

# **Maintenance Manual**

**MASTR<sup>®</sup> IIe**  
Utility Handset

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**SPECIFICATIONS**

**POWER SUPPLY**

Nominal	12.5 Vdc
Range	10 to 16 Vdc
	No failure or lack of function within this range.

**CURRENT DRAIN**

On (rated Audio)	100 mA
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**OPERATING TEMPERATURE RANGE**

Nominal	24°C
Operating Range	-30°C to +60°C

**Vcc VOLTAGE**

At 25°C	5.0 Vdc to 5.4 Vdc, typical
At 30°C	5.5 Vdc to 5.9 Vdc, typical
At 70°C	5.0 Vdc to 4.6 Vdc, typic

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## INTRODUCTION

The MASTR III/MASTR IIe Utility Handset 19A705965P1 or 19A705870P2 and handset cable 19D901619P2 are used to provide simple programming and diagnostic functions to aid the service technician when servicing the equipment.

This manual may be used with all versions of software. For equipment using group 1 through 5 software, refer to Appendix 1 in the back of this manual. For MASTR III and MASTR IIe with group 6 or later software, continue on in this section.

## DESCRIPTION

In MASTR IIe applications the auxillary backplane (B3MB1B) contains the handset interface circuitry and the handset connector. The backplane allows the service technician to do some programming and to perform various diagnostic functions using the Utility Handset. In MASTR III applications, all interface circuitry is housed in the Transmitter/Receiver shelf. The handset provides the following functions:

- Local Microphone and Speaker
- Adjustment of Digital Potentiometers
- Station Metering
- Channel Selection
- Function Enable/Disable

## CONTROL SHELF (MASTR IIe)

The Control Shelf hardware includes a EEPROM containing the operating characteristics (or personality) of the Control Shelf. The contents of the EEPROM can be changed only with the use of the Utility Handset or with a personal computer.

All audio input and output levels for the Control Shelf are controlled by electronic potentiometers. These potentiometers must be adjusted by the Utility Handset or by a personal computer. There are **NO** manual adjustments on the Control Shelf!

A complete description of the Control Shelf EEPROM personality settings is contained in the programming software, TQ3353. A complete listing of all lines and signals as well as a discussion of Level Adjustments is contained in Control Shelf Maintenance Manual, LBI 38430.

## AUXILIARY BACKPLANE (MASTR IIe)

The Auxiliary Backplane plugs into the standard MASTR IIe Backplane through a 96-pin DIN connector (see Figure 1). The backplane contains the necessary hardware to convert TTL levels of the handset to RS232 data understood by the MASTR IIe Control Module.

A mounting bracket and TORX® T15 screws secure the Auxiliary Backplane to the station frame. The Utility Handset cable connects to the RJ45 jack (J2) on the Auxiliary Backplane board.

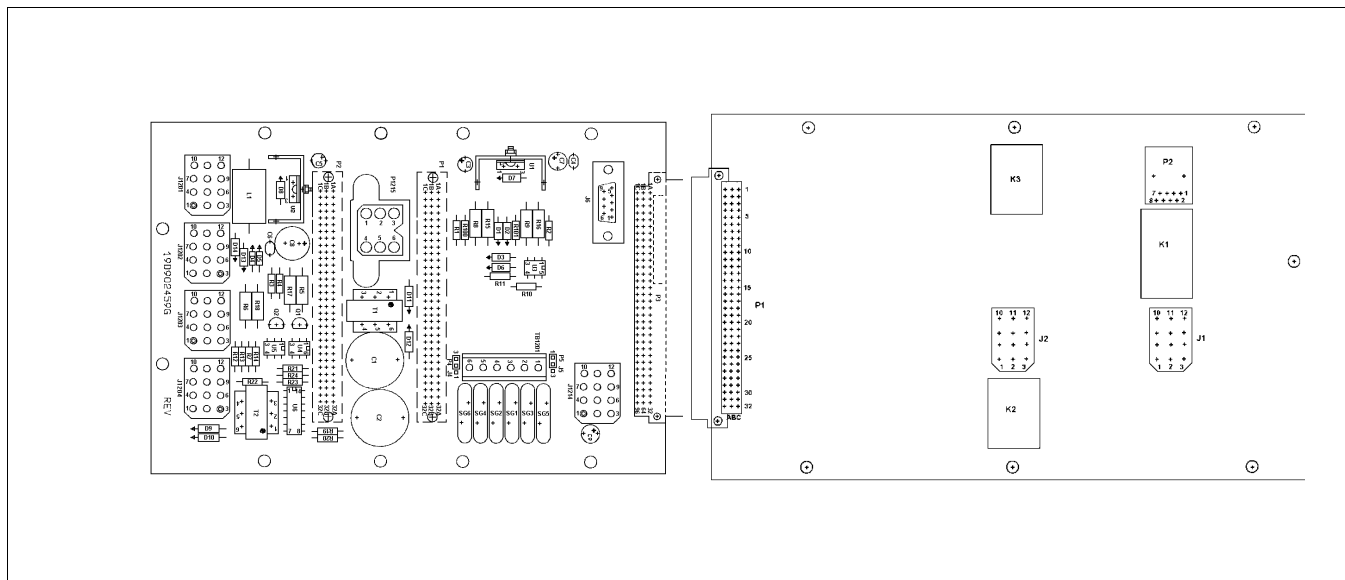


Figure 1 - Backplane and Auxiliary Backplane Boards

## UTILITY HANDSET

In MASTR Iie applications, the Utility Handset Cable plugs into the RJ45 jack (J2) on the Auxiliary Backplane board.

In MASTR III applications, the Utility Handset Cable plugs into the MIC jack located in the upper right hand corner of the Transmitter/Receiver shelf. See Figure 2.

## OPERATION

### POWER ON

While pressing either VOLUME button on the side of the handset, toggle the RESET switch on the front of the MASTR Iie Power Module. This tells the Control Module there is a handset present.

### NOTE

The handset will not operate if there is a PC connected to the DB9 serial port of the MASTR Iie backplane or to the MASTR III T/R shelf.

Successful power-up will cause the display to show:

MENU

On the initial handset power-up the invalid key flag may appear in the display. It should be disregarded. Pressing any key will cause it to disappear.

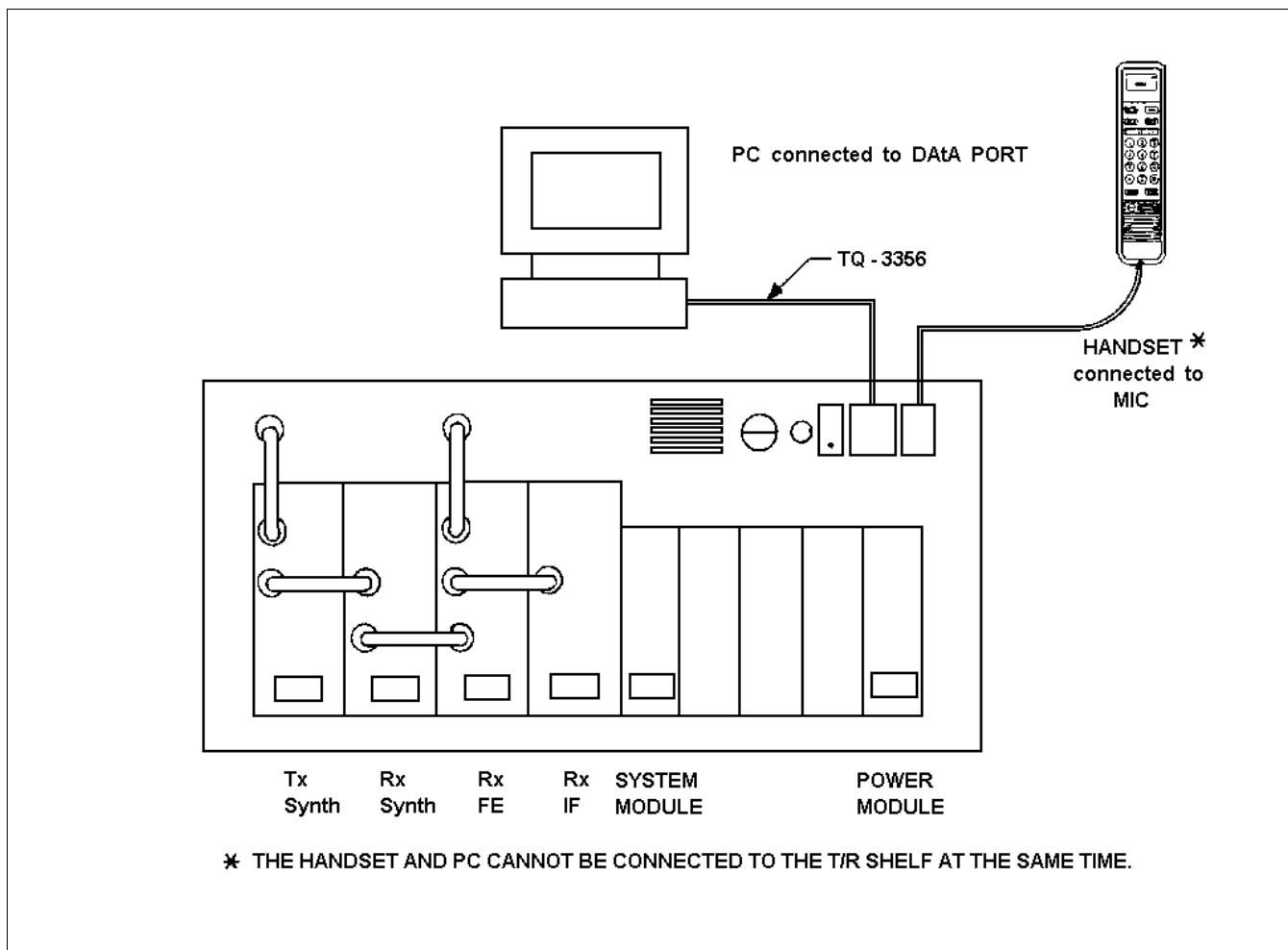


Figure 2 - MASTR III Control Shelf

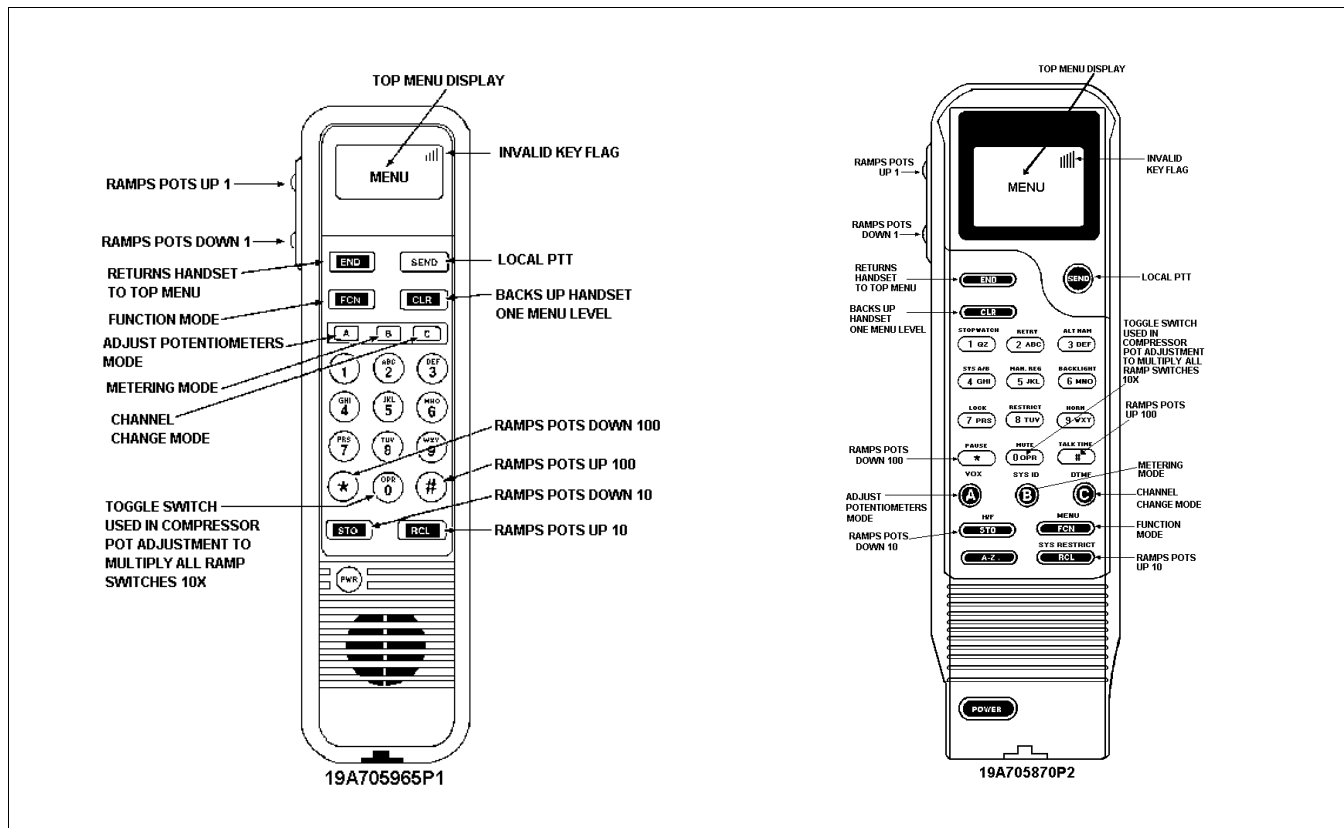


Figure 3 - Handset Operations

**OPERATING FUNCTIONS**

The handset operating functions are shown in Figure 3. These functions are in addition to the operating characteristics listed below:

Local Push-to-Talk is a toggled (press On-press Off) function. When active, the handset’s microphone may be used and the "IN USE" flag on the display will be illuminated. Also the Tx LED on the System Module will light if Tx is active.

**END Button** always returns the handset to the top MENU display.

**CLR Button** always moves the handset back one level.

**Volume Keys** may be held continuously to change any potentiometer setting.

**Handset Speaker** is active and may be used as an intercom speaker.

**Scan Active Indicator** will light the **ROAM** light on the display when Scan is active.

**NOTE**

MASTR IIe - Make sure the RF equipment has been properly aligned before making **ANY** adjustments to the control shelf.

**SYSTEM FUNCTIONS**

The Utility Handset may be used to toggle special functions in the station (see Figure 4).

To enter the Function Select Mode from the main menu, press the **FNC** key. While in the various Function Modes (select/display), the handset will show **FCN** on the display.

To clear an unwanted entry in the Function Select Mode, press **CLR**. Pressing **CLR** a second time will return the handset to "MENU" display.

If an invalid function number is entered and either **START** or **STOP** is pressed, the handset will display the **INVALID** key flag.

To make another selection from the Function Display Mode, press the **CLR** key. The handset will return to the Function Select Mode and display "**F SEL**".

Function	Key	Display
Power up handset	None	MENU
Enter function select mode	FNC	F SEL
Input desired function; e.g. 7 for CGD Enable	PRS 7	F SEL 7
To start function	A	START 7
To stop function	C	STOP 7
To return to function select mode	CLR	F SEL

**Figure 4 - System Functions**

The state of the control shelf after starting or stopping functions is dependent upon the function in question and external control shelf signals (e.g., keying/unkeying a local mic). Refer to the Function Description section for specific details.

Select a specific function as listed in Figure 5 and enter the corresponding number. Then press the "A" key to start (activate) the function.

**NOTE**

If the function was programmed to be active, starting it will have no effect.

To stop the selected function, press the "C" key.

**NOTE**

In some functions, the stop key will actually reset the station to its originally programmed state rather than stop the selected function. Consult the detailed explanations of the function to determine its actual operation. **END** will return the handset to the top menu, and like the **CLR** function, will leave the station in the condition set by the different function commands.

To reset the station's programmed personality defaults, toggle the **RESET** switch located on the front of the Power Module.

**FUNCTION DESCRIPTIONS** (See Figure 5)

**Repeat Disable**

Start: Disable the repeater function.  
Stop: Restore the original EEPROM setting.

NUMBER	FUNCTION
30	Repeat Disable
32	Tx Disable
34	CG Encode Disable
36	CG Decode Disable
37	RUS Mute
38	CG Monitor
39	Remote PTT
40	Local PTT
41	External PTT
42	Morse Code
44	Battery Alarm Disable
45	Test Tone
46	System Reset
47	CCT Disable
48	RUS Disable
49	Scan Enable
50	Scan Disable
58	Main Rx Enable
59	Main Rx Disable
60	Aux Rx Enable
61	Aux Rx Disable
64	Aux Control 1 On
65	Aux Control 1 Off
71	Priority Scan Disable
75	Scan Inhibit
96	Voting Tone Enable/ Voting Tone Disable

**Figure 5 - Function Chart**

**Tx Disable**

Start: Disable the transmitter.  
Stop: Restore the original EEPROM setting.

**CG Encode Disable**

Start: Disable channel guard encode.

Stop: Restore the original EEPROM setting.

**CG Decode Disable**

Start: Disable channel guard decode.

Stop: Restore the original EEPROM setting.

**RUS MUTE**

Start: Disable the main receiver.

Stop: Restore the original EEPROM setting.

**CG Monitor**

Start: Enable the Channel Guard monitor function.

Stop: Restore the original EEPROM setting.

**Remote PTT**

Start: Key remote push-to-talk.

Stop: Unkey remote push-to-talk.

**Local PTT**

Start: Key local push-to-talk.

Stop: Unkey local push-to-talk.

**External PTT**

Start: Key external push-to-talk.

Stop: Unkey external push-to-talk.

**Morse Code**

Start: Send Morse code ID if one is programmed.

Stop: Disable Morse code ID function.

Comments: If no ID is present, START will have no effect. If STOP is selected while station is transmitting ID, ID will be interrupted and terminated.

**Battery Alarm Disable**

Start: Disable battery Alarm Tone.

Stop: Restore the original EEPROM setting.

**Test Tone**

Start: Begin sending test tone.

Stop: Stop sending test tone.

Comment: The test tone frequency is 1000 Hertz.

**Soft Boot**

Start: Toggles software reset.

Stop: No function.

**Carrier Control Timer Disable**

Start: Disable the carrier control timer.

Stop: Restore the original EEPROM setting.

**RUS Disable**

Start: Enable Receiver Unsilenced Push to Talk.

Stop: Restore the original EEPROM setting.

**Scan Enable**

Start: Enable SCAN.

Stop: Restore original EEPROM setting.

**Scan Disable**

Start: Disable SCAN.

Stop: Restore original EEPROM setting.

**Main Rx Enable**

Start: Enable the main receiver.

Stop: Restore the original EEPROM setting.

**Main Rx Disable**

Start: Disable the main receiver.

Stop: Restore the original EEPROM setting.

**Aux Rx Enable**

Start: Enable the auxiliary receiver and toggle Aux Rx Mute.

Stop: No function.

**Aux Rx Disable**

Start: Disable the auxiliary receiver and toggle Aux Rx Mute.

Stop: No function.

**Aux Control 1 On**

Start: Activate Auxiliary 1 output.

Stop: Restore the original EEPROM setting.

**Aux Control 1 Off**

Start: Deactivate Auxiliary 1 output.

Stop: Restore the original EEPROM setting.

**Priority Scan Disable**

Start: Disable Priority SCAN.

Stop: Restore EEPROM setting of Priority SCAN Enable.

**Scan Inhibit**

Start: Suspend scan operation (if enabled).  
Stop: Restore the original EEPROM setting.

**Voting Tone Enable**

Start: Enable Voting Tone  
Stop: Disable Voting Tone

**ADJUSTMENTS**

**POTENTIOMETER ADJUST MODE**

The System Module contains up to 13 digital potentiometers (10 in MASTR IIe applications) to set various operational levels. These potentiometers must be adjusted properly to ensure optimum station performance. The potentiometers, their key, and function are listed on one of three pot pages. The pages and associated potentiometers are listed below. Page 3 applies to MASTR III only. The adjustment range for each potentiometer is given in Table 1.

Page 1.

1. Line Output Level (P LO)
2. Transmit Level (P TX)
3. Line Input Level (P LI)
4. Channel Guard Level (P CG)
5. DSP Line Cancellation Level (P DC)
6. DSP Line Input Level (P DI)
7. Compressor Level (CP)

Page 2.

1. Voting Tone Gain (VTG)
2. Compressor Threshold (CT)
3. Morse ID Transmit (MCTX)

Page 3.

1. PA Power (PA)
2. Repeater Gain (RG)
3. Squelch Pot (SQ)

**Table 1 - Potentiometer Adjustment Range**

PAGE	ADJUSTMENT	KEY* RANGE
1.	P LO	1 0-255
	P TX	2 0-255
	P LI	3 0-255
	P CG	4 0-255
	P-DC	5 0-255
	P-DI	6 0-255
2.	VTG	1 0-127
	CT	2 0-32767
	MCTX	4 0-255
3.	PA	1 0-99
	RG	2 0-32767
	SQ	3 0-99
* On each Pot Page the unused key numbers will have no effect.		

To enter the Adjust Potentiometer Mode from the main menu, press the "A" key. The handset will display "POT P1" for page 1. To select additional pages, press the "A" key again while "POT P1" is still displayed. Toggle it again to select page 3.

Select a specific potentiometer by selecting the appropriate page and then pressing the corresponding number key shown in Figure 6.

Ramping switches for these adjustments are shown in Figure 7.

Note: the "0" key is applicable **only** to the CP, CT and RG potentiometers (key 7 pg 1, and keys 1,2 pg 2 and with MASTR III key 2 pg 3.), and is a toggled (Press On-Press Off) function.

**NOTES**

It is not necessary to back up 1 level to the POT P1 display to select another pot on the same page. Just press the desired number corresponding to the next pot to be adjusted. To select a pot from another page, press CLR to return to Pot Px display and toggle the "A" key to the desired page. Now, press the desired number key shown in Figure 6.

Subsequent pressing of the "A" key will display the last selected page. Pressing the "CLR" key while in the process of actually adjusting a pot will return to the "POT Px" display where "x" was the last page selected.



FUNCTION	KEY	DISPLAY
Power up handset	None	MENU
Enter adjust pots mode	A	POT P1
<b>PAGE 1</b>		
Line output pot	QZ 1	P LO XXX
Tx level pot	ABC 2	P TX XXX
Line input pot	DEF 3	P LI XXX
Channel Guard pot	GHI 4	P CG XXX
DSP line cancellation pot	JKL 5	P DC XXX
DSP line input pot	MNO 6	P DI XXX
Compressor Gain pot	PRS 7	CP XXXXX
<b>PAGE 2</b>		
Voting Tone Gain	QZ 1	VTG
Compressor Threshold	ABC 2	CT
Morse ID Transmit	DEF 3	MCTX
<b>PAGE 3</b>		
PA Power	QZ 1	PA
Repeater Gain	ABC 2	RG
Back up one level	CLR	POTP1
Return to top level	END	MENU

Figure 6 - Potentiometer Adjust Switches

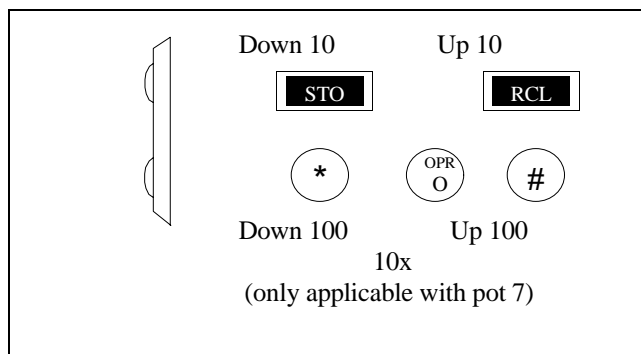


Figure 7 - Ramping Switches

The handset adjusts potentiometers in real time. These adjustments are recorded in the personality of the System Module.

Service Notes:

1. Potentiometers 5, 6 and 7 (page 1.), 1, 2 and 3 (page 2) and 1 and 2 (page 3.) apply to System Modules with the Digital Signal Processing (DSP) board.

2. The Channel Guard Level, TX, and PA pots are **channel specific**. To correctly set the level associated with a channel, first select a channel using the Channel Select Mode described on this page. Then return to the Adjust Potentiometer Mode and adjust the Channel Guard level pot. (Only applicable to multiple frequency stations.)

3. Also, changing the SQ Pot will have an affect only on those ststions that have been programmed to use the digital squelch pot instead of the manual pot.

(The station software must be group 12 or higher, and the MASTR III interface board must have the digital squelch pot on it.)

**METERING MODE**

The Utility Handset can monitor station performance by providing a readout of various DC voltages in a properly configured station.

To enter the Metering Mode from the main menu, press the **B** key.

Select a specific parameter to measure by pressing the corresponding number key shown below:

	Parameter	MIIE function	MIII base station function	Analog Range
1	PWR	Not Used	Circulator Power Sensor	0-5V
2	Rx	Rx Meter	RSSI, Receiver Sensitivity	0-5V
3	Tx	Tx Meter	External Metering Point	0-5V
4	Ext	Not Used	External Metering Point	0-10V

The Rx Meter and Tx Meter functions in the MASTR IIe are used with the Meter Switching kit, 19B226293G1. See LBI-4848.

In the MASTR III, PWR returns a voltage proportional to the reflected power in the circulator. Rx is the RSSI line from the IF module. Tx and EXT are external metering points on the MASTR III and are brought to a header on the MIII backplane for use in special functions. Otherwise, they are available for the operator to use in various metering applications.

The display provides the appropriate abbreviations and current level. These readings are updated every 2 seconds (see Figure 8).

The Handset can also present these data in decimal format. By pressing the "B" key while in the metering mode, the handset will toggle from volts to decimal. The decimal measurement range is 0 to 255.

Decimal data are presented with no spaces between the numbers. The default is analog voltages.

### CHANNEL SELECT MODE

In multi-frequency stations, the Utility Handset can change the selected channel.

To enter the Channel Select Mode from the main menu, press the "C" key.

The display will show the current channel. To change channels press the channel number desired (1-4). Assuming a two channel station with channel 1 as the current channel, pressing the 2 key will result in the handset displaying "C SEL 2". In order to complete this channel selection, the C key must be pressed. Now the handset will display "CHAN 2".

If desired, adjustments to the Channel Guard Level settings for channel 2 may now be made. It should be noted that when the handset is in the Channel Select Mode ("C SEL x"), any entry may be discarded by pressing the CLR key. Pressing the CLR key a second time will return the handset to the "MENU" display.

The Channel Select Mode may also be entered from the Channel Display Mode ("CHAN x") by using the "C" key. The resulting display is "C SEL". Channel selection may proceed as described above. Also note that when in the Channel Select Mode, the previously selected channel may be redisplayed by entering an invalid channel number (which includes a blank selection).

## REMOTE STATION ADJUSTMENTS VIA MODEM

Function	Key	Display
Power up handset	None	MENU
Enter metering mode	B	METER
To select power	QZ 1	PWR X XX
To select Rx	ABC 2	RX X XX
To select Tx	DEF 3	TX X XX
To select external	GHI 4	EXT X XX
To toggle to decimal display	B	Numbers read with no spaces in decimal: <b>XXX</b>

Figure 8 - Metering Switches

Function	Key	Display
Power up handset	None	MENU
Display Current channel	C	CHAN X
To select new channel	QZ 1    ABC 2 DEF 3    GHI 4 C	C SEL X

Figure 9 - Channel Select Switches

Remote station adjustments and diagnostics are available using the MASTR IIe/III Utility Program (LBI-38540).

The Utility Handset must be used to adjust the baud rate of a remote station. The default settings are:

Baud rate	9600 bps
Parity	NONE
Word length	8 bits
Stop bits	2

Only the baud rate is programmable. The procedure below allows you to select the baud rate required by your modem.

Power up the station. Successful power up will cause the display to show "MENU". From the "MENU" display, press the "#" key.

The display will show:

**BRxxxxx**

where xxxxx is the current baud rate right-justified in the 8 character display.

Numeric keys used to select the baud rates are given below. Keys other than those identified below are invalid and are not operable.

- |              |              |
|--------------|--------------|
| 1. 300 baud  | 4. 4800 baud |
| 2. 1200 baud | 5. 9600 baud |
| 3. 2400 baud |              |

After selecting the desired baud rate, press the **STO** key to actually change the baud rate in the System Module.

## **MAINTENANCE**

Refer to Maintenance Manual LBI-38509 for complete maintenance information for the Utility Handset (19A705965P1) or LBI-38412 for Utility Handset (19A705870P2).

- Circuit Analysis
- Test Specifications
- Handset Self-Test
- Outline and Schematic Diagrams
- Parts List
- IC Data

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