



GAI-TRONICS® CORPORATION

A HUBBELL COMPANY

PL1877A (MRTI 2000) Microprocessor Radio Telephone Interconnect Installation and Service Manual



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Table of Contents

FOREWORD	1
SCOPE OF MANUAL	2
NOMENCLATURE	2
ORDERING REPLACEMENT PARTS	2
SERVICE AND REPAIR	2
SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES	3
MODEL CHART	4
SPECIFICATIONS	6
DESCRIPTION.....	7
GENERAL DESCRIPTION.....	7
FEATURES OF THE PL1877A MICROPROCESSOR TELEPHONE INTERCONNECT.....	7
INSTALLATION.....	9
<i>FCC Interference Warnings.....</i>	<i>9</i>
<i>Equipment Required</i>	<i>9</i>
<i>Cable Installation Safety Considerations</i>	<i>9</i>
<i>Telephone Line Lightning and Over-voltage Protection</i>	<i>9</i>
<i>Rack-Mount Installation</i>	<i>10</i>
<i>Installation Considerations.....</i>	<i>10</i>
<i>Electrical Interface</i>	<i>10</i>
<i>Power Supply.....</i>	<i>11</i>
<i>P1 Radio Connector.....</i>	<i>12</i>
INTERNAL DIAGNOSTICS	13
<i>Test 1 – TX Softpot Adjustment.....</i>	<i>13</i>
<i>Test 2 – DTMF Decode Thresholds</i>	<i>13</i>
<i>Test 3 – Mobile-to-Phone Audio Path</i>	<i>13</i>
<i>Test 4 – Mobile-to-Phone Path 2.....</i>	<i>14</i>
<i>Test 5 – Mobile-to-Phone Audio Path</i>	<i>14</i>
<i>Test 6 – Non-accessed Patch Functions</i>	<i>14</i>
<i>Test 7 – Active Line Swap.....</i>	<i>15</i>
<i>Test 8 – Network Tone Decoding.....</i>	<i>15</i>
<i>Test 9 – HC11 DSP Communications.....</i>	<i>16</i>
<i>Test 10 – HC11 DSP Communications.....</i>	<i>16</i>
<i>Test 11 – TX Audio Port</i>	<i>16</i>
<i>Test 12 – RS-232 Diagnostic</i>	<i>16</i>
<i>Test 13 – DTMF Decode on Un-accessed Phone Line</i>	<i>16</i>
LEVEL SETTING	17
<i>Transmitter Audio Level</i>	<i>17</i>
<i>Carrier Detect Adjustments</i>	<i>17</i>
<i>Internal Noise-Operated Squelch Adjustment.....</i>	<i>18</i>
PC PROGRAMMING	19
GENERAL DESCRIPTION.....	19
<i>Hardware/Software Requirements.....</i>	<i>19</i>
<i>Communication Port.....</i>	<i>19</i>
<i>Connections</i>	<i>19</i>
<i>Installing the Programming Software.....</i>	<i>19</i>
IAPS PROGRAMMING.....	20
<i>Editing Screens</i>	<i>20</i>
INPUT/OUTPUT	21
<i>Input/Output – I/O Settings.....</i>	<i>21</i>
<i>Serial Port Setup.....</i>	<i>22</i>

<i>Input/Output – I/O Settings - Read ITI6000A</i>	22
<i>Input/Output – I/O Settings - Read Remote</i>	23
<i>Input/Output – Remote Programming -Dialing Directory</i>	24
<i>Input/Output – Read Local</i>	24
INSTALLATION.....	25
<i>Installation – Radio Interface Parameters</i>	25
<i>Installation – Telephone Line Settings</i>	27
BASIC OPERATION.....	28
<i>Basic Operation – Mode Selection</i>	28
<i>Basic Operation – Operational Settings</i>	30
<i>Basic Operation – Programming Privileges</i>	31
ACCESS/RELEASE SETTINGS.....	32
<i>Access/Release – Mobile Initiated – Mobile Access Release</i>	32
<i>Access/Release – Mobile Initiated – Mobile Access Release - Security Code Overrides</i>	34
<i>Access/Release – Mobile Initiated - Multi-Digit Prefixes</i>	35
<i>Access/Release – Mobile Initiated - Multi-Digit Release Codes</i>	35
<i>Access/Release – Telephone Initiated - Direct Access</i>	35
<i>Access/Release – Telephone Initiated - Misc. Access/Release</i>	37
<i>Access/Release – Global Access/Release</i>	38
SIGNALING	39
<i>Signaling – Telephone Line Dialing – Dialing Method</i>	39
<i>Signaling – Telephone Line Dialing -Autodial/Redial</i>	40
<i>Signaling – Telephone Line Dialing – Auto-dial Numbers</i>	41
<i>Signaling – Telephone Line Dialing – Toll Restriction</i>	41
<i>Signaling – Telephone Line Signaling Toll Restriction Prefixes</i>	42
<i>Signaling – Mobile Signaling – Ring Signaling</i>	42
<i>Station Identifier</i>	43
PAGING	44
<i>Paging – Telephone Line</i>	44
<i>Paging – Attendant Paging</i>	45
<i>Paging – Mobile Paging</i>	45
<i>Paging – General Paging</i>	45
<i>Paging – Paging Format - DTMF Paging Parameters</i>	46
<i>Paging – Paging Format – 1500 Paging Parameters</i>	46
<i>Paging – Paging Format – 2805 Paging Parameters</i>	47
<i>Paging – Paging Format Plectron Paging Parameters</i>	47
<i>Paging – Paging Format – 2-Tone Paging Parameters</i>	47
<i>Paging – Paging Format – 5-Tone Paging Parameters</i>	48
<i>Paging – Paging Format – Multi-Mode Paging Table</i>	49
SERVICE ADJUST.....	51
<i>Service Adjust – Service Diagnostics</i>	51
<i>Service Adjust – Manual Off hook - Telephone Line Off hook Threshold Voltage</i>	52
<i>Entering Programmed Parameters</i>	52
<i>Mobile Programming of Auto-Dial Numbers</i>	53
<i>Wildcard Access/Release</i>	54
<i>Programming Wildcard Access/Release</i>	55
<i>Wildcard Access/Release with Paging</i>	56
<i>Paging without Direct Channel Access</i>	56
<i>Paging with Direct Channel Access</i>	57
<i>Programming the Wildcard Code for use with Paging</i>	58
<i>Miscellaneous Information about Wildcard Access/Release Feature</i>	59
MULTI-DIGIT ACCESS/RELEASE	60
<i>Multi-Digit Access</i>	60
<i>Security Code Table</i>	61
<i>Multi-Digit Release</i>	62
OPERATOR INSTRUCTIONS	63
MOBILE ORIGINATED CALLS	63
<i>Signal Search Simplex Mode</i>	63

<i>Enhanced VOX Simplex Mode</i>	63
<i>Network Signaling</i>	64
<i>Half Duplex Mode</i>	64
LANDLINE ORIGINATED CALLS.....	66
<i>Direct Access</i>	66
<i>Selective Signaling</i>	66
MULTI-DIGIT ACCESS/RELEASE.....	67
<i>Multi-Digit Access</i>	67
<i>Bypassing Restrictions via Multi-digit Access</i>	67
<i>Security Code (Privileged User Override Code)</i>	68
<i>Installation of the Multi-Digit Access Feature</i>	69
<i>Configuring the Security Code to Bypass Restrictions</i>	71
<i>Multi-Digit Release</i>	71
<i>Linking Multi-Digit Release to Multi-Digit Access</i>	72
<i>Installation</i>	72
<i>Wildcard Access/Release Installation</i>	73
<i>Wildcard Access/Release with Selective Signaling</i>	74
<i>Selective Signaling without Direct Channel Access</i>	74
<i>Selective Signaling with Direct Channel Access</i>	75
<i>Programming the Wildcard Template for Use with Selective Signaling</i>	75
<i>Miscellaneous Information Regarding Wildcard Access/Release Feature</i>	76
PARAMETER MODIFICATION PROCEDURE	77
TERMINAL PROGRAMMING FEATURE.....	77
<i>Parameter Modification via RS-232</i>	77
<i>RS-232 Operator Instructions</i>	77
<i>Parameter Modification via Modem</i>	78
<i>Modem Operator Instructions</i>	79
DTMF PROGRAMMING FEATURE.....	79
<i>Operator Instructions</i>	79
<i>Procedure from Landline Telephone</i>	80
<i>Procedure from a Mobile or Portable Equipped with DTMF Pad</i>	81
MOBILE PROGRAMMING OF AUTO-DIAL NUMBERS.....	82
INSTALLATION PARAMETERS.....	83
<i>Radio Interface</i>	83
<i>Telephone Interface</i>	88
<i>Parameter Programming Methods</i>	90
MOBILE ACCESS METHODS.....	91
<i>Mobile Access Command</i>	91
<i>Multi-digit Access</i>	91
<i>Wildcard Access</i>	91
<i>Triple Key Access</i>	92
MANUAL RELEASE METHODS.....	92
<i>Mobile Originated Release</i>	92
<i>Telephone Originated Release</i>	93
AUTOMATIC RELEASE METHODS.....	93
<i>Mobile Originated Call</i>	93
<i>Telephone Originated Call</i>	93
GENERAL CALL CHARACTERISTICS.....	94
<i>Call Timers</i>	94
<i>Semi-private Operation</i>	95
SELECTABLE FEATURES.....	95
<i>Station Identification (SID or CWID)</i>	95
<i>Toll Restrictions</i>	97
<i>Autodial</i>	98
<i>Redial</i>	99
<i>Direct Channel Access</i>	100
<i>Mobile Security Code (Privileged User Override)</i>	102
<i>Station/Repeater Enable Feature</i>	102

<i>Miscellaneous Features</i>	103
PARAMETER/FUNCTION REFERENCE TABLE.....	104
FEATURES.....	117
SECOND LINE OPTION	117
<i>Answering Calls on Line 2</i>	117
<i>Originating Calls on Line 2</i>	117
SELECTIVE SIGNALING	118
<i>Landline Caller</i>	118
<i>Attendant</i>	119
<i>Mobile User (Mobile Revertive Signaling)</i>	119
<i>Group Calls</i>	119
<i>2-Tone Group Calls</i>	120
<i>Dual Addressing</i>	120
<i>Single-Mode Selective Signaling</i>	120
<i>Multi-Mode Selective Signaling</i>	121
<i>Capcode Characteristics</i>	121
SELECTIVE SIGNALING PARAMETERS AND FUNCTIONS.....	122
<i>General Selective Signaling Characteristics</i>	122
<i>Selective Signaling Method</i>	123
<i>Selective Signaling Types</i>	126
PAGING	129
TYPES OF PAGING.....	129
2-TONE PAGING	129
<i>2-Tone Paging Example</i>	129
<i>Group Call</i>	130
PLECTRON PAGING.....	133
<i>Plectron Paging Example</i>	133
5/6 TONE.....	134
PL1877A – RADIO INSTALLATION.....	137
<i>Mitrek Consolette – PL1877A Single Simplex Mode</i>	137
<i>Mitrek Consolette – Enhanced VOX Simplex Mode</i>	140
<i>MAXAR and MOXY Bases</i>	142
<i>MAXAR 80 Bases</i>	145
<i>MICOR RCB Repeater</i>	149
<i>FLEXAR Repeater</i>	151
<i>T1600 Series Remote Interfacing</i>	153
<i>MSF 5000 Digital Base/Repeater Stations</i>	154
<i>MAXTRAC 300/GM300 Base Station</i>	155
THEORY OF OPERATION	157
POWER SUPPLY	157
MICROPROCESSOR AND DSP MODULE (MDP).....	157
DIGITAL SIGNAL PROCESSING.....	158
TX AUDIO.....	158
RADIO INTERFACE.....	159
LINE INTERFACE.....	160
OPTIONAL LINE 2 INTERFACE.....	160
MAIN CIRCUIT BOARD	161
DEFINITIONS AND ACRONYMS.....	165

User Instructions (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment complies with Part 68 of the FCC rules. Located on the equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company. The REN is used to determine the quantity of devices that may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's contact the telephone company to determine the maximum REN for the calling area. This equipment cannot be used on the telephone company-provided coin service. Connection to Party Line Service is subject to State Tariffs. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact:

GAI-Tronics Corporation
400 E. Wyomissing Ave.
Mohnton, PA 19540 USA
800-492-1212 or 610-777-1374

If the trouble is causing harm to the telephone network, the telephone company may request you to remove the equipment from the network until the problem is resolved. This equipment uses the following USOC jacks: RJ11C. It is recommended that the customer install an ac surge arrester in the ac outlet to which this device is connected. This is to avoid damaging the equipment caused by local lightning strikes and other electrical surges. This equipment is Hearing-Aid Compatible (HAC). The telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device, including fax machines, to send any message unless such message clearly contains in a margin at the top or bottom of each transmitted page or on the first page of the transmission, the date and time it is sent and an identification of the business or other entity, or other individual sending the message and the telephone number of the sending machine or such business, other entity, or individual. (The telephone number provided may not be a 900 number or any other number for which charges exceed local or long-distance transmission charges.)

User Instructions (Canada) CP-01, Issue 8, Part I: Section 14.1

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.



Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

CP-01, Issue 8, Part I: Section 14.2

NOTICE: The **Ringer Equivalence Number** (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

Scope of Manual

This manual offers descriptive data and service information for the PL1877A Microprocessor Radio Telephone Interconnect. Printed circuit board details are a part of this service manual.

Nomenclature

The model number, located on the nameplate on the bottom, specifically identifies GAI-Tronics equipment.

Ordering Replacement Parts

When ordering replacement parts or requesting equipment information, please include the complete identification number. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part and sufficient description of the desired component to identify it. Order parts from:

Customer Service

GAI-Tronics Corporation

400 E. Wyomissing Ave.

Mohnton, PA 19540

US: 800-492-1212

Outside US: 610-777-1374

Service and Repair

Inoperative or malfunctioning equipment should be returned to the factory for repair. Please call **1-800-492-1212** to obtain a Return Authorization number, published repair prices, and shipping instructions.

NOTE: A purchase order or credit card number is required prior to processing non-warranty repairs.

Safe Handling of CMOS Integrated Circuit Devices

Many of the integrated circuit devices used in communications equipment are of the Complementary Metal Oxide Semiconductor (CMOS) type. Because of their high open circuit impedance, CMOS integrated circuits are vulnerable to damage from static charges. Care must be taken handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS integrated circuit inputs, the protection is effective only against overvoltage in the hundreds of volts range such as is encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules, even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal, earth-grounded surface. This will discharge any static charge that may have accumulated on the person doing the servicing.

NOTE: Wearing a conductive wrist strap will minimize static build-up during servicing.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.
3. Power down the unit before installing or removing the circuit module.
4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static build-up. Similarly, disconnect the test probe prior to removing the ground lead.
5. All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe.
6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) that is connected to ground through 100k of resistance.
7. When soldering, be sure the soldering iron is grounded, and has a grounded tip.
8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static build-up as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.
9. When replacing a CMOS integrated circuit device, leave the device in its conductive rail container or conductive foam until it is to be inserted into the printed circuit module.
10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.
11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). **Never use non-conductive material** for packaging these modules.

Model Chart

Model	Description
PL1877A	PL1877A Microprocessor Radio Telephone Interconnect

The following options are included in your PL1877A:

Options	Description
E375	Enhanced VOX
E380	Basic Selective Signaling (provides 2-Tone)
Z394	Selective Signaling Package One (provides DTMF and Plectron)
Z395	Selective Signaling Package Two (provides 5/6 Tone and 2805/1500)

The following field installation kits and accessories are available for the PL1877A:

Kit	Description
XAC0005A	Rack-Mount Kit
40419-008	110 V Power Supply (required if not powered by connected radio)
40420-001	European-style Power Adapter
M2000-MSF5000-CBL	MSF5000 Cable
M2000-MAX-CBL	MaxTrac/GM300 Cable
51018-0006	MTR2000 Cable
M2000-QUANT-CBL	Quantar/Quantro Cable
M2000-DIU-CBL	ASTRO/DIU Cable
XAC4000B	Programming Bundle Flash Drive
XAC0004A	Programming Cable

Specifications

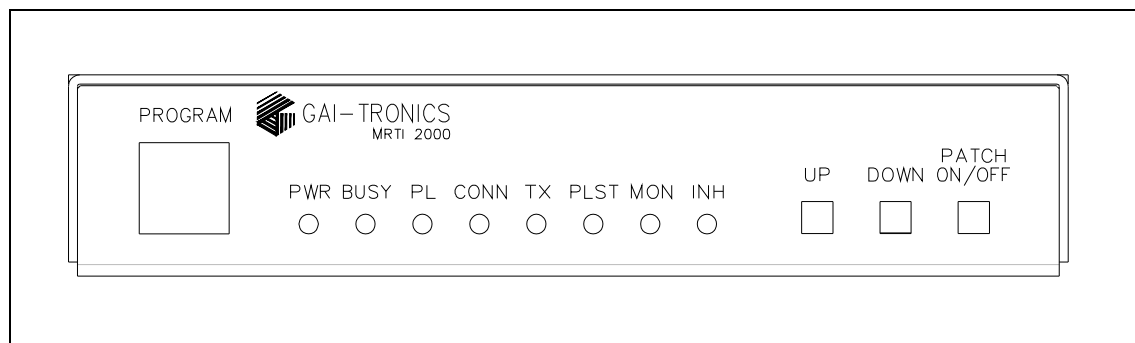
General

Input voltage	+10.5–16 V dc, or optional 115 V ac, 60 Hz; 220 V ac 50/60 Hz;
Input current.....	Less than 750 mA
RFI protection.....	Built-in
Hum and noise	–45 dB from 1,000 Hz reference
Audio Distortion	1% maximum with reference to a 1,000 Hz tone (–10 dBm input, phone to transmitter path) (0.45 V ac input, low level receiver speaker input to phone path)
Circuit loading to TX audio.....	Bridging impedance (ac-coupled)
Output level to radio transmitter.....	15 mV _{RMS} to 0.5 V _{RMS} into 600 ohms
Output level to phone line.....	–9 dBm maximum (time averaged over 3 seconds)
Input level from phone line.....	+5 dBm maximum autolevel threshold: –35 dBm, +3 dB
Phone line busy detect threshold	–20 V, ±2 V (or 10 V, ±2 V with 24 V threshold user selectable)
Phone line ring detect	Adjustable from 20 V _{RMS} to 50 V _{RMS}
Ringer equivalence	0.0B (ac)/4.9 (dc)
Input Audio Level from Receiver	
High level discriminator/detector	0.45 V _{RMS} ±8 dBm
Low level discriminator/detector.....	80 mV _{RMS} ±8 dB
High level flat audio	2.5 V _{RMS} +6 to –8 dBm
Low level flat audio	0.45 V _{RMS} +8 dB
Impedance	600 ohms or high impedance bridging (user selectable)
Audio Frequency Response	
RX to land-line.....	360 to 3,000 Hz, ±3 dB
Land-line to transmitter	300 to 3,000 Hz, ±3 dB (–45 dBm input, phone-to-transmitter path 45 mV ac input, low level flat input to phone line path, auto-level disabled)
Logic Level Inputs	
Input impedance.....	90k ohms (inputs pulled up through 100K ohms to power input voltage)
Maximum low level input.....	1.5 V
Maximum high level input.....	3.5 V
Maximum high level	100 V
Physical	
Temperature range.....	0° C to +60° C
Humidity	<95% at relative humidity at +50° C
Dimensions	7.0 W × 8.3 D × 1.5 H inches
Weight.....	26.9 ounces

General Description

The PL1877A Radio Telephone Interconnect is a highly advanced DSP-based tool to connect to a public telephone network. It can be used with a repeater or base station for initiating calls (with properly equipped portables and mobiles) and/or receiving landline-initiated calls. With the telephone interconnect, your wireless users can keep in contact with landline phone users.

The PL1877A provides a vast array of standard features that are optional with most telephone interconnects. Features such as triple key access, number restricts, timers, speed dial, enhanced VOX, built-in paging and more, mean easy operation, control of land-line communications, and user efficiency. Because of its programmable features, the PL1877A can be used in most user environments and radio systems.

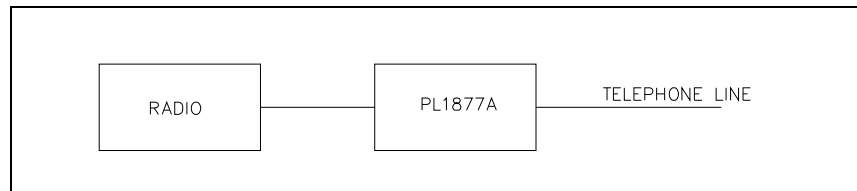


Front Panel View of the PL1877A

Features of the PL1877A Microprocessor Telephone Interconnect

- **Flash signal (***)** – Allows the mobile user to regain an in-house dial tone without releasing and re-accessing the patch (call transfer, etc.). (Applicable on certain PBX equipment)
- **Programmable Connect command** – The command sequence required for connection to the patch can be determined by parameter selection.
- **Enhanced VOX mode** allows the PL1877A to operate on control station and base station that require VOX operation. In this mode, the PL1877A keys the radio on the presence of audio on the telephone line. The telephone audio is delayed while the radio system is establishing the channel to avoid clipping of syllables.
- **Selective Signaling (Paging)** – The PL1877A is equipped with the capability for analog paging. Supported paging formats are 2-Tone, DTMF, Plectron, CTCSS\CDCSS, 2805, 1500, 5-Tone, and custom 2-Tone.
- **Last number redial** – The last number dialed may be redialed by entering the command sequence **. This feature may also be disabled by parameter selection.
- **Over-beep** – A beep is sounded when the mobile carrier is lost. This feature may be enabled or disabled by parameter selection.

- **Time out warning** – If the line has been inactive for a certain period of time (a period to be set by parameter selection), the unit sends ticks prior to disconnection to alert the user. These ticks can be enabled or disabled.
- **Mobile call origination restrictions** – Calls originating from mobile sources can be permitted, prohibited, or restricted to specific features.
- **Mobile signaling** – Ring signaling to mobiles may be sent to begin on any of the first 9 rings. Setting the patch to delay mobile ring signaling by a certain number of rings allows an attendant to answer the call on a line sharing telephone set before mobiles are alerted.
- **Mobile inactivity control** – If, after a conversation, the interconnect determines the mobile has been inactive for a set period of time and the # release code has not been sent, the line releases automatically. The inactivity time is set by parameter programming.
- **Telephone line origination restrictions** – Calls originating from the switched network (telephone lines) can be permitted or prohibited.
- **Toll (long distance) restriction** – The PL1877A disconnects when 1, 0, 9, or any of various prefixes (as programmed) is entered as the first digit(s) of the telephone number.
- **Programmable telephone line dialing method** – Either Touch Codes or dial pulses can be sent to the land-line.
- **Attendant control** – An attendant (telephone sharing the same telephone line with the PL1877A) can initiate or forward calls to the mobile users via a Touch-Code equipped, line-sharing telephone set by dialing the attendant access code.
- **Patch telephone line busy signal** – When a mobile user attempts to access the patch telephone line and the line is off-hook (in use by a line-sharing telephone set, etc.), the unit returns a busy signal to the mobile user. The line may be accessed in this condition by the busy override code.
- **CTCSS Control** – The TX CTCSS disable relay can be programmed to operate on command only, or automatically on access. This allows use of the patch without disturbing other mobile users in the system. If the relay has been activated, (disabling CTCSS), the CTCSS may be commanded back on in order to involve another mobile user in the telephone conversation.
- **Parallel telephone line capability** – The interconnect can share a telephone line with a standard telephone set. This eliminates the need for a separate telephone line dedicated to the patch.
- **Direct Access (Direct Air)** – Allows the telephone line callers to be placed on the air immediately after mobile signaling on telephone line originated calls.
- **Overall Access Time Limit** – The duration of access to the patch is set by parameter control.
- **Automatic Station Identifier (CWID)** – The patch can be configured to automatically send Morse Code station identification information at selected intervals. The choices for these intervals are: 0–59 minutes (periodic SID), at the end of every interconnect, or both.
- **Autodial** – The PL1887A can have up to 25 speed dial numbers programmed into it.
- **Triple Key Access** – This feature allows mobiles and portables without DTMF-equipped keypads to answer incoming calls.
- **PC Programmable** – All of the PL1877A's operating parameters can be programmed using IAPS Software. This makes installing and setting up the PL1877A easy.



Typical PL1877A Installation

The PL1877A can be placed on any flat level surface (desk top) that provides the operator with full visibility of all front panel controls and indicators. It can also be rack mounted using the optional rack-mount kit.

FCC Interference Warnings

The FCC requires that manuals pertaining to Class A and Class B computing devices contain warnings about possible interference with local and residential radio and TV reception. Please read these warnings and all safety information in the “Foreword” of this manual.

Equipment Required

- RF service monitor
- Radio interface cable
- AC voltmeter with dB ranges for measuring audio levels
- #1 Phillips screwdriver
- XAC0004A Programming Cable
- PC with Windows95 or higher (not Windows NT)
- IAPS Programming Software, included on XAC4000B Programming Bundle Flash Drive
- 1/8-inch flat blade screwdriver

Cable Installation Safety Considerations

Interconnecting, communications, and Class 2 dc power cables should be separated from electrical light or other Class 1 circuits by at least 2 inches. The exception is where Class 1 wiring or power circuits are run in a raceway, or are metal-sheathed or metal-clad, or are permanently separated from the conductors of the other circuitry by a continuous and firmly fixed nonconductor such as porcelain tubes or flexible tubing in addition to the insulation on the wire. Communications cables and in-building wiring should be listed and marked for the purpose according to NEC Article 800.

Telephone Line Lightning and Over-voltage Protection

The PL1877A has an over-current phone line fuse that protects against occasional extreme fault conditions that may get past the primary protectors. An example of such a fault condition is a power line cross. For maximum surge and lightning protection, building primary (and over-voltage) protectors should be installed at the point where the telephone lines enter the radio equipment building. Primary protectors are usually required by local codes and should be provided by your leased line provider.

Rack-Mount Installation

The optional Model XAC0005A Rack-Mount Kit for the PL1877A is available from GAI-Tronics. It includes a 19-inch rack-mounting bracket and other parts that can be used to mount one or two PL1877A units (or tone/dc adapter) into a standard 19-inch rack. The kit includes hardware and complete mounting instructions.

Installation Considerations

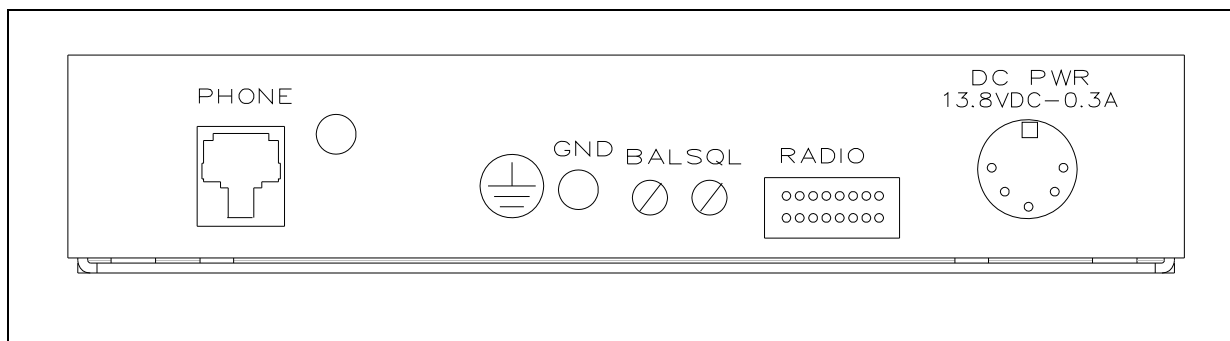
The electrical hook-up of the PL1877A requires these basic connections: the ground wire, radio interface cable, and the power supply cable.



Voltages hazardous to life may be present at the exposed control line terminals under certain conditions during the following procedures. These voltages are also present on some component leads. Care should be taken to avoid shock during installation.

Electrical Interface

All of the electrical connections to the PL1877A are made at the rear panel. Power to the console is furnished through a 5-pin, DIN connector. The figure below shows the rear view of the PL1877A and the locations of the various connectors.



View of the PL1877A Back Panel with Connectors

DC Power Connector Pin Chart			
Pin No.	Wire Color	Description	
3 and 5	Red	(+)	
1 and 4	Black	(-)	

Ground Cable

The PL1877A is designed with a high degree of protection against electro-static discharge (ESD), power line surges and telephone line surges. The protection circuitry is designed to shunt the transient current to earth ground through the GND terminal, located on the back panel of the unit. This terminal must be connected to a high quality earth ground in order to obtain maximum protection. All equipment at a site should be bonded frame-to-frame with adequately sized conductor.

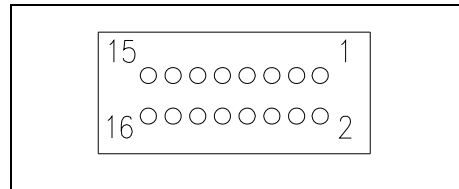
NOTE: This ground should be connected through a utility entrance ground cable and the telephone entrance ground cable, if different from the utility ground. Lightning is essentially RF, and as such does not like long leads or sharp bends. Make connections appropriately.

Power Supply

An optional ac power supply (XAC0001A) is available from GAI-Tronics, if power is not available from the radio. The Model 3308-00750-10 Power Supply is designed for use with 220 V ac applications.

P1 Radio Connector

The 16-pin radio connector (P1) pin designations are shown below. Refer to the applicable section of this manual for your specific radio for more detailed information on its installation.

**Radio Connector Pinout**

P1 Radio Connector Pin Chart		
Pin No.	Wire Color	Function
1	Red/Black	PL Strip
2	Red	PL Strip Return
3	Orange	Monitor
4	Orange/Black	Monitor Return
5	White	PTT
6	Green	PTT Sense
7	White/Black	Data TX (TPL and DPL signal output)
8	Blue White	TX Audio
9	Blue/Black	TX Audio Return
10	Green/White	RX Audio Return
11	Green/Black	RX Audio
12	Black	PL Detect
13	Blue	Carrier Detect
14	Black/White	Optional Input #1
15	Red/White	Patch Inhibit
16	Not connected	Optional Input #2

The PL1877A has been designed with several diagnostic tests to assist you in set-up and troubleshooting. Entry into the diagnostic mode is made by simultaneously pressing the UP and DOWN buttons.

To step to another test once the diagnostic mode has been entered, press the PATCH ON/OFF button. To exit, press both the UP and PATCH ON/OFF buttons simultaneously.

Each time a new test is selected, a test timer is set to 15 minutes. If this timer reaches zero, the patch resets itself to idle, ready for normal operation.

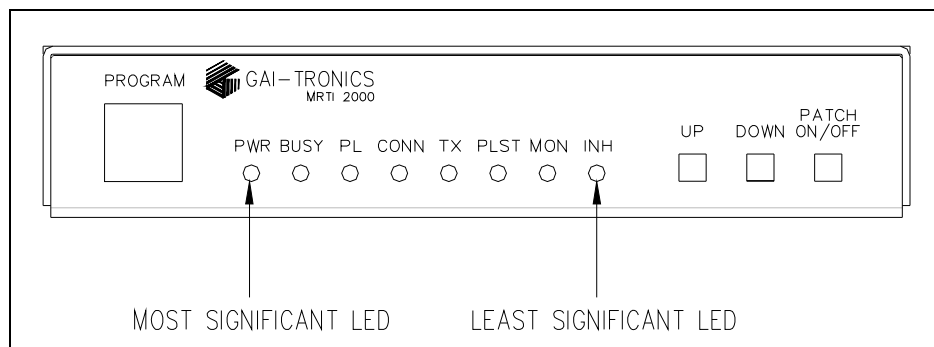
Internal Diagnostics

Test 1 – TX Softpot Adjustment

This test activates both the PTT and the PL strip output, accesses the phone line and generates 1000 Hz to the phone line and transmitter. The UP or DOWN buttons are used to adjust the TX softpot, UP increases the TX level and DOWN decreases the level. As the UP or DOWN button is pressed the value stored in gain stage U18 is displayed via the LEDs in binary form. When the PATCH ON/OFF button is pressed to exit Test 1, the TX softpot is set at the indicated TX level number. The TX softpot remains at this value permanently unless it is again changed through Test 1.

Test 2 – DTMF Decode Thresholds

Test 2 accesses the phone line and generates each of the 16 DTMF digits. The tones are generated at six different levels. The PL1877A decodes its own DTMF, and the decoded digits are indicated on the five least significant LEDs in binary form. Refer to the LED assignment diagram below. The most significant LED indicates that the digit being generated has been decoded.



Digit cycling may be slowed down by pressing the DOWN button once or frozen by pressing the DOWN button a second time. Pressing the UP button speeds up the cycling process.

NOTE: A DTMF “0” is displayed as hexadecimal 10 (decimal 16) in binary.

Test 3 – Mobile-to-Phone Audio Path

This test accesses the phone line and routes mobile audio to the phone lines with autoleveling. Decoded DTMF from the mobile is displayed via the 5 least significant LEDs in binary format. 15 dB of RX audio attenuation may be toggled ON or OFF by pressing the UP button. When test 3 is entered, the attenuator is in the state required by parameter 2.

Pressing the DOWN button toggles the state of the RX audio 6 dB per octave de-emphasis. When Test 3 is entered, the de-emphasis is in the state required by parameter 1. The three most significant LEDs (refer to the LED assignment diagram above) are used to indicate the state of the following:

- Carrier Detect Input - LED 1 (bit 7)
- RX VOX - LED 2 (bit 6)
- Internal Squelch Detection - LED 3 (bit 5)

If the LED is lit, the input is active, if the LED is not lit the input is inactive.

Test 4 – Mobile-to-Phone Path 2

Test 4 is identical to Test 3 with the following exceptions. Test 4 activates the monitor output and disables RX auto-leveling. The LEDs (refer to the LED assignment diagram on page 13) display the status of the following:

- PTT Sense Input - LED 1 (bit 7)
- PL Detect Input - LED 2 (bit 6)
- Auxiliary Carrier Detect - LED 3 (bit 5)

The 5 least significant LEDs are used to display decoded DTMF digits.

Test 5 – Mobile-to-Phone Audio Path

PTT is activated and phone audio is auto-leveled and routed to the transmitter. If enhanced VOX option is present, enhanced VOX operation is used, otherwise auto-leveling is used. The UP button is used to toggle phone line auto-leveling ON or OFF. The 5 least significant LEDs (refer to the LED assignment diagram on page 13) display a binary representation of DTMF decoded from the phone line. The most significant LED indicates the status of phone line VOX, if the enhanced VOX option is present.

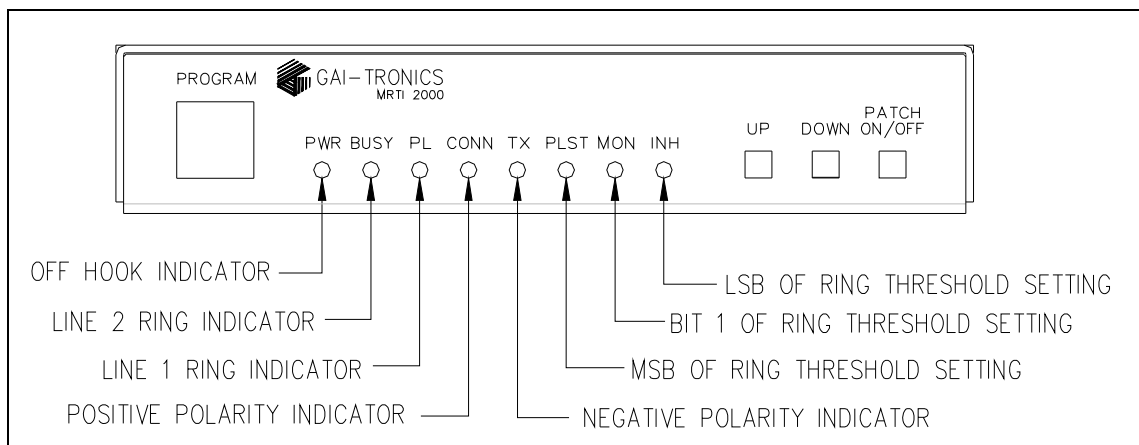
NOTE: A DTMF “0” is displayed as hexadecimal 10 (decimal 16) in binary.

Test 6 – Non-accessed Patch Functions

The non-accessed phone line status is represented by the LEDs. The signals displayed are:

- Off Hook Status of an Attendant Phone
- Ring Voltage
- Phone Line Current Polarity (positive, negative, none)
- Ring Threshold Setting

Refer LED assignment diagram for Test 6 below.



Off Hook Status of an Attendant Phone - If the LED is lit, the attendant phone is off-hook. If the LED is not lit the attendant phone is on-hook.

Ring Voltage - If the LED is flashing, ringing is present, if the LED is not lit the phone line is idle.

Phone Line Current Polarity - If the Negative Polarity Indicator is lit, the current is negative. If the Positive Polarity Indicator is lit, the current is positive. If neither indicator is lit, no current is being detected.

Ring Threshold Setting - Pressing the UP button increments the ring threshold setting (to a maximum of 7). Pressing the DOWN button decrements the ring threshold setting (to a minimum of 0).

Off-hook Voltage Threshold Adjustment

If parameter 163 is set to 2, you can manually adjust the PL1877A's off-hook voltage threshold from ± 48 V to ± 6 V through Test 6. To accomplish this, press the DOWN and PATCH ON/OFF buttons simultaneously while the PL1877A is in Test 6. The PWR LED should begin flashing, indicating that the PL1877A has entered the off-hook adjustment. The remaining LEDs display a binary representation of the voltage currently on the phone line (maximum displayed voltage = 51 V).

1. Disconnect the PL1877A from the phone line.
2. Set an external dc power supply to the maximum voltage that the PL1877A should recognize as off-hook.
3. Connect this voltage across the PL1877A's TIP and RING (P404 pins 2, 3).
4. Press the DOWN and PATCH ON/OFF buttons simultaneously. The PL1877A samples the voltage and stores it as the new off-hook threshold, and then returns to the normal operation of Test 6.

To abandon the off-hook adjustment without changing the current threshold, press the UP and PATCH ON/OFF buttons simultaneously while the PWR LED is flashing. The new off-hook threshold does not change unless the value of parameter 163 is changed or the threshold is again modified through Test 6.

Test 7 – Active Line Swap

If the PL1877A is equipped with the second line option, the phone line used for all other tests may be selected by pressing the UP button. A DTMF “#” is routed out the active phone line. The least two significant LEDs (refer to the LED assignment diagram on page 13) give a binary indication of the phone line selected.

Test 8 – Network Tone Decoding

This test accesses the phone line and the three most significant LEDs (refer to the LED assignment diagram on page 13) indicate the detection of:

- Dial Tone - When dial tone is detected, LED 1 (the most significant LED, bit 7) lights.
- Busy Tone - When busy tone is detected, LED 3 lights.

Test 9 – HC11 DSP Communications

In this test, the HC11 and DSP communication paths are checked. The LEDs should display (in binary) the value 0–253. A binary 255 or 254 indicates an error has occurred.

Test 10 – HC11 DSP Communications

In this test, each radio input is assigned a corresponding LED to indicate its state (active or inactive). If the LED is lit, the input is active; if the LED is not lit the input is inactive. Beginning with the least significant LED, the LEDs represent:

- PTT Sense Input (P1 pin 6)
- Carrier Detect Input (P1 pin 13)
- PL Detect Input (P1 pin 12)
- Patch Inhibit Input (P1 pin 15)
- Squelch Detect (Reduction of RX white noise)
- General Purpose Input 1 (P1 pin 7)
- General Purpose Input 2 (P1 pin 16)
- General Purpose Input 3 (P1 pin 14)

Test 11 – TX Audio Port

In this test the circuitry associated with TPL and DPL paging is checked. Upon entry into this test, the PL1877A generates 1800 Hz at the parameter selected. Pressing the UP button increments the output level of the TPL or DPL signal. It also causes the new level to be saved to EEPROM.

Pressing the DOWN button decrements the output level of the TPL or DPL signal. It also causes the new level to be saved to EEPROM.

Pressing the UP and DOWN buttons simultaneously switches from MDC (not applicable) to TPL to DPL signal generation. The output level associated with the newly selected signaling type is written to the circuitry. The most significant LEDs display binary 2 for TPL paging and binary 3 for DPL paging.

Pressing DOWN and PATCH ON/OFF while in TPL paging advances to the next TPL tone frequency. Pressing this button combination while in DPL paging will have no effect.

Test 12 – RS-232 Diagnostic

This test requires that the TX and RX pins on the RS-232 port be shorted. In this test the PL1877A transmits alternating patterns of 1's and 0's and expects to receive the exact same patterns. If the pattern received matches the pattern sent, the four most significant LEDs will light. If the pattern does not match, the LEDs remain unlit. The four least significant LEDs display the test number during this test.

Test 13 – DTMF Decode on Un-accessed Phone Line

During this test, phone DTMF is decoded and displayed in the five least significant LEDs (0 is displayed as 0x10). The phone line is not accessed during this test.

Level Setting

A service monitor or communications system analyzer is required for level setting adjustments. Connect the radio's antenna connector to the communications analyzer and a 50-ohm load. Set the equipment to monitor deviation at the radio's transmit frequency.

It is necessary to enter the diagnostic test mode for some of the level setting. To enter diagnostic mode, press both the UP and DOWN buttons simultaneously. To step to another test once the diagnostic mode has been entered, press the PATCH ON/OFF button. To exit, press both the UP and PATCH ON/OFF buttons simultaneously. (For more information on diagnostic test mode refer to the Internal Diagnostic section in this manual.)

Transmitter Audio Level

The following procedure is for setting and measuring transmitter modulator/IDC circuit performance and overall quality of the landline to mobile audio.

Before proceeding, disable the Private Line encoder output of the transmitter, if used. This may involve removing the PL code plug in older model radios. For newer model radios, select a carrier squelch mode, if available, or temporarily program the station to generate carrier only without PL/DPL. If the PL STRIP function has been properly wired to the station, it is not necessary to perform the above mentioned procedure. Simply verify that the transmitter is not sending PL/DPL while testing.

Enter diagnostic Test 1 by pressing both the UP and DOWN buttons simultaneously. This procedure also activates PTT, and generates a 1000 Hz tone to the transmitter.

If the PL STRIP function has been wired to the station, the transmitter should key and cause the station to transmit without generating Private Line codes. Adjustment of the transmit level should be made by pressing the UP or DOWN buttons as needed to produce 60% system deviation. Adjust the level to produce 3 kHz deviation, as indicated by the deviation monitor, for standard 5 kHz deviation radios. For split channel, narrow-band radios, set the level to produce 1.5 kHz deviation.

After the desired deviation level has been achieved, press the PATCH ON/OFF button. The value set remains stored in memory unless it is again changed through an adjustment in Test 1. Exit the test by pressing the UP and PATCH ON/OFF buttons simultaneously.

Carrier Detect Adjustments

Logic Carrier Detect

If using the logic carrier detect input (most recent radios models use this mode) the parameters must be set as follows:

- 1** = 1 (RX audio is post de-emphasis, or speaker (muted) source.)
- 2** = 1 or 0 (Set to match the available level from receiver, refer to Receiver Input Audio Level.)
- 3** = 1 (External logic level carrier detect.)
- 4** = 1 or 0 (Must be set to match the logic polarity available from the radio. Consult the radio manual or programming software to determine the polarity of the logic carrier detect output.)

Other parameters must be set as the system requires. Verify the proper selection of RX audio source from the radio. Some radios, such as the GM300 and MaxTrac Series radios require the positioning of an internal jumper to select muted, post de-emphasized audio. (JU551 in the "B" position in these models.) Refer to the radio's technical manual for information on internal jumpers.

Enter diagnostic Test 3 by pressing both the UP and DOWN buttons simultaneously. Press the PATCH ON/OFF button until Test 3 is reached.

While in Diagnostic Test 3, ensure that the Carrier Detect Input LED (marked PWR for this test) goes on and off at the desired RF threshold levels (generally 10 to 12 dB sinad). The actual squelch sensitivity is determined by the radio in this case. Any adjustments to squelch sensitivity must be made with the radio. When complete, exit the Diagnostic Test Mode by pressing the UP and PATCH ON/OFF buttons simultaneously.

Internal Noise-Operated Squelch Adjustment

This procedure applies only if using the PL1877A internal noise-operated carrier detect. Its use requires that receive audio is taken from the discriminator or detector prior to any high-frequency filtering. The primary use for this method is Signal Search Simplex, where its use is required. Refer also to page 83 of this manual for the Signal Search Simplex mode. Ensure that these basic parameters are set as follows:

1 = 0 (RX audio source has been pre-emphasized.)

2 = 1 or 0 (Set to match available detector level, refer to Receiver Input Audio Level)

3 = 0 (Internal carrier detect.)

5 = 0 (Internal squelch selected.)

With the PL1877A in the idle state, with no RF signal applied, observe the BUSY LED. Adjust control VR201 marked SQL with a small screwdriver until the LED extinguishes. (This adjustment is accessible on the rear of the PL1877A housing.) Then, from the communications service monitor, generate a signal on the receive frequency, and verify that the LED lights at 10 to 12 dB sinad. Readjust the control as needed to obtain the desired level of squelch sensitivity. Finally, ensure that the LED extinguishes when the RF signal is removed.

General Description

The IAPS Software included on No. XAC4000B Programming Bundle Flash Drive is needed to program the features of your equipment. It allows entry of programming data into your personal computer for transfer to your equipment. The programmed data can be retrieved and edited, and printed in hard copy form for record-keeping.

Hardware/Software Requirements

This software is for use on PCs with Windows 95 or higher operating system (not compatible with Vista or Windows NT). The computer should have 8 Mb of memory, VGA or higher, with one serial port. Use 800 × 600 or higher resolution to optimize viewing.

Communication Port

Data is transferred via a serial communication port on the computer. The port must be RS-232 compatible, and either COM1, 2, 3 or 4 port on the computer can be used.

Connections

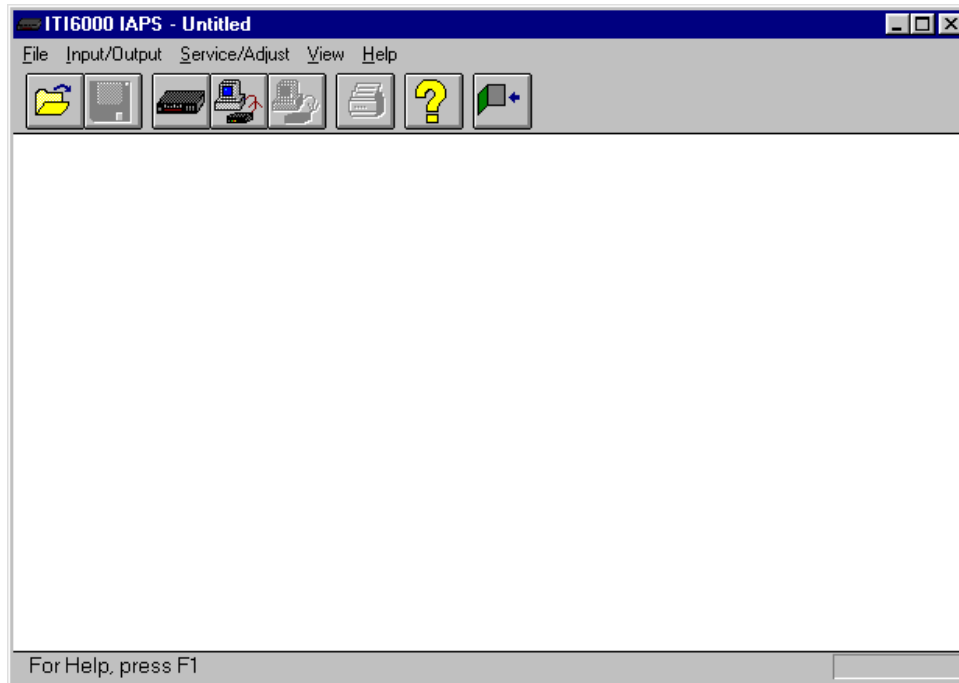
The PL1877A must be connected to your personal computer with the 25-pin D-connector cable (No. XAC0004A) before the programming software can be used. Connect the cable to the COM 1, 2, 3 or 4 connector on the computer. Connect the other end to the programming jack on the PL1877A.

Installing the Programming Software

Start the Windows program and ensure that all other applications are closed. Insert the No. XAC4000B Programming Bundle Flash Drive into the computer's USB port. Select the **Start** button and then select **Run** from the Start menu. At the prompt, type **x:/Setup.exe** where **x** represents the drive letter that is associated with your flash drive. A Card Suite icon should appear on the desktop display after successful installation.

IAPS Programming

To start the IAPS program, click on the IAPS Icon. This screen appears:



Editing Screens

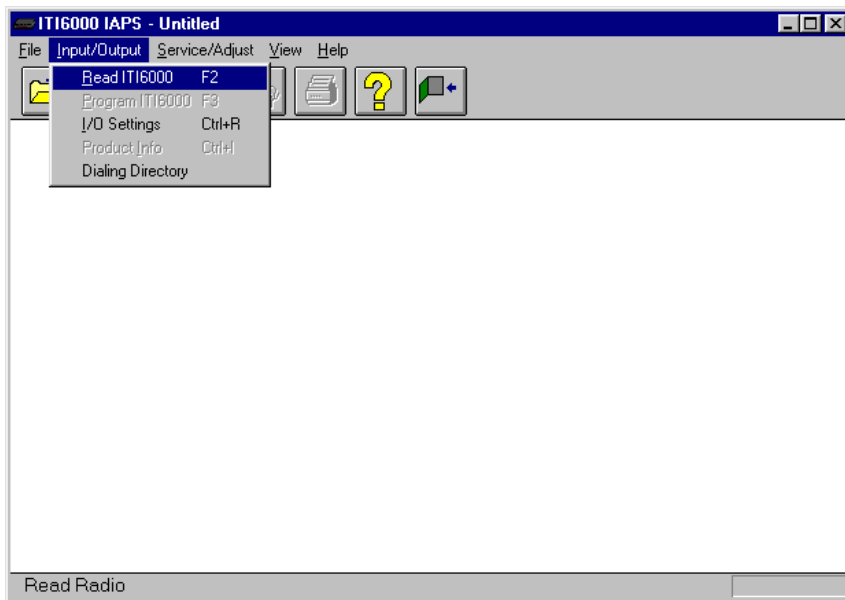
The status bar on the bottom of the window gives instructions for setting parameters. Editing some parameters depends on the state of another parameter. Most screens have “tabs” for selecting each set of parameters.

- Select tabs by clicking on the tab key.
- To select Next Page, press CTRL, TAB
- To select Previous Page, press CTRL, SHIFT, TAB

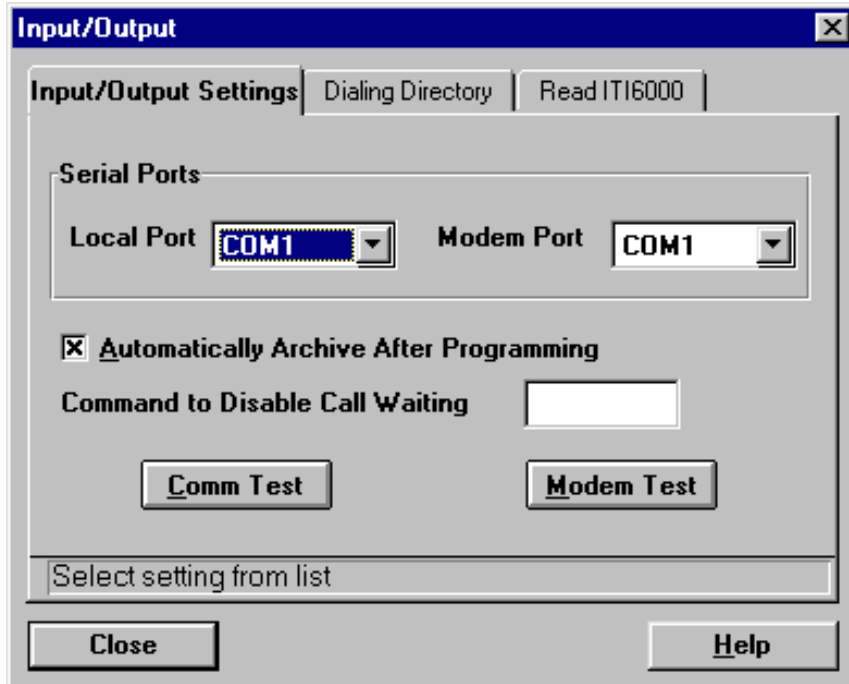
Input/Output

Input/Output - I/O Settings

When the main menu screen appears, click on Input/Output. This screen appears:



Click on the I/O Settings.



Serial Port Setup

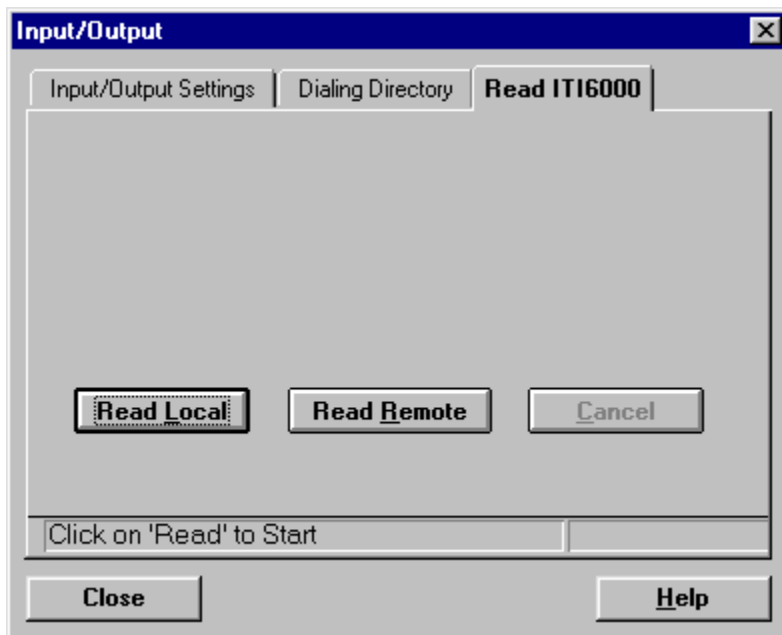
The PL1877A can be programmed from the Local Port or the Remote Port. This parameter must be entered to begin programming.

- If the PL1877A is installed in the same location as the computer used to program it, the serial port selected should be Local. Refer to Input/Output - I/O Settings - Local Reading on page 24.
- If the PL1877A is located at a remote location, a modem must be installed at the correct serial port. Select Modem Port. See the Modem Installation manual for complete information.

Make sure your COMM ports are connected properly.

Input/Output - I/O Settings - Read ITI6000A

- After the correct COMM port is selected, click on the Read ITI6000 tab.



NOTE: Once Read ITI6000 begins, you will not be able to close or switch from this window until the read either finishes or fails unless you click on Cancel.

- Select Read Remote for a remote (modem) installation.
- Select Read Local for a Local installation. Programming information about Read Local follows the Remote (modem) programming information on page 24.

When the progress bar reaches 100%, click on OK. The expanded main menu is now available that allows you to complete your IAPS programming.

Input/Output – I/O Settings - Read Remote

For Remote Programming, it is recommended that you have a telephone connected to the modem, or a modem with a speaker to monitor the connection process.

Call Waiting

If a modem is used, and the phone line being used has a Call Waiting feature, this feature must be disabled in the IAPS programming.

- To disable call waiting, enter *70. Although this is the standard Disable Call Waiting code, some local phone companies may use a different code. To verify *70 as the correct code, dial it on a phone connected to the phone line you will be calling from.
- A beep signifies it is the correct code.
- A busy signal means the code does not work. Check your phone book or call your local telephone company for information,

Paging

If the Paging option is enabled, these parameters must be set:

- Click on **Access/Release** under the main menu and select **Telephone Init**. Enable **Require * from Telephone User for Direct Access** for Line 1 and Line 2.
- Click on Basic Operational Settings and select Programming Privileges.

Enter the prefix to *#0 Telephone Line Programming Code - (Enter a code here if you want only those with an access code to be able to access the PL1877A parameters remotely. This code number must be entered as the Telephone Line Dialing Prefix, or the connection attempt will fail.)

After Call Waiting and Paging options have been programmed go to the Input/Output on the Main Menu.

Select Program, then click on Program Remote. The Dialing Screen appears. Select the desired dialing method.

If you want the computer to dial the PL1877A Interconnect phone number, select Enter Number. Type the PL1877A Interconnect telephone number at the Enter Number prompt. If applicable, enter the land-line access code.

If the PL1877A has a Remote Access Code, enter that number in the Land-Line Dialing Prefix field. Click on Dial. After the modem dials the number, listen for the remote PL1877A to answer. If using a telephone connected to the modem, pick up the telephone receiver and listen for the remote PL1877A to answer.

If dialing from a telephone connected to the modem, click on Manual Dialing, pick up the telephone, and dial the number of the remote PL1877A. Click on OK when the PL1877A connects, and then hang up. To ensure your parameters are saved after your programming session, make sure the Auto Archive box is checked.

Input/Output – Remote Programming -Dialing Directory

If there are multiple PL1877A installations, you have the option of storing up to 10 names, phone numbers and Telephone Line Access prefixes in the Dialing Directory. These can be selected and dialed directly from the screen entries.

To store entries in the directory, enter up to 16 digits/symbols. Valid entries are:

0-9, A-F, *, #	Standard DTMF digits
-, ()	Dash, open and close parenthesis
, (comma)	2-second pause
@	1 or more rings, then wait 5 seconds
!	Flash hook
0-9, A-D	Telephone line dialing prefix (6-digit access code allowing remote access to PL1877A)

When Remote Programming is completed, select Program Remote and click on OK after the progress bar reaches 100%.

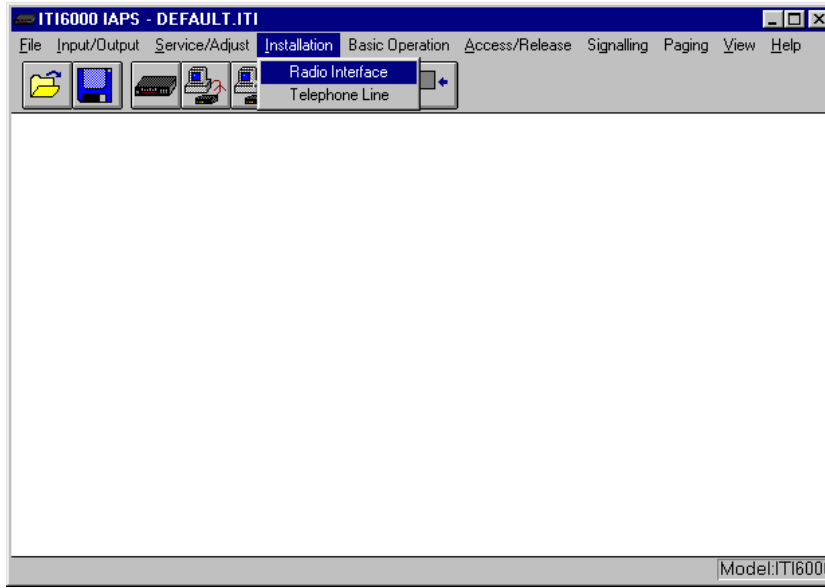
NOTE: If the IAPS only programs a partial program (because the user canceled or it failed before the program was completed), default parameters are reloaded.

Input/Output – Read Local

After selecting the Read ITI6000A tab, click on Read Local. The LEDs on the front of the PL1877A strobe, and then the PWR and BUSY LEDs remain illuminated. Click on OK after the progress bar reaches 100%.

After the Read ITI6000A tab menu has been completed, you are now ready to continue programming the necessary parameters.

Installation



Installation – Radio Interface Parameters

These parameters must be set:

RX Audio Source

Allows the installer to match the RX audio source. Choices are Detector/Discriminator audio, prior to de-emphasis, or from Speaker audio, after the de-emphasis circuit.

Use of the internal noise-operated squelch circuit requires the audio source be derived from the detector (or discriminator). Select Detector/Discriminator audio.

Use of the RX audio VOX for carrier detect requires speaker (muted) audio for its source. Select Speaker audio.

RX Audio Input Level

Allows the installer to match the available receive audio level.

High level discriminator/detector is $0.45 V_{RMS} \pm 8 \text{ dB}$.

Low level discriminator/detector is $80 \text{ mV}_{RMS} \pm 8 \text{ dB}$.

High level speaker is $2.5 V_{RMS} +6 \text{ dB to } -8 \text{ dB}$.

Low level speaker is $0.45 V_{RMS} \pm 8 \text{ dB}$.

Carrier Detect Source

Determines the method for carrier detection.

- Use of (noise operated) Internal Squelch requires discriminator detector audio.
- Use of RX Audio VOX requires that the source of receive audio is muted i.e., speaker audio. The external logic carrier detect also requires that the polarity match the radio's logic carrier detect output. Some radios require internal jumper changes to select the RX audio source - discriminator or speaker audio. Refer to the radio manual for specific help on jumper settings.

External Logic Carrier Detect Polarity

If Carrier Detect Source has been set to external, this determines the polarity of the Logic Carrier Detect Input as active low or active high.

CTCSS Validation of Carrier

Disables or Enables validation of the carrier detect by CTCSS detect input.

- Carrier squelch only systems should have this parameter disabled.
- If enabled, the CTCSS detect input polarity must also be set to match the radio.

CTCSS Detect Input

Sets the CTCSS detect input polarity as either active high or active low. This must be set to match the polarity of the radio whenever CTCSS validation of carrier is selected.

PTT Sense Input

Allows selection of the polarity of the PTT Sense Input as either active high or active low.

Patch Inhibit Input

Determines the polarity of the patch inhibit input as either active low or active high. If the patch inhibit is not used, leave set to active low.

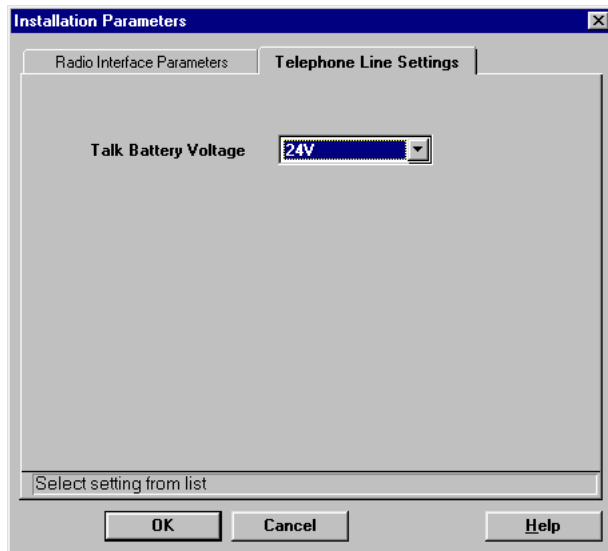
GPI-1 Input

Determines the polarity of the general purpose input as either active low or active high. Valid only if the GPI-1 input has been enabled.

RX Audio 2175 Hz Notch

Allows enabling of a 2175 Hz notch filter in the path between RX audio and phone line audio and is for special applications only.

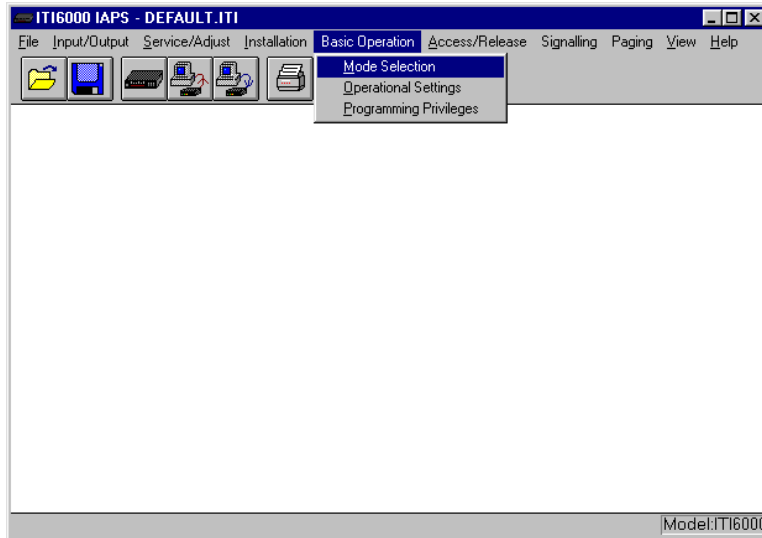
Installation – Telephone Line Settings

**Talk Battery Voltage**

Select the talk battery voltage as 48 V or 24 V, depending on what is supplied by the local phone system or PABX, as applicable. It will determine the off-hook threshold of the interconnect. Select Manual Set to allow the user to specify the off-hook voltage threshold via the IAPS or Diagnostic Test 6 in the PL1877A.

See Also: Off Hook Threshold.

Basic Operation



Basic Operation – Mode Selection

Mode of Operation

Selects between Half Duplex, Signal Search Simplex, or Enhanced VOX Simplex modes.

- Half Duplex should be chosen when the unit is directly attached to a repeater station.
- Signal Search Simplex is selected when the Interconnect is installed at your base station. It requires the transmit-to-receive turnaround time be less than 50 ms to avoid clipping of words during the receive sample period.
- Enhanced VOX Simplex is normally chosen when the unit is attached directly to a control station.

Signal Search Period

Contains the control value for the signal search frequency - the number of times per second that the base station reverts to the receive mode to check for a mobile carrier. It applies only when the signal search simplex is the selected operational mode. The range is 250–2500 ms in 25 ms increments.

Signal Search Duration

This is the time interval in which the base station reverts to the receive mode to check for a mobile carrier detect. Applies only to the signal search simplex mode. The range is 15–100 ms in 5 ms increments.

Enhanced VOX Ticks

If enabled, short attention-getting “ticks” are sent to the landline party upon initial access on mobile originated calls. These ticks allow time for the mobile operator to inform the landline party that they cannot speak while the mobile is speaking. It is applicable only when Mode of Operation is Enhanced VOX.

Enhanced VOX Telephone Line Transmit Timer

Limits the continuous, uninterrupted talk time from the landline to mobile to 30 seconds. This allows the mobile to maintain control of a simplex radio patch. Its use is required by Federal rules in most cases. Consult applicable regulations before disabling.

It is applicable only when Mode of Operation is Enhanced VOX. The default for the Enhanced VOX Transmit Timer is enabled.

Enhanced VOX Receive Recovery Delay

Determines "dead time" between station transmit and receive mode. This is necessary to allow time for the station receiver to fully recover after PTT is released (the landline user pauses). An insufficient delay time may cause false carrier detects to the interconnect. It is applicable only when Mode of Operation is Enhanced VOX.

Enhanced VOX Delay

The time telephone line audio is delayed before being presented at the TX audio port. Delay time may be set to the minimum time that will ensure no loss of syllables due to transmitter turn-on times and/or delays. Normally, it is set to 500 ms. It is applicable only when Mode of Operation is Enhanced VOX. The valid range is 0–500 ms.

VOX Detection Threshold

Alters the Enhanced VOX detection threshold. The threshold is the minimum level required to activate the transmitter PTT. High is –30 dBm; low is –45 dBm. It is applicable only when Mode of Operation is Enhanced VOX.

10 dB Extra Gain for Phone Audio

This can be selected to boost the phone audio level, if necessary. Applicable only when Mode of Operation is Enhanced VOX.

Basic Operation – Operational Settings

Mobile Call Origination

Enables or disables Mobile Call Origination.

Telephone Line Call Origination

Enables or disables Land-Line Call Origination.

Attendant Call Origination

Enables or disables Attendant Origination of calls to a mobile. The attendant phone must be parallel connected; one that shares a common line with the interconnect.

“Over” Beep

Controls the “Over” Beep to telephone users. When enabled, this beep tone occurs when the mobile de-keys to let the landline party know that it is their turn to speak.

Mobile “Go-Ahead” Beep

Controls the mobile go-ahead beep if Enhanced VOX is the selected mode of operation. This beep tone lets the mobile user know the landline party has paused and it is the mobile user's turn to speak.

Basic Operation – Programming Privileges

Remote DTMF Parameter Modification

Enables or disables the ability to modify parameter using a remote DTMF telephone or other DTMF source.

Modem Parameter Modification

Allows or disallows modification of parameters via modem.

Mobile Parameter Modification

Determines whether the modification of parameters from a mobile (equipped with a DTMF keypad) is allowed.

Prefix to *#0 Mobile Programming Code

Contains the 0–6 digit prefix to the *#0 mobile command. The valid range of each digit is 0–9, A–D.

Prefix to *#0 Telephone Line Programming Code

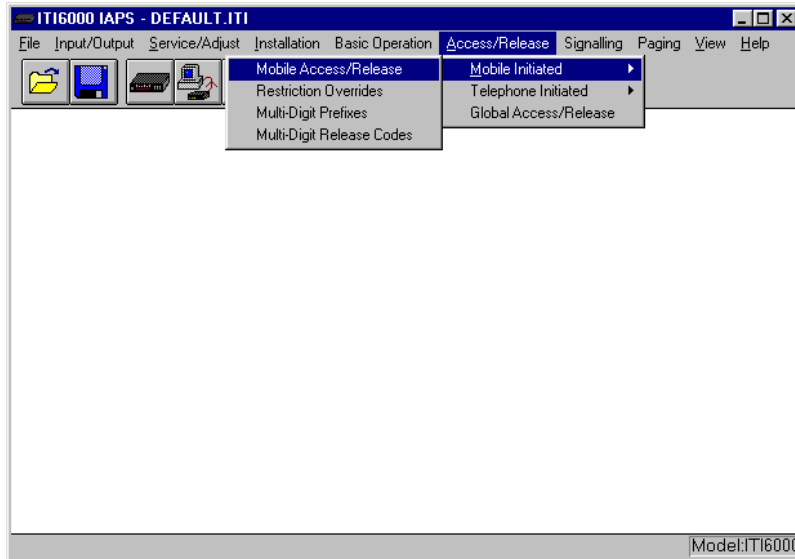
If enabled, enter as a prefix to one of the land-line programming commands.

*#0 is used for DTMF parameter programming

*#1 is used for modem IAPS parameter programming

Either *Remote DTMF Parameter Modification* or *Modem Parameter Modification* must be enabled in order for a code to be entered. The valid range of each digit is 0–9, A–D.

Access/Release Settings



Access/Release – Mobile Initiated – Mobile Access Release

Access Command

Allows selection of a Mobile Access Command. The choices are * or #*. The #* command may be better in systems sharing a radio channel with other users who may have an interconnect on their radio system. It may also help prevent accessing via “pseudo DTMF” character (*) generated by certain voice characteristics.

Normal Release Command

Allows selection of the Normal Release Command as # or ##.

Mobile Access to Busy Phone Line

When enabled, allows mobile users to access an off-hook telephone line with a *** command, making emergency interruptions of calls in progress to or from the attendant phone possible.

Require Multi-Digit Prefix

Restricts patch access to multi-digit prefix users. It can only be edited if there is at least one Multi-Digit Prefix or Wildcard code.

Require Multi-Digit Release after Multi-Digit Access

Ties together multi-digit access prefixes and release codes. If tied together, the user entering the multi-digit access prefix must enter a corresponding multi-digit release code to disconnect.

Multi-Digit Release Codes - Prefix/Suffix

Determines whether the Multi-Digit Release Codes will be a suffix or a prefix to the release command.

Bypass Multi-Digit Access Command

Allows the “answer if called” mobile command (*#*) or Access Command (*) to bypass the multi-digit access code if a landline call is waiting to be answered.

Wildcard Access/Release Code

Allows the user to edit the 0 to 6-digit wildcard code. The valid range is 0–9, E, F, #, *. Wildcard characters (characters that are variable and supplied by the mobile user) are specified by F or #. Capcode wildcards are specified by E or *. See the “Operation” section for more information about these codes.

Answer via Carrier Burst Detection (“Triple Key”)

This allows the user to specify whether to allow mobile to answer an attendant or landline originated call via carrier burst detection. If a mobile user sends three carrier bursts within a 3-second window, the PL1877A accesses the phone line.

Disconnection on Phone Line Current Reversal, Mobile Origin

Enables/disables the automatic disconnect of a mobile originated call in case of a loss of telephone loop current or phone line current reversal. The loss of loop current on current reversal occurs whenever the landline party hangs up the telephone on many telephone systems. Not all phone systems support this feature.

Number of Busy Cycles Detected Before Disconnect

If set to zero, busy signaling will not cause disconnection. If not set to zero, the parameter determines how many cycles of network busy signals are required to cause disconnection during a mobile originated call.

Access/Release – Mobile Initiated – Mobile Access Release - Security Code Overrides

This screen allows editing of parameters applicable to the General Override Features and Overrides for each of the four Multi-Digit Prefixes.

NOTE: When setting overrides for individual Multi-Digit Prefixes, a switch can only be set if the corresponding General Override Switch is enabled.

Mobile Origination

When the PL1877A is programmed such that mobile call origination is not allowed, users of this multi-digit prefix/security code will nevertheless be allowed to originate calls.

Reset Overall Access Timer

When the PL1877A is programmed such that mobile users are not allowed to reset the access timer (via the command), users of this multi-digit prefix/security code will nevertheless be allowed to do so.

Accessing Busy Phone Line

When the PL1877A is programmed such that mobile users cannot access an off hook phone line (via the command), users of this multi-digit prefix/security code will nevertheless be allowed to do so.

Manual Dialing Restriction

When the PL1877A is programmed such that mobile users can place auto-dial calls only, users of this multi-digit prefix/security code will nevertheless be allowed to do so.

Redialing Restriction

When the PL1877A is programmed such that automatic redialing is disabled, users of this multi-digit prefix/security code will nevertheless be allowed to use the ** redial command.

Auto-dial Restriction

When the PL1877A is programmed such that auto-dial is disabled, users of this multi-digit prefix/security code will nevertheless be allowed to place auto-dial calls.

Override Restriction Starting with 0

When the PL1877A is programmed such that phone numbers starting with 0 cannot be dialed, users of this multi-digit prefix/security code will nevertheless be allowed to dial them.

Override Restriction Starting with 1

When the PL1877A is programmed such that phone numbers starting with 1 cannot be dialed, users of this multi-digit prefix/security code will nevertheless be allowed to dial them.

Override Restriction Starting with 9

When the PL1877A is programmed such that phone numbers starting with 9 cannot be dialed, users of this multi-digit prefix/security code will nevertheless be allowed to dial them.

Override Restriction of Length of Numbers

When the PL1877A is programmed such that mobile users can only dial phone numbers with a quantity of digits $<N$, users of this multi-digit pre-fix/security code will nevertheless be allowed to dial numbers with a quantity $\sim N$.

Toll Restrict Prefixes 1–8

Disables the override restriction on each of the eight toll restriction prefixes.

Access/Release – Mobile Initiated - Multi-Digit Prefixes

Multi-Digit Prefixes (4 allowed)

Each of these four prefixes contains a 1 to 6-digit multi-digit access prefix. The valid range of digits is 0–9.

Multi-Digit Override Switches

Each multi-digit prefix code can be programmed to override certain restrictions on a mobile originated call. This allows assignment of specific privileges to groups of mobile users. (Each group can be given its own multi-digit access prefix code.)

NOTE: A restriction can only be overridden by entry of the security code. See also: Security Code Overrides.

Access/Release – Mobile Initiated - Multi-Digit Release Codes

General Multi-Digit Release Code

Contains the 6-digit general multi-digit release code. The valid range for each digit is 0–9, A–D.

Multi-Digits Release Codes

Each one of these four multi-digit release codes contains the 6-digit code that corresponds to a multi-digit access prefix. The valid range for each digit is 0–9, and A–D.

Access/Release – Telephone Initiated - Direct Access

Telephone Line Direct Access - Lines 1 & 2

Enables/disables the telephone line direct access feature. Telephone line direct access allows a telephone user to be placed directly on the air without any mobile intervention. It works in conjunction with the Direct Access Timer.

Telephone Line Access Prefix

The 0 to 6-digit prefix to * command.

See also: Require * from Telephone Line User for Direct Access - Lines 1 and 2

Require * from Telephone Line User for Direct Access - Lines 1 and 2

For telephone lines 1 and 2, this determines whether * command is required from a landline user before allowing direct channel access and applies for paging input also.

Attendant Direct Access

Enables/disables the attendant direct access feature. Direct access from the Attendant phone (a parallel connected telephone instrument) allows the attendant to talk directly to a mobile without mobile intervention. It works in conjunction with the Direct Access Timer.

Attendant Access Prefix

The 0 to 6-digit prefix to * command.

See also: Require * from Attendant for Direct Access.

Require * from Attendant for Direct Access

Determines whether the DTMT * command is required from the attendant user before allowing either a direct channel access or paging input.

Direct Access Timer

Determines overall talk-time permitted from the landline caller to the mobile before automatic disconnect occurs. Applicable only if direct access is enabled.

Revert to Overall Timer on Detection of Carrier

If enabled, the PL1877A will switch from direct access time to overall access time (which is considerable longer) if mobile activity is detected during a direct access call.

NOTE: If Wildcard access is required to perform this function in conjunction with the paging option, this parameter is ignored.

CTCSS Strip Output During Direct Access Time

Controls whether CTCSS/CDCSS is sent with the voice message during the direct access time. It applies only if the Direct Access parameter is also enabled. When enabled, it allows semi-private pages on the radio channel. Mobile units with microphones on-hook will not be aware of the voice page. Only the mobile unit that the voice page was directed to hears the page (unless a mobile is in the monitor mode).

Emergency Call Direct Access

Enables/disables the Emergency Call Direct Access feature. Emergency Call Direct Access allows a land-line or attendant to gain direct access (via the *** command) when direct access is disabled.

Mobile Ring Signaling

Enables/ disables mobile ring signaling prior to direct channel access.

Access/Release – Telephone Initiated - Misc. Access/Release

Disconnection on Phone Line Current Reversal, Land-Line Origin

Allows the installer to enable/disable the automatic disconnect of a land-line originated call in case of a phone current reversal or loss of loop current. Many phone systems use this feature to indicate the landline party has hung up, facilitating automatic disconnect of the equipment. Not all phone systems support this feature; check with your local telephone company.

Disconnection upon Detection of Dial Tone after Access

If enabled, the PL1877A disconnects if dial tone is detected during a landline originated call.

Land-Line Disconnect with DTMF Release Command

Allows or disallows the ability of a landline user to disconnect a mobile-originated call using the DTMF # command.

DTMF 1 upon Auto Phone Line Access

Enables/disables a DTMF 1 answer tone of 100 ms in duration upon automatic telephone line access (Direct Access). Some automatic systems have the capability to decode the DTMF 1 as an indication of answer signal. Enabling this feature allows interconnect compatibility with this equipment.

Time between Answering Call & Generating Beep

Determines the delay between automatic phone line access and beep tone generation. The value ranges from 500 ms to 1250 ms in 50 ms increments.

Access/Release – Global Access/Release

Station/Repeater Control Mode Enable

Controls the Station/Repeater Enable Mode feature. If enabled, a mobile can enable the base station or repeater remotely via a chosen prefix, followed by a ****#** command. This prefix, consisting of 1–6 digits, must be programmed in.

Station/Repeater Enable Prefix Code

Prefix to the ****#** Station/Repeater Enable command. It applies only if the Station/Repeater Enable mode is active.

Mobile Inactivity Control

The maximum allowable pause in mobile activity during a conversation. Normally, this parameter should be set to a maximum of 3 minutes. Consult applicable local rules before disabling. Its use prevents the interconnect from tying up the phone and radio system if the mobile drives out of range or is otherwise unable to drop the patch.

Overriding Access Time Limit by Mobile Command

When enabled, a mobile user can prevent the overall access time from expiring by using the ******* command.

Resets Access Timer to

Determines whether the ******* command resets the access time to 1 minute or to the overall access time limit.

Overall Access Time Limit

Valid range is 1 to 59 minutes of total access time before automatic disconnect occurs.

Time-Out Tick Duration

Determines the length of time prior to disconnect that time-out warning ticks are initiated. Valid range is 0–59 seconds. If set to 0, time-out ticks are disabled.

Control of External Devices via Security Code

When enabled, the monitor output will be activated upon reception of the security code. The monitor relay must not be used for any other function, that is, it must not be wired to enable MONITOR. Not applicable with VOX carrier detect method.

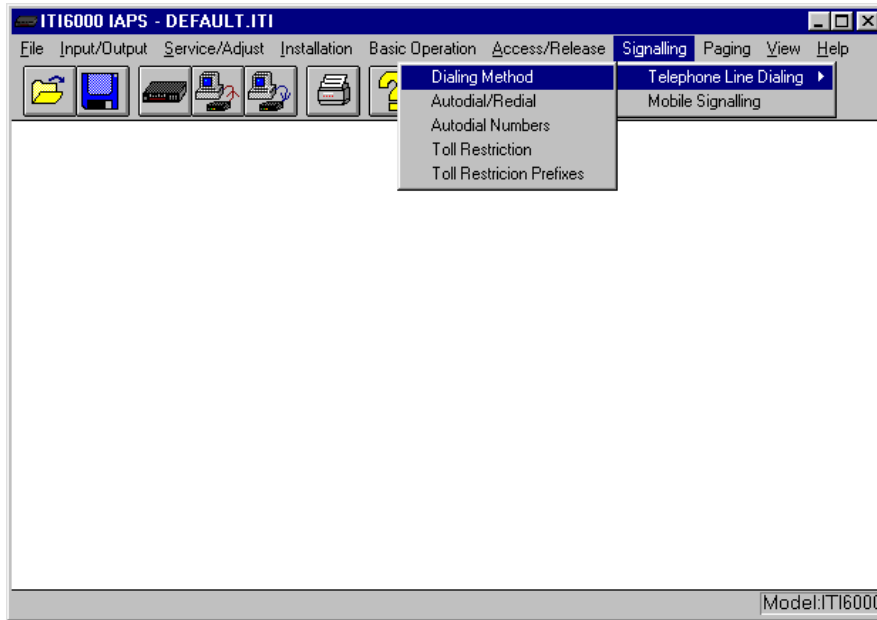
Security Code

Allows privileged users to enter a 6-digit security code to override some unit functions. The valid range for each digit is 0–9.

CTCSS Strip on Access

Determines whether the TX CTCSS disable output is automatically activated at the beginning of a conversation. If enabled in a system that uses CTCSS, limited privacy is afforded to the mobile, as other mobiles on hook will not hear the telephone conversation.

Signaling



Signaling – Telephone Line Dialing – Dialing Method

Telephone Line Dialing Type

Chooses the type of landline out-dialing compatible with the available telephone service. The default is DTMF.

Mobile DTMF Regeneration

Determines whether regeneration of DTMF numbers occurs during dialing. If disabled, all valid DTMF digits are simply passed through to the telephone line unprocessed or un-regenerated, except for auto-leveling (i.e., transparent). Disabling allows certain controls characters, such as the * and #, to pass through to the phone line to support special applications. These applications include local PABX paging, call transfers, etc. For most applications, this should be enabled to ensure accurate dialing. When enabled, only digits 0–9 and A–D are regenerated.

Pseudo DTMF Regeneration

Controls regeneration of DTMF after mobile dialing is ended. If enabled, additional DTMF digits after the cut-through timer expires will be regenerated. It also mutes the receive audio for the duration of the cut-through delay. If disabled, additional DTMF digits from the mobile are passed through un-regenerated.

DTMF On Time for Telephone Line Dialing

Selects the DTMF digit On-Time (i.e., the duration of the regenerated DTMF burst) sent to the telephone network during dialing. The valid range is 50–450 ms. Adjustable on-time allows the interconnect to work with telephone systems that require longer DTMF bursts. This parameter is only available if the Land-Line Signaling Type is set to DTMF.

Rotary Pulse Dial Rate

This is only available if the Land-Line Signaling Type is set to Pulse.

Mobile Audio Cut-Through Delay

Alters DTMF inter-digit time allowed to mobile users during manual dialing. After the time expires, receive audio is cut-through to the landline party.

This timer prevents direct pass-through of DTMF digits from the mobile, (i.e. non-regenerated) which can cause wrong numbers to be dialed.

Signaling – Telephone Line Dialing -Autodial/Redial

Autodial Feature Enabled

Determines whether a mobile can use the Auto-dial feature. If disabled, the mobile can only dial phone numbers manually.

Restrict Mobile Users to Autodial Numbers

Restricts mobile users to using only the autodial feature when dialing telephone numbers. This equates to placing a restriction on manual dialing telephone numbers for mobile users.

Mobile Modifications of Autodial Numbers

Determines whether mobiles are allowed to modify autodial numbers.

Redial

May be enabled or disabled. The last number dialed is automatically re-dialed if enabled when the mobile accesses the interconnect with a ** command instead of a single *. Any applicable multi-digit prefix must still be entered from the mobile.

Autodial Number Pause Time

Sets the duration of the pause in dialing that occurs whenever a pause character is encountered in an autodial number.

Signaling – Telephone Line Dialing – Auto-dial Numbers

Toll Restrict Prefixes			
Dialing Method	Autodial Parameters	Autodial Numbers	Toll Restriction Parameters
#1	18882549155	#9	
#2	19019474000	#10	
#3	16107771374	#11	
#4	18004921212	#12	
#5		#13	
#6		#14	
#7		#15	
#8		#16	
			#17
			#18
			#19
			#20
			#21
			#22
			#23
			#24
			#25

Enter up to 20 digits. Enter 0-9, A-F, #, or *

OK Cancel Help

There are 25 autodial numbers available. Each number is allowed a maximum quantity of 20 digits.

If the Land-Line Signaling Type is DTMF, the valid digits are 0–9, A–D, E(*) for pause, and F(#) for revert. For pulse dialing, valid digits are 0–9 and *. A # may be followed by any DTMF digit (0–9, A–F).

Signaling – Telephone Line Dialing – Toll Restriction

Allow 9 as First Digit of Phone Number

Dialing of phone numbers beginning with the digit 9 can be enabled/disabled. This feature is useful in prohibiting outside calls from a PABX.

Allow 1 as First Digit of Phone Number

Enables/disables use of number 1 as the first digit of a telephone number. This is useful in restricting mobiles to local or non-toll calls.

Allow 0 as First Digit of Phone Number

Allows or disallows use of the number 0 as the first digit of a telephone number. When disabled, prevents mobiles from abusing operator-assisted calling.

Toll Restrictions Apply to Autodial

Determines whether toll restrictions apply to auto-dial numbers.

Maximum Length of Telephone Numbers

Determines the maximum length (number of digits allowed) of a mobile originated telephone number. Valid range is from 1–20.

Signaling – Telephone Line Signaling Toll Restriction Prefixes

Toll Restrict Prefix (8 allowed)

Allows the user to enter a 4-digit toll restrict prefix. The valid range is from 0–D.

First & Second Number Excluded from Toll Restriction

Each of these parameters contains a 9-digit telephone number or prefix exempted from toll restrictions. If the Land-Line Signaling Type is DTMF, the valid range for each digit is 0–9, A–D. If pulse, the range is 0–9.

Emergency Access Number

Contains the 4-digit emergency access number excepted from toll restriction. The valid range for each digit is 0–9, A–D.

Signaling – Mobile Signaling – Ring Signaling

Enable Multiple Ringing to Mobiles

Enables/disables multiple ringing to mobiles. The default is one ring signal event to the mobile.

Frequency of Ring Signal Generated to Mobile

Permits the sound of the ring signal sent to the mobiles to be customized. Choices are Low or High frequency pairs of tones. The high-frequency pair may be advantageous in high-noise environments. The low-frequency pair may be more pleasant in quiet environments.

Rings Detected on Telephone Line before Mobile Signaling

Determines the number of rings the unit must receive from the landline before generating ring signaling to mobiles. Valid range is 1–9.

Signaling Pretime

Selects the time for signaling pretime, the period between PTT and generation of the first tone. This delay ensures a complete RF path is established before signaling commences.

Station Identifier

NOTE: The terms SID (Station Identifier) and CWID (Continuous Wave Identifier) are used here interchangeably.

SID on Patch Release

Enables/disables automatic transmission of Station ID (using Morse Code) on patch release. The station call identifier (letters and numbers) must also be programmed into its designated parameters.

SID Only After Station PTT

If enabled, the SID will be generated only if a station PTT has occurred since the last SID. If disabled, the SID will be generated regardless of whether station PTT occurred.

SID Transmission Time Cycles

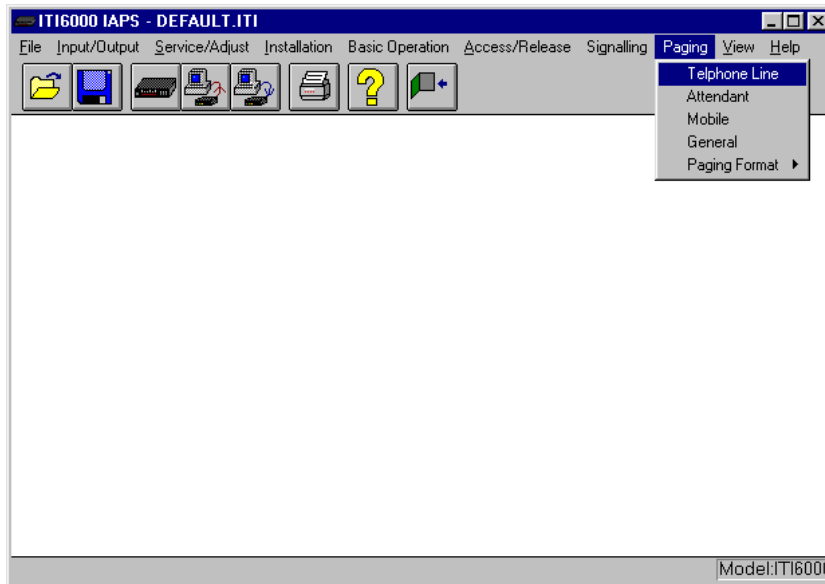
Edits the time between automatic Station ID transmissions. Valid range is 0–59 minutes. If set to 0, automatic, periodic CWID is disabled.

Station Identification

Contains the one to 12-digit Station ID. This ID is transmitted (in Morse Code) automatically at the pre-set time if the CWID is enabled. Valid values are:

0 to 9	A to Z	a to z	-	,	.	/	_ (to represent a space)
---------------	---------------	---------------	----------	----------	----------	----------	---------------------------------

Paging



Paging – Telephone Line

Paging Enabled from Telephone Line – Lines 1 & 2

Enables/disables access to the paging option from a landline originated call.

Telephone Line Group Calls Enabled

Enables the ability of landline users to cause generation of 2-Tone group calls.

Number of Digits Accepted from Telephone Line

Determines the number of digits accepted from landline user for paging. The range is from 0 to the maximum allowed by the Paging Format.

Pulse Dial Decoding – Telephone Line

Determines whether rotary (pulse dial) phone can be used to input paging digits.

NOTE: The telephone network must support pulse dialing throughput. Many electronic central office switches will disconnect a call if over-dialing is attempted in rotary, or pulse mode after the call is complete. Make sure the system supports this mode before enabling.

Paging – Attendant Paging

Paging Enabled from Attendant

Enables or disables the ability of an attendant to use the paging feature of the interconnect. The “attendant” is a parallel connected telephone instrument.

Attendant Group Calls Enabled

Enables the ability of attendant users to cause generation of 2-Tone group calls.

Number of Digits Accepted from Attendant

Determines the number of digits accepted from attendant for paging. The range is from 0 to the maximum allowed by the Paging Format.

Paging – Mobile Paging

Mobile Revertive Paging Enabled

Determines whether a mobile can use the paging feature to signal another mobile.

Mobile Group Calls Enabled

Enables the ability of mobile users to cause generation of 2-Tone group calls.

Number of Digits Accepted from Mobile

Determines die number of digits accepted from mobile user for revertive paging. The range is from 0 to the maximum allowed by the Paging Format.

Paging – General Paging

CTCSS Strip Output for Paging Tones

When enabled, causes CTCSS Stripping during transmission of paging tones. Other radio channel users (i.e., with microphones on-hook) are not annoyed by the paging call tones or data.

6 dB/octave De-Emphasis of Paging Tones

Enables/disables the 6 dB/octave de-emphasis (or reverse pre-emphasis) of paging tones. (Applies to transmit only.) Enabling increases the amplitude of the low-frequency tones when audio is injected into the (EIA) microphone input of the station. Higher modulation of the transmitter during signaling occurs, counteracting the effect of pre-emphasis. Pre-emphasis, which primarily benefits only voice audio, takes place in the IDC circuit.

Paging Format

Selects a Paging Format type.

Action to Take on Input Error from Telephone Line

Selects the type of action to take when the time allotted for receiving the first paging digit expires or improper telephone line dialing is received.

Mobile Answer Timer after Paging Tones

Determines the time allowed for a mobile to answer a page. This time is measured from immediately after the page is transmitted.

Phone Line/Attd DTMF Dialing Inter-digit Time

Selects the time allowed between individual digits entered as paging input.

Number of Times to Repeat Paging

Determines the number of times to repeat the page. The valid range is 0–8. Consult applicable rules before exceeding one signal event.

Paging – Paging Format - DTMF Paging Parameters

DTMF Outpulse Timing

Determines the duration of the DTMF digit/inter-digit time.

DTMF Paging Preamble

Contains a DTMT preamble of up to nine digits for paging.

Paging – Paging Format – 1500 Paging Parameters

1500 Paging Tone Off Time

Each 1500 digit consists of an ON time and OFF time. The OFF time is programmed here, the ON time is 100 ms minus the OFF time.

1500 Paging Preamble

Allows a user to enter a 1500 Preamble, up to nine digits, for paging.

Paging – Paging Format – 2805 Paging Parameters

2805 Paging Tone Off Time

Each 2805 digit consists of an ON time and OFF time. The OFF time is programmed here, the ON time is 100 ms minus the OFF time.

2805 Paging Preamble

Allows a user to enter a 2805 Preamble, up to nine digits, for paging.

Paging – Paging Format Plectron Paging Parameters

Plectron Paging A Tone Length

Selects the duration of the first tone of a Plectron paging sequence. Valid settings are 0.5–4.5 sec in 0.5 sec increments.

Plectron Paging B Tone Length

Selects the duration of the second tone of a Plectron paging sequence. Valid settings are 0.5–4.5 sec in 0.5 sec increments.

Plectron Paging Digits

If less than four digits are required as input from the land-line/attendant/mobile user, the remaining digits are supplied here. For example, if one digit were required from the telephone user, the first three capcode digits would be taken from this field. This is not applicable to multi-mode paging. The value of the first two digits cannot exceed 35. The remaining digits can have values 0–9.

Paging – Paging Format – 2-Tone Paging Parameters

2-Tone Paging (A & B) Tone Length

Selects individual tone duration in a 2-Tone paging sequence.

2-Tone Codeplan

Selects the codeplan for 2-Tone paging.

2-Tone Paging Digits

If less than three digits are required as input from the land-line/attendant/mobile user, the remaining digits are supplied here. For example, if one digit were required from the telephone user, the first two capcode digits would be taken from this field. This is not applicable to multi-mode paging.

Paging – Paging Format – 5-Tone Paging Parameters

5-Tone Diagnostic

Enables the 5-Tone diagnostic mode. The diagnostic mode extends the duration of individual tones to one second in length. Specific frequencies can then be measured with a frequency counter or other instrument.

NOTE: This parameter must be reset after testing is completed.

5-Tone Dual Addressing

Enables dual addressing in 5-Tone Paging.

5-Tone Paging Preamble

Selects the preamble for 5-Tone Paging. Choose from the list of available options to match the requirements of the mobiles or portables.

5-Tone Paging Digits

If less than five (or six, if Dual Addressing is enabled) digits are required as input from the land-line/attendant/mobile user, the remaining digits are supplied here. For example, if one digit were required from the telephone user, the first four or five digits would be taken from this field. This is not applicable to multi-mode paging. Six digits are allowed if 5-Tone Dual Addressing is enabled; five if it is not. If 5-Tone Dual Addressing is enabled, the sixth digit must either be a 0 or a 1.

Paging – Paging Format – Multi-Mode Paging Table

The top portion of the screen allows modification of the Multi-Mode Paging table, with up to 100 entries. Select the entry to modify from among Paging Table Entries. Pressing the Edit button selects that entry and its settings appear in the lower portion of the screen.

Paging Format

Allows selection of the type of paging for the corresponding user ID.

Codeplan/Preamble

Allows the user to select a codeplan for 2-Tone paging or a preamble tone for 5-Tone paging.

Capcode

Allows the user to enter the capcode for the selected signaling type. The number of capcode digits depends on the selected signaling type. All the capcode digits must be entered. For 2-Tone, three digits are allowed with valid range of 0–9.

- For DTMF, 15 digits are allowed with valid ranges 0–9, A–F, #, *.
- For 2805 and 1500, 15 digits are allowed with valid ranges 0–9.
- For Plectron, four digits are allowed. The first two digits cannot be larger than 35. The others have a valid range 0–9.
- For 5-Tone, five digits are allowed if Group Calls is disabled; six digits if Group Calls is enabled (with the sixth digit as either 0 or 1. The valid range for each digit is 0–9.

NOTE: Editable only if Paging Format is not set to either CTCSS or CDCSS.

ID

Select a CTCSS or CDCSS tone/code.

Invert Capcode

Allows the user to specify if the CDCSS capcode will be inverted.

NOTE: Editable only if Paging Format is set to CDCSS.

Group Calls/Dual Addressing

If either 2-Tone Group calls or 5-Tone Dual Addressing is enabled, it can nevertheless be allowed for this user ID by marking this field.

Direct Access

If land-line/attendant direct access is disabled, it can nevertheless be enabled after paging this user ID by marking this field.

CTCSS Stripping on Paging

If CTCSS is to be stripped during paging only for certain user IDs, enable CTCSS stripping here for those IDs. Also, disable CTCSS Stripping during Paging under the General Paging menu.

CTCSS Stripping on Direct Access

If CTCSS is to be stripped during direct access only after paging certain users, enable CTCSS stripping here for those IDs. Also, disable CTCSS Stripping during Direct Access under the Direct Access Parameters menu.

Tone 1 & 2 Frequencies

Tone 1: First of two tones generated during a custom page. Enter the desired frequency. The value will be adjusted to the actual frequency generated.

Tone 2: Second of two tones generated during a custom page. Enter the desired frequency. The value will be adjusted to the actual frequency generated.

Tone 1 & 2 Durations

Select the duration that each frequency is generated.

Link to Another ID?

Allows the user to specify whether another paging entry is linked to the one currently being edited.

NOTE: This is only available if the entry being edited is NOT the only entry in the list.

Linked ID

If Link to Another ID? is selected, this parameter contains the 2-digit user ID that is paged if the current user ID is unavailable.

NOTE: Empty entries, the current entry, and entries that eventually link back to the current entry are not available.

Service Adjust

Service Adjust – Service Diagnostics

Service Diagnostics allow the user to detect PL1877A hardware problems. The PL1877A cannot remain in communication with the IAPS while performing the remote diagnostics. Therefore, results of the remote diagnostic session must be read at least 15 seconds later. The following information is reported:

- Default parameters have been reloaded since remote diagnostics were last performed.
- Autodial memory has been modified by a mobile user since the remote diagnostic was last performed.
- For Telephone Line 1 and 2 PL1877A is currently disconnected from the phone line.
- An attendant phone on the phone line is off-hook, or the PL1877A is disconnected from the phone line.
- PL1877A is programmed for the wrong talk battery voltage on the phone line or the PL1877A access control circuitry is damaged.
- Audio path between the DSP processor and the phone line is damaged.
- DSP-HCII Error #1
- DSP-HCII Error #2
- DSP-HCII Error#3

Read Local

To perform a diagnostic on a PL1877A connected to the computer, click on Read Local button. The command to start the diagnostic is issued and the telephone line hangs up. After a 5-second delay, the results are read and displayed on the screen.

Read

To perform a diagnostic by modem, click on the Read Remote button. Go to the Dialing Screen where you select or enter the number to be dialed and, if applicable, the PL1877A access code. Click on the Dial button. After the PL1877A answers, click on OK. The command to start the diagnostic is issued and the telephone line hangs up.

The previously dialed telephone number is dialed, and after connecting to the PL1877A again, the results of the diagnostic are read and displayed on the screen.

Service Adjust – Manual Off hook - Telephone Line Off hook Threshold Voltage

The off-hook threshold determines the maximum phone line voltage at which the PL1877A recognizes that the line is in use by an attendant telephone. Valid entries are 6 through 48 volts.

NOTE: Talk Battery Voltage must be set to allow manual adjustment of the off-hook threshold. This must already be programmed into the PL1877A, whose threshold voltage is to be changed (not merely in the current parameter settings). Otherwise, the PL1877A automatically resets the off-hook threshold to a default value upon exiting the IAPS session.

Set Local

After clicking on the Set Local button, the computer sends commands to change the threshold. It then reads back the threshold voltage to verify that the change was successful.

Set Remote

After clicking on the Set Remote button, you go to the Dialing Screen where you may select the telephone number to access the PL1877A. Click on Dial to dial the number. You are returned to the previous screen. After the PL1877A answers, click on the OK button. It should now process as described in Set Local.

Entering Programmed Parameters

After all desired parameters are entered, select Program ITI6000A from the Input/Output Menu on the Main Menu. Select the Program ITI6000A tab and click on Program Local or Program Remote. Name the programming file and click on OK.

Mobile Programming of Auto-Dial Numbers

If allowed by programming, mobile users can install or modify telephone numbers in the auto-dial memory.

1. With the PL1877A idle, dial *0* from the mobile DTMF keypad. Three mid-frequency beeps are generated, indicating that the PL1877A is awaiting entry of a valid auto-dial location number (1 through 25) followed by *. If an invalid auto-dial location number is entered, 6 disconnect beeps are generated and the auto-dial programming mode is exited.
2. Upon receipt of * following the location number, an auto-dial location is opened. Enter the desired phone number.

You can program pauses between telephone number digits by entering DTMF * at the desired point. For example, if you want to dial 9 (pause) 948-1490, enter 9*9481490. This is useful when you are dialing out of a PABX and must wait for the PSTN (external) dial tone before continuing dialing.

If the PL1877A is programmed for pulse dialing, you can dial several pulse auto-dial digits, then pause and dial the remaining digits in DTMF. This is called a revert since the PL1877A reverts from pulse to DTMF dialing. To place a revert in an auto-dial number, enter a DTMF # at the desired point. For example, if you want the PL1877A to dial 9 (revert) 948-1490 (where 9 is dialed in pulse and 948-1490m DTMF), enter 9#9481490.

NOTE: Only one revert can be in an auto-dial telephone number. All reverts after first one cause the PL1877A to pause in dialing. Two adjacent pauses or reverts cannot be entered in an auto-dial telephone number because the **, ##, *#, and #* commands cause certain functions to occur. Also, a pause or revert cannot be the last digit of an auto-dial telephone number. For a long pause, modify the autodial pause duration via the IAPS. The PL1877A automatically pauses at a revert character, so it is not necessary to enter adjacent pauses and reverts.

3. While entering the auto-dial telephone number, pressing ** causes the PL1877A to key the transmitter and repeat the input digits received so far. This is useful in determining that you did not make any mistakes while entering the number.
4. #* causes the PL1877A to abandon your input, transmit 3 beeps, and wait for entry of a new auto-dial location number (followed by *). Use this command if you made a mistake and wish to start over. ## causes the PL1877A to abandon your input and exit auto-dial programming. You can enter ## at any point in auto-dial.
5. To store a telephone number just entered, press *#. The PL1877A saves your input, returns 3 beeps, and waits for entry of a new auto-dial location number (followed by *). You can modify another auto-dial number or exit the auto-dial programming mode (by entering # or ##).
6. To clear an auto-dial location number, enter the auto-dial programming mode as described above.

Enter the number to be cleared (followed by *), then, dial *#. The PL1877A clears the location, returns 3 beeps, and waits for you to enter a new location number.

Wildcard Access/Release

This provides a mobile user with the ability to create a unique access prefix each time a call is placed or answered. This access prefix then becomes the required release suffix to disconnect the call.

This feature increases the level of security beyond that provided by the standard multi-digit access/release feature. Since the standard multi-digit access and release codes are fixed, security is limited by the number of mobile users who know the codes. For example, if the PL1877A is programmed to require a multi-digit suffix from the mobile user, anyone who knows the required suffix can cause disconnection of the conversation.

However, with wildcard access/release, it is unlikely that anyone will be able to disconnect a call except the mobile user who originated it via the wildcard access prefix.

For example, suppose a mobile user accessed the PL1877A with the wildcard access code 1776 and then the standard * access code. The user would be required to enter the same wildcard code to disconnect the call (i.e., enter #1776; or 1776#, depending on whether the PL1877A is programmed for multi-digit release prefixes or suffixes).

On the next call, the mobile user might use 1812* as the access code, so the same wildcard code (#1812 or 1812#) would need to be used to disconnect.

Notice that the mobile user used two entirely different access prefixes in each case above. In fact, the user could enter a different prefix each time the PL1877A is accessed. Each time, the wildcard release suffix (or prefix) must exactly match the wildcard access prefix.

Programming Wildcard Access/Release

The wildcard access prefixes can be programmed to be from 1 to 6 digits long. However, they cannot be of variable lengths - if this feature is programmed for 3-digit wildcard access prefixes, then all wildcard access prefixes (and corresponding wildcard release suffixes/ prefixes) must only be three digits long.

Also, some of the digits can be set to specific values.

For example, you can program the PL1877A such that all wildcard prefixes are in the form of $x3x$ where x is a wildcard digit chosen by the mobile user. In this case, the user can access the PL1877A only with a 3-digit access prefix in which the second digit is 3.

Suppose you have decided that wildcard access codes will be four digits long, and take the form of $3xx2$, where the x represents wildcard digits selected by the mobile user.

Program required values into the Wildcard Access/Release Code using #'s where you want the wildcard digits (3##2 in this example).

Suppose you decide you don't want any fixed digits in the wildcard prefix. In the four-digit example above, you would enter #####.

Wildcard Access/Release with Paging

This feature can provide added security to paging.

Paging without Direct Channel Access

In this situation, the PL1877A must receive a wildcard access command after the mobile is paged. If this command is not sent within a specified time period, it normally disconnects the telephone user.

To prevent anyone except the paged mobile user from answering the call, the PL1877A can be programmed to restrict mobile access to users of wildcard access prefixes. Then, you can program the wildcard code such that wildcard access requires the mobile users include their capcode digits or user ID in a wildcard prefix to answer a page.

For example, if the PL1877A is operating in single mode paging and the mobile user's 2-tone capcode is 023, the PL1877A can be programmed to allow the user to answer a page only if the digits 0, 2, or 3 are entered in the wildcard access code.

If the PL1877A is operating in multi-mode paging, and the mobile's user ID is 56, you can program the PL1877A to allow that mobile user to answer a page only if the digits 5 and 6 are entered in the wildcard access prefix.

Paging with Direct Channel Access

With this feature, direct channel access is granted to the telephone user immediately after paging the mobile. The telephone user has access to the channel for a certain time (the direct access duration). At the end of that time, the PL1877A disconnects the telephone user. The direct access duration can be extended to the normal, overall access duration by:

- Programming the PL1877A to extend the direct access duration if mobile carrier is detected; or
- Requiring reception of a wildcard access code that includes the paged mobile's capcode or user ID digits.

For example, suppose the PL1877A is operating in single-mode paging and has paged a mobile with a 2-tone capcode of 023. The telephone user has been granted direct channel access. If the mobile enters a wildcard access code that includes some or all of the digits 0, 2, or 3, the time allotted for direct access is extended to the overall access duration.

Suppose the PL1877A is operating in multi-mode paging and has just paged a mobile with a user ID of 56. The telephone user has been granted direct channel access. If the mobile user enters a wildcard access code that includes the digits 5 and 6 the time allotted for direct access is extended to the overall access duration.

Programming the Wildcard Code for use with Paging

If you wish to allow only the paged mobile user to answer a page (without direct access), restrict mobile access to multi-digit access prefix users. Also, disable all standard multi-digit access prefixes.

Determine how many digits, from 1 through 6, you want in the wildcard access prefix.

Determine how the capcode digits or user ID will be encoded in the prefix.

For example, suppose you have decided that wildcard prefixes are to consist of five digits, represented by XXXXX. Since the PL1877A is programmed for multi-mode selective signaling, you want the 2-digit user ID (represented here by YY) to be encoded in the wildcard prefix. This can be programmed a variety of ways, including:

XXXYY

YYXXX

XYYX

XYXXY

YXXYX

Fill in the remaining digits with specific or wildcard digits.

Suppose you have chosen YXXYX as the wildcard pattern. You must determine what will be placed in the locations marked by X. These can be either fixed digits (0–9, A–D) or they may be wildcard digits (#). Of course, you may also place a mixture of fixed and wildcard digits in this code.

There are numerous possibilities, such as:

Y12Y3

Y 1 # Y #

Y# # #

Program the required values into the wildcard code.

For the example above, you have chosen Y 1 # Y # 3 & the required wildcard structure. This would be programmed as *#*#.

Notice the Y digits have been replaced by *. The * is referred to as the capcode wildcard digit since it is actually a special wildcard digit that is replaced by capcode digits or the user ID digits.

To complete the above example, suppose you have just paged the mobile corresponding to user ID 56.

The telephone user is waiting on a mobile answer, since direct access is disabled. In this situation the PL1877A doesn't respond to any mobile access codes except those matching the 51x6x*. Here, x represents wildcard digits chosen by the mobile user when transmitting the code.

Miscellaneous Information about Wildcard Access/Release Feature

Capcode and Normal Wildcard Codes

When the PL1877A is not paging a mobile, any capcode wildcards in the wildcard code are treated as normal wildcard digits.

For example, suppose the PL1877A is programmed with a wildcard code of *l#*#. Mobile access has been restricted to multi-digit access prefixes, and all standard multi-digit access prefixes have been disabled.

Here, the mobile is always required to access the PL1877A with a wildcard prefix. To answer a page, mobile users must substitute their user ID digits into the capcode wildcard positions. However, to originate a call to a telephone user, the mobile user treats the capcode wildcards as normal wildcard digits. Instead of substituting their user ID digits into the capcode wildcard position, the mobile user can substitute any digits for those locations.

Use of the Right-Most Digit

If the wildcard code contains fewer capcode wildcards than there are digits in the capcode, only the right-most digits of the capcode will be used in the wildcard prefix.

For example, suppose your wildcard code is *l#*# and the PL1877A is programmed for 2-tone single-mode paging. If the PL1877A pages a user with the capcode 023, the PL1877A requires a wildcard access code matching the pattern 21x3x. Notice that only the right-most digits of the capcode were placed in the wildcard prefix.

Or, suppose the wildcard code is * 12 34, and the PL1877A is programmed for multi-mode paging. If user ID 56 is paged, the PL1877A requires a wildcard access prefix that matches the pattern 61234. Again, the right-most digit of the user ID was placed in the wildcard prefix.

Multi-Digit Access/Release

Multi-Digit Access

This feature provides a method of allowing certain privileged mobile users to override restrictions that have been programmed into the PL1877A.

For example, the parameters may be set so that mobile users are not allowed to dial telephone numbers with a first digit of 1. If a mobile user attempts to dial a number beginning with 1, the PL1877A disconnects. However, with multi-digit access, certain privileged users may override this restriction and dial numbers beginning with 1.

The Multi-Digit Access Code

A multi-digit access code is a 1 to 6-digit DTMF code that is used as a prefix to DTMF access commands, which are *, #*, *n (autodial, where *n* is the autodial location) and ** (redial). The PL1877A supports four unique multi-digit access codes, each of which may be 1 to 6 digits in length.

Each can be programmed to override a specified set of restrictions, such as dialing telephone numbers beginning with 1.

NOTE: PL1877A only recognizes multi-digit access prefixes if the time between entry of individual digits (including the access command *) is less than one second and the duration of each digit is not greater than 3.5 seconds.

The table on page 61 lists the restrictions that can be overridden using a multi-digit access prefix.

Security Code

This code consists of the DTMF command *0# followed by a 1 to 6-digit suffix. When the PL1877A receives the security code *0#*n*, where *n* is the security code suffix, it immediately overrides all restrictions listed in the table below. The PL1877A continues to override these restrictions until the next disconnection (i.e., when the PL1877A generates six beeps).

NOTE: The security code is not an access code. The PL1877A will not access the phone line in response to this code; it will only override the restrictions.

It may not be desirable to override all of the restrictions in listed in the table. You can program the PL1877A to override some of the restrictions; however, this limits the number of restrictions that can be overridden by a single multi-digit access prefix. For example, suppose you require that the security code cannot override the manual dialing restriction (restriction #4). Doing this results in none of the multi-digit access prefixes being capable of overriding the manual dialing restriction.

NOTE: As a general rule, a multi-digit access prefix can only override restrictions that can be overridden by the security code.

Security Code Table	
No.	Restriction
1	No mobile call origination.
2	No overriding of access time limit by * * * command.
3	No mobile access of busy phone line by * * * command.
4	Mobile user restricted to use of auto-dial feature (no manual dialing).
5	No redialing.
6	No autodialing.
7	No dialing of numbers starting with 0.
8	No dialing of numbers starting with 1.
9	No dialing of numbers starting with 9.
10	No dialing of numbers greater than length of N.
11	No dialing of number starting with a toll restrict prefix of #1.
12	No dialing of number starting with a toll restrict prefix of #2.
13	No dialing of number starting with a toll restrict prefix of #3.
14	No dialing of number starting with a toll restrict prefix of #4.
15	No dialing of number starting with a toll restrict prefix of #5.
16	No dialing of number starting with a toll restrict prefix of #6.
17	No dialing of number starting with a toll restrict prefix of #7.
18	No dialing of number starting with a toll restrict prefix of #8.

Limiting Interconnect Access to Users of Multi-Digit Prefixes

The PL1877A can be programmed to allow access to the phone line only if the mobile user enters a multi-digit access sequence. This feature can be used to prevent the PL1877A from responding to the basic access commands: *, *#, ** and *n.

Multi-Digit Release

This feature requires entry of a DTMF suffix after the # (or ##) standard release command. If the PL1877A does not receive this suffix, it will not respond to the release command. This is used when it is desirable to allow the mobile user to dial a DTMF # without causing phone line disconnection. There are 5 available release codes - one general multi-digit code and four specific multi-digit codes.

Linking Multi-Digit Release to Multi-Digit Access

When it is desired to have all mobile users employ the same release code, the general multi-digit release code is sufficient. However, for added security it may be desirable to prevent the PL1877A from disconnecting unless it receives a multi-digit release code from the same mobile user who originally entered the multi-digit access code.

For example, suppose the multi-digit access prefix #2 is 786 and the general multi-digit release suffix is 999. When a mobile enters 786*, the PL1877A accesses the phone line. To disconnect, the mobile user would enter #999. However, since 999 is the general multi-digit release code that is known to all users of the system, any other mobile user could disconnect the call in progress.

In addition to the general release suffix, the PL1877A provides four other release suffixes, each of which corresponds to one of the multi-digit access prefixes.

The PL1877A can be programmed to require the corresponding multi-digit release code when the mobile user has accessed the phone line using a multi-digit access code.

For example, suppose the multi-digit access code #1 is 786 and the corresponding release suffix is 546. When the mobile user accessed the PL1877A by entering 786*, the sequence #546 would be required to disconnect.

NOTE: If the associated multi-digit release code is not enabled, the PL1877A requires the general multi-digit release code. If the general multi-digit release code is not enabled, the PL1877A will simply disconnect in response to the # or ## disconnect command.

Mobile Originated Calls

The PL1877A Radio Telephone Interconnect is capable of operating in three different modes to work with different types of radio systems. Each of these types of systems requires a slightly different set of mobile operating instructions. Therefore, it is important to refer to the section that applies to your system.

Signal Search Simplex Mode

In this mode, the patch is installed at your base station. To access the telephone line (connect), push the * button on your encoder. In about two seconds you should hear the dial tone, interrupted by short bursts of squelch noise. These short bursts are sample intervals during which the patch is searching for your transmitter signal and are heard only by the mobile radio users. When dial tone is heard, you may enter the telephone number, “stretching” the duration of the first digit for about a second to enable the patch to detect your transmitter signal.

You should follow the telephone number with another *. This second * tells the patch that you are finished with telephone line signaling. If you omit this, the patch assumes you are finished 1 to 10 (programmable) seconds after the last digit has been entered and then opens the voice path to the telephone line.

When the called party answers, you may converse in the same manner as with the base station operator. You may interrupt the telephone party, but they cannot interrupt you and be heard. Each time you push your microphone button, you should pause for about a half second before you begin speaking in order to allow the patch to detect your transmitter signal. This eliminates lost words to the telephone line party.

When you release your microphone button, the telephone party hears a short beep to indicate that they may speak and be heard by you. At the end of the conversation, push the # button on your encoder, stretching the duration for about a second. This disconnects the telephone line, and the patch confirms disconnect back to you with a series of short beeps.

Optional control signaling should be handled in the same manner to the signal search mode by always stretching the first control digit in order to be recognized by the phone patch. Many hand-held portable radios are equipped with Touch-Code encoders that only put out a short burst of Touch-Code signaling. The patch recognizes these units with no problem if the transmit button is pressed a second before the Touch-Code signaling commences. Then, signaling may be entered at a normal rate.

Enhanced VOX Simplex Mode

In this mode, the patch is installed either on your base station, or on a wire-line remote control located away from the radio base station. The feature unique to this mode of operation is the cross lock-out between you, the mobile radio party, and the telephone line party. This means that whoever begins speaking first maintains control of the conversation until they are finished speaking.

For example, after the first party finishes speaking, the second party may speak and maintain control of the conversation until they are finished speaking. Then, the first party may speak and maintain control, “locking out” the second party from being heard until speaking is finished. The patch recognizes signaling tones to be different from speech and interrupts such tones as dial tone, busy tone, etc., for mobile control. Typical operation is as follows:

Press the * button on your encoder. After a short delay, you should hear the dial tone for a duration of about 2 seconds. When it drops out, enter the telephone number.

You should follow the telephone number with another *. This second * tells the patch that you are finished with telephone line signaling. If you omit this, the patch assumes that you are finished 1 to 10 (programmable) seconds after the last digit has been entered and then opens the voice path to the telephone line.

When the called party answers, you cannot interrupt and be heard until they have finished speaking. When they have finished speaking, you may then talk to the telephone line party. In order to allow time for you to answer, the patch sends an attention-getting ticking sound to the called party that disappears after your first reply.

When you finish speaking, the called party hears a short beep tone. Make a brief statement informing the telephone line party not to speak to you until they have heard the go-ahead beep tone. For example, "When you hear the beep, it is your turn to talk." At the end of the conversation, press the # button to release (hang up) the telephone line. The patch confirms release with a series of short beeps.

Network Signaling

When you dial a telephone number that is busy, or make a dialing mistake and get the fast busy signal, the phone patch determines the repetitive signaling condition and allows you to hear a few seconds of the telephone network signaling. Then, when the patch interrupts the signaling, you may respond with the # button to release the telephone line. The patch continues to alternate between two seconds of transmitting the repetitive signaling and five seconds of awaiting mobile commands until the telephone is released.

Half Duplex Mode

In this mode, the patch is installed at your radio repeater site. To access the telephone line (connect), press the * button for about a half second. When dial tone is heard, dial the telephone number, "stretching" the first digit for about a half second in order to allow the patch to detect your transmitter signal.

You should follow the telephone number with another *. This second * tells the patch that you are finished with telephone number signaling. If you omit this, the unit assumes you are finished 1 to 10 (programmable) seconds after the last digit is entered and then opens the voice path to the telephone line.

When the called party answers, you may talk to him in the same manner as you would to your base station operator or another mobile except that you are able to interrupt the telephone line party but they cannot interrupt you and be heard.

Each time you finish speaking and release your microphone button, the patch sends a short beep tone to the telephone party to inform him that you are finished speaking. At the end of the telephone conversation, press the # button for about a half second to release (hang up) the telephone line. The patch confirms release with a series of short beeps.

The following is a list the mobile commands:

Abbreviated Mobile Commands Chart	
NOTE: All multi-digit commands must be entered with a maximum of 1 second inter-digit time.	
Standard Commands	
* (or #*)	Access telephone line (#* if set by parameters)
# (or ##)	Release telephone line (## if set by parameters)
**	Redial last number called
***	Overrides line busy
***	After access = refresh/reset overall access timer
n**#	Station/repeater enable command (n = station/repeater enable prefix)
##*	Before access = answer if called (special applications)
##*	After access = flash (momentary on-hook to regain dial tone where applicable)
1	TX PL tone on
*1#	TX PL tone off
n*	Multi-digit access code: n = 1–6 digits
#n	Multi-digit access code: n = 1–6 digits
*0#n	Executive override code: n = 1–6 digits (overrides a variety of programmed restrictions)
n*#0	Enter mobile, DTMF programming mode (n = remote parameter access code, 1–6 digits)
Auto-dial	
*1	Patch dials stored telephone number 1
*9	Patch dials stored telephone number 9
*25	Patch dials stored telephone number 25
0	Enter autodial programming mode
Selective Signaling Option	
###n	Revertive (mobile-to-mobile) call where n is the capcode or user ID of the target mobile
2nd Line Option	
2	Select line 2 for outbound call origination
*2#	Select line 1 for outbound call origination (if line 2 is currently selected)

Landline Originated Calls

The landline (telephone-originated) call proceeds in two different manners, depending upon installed options. If special information (access code, selective signaling code, etc.) is required to initiate mobile signaling, refer to the applicable section in this manual for operational details.

When the landline caller dials the phone patch, the unit detects ringing on its line (as indicated by the flashing CONN LED). After ensuring that the channel is available (not receiving carrier and not sensing PTT), the patch transmits one 3-second ring tone. To answer the call, the mobile operator presses * on the encoder after the ring tone ceases. The patch accesses the telephone line and conversation may proceed as outlined previously. When the conversation is over, the mobile or telephone user sends a # to release the telephone line. The patch confirms release with a series of short beep tones.

Direct Access

NOTE: Direct Access is used for portables with no DTMF keypad.

The landline caller dials the phone patch. The unit detects ringing on its line and accesses the phone line. Then, the patch generates two beeps. After ensuring that the channel is clear, the patch transmits one 3-second ring signal to the mobile. Immediately following this ring, the audio paths between phone and radio are established. The telephone user may speak over the air according to the instructions regarding conversations outlined previously. When the allowed time for direct channel access expires, the patch automatically releases the phone line.

Selective Signaling

The landline caller dials the phone patch. The unit detects ringing on its line and accesses the phone line. Then, the patch generates two beeps, to indicate it is awaiting input (the desired capcode digits or user ID) from the phone user. When the proper number of digits is received, three beeps are generated.

After ensuring that the channel is clear, the signaling sequence is transmitted. If the patch is programmed for direct access, the audio paths between phone and mobile are established immediately following the signaling transmission. The path automatically releases the phone line when the direct access time expires. If the patch is not programmed for direct access, it waits for a mobile to respond by sending the access command. If a mobile does not respond in the time set by parameters, the patch disconnects.

NOTE: When the patch attempts to transmit the direct access ring or the selective signaling sequence, it checks for a clear channel (absence of mobile carrier and station PTT). If the channel is not clear, the phone user hears busy tones until the channel clears or until one minute has transpired. If the channel remains busy for one minute, the patch aborts the call.

Multi-Digit Access/Release

Multi-Digit Access

The multi-digit access feature provides a method of allowing certain privileged mobile users to bypass restrictions that have been programmed into the PL1877A.

For example, if parameter 47 is set to 0, mobile users are not allowed to dial telephone numbers whose first digit is 1. Thus, every time a mobile accesses the PL1877A and attempts to dial a number beginning with 1, the PL1877A disconnects.

However, it may be desirable to allow certain mobiles to dial telephone numbers beginning with 1 even though most mobiles in the system are not allowed this privilege. To accomplish this, you must use the multi-digit access feature.

A multi-digit access code is a DTMF code of 1–6 digits that is used as a prefix to the DTMF access commands (*, #*, **n* [the autodial command, where *n* is the desired autodial location] and ** [the redial command]). The PL1877A supports four unique multi-digit access codes, each of which may be from 1–6 digits in length. Each multi-digit access code can be programmed to bypass a specified set of restrictions (such as dialing a telephone number beginning with 1, as cited in the example above).

NOTE: Consider the multi-digit access sequence XYZ* where XYZ is the 3-digit multi-digit access prefix to the * access command. The PL1877A recognizes XYZ as a multi-digit access prefix only if the time between individual digits (represented by the “-” in X-Y-Z-*) is no greater than 1 second. Also, the duration of each digit must be no greater 3.5 seconds.

Bypassing Restrictions via Multi-digit Access

Refer to the Bypassing Restriction Table on page 68 for the list of the restrictions that can be bypassed via a multi-digit access prefix. The parameter that enables each restriction is also listed.

Security Code (Privileged User Override Code)

The security code consists of the DTMF command *0# followed by a suffix of 1–6 digits.

When the PL1877A receives the security code *0#*n* (where *n* is the security code suffix), it immediately bypasses all restrictions listed in the table below. The restrictions remain bypassed until the next disconnection (i.e., the next time the PL1877A generates 6 disconnect beeps).

NOTE: The security code is not an access code - the PL1877A does not access the phone line in response to this code. The PL1877A only bypasses the restrictions listed in the table below.

Bypassing Restriction Table		
Restriction #	Restriction	Valid when parameter:
1	Mobile origination	13 = 0
2	Resetting overall access time	18 = 0
3	Accessing busy phone line	54 = 0
4	Manual dialing of phone numbers	53 = 1
5	Redialing	71 = 0
6	Autodialing of phone numbers	30 = 0
7	Dialing #s starting with 0	48 = 0
8	Dialing #s starting with 1	47 = 0
9	Dialing #s starting with 9	46 = 0
10	Dialing #s greater than length N	500 = N
11	Dialing #s starting with specified prefix	446–449
12	Dialing #s starting with specified prefix	450–453
13	Dialing #s starting with specified prefix	454–457
14	Dialing #s starting with specified prefix	458–461
15	Dialing #s starting with specified prefix	462–465
16	Dialing #s starting with specified prefix	466–469
17	Dialing #s starting with specified prefix	470–473
18	Dialing #s starting with specified prefix	474–477

Installation of the Multi-Digit Access Feature

It is recommended that programming software be used to install the multi-digit access feature. However, these instructions are also provided for use with the terminal programming feature. Multi-digit access prefix 1 is located in parameters 362–367; multi-digit access prefix 2 is located in parameters 368–373; multi-digit access prefix 3 is located in parameters 374–379; multi-digit access prefix 4 is located in parameters 380–385. Each multi-digit prefix can consist of DTMF digits from 0–D. Fill all unused digits with FF (hexadecimal FF). If all digits are filled with FF, the corresponding multi-digit access prefix is disabled.

1. Limiting patch access to users of multi-digit prefixes:

You can program the PL1877A to allow accessing the phone line ONLY if the mobile user has entered a multi-digit access sequence. This feature can be used to prevent the PL1877A from responding to the simple access commands (*, #*, **, and *n). Parameter 38 should be set to 1 if you wish to limit phone line access to users of multi-digit access prefixes.

2. Programming the bypass characteristics of each prefix

Programming the bypass information for each individual multi-digit access prefix is a somewhat complicated affair. To greatly simplify this task, it is recommended that you use the PL1877A's programming software. However, the instructions below are provided in case you wish to use the terminal programming feature for programming this information.

Associated with each multi-digit access prefix are three parameters that define the bypass characteristics for that prefix:

- The bypass characteristics for multi-digit access prefix #1 are set by parameters 515–517.
- The bypass characteristics for multi-digit access prefix #2 are set by parameters 518–520.
- The bypass characteristics for multi-digit access prefix #3 are set by parameters 521–523.
- The bypass characteristics for multi-digit access prefix #4 are set by parameters 524–526.

The first bypass parameter for each access prefix (that is, parameters 515, 518, 521, and 524) is structured according to the following table:

First Bypass Parameter	
Bit #	Bypasses Restriction #
7	1
6	2
5	3
4	4
3	5
2	6
1	Unused
0	Unused

The second bypass parameter for each access prefix (that is parameters 516, 519, 522, and 525) is structured according to the following table:

Second Bypass Parameter	
Bit #	Bypasses Restriction #
7	Unused
6	Unused
5	Unused
4	Unused
3	7
2	8
1	9
0	10

The third bypass parameter for each access prefix (that is parameters 517, 520, 523, and 526) is structured according to the following table:

Third Bypass Parameter	
Bit #	Bypasses Restriction #
7	11
6	12
5	13
4	14
3	15
2	16
1	17
0	18

To bypass a restriction, set the appropriate bit from the tables above to 1. If you do not wish the restriction bypassed, set the appropriate bit from the above tables to 0. For example, suppose the PL1877A is programmed such that mobile users cannot dial telephone numbers starting with 0 (parameter 48 = 0). Also, suppose that the PL1877A is programmed to disable the auto-dial feature (parameter 30 = 0); also, manual dialing of telephone numbers is disabled (parameter 53 = 1).

You wish to allow one group of mobiles to manually dial telephone numbers starting with 0; however, you do not wish them to have access to the autodial feature. On the other hand, you wish another group of mobiles to have access to the autodial feature only.

To satisfy these differing requirements, you create two multi-digit access prefixes. To those mobiles that must manually dial phone numbers starting with 0, you assign the prefix 1938; to those mobiles that are only allowed to use the auto-dial feature, you assign the prefix 1941.

1938 is treated as multi-digit access prefix #1. Therefore, it is programmed into parameters 362–367 (362 = 1; 363 = 9; 364 = 3; 365 = 8; 366 = FF; 367 = FF). In order to bypass the restriction on manual mobile dialing (restriction #4) and the restriction on dialing phone numbers beginning with 0 (restriction #7), parameters 515-517 are programmed as follows:

515 = \$10 (hexadecimal 10; bit 4 = 1)

516 = 8 (bit 3 = 1)

517 = 0

1941 is treated as multi-digit access prefix #2. Therefore, it is programmed into parameters 368–373 (368 = 1; 369 = 9; 370 = 4; 371 = 1; 372 = FF; 373 = FF). In order to bypass the restriction on autodialing (restriction #6), parameters 518-520 are programmed as follows:

518 = 4 (bit 2 = 1)

519 = 0

520 = 0.

If the security code suffix was enabled and a mobile user was acquainted with it, the security code could be transmitted to allow autodialing, manual dialing, AND bypassing the restriction on telephone numbers starting with 0.

Configuring the Security Code to Bypass Restrictions

As indicated in the previous table, the multi-digit access prefixes have the potential to bypass 18 programmed restrictions. The security code bypasses all 18 of these restrictions. It may not be desirable to allow all 18 of these restrictions to be bypassed by the security code. It is possible to configure the security code to bypass only certain restrictions. However, doing so limits the number of restrictions that can be bypassed by a single multi-digit access prefix.

For example, you may require that the security code cannot bypass the restriction on manual dialing. This is possible, but to require this also results in none of the multi-digit access prefixes being capable of bypassing the restriction on manual dialing.

NOTE: As a general rule, a multi-digit access prefix can only bypass restrictions that are definitely bypassed by the security code. Parameters 527–529 are used to configure the security code to bypass restrictions.

- The structure of parameter 527 exactly matches the structure of parameters 515, 518, 521, and 524.
- The structure of parameter 528 exactly matches the structure of parameters 516, 519, 522, and 525.
- The structure of parameter 529 exactly matches the structure of parameters 517, 520, 523, and 526.

Multi-Digit Release

The multi-digit release feature requires a DTMF suffix following the # (or ##) release command. If the PL1877A does not receive this suffix, it will not respond to the release command. This feature is used when it is desirable to allow the mobile user to dial a DTMF # without causing phone line disconnection.

NOTE: Consider the multi-digit release sequence #XYZ where XYZ is the 3-digit multi-digit release suffix to the # release command. The PL1877A recognizes XYZ as a multi-digit release suffix only if the time between individual digits (represented by the “-” in #-X-Y-Z) is no greater than 1 second. Also, the duration of each digit must be no greater than 3.5 seconds. The multi-digit release suffix (hereafter referred to as the general multi-digit release suffix) is defined by parameters 410–415. It can consist of DTMF digits from 0–D. Fill all unused digits with FF (hexidecimal FF). If all digits are filled with FF, the general multi-digit release suffix is disabled.

Linking Multi-Digit Release to Multi-Digit Access

When it is desired that all mobile users employ the same release code, the general multi-digit release suffix is sufficient. However, for added security, it may be desirable to prevent the PL1877A from disconnecting unless it receives a disconnect sequence from the same mobile user who originally entered the multi-digit access sequence.

For example, suppose multi-digit access prefix #2 were 786. Also, suppose the general multi-digit release suffix is 999. Thus, when a mobile entered 786*, the PL1877A would access the phone line. To disconnect the phone line, the mobile user would enter #999. However, since 999 is a general multi-digit release suffix that is known to all users of the system, any other mobile user could disconnect the call in progress.

In addition to the general release suffix, the PL1877A provides four other release suffixes, each of which corresponds to one of the multi-digit access prefixes.

- Multi-digit release suffix #1 (parameters 386 - 391) corresponds to multi-digit access prefix #1 (parameters 362–367).
- Multi-digit release suffix #2 (parameters 392 - 397) corresponds to multi-digit access prefix #2 (parameters 368–373).
- Multi-digit release suffix #3 (parameters 398 - 403) corresponds to multi-digit access prefix #3 (parameters 374–379).
- Multi-digit release suffix #4 (parameters 404 - 409) corresponds to multi-digit access prefix #4 (parameters 380–385).

The PL1877A can be programmed to require the corresponding multi-digit release suffix when the mobile user has accessed the phone line via a multi-digit access prefix. For example, suppose multi-digit release suffix #2 is 546. Then, when the mobile user accessed the PL1877A by entering 786*, the sequence #546 would be required to cause disconnection.

NOTE: If the associated multi-digit release suffix is not enabled, the PL1877A requires the general multi-digit release suffix. If the general multi-digit release suffix is not enabled, the PL1877A simply disconnects in response to the # (##) disconnect command.

Installation

To force the user of a multi-digit access prefix to use the associated multi-digit release suffix, set parameter 39 = 1. Then enter the release suffix digits in the appropriate parameters, as listed above. The PL1877A can be programmed to use multi-digit release prefixes instead of suffixes. If this is desired, set parameter 40 = 1. In this case, the general multi-digit release code (and all multi-digit release codes corresponding to the multi-digit access prefixes) is a prefix to the # (or ##) release command. The wildcard access/release feature provides a mobile user with the ability to create a unique access prefix each time a call is placed or answered. This access prefix then becomes the release suffix (or prefix, depending on parameter 40), which is required to disconnect the call.

For example, suppose a mobile user accessed the PL1877A with the code 1776*. Then, to release the PL1877A, that user would be required to enter #1776 (or 1776#, depending on whether the PL1877A is programmed for multi-digit release prefixes or suffixes by parameter 40).

On the next call, the mobile user might access the PL1877A with the code 1812*. Then, to release the PL1877A, the required code would be #1812 (or 1812#). Notice that the mobile user used two entirely different access prefixes in each case above. In fact, the mobile user could enter a different prefix each time the PL1877A is accessed. In each case, the PL1877A would require a release suffix (or release prefix, depending on parameter 40) that exactly matched the access prefix.

The wildcard access/release feature is generally used to increase the level of security beyond that provided by the standard multi-digit access/release feature. Since the standard multi-digit access and release codes are fixed, security is limited by the number of mobile users who know the codes.

For example, if the PL1877A is programmed to require a multi-digit release suffix from the mobile user, anyone who knows the required suffix can cause disconnection of the conversation. However, with wildcard access/release, it is unlikely that anyone would be able to disconnect a call in progress except the mobile user who originated it via a wildcard access prefix.

Wildcard Access/Release Installation

The wildcard feature can be programmed to require wildcard access prefixes from 1 to 6 digits in length. Note that the feature does not support variable length prefixes – that is, if the feature is programmed for 3-digit wildcard access prefixes, then ALL wildcard access prefixes (and the corresponding wildcard release suffixes/prefixes) must be 3 digits in length, etc.

Furthermore, some of the digits in wildcard codes can be set to specific values. For example, you can program the PL1877A such that all wildcard prefixes are of the form $x3x$ where x is a wildcard digit (that is, a digit chosen by the mobile user when the prefix is used). In this case, the mobile user could access the PL1877A only with 3-digit access prefixes in which the 2nd digit is 3.

The features described above are determined by programming parameters 530–535. This group of parameters is referred to as the wildcard template since it defines the structure that all valid wildcard prefixes must match. To program the wildcard template, follow the steps listed below:

1. Determine how many digits you want in all wildcard prefixes. The allowable range is 1–6.
2. Determine whether you want any fixed digits in all wildcard prefixes.
For example, suppose you have decided that you want all wildcard prefixes to be four digits in length and conform to the structure $3xx2$ (where x represents a wildcard digit).
3. Program the required values into the wildcard template.
For the example above, you have chosen $3xx2$ as the required wildcard structure. The last digit of your wildcard structure must be programmed into parameter 535. Thus, you would program parameters 530–535 as follows:

parameter 530: FF
parameter 531: FF
parameter 532: 3
parameter 533: F
parameter 534: F
parameter 535: 2

Notice that all unused locations must be programmed with the value FF (hexadecimal FF). All wildcard digits must be programmed with the value F (hexadecimal F).

Suppose you have changed your mind and decided that you don't want any fixed digits in your wildcard prefixes. This allows the mobile user to choose all digits in the wildcard prefix when the prefix is actually used. To accomplish this, you would program parameters 530–535 as follows:

parameter 530: FF
parameter 531: FF
parameter 532: F
parameter 533: F
parameter 534: F
parameter 535: F

Notice that all four digits used in the wildcard prefixes are wildcard digits.

4. If you want to completely disable the wildcard feature, simply program parameters 530–535 to FF (hexadecimal FF).

Wildcard Access/Release with Selective Signaling

The wildcard access/release feature can provide added security to the selective signaling feature.

Selective Signaling without Direct Channel Access

In this situation, the PL1877A must receive a mobile access command subsequent to paging the mobile. If the PL1877A does not receive this command within a specified time period, it normally disconnects the telephone user.

To prevent anyone except the paged mobile user from answering the call, you can program the PL1877A to restrict mobile access to users of wildcard access prefixes. Then, you can program the wildcard template such that wildcard access requires that the mobile users include their capcode digits or user ID in a wildcard prefix used to answer a page.

For example, if the PL1877A is operating in single mode selective signaling and the mobile user's QuickCall II capcode is 023, you can program the PL1877A to allow that mobile user to answer a page only if they include the digits 0, 2, and 3 in their wildcard access prefix.

If the PL1877A is operating in multi-mode selective signaling and the mobile's user ID is 56, you can program the PL1877A to allow that mobile user to answer a page only if the digits 5 and 6 are included in the wildcard access prefix.

Selective Signaling with Direct Channel Access

In this situation, the PL1877A grants direct channel access to the telephone user immediately after paging the mobile. The telephone user has access to the channel for a certain time (the direct access duration). At the end of that time, the PL1877A disconnects the telephone user.

The direct access duration can be extended to the normal, overall access duration (set by parameter 357) in one of two ways. First, you can program the PL1877A (via parameter 25) to extend the direct access duration if mobile carrier is detected. The other method of extending the direct access duration is to require reception of a wildcard access code that includes the paged mobile's capcode or user ID digits.

For example, suppose the PL1877A is operating in single-mode selective signaling and has just paged a mobile whose QuickCall II capcode is 023. The telephone user has been granted direct channel access. If the PL1877A receives a wildcard access code that includes some or all of the digits 0, 2, and 3, the time allotted for direct access is extended to the overall access duration (parameter 357).

Suppose the PL1877A is operating in multi-mode selective signaling and has just paged a mobile whose user ID is 56. The telephone user has been granted direct channel access. If the PL1877A receives a wildcard access code that includes the digits 5 and 6, the time allotted for direct access is extended to the overall access duration.

Programming the Wildcard Template for Use with Selective Signaling

To program the wildcard template such that the wildcard access feature functions as described for selective signaling, follow the steps of this section:

1. If you wish to allow only the paged mobile user to answer a page (without direct access), restrict mobile access to users of multi-digit access prefixes by setting parameter 38 to 1. Also, disable all standard multi-digit access prefixes by setting parameters 362–385 to FF (hexadecimal FF).
2. Determine how many digits you want in wildcard access prefixes. The allowable range is 1–6.
3. Determine the manner in which the mobile's capcode digits or user ID is to be encoded into the wildcard prefix.

For example, suppose you have decided that wildcard prefixes are to consist of five digits represented by X X X X X. Since the PL1877A is programmed for multi-mode selective signaling, you want the 2-digit user ID (represented by YY) to be encoded into the wildcard prefix. There are a number of ways you can encode the user ID into the wildcard prefix. Listed below are just a few:

X X X Y Y Y Y X X X X Y X Y X X Y X X Y Y X X Y X

4. Fill in any remaining digits with specific digits or wildcard digits. Suppose you have chosen Y X X Y X as your wildcard pattern. You must now determine what will be placed in those locations marked by X. You may either place fixed digits (0–9, A–D) in these positions or you may place wildcard digits (F) in them. Of course, you may also place a mixture of fixed and wildcard digits in them. There are numerous possibilities for the resulting wildcard pattern. Listed below are just a few.

Y 1 2 Y 3 Y 1 F Y F Y F F Y F

5. Program the required values into the wildcard template.

For the example above, you have chosen Y 1 F Y F as the required wildcard structure. The last digit of your wildcard structure must be programmed into parameter 535. Thus, you would program parameters 530–535 as follows:

parameter 530: FF	parameter 533: F
parameter 531: E	parameter 534: E
parameter 532: 1	parameter 535: F

Notice that the Y digits (representing user ID digits) have been replaced by E (hexadecimal E). E is referred to as the capcode wildcard digit since it is actually a special wildcard digit that is replaced by capcode digits or the user ID digits.

To complete the example above, suppose the PL1877A has just paged the mobile corresponding to user ID 56. The telephone user is waiting on a mobile answer since direct access is disabled. In this situation, the PL1877A does not respond to any mobile access codes except those that match the following structure: 51x6x* (where *x* represents wildcard digits — digits chosen by the mobile user when transmitting the code).

Miscellaneous Information Regarding Wildcard Access/Release Feature

1. When the PL1877A is not paging a mobile, any capcode wildcards in the wildcard template are treated as normal wildcard digits.

For example, suppose the PL1877A is programmed with the wildcard template E1FEF. Also, mobile access has been restricted to users of multi-digit access prefixes, and all standard multi-digit access prefixes have been disabled.

In this example, the mobile is always required to access the PL1877A with a wildcard prefix. To answer a page, mobile users must substitute their user ID digits into the capcode wildcard positions. However, to originate a call to a telephone user, the mobile treats the capcode wildcards as normal wildcard digits.

That is, instead of substituting their user ID digits into the capcode wildcard positions, the mobile can substitute any digits for those locations. Thus (continuing the example above), to answer a page, the mobile must always use a wildcard access prefix that matches the pattern 51x6x. However, to originate a call to a telephone user, the mobile may use a wildcard access prefix that matches the pattern x1xxx.

2. If the wildcard template contains less capcode wildcards than there are digits in the capcode, only the right-most digits of the capcode are used in the wildcard prefix. For example, suppose your wildcard template contains E1FEF. Also, suppose your PL1877A is programmed for QuickCall II, single mode selective signaling.

If the PL1877A pages a user with the capcode 023, the PL1877A requires wildcard access prefixes that match the pattern 21x3x. Notice that only the right-most digits of the capcode were placed in the wildcard prefix. Suppose your wildcard template contains E1234. Also, suppose your PL1877A is programmed for multi-mode selective signaling. If the PL1877A pages user ID 56, the PL1877A requires wildcard access prefixes that match the pattern 61234. Notice that only the right-most digit of the user ID was placed in the wildcard prefix.

Parameter Modification Procedure

Terminal Programming Feature

NOTE: GAI-Tronics recommends using the programming software to set up the PL1877A's initial configuration. Terminal programming should only be used for making small modifications to the unit's archive.



Parameter Modification via RS-232

The terminal programming feature allows the user to observe and/or modify parameter locations from a display terminal. The RS-232 interface operates at 9600 baud rate and the data format is eight bits/character with one stop bit and no parity. To program, use the XAC0004A Programming Cable available from GAI-Tronics.

RS-232 Operator Instructions

To begin the parameter routine when using a local video display terminal connected to the program port, first press ENTER five times. If an access code has been programmed in parameters 422–427, the display screen prompts you to enter the correct code. The RS-232 Help Screen shown below is then displayed on the monitor.

Parameters may be cleared, displayed, or modified using the commands listed in the following paragraphs. During terminal programming, the front panel LEDs strobe from right to left.

 **NOTE**  Before displaying the Help Screen, the patch attempts to clear the monitor screen and return the cursor to the top left corner. However, due to the wide variety of video display terminals available, some monitors may not allow these actions, and the Help Screen is displayed starting at the current cursor position. This should not cause any problem due to the scrolling nature of the display on all terminals.

F OP1 OP2 VALUE<cr>	Fill Parameter Block With Value OP1: Start Parameter #; OP2: End Parameter #
D OP1 OP2 <cr>	Display parameter block OP1: Start Parameter No. OP2: End parameter No.
Ctrl-E	Reload EEPROM Default Parameters and Exit
Ctrl-N	Reload NVRAM Default Parameters and Exit
Ctrl-X	Exit
# <cr>	Change parameter starting at # #<cr> Change the current parameter to # Ctrl-J or Dn Arrow—Decrease one parameter Ctrl-K or UpArrow—Increase one parameter Ctrl-U or PgUp—Increase ten parameters Ctrl-D or PgDn— Decrease ten parameters . <cr> Return to main menu

RS-232 Help Screen

Clear Parameters – Parameters may be cleared by entering the command sequence: C OP1 OP2 <cr>, where OP1 is the starting parameter number and OP2 is the ending parameter number.

Display Parameters – Parameters may be displayed on the screen by entering the command sequence D OP1 OP2 <cr>, where OP1 is the starting parameter number and OP2 is the ending parameter number.

View Parameters – Parameters may be displayed and opened for modification by entering the command sequence No. <cr> where No. is the number of the parameter to be modified. After entering the No. <cr> command, the parameter number chosen is displayed along with the current value of this parameter. To change the value, enter the new value and then close the location by pressing ENTER. The next parameter is then displayed.

1. Press the ^J (CTRL and J entered simultaneously) or the DOWN arrow to display the previous parameter.
2. Press the ^K (CTRL and K entered simultaneously) or the UP arrow to display the next parameter.
3. Press the ^U (CTRL and U entered simultaneously) or the PgUp button to display parameters in increments of 10.
4. Press the ^D (CTRL and D entered simultaneously) or the PgDn button to display parameters in decrements of 10.

Help Screen – To regain the help screen at any time during the routine, enter a ? <cr> (question mark) at the prompt.

Exit – To exit the parameter modification routine and cease communication between the patch and the video display terminal, enter the sequence ^X (CTRL and X pressed simultaneously).

NOTE: Generally, when entering parameter values larger than 9, the hexadecimal equivalent of the parameter value must be entered (as opposed to the decimal value). For example, to program the overall access timer to a duration of 59 minutes, 3B (the hexadecimal equivalent of 59) must be entered.

Parameter Modification via Modem

The modem feature allows operating parameters to be programmed, checked or modified remotely using a computer equipped with a modem. The format is Bell 212A operating at 1200 baud. Modification of parameters requires the computer modem software to work in a terminal emulation program, such as VT100/ANISE, or other program that supports ASCII characters. This feature can be enabled or disabled via parameter 22.

Modem Operator Instructions

To access the remote terminal programming (modem) feature of the PL1877A, connect a standard DTMF telephone in parallel with the originating modem. From the telephone, dial the phone number of the remote PL1877A. While listening on the telephone, wait until the PL1877A seizes the line and returns a prompting tone (beep) to the caller. The amount of rings and the length of time vary depending on parameter programming.

At the beep, enter the sequence `*#2`. If the landline security code has been enabled, it must be entered as a prefix to this command (see parameters 145–150). Next, type the command `+++ATA` at the computer keyboard. The PL1877A connects approximately 2 seconds after the answer tone. Once access has been gained, changing or viewing of operating parameters can proceed as described under Parameter Modification via RS-232.

NOTE: If the PL1877A is configured for land-line selective signaling and you wish to allow modem programming, you must program the PL1877A to require a `*` access command from the land-line caller (parameters 43, 50). Then, to use the modem, dial `*#2` (along with any required prefix) instead of `*`. If you do not program the PL1877A to require a `*` access command, the PL1877A interprets `*#2` as paging input instead of a command to enter the modem programming mode.

DTMF Programming Feature

Operator Instructions

Limited programming of the PL1877A is provided from either a standard DTMF (Touch-Code) telephone, or from a mobile or portable radio equipped with a Touch-Code pad. The PL1877A may be programmed to require an access code prefix to provide additional protection against accidental modifications of parameters. This code may be different for mobile (or portable) and land-line parameter modification.

Parameter 21 enables or disables remote programming of parameters via DTMF telephone. The default for this parameter is enabled (parameter 21 = 1). Parameter 57 enables or disables mobile DTMF programming of parameters. The default for this parameter is disabled (parameter 57 = 0).

A second PL1877A, or similar device for decoding DTMF digits, is required to display the DTMF digits from the remote programming telephone location. This PL1877A should be placed in parallel with the calling telephone instrument, using a modular “T” adapter, similar to the installation of an answering machine. The PL1877A should also be placed in diagnostic Test 13 to allow displaying of any valid DTMF digit.

Procedure from Landline Telephone

Two telephone lines are required: one for the interconnect and a second line for the telephone that is used to originate Touch-Code commands. After connecting the patch to the first telephone line, dial the number assigned to the PL1877A from the telephone. Allow the PL1877A one full minute to answer the line. At that time the PL1877A returns a short beep tone to the caller. After the beep tone is heard, you must enter the sequence `*#0`. If a landline programming prefix has been programmed into parameters 145-150, you must precede `*#0` with that prefix.

To check parameters without changing them, you should enter a `*`, followed by the parameter number you wish to examine, then a second `*`. If you make a mistake while entering this number, you may cancel the incorrect entry with a `#`, prior to the second `*`. At this time, the PL1877A should return to the caller the corresponding DTMF code of the number that has been stored into that specific location. If an invalid parameter has been attempted from the originating DTMF phone, the PL1877A returns “bad beeps” (3 short, high-frequency tones).

To modify a parameter, enter the parameter number followed by a `*`. The patch returns “good” beeps (three short, mid-frequency tones) if the parameter has been successfully opened. Enter the desired parameter value. Once the parameters have been programmed as needed, exit the parameter modification routine by entering a `##` from the DTMF telephone. The PL1877A should then return to you a series of six disconnect beeps, returning the PL1877A to an idle state.

Refer to the parameters section of this manual for specific parameter functions and the table at the end of this section for a valid DTMF parameter modification list. This list informs you of what specific parameters can be programmed via DTMF.

NOTE: If the PL1877A is configured for land-line selective signaling and you wish to allow land-line DTMF programming, you must program the PL1877A to require a `*` access command from the land-line caller (parameters 43, 50). Then, to program parameters via DTMF, dial `*#0` (along with any required prefix) instead of `*`. If you do not program the PL1877A to require a `*` access command, the PL1877A interprets `*#0` as paging input instead of a command to enter the land-line DTMF programming mode.

Procedure from a Mobile or Portable Equipped with DTMF Pad

From the mobile, enter the command `*#0`. If the PL1877A is to require a prefix prior to the `*#0` command, this prefix must be entered into parameters 422–427. The prefix gives additional protection against unauthorized or accidental parameter changes. Once you have entered the prefix code, if so programmed, followed by the `*#0` command, the parameter modification procedure is the same as for land-line remote programming of parameters.

Once you have completed programming the desired parameters, exit the parameter modification routine by entering a `##` from the mobile DTMF pad. The PL1877A should return a series of 6 disconnect beeps to the mobile, informing you that the patch is in the idle condition.

NOTE: The DTMF programming mode times out after approximately 1 minute of no activity from the user. When this occurs, the PL1877A returns to idle operation.

The following is a list of parameters that are programmable via DTMF:

Parameter	Function
11	Determines whether access command is * or #*.
12	Determines whether the normal release command is # or ##.
16	Determines whether phone line reversal or loss to disconnect mobile originated call is disabled or enabled.
17	Determines whether phone line current reversal or loss to disconnect land-line originated call is disabled or enabled.
26	Enables or disables multiple ringing to mobiles.
28	Enables or disables enhanced VOX attention getting ticks.
33	Allows “over” beep to phone user to be enabled or disabled.
34	Allows mobile go-ahead beep to be enabled or disabled.
37	Determines whether mobile DTMF regeneration, after call is established, is enabled or disabled.
45	Determines whether DTMF 1 tone upon automatic phone line access is enabled or disabled.
64	Enable or disable disconnection, upon detection of dial tone, of a land-line originated call.
69	Determines whether the ring signal generated to the mobile is a low or a high frequency.
121	Mobile audio cut-through delay.
122	Mobile inactivity control.
128	The time that the PL1877A is to pause and wait for a dial tone when the pause character is encountered in an auto-dial number.
131	The number of busy tone cycles that must be received to cause the PL1877A to disconnect during a mobile originated call.

Mobile Programming of Auto-dial Numbers

If enabled by parameter 55, mobile users can install or modify telephone numbers in the auto-dial memory. Following are instructions regarding how this is accomplished.

1. With the PL1877A in the idle state, dial *0* from the mobile DTMF keypad. The PL1877A responds by transmitting three mid-frequency beeps. The PL1877A is now waiting for you to enter a valid auto-dial location number (1–25) followed by a *.

NOTE: Auto-dial locations 10–25 are only available for use and modification if the selective signaling option is present. If you enter an invalid auto-dial location number, the PL1877A generates 6 disconnect beeps and exit the auto-dial programming mode.

2. Upon receipt of the * following the location number, the PL1877A opens the auto-dial location and waits for you to enter a phone number. Enter the desired phone number.

You can program the PL1877A to pause between digits of a telephone number. This is useful when you are dialing out of a PABX and must wait for the PSTN (external) dial tone before continuing dialing. To place a pause in an auto-dial telephone number, enter a DTMF * at the desired point. For example, if you want the PL1877A to dial 9 (pause) 948–1490, enter the following into the auto-dial location: 9*9481490.

If the PL1877A is programmed for pulse dialing, you can cause the PL1877A to dial several auto-dial digits in pulse then pause and switch to dialing the remaining digits in DTMF. This is called a “revert” since the PL1877A reverts from pulse dialing to DTMF dialing. To place a revert in an auto-dial telephone number, enter a DTMF # at the desired point. For example, if you want the PL1877A to dial 9 (revert) 948–1490 (where the 9 is dialed in pulse and 948–1490 is dialed in DTMF), enter the following into the auto-dial location: 9#9481490.

NOTES:

- Only one revert can be placed in an auto-dial telephone number. If you place more than one revert in a number, all reverts subsequent to the first will only cause the PL1877A to pause in dialing.
 - Two adjacent pauses or reverts cannot be entered into an auto-dial telephone number. This is because **, ##, *#, and #* are commands that cause the PL1877A to perform certain functions (see the paragraphs below). Also, a pause or revert cannot be the last digit of an auto-dial telephone number. If you wish to cause a long pause, simply modify the pause duration via parameter 128. The PL1877A automatically pauses when a revert character is encountered, so it is not necessary to enter adjacent pauses and reverts.
 - You can cause the PL1877A to revert from pulse to DTMF dialing when manually dialing telephone numbers (that is, when not using the auto-dial feature). To accomplish this, program the PL1877A for pulse dialing (parameter 31 = 1) and DTMF regeneration subsequent to receipt of a * (parameter 36 = 1; parameter 37 = 1). Then, when dialing a telephone number, enter a * where you wish the revert to occur. For example, if you wanted to dial 9 (revert) 948 - 1490, you would dial 9*. Then, after pausing the required amount of time, you would dial 948 - 1490.
3. While you are entering the auto-dial telephone number, pressing ** causes the PL1877A to key the transmitter and repeat the input digits received so far. This is useful in determining that you have not made any mistakes while entering the number.

4. If you wish to abandon modification of this phone number without saving any of your input, you can enter ****** or **##**. ****** causes the PL1877A to abandon your input, transmit three beeps, and wait for you to enter a new auto-dial location number (followed by a *****). This command is useful if you have made a mistake and wish to start over. **##** causes the PL1877A to abandon your input and exit the auto-dial programming mode. You can enter **##** from any point in the auto-dial programming mode.
5. When you have entered the desired telephone number and wish to store it, enter ***#**. The PL1877A saves your input, returns three beeps, and waits for you to enter a new auto-dial location number (followed by a *****). You can either modify another auto-dial number or exit the auto-dial programming mode (by entering **#** or **##**).
6. To clear an auto-dial location number, enter the auto-dial programming mode as described in 1 above. Then, enter the location number to be cleared (followed by a *****). Then, dial ***#**. The PL1877A clears the location, returns 3 beeps, and waits for you to enter a new location number (followed by *****).

Installation Parameters

Radio Interface

If the PL1877A is to operate in signal search simplex, program parameter 9 = 1, 70 = 0.

If the PL1877A is to operate in half duplex, program parameter 9 = 0.

If the PL1877A is to operate in enhanced VOX, program parameter 9 = 1, 70 = 1.

NOTE: Enhanced VOX option must be present for enhanced VOX to be operational.

Parameter	Function
72	VOX detection threshold for enhanced VOX is more sensitive (threshold = -45 dBm) = 0 VOX detection threshold for enhanced VOX is less sensitive (threshold = -30 dBm) = 1
73	Expected phone audio level for enhanced VOX option is high = 0 Expected phone audio level for enhanced VOX option is low = 1 This parameter determines the maximum gain that can be added to phone line signals that are below the compression threshold. If parameter 73 equals 0, gain is 20 dB. If parameter 73 equals 1, gain is 30 dB.
74	Switch notch filter ON = 1 Switch notch filter OFF = 0

Signal Search Simplex Mode

Description

The standard signal search frequency is two per second or every one-half second. The standard search duration is 20 ms. If these times are not adequate (slower transmitter relays, etc.), they may be adjusted to fit the individual requirements in the following ranges:

Frequency: 4 per sec to once every 2.5 sec; Duration: 15–100 ms.

Installation

The frequency is stored in parameter 358. Determine the number of 25-ms periods in the required frequency. For example, if a frequency of 1 sample per second is desired, the value required would be 40 (hexadecimal 28) ($40 \times 25 \text{ ms} = 1000 \text{ ms} = 1 \text{ sec}$). The duration is stored in parameter 359. Determine the number of 5-ms periods in the required duration. For example, if a duration of 40 ms were required, the value would be 8 ($8 \times 5 \text{ ms} = 40 \text{ ms}$).

Parameter	Function
358	Number of 25-ms periods in the signal search frequency. Range = 10–100
359	Number of 5-ms periods in the signal search sample duration. Range = 3–20

Enhanced VOX Simplex Mode

Parameter	Function
28	<p>Disable enhanced VOX attention getting ticks = 0</p> <p>Enable enhanced VOX attention getting ticks = 1</p> <p>These ticks are sent to the landline user at the beginning of a mobile-originated call. Their purpose is to hold the landline user's attention until the mobile user seizes control of the audio path, keeping the landline user from locking the station in transmit when he answers the telephone. The ticks disappear upon mobile carrier detection after the landline user answers the phone.</p>
29	<p>Disable enhanced VOX, land-line transmit timer = 0</p> <p>Enable enhanced VOX, land-line transmit timer = 1</p> <p>When the patch is being used in the enhanced VOX simplex mode, if landline audio is continuous (keeping the transmitter keyed) for more than 30 seconds, the landline transmit timer unkeys the transmitter for 5 seconds to allow the mobile to take control.</p> <p>Caution: FCC regulations in many services require the landline transmit timer to be enabled.</p>
34	<p>Disable mobile go-ahead beep = 0</p> <p>Enable mobile go-ahead beep = 1</p> <p>The mobile go-ahead beep is sent to the mobile user when the PL1877A detects loss of landline VOX. It signals him/her that it is his/her turn to talk.</p>
127	<p>Enhanced VOX receive recovery delay: number of 50-ms periods in the delay between transmitting and receiving in enhanced VOX mode. Valid range = 0–8</p> <p>Some radios have an inherent delay between transmitting and receiving during which the radio receiver and/or carrier detect outputs are invalid. The PL1877A must be programmed to ignore receiver audio squelch and carrier detect logic during this period. Otherwise, transmitter cycling could result when receiving dial tone or busy tone on the phone line.</p>
514	<p>Enhanced VOX delay. Valid range = 0–100. Default = 100. This parameter determines how long (in 5-ms increments) phone line audio is delayed before being presented at the TX audio port in the enhanced VOX mode.</p>

Carrier Detect Methods

The following parameters determine the source of the signal used to indicate mobile carrier detect. One of three signals can be selected. These are as follows: external logic level input, internal squelch, or internal VOX. The active polarity of the external input can also be selected. By default, the PL1877A is configured for internal squelch carrier detect.

Parameter	Function
3	0 = Internal carrier detect 1 = External logic level carrier detect
4	0 = Carrier detect input is active low 1 = Carrier detect input is high
5	0 = Internal squelch for carrier detect 1 = RX audio VOX for carrier detect
External Logic Input	
	Set parameter 3 = 1 Set parameter 4 as needed.
Internal Squelch Circuit	
	Set parameter 3 = 0 Set parameter 5 = 0
RX Audio VOX	
	Set parameter 3 = 0 Set parameter 5 = 1
PL Validation of Carrier Signal	
When parameter 06 is enabled, the Private Line detect input is checked to determine if a valid system carrier is present. The active polarity of this input is set by the next parameter.	
6	No PL detect input required to validate carrier detect = 0 PL detect input required to validate carrier detect = 1 Default = 0
7	PL detect input is active low = 0 PL detect input is active high = 1 Default = 0

General Purpose Inputs

Parameter	Function
66	GPI-1 input is active low = 0 GPI-1 input is active high = 1 Default = 0
67	GPI-2 input is active low = 0 GPI-2 input is active high = 1 Default = 0
124	Function of programmable input GPI-1 (pin P1-14) 0 = GPI-1 unused 1 = Auxiliary carrier detect input
125	Function of programmable input GPI-2 (pin P1-16) 0 = GPI-2 unused 1 = Auxiliary carrier detect input NOTE: If both GPI-1 and GPI-2 are programmed for auxiliary carrier detect, GPI-2 is unused. In that event, only GPI-1 functions as the auxiliary carrier detect input. The auxiliary carrier detect function is used in applications where two repeaters may be sharing the same channel. In this situation, the auxiliary carrier detect input is connected to the logic carrier detect output of an auxiliary receiver that monitors the repeater transmit frequency. The auxiliary carrier detect function is used only to establish that the channel is idle prior to generating mobile signaling (ring, paging, SID, etc.).

Miscellaneous**Receiver Input Audio Source**

The input from the receiver is obtained from either a pre-emphasized source requiring de-emphasis (discriminators and detectors) or from a de-emphasized (flat) source (volume control or speaker). Parameter 01 is set to match the source.

Parameter	Function
1	RX audio source is pre-emphasized = 0 RX audio source is flat = 1

Receiver Input Audio Level

The input from the receiver is obtained from either a high, mid, or low level source. Parameter 2 and jumper JU202 must be set to match the receiver audio source. Refer to the following information in determining the required state of parameter 2 and jumper JU202.

Audio Source Level	Parameter 2	JU202
2.5 V ac	1	In
0.5 V ac	1	Out (default)
80 mV ac	0	Out

Parameter	Function
10	PTT sense input is active low = 0 PTT sense input is active high = 1 Default = 0
65	Patch inhibit input is active low = 0 Patch inhibit input is active high = 1 Default = 0
549	Signaling pretime – This parameter sets the delay between activating the PTT and generating mobile signaling (rings, paging beeps, SID, etc.). This number is x in the following equation: pretime = 100 ms ($x + 1$). Valid range = 0–24. Default = 3

Telephone Interface

Parameter	Function
163	<p>Off-hook voltage threshold is 25 V = 0</p> <p>Off-hook voltage threshold is 15 V = 1</p> <p>Allow user to manually set off-hook voltage threshold via test 6 (or programming software) = 2</p> <p>Default = 0</p> <p>This parameter is required for determining the off-hook voltage threshold on the PL1877A's phone line. This allows the PL1877A to determine when an attendant (line-sharing) telephone is in use.</p> <p>Program parameter 163 to 0 for a phone line that provides a 48 V talk battery.</p> <p>Program parameter 163 to 1 for a phone line that provides a 24 V talk battery.</p> <p>If the phone line provides substantially less than 24 V of talk battery, it may be necessary to manually program the off-hook threshold via test 6 (or via the programming software). If so, program parameter 163 to 2.</p>
123	<p>Number of rings that PL1877A must receive before generating ring signaling to mobile.</p> <p>Valid range = 1–9.</p> <p>Default = 1</p> <p>This parameter is used to delay ring signaling to the mobile long enough for an attendant to answer the call via a line sharing telephone.</p>

Dialing Characteristics

Parameter	Function
31	DTMF land-line signaling selected = 0 Pulse land-line signaling selected = 1 Default = 0
121	Mobile audio cut-through delay: Valid range = 0–9. This number is x in the following equation: cut through delay = 1 second + x (1 second). Default = 5 Mobile audio cut-through delay is the allowed DTMF interdigit time for a telephone number dialed by the mobile. The audio path from the mobile to phone line is disabled for the duration of this timer. Thus, mobile DTMF is kept from being routed to the phone line while the PL1877A regenerates the DTMF or converts the mobile DTMF into pulse dialing. This timer is refreshed each time a new DTMF digit is received from the mobile.
DTMF Dialing	
36	Disable mobile DTMF regeneration = 0 Enable mobile DTMF regeneration = 1 Default = 1
37	Disable mobile DTMF regeneration after call established = 0 Enable mobile DTMF regeneration after call established = 1 Default = 1 When the mobile user dials a telephone number, he is supposed to terminate his dialing with a *. This parameter determines how subsequent mobile DTMF digits are treated. If this parameter is enabled, the PL1877A regenerates DTMF digits subsequent to the *. Otherwise, the mobile DTMF is routed transparently to the phone line.
129	This parameter determines the “on” time for regenerated digits (the interdigit time is fixed at 100 ms). Valid range = 0–8, for a DTMF “on” time range for 50–450 ms. Default = 1
Pulse Dialing	
Due to the wide variations in telephone line performance experienced in rural and urban environments, it may be necessary or desirable to vary the dial pulse rates from the nominal 9 pulses per second (pps). Long telephone lines to the central office sometimes require lower pulse rates for reliable operation while short telephone lines may allow higher pulse rates. It is recommended that several pulse rates be tried initially to determine the highest reliable rate. Then reduce that rate somewhat to ensure continuously reliable performance.	
130	Rotary dial pulse rate. Valid range = 0–9 0 = 9 pps 6 = 12 pps 1 = 6 pps 7 = 13 pps 2 = 7 pps 8 = 14 pps 3 = 8 pps 9 = 20 pps 4 = 10 pps Default = 0 5 = 11 pps

Parameter Programming Methods

Terminal Programming

Parameter	Function
422-427	<p>Remote parameter access code. This parameter is the prefix to the *#0 mobile DTMF parameter programming command and is also the access code for the terminal programming feature.</p> <p>Valid range = 0–9, A–D, FF. Unused digits must be filled with FF (hexadecimal FF). If all digits are filled with FF, the code is disabled.</p> <p>Default = disabled</p>

Programming from the Telephone

Parameter	Function
145-150	<p>If this code is enabled, it must be entered as a prefix to one of the land-line programming commands:</p> <ul style="list-style-type: none"> *#0 for DTMF parameter programming *#1 for modem software parameter programming *#2 for modem terminal parameter programming <p>Valid range = 0–9, A–D, FF. Unused digits must be filled with FF (hexadecimal FF). If all digits are filled with FF, the code is disabled.</p> <p>Default = disabled</p>

DTMF Programming

21	<p>Disable parameter modification from remote DTMF telephone = 0 Enable parameter modification from remote DTMF telephone = 1</p> <p>Default = 1</p>
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Modem Programming

22	<p>Disable parameter modification via modem = 0 Enable parameter modification via modem = 1</p> <p>Default = 1</p>
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Programming from a Mobile or Portable

Parameter	Function
55	<p>Disable mobile modification of auto-dial numbers = 0 Enable mobile modification of auto-dial numbers = 1 Default = 1</p>
57	<p>Disable parameter modification via mobile user with DTMF keypad = 0 Enable parameter modification via mobile user with DTMF keypad = 1</p> <p>Default = 0</p>

Mobile Access Methods

Mobile Access Command

Parameter	Function
11	Access command is * = 0 Access command is ## = 1 Default = 0

Multi-digit Access

Parameter	Function
38	Don't restrict patch access to users of multi-digit access prefixes = 0 Restrict patch access to users of multi-digit access prefixes = 1 Default = 0
44	When patch access is restricted to mobiles using multi-digit access commands, it may be desirable to allow mobile users to answer a landline call without the necessity of entering the multi-digit prefix. In this case, only a * or *** (answer if called) command would be required. Don't allow bypassing multi-digit access restriction to answer a landline call = 0 Allow bypassing multi-digit access restriction to answer a landline call = 1 Default = 0
NOTE: The valid range for parameters 362–385 is 0–9, A–D, FF. Unused digits must be filled with FF (hexadecimal FF). If all digits are filled with FF, the corresponding code is disable.	
362–367	Multi-digit access prefix #1.
368–373	Multi-digit access prefix #2.
374–379	Multi-digit access prefix #3.
380–385	Multi-digit access prefix #4.

Overriding Preprogrammed Restrictions via Multi-digit Access

Parameter	Function
515–517	Override table entry corresponding to multi-digit access prefix #1.
518–520	Override table entry corresponding to multi-digit access prefix #2.
521–523	Override table entry corresponding to multi-digit access prefix #3.
524–526	Override table entry corresponding to multi-digit access prefix #4.
527–529	Override table entry corresponding to security code.

For details on the override feature, refer to the section on multi-digit access/release in this manual.

Wildcard Access

Parameter	Function
530–535	Refer to the section on Wildcard Access/Release in this manual.

Triple Key Access

The PL1877A can be programmed to allow answering of land-line/attendant calls by mobiles that are not equipped with DTMF decoders. If enabled by parameter 20, the PL1877A interprets three carrier bursts over a 3-second interval as an attempt to answer ring or selective signaling. The PL1877A responds just as if it had received the * access command.

NOTE: This feature requires that the PL1877A be programmed for external logic or internal squelch carrier detection. It is incompatible with RX VOX carrier detection.

Parameter	Function
20	Disable triple key access feature = 0 Enable triple key access feature = 1 Default = 0

Manual Release Methods

Mobile Originated Release

Mobile Release Command

Parameter	Function
12	Normal release command is # = 0 Normal release command is ## = 1 Default = 0

Multi-digit Mobile Release

Parameter	Function
40	Multi-digit release codes are suffixes to release commands = 0 Multi-digit release codes are prefixes to release commands = 1 Default = 0
General Multi-digit Release Code	
410–415	The valid range for parameters 410–415 is 0–9, A–D, FF. Unused digits must be filled with FF (hexadecimal FF). If all digits are filled with FF, the corresponding code is disable. General multi-digit release code.
Specific Multi-digit Release Code	
	The valid range for parameters 386–409 is 0–9, A–D, FF. Unused digits must be filled with FF (hexadecimal FF). If all digits are filled with FF, the corresponding code is disable.
386–391	Multi-digit release code corresponding to multi-digit access prefix #1.
392–397	Multi-digit release code corresponding to multi-digit access prefix #2.
398–403	Multi-digit release code corresponding to multi-digit access prefix #3.
404–409	Multi-digit release code corresponding to multi-digit access prefix #4.

Parameter	Function
Multi-digit Release as Related to Multi-digit Access	
39	Don't tie multi-digit release codes to multi-digit access prefixes = 0 Tie multi-digit release codes to multi-digit access prefixes = 1 Default = 0 Refer to the section on Multi-digit Access/Release in this manual.

Telephone Originated Release

Parameter	Function
23	Don't allow land-line user to disconnect a mobile originated call using DTMF # command = 0 Allow land-line user to disconnect a mobile originated call using DTMF # command = 1

Automatic Release Methods

Mobile Originated Call

Current Supervision

Parameter	Function
16	Don't allow phone line battery reversal or loss to disconnect mobile originated call = 0 Allow phone line battery reversal or loss to disconnect mobile originated call = 1 Default = 0

Busy Tone Detection

Parameter	Function
131	Disconnection due to busy detection. This parameter defines the number of busy tone cycles that must be received to cause the PL1877A to disconnect during a mobile originated call. If set to 0, busy tone detection is set to disabled. Valid range = 1–15. If this parameter is not set to 0, the actual number of busy cycles required to produce disconnection is: 2 + (the value of this parameter).

Telephone Originated Call

Current Supervision

Parameter	Function
17	Don't allow phone line battery reversal or loss to disconnect land-line originated call = 0 Allow phone line battery reversal or loss to disconnect mobile originated call = 1 Default = 0

Dial Tone Detection

Parameter	Function
64	Disable disconnection upon detection of dial tone for a land-line originated call = 0 Enable disconnection upon detection of dial tone for a land-line originated call = 1 Default = 0

General Call Characteristics

Parameter	Function
13	Disable mobile call origination = 0 Enable mobile call origination = 1 Default = 1
14	Disable land-line call origination = 0 Enable land-line call origination = 1 Default = 1
15	Disable attendant call origination = 0 Enable attendant call origination = 1 Default = 1

Call Timers

Parameter	Function
360	The length of time before disconnect that time out warning ticks are generated. Valid range = 0–59 seconds. If this parameter is programmed to 0, time-out ticks are disabled. Default = 15

Overall Access Timer

Parameter	Function
18	Don't allow mobile user to override access time limit with *** command = 0 Allow mobile user to override access time limit with *** command = 1 Default = 0
19	*** command (entered during conversation) resets overall access timer to 1 minute = 0 *** command (entered during conversation) resets overall access timer to duration specified by parameter 357 = 1 Default = 1
357	Overall access timer. Valid range = 1–59 minutes. Any number greater than 59 sets the overall access time to an infinite duration. Default = 1 minute

Mobile Inactivity Timer

Parameter	Function
122	Mobile inactivity timer. This parameter determines how long the PL1877A keeps the phone line accessed without detection of mobile carrier. Valid range = 0-14. This parameter is x in the following equation: mobile inactivity timer = 30 seconds + x (30 seconds). If set to 15 (hexadecimal F), the mobile inactivity timer is disabled. Default = 0

Semi-private Operation

PL Strip Control

Parameter	Function
32	Automatically activate PL strip relay on access = 1 Do not activate PL strip relay on access = 0 Default = 0

Selectable Features

Station Identification (SID or CWID)

Parameter	Function
52	Disable SID on patch release = 0 Enable SID on patch release = 1
62	Do not transmit the SID if it is time to do so and no station PTT has occurred since the last SID transmission = 0 Transmit the SID if it is time to do so and no station PTT has occurred since the last SID transmission = 1
361	The time, in minutes, between SID transmissions. Valid range = 0–59 minutes. If this parameter is programmed to 0, periodic SID is disabled.
501-512	Station ID (SID) - enter the SID in ASCII as shown in the table below. NOTE: ASCII equivalents are given in hexadecimal.

ASCII Equivalentents in Hexadecimal

Character	ASCII Equivalent	Character	ASCII Equivalent	Character	ASCII Equivalent
A	\$41	P	\$50	0	\$30
B	\$42	Q	\$51	1	\$31
C	\$43	R	\$52	2	\$32
D	\$44	S	\$53	3	\$33
E	\$45	T	\$54	4	\$34
F	\$46	U	\$55	5	\$35
G	\$47	V	\$56	6	\$36
H	\$48	W	\$57	7	\$37
I	\$49	X	\$58	8	\$38
J	\$4A	Y	\$59	9	\$39
K	\$4B	Z	\$5A	Period (.)	\$2E
L	\$4C			Comma (,)	\$2C
M	\$4D			Dash (-)	\$2D
N	\$4E			Slash (/)	\$2F
O	\$4F			Space	\$20

Toll Restrictions

Parameter	Function
46	Don't allow 9 as the first telephone number digit = 0 Allow 9 as the first telephone number digit = 1
47	Don't allow 1 as the first telephone number digit = 0 Allow 1 as the first telephone number digit = 1
48	Don't allow 0 as the first telephone number digit = 0 Allow 0 as the first telephone number digit = 1 Up to eight different prefixes of up to four digits each may be restricted. Additionally, up to two numbers or prefixes of up to nine digits each may be specifically allowed, even though they contain a restricted prefix (such as 1411 for information, etc.). One other number or prefix of up to four digits may be specifically allowed. When a number is determined to be restricted and not stored as an allowed number, the patch disconnects the phone line.
For all the remaining parameters of this section, unused digits must be filled with FF (hexadecimal FF). To completely disable an entry, program all its digits to FF.	
446-449	Toll restrict prefix #1. Valid range = 0-\$D (1-4 digits).
450-453	Toll restrict prefix #2. Valid range = 0-\$D (1-4 digits).
454-457	Toll restrict prefix #3. Valid range = 0-\$D (1-4 digits).
458-461	Toll restrict prefix #4. Valid range = 0-\$D (1-4 digits).
462-465	Toll restrict prefix #5. Valid range = 0-\$D (1-4 digits).
466-469	Toll restrict prefix #6. Valid range = 0-\$D (1-4 digits).
470-473	Toll restrict prefix #7. Valid range = 0-\$D (1-4 digits).
474-477	Toll restrict prefix #8. Valid range = 0-\$D (1-4 digits).
478-486	1st 9-digit phone number/prefix excepted from toll restrictions.
487-495	2nd 9-digit phone number/prefix excepted from toll restriction.
496-499	4-digit emergency access number excepted from toll restrictions.
500	Maximum phone number length allowed. Valid range = 1-20. If this parameter is greater than 20, an entry of 20 is assumed.

Autodial

The auto-dial feature allows storage of up to nine often used telephone numbers. When the selective signaling option is present, an additional 16 numbers are available. These numbers can be up to 20 digits each in length. They are stored in the EEPROM/NVRAM, which ensures that the numbers are remembered even during power outages.

Parameter	Function
30	Disable auto-dial feature = 0 Enable auto-dial feature = 1 Default = 0
49	Toll restriction does not apply to auto-dial numbers = 0 Toll restriction applies to auto-dial numbers = 1 Default = 0
53	Don't restrict mobile user to using auto-dial feature for dialing telephone numbers = 0 Restrict mobile user to using auto-dial feature for dialing telephone numbers = 1 Default = 0
128	Time (in seconds) that the PL1877A pauses and waits for dial tone when pause character is encountered in auto-dial number. Valid range = 0–7. This parameter is x in the following equation: pause delay = 1 second ($x + 1$). Default = 5

Entry of Auto-dial Numbers

The following information provides the valid range for auto-dial digits:

1. Pause - Store a hexadecimal E. The pause character allows a pre-programmed amount of time (in seconds) to pass, before continuing with the auto-dial number. See parameter 128.
2. End - Store a hexadecimal FF.
NOTE: If the auto-dial number is less than 20 characters, an END character is necessary. If the auto-dial number (including any reverts and/or pauses) is 20 digits in length, the END character is not necessary.
3. Revert - Store hexadecimal F. The revert character causes a revert from pulse dialing to DTMF if pulse dialing is selected via parameter 31. A revert cannot be made from DTMF to pulse. The revert is followed automatically by a pause. Only one revert may be used per auto-dial number. Any subsequent reverts are treated as pauses. Refer also to the section on mobile programming of auto-dial numbers on page 82.

4. Digits – Valid range = 0–9, A–D.

Parameter	Function
177–196	Auto-dial location #1
197–216	Auto-dial location #2
217–236	Auto-dial location #3
237–256	Auto-dial location #4
257–276	Auto-dial location #5
277–296	Auto-dial location #6
297–316	Auto-dial location #7
317–336	Auto-dial location #8
337–356	Auto-dial location #9
4871–4890	Auto-dial location #10
4891–4910	Auto-dial location #11
4911–4930	Auto-dial location #12
4931–4950	Auto-dial location #13
4951–4970	Auto-dial location #14
4971–4990	Auto-dial location #15
4991–5010	Auto-dial location #16
5011–5030	Auto-dial location #17
5031–5050	Auto-dial location #18
5051–5070	Auto-dial location #19
5071–5090	Auto-dial location #20
5091–5110	Auto-dial location #21
5111–5130	Auto-dial location #22
5131–5150	Auto-dial location #23
5151–5170	Auto-dial location #24
5171–5190	Auto-dial location #25 NOTE: Auto-dial locations 10–25 require that the selective signaling option be present.

Redial

Parameter	Function
71	Disable redial feature = 0 Enable redial feature = 1 Default = 0

Direct Channel Access

Normally, the PL1877A generates a ring signal to the mobile and landline users before granting direct channel access. However, it may be desirable to eliminate this ring.

Parameter	Function
27	Disable mobile ring signaling prior to direct access = 0 Enable mobile ring signaling prior to direct access = 1 Default = 1
58	Disable land-line direct channel access on line 1 = 0 Enable land-line direct channel access on line 1 = 1 Default = 0
42	Disable land-line direct channel access on line 2 = 0 Enable land-line direct channel access on line 2 = 1 Default = 0
59	Disable attendant direct channel access = 0 Enable attendant direct channel access = 1 Default = 0
61	Deactivate PL strip output during direct access time = 0 Activate PL strip output during direct access time = 1 Default = 0
165	The time between automatically answering a land-line call and generating a beep prompt (time = 500 ms + x (50 ms)). Valid range = 0–15 Default = 0

Direct Access Timer

Parameter	Function
25	Disable revert from direct access timer to overall access timer upon detection of mobile carrier during direct access time = 0 Enable revert from direct access timer to overall access timer upon detection of mobile carrier during direct access time = 1 Default = 0 NOTE: If wildcard access is required to perform this function in conjunction with the selective signaling option, this parameter is ignored. Refer to Wildcard Access/Release section.
126	Direct access duration: number of 5 second periods in direct access time. This parameter is x in the following equation: direct access duration = 5 seconds (1 + x). Valid range = 0–8 Default = 0

Direct Access/Selective Signaling Password

Parameter	Function
45	<p>Disable DTMF 1 tone upon automatic phone line access = 0 Enable DTMF 1 tone upon automatic phone line access = 1 Default = 0</p> <p>Some automated equipment requires a specific indication that the patch is ready to accept DTMF digits. When enabled, this parameter causes the patch to answer the line with a DTMF 1 (instead of the usual beep).</p>
50	<p>Don't require * access command from landline user on line 1 before allowing direct channel access or selective signaling input = 0 Require * access command from landline user on line 1 before allowing direct channel access or selective signaling input = 1 Default = 0</p>
43	<p>Don't require * access command from land-line user on line 2 before allowing direct channel access or selective signaling input = 0 Require * access command from landline user on line 2 before allowing direct channel access or selective signaling input = 1 Default = 0</p>
51	<p>Don't require * access command from attendant user before allowing direct channel access or selective signaling input = 0 Require * access command from attendant user before allowing direct channel access or selective signaling input = 1 Default = 0</p>
133-138	<p>Prefix to * land-line access command Valid range = 0-\$D. All unused digits must be programmed to \$F. To completely disable the prefix requires programming all digits to \$F. The landline user must enter this code as a prefix to the * command before being granted direct channel access or selective signaling privileges.</p>
139-144	<p>Prefix to * attendant access command Valid range = 0-\$D. All unused digits must be programmed to \$F. To completely disable the prefix requires programming all digits to \$F. The attendant user must enter this code as a prefix to the * command before being granted direct channel access or selective signaling privileges.</p>

Emergency Call Direct Access

Parameter	Function
24	Disable emergency call direct access = 0 Enable emergency call direct access = 1 Default = 0 With this feature enabled, a caller or attendant that has dialed into the patch (and has been answered by the patch) and is waiting (channel busy, another call, no mobile answer, etc.) can declare an emergency and immediately be connected to the radio by sending ***. The patch returns a connect beep, and cuts through the conversational audio (this occurs even if the channel is busy). The duration of channel access is governed by the value of parameter 126.

Mobile Security Code (Privileged User Override)

Parameter	Function
60	Disable control of external devices using the security code = 0 Enable control of external devices using the security code = 1 Default = 0 In some installations, it is desirable to operate an external device whenever the security code has been entered by the mobile user. An example of such an application would be operating a second PL code. This function should not be used in installations where receive audio is used as the mobile carrier indicator (parameter 03 = 0, parameter 05 = 1). With this parameter enabled, the monitor relay activates whenever the security code is received. It remains active until the patch disconnects again.
416-421	DTMF Security Code (Privileged User Override Code) - Refer to the section on Multi-digit Access/Release in this manual.

Station/Repeater Enable Feature

The station/repeater enable feature allows a mobile user to selectively enable the PL1877A and/or associated station. Until the station repeater enable command ($n^{**}\#$, where n is the station/repeater enable prefix stored in parameters 428–433) is received, the PL1877A will not respond to any mobile commands. However, the PL1877A transmits ring and/or selective signaling in response to phone line activity.

Upon receiving the station/repeater enable command, the PL1877A activates the monitor output. This output can be used to enable the base station or repeater, if desired. The PL1877A remains responsive to mobile DTMF commands for 7 minutes following reception of the enable command. The monitor output remains active for that entire duration. If the mobile accesses the phone line during the 7 minutes, the PL1877A remains responsive to mobile DTMF (and keeps the monitor output active) until disconnection occurs.

The mobile user can refresh the 7-minute timer by sending the *** command. He can disable the PL1877A and deactivate the monitor output by sending a disconnect sequence ($\#$ or $\#\#$ with any required multi-digit prefix/suffix) at any time.

Installation

To enable the station/repeater enable feature, program parameter 56 to 1.

NOTE: The station/repeater enable feature is not available when the PL1877A is programmed for RX VOX carrier detect (parameter 3 = 0; parameter 5 = 1). This is because the monitor output is used for channel scanning in that configuration.

The station/repeater enable prefix consists of 1–6 DTMF digits. Each digit has a valid range of 0-D. Unused digits must be filled with FF (hexadecimal FF). To completely disable the prefix (thus requiring only *****#** as the enable command), store FF in all digits.

Parameter	Function
56	Disable station/repeater enable feature = 0 Enable station/repeater enable feature = 1 Default = 0
428-433	Station/repeater enable prefix.

Miscellaneous Features

Parameter	Function
26	Disable multiple ringing to mobiles = 0 Enable multiple ringing to mobiles = 1 Default = 0
33	Disable “over” beep to phone user = 0 Enable “over” beep to phone user = 1 Default = 1 The over beep is returned to the phone user when the PL1877A detects loss of mobile carrier. It indicates that it is the phone user’s turn to talk.
54	Don’t allow mobile user to access busy phone line with *** command = 0 Allow mobile user to access busy phone line with *** command = 1 Default = 0 If the mobile has attempted to access the PL1877A for an outbound call and the PL1877A detects that the phone line is already in use by an attendant (line-sharing telephone user), busy tones are transmitted to the mobile. The PL1877A continues to return busy tones for 30 seconds, or until the attendant hangs up. If the attendant hangs up, the PL1877A accesses the phone line for the requested outbound call. In this situation the mobile can force the PL1877A to access the busy line by sending ***.
69	Ring signal generated to mobile is low frequency = 0 (low frequency is a 430/390 Hz combination) Ring signal generated to mobile is high frequency = 1 (high frequency is an 840/800 Hz combination) Default = 0

Parameter/Function Reference Table

Parameter No.	Description	Control Digits	Refer to Section on Page:
1	Determines whether RX receiver audio source is pre-emphasized or flat.	0 = Pre-emphasized 1 = Flat	87
2	Determines whether RX audio input level is low or high.	See appropriate section.	Beginning 12
3	Determines whether internal carrier detect or external logic level carrier detect will be used.	0 = Internal carrier detect 1 = External logic level carrier detect	85
4	Determines whether the carrier detect input is active low or high.	0 = Active low 1 = High	85
5	Determines whether internal squelch or RX audio VOX is used for carrier detect.	0 = Internal squelch 1 = RX audio VOX	85
6	Determines whether or not PL detect input is required to validate carrier detect.	0 = no PL detect input required 1 = PL detect input required Default = 0	85
7	Determines whether PL detect input is active low or active high.	0 = Active low 1 = Active high Default = 0	85
9	Determines whether patch is half duplex or simplex.	0 = Half duplex 1 = Simplex Default = 1	83
10	Determines whether PTT sense input is active low or active high.	0 = Active low 1 = High Default = 0	87
11	Determines whether the access command is * or #*.	0 = * 1 = #* Default = 0	91
12	Determines whether the normal release command is # or ##.	0 = # 1 = ## Default = 0	92
13	Determines whether the mobile call origination is disabled or enabled.	0 = Disable 1 = Enable Default = 1	94
14	Determines whether landline call origination is disabled or enabled.	0 = Disable 1 = Enable Default = 1	94
15	Determines whether attendant call origination is disabled or enabled.	0 = Disable 1 = Enable Default = 1	94

Parameter No.	Description	Control Digits	Refer to Section on Page:
16	Determines whether phone line battery reversal or loss, to disconnect mobile originated call is allowed.	0 = Don't allow 1 = Allow Default = 0	93
17	Determines whether phone line battery reversal or loss, to disconnect landline originated call is allowed.	0 = Don't allow 1 = Allow Default = 0	93
18	Determines whether the mobile user is allowed to override the access time limit with ***.	0 = Don't allow 1 = Allow Default = 0	94
19	Determines whether the *** command resets the overall access timer to 1 minute or the time specified by parameter 357.	0 = Resets timer to 1 minute 1 = Resets timer to duration specified by parameter 357.	94
20	Enables or disables the triple key access feature.	0 = Disable 1 = enable Default = 0	92
21	Enables or disables parameter modification from a remote DTMF telephone.	0 = Disable 1 = Enable Default = 1	90
22	Enables or disables parameter modification via a modem.	0 = Disable 1 = Enable Default = 1	90
23	Determines whether a landline user can disconnect a mobile originated call using the DTMF # command.	0 = Disable 1 = Enable	93
24	Determines whether emergency call direct access is enabled or disabled.	0 = Disable 1 = Enable Default = 0	102
25	Determines whether revert from direct access timer to overall access timer upon detection of mobile carrier is enabled or disabled.	0 = Disable 1 = Enable Default = 0	100
26	Enables or disables multiple ringing to mobiles.	0 = Disable 1 = Enable Default = 0	103
27	Enables or disables mobile ring signaling prior to direct access.	0 = Disable 1 = Enable Default = 1	100
28	Enables or disables enhanced VOX attention getting ticks.	0 = Disable 1 = Enable	84
29	Determines whether enhanced VOX, landline transmit timer is enabled or disabled.	0 = Disable 1 = Enable	84

Parameter No.	Description	Control Digits	Refer to Section on Page:
30	Enable or disable auto-dial feature.	0 = Disable 1 = Enable Default = 0	98
31	Determines whether DTMF or pulse landline signaling is selected.	0 = DTMF land-line signaling 1 = Pulse land-line signaling Default = 0	89
32	Determines whether PL strip relay is automatically activated on access.	0 = Do not activate 1 = Activate Default = 0	95
33	Determines whether "over" beep to phone user is enabled or disabled.	0 = Disable 1 = Enable Default = 1	103
34	Enables/disables mobile go-ahead beep.	0 = Disable 1 = Enable	84
36	Determines whether mobile DTMF regeneration is enabled or disabled.	0 = Disable 1 = Enable Default = 1	89
37	Determines whether mobile DTMF regeneration, after call is established, is enabled or disabled.	0 = Disable 1 = Enable Default = 1	89
38	Allows the patch access, to users of multi-digit access prefixes, to be restricted or unrestricted.	0 = Don't restrict patch access 1 = Restrict patch access Default = 0	91
39	Determines whether multi-digit release codes are tied to multi-digit access prefixes.	0 = Don't tie release codes 1 = Tie release codes Default = 0	92
40	Determines whether multi-digit release codes are suffixes to release commands or prefixes to release commands.	0 = Suffixes 1 = Prefixes Default = 0	92
42	Determines whether landline direct channel access on line 2 is enabled or disabled.	0 = Disable 1 = Enabled Default = 0	100
43	Determines whether * access command is required from a landline user on line 2 before allowing direct channel access or selective signaling input.	0 = Don't require 1 = require Default = 0	101
44	Determines whether bypassing multi-digit access restriction, to answer a landline call is allowed.	0 = Don't allow 1 = Allow Default = 0	91
45	Determines whether DTMF 1 tone upon automatic phone line access is enabled or disabled.	0 = Disable 1 = Enable Default = 0	101

Parameter No.	Description	Control Digits	Refer to Section on Page:
46	Allows 9 as the first telephone digit.	0 = Don't allow 1 = Allow	97
47	Allows 1 as the first telephone digit.	0 = Don't allow 1 = Allow	97
48	Allows 0 as the first telephone digit.	0 = Don't allow 1 = Allow	97
49	Determines whether toll restriction applies to auto-dial numbers.	0 = Does not apply 1 = Applies Default = 0	98
50	Determines whether * access command is required from a landline user on line 1 before allowing direct channel access or selective signaling input.	0 = Don't require 1 = Require Default = 1	101
51	Determines whether * access command is required from attendant user before allowing a direct channel access or selective signaling input.	0 = Don't require 1 = Require Default = 1	101
52	Enable or disable SID on patch release.	0 = Disable 1 = Enable	95
53	Determines whether the mobile user is restricted to using the auto-dial feature for dialing telephone numbers.	0 = Don't restrict 1 = Restrict Default = 0	98
54	Allows a mobile user to access a busy phone line with the *** command.	0 = Don't allow 1 = Allow Default = 0	103
55	Enables/disables mobile modification of auto-dial numbers.	0 = Disable 1 = Enable Default = 1	90
56	Determines whether the station/repeater enable feature is enabled or disabled.	0 = Disable 1 = Enable Default = 0	103
57	Enables or disables a mobile users ability to modify parameters with a DTMF keypad.	0 = Disable 1 = Enable Default = 0	90
58	Enable or disables landline direct channel access.	0 = Disable 1 = Enable Default = 0	100
59	Enable or disables attendant direct channel access.	0 = Disable 1 = Enable Default = 0	100

Parameter No.	Description	Control Digits	Refer to Section on Page:
60	Determines whether control of external devices using the security code is enabled or disabled.	0 = Disable 1 = Enable Default = 0	102
61	Determines whether the PL strip output is activated or deactivated during direct access time.	0 = Deactivate 1 = Activate Default = 0	100
62	Determines whether the SID is transmitted, if it is time to do so and no station PTT has occurred since the last SID transmission.	0 = Do not transmit 1 = Transmit	95
64	Enable or disable disconnection upon detection of dial tone for a landline originated call.	0 = Disable 1 = Enable Default = 0	94
65	Determines whether patch inhibit input is active low or active high.	0 = Active low 1 = High Default = 0	87
66	Determines whether GPI-1 is active low or active high.	0 = Active low 1 = Active high Default = 0	86
67	Determines whether GPI-2 is active low or active high.	0 = Active low 1 = Active high Default = 0	86
69	Determines whether the ring signal generated to the mobile is a low frequency (430/390 Hz combination) or a high frequency (840/800 Hz combination)	0 = Low frequency 1 = High frequency Default = 0	103
70	Enable or disable enhanced VOX.	0 = Disable 1 = Enable	83
71	Enable or disable redial feature.	0 = Disable 1 = Enable Default = 0	99
72	Determines whether VOX detection threshold is more or less sensitive.	0 = more sensitive (threshold = -45 dBm) 1 = less sensitive (threshold = -30 dBm)	83
73	Determines whether phone audio level for enhanced VOX option is high or low.	0 = High 1 = Low	83
74	Switches notch filter Off or On.	0 = Off 1 = On	83
121	Mobile audio cut-through delay.	Valid range = 0–9 Default = 5	89
122	Mobile inactivity control.	Valid range = 0–14 Default = 0	95

Parameter No.	Description	Control Digits	Refer to Section on Page:
123	Determines the number of rings that the PL1877A must receive before generating ring signaling to the mobile.	Valid range = 1–9 Default = 1	88
124	Determines the function of programmable GPI-1 (pin P1-14).	0 = GPI-1 unused 1 = Aux. carrier detect input	86
125	Determines the function of programmable GPI-2 (pin P1-16).	0 = GPI-2 unused 1 = Aux. carrier detect input	86
126	Direct access duration - the number of 5-second periods in the direct access time.	Valid range = 0–8 Default = 0	100
127	Enhanced VOX receive recovery delay - the number of 50-ms periods in the delay between transmitting and receiving enhanced VOX mode.	Valid range = 0–8	84
128	The time, in seconds, that the PL1877A is to pause and wait for a dial tone when the pause character is encountered in an auto-dial number.	Valid range = 0–7 Default = 5	98
129	Determines the “on” time for regenerated digits.	Valid range = 0–8 (50–450 ms) Default = 1	89
130	Rotary dial pulse rate.	Valid range = 0–9 0 = 9 pulses per second 1 = 6 pulses per second 2 = 7 pulses per second 3 = 8 pulses per second 4 = 10 pulses per second 5 = 11 pulses per second 6 = 12 pulses per second 7 = 13 pulses per second 8 = 14 pulses per second 9 = 20 pulses per second Default = 0	89
131	The number of busy tone cycles that must be received to cause the PL1877A to disconnect during a mobile originated call. When this parameter is set to 0, busy tone detection is disabled.	Valid range = 1–15 Default = 0	93
133-138	Prefix to * landline access code - the access code a landline user must enter as a prefix to the * command, before being granted direct channel access or selective signaling privileges.	Valid range = 0–\$D	101

Parameter No.	Description	Control Digits	Refer to Section on Page:
139-144	Prefix to * attendant access code - the code an attendant user enters as a prefix to the * command before being granted direct channel access or selective signaling privileges.	Valid range = 0-\$D	101
145-150	Landline remote parameter programming code - when enabled, the code must be entered as a prefix to one of the landline programming commands.	Valid range = 0-9, A-D, FF Default = disabled	90
163	Off-hook Voltage Threshold	See appropriate section.	88
165	Time between automatically answering a land-line call and generating a beep prompt (time = 500 ms + x)50 ms))	Valid range = 0-15 Default = 0	100
177-196	Auto-dial location #1.	See appropriate section.	98
197-216	Auto-dial location #2.	See appropriate section.	98
217-236	Auto-dial location #3.	See appropriate section.	98
237-256	Auto-dial location #4.	See appropriate section.	98
257-276	Auto-dial location #5.	See appropriate section.	98
277-296	Auto-dial location #6.	See appropriate section.	98
297-316	Auto-dial location #7.	See appropriate section.	98
317-336	Auto-dial location #8.	See appropriate section.	98
337-356	Auto-dial location #9.	See appropriate section.	98
357	Overall access time limit. Any number greater than 59; sets the overall access time limit to an infinite duration.	Valid range = 1-59 minutes Default = 0	94
358	The number of 25-ms periods in the signal search frequency.	Valid range = 10-100	83
359	The number of 5-ms periods in the signal search sample duration.	Valid range = 3-20	83
360	The length of time before disconnect that time out warning ticks are generated.	Valid range = 0-59 seconds Default = 15	94
361	Determines the time between SID transmissions. If this parameter is programmed to 0, periodic SID is disabled.	Valid range = 0-59 minutes	95
362-367	Multi-digit access prefix #1.	Valid range = 0-9, A-D, FF	91
368-373	Multi-digit access prefix #2.	Valid range = 0-9, A-D, FF	91
374-379	Multi-digit access prefix #3.	Valid range = 0-9, A-D, FF	91
380-385	Multi-digit access prefix #4.	Valid range = 0-9, A-D, FF	91

Parameter No.	Description	Control Digits	Refer to Section on Page:
386-391	Multi-digit release code, corresponding to multi-digit access prefix #1.	Valid range = 0-9, A-D, FF	92
392-397	Multi-digit release code, corresponding to multi-digit access prefix #2.	Valid range = 0-9, A-D, FF	92
398-403	Multi-digit release code, corresponding to multi-digit access prefix #3.	Valid range = 0-9, A-D, FF	92
404-409	Multi-digit release code, corresponding to multi-digit access prefix #4.	Valid range = 0-9, A-D, FF	92
410-415	General multi-digit release code.	Valid range = 0-9, A-D, FF	92
416-421	DTMF Security Code (Privileged User Override Code)	See appropriate section	102
422-427	Remote parameter access code - this code is the prefix to the *#0 mobile DTMF parameter programming command. It is also the access code for the terminal programming feature.	Valid range = 0-9, A-D, FF Default = disabled	90
428-433	Station/repeater enable prefix - this parameter is the prefix to the **# station/repeater enable command.	See appropriate section.	103
446-449	Toll restrict prefix #1.	Valid range = 0-\$D (1-4 digits)	97
450-453	Toll restrict prefix #2.	Valid range = 0-\$D (1-4 digits)	97
454-457	Toll restrict prefix #3.	Valid range = 0-\$D (1-4 digits)	97
458-461	Toll restrict prefix #4.	Valid range = 0-\$D (1-4 digits)	97
462-465	Toll restrict prefix #5.	Valid range = 0-\$D (1-4 digits)	97
466-469	Toll restrict prefix #6.	Valid range = 0-\$D (1-4 digits)	97
470-473	Toll restrict prefix #7.	Valid range = 0-\$D (1-4 digits)	97
474-477	Toll restrict prefix #8.	Valid range = 0-\$D (1-4 digits)	97
478-486	1st 9-digit phone number/prefix excepted from toll restriction.	Valid range = 0-9 (4 digits)	97
487-495	2nd 9-digit phone number/prefix excepted from toll restriction.	Valid range = 0-9 (4 digits)	97

Parameter No.	Description	Control Digits	Refer to Section on Page:
496–499	Four-digit emergency access number exception from toll restrictions.	Valid range = 0–9 (4 digits)	97
500	Maximum phone number length allowed. If this parameter is greater than 20, an entry of 20 is assumed.	Valid range = 1–20	97
501–512	Station ID (SID)	See appropriate section.	95
514	Enhanced VOX delay.	Valid range = 0–100 Default = 100	84
515–517	Override table entry corresponding to multi-digit access prefix #1.	See appropriate section.	91
518–520	Override table entry corresponding to multi-digit access prefix #2.	See appropriate section.	91
521–523	Override table entry corresponding to multi-digit access prefix #3.	See appropriate section.	91
524–526	Override table entry corresponding to multi-digit access prefix #4.	See appropriate section.	91
527–529	Override table entry corresponding to security code.	See appropriate section.	91
530–535	Wildcard access/release code template - a 6-byte template that defines the structure of wildcard access/release codes. The code appearing in the template must be right justified (the last digit of the template must be in parameter 535). Filling the template with \$FF disables wildcard features.	Refer to the Wildcard Access/Release section in this manual.	91
549	Signaling pretime - the delay between activating the PTT and generating mobile signaling.	Valid range = 0–24 Default = 3	87
1001	Determines whether selective signaling from a landline caller on line 1 is enabled or disabled.	0 = Disabled 1 = Enable Default = 0	117
1002	Determines whether selective signaling from an attendant is enabled or disabled.	0 = Disabled 1 = Enable Default = 0	119
1003	Determines whether mobile revertive mobile-to-mobile signaling is enabled or disabled.	0 = Disabled 1 = Enable Default = 0	119
1004	Determines whether the PL strip output during transmission of selective signaling tones is activated or deactivated.	0 = Deactivate 1 = Activate	122

Parameter No.	Description	Control Digits	Refer to Section on Page:
1005	Determines whether pulse dial decoding for landline selective signaling input is enabled or disabled.	0 = Disabled 1 = Enable	123
1006	Determines whether 6 dB/octave de-emphasis of selective signaling tones is enabled or disabled.	0 = Disabled 1 = Enable	122
1007	Determines whether selective signaling from a landline caller on line 2 is enabled or disabled.	0 = Disable 1 = Enable Default = 0	122
1008	Determines whether 5-tone diagnostic mode is enabled or disabled.	0 = Disable 1 = Enable	122
1009	Enable or disable the ability of a landline user to cause generation of group calls for a selected paging type.	0 = Disable 1 = Enable	126
1010	Enable or disable the ability of an attendant to cause generation of group calls for a selected paging type.	0 = Disable 1 = Enable	126
1011	Enable or disable the ability of a mobile user to cause generation of group calls for a selected paging type.	0 = Disable 1 = Enable	126
1012	Determines whether dual-addressing in Motorola 5-Tone selective signaling is enabled or disabled.	0 = Disable 1 = Enable	128
1081	Allows selection of the type of selective signaling for a landline user.	0 = DTMF 1 = 2-Tone 2 = Plectron 3 = 2805 4 = 1500 5 = Motorola/EIA 5-Tone 8 = TPL 9 = DPL \$F = Multi-mode	123
1082	Determines the action to take when the time allotted for receiving the first selective signaling or user ID digit expires or an improper phone line dialing is received.	0 = Disconnect 1 = Revert to ring signaling 2 = Revert to user ID 00	123
1083	Determines the number of digits accepted from a landline user for selective signaling. The valid range depends on the type of selective signaling selected.	0-6 = DTMF, 2805, 1500 0-3 = 2-Tone 0-4 = Plectron 0-6 = Motorola/EIA	123

Parameter No.	Description	Control Digits	Refer to Section on Page:
1084	Determines the number of digits accepted from an attendant for selective signaling. The valid range depends on the type of selective signaling selected.	0-6 = DTMF, 2805, 1500 0-3 = 2-Tone 0-4 = Plectron 0-6 = Motorola/EIA	123
1085	Determines the number of digits accepted from a mobile user for selective signaling. The valid range depends on the type selective signaling selected.	0-6 = DTMF, 2805, 1500 0-3 = 2-Tone 0-4 = Plectron 0-6 = Motorola/EIA	123
1087	Determines the number of times to repeat signaling.	Valid range = 0-8	122
1088	Mobile answer time - the number of 10-second increments for a mobile to answer a selective call before disconnection or advancing to an alternate user ID.	Valid range = 0-15	122
1089	Landline and attendant DTMF dialing inter-digit time - the time between digits being entered as selective signaling input.	Valid range = 0-15	123
1090	DTMF outpulse timing - the number of 50-ms periods in the DTMF digit/inter-digit time.	Valid range = 0-8	126
1091	2-Tone paging A tone length - the number of .5-second increments in the duration of the first tone of a 2-Tone sequence.	Valid range = 0-8	126
1092	2-Tone paging B tone length - the number of .5-second increments in the duration of the second tone of a 2-Tone sequence.	Valid range = 0-8	126
1093	Plectron paging A tone length - the number of .5-second increments in the duration of the first tone of a Plectron tone sequence.	Valid range = 0-8 (.5 to 4.5 seconds)	121
1094	Plectron paging B tone length - the number of .5 second increments in the duration of the second tone of a Plectron tone sequence.	Valid range = 0-8 (.5 to 4.5 seconds)	121
1095	2805 Tone off time - the number of 10-ms periods in tone off time for 2805 paging. This parameter is x in the following equation: $10 \text{ ms} + x (10 \text{ ms})$.	Valid range = 0-8 (10-90 ms)	127
1096	1500 Tone off time - the number of 10 ms periods in tone off time for 1500 paging.	Valid range = 0-8 (10-90 ms)	127

Parameter No.	Description	Control Digits	Refer to Section on Page:
1129	Selected code plan number for single-mode and 2-tone paging. NOTE: This parameter must be loaded such that the 1st digit of the 2-digit decimal code plan number appears in the upper nibble and the 2nd digit appears in the lower nibble. Example: code plan #23 would be loaded as \$23.	Valid range = 00–24 (decimal)	126
1130	Preamble tone number for single-mode and Motorola/EIA 5-Tone paging. NOTE: This parameter must be loaded such that the 1st digit of the 2-digit decimal tone number appears in the upper nibble and the 2nd digit appears in the lower nibble. Example: code plan #25 would be loaded as \$25.	Valid range = 00–25 (decimal)	128
1131-1139	DTMF paging preamble	Valid digit range – 0–\$F	126
1140-1142	Preprogrammed 2-Tone paging digits	Valid digit range = 0–9	126
1143-1146	Preprogrammed Plectron paging digits. NOTE: The first 2 digits of a Plectron capcode cannot exceed 35.	Valid digit range = 0–9	127
1147-1155	2805 paging preamble	Valid digit range = 0–9	127
1156-1164	1500 paging preamble	Valid digit range = 0–9	127
1165-1170	Preprogrammed Motorola/EIA 5-Tone paging digits	Valid digit range = 0–9	128
1179-2878	Multi-mode paging table	See appropriate section.	124
4871-4890	Auto-dial location #10	See appropriate section.	98
4891-4910	Auto-dial location #11	See appropriate section.	98
4911-4930	Auto-dial location #12	See appropriate section.	98
4931-4950	Auto-dial location #13	See appropriate section.	98
4951-4970	Auto-dial location #14	See appropriate section.	98

Parameter No.	Description	Control Digits	Refer to Section on Page:
4971-4990	Auto-dial location #15	See appropriate section.	98
4991-5010	Auto-dial location #16	See appropriate section.	98
5011-5030	Auto-dial location #17	See appropriate section.	98
5031-5050	Auto-dial location #18	See appropriate section.	98
5051-5070	Auto-dial location #19	See appropriate section.	98
5071-5090	Auto-dial location #20	See appropriate section.	98
5091-5110	Auto-dial location #21	See appropriate section.	98
5111-5130	Auto-dial location #22	See appropriate section.	98
5131-5150	Auto-dial location #23	See appropriate section.	98
5151-5170	Auto-dial location #24	See appropriate section.	98
5171-5190	Auto-dial location #25	See appropriate section.	98

Second Line Option

The PL1877A Second Line Option (Kit No. XTI0001A) provides mobile users with the ability to answer and originate calls on a second phone line. Note, however, that conferencing of calls between lines 1 and 2 is not supported. At any given time, the PL1877A operates on whichever line is currently selected. When the PL1877A is idle, it defaults to line 1 being the selected line. The PL1877A automatically selects line 2 when it detects ringing on that line while in the idle condition. Also, the mobile can specifically command the PL1877A to select line 2 if line 1 has not been accessed (that is, if a conversation is not occurring on line 1).

NOTE: Generally, the PL1877A's support for attendant originated calls (calls originated from a line-sharing telephone set) is limited to line 1. This is because the PL1877A idles on line 1 (as stated above). Thus, unless the PL1877A has switched to line 2 for some reason (such as a mobile command), it cannot receive the attendant access command from a line-sharing telephone set on line 2.

Answering Calls on Line 2

When the PL1877A is idle and detects ringing on line 1, it transmits a 3-second ring signal to the mobile (if not programmed for selective signalling or direct access). The same applies for line 2; however, the ring signal for line 2 is comprised of two bursts (1 second burst, .5 second silence, 1.5 second burst). This difference allows the mobile to determine whether the incoming call is on line 1 or line 2.

The mobile user answers a call on line 2 in exactly the same manner as he answers a call on line 1. That is, he uses the * (or #* or ***) access command (possibly preceded by a multi-digit or wildcard access prefix).

If line 2 begins ringing while a conversation is occurring on line 1 (or if line 1 begins ringing while a conversation is occurring on line 2), the PL1877A generates a periodic, soft, high-pitched warbling tone to the mobile. This tone is summed with the phone line audio and does not interfere with voice communications. It alerts the mobile that the PL1877A's other line is ringing. If the mobile wishes to answer the other line, he must first terminate the current conversation by entering the disconnect command (# or ## - possibly in conjunction with a multi-digit release sequence). The PL1877A generates 6 disconnect beeps and then transmits the 3-second ring signal (if the other line is not programmed for selective signalling or direct access).

NOTE: Selective signaling and direct access are programmable on a per-line basis. That is, you can program the selective signaling or direct access features to operate on one, both, or neither line.

Originating Calls on Line 2

Since the PL1877A idles on line 1, the mobile user must specifically direct the PL1877A to line 2 if he wishes to place a call on that line. This is accomplished by dialing *2* from the mobile encoder. The mobile user can then access the PL1877A via an access command, autodial command, or redial command. If the mobile user has not attempted to access the phone line within 30 seconds after entering the *2* command, the PL1877A automatically reselects line 1.

The *2* command can also be used when the PL1877A is generating a busy signal to the mobile. When the PL1877A attempts to access the phone line for a mobile originated call, it returns a busy signal if it detects that the line is in use by a line-sharing telephone set. If the mobile wishes to bypass the busy line and place the call on line 2, he can dial *2*. The PL1877A switches to line 2 and attempts the call on that line.

NOTE: If the mobile user switches to line 2 in response to busy signaling (as described above), it is not necessary to re-enter the access command. When the PL1877A switches to line 2, it automatically accesses the phone line. If the mobile had previously entered an auto-dial or redial command, the PL1877A proceeds with auto-dialing or redialing the telephone number.

The *2# command can be used to immediately return the PL1877A to line 1 when line 2 has already been selected. For example, if the PL1877A detects ringing on line 2, switches to line 2, and rings the mobile, the mobile user can command the PL1877A back to line 1 (in order to originate a call) via the *2# command. *2# can also be used when the PL1877A returns busy signaling (as described previously) to the mobile because line 2 is in use by a line-sharing telephone set.

Selective Signaling

The PL1877A supports single-mode and multi-mode selective signaling. In single-mode selective signaling, the PL1877A is programmed to use only one paging type (DTMF, 2-tone, etc.) for all mobiles. In multi-mode selective signaling, the PL1877A is capable of paging 100 mobiles, each of which has its own defined paging type. In multi-mode operation, each mobile is assigned a user ID from 0 to 99.

The selective signaling feature may be operated by:

1. A land line caller with a DTMF or rotary telephone;
2. An attendant (the user of a DTMF telephone that shares the same phone line as the PL1877A);
3. A mobile user with a DTMF encoder.

Parameter settings determine which of these are allowed (any, all, or none).

Landline Caller

The caller dials the telephone number of the PL1877A. When the PL1877A answers, it normally generates two beeps to indicate that it is waiting on the landline user to enter the required capcode digits or user ID.

NOTE: If the PL1877A is programmed to require a landline access code before allowing selective signaling (parameter 50 = 1 or parameter 43 = 1), then it answers the phone line with one beep. After the landline user has entered * (possibly preceded by an access prefix - parameters 133–138), the PL1877A generates two beeps and awaits the paging input digits.

The caller is allowed a certain time (set by parameter 1089) to enter the first input digit. When the proper number of digits has been entered, the PL1877A generates three beeps. Then, the PL1877A checks for a clear channel before paging the mobile. If the channel is busy, the PL1877A returns busy tones to the landline. The PL1877A continues to check for a clear channel for a maximum of one minute. If the channel is not clear at the end of 1 minute, the PL1877A disconnects.

When the channel is clear, the PL1877A pages the mobile. Then, if the PL1877A is not programmed for direct access, it waits for the mobile to answer. Otherwise, the PL1877A immediately patches the landline user through to the channel for the duration of the direct access timer.

If the landline user takes too long to enter the paging input digits, the PL1877A responds in one of 3 ways, depending on the value of parameter 1082. It either disconnects the land-line, transmits ring signaling to the mobiles, or pages user ID 00 (if user ID 00 has been enabled).

If the landline user desires to page several mobiles at once, he enters the paging input for the first mobile as described above. Then, when the PL1877A has paged the mobile, he presses **. In response, the PL1877A generates two beeps to indicate it is again awaiting paging input. Then, he enters the paging input digits for the second mobile. This process continues until all the desired mobiles have been paged.

Attendant

The attendant dials #* (the attendant access command). When the PL1877A answers, it normally generates two beeps to indicate that it is waiting on the attendant user to enter the required capcode digits or user ID.

NOTE: If the PL1877A is programmed to require an attendant access code before allowing selective signaling (parameter 51 = 1), then it answers the phone line with one beep. After the attendant has entered * (possibly preceded by an access prefix - parameters 139–144), the PL1877A generates two beeps and awaits the paging input digits.

The attendant is allowed a certain time (set by parameter 1089) to enter the first input digit. When the proper number of digits has been entered, the PL1877A generates the beeps. Then, it checks for a clear channel before paging the mobile. If the channel is busy, the PL1877A returns several busy tones to the attendant. The PL1877A continues to check for a clear channel for a maximum of one minute. If the channel is not clear at the end of one minute, the PL1877A generates six disconnect beeps and returns to idle.

When the channel is clear, the PL1877A pages the mobile. Then, if the PL1877A is not programmed for direct access, it waits for the mobile to answer. Otherwise, the PL1877A immediately patches the attendant through to the channel for the duration of the direct access timer.

If the attendant takes too long to enter the paging input digits, the PL1877A responds in one of three ways, depending on the value of parameter 1082. It either disconnects the landline, transmits ring signaling to the mobiles, or pages user ID 00 (if user ID 00 has been enabled).

If the attendant desires to page several mobiles at once, he enters the paging input for the first mobile as described above. Then, when the PL1877A has paged the mobile, he presses **. In response, the PL1877A generates two beeps to indicate it is again awaiting paging input. Then, he enters the paging input digits for the second mobile. This process continues until all the desired mobiles have been paged.

NOTE: While the PL1877A is awaiting input digits from the attendant (or after the PL1877A has generated several busy tones to the attendant and is waiting for the channel to clear), the PL1877A de-accesses the phone line. This is to allow the PL1877A to detect whether the attendant telephone is placed on-hook. If it is, then the PL1877A terminates the call.

Mobile User (Mobile Revertive Signaling)

A mobile can selectively signal another mobile using the revertive signaling feature of the PL1877A. The mobile dials the revertive code (*##) and the appropriate paging input digits (capcode digits or user ID). After monitoring the channel for activity, the PL1877A sends the paging sequence.

Group Calls

A group call is a paging sequence that alerts several mobiles/portables/pagers at once. The PL1877A supports group calls for 2-tone paging.

The ability of landline, attendant, and mobile users to initiate group calls can be independently enabled or disabled via parameters 1009, 1010, and 1011.

If a landline user attempts to transmit a group call when parameter 1009 specifically forbids group calling, the PL1877A disconnects. If an attendant user attempts to transmit a group call when parameter 1010 specifically forbids group calling, the PL1877A disconnects. If a mobile user attempts to transmit a group call when parameter 1011 specifically forbids group calling, the PL1877A ignores the mobile revertive paging command (*##*n*, where *n* is the paging input).

2-Tone Group Calls

A 2-Tone Group Call is an 8-second tone burst of a specified frequency. It alerts all devices whose 2-tone capcodes consist of B tones matching the group call tone. For example, an 8-second burst of 330.5 Hz would alert all devices whose 2-tone capcodes consisted of B tones of frequency 330.5 Hz.

NOTE: GE systems do not support this method of group calling. Therefore, 8-second tone bursts are not generated if the selected code plan is the GE code plan (parameter 1129 = \$23). If identical A and B tones are specified for a capcode under the GE codeplan, the A tone is replaced by the diagonal tone of 742.5 Hz.

Dual Addressing

Dual Addressing applies to Motorola/EIA 5-Tone paging. The 5-tone paging sequences transmitted by the PL1877A consist of 5 tones. However, if enabled by parameter 1012, the PL1877A can generate 5-tone paging sequences that consist of a 6th tone (the dual address tone). This sixth tone is always the same frequency (2010 Hz).

When dual addressing is enabled through parameter 1012, the PL1877A requires that all 5-tone capcodes consist of six digits. The sixth digit is either 0 or 1. If the dual address tone is to be generated, the sixth digit must be 1; otherwise, the sixth digit must be 0.

Single-Mode Selective Signaling

When the PL1877A is programmed for single-mode selective signaling, input is normally required from the user (landline, attendant, or mobile user). This input specifies all or some of the target device's capcode digits.

The number of input digits required from the landline user is determined by parameter 1083. The number of input digits required from the attendant user is determined by parameter 1084. The number of input digits required from the mobile user is determined by parameter 1085.

Suppose, for example, that the PL1877A is programmed for 5-tone, single-mode selective signaling (parameter 1081 = 5). Suppose also that your system is configured such that the capcodes of all 5-tone devices are of the form 88*xyz*. You wish to allow the landline user to page only a limited group of mobiles - capcodes 88120 through 88129. You wish to allow mobile and attendant users to page any mobile in the system - capcodes 88000 through 88999.

To accomplish this, program parameter 1083 to 1. This sets the PL1877A to require one input digit from landline users. Program parameters 1084 and 1085 to 3. This sets the PL1877A to require three input digits from attendant and mobile users.

Then, 8812 must be programmed into the preprogrammed 5-tone capcode (parameters 1165–1170). (Parameters 1169 and 1170 would be programmed with \$FF since they are unused). The PL1877A draws whatever digits it needs from this capcode. Thus, since landline users enter only one digit, the PL1877A draws the first four capcode digits (8812) from these parameters. Since attendant and mobile users enter three digits, the PL1877A draws the first two capcode digits (88) from these parameters.

Multi-Mode Selective Signaling

When the PL1877A is programmed for multi-mode selective signaling, the user enters only the required user ID (from 00 to 99). The capcode is already preprogrammed as part of the user ID.

Overriding Certain Restrictions for Individual User IDs

Each user ID can be assigned certain properties that allow it to bypass specific restrictions on selective signaling. For example, if group calling is disabled via parameters 1009, 1010, or 1011, you can specifically allow it for an individual user ID. Refer to page 124, which describes the multi-mode paging table.

Capcode Characteristics

DTMF

DTMF capcodes consist of 1–6 digits. For single-mode paging, the PL1877A can be programmed to generate a 1–9 digit preamble (parameters 1131-1139) prior to the DTMF capcode. For multi-mode paging, you can specify 1–15 DTMF digits for each user ID.

2-Tone

The 2-tone capcodes consist of 3 digits that specify 2 tones (the A tone and the B tone). The frequencies for the A and B tones are determined from Tables 1 and 2 on pages 131 and 132 according to the following procedure.

Suppose you wish to determine the frequencies for capcode 765 when the selected codeplan is R (parameter 1129 = \$16). Locate the chosen code plan in Table 1. From the same table, locate the most significant digit (MSD) (7 in this example) of the 2-tone capcode. Next, determine the two-digit number that appears at the intersection of the codeplan row and the MSD column (62 in this example). The first digit of this number (6 in this example) corresponds to a number under “Chart A Group #” (Table 2) and indicates which row of frequencies in Table 1 is used for the A tone. In this example, the A tone number is 6, which corresponds to 1321.2 Hz. The second digit of the number from Table 1 (2 in this example) also corresponds to a number under “Chart A Group #” and indicates which row of frequencies in Table 2 is used for the B tone. In this example, the B tone number is 5, which corresponds to 746.8Hz.

Plectron

Plectron capcodes consist of four digits that specify two tones (the A tone and the B tone). The frequencies of the A and B tones are determined from Table 3 and Table 4 on pages 133 and 134 according to the following procedure:

Suppose you wish to determine the frequencies for the Plectron capcode 3456. The first two digits of the capcode (3 and 4 in this example) are located on the Plectron Code Plan chart (Table 3). In the column beneath this two-digit number, there are two P numbers (P5 and P6 in this example) that correspond to tone groups in the Plectron Tone Group/Frequency Chart (Table 4).

Using the P number for the third digit of the capcode, determine the correct tone group from Table 4. The frequency of the A tone (330.5 Hz) is found by locating the intersection of the tone group row with the column headed by the third capcode digit (5 in this example). The frequency of the B tone (564.7 Hz in this example) is found in the same manner by using the tone group for the fourth capcode digit as listed in the Plectron Code Plan Chart (Table 3).

2805/1500Hz Paging

The 2805/1500 capcodes consist of 1 to 6 digits. For single-mode paging, the PL1877A can be programmed to generate a 1–9 digit preamble (parameters 1147-1155/1156-1164) prior to the 2805/1500 capcode. For multi-mode paging, you can specify 1–15 2805/1500 digits for each user ID.

Motorola/EIA 5-Tone

5-Tone capcodes consist of five digits. If dual addressing is enabled, a sixth digit is required.

Selective Signaling Parameters and Functions

Parameter	Function
1001	Disable selective signaling from a land-line caller on line 1 = 0 Enable selective signaling from a land-line caller on line 1 = 1
1007	Disable selective signaling from a land-line caller on line 2 = 0 Enable selective signaling from a land-line caller on line 2 = 1
1002	Disable selective signaling from an attendant = 0 Enable selective signaling from an attendant = 1 Default = 0
1003	Disable mobile revertive signaling = 0 Enable mobile revertive signaling = 1 Default = 0

General Selective Signaling Characteristics

Selective Signaling Password

Refer to Direct Access/Selective Signaling Password in the Parameter Modification Procedure section on page 101 of this manual.

Paging Tone Transmission Characteristics

Parameter	Function
1004	Deactivate the PL strip output during transmission of selective signaling tones = 0 Enable the PL strip output during transmission of selective signaling tones = 1
1006	Disable 6 dB/octave de-emphasis of selective signaling tones = 0 Enable 6 dB/octave de-emphasis of selective signaling tones = 1
1087	Number of times to repeat signaling. Valid range = 0–8 If the mobile fails to respond to a page in the time specified by parameter 1008, the PL1877A can repeat the paging sequence and wait again. This parameter determines the maximum number of times this occurs before disconnection.
1088	Mobile answer time - time for a mobile to answer a selective call before disconnection (in single mode) or advancing to a linked user ID (in multi-mode). This parameter is x in the following equation: Time = 10 seconds $(1 + x)$. Valid range = 0–15

Parameter	Function
1085	The number of digits accepted from a mobile user for selective signaling. The valid range depends on the type of signaling selected: DTMF, 2805, 1500 = 0-6 2-Tone = 0-3 Plectron = 0-4 Motorola/EIA = 0-6

NOTE: Parameters 1083, 1084, and 1085 apply only if multi-mode selective signaling has not been selected. If one of these parameters has been set to 0, the same paging sequence is generated every time. For example, if parameter 1083 = 0, the PL1877A automatically pages the preprogrammed capcode every time the landline user dials into the patch.

Multi-Mode

Parameter	Function
1179 to 2878	<p>The multi-mode paging parameters create a table of the user IDs associated with multi-mode paging. It consists of up to 100 entries in a 17-byte pattern. The pattern for each entry is described below:</p> <ol style="list-style-type: none"> The first byte is to be entered using the format <i>wxyzaaa</i>. <i>aaaa</i> defines the paging type of the user ID. Paging types, as defined in parameter 1081, are: 0 = DTMF 1 = 2-Tone 2 = Plectron 3 = 2805 4 = 1500 5 = Motorola/EIA 5 Tone 8 = TPL 9 = DPL If this byte is set to \$F (the multi-mode selection), this entry is disabled. If <i>z</i> is set to 1, direct channel access is granted following paging even if it has been previously disabled in parameters 58, 42 and/or 59. If the capcode for this user ID specifies a group call, and parameters 1009, 1010, or 1011 are set to disable group call generation, bit <i>y</i> must be set. If the selected paging type for this user is Motorola 5/6 tone, six digits have been entered, and parameter 1012 is set to disable dual addressing, bit <i>y</i> must be set. If parameter 1004 is set to deactivate the PL strip output during selective signaling tones, but it is necessary to activate this output when paging this particular user, bit <i>x</i> must be set. If parameter 61 is set to deactivate the PL strip output during direct access time, but it is necessary to activate the PL strip output during direct access after paging this particular user, bit <i>w</i> must be set. The second byte links the user ID to another user ID. If the PL1877A receives no answer after paging this user the required number of times, it pages the user ID# specified by this byte. The valid range for this entry is 0-99. This entry must have the ten's digit of the user ID in the four most significant bits and the one's digit in the four least significant bits. For example, for user ID 36, enter \$36 (hexadecimal 36). This feature allows you to create a "chain" of user IDs. If the PL1877A receives no answer to a page, it advances to the next user ID in the chain. This process continues until the PL1877A reaches a user ID with no linked ID or until the PL1877A pages a user ID that requires direct access following paging (bit <i>z</i> = 1).

Parameter	Function
	<p>NOTE: If you desire to link user IDs in this manner, disable direct access through parameters 58, 42, and 59.</p> <p>3. The remaining 15 bytes for this entry consist of the 15 digits of the user capcode. Any unused bytes must be filled with \$FF. There are different valid capcode ranges for each of the paging types, check parameter descriptions for the appropriate range.</p> <p>DTMF capcode Bytes 3–17 contain the DTMF digits to be paged. Thus, a maximum of 15 DTMF digits can be assigned to a user ID.</p> <p>2-Tone capcode Byte 3 contains the code plan to be used when paging this user ID. Refer to the instructions regarding parameter 1129 in determining a value for byte 3. Bytes 4–6 contain the 2-Tone capcode digits.</p> <p>Plectron capcode Enter the 4-digit Plectron capcode in bytes 3–6.</p> <p>2805/1500 capcode Bytes 3–17 contain the 2805/1500 pulse digits. Thus, a maximum of 15, 2805/1500 digits can be assigned to a user ID.</p> <p>Motorola/EIA 5-Tone capcode Byte 3 designates the preamble tone to be used when paging this user ID. Refer to the instructions regarding parameter 1130 in determining a value for byte 3. Bytes 4–8 contain the 5-tone capcode. Byte 9 is the dual-address digit. If the dual-address tone is to be sent with this page, enter a 1 in byte 9. Otherwise, enter a 0. Note that byte 9 is used only if dual addressing is enabled via parameter 1012, or if bit y is set in byte 1 of this user ID entry.</p> <p>TPL Byte 3 designates the TPL frequency to be used in signaling this user. Determine this value from Table 8 on page 135 and enter it in hexadecimal. For example, a value of 4 designates TPL frequency XB.</p> <p>DPL Byte 3 designates the DPL code to be used in signaling this user. Determine this value from Table 9 on page 136 and enter it in hexadecimal. For example, a value of \$A designates DPL code 071. Byte 4 must be set to 1 if this DPL code is to be inverted.</p>

Selective Signaling Types

DTMF

Parameter	Function
1090	DTMF outpulse timing. The number of 50 ms periods in the DTMF digit/inter-digit time. Valid range = 0–8 .
Single Mode DTMF Paging	
1131–1139	DTMF paging preamble. Valid digit range = 0–\$F .

2-Tone Sequential

Parameter	Function																				
1091	2-Tone paging A tone length. The number of 0.5 second increments in duration of the first tone of a 2-Tone sequence. Valid Range = 0–8 (0.5 to 4.5 seconds).																				
1092	2-Tone paging B tone length. The number of 0.5 second increments in duration of the first tone of a 2-Tone sequence. Valid Range = 0–8 (0.5 to 4.5 seconds).																				
2-Tone Single Mode Paging																					
1129	Selected code plan # for single mode, 2-Tone paging. Valid range is 00–24 (decimal). Determine the code plan number from the table below. Then, enter the number in this parameter such that the 10's digit appears in the four most significant bits, and the 1's digit appears in the four least significant bits. For example, for codeplan Q, enter \$15 (hexadecimal 15).																				
	<table style="width: 100%; border: none;"> <tbody> <tr> <td style="width: 50%;">General Encode Plan = 00</td> <td style="width: 50%;">Modified General Encode Plan = 00</td> </tr> <tr> <td>Code Plan B = 02</td> <td>Code Plan N = 13</td> </tr> <tr> <td>Code Plan C = 03</td> <td>Code Plan P = 14</td> </tr> <tr> <td>Code Plan D = 04</td> <td>Code Plan Q = 15</td> </tr> <tr> <td>Code Plan E = 05</td> <td>Code Plan R = 16</td> </tr> <tr> <td>Code Plan F = 06</td> <td>Code Plan S = 17</td> </tr> <tr> <td>Code Plan G = 07</td> <td>Code Plan T = 18</td> </tr> <tr> <td>Code Plan H = 08</td> <td>Code Plan U = 19</td> </tr> <tr> <td>Code Plan J = 09</td> <td>Code Plan V = 20</td> </tr> <tr> <td>Code Plan K = 10</td> <td>Code Plan w = 21</td> </tr> </tbody> </table>	General Encode Plan = 00	Modified General Encode Plan = 00	Code Plan B = 02	Code Plan N = 13	Code Plan C = 03	Code Plan P = 14	Code Plan D = 04	Code Plan Q = 15	Code Plan E = 05	Code Plan R = 16	Code Plan F = 06	Code Plan S = 17	Code Plan G = 07	Code Plan T = 18	Code Plan H = 08	Code Plan U = 19	Code Plan J = 09	Code Plan V = 20	Code Plan K = 10	Code Plan w = 21
General Encode Plan = 00	Modified General Encode Plan = 00																				
Code Plan B = 02	Code Plan N = 13																				
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Code Plan D = 04	Code Plan Q = 15																				
Code Plan E = 05	Code Plan R = 16																				
Code Plan F = 06	Code Plan S = 17																				
Code Plan G = 07	Code Plan T = 18																				
Code Plan H = 08	Code Plan U = 19																				
Code Plan J = 09	Code Plan V = 20																				
Code Plan K = 10	Code Plan w = 21																				
1140-1142	Preprogrammed 2-Tone paging digits. Valid digit range = 0–9 .																				

Plectron

Parameter	Function
1093	Plectron paging A tone length. The number of 0.5 second increments in duration of the first tone of a 2-tone sequence. Valid range = 0–8 (0.5 to 4.5 seconds).
1094	Plectron paging B tone length. The number of 0.5 second increments in duration of the first tone of a 2-tone sequence. Valid range = 0–8 (0.5 to 4.5 seconds).
Plectron Single Mode Paging	
1143–1146	Preprogrammed Plectron paging digits. Valid digit range = 0–9 . NOTE: The first two digits of a Plectron capcode cannot exceed 35.

2805 Hz

Parameter	Function
1095	The number of 10 ms periods in tone-off time for 2805 paging. Valid range = 0–8 (10 ms to 90 ms).
2805 Hz Single Mode Paging	
1147–1155	2805 paging preamble. Valid digit range = 0–9.

1500 Hz

Parameter	Function
1096	The number of 10 ms periods in tone-off time for 1500 paging. Valid range = 0–8 (10 ms to 90 ms).
1500 Hz Single Mode Paging	
1156–1164	1500 paging preamble. Valid digit range = 0–9 .

Motorola 5/6 Tone

Parameter	Function																														
1008	Disable 5-Tone diagnostic mode = 0 . Enable 5-Tone diagnostic mode = 1 . If this parameter is set to 1, all tones in a 5-tone sequence will be generated with a duration of 1 second.																														
1012	Disable dual-addressing in Motorola 5 tone selective signaling = 0 . Enable dual-addressing in Motorola 5 tone selective signaling = 1 .																														
5/6-Tone Single Mode Paging																															
1129	Determine the preamble tone number from the table below. Then, enter the number in this paragraph such that the 10's digit appears in the four most significant bits, and the 1's digit appears in the four least significant bits. For example, for a preamble tone of 570 Hz, enter \$13 (hexadecimal 13).																														
	<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 2px;">00 = 600</td> <td style="padding: 2px;">05 = 1305</td> <td style="padding: 2px;">10 = 370</td> <td style="padding: 2px;">15 = 675</td> <td style="padding: 2px;">20 = 1240</td> </tr> <tr> <td style="padding: 2px;">01 = 741</td> <td style="padding: 2px;">06 = 1446</td> <td style="padding: 2px;">11 = 450</td> <td style="padding: 2px;">16 = 750</td> <td style="padding: 2px;">21 = 1520</td> </tr> <tr> <td style="padding: 2px;">02 = 882</td> <td style="padding: 2px;">07 = 1587</td> <td style="padding: 2px;">12 = 550</td> <td style="padding: 2px;">17 = 825</td> <td style="padding: 2px;">22 = 1750</td> </tr> <tr> <td style="padding: 2px;">03 = 1023</td> <td style="padding: 2px;">08 = 1728</td> <td style="padding: 2px;">13 = 570</td> <td style="padding: 2px;">18 = 850</td> <td style="padding: 2px;">23 = 1860</td> </tr> <tr> <td style="padding: 2px;">04 = 1164</td> <td style="padding: 2px;">09 = 1869</td> <td style="padding: 2px;">14 = 650</td> <td style="padding: 2px;">19 = 1010</td> <td style="padding: 2px;">24 = 2135</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td style="padding: 2px;">25 = 2280</td> </tr> </tbody> </table>	00 = 600	05 = 1305	10 = 370	15 = 675	20 = 1240	01 = 741	06 = 1446	11 = 450	16 = 750	21 = 1520	02 = 882	07 = 1587	12 = 550	17 = 825	22 = 1750	03 = 1023	08 = 1728	13 = 570	18 = 850	23 = 1860	04 = 1164	09 = 1869	14 = 650	19 = 1010	24 = 2135					25 = 2280
00 = 600	05 = 1305	10 = 370	15 = 675	20 = 1240																											
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03 = 1023	08 = 1728	13 = 570	18 = 850	23 = 1860																											
04 = 1164	09 = 1869	14 = 650	19 = 1010	24 = 2135																											
				25 = 2280																											
1165-1170	Preprogrammed Motorola/EIA 5-Tone paging digits. Valid digit range = 0-9 .																														

Group Calls

Parameter	Function
1009	Disable the ability of a land-line user to cause generation of group calls for selected paging type = 0 Enable the ability of a land-line user to cause generation of group calls for selected paging type = 1
1010	Disable ability of attendant to cause generation of group calls for selected paging type = 0 Enable ability of attendant to cause generation of group calls for selected paging type = 1
1011	Disable mobile user's ability to cause generation of group calls for selected paging type = 0 Enable mobile user's ability to cause generation of group calls for selected paging type = 1 NOTE: These parameters (1009, 1010, and 1011) apply only to 2-tone.

Types of Paging

The PL1877A supports the following types of paging: DTMF, 2-Tone, Plectron 5/6-Tone, 1500, and 2805.

NOTE: In many applications below 800 MHz, the maximum allowable signaling time, as prescribed by FCC regulations, is 3 seconds and only signal once. Therefore, be sure that regulations applying to this system are not violated before programming the tone length values that would cause the console to signal for more than the allowed time.

2-Tone Paging

The 2-tone paging format requires a 3-digit prefix or capcode. This capcode and the selected code plan determine what paging tone frequencies are transmitted.

2-Tone Paging Example

Example 1

Suppose the number of 2-tone keypad digits accepted from the user on the selected channel is 2, and Code Plan R has been selected. The 8-second group call has been selected and the preset 2-tone digit is 7. Also, the A tone length is set to 1 second and the B tone length is set to 3 seconds.

If the console operator entered the digits 43 and pressed the TRANSMIT button, the console would generate 1251.4 Hz for 1 second followed by 669.9 Hz for 3 seconds. These tone frequencies are located on Table 2 according to the following procedure.

1. Locate the chosen code plan (R in this example) on Table 1.
2. From the same chart, locate the most significant digit (MSD) of the 2-Tone prefix (7 in this example).
3. Next, determine the 2-digit number that appears at the intersection of the code plan row and the MSD column (62 in this example).
4. The first digit of this number (6 in this example) corresponds to a number under the Group # heading on Table 2, and indicates which row of frequencies on Table 2 will be used for the A tone. In this example, the A tone number entered by the console operator is 4, which corresponds to 1251.4 Hz.
5. The second digit of the number from chart B (2 in this example) also corresponds to a number under Table 2 Group #, and indicates which row of frequencies on Table 2 will be used for the B tone. In this example, the B tone number entered by the console operator is 3, which corresponds to 669.9 Hz.

The previous example involves the console operator being required to enter two digits from the keypad (programming the number of 2-Tone digits accepted from the user on the selected channel to 2).

However, if all three digits were required from the console operator (programming the number of 2-Tone digits accepted from the user on the selected channel to 3), the procedure for finding the frequencies from Table 2 would be the same except that the most significant digit of the prefix would be the first digit entered from the keypad.

If no digits were required from the operator (programming the number of 2-Tone digits accepted from the user on the selected channel to 0) both the A and B tone frequencies would be predetermined through programming and the same tone sequence would be sent every time a 2-Tone page is generated on this particular channel.

Group Call

A group call occurs when both tones of a 2-Tone paging sequence are the same frequency. If the console is programmed to allow 8-second group calls on a particular channel, then whenever a paging sequence is generated that consists of two tones of the same frequency, the page consists of an 8 second burst of that tone frequency.

However, 8-second group calls do not apply when the GE code plan has been selected. In the GE system, a “diagonal” tone of 742.5 Hz is inserted in place of the first tone if that tone is the same as the second tone.

Example 2

Suppose the number of 2-Tone keypad digits accepted from the user on the selected channel is 2 and the GE code plan has been selected. The preset 2-Tone digit is 4.

Therefore, if the operator entered 55 as the paging digits and pressed the TRANSMIT button, the console would send the 2-Tone sequence $A = 742.5 \text{ Hz}$, $B = 907.5 \text{ Hz}$. This would alert a pager with a GE capcode of 455.

Table 1. 2-Tone Paging Code Plans (Chart B)

Important Note: The first digit indicates Chart A Group # Source for the A tone, and the second digit indicates Chart A Group # Source for B Tone.

Code Plan	MSD Digit of 3 Digit Capcode									
	0	1	2	3	4	5	6	7	8	9
Gen Enc	42	11	22	12	44	55	21	45	54	24
Gen Enc Modified	42	11	22	33	44	55	66	DD	EE	FF
B	N/A	11	22	33	12	13	21	31	23	32
C	N/A	11	22	12	44	14	21	41	24	42
D	N/A	11	22	12	15	55	21	51	25	52
E	N/A	11	22	12	21	16	66	61	26	62
F	N/A	11	13	33	44	31	14	41	34	43
G	N/A	11	13	33	31	55	15	51	35	52
H	N/A	11	13	33	31	16	66	61	36	63
J	N/A	11	14	41	44	55	15	45	54	51
K	N/A	11	14	41	44	16	66	61	46	64
L	N/A	11	15	51	16	55	66	61	56	65
M	N/A	23	22	33	44	32	24	42	34	43
N	N/A	23	22	33	32	55	25	52	35	53
P	N/A	23	22	33	32	26	66	62	36	63
Q	N/A	24	22	42	44	55	25	45	54	52
R	N/A	24	22	42	44	26	66	62	46	64
S	N/A	25	22	52	26	55	66	62	56	65
T	N/A	34	43	33	44	55	35	45	54	53
U	N/A	34	43	33	44	36	66	63	46	64
V	N/A	35	53	33	36	55	66	63	56	65
W	N/A	46	64	56	44	55	66	45	54	65
Y	N/A	77	88	99	78	79	87	97	89	98
GE	AA	BA	BB	AB	CC	CA	CB	AC	BC	N/A
SP	99	AA	BB	DD	9D	D9	AD	DA	BD	DB

Table 2. Tone Group Frequency Chart (Chart A)

The chart below cross-references the 2-Tone Paging Code to the frequency in Hz.

Tone Group #	0	1	2	3	4	5	6	7	8	9	Group #
1	330.5	349.0	368.5	389.0	410.8	433.7	457.9	483.5	510.5	539.0	1
2	569.1	600.9	634.5	669.9	707.3	746.8	788.5	832.5	879.0	928.1	2
3	1092.4	288.5	296.5	304.7	313.0	953.7	979.9	1006.9	1034.7	1063.2	3
4	321.7	339.6	358.6	378.6	399.8	422.1	445.7	470.5	496.8	524.6	4
5	553.9	584.8	617.4	651.9	688.3	726.8	767.4	810.2	855.5	903.2	5
6	1122.5	1153.4	1185.2	1217.8	1251.4	1285.8	1321.2	1357.6	1395.0	1433.4	6
A	358.9	398.1	441.6	489.8	543.3	602.6	668.3	741.3	822.2	912.0	7
B	371.5	412.1	457.1	507.0	562.3	623.7	691.8	767.4	851.1	944.1	8
Z	346.7	384.6	426.6	473.2	524.8	582.1	645.7	716.1	794.3	881.0	9
GE(A)	682.5	592.5	757.5	802.5	847.5	892.5	937.5	547.5	727.5	637.5	A
GE(B)	652.5	607.5	787.5	832.5	877.5	922.5	967.5	517.5	562.5	697.5	B
GE(C)	667.5	712.5	772.5	817.5	862.5	907.5	952.5	532.5	577.5	622.5	C
Plectron	643.0	910.0	1036.0	1082.0	1130.0	1287.0	1465.0	1820.0	1985.0	2688.0	D
10	1472.9	1513.5	1555.2	1598.0	1642.0	1687.2	1733.7	1781.5	1830.5	1881.0	E
11	1930.2	1989.0	2043.8	2094.5	2155.6	2212.2	2271.7	2334.6	2401.0	2468.2	F

Plectron Paging

The Plectron paging feature requires a 4-digit prefix (capcode). Like 2-tone paging, the capcode and code plan will determine at what frequency the paging tones will be transmitted.

Plectron paging uses the Plectron Code Plan Chart (Table 3) and Plectron Tone Group/Frequency Chart (Table 4). Refer to the example below and the tables to determine the capcodes you need.

Plectron Paging Example

Suppose the number of Plectron keypad digits accepted from the user on the selected channel is 0 and the capcode has been programmed to 3456. The A tone length is one second and the B tone length is two seconds.

If the console operator were to press the TRANSMIT button, the console would send an A tone of 330.5 Hz for one second, and then a B tone of 564.7 Hz for two seconds.

The frequencies for the A and B tones are determined from the charts, according to the following procedure:

1. Locate the first two digits of the prefix (3 and 4 in this example) on Table 3.
2. In the column beneath this two-digit number, there are two P numbers (P5 and P6 in this example) that correspond to tone groups on Table 3. Using the P number for the third digit of the prefix, determine the correct tone group from the Table 4.
3. Find the frequency of A tone (330.5 Hz) by locating the intersection of the tone group row with the column headed by the third prefix digit (5 in this example).
4. Find the frequency of the B tone is in the same manner by using the tone group for the fourth prefix digit as listed in Table 3 below.

Table 3. Plectron Paging Code Plan Chart

	Most Significant Digits-to-Tone Source																	
1st 2 (MS) Digits	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
3rd digit tone source	P1	P2	P1	P2	P3	P1	P3	P2	P3	P4	P1	P4	P2	P4	P3	P4	P5	P1
4th digit tone source	P1	P2	P2	P1	P3	P3	P1	P3	P2	P4	P4	P1	P4	P2	P4	P3	P5	P5
1st 2 (MS) Digits	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
3rd digit tone source	P5	P2	P5	P3	P5	P4	P5	P6	P1	P6	P2	P6	P3	P6	P4	P6	P5	P6
4th digit tone source	P1	P5	P2	P5	P3	P5	P4	P6	P6	P1	P6	P2	P6	P3	P6	P4	P6	P5

Table 4. Plectron Tone Group/Frequency Chart (in Hz)

3rd and 4th Digits	0	1	2	3	4	5	6	7	8	9
Tone Group P1	643	672	701	732	765	799	834	871	910	950
Tone Group P2	992	1036	1082	1130	1180	1232	1287	1344	1403	1465
Tone Group P3	1530	1598	1669	1743	1820	1901	1985	2073	2164	2260
Tone Group P4	2361	2465	2575	2688	2807	2932	3062	3197	3339	3487
Tone Group P5	282.2	294.7	307.8	321.4	335.6	330.5	366.0	382.3	399.2	416.9
Tone Group P6	435.3	454.6	474.8	495.8	517.8	540.7	564.7	589.7	615.8	742.5

5/6 Tone

The following charts are used with 5/6 Tone paging:

Table 5 – Tone Timing (in milliseconds)

	Motorola EIA
TX up time	350 ms
Preamble	690 ms
Gap	45 ms
1 st add tone	33 ms
Next 4 tones	33 ms
Gap	800 ms
Number of times to signal	2 ms
Time (in seconds)	2.95 ms

Table 6 - 5/6 Tone Frequencies (in Hz)

Digit	Frequency	Digit	Frequency
0	600	6	1446
1	741	7	1587
2	882	8	1728
3	1023	9	1869
4	1164	R	459
5	1305	X	2010

Table 7 - 5/6 Tone Preamble Chart

2-Digit Preamble with Corresponding Frequency (Hz)							
00	600	07	1587	14	650	21	1520
01	741	08	1728	15	675	22	1750
02	882	09	1869	16	750	23	1860
03	1023	10	370	17	825	24	2135
04	1164	11	450	18	850	25	2280
05	1305	12	550	19	1010		
06	1446	13	570	20	1240		

Table 8 - TPL Code Chart

Code	Frequency (Hz)	Code	Frequency (Hz)	Code	Frequency (Hz)	Code	Frequency (Hz)
XZ	0 = 67.0	1A	13 = 103.5	5B	26 = 162.2	M6	39 = 241.8
WZ	1 = 69.3	1B	14 = 107.2	6Z	27 = 167.9	M7	40 = 250.3
XA	2 = 71.9	2Z	15 = 110.9	6A	28 = 173.8	OZ	41 = 254.1
WA	3 = 74.4	2A	16 = 114.8	6B	29 = 179.9	J1	42 = 159.8
XB	4 = 77.0	2B	17 = 118.8	7Z	30 = 186.2	J2	43 = 165.5
WB	5 = 79.7	3Z	18 = 123.0	7A	31 = 192.8	J3	44 = 171.3
YZ	6 = 82.5	3A	19 = 127.3	M1	32 = 203.5	J4	45 = 177.5
YA	7 = 85.4	3B	20 = 131.8	8Z	33 = 206.5	J5	46 = 183.5
YB	8 = 88.5	4Z	21 = 136.5	M2	34 = 210.7	J6	47 = 189.9
ZZ	9 = 91.5	4A	22 = 141.3	M3	35 = 218.1	J7	48 = 196.6
ZA	10 = 94.8	4B	23 = 146.2	M4	36 = 225.7	J8	49 = 199.5
ZB	11 = 97.4	5Z	24 = 151.4	9Z	37 = 229.1		
1Z	12 = 100.0	5A	25 = 156.7	M5	38 = 233.6		

Table 9 - DPL Code Chart

DPL Code # = DPL Code				
0 = 23	22 = 152	44 = 343	66 = 606	88 = 212
1 = 025	23 = 155	45 = 346	67 = 612	89 = 225
2 = 026	24 = 156	46 = 351	68 = 624	90 = 246
3 = 031	25 = 162	47 = 364	69 = 627	91 = 252
4 = 032	26 = 165	48 = 365	70 = 631	92 = 255
5 = 043	27 = 172	49 = 371	71 = 632	93 = 266
6 = 047	28 = 174	50 = 411	72 = 645	94 = 274
7 = 051	29 = 205	51 = 412	73 = 654	95 = 325
8 = 054	30 = 223	52 = 413	74 = 662	96 = 332
9 = 065	31 = 226	53 = 423	75 = 664	97 = 356
10 = 071	32 = 243	54 = 431	76 = 703	98 = 446
11 = 072	33 = 244	55 = 432	77 = 712	99 = 452
12 = 073	34 = 245	56 = 445	78 = 723	100 = 454
13 = 074	35 = 251	57 = 464	79 = 731	
14 = 114	36 = 261	58 = 465	80 = 732	
15 = 115	37 = 263	59 = 466	81 = 734	
16 = 116	38 = 265	60 = 503	82 = 743	
17 = 125	39 = 271	61 = 506	83 = 754	
18 = 131	40 = 306	62 = 516	84 = 036	
19 = 132	41 = 311	63 = 532	85 = 053	
20 = 134	42 = 315	64 = 546	86 = 133	
21 = 143	43 = 331	65 = 565	87 = 145	

This section covers the installation information for the specific radio models listed below. General installation instructions not specifically mentioned here are covered in the “Installation Considerations” section of this manual.

- Mitrek Consolette
- Maxar 80 Base
- Micor RCB Repeater
- Flexar Repeater
- T1600 Series Remote
- MSF5000 Series Base
- MCR100 Repeater
- MaxTrac 300 Base Station

NOTE: If any of the following options are included in this PL1877A set-up, parameter modification as described in the “Parameter Modification Procedures” section starting on page 77 may be necessary to enable or disable a particular function.

Mitrek Consolette – PL1877A Single Simplex Mode

Interconnection between the PL1877A and the base station can be made via the accessory terminal strips TB1 and TB2 on the rear of the chassis. In most applications, there are several spare terminals available for special interfacing in addition to the standard function provided. Install the following modification/additions to the base station using spare screw terminals on TB1 and TB2:

1. **RX Detected Audio** - Run a wire to DETECTED AUDIO available at solder strip TB4-6 (local control station only), or TB10-6 (remote control station).
2. **PL Detect** – Run a wire to SQUELCH DISABLE on the Mitrek transmitter-receiver board. Set up the PL detect circuit output for “or squelch” operation. (JU1 in, JU2 out on the PL deck for tone PL; JU5 in, JU4 out for digital PL.) If the radio has a busy light kit, refer to the schematic for jumper information. If the busy light kit is not present, add a 5.6k ¼ W resistor from SQUELCH DISABLE to ground.
3. **PL Stripping** – Run a wire to the CD (code disable) stake pin on the PL deck.
4. **Reverse Burst Inhibit** – Run a wire to the PL deck as follows: digital PL deck – to E3 stake pin; tone PL deck – to junction of R18 + R22.
5. Now connect the PL1877A P1 interconnect cable to TB1 and TB2 as follows:

P1 Cable Color	To	Function
Red/black	Designated spare	TX PL stripping
Red	TB2-4	Ground
Green/black	TB2-4	Ground
Orange	Designated spare	Reverse burst inhibit
Green/white	Designated spare	RX detected audio
White	TB2-5	PTT
Black	Designated spare	PL detect
Blue/black	TB2-6	Mic low
Blue/white	TB2-7	Mic high

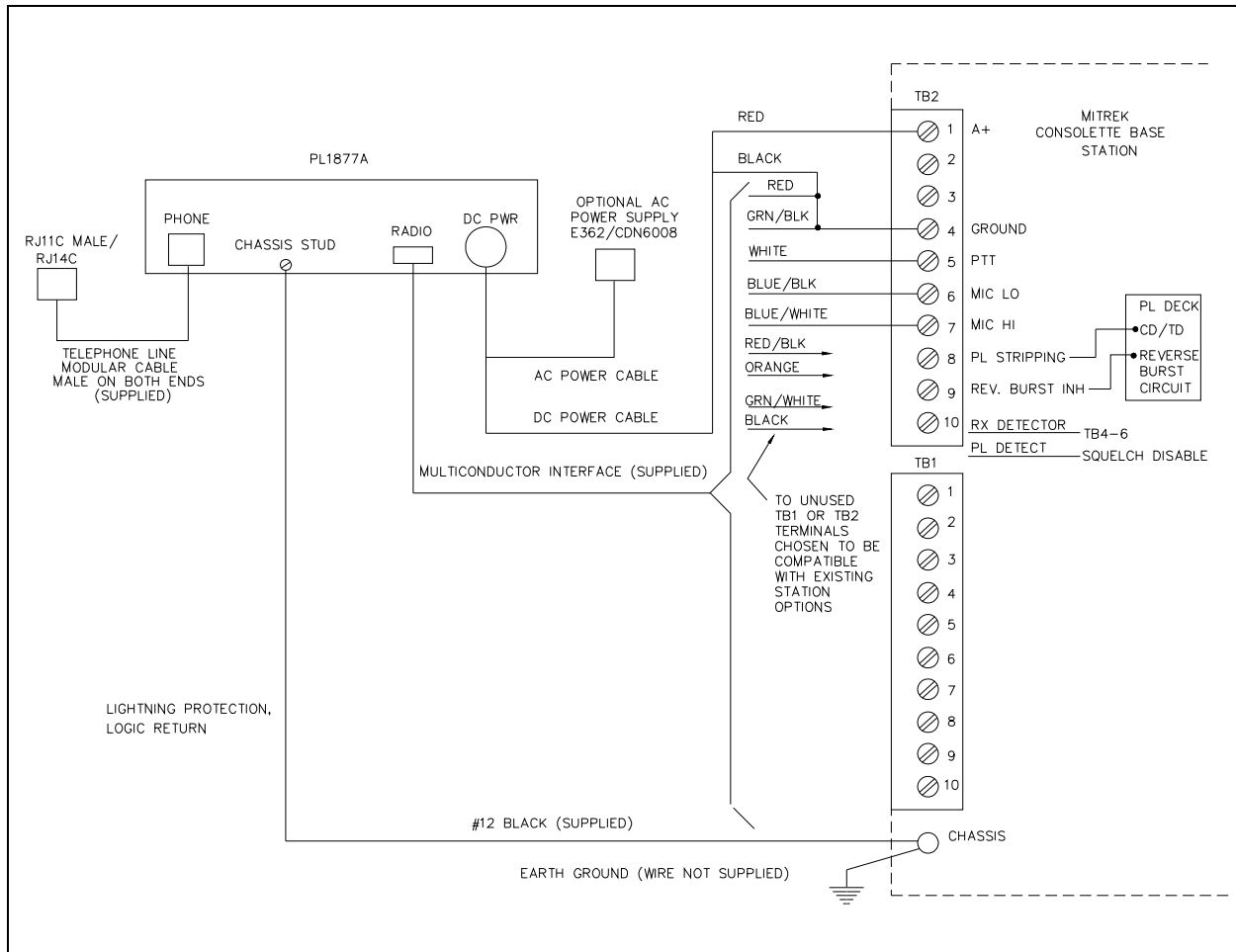
If the PL1877A is to be dc-powered, connect the red lead in the dc power cable to TB2-1 and the black lead to TB2-4; connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A. If the optional ac transformer and cable are to be used, install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

Earth Ground – Run the supplied #12 or larger wire from the GND terminal on the rear of the PL1877A to the base station chassis ground. This wire must be as short as practical, not coiled, and fastened securely to the base station chassis. After this connection has been made, the installation is complete.

Using the Parameters Modification Procedure in this manual, set the following required parameter settings:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (mid-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	0 (PL detect input is active low) 1 (PL detect input is active high)
9	1 (simplex)
10	0 (active low PTT sense input)

All other parameters are programmed as applicable to system requirements. Refer to “Level Setting” in the “Parameters Modification Procedure” section of this manual.



Intercabling Diagram for Signal Search Simplex Mode – Mitrek Console Base Station to PL1877A

Mitrek Console – Enhanced VOX Simplex Mode

Make the following modifications and additions to the base station using spare screw terminals on TB1 and TB2.

1. **RX Detected Audio** - Run a wire to DETECTED AUDIO available at solder strip TB4-6 (local control station only), or TB10-6 (remote control station).
2. **PL Detect** - Run a wire to SQUELCH DISABLE on the MITREK transmitter-receiver board. Set up the PL detect circuit output for “or squelch” operation. (JU1 in, JU2 out on the PL deck for tone PL; JU5 in, JU4 out for digital PL). If the radio has a busy light kit, refer to the schematic for jumper information. If the busy light kit is not present, add a 5.6k, ¼ W resistor from SQUELCH DISABLE to ground.
3. **PL Stripping** - Run a wire to the CD (code disable) stake pin on the PL deck.

Now connect the PL1877A P1 interconnect cable to TB1 and TB2 as follows:

P1 Cable Color	To	Function
Red/black	Designated spare	TX PL stripping
Red	TB2-4	Ground
Green/black	TB2-4	Ground
Green/white	Designated spare	RX detected audio
White	TB2-5	PTT
Black	Designated spare	PL detect
Blue/black	TB2-6	Mic low
Blue/white	TB2-7	Mic high

Earth Ground – Run the supplied #12 or larger wire from the GND terminal on the rear of the PL1877A to the base station chassis ground. This wire must be as short as practical, not coiled, and fastened securely to the base station chassis. After this connection has been made, the installation is complete.

If the PL1877A is to be dc powered, connect the red lead in the dc power cable to TB2-1 and the black lead to TB2-4; connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

If the optional ac transformer and cable are to be used, install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A. If this is a control station in a repeater system that transmits PL/DPL during transmit turn off delay, it is necessary that the repeater be set for zero turn-off delay. (See Note 1).

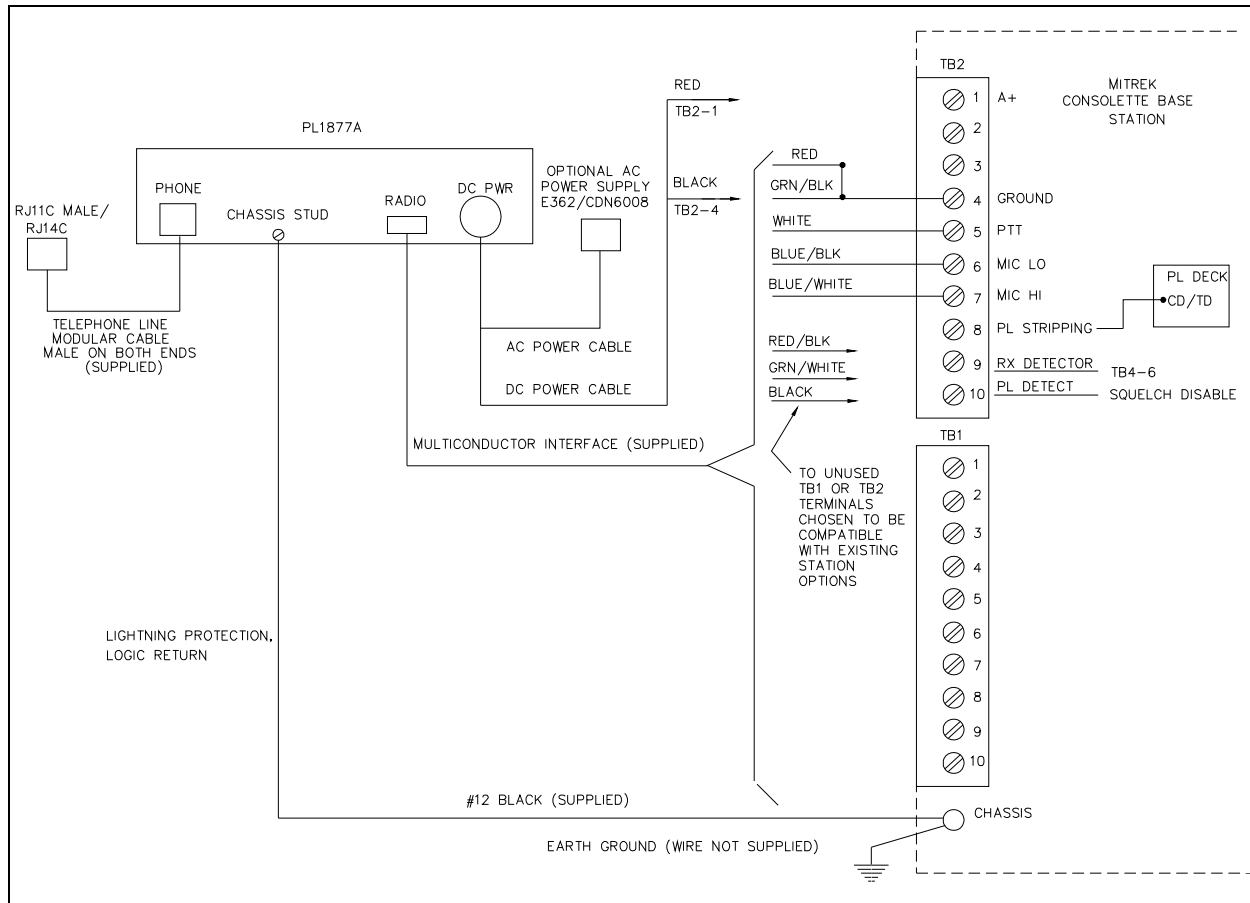
Using the “Parameters Modification Procedure” in this manual, set the following required parameter settings:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (mid-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	0 (PL detect input is active low) 1 (PL detect input is active high)
9	1 (simplex)
10	0 (active low PTT sense input)
70	1 (enhanced VOX simplex mode)

All other parameters are programmed as applicable to system requirements. Refer to the “Parameters Modification Procedure” and then the “Level Setting” sections of this manual.

NOTES:

1. Repeater transmit turn-off delay in repeater control station installations:
When the PL1877A is being installed in a control station controlling a repeater, it is necessary to ensure that the repeater does not stay on the air after the control station unkeys. If the PL1877A detects carrier (and PL/DPL, if applicable) after unkeying the control station, it is erroneously seen as a mobile transmission. In systems that require PL/DPL and retransmit (not generate) the PL/DPL signal (such as most community repeaters), no problem is encountered since carrier-only is not seen as a system mobile. Some repeater stations have a jumper for turn-off delay, but many delay turn-off more than a second even though the “0” position is selected. In these cases, reducing the timing capacitor to a much smaller value produces the required results (for example, changing C11 on a MICOR repeater TLN4662A squelch gate module from 68 μ F to 4.7 μ F).
2. 60-Second Mobile Inactivity Timer:
In the enhanced VOX simplex mode, the landline caller cannot be interrupted by the mobile (until the 30-second time-out). Therefore, it is possible for the mobile to hear the warning ticks and not be able to reset the inactivity timer because the landline party is talking. Therefore, it is recommended that the mobile inactivity timer (parameter 122) be set to 3 minutes of mobile inactivity in Enhanced VOX simplex systems.



Intercabling Diagram for Enhanced VOX Simplex Mode – Mitrek Console Base Station to PL1877A

MAXAR and MOXY Bases

The MAXAR and MOXY bases are characterized by all pins in the cable connector being the same size. Install the following modifications/additions to the base station using the female connector pins supplied where necessary.

1. **RX Detector Audio** – Run a wire from U10, pin 6, to J601-13 (wire for meter 2 may be in pin 13 of J601 and possibly could be rerouted and used for this function).
2. **TX PL Disable** – Run a wire from the PL/DPL code disable – pin CD or TD on the PL/DPL deck to J601-3.
3. **PL Detect**
Tone PL (reed type, TRN6177C and similar) Locate and remove the soldered-in JU401 and install a 100k, ¼ W resistor in its place (**NOTE:** There are two JU401’s shown on the board pictorial. The correct one for this function is the one in series between U401 pin 13 and Q409 base. This resistor allows pin 13 of U401 to swing between detectable logic levels).
 Remove C428 and replace it with a 1 µF capacitor, observing polarity.
 Run a wire from U410 pin 13 to J601, pin 10 (wire for meter 1 may be in pin 10 of J601 and possibly can be rerouted and used for this function).
Tone PL (reedless type, TRN 4237A and similar) Run a wire from U401, pin 28, on the PL deck to J601, pin 10 (wire for meter 1 may be in pin 10 of J601 and possibly can be rerouted and used for this function).
Digital PL (TRN6207A and similar) Run a wire from U301, pin 7, on the DPL deck to J601, pin 10, (wire for meter 1 may be in pin 10 of J601 and possibly can be rerouted and used for this function).

4. **Reverse Burst Disable** (necessary for signal search mode only)

Tone PL (reed type, TRN6177C and similar) - Remove the lead on the PL deck that comes from J601, pin 1 (PL on-off from hang-up box) and solder it to Q406 base. Solder the supplied .01 μ F RF decoupling capacitor between base and emitter of Q406.

Connect JU401 to HD (Note: there are two JU401s shown on the board pictorial. The correct one for this function is the one that grounds the emitter of Q409 when connected to pin HD.)

Tone PL (reedless type, TRN4237A and similar) - Remove the lead on the PL deck that comes from J601, pin 1 (PL on-off from hang-up box) and solder it to U401, pin 36.

Remove the lead on the PL deck that comes from J601, pin 2 (hang-up box ground) and solder it to the junction of C414 and R408 on the PL deck.

Remove R421 on the PL deck (between U401, pin 7, and pin 26).

Solder the supplied diode into the JU102 holes on the main circuit board (close to squelch control) with the cathode toward mic PTT.

Digital PL (TRN 6207A and similar) - Remove the lead on the PL deck that comes from J601, pin 1 (on-off from hang-up box) and solder it to Q312 base. Connect JU302 to pin D.

The monitor function is now via the front panel and/or desk mic monitor switch. Connect the PL1877A P1 radio cable to the base station P601 connector as follows, using the supplied male connector pins, as applicable.

Pin 601 Pin #	Color	Function
6	Red	TX PL disable return
6	Green/black	RX detector return
6	Blue/black	TX audio return

Twist the above listed leads together and solder to a short wire lead. Then strip a small section on the black power lead close to the connector. Neatly solder the short lead from the returns to the stripped section of the black power lead.

Pin 601 Pin #	Color	Function
5	Blue/white	TX audio (mic high)
13	Green/white	RX detector audio
3	Red/black	TX PL disable
10	Black	RX PL detect
8	White	PTT
1	Orange	Reverse burst inhibit
2	Orange/black	Reverse burst inhibit return

NOTE: The orange and orange/black leads (reverse burst inhibit and return) need to be connected only in the signal search mode.

If the PL1877A is to be dc powered, connect the red lead in the dc power cable to P601 pin 4, and the black lead to P601 pin 6. Connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR) on the rear panel of the PL1877A. If the optional ac transformer and cable are to be used, install the ac power connector into the 5-pin DIN connector (DC PWR) on the rear panel of the PL1877A.

Earth ground - Run the supplied #12 (or larger) wire from the GND terminal on the rear of the PL1877A to the base station chassis ground. This wire must be as short as practical, not coiled, and fastened securely to the base station chassis. If this is a control station is a repeater system that transmits PL/DPL during transmit turn-off delay, it is necessary that the repeater be set for zero turn off delay. (See Note 2).

All other parameters are programmed as applicable to system requirements. Refer to the Parameters Modification Procedures and then the Level Setting sections of this manual.

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (low-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	1 (PL detect input is active high)
9	1 (simplex)
10	0 (active low PTT sense input)
70	0 (signal search) 1 (enhanced VOX, requires the enhanced VOX option)

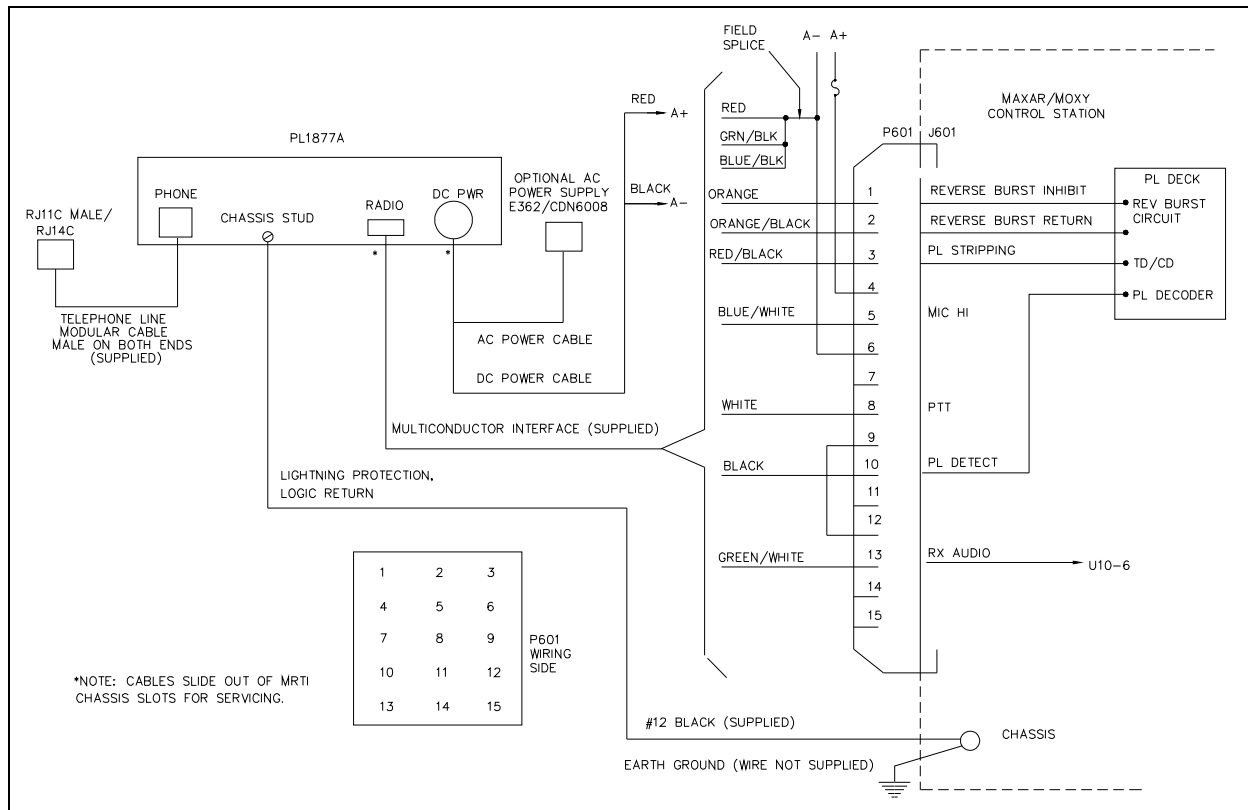
NOTES:

1. MAXAR Quadrature Detector Adjustment can cause receiver response time problems, especially in DPL systems. This can adversely affect PL1877A operation, especially in the Signal Search mode. The following procedure ensures the shortest possible receiver PL/DPL response time and is the procedure currently being used on all MAXAR, MOXY and MAXAR 80 radios being shipped from the factory.
 - a. Transmit into a 50-ohm load at 13.8 V.
 - b. Note meter 2 (quadrature output) using a high impedance DVM (may be necessary to measure on the radio circuit board if the meter 2-wire was used in the PL1877A installation).
 - c. Dekey the radio.
 - d. Inject a 10.7 MHz signal into the IF of the MAXAR radio.
 - e. Adjust the quadrature coil (L18 or L23) for a meter 2 reading as measured in step “b”, ±0.1 V dc. This procedure reduces or eliminates the pulse to the PL/DPL deck caused by the difference of quadrature voltage between transmitting and receiving an on-frequency signal. Note that a mobile transmitting off frequency can cause the same problem.
2. Repeater transmit turn-off delay in repeater control station installations:

When the PL1877A is being installed in a control station controlling a repeater, it is necessary to ensure that the repeater does not stay on the air after the control station unkeys. If the PL1877A detects carrier (and PL/DPL, if applicable) after unkeying the control station, it erroneously is seen as a mobile transmission. In systems that require PL/DPL and retransmit (not generate), no problem is encountered with the PL/DPL signal (such as most community repeaters) since carrier only is not seen as a system mobile. Some repeater stations have a jumper for turn-off delay but many delay turn off more than a second even though the “0” position is selected. In these cases, reducing the timing capacitor to a much smaller value produces the required results (for example, changing C11 on a MICOR repeater TLN4662A squelch gate module from 68 µF to 4.7 µF).

3. 60-Second Mobile Inactivity Timer:

In the enhanced VOX simplex mode, the land-line caller cannot be interrupted by the mobile (until the 30-second time-out). Therefore, it is possible for the mobile to hear the warning ticks and not be able to reset the inactivity timer because the land-line party is talking. Therefore, it is recommended that the mobile inactivity timer (parameter 122) be set to 3 minutes of mobile inactivity in Enhanced VOX simplex systems.



Intercabling Diagram – Maxar/Moxy Control Station to PL1877A

MAXAR 80 Bases

MAXAR 80 Bases are characterized by two large power pins in the cable connector, pins A and B. Install the following modifications/additions to the base station using the supplied female pins where necessary.

1. **RX Detector Audio** - Run a wire from U10, pin 6 to J601-6 (wire for meter 2 may be in pin 13 of J601 and possibly could be rerouted and used for this function).
2. **TX PL Disable** - Run a wire from the PL/DPL code disable - pin CD or TD o the PL/DPL deck to J601-3.
3. **PL Detect**

Tone PL (reed type, TRN6177C and similar) Locate and remove the soldered-in JU401 and install a 100k, ¼ W resistor in its place (Note: There are two JU401's shown on the board pictorial. The correct one for this function is the one is series between U401, pin 13 and Q409 base. This resistor allows pin 13 of U401 to swing between detectable logic levels). Remove C428 and replace it with a 1 µF capacitor, observing polarity. Run a wire form U401, pin 13 to J601, pin 4.

Tone PL (reedless type, TRN6207A and similar) Run a wire from U401, pin 28, on the PL deck to J601, pin 4.

Digital PL (TRN6207A and similar) Run a wire from U301, pin 7, on the DPL deck to J601, pin 4.

4. **Reverse Burst Disable (necessary for signal search mode only.)**

Tone PL (reed type, TRN6177C and similar)

Remove the lead on the PL deck that comes from J601, pin 1 (PL on-off from hang-up box) and solder it to Q406 base. Solder the supplied .01 µF RF decoupling capacitor between base and emitter of Q406. Connect JU401 to HD (**NOTE:** There are two JU401’s shown on the board pictorial. The correct one for this function is the one that grounds the emitter of Q409 when connected to pin HD).

Tone PL (reedless type) (TRN4237A and similar) Remove the lead on the PL deck that comes from J601, pin 1 (PL on-off from hang-up box), and solder it to U401, pin 36. Remove the lead on the PL deck that comes from J601, pin 2 (hang-up box ground), and solder it to the junction of C414 and R408 on the PL deck. Remove R421 on the PL deck (between U401, pin 7 and pin 26). Solder the supplied diode into the JU102 holes on the main circuit board, (close to squelch control) with the cathode toward mic PTT.

Digital PL (TRN6207A and similar) Remove the lead on the PL deck that comes from J601, pin 1 (on-off from hang-up box) and solder it to Q312 base. Connect JU302 to pin D.

The Monitor function is now via the front panel and/or desk mic monitor switch. Now, connect the PL1877A P1 radio cable to the base station P601 connector as follows, using the supplied male connector pins, as applicable.

Pin 601 Pin #	Color	Function
B	Red	TX PL disable return
B	Green/black	RX detector return
B	Blue/black	TX audio return

Twist the above listed leads together and solder to a short wire lead. Then strip a small section on the black power lead close to the connector. Neatly solder the short lead from the returns to the stripped section of the black power lead.

Pin 601 Pin #	Color	Function
5	Blue/white	TX audio (mic high)
6	Green/white	RX detector audio
3	Red/black	TX PL disable
4	Black	RX PL detect
8	White	PTT
1	Orange	Reverse burst inhibit
2	Orange/black	Reverse burst inhibit return

NOTE: The orange and orange/black leads (reverse burst inhibit and return) need to be connected only in the signal search mode.

If the PL1877A is to be dc-powered, connect the red lead in the dc power cable to P601 pin 4, and the black lead to P601 pin 6. Connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR) on the rear panel of the PL1877A. If the optional ac transformer and cable are to be used, install the ac power connector into the 5-pin DIN connector (DC PWR) on the rear panel of the PL1877A.

Earth ground - Run the supplied #12 black ground wire from the PL1877A GND terminal to the base station chassis. This wire must be as short as practical, not coiled, and connected securely to the base station chassis.

If this is a control station in a repeater system that transmits PL/DPL during transmit turn-off delay, it is necessary that the repeater be set for zero turn-off delay. (See Note 2).

Required Parameters – Using the Parameter Modification Procedure, set the following parameters:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (low-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	1 (PL detect input is active high) If parameter 6 =0, parameter 7 = don't care.
9	1 (simplex)
10	0 (active low PTT sense input)
70	0 (signal search) 1 (enhanced VOX, requires the enhanced VOX option)

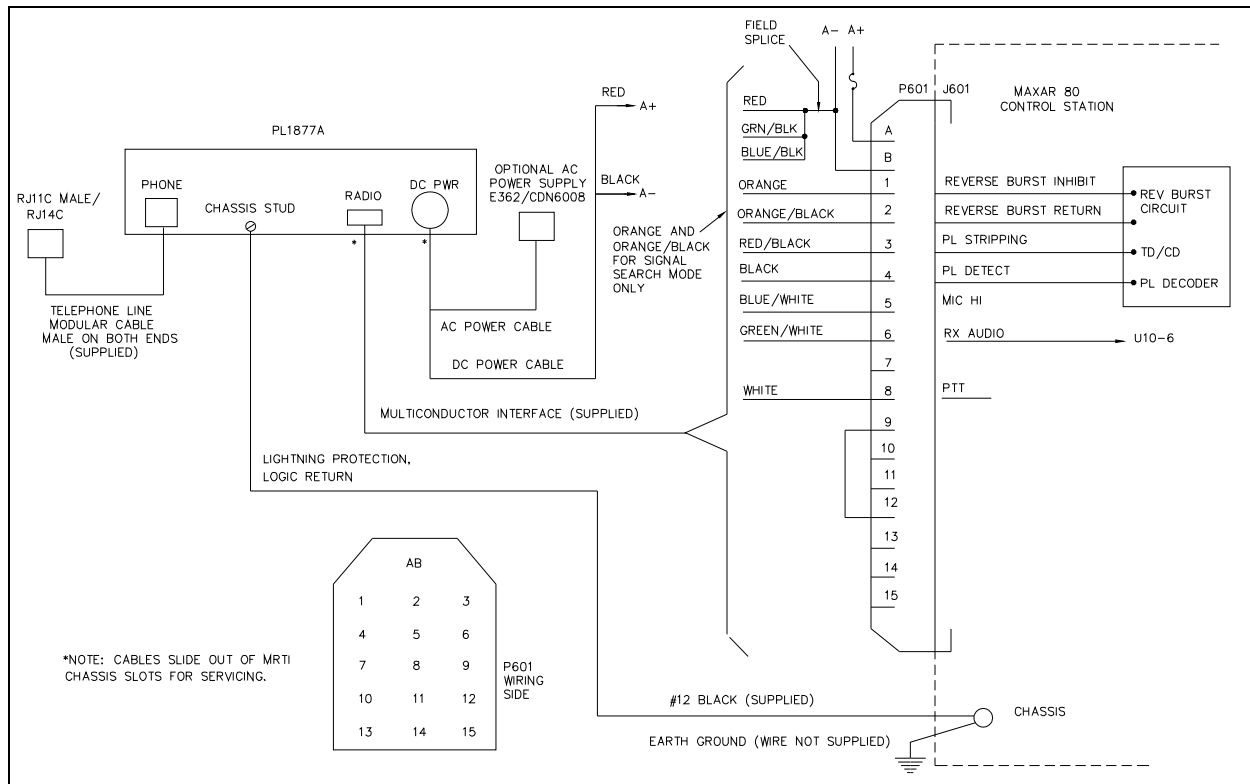
All other parameters are programmed as applicable to system requirements. Refer to the “Parameter Modification Procedure” starting on page 77 and then the “Level Setting” section on page 17 of this manual.

NOTES:

1. MAXAR Quadrature Detector Adjustment can cause receiver response time problems, especially in DPL systems. This can adversely affect PL1877A operation, especially in the signal search mode. The following procedure ensures the shortest possible receiver PL/DPL response time and is the procedure currently being used on all MAXAR, MOXY and MAXAR 80 radios being shipped from the factory.
 - a. Transmit into a 50-ohm load at 13.8 V.
 - b. Note meter 2 (quadrature output) using a high impedance DVM (may be necessary to measure on the radio circuit board if the meter 2-wire was used in the PL1877A installation).
 - c. Dekey the radio.
 - d. Inject a 10.7 MHz signal into the I.F. of the MAXAR radio.
 - e. Adjust the quadrature coil (L18 or L23) for a meter 2 reading as measured in step “b”, ± 0.1 V dc.

This procedure reduces or eliminates the pulse to the PL/DPL deck caused by the difference of quadrature voltage between transmitting and receiving an on-frequency signal. Note that a mobile transmitting off-frequency can cause the same problem.

2. Repeater transmit turn-off delay in repeater control station installations: When the PL1877A is being installed in a control station controlling a repeater, it is necessary to ensure that the repeater does not stay on the air after the control station unkeys. If the PL1877A detects carrier (and PL/DPL, if applicable) after unkeying the control station, it is erroneously seen as a mobile transmission. In systems that require PL/DPL and retransmit (not generate), no problem is encountered with the PL/DPL signal (such as most community repeaters) since carrier only is not seen as a system mobile. Some repeater stations have a jumper for turn-off delay but many delay turn-off more than a second even though the “0” position is selected. In these cases, reducing the timing capacitor to a much smaller value produces the required results (for example, changing C11 on a MICOR repeater TLN4662A squelch gate module from 68 μ F to 4.7 μ F).
3. 60-Second Mobile Inactivity Timer: In the enhanced VOX simplex mode, the land-line caller cannot be interrupted by the mobile (until the 30-second time-out). Therefore, it is possible for the mobile to hear the warning ticks and not be able to reset the inactivity timer because the landline party is talking. Therefore, it is recommended that the mobile inactivity timer (parameter 122) be set to 3 minutes of mobile inactivity in enhanced VOX simplex systems.



Intercabling Diagram – Maxar 80 Control Station to PL1877A

MICOR RCB Repeater

PL1877A Half-duplex mode: To facilitate easier installation and servicing, the screw terminals (TB3) should be used for connection of the PL1877A P1 interface cable. The following jumper wires should be soldered into the holes adjacent to the screw terminals rather than wrapping the jumper ends around the terminals. Install the following jumpers:

From	To	Function
1. Screw terminal #9	J5 pin 9	PL stripping
2. Screw terminal #13	Sta cont Pin 21	R1 disc
3. Screw terminal #15	F1-PL pin 22	Exciter input
4. Screw terminal #17	J2-10	PL indicator

In order to use the PL stripping function, a jumper must also be installed from P701 on the PL encoder board to P964 on the transmitter interconnect board. This jumper is also used with the paging PL defeat option.

Installation of P1 Interface Cable		
Cable Color	To	Function
Red	Screw terminal #1	PL stripping return
Orange/black	Screw terminal #1	PTT return
Green/black	Screw terminal #1	RX audio return
Blue/black	Screw terminal #1	TX audio return
Red/black	Screw terminal #9	PL stripping
Green/white	Screw terminal #13	RX disc audio
White	Screw terminal #14	Repeater PTT
Blue/white	Screw terminal #15	TX audio
Black	Screw terminal #17	PL indicator

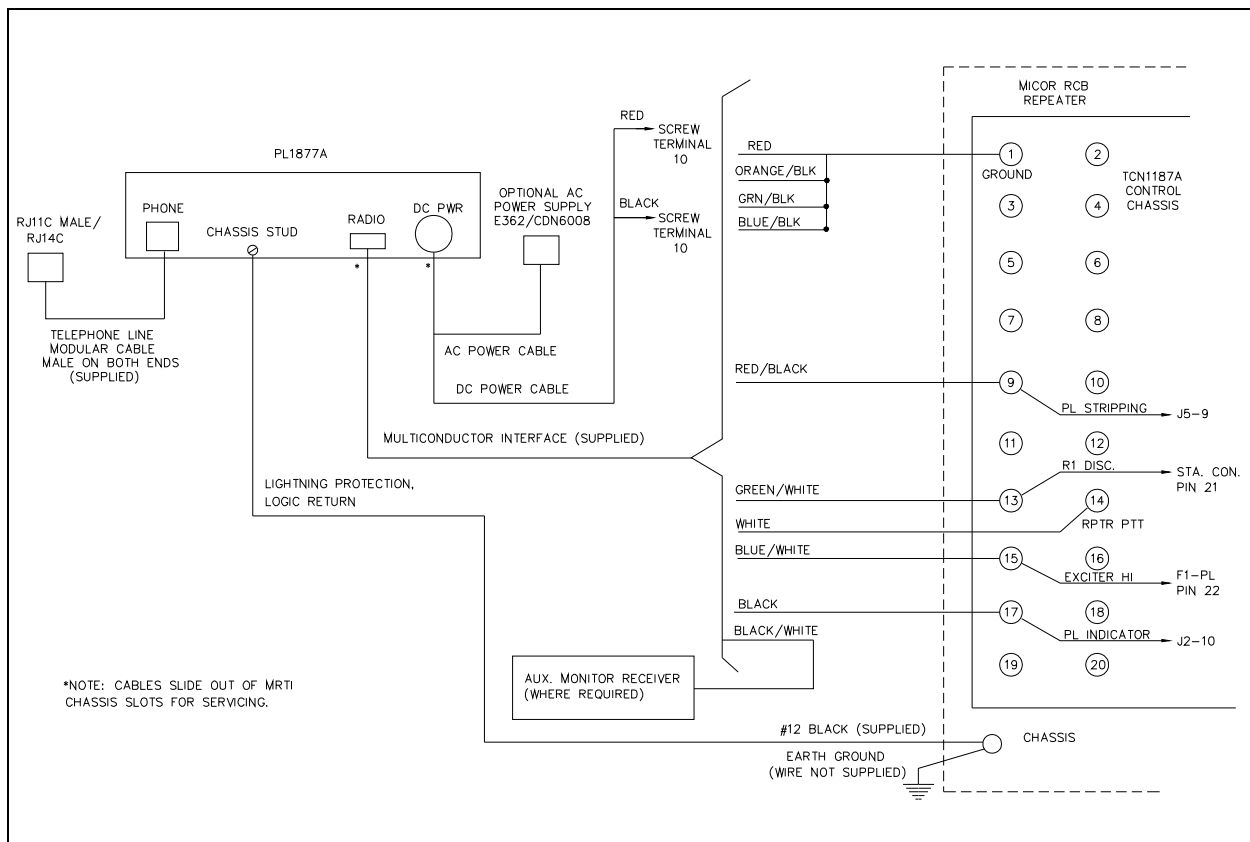
If the PL1877A is to be dc-powered, connect the red lead in the dc power cable to screw terminal #10 and the black lead to screw terminal #1; connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A. If the optional ac transformer and cable are to be used, install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

Earth ground - run the supplied #12 (or larger) wire from the GND terminal on the PL1877A to the base station chassis ground. This wire must be as short as practical, not coiled, and fastened securely to the base station chassis.

Required Parameters - Using the Parameters Modification Procedure in this manual, set the following required parameter settings:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (mid-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	0 (PL detect input is active low) 1 (PL detect input is active high)
9	0 (half duplex)
10	0 (active low PTT sense input)

All other parameters are programmed as applicable to system requirements. Refer to the Parameter Modification Procedure starting on page 77 and then the "Level Setting" section on page 17 of this manual.



Intercabling Diagram Micor RCB to PL1877A

FLEXAR Repeater

Install the following modifications/additions to the Flexar repeater using the supplied connector pins. Female pins are used on J801. Wire colors specified match PL1877A cable wire colors, and, if followed, may assist in any future service.

1. **RX Detector Audio** - Run a green/white wire from J801 (metering socket) pin 1 to P901 (receiver chassis plug) pin 1 (male pin). Run another green/white wire from J901 pin 1 (female pin) on the receiver chassis to U10 pin 6 (detector audio output).
2. **PL Detect** - Run a black wire from J801 pin 9 position to P901 pin 2 (male pin).
Tone PL (reed type, TRN6177 and similar) - Run another black wire from J901 pin 2 (female pin) on the receiver chassis to U401 pin 13 on the PL deck. Locate and remove the soldered in JU401 and install a 100k, 1/4 W resistor in its place. (Note: There are two JU401's shown on the board pictorial. The correct one for this function is the one in series between U401 pin 13 and Q409 base.) This resistor allows pin 13 of U401 to swing between detectable logic levels. Remove C428 and replace it with a 1 μ F capacitor, observing polarity.
Tone PL (reedless type, TRN4273A and similar) - Run another black wire from J901 pin 2 (female pin) on the receiver chassis to U401 pin 28 on the PL deck.
Digital PL (TRN6207A and similar)
 Run another black wire from J901 pin 2 (female pin) on the receiver chassis to U301 pin 7 on the PL deck.
3. **TX PL Strip** - Locate the orange/black wire running from J701 pin 10 to filter bracket terminal 10. Cut this wire off at the filter bracket and install a male pin on the free end. Insert the pin into J801 pin 2 position. This is a spare wire that terminates at J601 on the transmitter chassis in the Flexar housing. Run another orange/black wire from J602 pin 10 position (may already be present) to the cathode side of CR120 on the exciter chassis.
4. **TX Audio** - Run a blue/white wire from the J801 pin 4 position to the previously vacated filter bracket terminal 10. On the Repeater control board, connect a blue/white lead in series with a 1M resistor: from J20 pin 10, clipping the resistor leads to 1/2 inch and soldering the resistor to U2 pin 9. Use heat shrink or other "spaghetti" to insulate the wire-end of the resistor.
5. **PTT** - Run a white wire from the J801 pin 5 position to terminal 8 of the filter bracket.
6. Install male pins on the PL1877A P1 radio cable and insert them into a plug body (not supplied - Motorola P/N 15-80315A40) as follows:

Color	Function	Plug Pin No.
Green/white	Rec. audio	1
Black	PL detect	9
Blue/white	Transmit audio	4
White	PTT	5
Red/black	TX PL strip	2
Red, orange/black	Ground	6
Green/black, blue/black	Ground	6

This plug mates with J801.

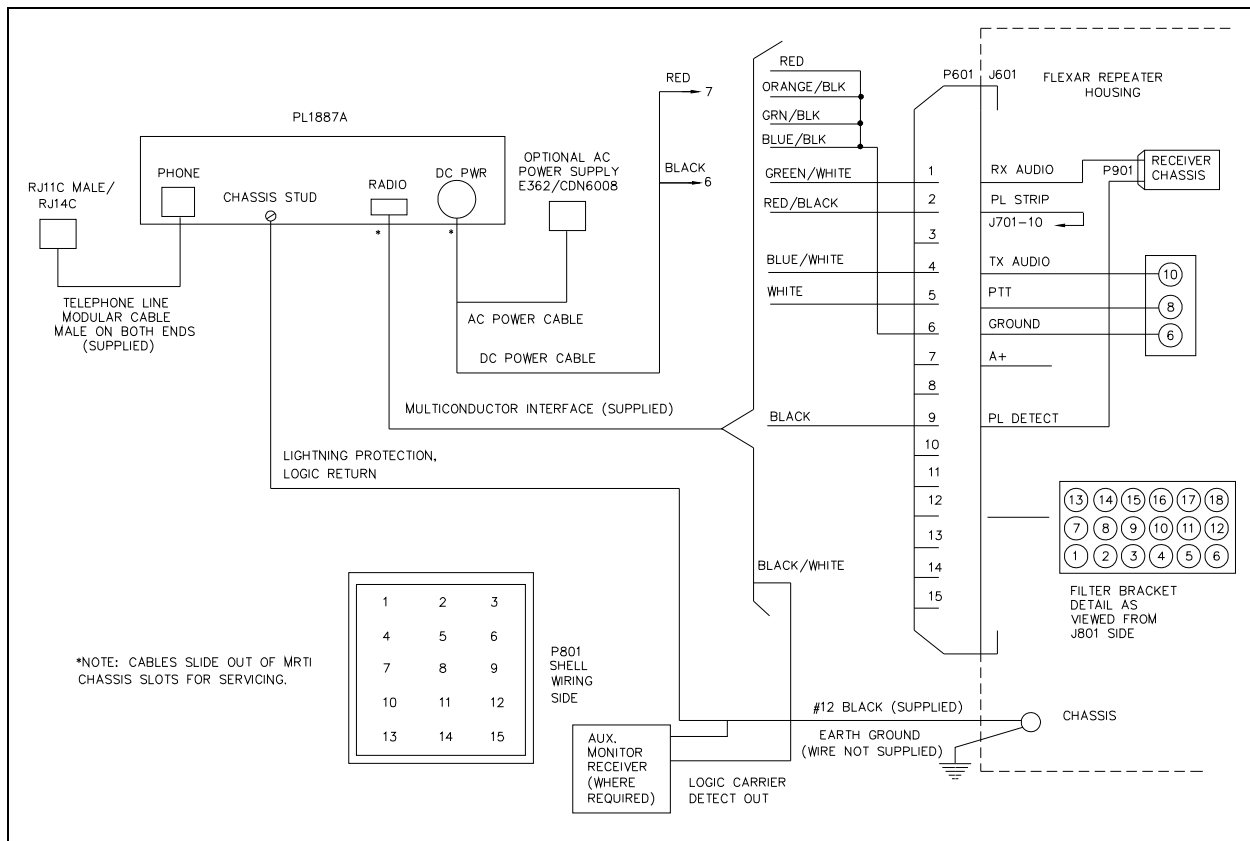
If the PL1877A is to be dc-powered, connect the red lead in the dc power cable to P801 pin 7 and the black lead to P801 pin 6; connect the other end of the dc power cable into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A. If the optional ac transformer is to be used, install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

Earth ground - Run the supplied # 12 black ground wire from the PL1877A ground terminal to the repeater chassis frame. This wire must be as short as practical, not coiled, and connected securely to the chassis.

Required Parameter Settings – Using the “Parameter Modification Procedure” section of this manual set the following parameters:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (low-level source)
3	0 (internal carrier detect)
4	Don't care
5	0 (internal squelch for carrier detect)
6	0 (No PL detect input required) 1 (PL detect input required)
7	1 (PL detect input is active high) If parameter 6 = 0, parameter 7 = don't care
9	0 (half duplex)
10	0 (active low PTT sense input)

All other parameters are programmed as applicable to system requirements. Refer to the Parameter Modification Procedure on page 77 and then the “Level Setting” section on page 17 of this manual.



Intercabling Diagram – Flexar Repeater to PL1877A

T1600 Series Remote Interfacing

In this mode of operation, the PL1877A normally operates in the enhanced VOX simplex mode. Receiver audio is used as the receiver carrier source. Connect the PL1877A radio cable to the remote as follows:

Radio Cable Interfacing		
Color	Function	Terminal
Green/white	Receive audio high	13
Black/green	Receive audio low	12
Blue/white	Transmit audio high	28
Blue/black	Transmit audio low	27
White	PTT	15
Green	PTT return	1
Orange	Monitor (rec PL disable)	19
Yellow	Monitor return	1
Blue	Receive carrier indicate	n. c.
Red/black	Transmit PL disable	n. c.
Red	Transmit PL disable return	n. c.
#12 black ground	Logic/lightning ground	1



It is recommended to use the optional ac transformer and cable on remote installations. Install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

Required Parameter Settings – Using the “Parameter Modification Procedure” section of this manual set the following parameters:

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 IN (high level speaker audio)
3	0 (internal carrier detect)
4	Don't care
5	1 (RX audio VOX for carrier detect)
6	Don't care
7	Don't care
9	1 (simplex)
10	0 (active low PTT sense input)
70	1 (enhanced VOX, requires enhanced VOX option)

All other parameters are programmed as applicable to system requirements. Refer to the “Parameter Modification Procedure” on page 77 and then the “Level Setting” section on page 17 of this manual.

Level Setting – The remote should be set to provide +8 dBm output measured at the 8-ohm hot output with any Touch-Code digit from a properly adjusted mobile. Also, refer to “Level Setting” section in this manual.

 **NOTE**  The line input level to the remote should be adjusted to the minimum level that will provide satisfactory receive volume (at the knee of compression and no more).

Excessive input sensitivity or too high an adjustment of the receive line input level potentiometer will result in an increase in effective line noise and/or hum, possibly causing improper operation of the PL1877A cross lock-out VOX feature. During final tests, a check should be made by setting up the PL1877A for Test 5 (refer to “Internal Diagnostics” section of this manual) and ascertain the RADIO BUSY LED is extinguished when not receiving a mobile signal and is illuminated with the presence of receive audio.

MSF 5000 Digital Base/Repeater Stations

Installation of the PL1877A to the MSF 5000 digital station requires the MSF 5000 Cable Kit, Part No. M2000-MSF5000-CBL. The station must be programmed for phone patch operation using MSF 5000 Radio Service Software (available through Motorola Service Stations). Connect the signal cable to connector P802 on the MSF 5000 station control module. Connect the dc power cable to the screw terminal strip on the station power supply.

Earth Ground - Run the supplied #12 black ground wire from the PL1877A GND terminal to the base station chassis. This wire must be as short as practical, not coiled, and connected securely to the base station chassis.

Required Parameter Settings - Using the Parameters Modification Procedure detailed in this manual set the following parameters:

Parameter	Setting
1	0 (flat source audio)
2	1, JU202 OUT (mid-level)
3	1 (external logic level carrier detect)
4	0 (carrier detect input is active low)
5	0 (internal squelch for carrier detect)
6	0 (no PL detect input required) 1 (PL detect input required)
7	0 (PL detect is active low)
9	0 (half duplex)
10	0 (active low PTT sense input)



MAXTRAC 300/GM300 Base Station

Enhanced VOX Mode – Installation of the PL1877A to the MaxTrac 300 radio requires the MaxTrac/GM300 Cable Kit, Part No. M2000-MAX-CBL. The radio must be programmed for phone patch operation using Radio Service Software (available through Motorola Service Stations).

If the PL1877A is to be dc-powered, connect the dc power cable from the patch to the base station power supply. If the optional ac transformer and cable is to be used, install the ac power connector into the 5-pin DIN connector (DC PWR), on the rear panel of the PL1877A.

Earth Ground – Run the supplied #12 black ground wire from the PL1877A ground terminal to the base station chassis. This wire must be as short as practical, not coiled, and connected securely to the base station chassis.

Required Parameter Settings – Using the Parameter Modification Procedure detailed in this manual, set the following parameters:

 **NOTE**  With the parameter settings listed below, the radio must be internally jumpered to provide de-emphasized muted audio, JU551 must be in the B position.

Parameter	Setting
1	0 (flat source audio)
2	1, JU202 OUT (mid-level audio)
3	1 (external logic level carrier detect)
4	0 (carrier detect input is active low)
5	0 (internal squelch for carrier detect)
6	0 (no PL detect input required) 1 (PL detect input required)
7	0 (PL detect is active low)
9	1 (simplex)
10	0 (active low PTT sense input)
70	1 (enhanced VOX, requires Enhanced VOX option)

The PL1877A could also be configured to use the PL1877A’s internal squelch circuit. This would require setting the parameters as shown on the previous page, with the following exceptions:

⚠ NOTE ⚠ With the parameter settings listed below, the radio must be internally jumpered to provide discriminator audio, and JU551 must be in the “A” position.

Parameter	Setting
1	0 (de-emphasis)
2	1, JU202 OUT (mid-level audio)
3	0 (internal carrier detect)
4	Don’t care

All other parameters are programmed as applicable to system requirements. Refer to the Parameter Modification Procedure on page 77 and then the “Level Setting” section on page 17 of this manual.

Power Supply

DC power enters the PL1877A via J2 and passes through fusible resistor R350. Common-mode choke L201 acts to reduce the level of EMI/RFI out of the dc power port. C261 and C262 also work with the choke to accomplish additional filtering. D226 provides reverse and overvoltage protection. C259, L202 and C260 provide high-frequency filtering from the switch-mode power supply.

C215, U206b and associated components regulate the -5 volt source, derived from the -14 volt supply. Programmable zener U212 provides the 5 volt reference. The 2-volt reference voltage is obtained by dividing the reference 5 volts in half by voltage divider R370 and R369, and buffered by U202d.

U211, Q211, T201 and associated components comprise a fly-back switch-mode power supply operating at approximately 50 kHz. This supply furnishes the regulated 5 volts for analog and digital circuits, and unregulated -14 volts. The 5 volt analog output is delayed “on” by Q217 and Q213 until the -5 volt supply is present.

U234 and associated components provide an RS-232 compatible interface for programming system parameters from the serial port of a terminal. U234a functions as a line receiver, while section “d” serves as the line driver.

Microprocessor and DSP Module (MDP)

U1, a 68HC11 8-bit microcontroller, controls audio paths, provides timing, and regulates output levels. The processor contains an internal power-up reset and computer operating properly (COP) watchdog timer. In the event that an internal failure occurs, the reset output is asserted. This resets the DSP controller.

DSP processor U10 handles the following: audio routing, tone detection, DTMF tone generation, receive audio de-emphasis, VOX autolevel, and modem functions. Host and DSP processors generate an operating clock internally by crystals Y2 and Y1 respectively. Operating parameters are stored in NVRAM U3. U2 contains the operating program that runs the HOST processor. Communication between the Host and DSP processors is via U5 and U6.

Digital Signal Processing

Receive audio enters the module through U18a. U24b and U18, configured as a digitally controlled gain stage, are under processor control via data lines MPD8-15. The leveled audio signal passes through an anti-aliasing filter, U24c, and onto the encoder portion of CODEC U20.

The CODEC is a device that “quantizes” (samples) the analog audio signal according to “mu”-law coding conventions (i.e., companding). Output at U20-11 is a serial 8-bit code suitable for conditioning by the DSP algorithms. The conditioned receive audio data, in serial form from U10, is input to the receive data (DR input, pin-6) of the CODEC. There it is restored to analog by the decoder portion of the CODEC.

The CODEC expands the signal (decompression) back to its original dynamics, reversing the compression that took place in the encoding process. This process is known as companding.

The restored audio signal is without much of its original undesirable attributes, such as noise, hum, etc. Also if de-emphasis is selected by parameter 1, audio is restored to flat response. Reset to the DSP processor, asserted on power up to assure proper initialization (provided by U4), is under control of the HOST processor.

TX Audio

The audio processing that occurs to the TX (phone line to transmitter audio), is similar to the process that occurs to receive audio. However, different algorithms are used to detect VOX, dial-tone and call progress tones, and DTMF tones. Audio enters the DSP module and is directed to U19-19.

The process of audio signal leveling is essentially the same to that used in the receiver path. Once auto-leveled, the analog transmit audio is routed through CODEC U21, where companding takes place as in the case of receive audio. From there, the PCM signal is handled by the DSP processor, and reconstituted as analog audio by the CODEC.

Radio Interface

Receive audio from the station receiver, enters via P1-10 and passes through an attenuator consisting of R221, R225 and R205, and R206. JU202 “IN” allows use of high-level audio sources, such as a line or speaker level source. A 15 dB attenuator (Q201, 202, and 203) can be enabled on demand (parameter 2), by the processor, as needed to give flexibility in acceptable receive levels. R220 serves as a termination resistor (JU202 “IN”) to establish a 600-ohm input impedance.

With JU202 “OUT”, the input impedance is high, or bridging. Receive audio then is routed to the microprocessor/DSP module via U206b. There it is digitized to a serial output by CODEC U20, to allow processing by U10.

U207a, U207b, and associated components comprise an active high pass filter, extracting the noise component from the detector but ignoring the speech audio. (Wide-band noise is always present from an FM detector when no signal is present). The extracted noise, level set by VR201, is detected by D210 and U207c, which comprises a half-wave precision rectifier.

The dc output derived feeds comparator U207d, which outputs a logical high upon a reduction of high-frequency noise (mobile carrier detected). The line is read by the microprocessor, being an input to the SPI (serial peripheral interface) bus via U205, which then validates detection of a mobile transmission.

Reconstituted (analog), processed transmit audio enters line driver U210, functioning as a constant current driver. This configuration allows the PL1877A to bridge the microphone input circuit, without loading it. Q221, Q222, and Q223 function as an audio switch, muting the TX audio path in the receive mode.

Logical inputs from the station (PTT sense, COR IN, PL sense, Patch Inhibit, and options), are selected by U205. Then they are fed to the host processor via the SPI wire, under control of bus line MISO_D, synchronized by serial clock.

All logical outputs to the station, TX PL disable, PTT, and MON are under control of the HOST processor through serial to parallel data latch U204. U204 interfaces with the processor via the SPI bus. The logical outputs then are directed to the appropriate driver as an output, synchronized by the SCK line from the host processor.

A logic high on the PTT line turns on Q205, sinking its drain to ground, and providing the PTT to the station transmitter. In a similar fashion, the MON (high) turns on Q206, or PL strip turns on Q207, activating optical relays U208 and U209 respectively. This scheme provides a very high degree of isolation, and assures flexible interfacing to various radios.

Line Interface

The line interface complies with FCC part 68 rules, allowing direct connection to the public switched telephone network (PSTN). The interface functions are: lightning and surge protection from the phone line, isolation, line accessing, pulse dialing, ring detection, hybrid, and longitudinal balance. Land-line audio, from the PSTN (or PABX) enters the PL1877A via P404. L401, L402, S401, S402, and S403 provide surge protection.

Ring detection is afforded by comparators U403c and U403d, generating an input pulse-train to the HOST processor. This occurs whenever the level of the ring component exceeds the threshold level of the positive and negative comparators. There it is validated. U402a functions as a differential mode amplifier, reflecting a high impedance load to the phone line.

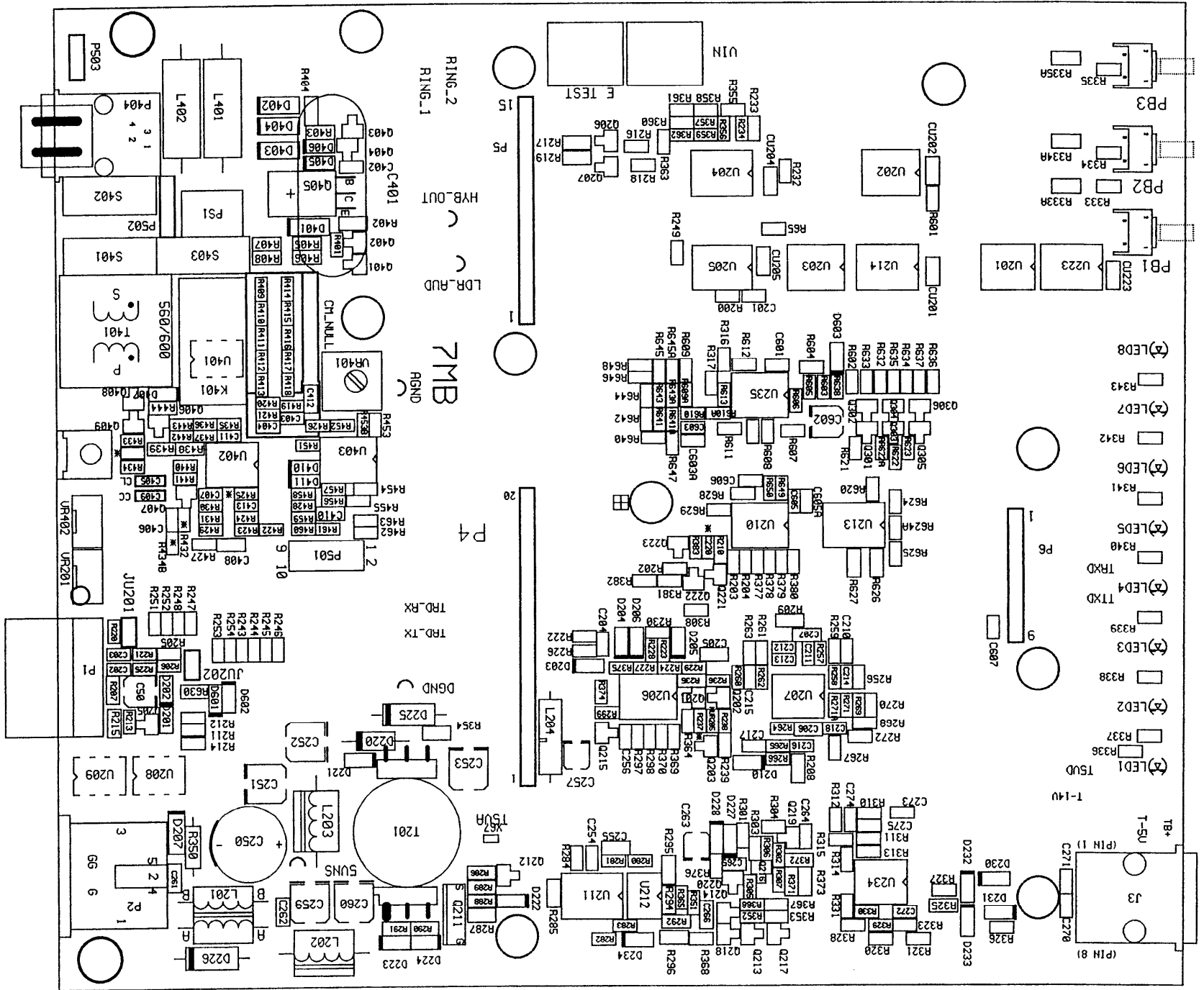
Common mode balance is enhanced by proper setting of VR401. Phone line audio, entering U402a, is reduced in level by a factor of 20.71. From this point the audio passes on to U402b, comprised as a gain stage of 26DB. U402b also is part of the hybrid. The receive audio is then injected out of phase with the line audio at the summing junction of U402-9. The signal at HYBR_OUT (U402-8) is thus suppressed of the receive audio component.

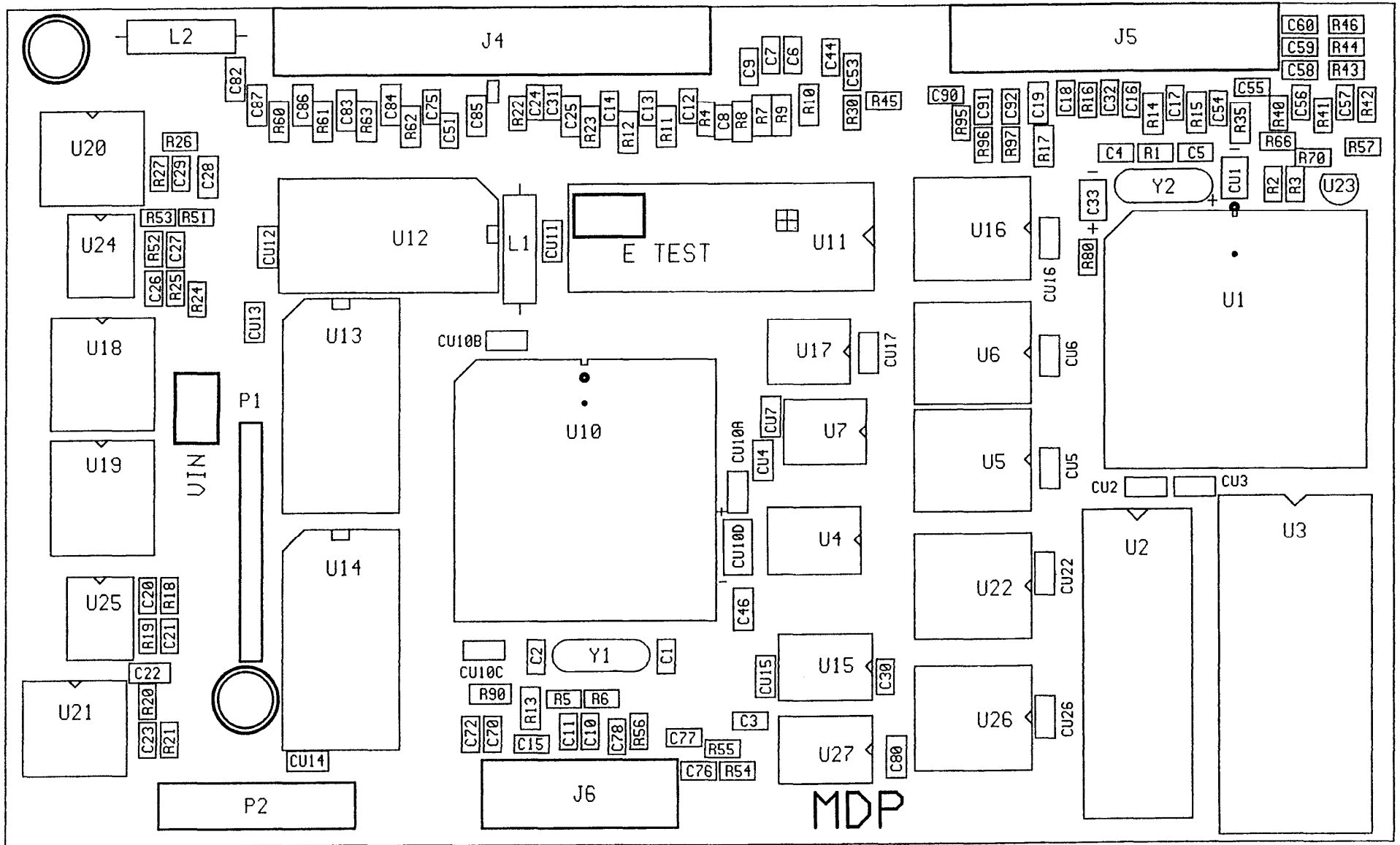
Phone audio enters the module and into U402b, the line driver. Amplified audio, coupled through T401 and C401, provides isolation and impedance matching to the line. No dc current flows through T401, but rather only the ac component (audio).

DC loop current flows instead through the constant current circuit comprised of Q401-Q405 and associated components. Opto-switch U401 serves as the access relay, and provides isolation to the phone line from high voltage surges. The opto-switch is also pulsed at the selected dialing rate by the microprocessor if pulse dialing is required.

Optional Line 2 Interface

The optional line 2 interface provides the ability to answer and originate calls on a second phone line. Dual ring detect is provided by U502, necessary to detect ring on line 1 when line 2 is accessed. U502a-d is configured as two, dual polarity comparators. Line selection is provided by energizing relay K501, under processor control via LIN_Sel. Land-line audio is then routed through the same path that line 1 used (T401). From there the operation is identical to line 1.





Component Layout for MDP Circuit Board

Definitions and Acronyms

Term	Definition
CSQ	Carrier squelch
Capcode	The identifying number on the outside of the radio pager. It is related to the tone or digital code that gives the address and other information about this particular pager.
Carrier Squelch	Detection of a valid mobile signal is based on loss (squelch) of random channel noise.
CTCSS	Continuous Tone Controlled Subaudible System – A means of grouping users of a common radio channel. Subaudible tones are transmitted with audio; a particular radio's speaker (or the speakers of a group of radios) will unmute to broadcast a transmission only if the associated subaudible tone identifies it as belonging to the radio's user group.
CDCSS	Continuous Digital Coded Squelch System – A system analogous to CTCSS but using low speed digital signaling instead of subaudible tones.
Diagnostics	Tests to determine if any hardware or software problems exist.
DPL	
DTMF	Dual-Tone, Multi-Frequency – is a method used by the telephone system to communicate the keys pressed when dialing. Pressing a key on the phone's keypad generates two simultaneous tones, one for the row and one for the column.
HLGT	High level guard tone
LLGT	Low level guard tone
Plectron	
Patch	A term synonymous with interconnect
PTT	Push-to-talk – a switch, which when pressed, causes the radio to transmit.
RX, Receive	To accept a signal from a radio.
TPL	
TX, Transmit	To send a signal to a radio.
Squelch	A system that prevents audio from being heard when no signal is being received.

