manual, the words Base Station, Radio and Unit are used interchangeably.

*DCS stands for Digital Coded Squelch.

See Figure 1 below for Front Panel details.

The Unit comes with the following standard accessories:

- Microphone Hang-up Clip with mounting hardware
- Instruction Manual (7001-2031-300)

Optional accessories include:

- 45 Watt PA Option
- MHM6 Handheld Microphone with Coiled Cable
- RAIB600 Balanced 600 Ohm Audio Interface Board
- RS303 External 5 Watts Speaker
- Heavy Duty Desk Microphone

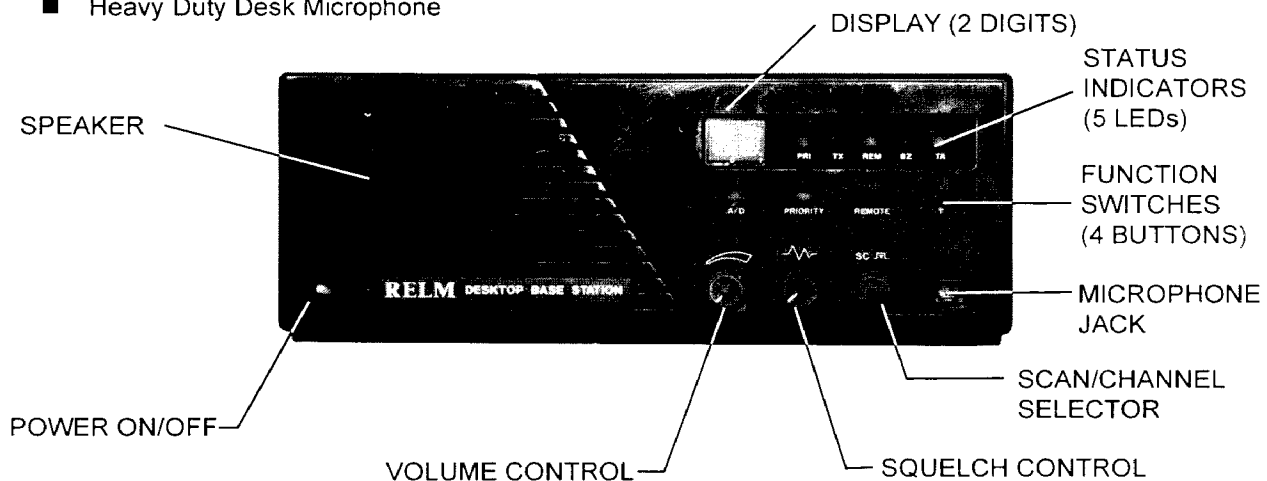


Figure 1. Front Panel Details.

SPECIFICATIONS

(Subject to change without notice)

General

Frequency Ranges/Model	406 – 420 MHz, DBU2516A 450 – 470 MHz, DBU2516B 470 – 490 MHz, DBU2516C 490 – 520 MHz, DBU2516D
Number of Channels	16
Operating Temperature	-30°C to +60°C
Frequency Stability	± 2.5 PPM, -30°C to +60°C
Antenna Impedance (RX and TX)	50 Ohms
Speaker – Internal	8 Ohm, 2 Watts
– External	3.2 Ohm, 5 Watts
Supply Voltage	120 VAC, 50/60 Hz; 105 Watts (@ 25W TX) 240 VAC, 50/60 Hz; 105 Watts (@ 25W TX)
AC Line Protection	4A Fuse, fast blow type
Connectors – Antenna	Type N, female (jack)
– Microphone	Modular, 6-pin
– Multifunction Port	DB15, female
– External Speaker	3.5mm jack
Size (H x W x D)	5.625" x 13.187" x 15.750"
Weight	13 lbs., 12 oz.

Receiver

Operational Bandwidth	10 MHz
Sensitivity – 12 dB SINAD	0.3 μ V Max.
Threshold Squelch	8 dB SINAD Max.
Selectivity – 25 kHz	75 dB Min.
– 50 kHz	80 dB Min.
Intermodulation	75 dB Min.
Spurious Response	85 dB Min. (w/o duplexer)
Audio Output	5 Watts Max.
Audio Distortion	5% Max. @ 4.0 V _{RMS}
Attack Time	50 ms Max.
Closing Time	100 ms Max.
Unsquelled Hum and Noise	45 dB Min.
Squelched Hum and Noise	-65 dBW Min.
Scan Rate	12 channels per second
Priority Sampling Rate	Once every 2 seconds
FCC	Part 15

Transmitter

Operational Bandwidth	10 MHz
RF Output – Standard	25 Watts Min. @ 50% Duty Cycle 10 Watts Min. @ Continuous
– Low Power (programmable)	Adjustable from 2 Watts to 10 Watts
– Optional High Power PA	45 Watts Min. @ 35% Duty Cycle 20 Watts Min. @ Continuous
Spurious/Harmonics Emissions	-70 dBc
FM Hum and Noise	-43 dB Min.
Modulation	± 5 kHz
Audio Distortion	3% Max.

SPECIFICATIONS (Continued)

Attack Time	100 ms Max.
Time-Out Timer (programmable)	0, 15, 30 or 60 seconds; 2, 4, 8 or 16 minutes
Identifier (programmable)	Call sign in Morse code (CW); up to 8 characters
Tone Frequency	1215.9 Hz
Modulation (40% ± 10%)	± 2kHz (± 0.5 kHz)
Transmission (Keying) Rate	21 – 22 WPM; Dot = 64 ms, Dash = 192 ms
Transmission Intervals	15, 30, 60 or 90 Minutes
FCC Type Acceptance	Part 90; Emission Designator 16K0F3E, 14K8F1D Part 95; Emission Designator 16K0F3E

INSTALLATION

NOTE: It is recommended that the Base Station and antenna installations be performed by a technician qualified in 2-way radio.

LOCATION CONSIDERATION

Choose a location for the Radio that permits several inches of clearance all around. This is necessary for proper heat dissipation, especially around the heat sink mounted on the rear panel.

CABLE CONNECTIONS

1. Install the antenna cable on the N type connector. See Figure 2 below.
2. If used, plug in the cable to the Multifunction Port's DB15 connector. See page 6 for more details.
3. If used, plug in the External Speaker. This disconnects the Unit's internal speaker.
4. Install the microphone's cable in the modular jack located on the front panel. There will be a *click* when the connector is fully seated.
5. Plug the AC cord into a suitable AC receptacle. Make sure the AC voltage is proper for the Unit's Line Voltage setting.

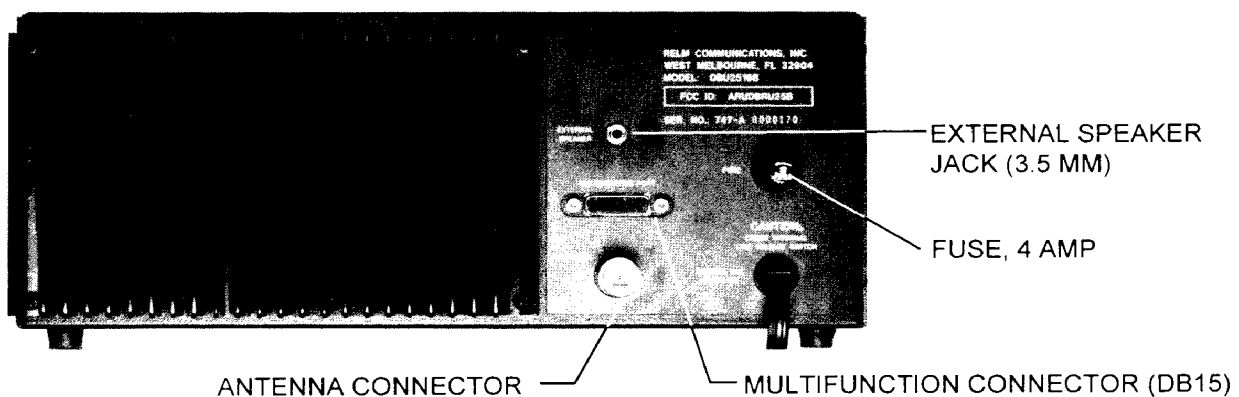


Figure 2. Rear Panel Details.

HANDHELD MICROPHONE

If a handheld microphone (such as the MHM6) is used, a hang-up clip (supplied) can be mounted on the Unit's right side near the front panel. Using the one screw at the upper front corner and the one approximately 2 1/2" below it, install the clip so that the microphone's hang-up button can be easily slid downward in place.

OPERATING CONTROLS AND INDICATORS

This section gives a brief description of each control, button and status indicator. The OPERATION section, starting on page 7, provides more details on each of these and how they relate to the Unit's overall operation.

NOTE: In the following descriptions and throughout this manual, "pressing" a button means to just momentarily press the button. To "press and hold" a button means to press and then hold the button in for approximately one second.

As each button is pressed, a beep (if enabled; Dealer programmable; see Option No. 12 on page 12) will be heard. A high frequency beep indicates the ON or enabled state of the desired function, while a low frequency beep indicates the OFF or disabled state.

POWER ON/OFF Switch

Power ON/OFF is a rocker switch. Press in at the top end of it to turn the Radio ON. There should be red visible at the bottom end of the switch when in its ON position. Press in at the bottom end to turn the Unit OFF.

DISPLAY

The 2-digit LED display at the left end of the window should be lighted (yellow) when the Unit is ON. The display also has two small yellow LEDs to indicate the Unit's TONE Mode (T) and the displayed channel's Scan List DELETE (D) status.

VOLUME Control

Use this knob to vary the receiver's audio output level. This also varies the audio level to an external speaker.

SQUELCH Control

Use this knob to eliminate speaker noise when not receiving a transmission. For proper operation, turn the knob counter-clockwise until noise is heard. Then turn the knob clockwise until the noise just disappears.

NOTE: When adjusting the squelch control, the Radio should be in the MONITOR Mode.

SC (SCAN/CHANNEL) Selector

Rotate this knob to manually select a channel. Push the knob in to put the Unit into the SCAN Mode.

T Button

Pressing this button toggles the Unit into and out of the Tone Mode. When the Unit is in the Tone Mode, the small yellow LED labeled T will be lighted. When the T LED is off, the Radio is in the MONITOR Mode and any input signal to the Unit's receiver can be heard, even if it has tone coding such as CTCSS or DCS. Pressing and holding this button enables or disables Talk-Around, providing the Unit is programmed (by the Dealer) for this feature. See Option No. 16 on page 12.

REMOTE Button

This button toggles the Radio into and out of the Remote Control Mode. When in the Remote Control Mode, the yellow LED labeled REM is lighted and any remote control device is enabled. When the REM LED is off, remote control is disabled.

PRIORITY Button

Pressing this button toggles the Unit into and out Priority operation. The yellow LED labeled PRI is lighted when Priority is enabled. Pressing and holding this button programs the current channel displayed as the Priority Channel.

A/D Button

Pressing this button ADDS or DELETES the current channel displayed from the Scan List. If the displayed channel is deleted, the small yellow LED labeled **D** will be lighted.

TA Indicator

This yellow LED labeled **TA** will be lighted whenever the Talk-Around feature is enabled. The Unit will transmit on the same frequency as the displayed channel's receive frequency.

BZ Indicator

This green LED labeled **BZ** will be lighted whenever a signal is received. In other words, the channel is *busy* (in use).

TX Indicator

When the Base Station's transmitter section is activated, the red indicator labeled **TX** will be lighted.

MULTIFUNCTION CONNECTOR

The female DB15 connector, labeled MULTIFUNCTION PORT and located on the rear panel, provides for interfacing to a remote control device (DC, Tone or Local), an Interconnect Control panel or for RS232 data input. See Figure 3 below for pin configuration. The purpose and/or specification of each pin is as follows:

Pin No.	Purpose/Specification
1	Ground
2	Remote PTT ; a low (ground) will cause the Unit to transmit with the current channel's tone and the Remote TX Audio (Pin 7).
3	Remote RX Audio Output ; buffered de-emphasized receiver audio.
4	Data PTT ; a low (ground) will cause the Unit to transmit with Data In audio (Pin 11).
5	Interconnect PTT ; a low (ground) will cause the Unit to transmit with Channel 16's tone and the Interconnect TX Audio (Pin 14).
6	Switched +13.8 VDC ; provides a low current (less than 1 A) voltage source.
7	Remote TX Audio Input ; is pre-emphasized by the Unit.
8	Carrier Operated Relay (COR) ; output will be low (transistor turned on) when the Repeater's squelch opens (breaks), regardless if Repeater's audio is muted or not.
9	Discriminator's Audio Output ; buffered unprocessed (not de-emphasized) audio.
10	Interconnect RX Audio Output ; buffered de-emphasized receiver audio.
11	Data In ; 4800 BAUD (2400 Hz) Maximum.
12	Remote Audio B ; requires internal (DBU2516) connection to ground or to option board.
13	External DCS/CTCSS Input ; modulates the VCO/Reference; External Encoding must be selected for the Encode Tone.
14	Interconnect TX Audio Input ; is pre-emphasized by the Unit.
15	Interconnect Control Output ; goes Low when Channel 16's tone is decoded (or if the External Decode pin is low).

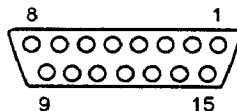


Figure 3. DB15 Connector Pin Positions - Rear Panel View.

OPERATION

INITIAL

Turn on the Unit. If squelch hasn't been set yet, put the Unit into the Monitor Mode. If the small yellow **T** LED is lighted, press the **T** button. Set the Volume Control approximately to its 9 o'clock position. Then turn the Squelch Control counter-clockwise until "noise" is heard. If noise is still not heard, select a channel (by turning the **SC** knob) that does not have Busy Channel Lockout (BCL) enabled.

At this time, the Volume Control can now be set for the desired audio listening level. It can also be set later, when an actual signal is being received.

Now turn the Squelch knob clockwise slightly past the point where the noise just disappears. This is the proper position for all normal squelched operations. If "noise" is occasionally heard, turn the Squelch Control slightly more clockwise. If desired, the Unit can now be taken out of the Monitor Mode by pressing the **T** button. The **T** indicator should turn on.

When the Unit is turned on, it always returns to the same state or condition that it was in when turned off.

RECEIVER OPERATION

The Receiver operates in one of *two* modes: **MANUAL** or **SCAN**. While the Unit is in the **SCAN** Mode, **SC** is displayed instead of a channel number.

MANUAL MODE

In this mode, the Unit monitors activity on the displayed channel. To put the Receiver in this mode, rotate the **SC** knob to select any valid programmed channel. All channels programmed into the Unit by the Dealer are valid.

Selecting Channels

Rotate the **SC (SCAN/CHANNEL) SELECTOR** switch until the desired channel is in the display. The switch can be rotated in either direction. Only channels programmed by the Dealer will be displayed.

SCAN MODE

In this mode, the Unit monitors activity *only* on those channels which are included in the Scan List, and the Priority Channel when the Priority function is activated. (See **SCAN LIST**, below).

To place the Unit in the **SCAN** Mode, make sure that the microphone is on-hook and then press in the **SC** knob. The display will show **SC** and the Unit will *scan*, at approximately 12 channels per second, the User-selected channel list. When activity is found on a channel, the active channel's number will be displayed. After activity has ceased on a channel, the Unit will stay on that channel for *approximately* 2 seconds (this is often referred to as *Scan Delay* and is Dealer-programmable) and then resume *scanning*.

NOTE: If the microphone is lifted off hook before scanning resumes, the Radio will stay on that channel until the microphone is returned to on-hook.

Off-Hook Scan

An option (Dealer-programmable) is available that permits scanning to continue for an *active* channel even if the microphone is lifted off hook. Before transmitting, observe if the **BZ** LED is on to see if the channel is busy. This complies with the FCC Rules about monitoring the channel for activity before transmitting.

If the Open Channel Scan option is selected instead, the Unit will scan for an *inactive* (open) channel. While off-hook, press the **SC** knob to initiate open channel scanning. **SC** will be displayed until the first open or inactive channel is found. Then a beep will be emitted and the channel's number will be displayed.

Scan List

The Unit will scan only those channels that are in the Scan List and the Priority Channel if Priority is activated. The User can select (add or delete) which channels are to be scanned.

To review the channels in the Scan List, first rotate the **SC** knob to put the Unit in the **MANUAL** Mode. Second, slowly rotate the **SC** knob and observe the **D** status LED. For every channel that is **NOT** in the Scan List, this small LED will be lighted.

To change a channel's Scan List status, press the **A/D** button. This will add (**D** LED goes off) or delete (**D** LED comes on) the displayed channel to/from the Scan List. The **A/D** button is usable while the Unit is in the **MANUAL** or when an active channel has been found in the **SCAN** Mode.

If the display channel is deleted while in the **SCAN** Mode, scanning will resume immediately **UNLESS** the channel is also the Priority Channel and the Priority Feature is activated.

NOTE: If you delete ALL of the channels and press **SC**, **Π.C** will be displayed briefly and the last channel deleted will be shown again. There must be at least one channel in the Scan List in order to put the Unit in the **SCAN** Mode.

PRIORITY FEATURE

To activate (or deactivate) the Priority Feature, press **PRIORITY**. When the Priority function is activated, the **PRI** status LED will light.

To review or see which channel is the current Priority Channel, put the Unit in **MANUAL** Mode (by rotating the **SC** knob) and activate the Priority Feature (**PRI** LED on). If the channel being displayed is **NOT** the Priority Channel, the Priority Channel's number will be displayed very briefly (flashes) every two seconds.

Hint No. 1: To make it easier to "read" the Priority Channel's number, rotate **SC** until Channel 1 is displayed.

Hint No. 2: or, very slowly rotate the **SC** knob until the **PRI** status LED blinks twice and the display stops *flashing* (priority sampling). This is the current Priority Channel.

Priority Channel Selection

To change the Priority Channel:

1. Put the Unit in the **MANUAL** Mode (rotate **SC** knob).
2. Rotate the **SC** knob until the desired channel's number is displayed.
3. Press and Hold the **PRIORITY** button for *approximately* 1 second. When a *beep* is heard, release the **PRIORITY** button and the channel being displayed is now the Priority Channel.

Priority Operation in MANUAL Mode

When a channel (other than the Priority Channel) is *manually* selected, the Unit will sample the Priority Channel *approximately* every 2 seconds. If any activity is found on the Priority Channel, the Radio will stay on the Priority Channel and monitor the transmission. If the microphone is taken off-hook during the reception, the Unit will stay on the Priority Channel until the microphone is returned to on-hook and the Priority Channel activity is completed.

Priority Operation in SCAN Mode

When the Radio has stopped on an active non-priority channel, it will *periodically* look at the Priority Channel. If the Priority Channel has activity, the Radio will then stay on the Priority Channel. If the Priority Channel is **NOT** active, the Radio will return to the channel (non-priority) that was interrupted. When activity on the non-priority channel is completed, the Unit will resume *scanning*.

Depending upon the option selected (Dealer-programmable), if the Radio is *scanning* and the microphone is taken off hook, the Unit will *either* go to the Priority Channel and stay there until the microphone is returned on-hook or the Unit will continue *scanning* (see Off-Hook Scan on page 7).

TONE OPERATION

The built-in decoder is enabled when the **T** button is pressed and the **T** status LED is lighted. Each channel can be programmed by the Dealer for **TONE** (CTCSS or DCS) operation. This is also true if an external decoder has been installed by the Dealer.

If the **T** LED is lighted and the microphone is on-hook, the Receiver's audio for a channel programmed for **TONE** operation will be heard *only* when a signal with the correct tone is received. If the microphone is off-hook, *any* signal on that channel can be heard. See *Busy Channel Lockout* on page 9 for an exception.

Message Annunciator

A *blinking* display is the Message Annunciator, when enabled by the Dealer, which indicates a signal with the proper tone has been received. This annunciator stays ON (still *blinking*) *even after* the signal is gone. This feature is operational *only* on a tone channel. The Message Annunciator goes OFF (stops *blinking*) when the microphone is lifted off-hook or the channel is changed.

Busy Channel Lockout

Busy Channel Lockout (BCL) is a special TONE operation feature, when enabled by the Dealer, that prohibits monitoring (listening to) a channel that is receiving a signal with an improper tone or DCS code. It does NOT matter if the squelch knob is turned fully counter-clockwise or if the microphone is off-hook, normal audio will NOT be heard (only "noise" will be heard) unless the signal has the proper tone or DCS code.

TRANSMITTER OPERATION

WARNING: An FCC license is required on all transmit channels. Do NOT transmit on unlicensed channels.

NOTES:

1. When the microphone is on hook, pressing the PTT switch will NOT activate the Transmitter.
2. The Channel Selector becomes disabled while the Unit is transmitting.
3. While the Unit is transmitting, the TX LED will be lighted **red**.

PTT OPERATION

The operation of the Radio's PTT function has 4 priority levels (1 being the highest) as follows:

1. Local (front panel jack) microphone.
2. Remote, if enabled (REM LED on).
3. DATA (via DB15 connector).
4. Interconnect Control panel.

What the effect of prioritizing the various PTTs means is that the TX audio of the PTT with the higher priority will always be transmitted.

REMOTE CONTROL

The Unit is designed to easily provide all of the necessary connections required by a Tone Remote Control. Thus, the lines for voice, tone and switching functions from the Remote Control can be made through the Multifunction Port via a male DB15 connector.

If the lines are telephone lines, they should be dedicated and of voice grade. If the lines run outside of the building where the Repeater is located, a telephone type lightning suppressor should be installed and a good earth ground provided.

INTERCONNECT CONTROL PANEL

The Unit is also designed for use with an Interconnect Control Panel that provides for proper half duplex operation. Please note, the Unit's transmitter and receiver sections can not be active at the same time. When ordering an optional Interconnect/Tone panel, please specify that it will be used with a model DBU2516 so that the proper wiring harness and Installation Instructions are included.

If technical assistance and/or more details are required, please call RELM's Customer Service Department. See page 15.

DATA

The Unit can transmit normal NRZ type RS-232 data at a rate up to 4800 BAUD. It should be noted that when the Data PTT is active (low), all encode tones and CW Ident are disabled. In other words, no other modulation can occur when data is being transmitted.

PROCEDURE

1. Select the desired channel. If the green **BZ** LED is lighted, the channel is *busy* (receiving a signal). The channel, if programmed for TONE or DCS and TONE Mode is enabled, can be monitored (listened to) by lifting the microphone off-hook.

However, if *Busy Channel Lockout* (see page 9) is enabled, the channel can NOT be monitored or used for transmission if the channel is receiving a signal with an incorrect tone or DCS code.

2. Lift the microphone off hook.
3. Press and hold in the **Push-to-talk (PTT)** switch of the microphone and then speak clearly into the microphone in a normal conversational voice. Try to keep the conversation as brief as possible. To listen, release the **PTT** switch.

NOTES:

1. The Unit will NOT transmit if *Busy Channel Lockout* is enabled and the channel is receiving an incorrect tone or DCS code. A series of *beeps* will be heard if the **PTT** switch is pressed.
2. The Unit will NOT transmit if the channel is *Receive Only*. A series of *beeps* will be heard if the **PTT** switch is pressed.

4. Place the microphone back on hook to resume normal operation.

DTMF OPERATION

The Dealer can program any Channel for DTMF encoding. Each channel can have up to 4 DTMF tones (numbers 0 through 9; * and #) that can be automatically sent upon either the first or every press of the **PTT** switch. This Option can be used for unit identification, repeater access, etc. The automatic sending of the tones can be Dealer-programmed to be delayed for 0.55, 0.80 or 1 second.

OFF-HOOK TO PRIORITY

The Unit can be programmed by the Dealer so that when Priority is enabled, it will go to the Priority Channel whenever the microphone is lifted off-hook. This selection is disregarded if the Off-Hook Scan option (No. 14, page 12) is also programmed by the Dealer. However, the Unit will still go to the Priority Channel if the **PTT** switch is pressed while the Unit is scanning.

TALK-AROUND

A Talk-Around function, an option programmed by the Dealer, provides for the User the capability to transmit on the channel's receive frequency. The receive channel's tone is also transmitted. Thus, the base station and one or more mobile units could talk directly to one another, rather than through a repeater.

When the Talk-Around option is selected, the **T** button (by pressing and holding) enables/disables this function. The yellow **TA** status LED will be ON when the function is enabled.

REMINDER: Talk-Around **MUST** be disabled (**TA** status LED off) for normal usage with a repeater channel.

TIME-OUT TIMER

A transmit Time-Out Timer is built into the Unit. It can be programmed by the Dealer to *automatically* shut down the transmitter after 30 seconds (or up to 16 minutes) of operation even if the PTT switch is held in continuously. The Dealer can also *disable* the Timer. In which case, the length of any transmission is determined by how long the PTT switch is pressed.

If the Timer is enabled, a series of *beeps* will be heard when the PTT switch is held in after the timer has timed out. In addition, the TX indicator will NOT be lighted. To resume transmitting, release the PTT switch momentarily and press again.

TX CARRIER DELAY

A Dealer-programmable option is available which permits the Radio to delay the dropout of the carrier, with no modulation (except for DCS turn-off code) for 165, 300, 400 or 500 milliseconds after the PTT switch is released. See Option No. 11 on page 12.

REPEATER OPERATION

If the Unit is to be used in conjunction with various repeaters, the duration of time that a carrier *only* (no modulation) is transmitted after the release of the PTT switch can be Dealer programmed for optimum operation. This built-in TX Carrier Delay will eliminate the need for possible modification to the Unit, such as the installation of a *reverse-burst* type accessory. Carrier Delay is only enabled when the channel is programmed for tone encoding.

If a repeater uses a sub-audible tone (such as CTCSS) for control purposes, it is recommended that a quick or fast operation of the PTT switch be avoided. For some repeaters' proper tone operation, up to 250 milliseconds (1/4 second) may be required after the PTT switch is pressed before speaking. This will help ensure that the first word or two will NOT be lost or distorted.

SUMMARY OF DEALER'S PROGRAMMING OPTIONS

1. Number of Channels – the Unit can be programmed for 1 to 16 channels. Any channel not programmed is *deleted* and cannot be accessed by the User.
2. Receive Only Channel – the transmit frequency can be *deleted* from any channel, thus making that channel only capable of receiving. This would be very useful for such purposes as monitoring a channel (a National Weather Service channel for example) that would not require or permit transmitting.
3. CTCSS Tones – any one of 50 CTCSS Tones can be programmed for any channel. The tone used for a channel's decode (receive) frequency can *either* be the same, or different, from that channel's encode (transmit) frequency.
4. DCS Codes – any one of 104 DCS (Digital Coded Squelch) Codes can be programmed for any channel. The DCS Code used for a channel's decode (receive) function can *either* be the same, or different, than that channel's encode (transmit) function.
5. External Decoder/Encoder – any channel can be programmed for External Decoder or Encoder (installed by the Dealer) operation.
6. External Decoder Delay – any one of 35 different delays (from 0 to 3.40 seconds) can be programmed. This delay is used when the Dealer installs an External Decoder that may require a specified minimum delay for proper tone decoding.
7. Busy Channel Lockout – *any* channel can be programmed to prevent listening or transmitting on that channel if it is receiving a signal that has a Tone or DCS Code that does NOT match its own Tone or Code. Thus, it is a busy channel and should not be used at this time.

8. Scan Delay – the Unit can be programmed to delay (for 1/2, 1, 2 or 4 seconds) the restart of the scanning action after the signal has gone away. This delay gives the User some time to respond to the signal before scanning resumes.
9. Priority Delay – the Unit can be programmed to delay (for 1, 2, 3, or 4 seconds) before returning to the non-priority channel after the Priority Channel's signal has gone away. This delay gives the User some time to respond to the Priority signal before the Unit leaves the channel.
10. Time-Out Timer – the Unit's Time-Out Timer can *either* be disabled completely or set to allow a transmission of 1/2 to 16 minutes duration. The Timer is normally used to prevent excessively long transmissions that might be either deliberate or caused by an inadvertent or accidental pressing of the PTT switch.
11. TX Carrier Delay – the Unit can be programmed to continue to transmit a carrier only (no modulation) for either 100, 300, 400 or 500 milliseconds after the PTT switch is released. This Delay is enabled only for channels that are programmed to transmit (encode) a sub-audible or CTCSS tone. Channels programmed for DCS operation automatically send a 200mS turn-off code at the end of a transmission.
12. Button Beep – the Unit can be programmed to either *beep* or *not beep* whenever the **SC** knob or a button such as **PRIORITY** or **A/D**, is pressed. Error beeps are not affected by this option.
13. Off-Hook to Priority – the Unit can be programmed to always go to the Priority Channel whenever the microphone is lifted off hook and Priority is enabled. See Option No. 14 for an overriding selection.
14. Off-Hook/Open Channel Scan – the Unit can be programmed to continue scanning for an active (RF signal present) channel if the microphone is lifted off hook. This selection overrides the Off-Hook to Priority Option (No. 13). The Unit can also be programmed to scan for the first open, or inactive, channel instead of an active channel while the microphone is off hook.
15. Message Indicator – the Unit can be programmed to display an indication that a signal with a proper tone has been received. The indication will be the display slowly *blinking*. This feature is useful if it is desired to know if the channel of interest was active while the operator was not present.
16. Talk-Around – the Unit can be programmed to transmit on the channel's receive frequency whenever the **TA** status LED is lighted. Thus, the User can select this function by pressing and holding the **T** button. This function is useful for the base station and one or more mobile units to communicate with each other on a "repeater channel" without actually going through the repeater. Of course, the operating range (distance) is normally much less than when using the repeater.

NOTE:

1. Talk-Around can not be used on a "Receive Only" channel (see Option No. 2). This prevents an inadvertent or accidental transmission on a frequency (such as a National Weather Service channel) that does not permit normal 2-way communications. Thus, even though the **TA** LED may be on, the transmitter can not be activated on a Receive Only channel and a series of error beeps will be emitted as long as the PTT switch is depressed.
2. When the Talk-Around option is programmed in the Unit, the **T** button still can be used to disable the built-in tone decoder in order to monitor a Tone Coded channel.
17. CW Ident – the unit can be programmed to transmit a Continuous Wave (CW) Morse Code Identification (Ident) consisting of 1 to 8 characters comprised of any of the 26 letters (standard English alphabet) and any number 0 through 9. This applies only to Channel 1, or any channel that uses the same transmit frequency as Channel 1.
18. CW Ident Interval – the Unit can be programmed to send its CW Ident upon activation of any PTT (except DATA PTT) after every 15, 30, 60 or 90 minutes of activity. The Unit will also automatically send its CW Ident upon the first PTT (except DATA PTT) after power up and after a channel change to either Channel 1 or any channel with the same transmit frequency as Channel 1.

You may use this form to record the Unit's configuration.

Ch.	Receive Frequency	Decode Tone (Hz) or Code	BCL	Transmit Frequency	Encode Tone (Hz) or Code	RF Pwr	DTMF
1	_____	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____	_____	_____
9	_____	_____	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____	_____	_____
11	_____	_____	_____	_____	_____	_____	_____
12	_____	_____	_____	_____	_____	_____	_____
13	_____	_____	_____	_____	_____	_____	_____
14	_____	_____	_____	_____	_____	_____	_____
15	_____	_____	_____	_____	_____	_____	_____
16	_____	_____	_____	_____	_____	_____	_____
	MHz		Y/N	MHz		H/L	

Beep on Button Press: _____ (Yes/No)
 Off-Hook Scan: _____ (Yes/No)
 Open Channel Scan: _____ (Yes/No)
 Talk-Around: _____ (Yes/No)
 Message Annunciator: _____ (Yes/No)
 External Decoder Delay: _____ Seconds
 Scan Delay: _____ Seconds
 Priority Delay: _____ Seconds
 Go to Priority if in Priority: _____ (Yes/No)
 DTMF Sent On: _____ (First/Every PTT press)
 DTMF Delay: _____ Seconds
 TX Time-Out Timer: _____ Seconds Minutes
 TX Carrier Delay: _____ Milliseconds (Tone only)
 RF Output Power-Low: _____ Watts
 RF Output Power-High: _____ Watts
 CW Ident Interval: _____ Minutes
 CW Ident: _____ (up to 8 characters)

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SUMMARY OF OPERATIONAL PROCEDURES

OPERATION	PROCEDURE	DISPLAY/STATUS LED INDICATION
MANUAL MODE		
<u>Selecting Channel</u>	Turn SC knob.	Channel Number.
<u>Enabling Priority</u>	Press PRIORITY button.	PRI LED on.
<u>Disabling Priority</u>	Press PRIORITY button.	PRI LED off.
SCAN MODE		
Scanning	Lift microphone off hook.	Channel Number.
	Set squelch control on radio.	Channel Number.
	Hang up microphone. Press in SC knob.	SC
Priority Scanning	Set squelch with mic. off-hook. Hang up microphone. Press PRIORITY button.	PRI LED on.
	Press in SC knob.	SC
SCAN LIST		
Adding Channels	Select Channel.	Channel Number + D LED on.
	Press A/D button.	Channel Number (without D LED on).
Deleting Channels	Select Channel.	Channel Number (without D LED on).
	Press A/D button.	Channel Number + D LED on.
Reviewing Scan List	Slowly turn SC knob.	Chs. shown in order; Chs. with D LED on are not in Scan List.
PRIORITY FEATURE		
Changing Priority Channel	Select Channel.	Channel Number.
	Press and Hold PRIORITY button.	Beep on change completion.
Reviewing Priority Channel	Slowly turn SC knob.	PRI LED blinks twice when Priority Channel is displayed.
TONE MODE		
<u>Activating Tone Decoder</u>	Press T button.	T LED on.
<u>De-activating Decoder</u>	Press T button.	T LED off.
TRANSMITTING		
	Select Channel.	Channel Number.
	Lift microphone off hook.	
	Press and hold in PTT switch for the duration of the transmission.	Channel's Number + TX LED on. Speak into the microphone.
	Release PTT switch to listen.	Channel Number.
Talk-Around	Select Channel.	Channel Number.
	Press and Hold T button.	TA LED on.
	Lift microphone off hook.	
	Press and hold in PTT switch for the duration of the transmission.	Channel's Number + TX & TA LEDs on. Speak into the microphone.
	Release PTT switch to listen.	Channel Number.
	Press and Hold T button to disable Talk-Around	TA LED off.

Press = press the button in and quickly release it.

Press and Hold = press the button and hold in until a *beep* is heard or the desired indication is realized.

MAINTENANCE

NOTE: All adjustments affecting transmitter power output, carrier frequency or modulation **MUST** be performed by a qualified electronics technician.

CAUTION: Do **NOT** tamper with internal adjustments. Damage to the equipment and/or improper operation may result.

Service Reminder

Have the Base Station checked periodically by a qualified electronics technician. A Service Manual, RELM Part No. 0300-2087-800, is available.

SIMPLIFIED TROUBLESHOOTING

Perform the simple checks indicated below prior to returning the Unit for service.

Trouble	Check
No reception	Check antenna connections.
No sound.	Volume control setting (see page 7). Check External speaker connection.
Does not scan.	Microphone must be on hook (unless Off-Hook Scan is enabled; see Option 14 on page 12). Check squelch setting (see page 7).
No channel in Scan List.	Add channels to Scan List (see page 7).
Can't seem to activate PTT switch.	Is microphone on hook? Microphone connection.
Can't transmit on a selected channel.	Is Channel <i>Receive only</i> ? Is <i>BCL</i> enabled and BZ indicator lighted (green)? There will be a series of <i>beeps</i> while PTT is depressed for either condition.
Remote Control doesn't control the Radio's transmitter.	Is REM indicator lighted? If not, press REMOTE button.

For service, in or out of Warranty, send Unit to:

Customer Service Department
RELM Communications, Inc.
7505 Technology Drive
West Melbourne, FL 32904

For information, contact: 1-800-422-6281

NOTE: For in-Warranty service information, read the Warranty Statement on the back cover.

For future reference, please record:

Model No. _____ FCC Identifier _____

Serial No. _____ Date Purchased _____

Dealer _____

RELM COMMUNICATIONS, INC. 2 YEAR LIMITED WARRANTY

RELM Communications, Inc. and its subsidiaries (hereinafter collectively referred to as "RELM") warrant to the original purchaser that should RELM's products, within the periods specified below, prove to be defective by reason of improper workmanship and/or material, RELM will, at its option, repair or replace any defective product, or refund the purchase price of the product, for a period of two (2) years from the date of purchase as shown on the original purchaser's sales receipt; provided, however, that rechargeable batteries, tone reeds, and coiled cords will be warranted for one year from the date of purchase. For the full 2 years of the warranty period labor to perform warranty service will be provided without charge. Thereafter, the purchaser must pay for labor at the prevailing rates of the Authorized Warranty Repair Center or RELM. Parts necessary to provide warranty service will be provided at no charge for the entire warranty period. Any product that is repaired or replaced under this warranty will be warranted to be free of defects in material and workmanship for the remainder of the original warranty period.

1. To obtain warranty service, bring the following to the retailer from whom you purchased the product:
 - the defective product
 - proof of purchase (your sales receipt or other documents showing the date of purchase)

Costs of transportation, removal, reinstallation or similar costs must be paid by the purchaser.

2. This warranty does not cover defects caused by:
 - Physical abuse or misuse of the product
 - Neglect or accident
 - Improper use or installation of the product
 - Repair or alteration by unauthorized personnel

3. ANY EXPRESS WARRANTY NOT PROVIDED HEREIN, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION OR OPERATION OF LAW, IS HEREBY EXCLUDED AND DISCLAIMED.

4. ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR ANY PARTICULAR PURPOSE, ARE HEREBY EXCLUDED AND DISCLAIMED.

5. UNDER NO CIRCUMSTANCES SHALL RELM BE LIABLE TO PURCHASER OR ANY OTHER PERSON FOR ANY OTHER BREACH OF WARRANTY, BREACH OF CONTRACT, OR OTHERWISE, OR FOR ANY INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES.

6. Equipment and accessory items not manufactured by RELM are excluded from this warranty.

7. This warranty applies only to RELM products sold by dealers within the United States and used exclusively in the United States.

8. RELM reserves the right to modify or change the equipment in whole or in part at any time prior to delivery in order to include refinements deemed appropriate by RELM, but without incurring any liability to: (i) modify or change any equipment previously delivered, or (ii) supply new equipment in accordance with earlier specifications.

9. This written warranty constitutes the final, complete and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of RELM.