PAGE CENTER

On-Site Communications System

User Manual

Firmware Version A14

Sonik Technologies Corp.
310 Via Vera Cruz
San Marcos, CA 92069
PH: 760-752-1011
Fax: 760-752-1411
Email: sales@sonik.com

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1 PAGE CENTER Installation

1.1 Environment

The **PAGE CENTER** is designed for an indoor office environment. Ambient air temperature should be between -10 and +40C, and relative humidity in the 20-80% range. Operation outside of this range may cause damage to the unit.

1.2 Licensing

This product operates in the commercial two-way radio communications band. A license to operate on a particular frequency must be obtained from the FCC. Use form 600 to apply for a license to operate this unit in your area. Operation of this product must be in compliance with the applicable FCC rules and regulations. In most cases, the FCC Rules and Regulations are covered in Title 47 of the CFR, part 90 pr Part 22. Form 600 is available at the FCC WEB site: http://www.fcc.gov/formpage.html. See appendix A for a list of frequency coordinating agencies.

This product is Certified for use under FCC Parts 22 and 90. Internal circuitry may not be modified. Modification of circuitry within this unit may void the your authority to operate the equipment.

1.3 Radio Communication Interference

The **PAGE CENTER** generates and uses high-frequency radio energy which can cause interference if not installed in accordance to the user manual and using sound radio system engineering practice. For best results, it is recommended that a qualified radio service technician install and configure the **PAGE CENTER**.

The **PAGE CENTER** has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of the FCC Rules and Regulations. Operation of this device in a residential area is likely to cause interference in which case the user must, at his own expense, be required to take whatever measures may be required to correct the interference.

1.4 Locating the PAGE CENTER

The **PAGE CENTER** is designed to sit on a desk top. Although this is a good location for ease of operation, it is usually not the best place to locate the antenna. For most installations, it is recommended that the antenna be located away from the unit, and high enough to provide good coverage. "Base Station" type antennas will provide much better coverage than will the "rubber duck" type antennas.

The LCD's contrast may be adjusted through a small hole in the rear of the unit, so if it is difficult to read, try adjusting its contrast.

1.5 Connections

a) Connect the antenna to the BNC jack on the rear of the unit.

b) If you are using the **PAGE CENTER** with a computer system, connect the computer's RS-232 port to the lower serial port on the rear of the unit.

c) If the telephone interface will be used, connect a telephone line to the RJ-11 jack on the rear of the unit.

d) Turn the power switch on the rear of the unit to the OFF position.

e) Connect the DC power supply to the **PAGE CENTER**. It connects to the large DIN connector on the rear. Plug the external DC supply into an AC wall socket.

f) Turn the power to the unit ON.

g) The unit is now read to begin operation.

2 PAGE CENTER Operation

2.1 Overview

The PAGE CENTER is a desk top system that provides paging and wireless two-way communications. With an Intel 32 bit processor at its core, and 4 megabytes of FLASH memory, the PAGE CENTER can handle the wireless communications needs of the small office or a large plant.

PAGE CENTER features:

- ⇨ *Stand-alone operation with built-in keypad and LCD display.*
- ⇨ *Build-in RS-232 serial port for advanced paging applications.*
- ⇨ *Built-in telephone interface for remote access.*
- ⇨ *Internal two-way radio for monitoring the channel and two-way voice communication.*
- ⇨ *POCSAG paging encoder at 512, 1200, and 2400 baud*
- ⇨ *999 pager database*
- ⇨ *Group paging*
- ⇨ *8 external alarm inputs for automatic generation of pre-programmed pages.*
- ⇨ *Pages may be initiated from DTMF equipped two-way radios.*
- ⇨ *Built-in speaker and microphone, with provisions for external connections.*

The PAGE CENTER operates in one of two basic modes. They are the *Page Mode* and the *Program Mode*. The *Page Mode* is used to send digital pages to a selected pager or group of pagers. It may also be used to communicate with a two-way radio. For the PAGE CENTER to send pages to a pager, it must first be programmed with the pager's CAP code. This is done, one time, using the *Program Mode.* The *Program Mode* is used to set up the individual pager's information, group information, automatic paging information, and some system-level features.

Although the operator may send pages using the built-in keypad, pages may also be generated in a variety of other ways. Pages may be initiated through the RS-232 serial port on the rear of the unit. Another way is to use the built-in telephone interface. When connected to a telephone line, pages may be entered using a touch-tone phone by dialing into the unit. The PAGE CENTER may also be configured to automatically generate a page, based upon an electrical input to special input pins on the rear of the unit. The PAGE CENTER is one of the most versatile paging devices on the market today!

The PAGE CENTER has an internal database, which stores the CAP code for every pager in your system. The CAP code is the special 7 digit code that identifies an individual pager or paging receiver device. To make paging simpler, you need only configure the CAP codes once by assigning an easy-to-remember number or name to it. For instance, you may have 3 pagers with the following CAP codes: 1924589, 0029111, 0935199. You can program them into the database as pager names 1, 2, and 3 as follows:

Pager CAP Code	Pager Name
1924589	1
0029111	2
0935199	3

Now, when it comes time to page pager 2, you will only have to enter the digit 2, rather that the whole CAP code. Other parameters that must be entered into the database for each pager are the pager type (tone, numeric, alpha-numeric), baud rate (512, 1200, 2400) active or inactive status, and which groups it belongs to (if any).

To facilitate sending pages to a large number of different pagers, groups of pagers may be set up in the PAGE CENTER. A group is first assigned a name, and the members of the group are programmed into the group pager database. Once a group is set up, a page may be sent to all the members of the group simply by sending the page to the named group.

2.2 *Keypad*

The built-in keypad is used to program the unit, and to manually enter pages. Its 16 keys have the following functions:

Key	Primary Use	Secondary Use
0 thru 9	Entering numbers	Selecting a sub-menu
F1 (Enter)	Send a page after it is entered	Override monitor, and transmit immediately.
F2 (Display)	Select display page function	
F3(Voice)	(Voice paging not supported at this time.)	Talk to a two-way radio
DEL	Correct an incorrect entry	
- (Program)	Used as a dash (-) when entering a message.	Enters the programming mode
↓↑	Upd/down arrows scroll through various options on the display.	
VOL+/-	Adjust the local speaker volume	

The **PAGE CENTER** has a keypad buffer that allows a user to type faster than the prompts on the display come up. Keystrokes will not be lost, and efficient data entry is possible by operators skilled in the operation of the **PAGE CENTER**.

2.3 *Display*

There is a two-line, twenty-character LCD display on the **PAGE CENTER**. The three LEDs on the top right indicate the state of the transmitter, the channel busy, and the programming mode.

2.4 *Sending a page*

The **PAGE CENTER** is ready to send a page when the LCD display shows:

```
PAGER NO =
```

PAGEr NO =

This means that it is waiting for you to enter the pager name to which you which to send a page to. Using the keypad, enter the number (not the CAP code) of the pager you wish to page. Once you enter the pager number, press the **F1** key. There are three different types of pagers supported by the **PAGE CENTER**. They are: tone-only, numeric, and alpha-numeric. Depending upon what type of pager you are sending the page to, one of the following sequences will take place:

a. Tone-only paging

If the pager is a tone-only, it does not have a display. A page sent to it will cause it to beep. When a page is sent to it, the display will show:

```
TONE PAGE
```

While it is sending the page over-the-air to the pager. This will take about one second, after which it will display PAGE ACCEPTED for a couple seconds, and then return back to the PAGER NO= prompt.

b. Numeric and alpha-numeric pagers

If the pager is designated as a Numeric pager or an Alphanumeric pager in the PAGE CENTER database, then the LCD display will show:

```
DISPLAY PAGE
```

for one second, and then the LCD display will show:

```
ENTER MESSAGE
```

The user enters the message using the keypad into line 2 of the display. If the message is longer than the length of the display, the display will automatically scroll down to the next line as the message is entered. Pressing the DEL key allows the operator to delete the last character entered. Once the data is entered, press the F1 key to send the page. The display will show PAGE ACCEPTED for a couple seconds along with a bar next to the Transmit indicator, and then the display will return back to the PAGER NO= prompt.

Typically it takes a second or so to send a page to a pager. If the page is intended for a group of pagers, it may take longer. A group consisting of 10 pagers may take 5-10 seconds to transmit, and a group of 100 pagers may take 50-100 seconds to transmit.

2.5 Group Page

The PAGE CENTER can send a page to a group of pagers through the entry of a single group name. The pager numbers that are members of the group must have been previously assigned using the Assign Group configuration menu. When sending a group page, the PAGE CENTER sequentially sends the page to each pager in the group.

The procedure for sending a group page is the same as for the individual page described in the above procedure. Group pages generally take longer to send out, so you may find the PAGE CENTER will take a bit longer to return to the PAGER NO= prompt when a group page is sent.

2.6 Shortcuts

2.6.1 Function Skip

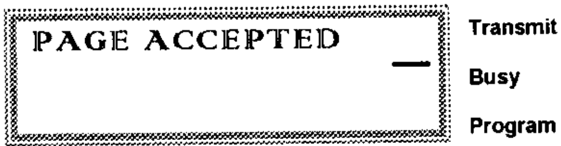
When you enter the name of the pager to page, the PAGE CENTER will display the type of page to be sent (Tone or Display) for one second. To skip this, use the correct function key instead of the **F1** key when entering the pager name, then the one-second function display will be skipped.

2.6.2 Tone Paging

Some pagers can receive tone or numeric pages. If you wish to send a tone page (make it beep) to a pager that is set-up for numeric or alpha paging, you can press the **F4** (Tone) key when entering the page instead of the **F1** (Enter) key. Pressing the **F4** key after entering the pager name will force the **PAGE CENTER** to send a tone page to the pager.

2.7 Busy Channel Override

The system will normally monitor the channel before transmitting, and if the channel is busy, it will wait to send the page. While it is waiting, you will see the busy LED lit.



To force the **PAGE CENTER** to transmit on the channel, even if it is busy, press the **F1** key (Enter) key when the **Busy** channel indicator is on. This will force the **PAGE CENTER** to send the page, even if the channel is busy. Transmitting on a busy channel may interfere with other radio communications on the channel. If the channel is busy, there is also a chance that the page you send may not be received.

2.8 2-way voice communications

The **PAGE CENTER** can communicate with portable and mobile two-way radios. The **PAGE CENTER** has a privacy feature called Continuous Tone Coded Squelch System (CTCSS). CTCSS blocks the reception of signals or noise that are not encoded with certain preset tones. You will only hear signals at the **PAGE CENTER** that have the correct CTCSS tone encoded on them. This means that the radio channel may be in use by someone else, and you will not hear anything come out the speaker because the CTCSS decoder has muted it.

To disable the CTCSS decoder to monitor all of the communications on the channel, momentarily press the F3 (Voice) key. The display will show LISTENING when the CTCSS decoder is disabled.

Before transmitting, you should always monitor the channel to see if it is busy. When you want to talk on the channel, press and hold down the **F3** (Voice) key. If the channel is not in use, the **PAGE CENTER** will turn the transmitter on and display **TALK** on the LCD. Your voice will be sent out over the air. The microphone is located on the front of the unit, so speak clearly into it in a normal voice. If the channel is busy, the LCD will display **LISTENING**. If after 3 seconds you do not release the **F3** key, the **PAGE CENTER** will begin transmitting.

After you release the F3 key, the display will show **LISTENING**. If no signal is received within a few seconds, the display will switch back to **PAGER NO**= prompt.

3 Program Mode Operation

The Program Mode is used to program CAP codes, add pagers, delete pagers, assign pagers to groups, configure the alarm pages, and set up various features of the PAGE CENTER.

To enter the programming mode, press the dash "-" key on the keypad. The PAGE CENTER will prompt you to enter the password. After entering the Program Mode password (factory default is **7531**) and pressing **F1**, you can select one of the following menu items:

1 = Assign Pager	**Assigns pager CAP codes**
2= Assign Group	**Assigns pagers to groups**
3= Test Page	**Sends a test page**
4= Alarm Pages	**Configures alarm triggered pages**
5= voice Prompts	**Configures telephone voice prompts (if opt. installed)**
6= PHONE CONNECTION	**Configures call forwarding**
7= Show ERROR LOG	**Show error log**
8= SHOW PAGE LOG	**Configure the radio**
-= RETURN TO PAGE	**Return back to the page mode**

When you enter the Program Mode you will see the first selections. Use the UP/DOWN arrows to scroll through the available options. To exit the Program Mode, press the - (Program) key. Any changes you make will automatically be saved.

Note: When the PAGE CENTER is in the Program Mode, it will revert back to the Page Mode if it is idle (no keyboard inputs) for more than two minutes.

3.1 Assign Pager

All pagers have an ID code, commonly referred to as a *CAP* code. It is a long number, difficult to remember, and may change if a pager is replaced or in for repair. To make paging a pager easy, the PAGE CENTER uses a database stored in its memory to remember every pager's CAP code. Within the PAGE CENTER, every pager is assigned a number. Because pagers don't recognize names, only CAP codes, the PAGE CENTER must translate the pager number into the proper CAP code. The **1 - Assign Pager** menu is used for this function.

Begin by entering the Programming Mode as described above, and pressing the number **1** key. The PAGE CENTER will respond with:

```
Start PG name =
15
```

PAGER NUMBER =
DASH (-) TO EXIT

Enter the number for the pager you wish to add to the database. For example, to add a pager number "15" to the database press **1** then **5** then **F1**. Once a pager name or number is entered, the PAGE CENTER will respond with a prompt asking for the CAP code for this pager. If the pager number was already in the database, it will display the CAP code already programmed. If it was not in the database, the CAP code will default to the pager number. To edit the CAP code, use the DEL key to backspace over it.

After you enter the CAP code for the pager, you must tell the PAGE CENTER just what type of pager is being assigned. The PAGE CENTER will display the default type. Press any of the number keys to cycle

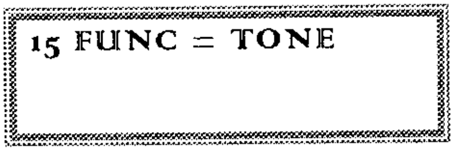
```
15 CAPCode =
15 TYPE = XXXXX
```

through the list of possible pager types.

The possible types are: POCSAG512, POCSAG1200, and POCSAG2400. Press the up/down arrows to cycle through the list of possible choices. The OSMAC system must have all pagers set to 512 baud POCSAG.

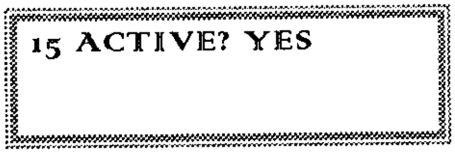
Once the correct paging format type is in the display, press the **F1** key.

After programming the type, you must program in the function type of the pager being used. The function type is either TONE (the pager just beeps), NUMERIC(beeps and displays numbers), ALPHA(beeps and displays numbers and letters), or OSMAC(numeric only).


15 FUNC = TONE

Press any number key on the keypad to cycle through the list of functions. Press the F1 key when the correct function is displayed.

Once the function has been entered, you are prompted to activate the pager. Press **F1** to activate it, or any numeric key to switch between YES and NO on the display. Press **F1** when the correct response has been chosen.


15 ACTIVE? YES

Once the ACTIVE parameter has been programmed, the **PAGE CENTER** will restart back at the **PAGER NUMBER =** prompt. It will automatically increment the name to the next pager number. Press the - to exit the Program Mode when all of the pagers have been entered into the database.

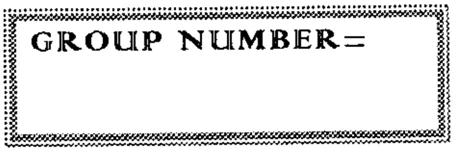
3.2 Assigning a Group

The Group-Page feature is used to send the same page to a number of different pagers. Groups have names just like pagers, and once you define a groups and its members, you send pages to the group just as if it were a single pager. When you assign a name to a group, it is important that the name is not the same as any individual pager.

There is a limit to the number of pagers that may be assigned to any one group. This is listed in the specifications section of the **PAGE CENTER** User Manual.

3.2.1 Entering the Group Assignment Mode

To do the group assignments, select **2-Assign GROUP** from the program mode menu. The display will then show:

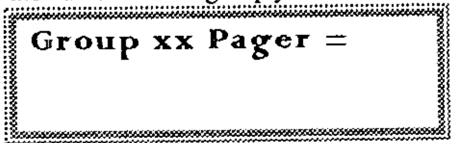

GROUP NUMBER=

GROUP NUMBER =
SELECT GROUP

Enter the number of the group you wish to work on and then press the **F1** key. Valid group numbers are 1 through 16. The display will then show:

GROUP X PAGER NN
SELECT GROUP

Where X is the number of the group you wish to work on and NN is the pager number assigned to this group. Note: when you wish to page this group, you will enter the pager number NN for it, not the group number.



Group xx Pager =

Use the DEL key to backspace over NN if you wish to change the pager number this group is referred to by. Once the pager number is set, press the F1 button.

GROUP X = num
SELECT GROUP FUNC

Using the UP/DOWN arrow buttons, select the function (numeric, alpha, tone) for this pager group. Members of the group may be of any type, but this selection will determine the prompt to the user when a page to this group is initiated. Press F1 when your selection is made. The display will change to :

GROUP X MEMBER NN
ENTER MEMBER NUMBER

X will be the group number you are currently working on, and NN will be a number corresponding to the member number you wish to edit. The first group member you enter will be member 1. The second one you enter will be member 2 and so on. The display always first shows the next member number you can enter a new member as. Use the UP/DOWN arrows if you wish to scroll through the members, or press the DEL key to edit the member number and manually enter the member number to edit. Press F1 key when you are ready to edit/add the selected group member. The display will the show:

MEMBER NN =
ENTER PAGER NUMBER

Now enter the number of the pager you wish to add to the group. For example if you wish to add pager name 123 to the group, then enter **1 2 3** and then press the **F1** key. Use the DEL key to backspace over any entry if you wish to edit it. TO see what pagers are members of this group, you can use the UP/DOWN arrow key to scroll through the members of the group.

To delete a member, at the **MEMBER NN =** prompt, use the DEL key to erase its number from the screen, and press the F1 key.

3.3 Sending a Test Page

The test page mode is used to check the range of the system. When this mode is enacted, the **PAGE CENTER** will automatically generate a page to pager name "0" every thirty seconds. Before using this feature, pager name "0" must be assigned. To enable this feature, enter the program mode, and press **4** and then **F1**. The display will then begin to show TEST PAGE ON. It will stay on until any key on the keypad is pressed. When any key is pressed, the unit will return to the program mode. Press the - key to return to the PAGER NO= prompt.

3.4 Alarm Pages

The PAGE CENTER has 8 alarm inputs. These digital inputs are used to generate pre-programmed pages, each with its own pre-programmed message to any pager, or group of pagers. These may be used for alarms, but they may also be used to simply generate pre-programmed pages.

The inputs should be connected to normally-open switches or contacts. When any input is pulled low to ground, it will generate its pre-programmed page. Note that these inputs are not protected from lighting, so the wires must not be run out of doors. See Section 6.2 for details regarding the wiring of the alarm input connector.

To set up the alarm pages, the user must perform the following steps:

a) Put the unit into the program mode.
b) Press 4 and then **F1** to enter the Alarm sub-menu.
c) When the ALARM NUMBER = prompt is shown, enter the number of the alarm you wish to configure. Then press the **F1** key.
d) The PAGE CENTER will display AlaRM x PAGER on the top line, and the pager number that will be paged when the alarm is triggered. Erasing the pager name disables the alarm. Enter the number of the pager you wish to have paged when the selected alarm input is triggered.
e) PAGE CENTER will display ENTER ALARM MSG on the top line of the LCD. On the second line, you may enter or edit the message to be sent when the alarm is triggered. Press **F1** when the message has been entered.

When entering the alarm message, you may wish to use letters of the alphabet. In this mode, the **F1, F2, F3** and **F4** keys have slightly different meanings. You can use the numeric keys to enter number, and use the **F2** and **F3** keys to scroll through the alphabet to create text. When you have selected a letter that you want, press the **F1** key. Once the message has been entered, press the **F4** key. After the message has been entered, the display will return to the SET ALARM No prompt.

3.5 Accessing the PAGE CENTER via two-way radio.

The PAGE CENTER has a built-in radio transceiver enabling it to receive commands over-the-air to generate pages, connect to the telephone system, dial phone numbers, remote control a relay, and receive telephone calls.

To remotely control the PAGE CENTER with a two-way radio, the two-way radio must be equipped with a DTMF encoder. All commands sent to the PAGE CENTER are entered into the DTMF keypad, and in most cases, the commands are similar to the ones used locally on the PAGE CENTER's built-in keypad. The two-way radio operation of the PAGE CENTER is a standard feature, but it must be enabled before it will work

3.6 Sending Pages from the Two-Way Radio

This section describes how to send a page with the PAGE CENTER using a DTMF keypad-equipped two-way radio. The PAGE CENTER and the two-way radio must have previously been configured to communicate on the same channel, and utilize the same CTCSS tones.

To send a page to a pager from the two-way radio, you must:

a) Type * 9 to alert the PAGE CENTER that you intend to send a page.

b) If desired, optionally listen to the receiver for the "Enter Pager Number" prompt, which is a sequence of three tones. A series of alternating high and low tones indicates an error in the command sequence or a timeout occurred.

c) Enter the digits of the pager number you wish to page. If the pager's number is less than three digits in length, then press the * key to terminate the pager's number. Note that the * key is not used to terminate three digit pager numbers.

d) If desired, optionally listen to the receiver for a low / high tone sequence, which signifies that the pager number was accepted. A series of alternating high and low tones indicates an error in the pager number or a timeout occurred.

e) Enter the numeric digits you wish to send to the pager. Do not enter any digits if you only wish to "beep" the pager. Note that the following DTMF keys which are on many two-way radios with DTMF keyboards have special meanings:

DTMF Key	Pager Character	Comments
*	-	Hyphen character
#	{none}	Send the page
A		Space character
B	]	Right bracket
C	[	Left bracket
D	U	Urgency indicator

f) Press the # key to send the page.

3.7 Placing Telephone Calls with the Two-Way Radio

Two-way radios can place telephone calls through the **PAGE CENTER** to a telephone line connected to the rear of the **PAGE CENTER**. The PageCenter also has 10 "auto-dial" telephone numbers which can be automatically dialed. See the **PAGE CENTER** Configuration section for information on how to program these numbers.

The **PAGE CENTER** operates in a simplex mode. In other words, it can only receive or transmit at any one time, and not both simultaneously. If it is transmitting, it cannot receive, and when it is receiving, it is never transmitting. Because of this, there are a number of things to keep in mind when making or receiving a telephone call through the **PAGE CENTER**. One is that the two-way radio user will hear an occasional ticking sound. This is the **PAGE CENTER** verifying that two-way radio is not transmitting. The other is that users must learn to wait about a second before talking whenever the **PAGE CENTER** switches between transmit and receive modes.

The **PAGE CENTER** uses a Voice Operated Switch (VOX) circuit on the telephone line. VOX circuits switch the **PAGE CENTER** from transmit mode to receive mode when it detects that the audio coming in from the telephone line has stopped.

3.7.1 To place a telephone call:

a) Press the * 7 keys on the two-way radio's DTMF keypad. This tells the **PAGE CENTER** that you wish to place a telephone call.

b) Listen for the confirmation beeps to come back from the **PAGE CENTER**.

c) Begin dialing the telephone number you wish to call. At the end of the telephone number, you may enter a * to dial the phone number. Alternatively, the phone number will be dialed if no keys are pressed after a few seconds. The DTMF tones being sent to the phone line will be heard to confirm dialing.

d) Once the called party answers, the phone VOX circuit takes over. When the called party speaks, the PAGE CENTER transmits his or her voice.

e) A periodic ticking sound will be heard by the mobile user as the PAGE CENTER briefly switches to receive mode to determine whether the mobile user wishes to interrupt the conversation and has begun transmitting.

f) If neither party is talking, a single beep will be heard periodically to remind the mobile user that the phone patch is still in operation.

g) A timeout timer exists in order to shut down the phone patch automatically in the event that the mobile user goes out of range or has a battery outage. Warning tones will be sent a few seconds before the timeout timer expires and the phone call is terminated. The mobile user must press * to reset the timeout timer and continue the phone call.

h) End the conversation from the two-way radio by pressing the # key. A high, then low tone sequence should be heard to confirm the disconnect.

3.7.2 To place an Auto-Dialed call

a) Press the * 6 keys on the two-way radio's DTMF keypad. This tells the PAGE CENTER that you wish to make a telephone call to a pre-programmed phone number. Optionally press an auto-dial number between 0 and 9 . If no auto-dial number is given, then 0 is assumed.

b) Once the called party answers, the phone VOX circuit takes over. When the called party speaks, the PAGE CENTER transmits his or her voice.

c) A periodic ticking sound will be heard by the mobile user as the PAGE CENTER briefly switches to receive mode to determine whether the mobile user wishes to interrupt the conversation and has begun transmitting.

d) If neither party is talking, a single beep will be heard periodically to remind the mobile user that the phone patch is still in operation.

e) A timeout timer exists in order to shut down the phone patch automatically in the event that the mobile user goes out of range or has a battery outage. Warning tones will be sent a few seconds before the timeout timer expires and the phone call is terminated. The mobile user must press * to reset the timeout timer and continue the phone call.

f) End the conversation from the two-way radio by pressing the # key. A high, then low tone sequence should be heard to confirm the disconnect.

3.7.3 Executing a Flash-hook command (FUTURE FEATURE)

In many system, it is necessary to execute a "flash-hook" This is a short (100mS) temporary disconnect from the telephone circuit. To do this while making a telephone call, press the *# sequence on the radio's DTMF keypad.

3.8 Receiving Telephone Calls at the Two-Way radio

The PAGE CENTER can be used to route telephone calls from the telephone line to a portable radio, or it can use the telephone line to initiate pages.

To initiate a phone call from the telephone interface, you must:

a) Dial the phone number of the telephone line connected to the PAGE CENTER.

b) It will answer the phone and send an "Enter Pager Number" prompt, which is a sequence of three tones.

c) Enter * 5 to request a phone call.

d) When Call-Forwarding is enabled and the telephone line rings, the PAGE CENTER will transmit a simulated ring signal over the air. To answer the call, a mobile user must press the * key to take the telephone line off-hook.

e) Once the called party answers, the phone VOX circuit takes over. When the phone user speaks, the PAGE CENTER transmits his or her voice.

f) A periodic ticking sound will be heard by the mobile user as the PAGE CENTER briefly switches to receive mode to determine whether the mobile user wishes to interrupt the conversation and has begun transmitting.

g) If neither party is talking, a single beep will be heard periodically to remind the mobile user that the phone patch is still in operation.

h) A timeout timer exists in order to shut down the phone patch automatically in the event that the mobile user goes out of range or has a battery outage. Warning tones will be sent a few seconds before the timeout timer expires and the phone call is terminated. The mobile user must press * to reset the timeout timer and continue the phone call.

i) End the conversation from the two-way radio by pressing the # key. A high, then low tone sequence should be heard to confirm the disconnect.

3.9 Sending Pages using the Telephone Interface

This section describes how to send a page with the PAGE CENTER using a DTMF keypad-equipped telephone. Note that only pagers with numeric names may be paged via the telephone. Furthermore, note that the phone will not be answered until any "radio paging" command sequence in progress is completed.

To send a page to a pager from the telephone interface, you must:

a) Dial the phone number of the telephone line connected to the PAGE CENTER.

b) It will answer the phone and send an "Enter Pager Number" prompt, which is a sequence of three tones.

c) Enter the digits of the pager number you wish to page. If the pager's number is less than three digits in length, then press the * key to terminate the pager's number. Note that the * key is not used to terminate three digit pager numbers.

d) If desired, optionally pause sending tones and listen for a low / high tone sequence, which signifies that the pager number was accepted. A series of alternating high and low tones indicates an error in the pager number or a timeout occurred.

e) Enter the numeric digits you wish to send to the pager. Do not enter any digits if you only wish to "beep" the pager.

f) Press the # key to send the page. You will hear a series of tones increasing in pitch to indicate that the page was sent.

g) After a short delay, the "Enter Pager Number" prompt will be given again. You may send another page if desired by following the above sequence again.

h) If the caller hesitates sending DTMF tones for a number of seconds, a series of alternating high and low tones will be sent, indicating that a timeout occurred. The PAGE CENTER will then hang-up the phone line.

4 PAGE CENTER Configuration

The following table lists the configuration parameters and menus within the PAGE CENTER unit that the user may wish to modify. They are stored in non-volatile memory, and will not need to be reconfigured during the life of the product. These parameters will normally be configured by the service shop before installation of the product.

PAGE CENTER Command Structure

System Configuration

```
PASSWORD = Contact Factory
1 TRANSCEIVER
  1 TX TYPE
    1 - UHF
    2 - VHF
    3 - 260 Mhz
*  2 SPEAKER ENABLE
       YES
       NO
*  3 TWOWAY HOLD TIME
     TWOWAY HOLD =
*  4 SELECT CHANNEL
*  5 MONITOR ENABLE
*  6 INVERT DATA
       YES
       NO
*  7 BUSY CH LOCKOUT
     BUSY CHANNEL
       LOCKOUT
       UNLOCKED
   8 TX SETUP
     1 TX FREQUENCY
       FREQUENCY
     2 TX SIGNALING
       1 (CARRIER ONLY)
       2 CTCSS
       - EXIT
     3 TX BANDWIDTH
       SELECT BANDWIDTH
         NARROW BAND
         WIDE BAND
   9 RX SETUP
     1 RX FREQUENCY
       FREQUENCY
     2 RX SIGNALING
       1 (CARRIER ONLY)
       2 CTCSS
       - EXIT
 2 INTERCONNECT
*  1 TWOWAY TIME
*  2 VOX DURATION
*3 REMOTE
   REMOTE PAGE ENABLE
     REMOTE ENABLE
     REMOTE DISABLE
*4 PAGER CONFIGURATION
   ENTER FAMILY CODE
9 SERIAL PORT
*  1 SERIAL DATA BITS
     SELECT DATA BITS
       7 DATA BITS
       8 DATA BITS
   2 SERIAL PORT RATE
     1 - 300 BAUD
     2 - 600 BAUD
     3 - 1200 BAUD
     4 - 2400 BAUD
     5 - 4800 BAUD
    6 - 9600 BAUD
    7 - 19200 BAUD
    - RETURN TO MAIN
* 3 SERIAL STOP BITS
    SELECT STOP BITS
      1 STOP BIT
      2 STOP BITS
* 4 SERIAL PARITY
    SELECT PARITY
      EVEN PARITY
      ODD PARITY
      NO PARITY
* 5 FLOW CONTROL
    SELECT FLOW CONTROL
      XON/XOF ENABLED
      XON/XOF DISABLED
* 6 TAP ACCESS TIME
* 7 TAP IDLE TIME
  8 SERIAL PROTOCOL
    1 TAP
    2 COMP1
    3 COMP2
```

Built-in self tests (key 2 held down during power up)

```
DIAGNOSTICS TESTS
1 - PAGER BIT TEST
  PAGE BITS OUT TEST
    2400 BAUD
    1200 BAUD
    512 BAUD
    - EXIT

2 - AUDIO TESTS
  RUNNING AUDIO TEST
    1 - RX TO SPEAKER
    2 - MIC TO TXMTR
    3 - DISCONNECT

3 - DTMF TESTS
5 - LCD TESTS
6 - KEYPAD TESTS
  TESTING KEYPAD
7 - ALARM INPUTS
  ALARMS XXXXXXXX
  - EXIT
8 - FIRMWARE VER
  REV 307A3   OK
  - EXIT
```

Power up FLASH memory clear (key 8 held down during power up)

```
RESET FLASH?
PASSWORD = 42983
RESET FLASH?
ARE YOU SURE?
  NO
  YES
```

Program Mode and pager database management

```
  password = 7531
1 = ASSIGN PAGER
  PAGER NAME =
  DASH (-) TO EXIT

  CAPCODE =
  TYPE =
    POCSAG512
    POCSAG1200
```

POCSAG2400
FUNC =
TONE
NUM
ALPHA
ACTIVE?
SAVE CHANGES?

2 = ASSIGN GROUP
GROUP NUMBER =
SELECT GROUP
GROUP PAGER =
ASSIGN PAGER NUMBER
GROUP FUNC =
ADD NEW MEMBER?
SELECT GROUP FUNC
GROUP MEM =
ENTER PAGER NUMBER

3 = TEST PAGE
TEST PAGE ON
DASH (-) TO EXIT

4 = ALARM PAGES
SET ALARM NUMBER
ALARM PAGER
ENTER ALPHA MESSAGE
ENTER ALARM MESSAGE

*5 = VOICE PROMPTS
VOICE PROMPTS?

*6 = CALL FORWARD
CALL FORWARD?

7 = SHOW ERROR LOG
ERROR LOG DISPLAY
TOTAL ERRORS
CLEAR ERROR LOG?

8 = SHOW PAGE LOG
PAGE LOG STOPPED
1 - SHOW PAGE LOG
2 - START PAGE LOG
3 - STOP PAGE LOG
NO PAGE LOG DATA

The system configuration mode is entered by holding the 1 key down when the power is turned on. If password is enabled, then the **PAGE CENTER** will prompt the user for a password before entering the programming mode.

Press the arrow keys to cycle through the configuration parameters. The Menu number in the table above lists the location within the **PAGE CENTER** Programming menus that the particular parameters may be found.

To change any of the parameters that require a numeric entry, press the number key to enter the value and then press the **Enter** key. In the case of values that will scroll, press any number key to scroll through the available selections.

To exit the configuration mode, press the - key. Note that values are not permanently stored until the mode is exited by pressing the -. If the unit is turned off, or power is lost before the - is entered, changes to the configuration and to the database of pagers may not be saved.

5 PAGE CENTER Serial Port Protocols

The PAGE CENTER paging transmitter supports three different serial port communication protocols. Each protocol has its own uses, and the correct one for one application, may not be the correct one for another. The PAGE CENTER must be configured to support the desired protocol, and only one protocol may be used at a time. The three protocols supported are:

TAP (also called IXO)	The Telocator Access Protocol is an industry standard protocol for communications between paging entry devices and a paging terminal. Individual pagers can be sent individual messages.
COMP1	This protocol is a simple way to send data to one pager. It is designed to allow a person with a simple computer terminal to type a message into the PAGE CENTER. The PAGE CENTER must be pre-configured with the CAPCODE of the pager to send the data to, and all data sent into the serial port of the PAGE CENTER will be sent to that one pager.
COMP2	COMP2 is similar to COMP1, except each page requires two lines of text to be entered. The first line is the pager number to send the page to, and the second line is the alpha or numeric message to send to that pager.

5.1 TAP

The Telocator Alphanumeric Protocol, or TAP protocol as it is called, is used to send pages to communicate paging information to a transmitter. It is a sequence of characters sent over a serial interface to a transmitter. The transmitter must parse the commands, and take the appropriate actions.

The following sections describe how the TAP protocol works. It assumes that the device communicating to the PAGE CENTER Station is directly connected to it via a serial cable. If other means are used (i.e. modem) them the modem connection must first be established. For the purposes of this manual, the PAGE CENTER is assumed to be the transmitter, and the device connected to its serial port is the "Entry Device". Typical entry devices are computers, paging terminals, and alarm monitors. Characters listed in brackets <xx> are ASCII codes, and the values for them are listed at the end of this document.

Initiating a Page

Entry Device	PAGE CENTER *Action*	*Comment*
<CR>		The Entry Device should send a <CR> at two second intervals until the PAGE CENTER responds with the characters ID=. The <CR> is an ASCII code 13h.
	ID=<CR><LF>	The PAGE CENTER will respond within one second of the <CR>, and it does not end the ID= prompt with a <CR> or a <LF>.

After initating a page, and receiving the ID= prompt, the Entry Device can respond in one of two different ways. One way puts the PAGE CENTER into an Automatic Mode, and the other ways puts it into a Manual Mode.

Automatic Entry of a Page

Entry Device	PAGE CENTER *Action*	*Comment*
<ESC>PG1<CR>		The Entry Device tells the PAGE CENTER transmitter that it wants to automatically send a POCSAG page, by ending this sequence.
	<ACK><CR> or **NAK><CR>** or **<ESC><EOT><CR>**	The PAGE CENTER will respond within one second of the ACK sequence signifying that the Entry Device has successfully logged on to the PAGE CENTER. If for some reason, paging entries cannot be accepted, it will respond with the NAK sequence of the ETX sequence, which shouldl force the Entry Device to disconnect.
	<ESC> [p <CR>	This "go ahead" sequence tells the Entry Device that it is OK to go ahead and send over the information for the first page or pages. The p is always the lower case "p".
<STX> **PagerID<CR>** **Message<CR>** **<ETX>** **Checksum <CR>**		This Pager/Message Sequence Block tells the PAGE CENTER the ID (the Pager Name in the PAGE CENTER's database) of the pager this the Message is to be sent to. The checksum is computes as shown later in this document. The total number of characters sent from the Entry Device per sequence should not exceed 255.
	<CR><ACK><CR> or **<Message><CR><NAK><CR>** or **<Message><CR><RS><CR>**	The PAGE CENTER sends the ACK sequence if the page is accepted. It sends the NAK if the checksum was bad, and it wants the Entry Device to re-enter the page. It sends the RS sequence if the page is rejected (probably due to PagerID no in the PAGE CENTER's database.)
Repeat the above Pager/Message Sequence Block as many times as required, if more pages are to be sent.		
<EOT> <CR>		When the Entry Device does not want to send any more pages, it sends this EOT sequence, to tell the PAGE CENTER that it is finished with this automatic session.
	Pages Accepted <CR> **or** **Invalid Page Entered<CR>** **or** **<Message><CR>**	One of these status messages will be returned at the end of the session. They are for information purposes only.
	<CR><RS><CR>	This is only sent if there was an error in this session, probably due to an invalid pager ID or a message type mismatch.
	PAGING SERVICES DISCONNECT <CR> <ESC> <EOT>	The End of Transaction message sent from the PAGE CENTER to the entry device, telling it to disconnect.

Manual Entry of a Page

Entry Device	PAGE CENTER Action	Comment
M<CR>		The Entry Device tells the PAGE CENTER transmitter that it wants to manually send a POCSAG page, by ending the M.
	ENTER PAGER NUMBER:	The PAGE CENTER will respond within one second of the M sequence signifying that the Entry Device has successfully logged on to the PAGE CENTER, and it is ready to receive paging info. The PAGE CENTER begins by responding with this prompt.
PagerID<CR>		The user responds with the ID of the pager he wishes to page.
	Enter Alpha Message: **or** **Enter Numeric Message:**	The PAGE CENTER responds with one of the following messages, depending upon the type of pager that the PagerID is assigned to.
Message<CR>		The user enters a message to send to the pager.
	Sending Message...<CR>	The PAGE CENTER displays this message as it sends the message to the pager.
	MessageSent<CR> **or** **Can't Deliver to xxxxxxx<CR>** **or** **Too Slow. Goodby.<CR>** **or** **Two many errors. Goodby. <CR>**	One of these messages will then be sent from the PAGE CENTER, depending upon the current situation with the page that was entered. The serial port has a 45 second activity time, and will force and end to the manual session if the user does not complete the page in that time.

5.2 TAP Protocol Issues

5.2.1 Timing

The PAGE CENTER will only wait for 15 seconds for a response to come back from the Entry Device. If a response is not received before the time-out period, the PAGE CENTER will cancel the current transaction, sending the **<ESC> <EOT> <CR>** sequence.

5.2.2 Line Feeds

The PAGE CENTER will ignore all <LF> characters it receives. The Entry Device may send a <LF> with any <CR>.

XOFF

In the very unlikely event that the user enters more pages than the PAGE CENTER can queue up, the PAGE CENTER will send the <XOFF> character before sending a carriage return. It will send the <XON> character when buffer space is available for more pages. If the PAGE CENTER does not receive data within 10 seconds after sending an <XON>, it will send another <XON>.

5.2.3 EOT

Whenever the PAGE CENTER terminates a session by sending the <EOT><CR> sequence, it will drop the DTR signal on the RS-232 signal for 250mS. This will normally cause any modem connected to it to disconnect.

5.3 Sending Multiple-Line Pages

If you wish a message to continue on another line of a multi-line pager, you cannot send the <CR> return into the serial port. Use the TAB character instead of a <CR>. The PAGE CENTER will translate it to a <CR> when it sends the page to the pager.

5.4 Computing the Checksum

The checksum is a simple arithmetic sum of the 7-bit values of all characters preceding it. The checksum reported is the least significant 12 bits of this summation, converted to BCD ASCII.

Checksum Example:

STX	000	0010
1	011	0001
2	011	0010
3	011	0011
<0CR>	000	1101
A	100	0001
B	100	0010
C	100	0011
<CR>	000	1101
ETX	000	0011
Total	10111	1011
Convert to BCD	1 0111	1011
Answer in BCD ASCII	1 7	;

5.5 COMP1

COMP1 allows a "dumb terminal" to be used to send a page, although any device that can output RS-232 data can be used.

All data entering the serial port is sent to a pre-set pager. The reception of a <CR> initiates the page.

Manual Entry of a Page

Entry Device	PAGE CENTER *Action*	*Comment*
<Message><CR>		The Entry Device (in this case it is often a user on a terminal) type in the message to send to a pre-set pager.
	Characters are echoed back.	

5.6 COMP2

COMP2 allows a "dumb terminal" to be used to send a page, although any device that can output RS-232 data can be used. It has the added capability of selecting which pager to send the data to.

All data entering the serial port is sent to a pre-set pager. The reception of a <CR> initiates the page. If the last <CR> is not sent within 15 seconds, the PAGE CENTER will abort this transaction, and begin waiting for a new <Page #> entry.

Manual Entry of a Page

Entry Device	PAGE CENTER *Action*	*Comment*
<Page #><CR> **<Message><CR>**		The Entry Device (in this case it is often a user on a terminal) type in the message to send to a pre-set pager.
	Characters are echoed back.	

5.7 ASCII control characters

For your reference, here is a list of the commonly used ASCII characters.

Decimal	**Hex**	**Code**		**Decimal**	**Hex**	**Code**
00	00	<NUL>		16	10	<DLE>
01	01	<SOH>		17	11	<XON>
02	02	<STX>		18	12	<DC2>
03	03	<ETX>		19	13	<XOFF
04	04	<EOT>		20	14	<DC4>
05	05	<ENQ>		21	15	<NAK>
06	06	<ACK>		22	16	<SYN>
07	07	<BEL>		23	17	<ETB>
08	08	<BS>		24	18	<CAN>
09	09	<TAB>		25	19	<EM>
10	0A	<LF>		26	1A	<SUB>
11	0B	<VT>		27	1B	<ESC>
12	0C	<FF>		28	1C	<FS>
13	0D	<CR>		29	1D	<GS>
14	0E	<SO>		30	1E	<RS>
15	0F	<SI>		31	1F	<US>

6 External Connectors

6.1 External Transceiver

The PAGE CENTER may utilize an internal transceiver, or an external transmitter, or transceiver. A 15pin D-sub connector is located on the rear of the PAGE CENTER to facilitate interfacing and external transmitter or external transceiver to the PAGE CENTER. The pin-out of this connector is as follows:

External Transceiver I/O Connector Pin Out

Pin Number	*Function*
1	Ground
2	B+ for radio. Internally jumper selectable between +8V and +12V. 1A maximum current draw.
3	+8V TX. This pin floats when in the RX mode, and will be pulled to +8V when in the TX mode. 50mA maximum current source.
4	+5V for radio. 50mA maximum current draw.
5	+5VRX. This pin floats in the TX mode, and will have +5V when in the RX mode. 50mA maximum current source.
6	TX audio. Approximately 1V p-p for full system deviation. 2.5V DC bias on this signal.
7	Do not use and do not connect to anything.
8	Do not use and do not connect to anything.
9	Do not use and do not connect to anything.
10	Do not use and do not connect to anything.
11	TX data out. This is the TTL POCSAG data output in the transmit mode.
12	Receiver signal strength indication input. Positive voltage represents carrier present on channel.
13	RX audio input. 200mV p-p for a signal with full system deviation.
14	CTCSS tone encoder output.
15	Do not use and do not connect to anything.

6.2 Auxiliary/Alarm Connector

A 15p D-Sub female connector is located on the rear of the unit. This connector has digital inputs used for triggering alarms. It also has contacts for two relay outputs. The digital inputs may be programmed to automatically generate a page or dial the phone. The relay outputs may be switched on remotely via the telephone, radio, or console.

Note, all digital inputs/alarms have an internal 10K pull-up resistor on them. They are activated by pulling their inputs to ground. Open circuit or a TTL/CMOS high level is the inactive state. Do not pull these input above 5V.

Auxiliary/Alarm I/O Connector Pin Out

Pin Number	*Function*
1	Alarm 8
2	Alarm 7
3	Alarm 6
4	Alarm 5
5	Alarm 4
6	Alarm 3
7	Alarm 2
8	Alarm 1
9	Relay 1 contact A
10	Relay 2 contact A
11	Relay 2 contact B
12	Relay 1 contact B
13	
14	
15	Ground

7 Test Functions

7.1 *Built-in Test Functions*

If the 2 button is held down upon power up, the PageCenter goes into a test mode which allows the operator to exercise many of the PageCenter's hardware functions. Connections to the phone line, radio, speaker and microphone may be independently toggled for any desired test configuration.

The Functions that are available are:

F1 - Toggle the connection to the phone line between On and Off

F2 - Toggle the radio connection between Off, Receive and Transmit modes

F3 - Connect the microphone to the transmitter and key the transmitter

F4 - Toggle the unit's speaker between On and Off

1 – Pager Bit Test (sends alternating 1010 pattern at a specific baud rate)
    1- 512 baud
    2- 1200 baud
    3 – 2400 baud

2 – Audio Tests
    1 – RX to speaker
    2 – Microphone to transmitter
    3 – disconnect all audio connections

3 – DTMF tests
    – Press one of the 16 lower buttons to generate DTMF tones in "encode" modes
    – Press the "down arrow" key to exit the DTMF test mode
    – Press the "up arrow" key to toggle between the following test modes:
        - Encode DTMF continuously
        - Decode DTMF from the radio or phone line, depending on which was enabled last
        - Encode DTMF in 50 mS beeps
        - Encode only the low tone continuously
        - Encode only the high tone continuously

5 – LCD display tests
    – Press the - button to sequence between the tests

6 – Keypad test
    – Press the - button twice to exit this test mode

7 – Alarm inputs (displays the status of the alarm input)

7.2 *Remote test functions*

Test functions may also be initiated remotely via a two-way radio which is equipped with a 16 tone DTMF keyboard.

Key Sequence	Function
* A	Send an "A" DTMF tone to the radio and the phone line continuously for a period of time.
* B	Send all 16 DTMF tones plus all 8 single tones to the radio and the phone line.

8 Specifications

Encoder/Terminal general

Frequencies	450-470MHz, 403-512MHz*
Paging Format	POCSAG(tone, numeric, and alpha at 512,1200 or 2400bps)
Squelch formats	CTCSS or carrier squelch
Serial port protocols	TAP, COMP2, COMP1
Pager database maximum size	4096 individual pagers
Maximum page length	250 characters
Maximum pre-programmed alarm message	128 characters
Maximum number of pager groups	16
Maximum number of pagers per group	128
LCD display size	20 characters X 2 lines
Maximum message length	200 characters
Speaker audio (2-way version only)	1 watt maximum at <5% THD
Power supply	External 12-15V DC, 2A, DIN connector.
Weight	3.5lbs.
Temperature range	-10-+40C
Processor	80386EX
Non-volatile flash memory size	2M bytes
External keyboard interface	Standard PS/2
Telephone interface	RJ-11 female, DTMF signaling
Alarm/data inputs	8

RF Section

RX channel spacing	12.5kHz (narrowband) or 25kHz (wideband) models available
Frequency Stability	2.5ppm (12.5kHz BW version) 5ppm (25kHz version)
RX Sensitivity	.0.5uV for 12dB SINAD 0.35uV for 12.5kHz version)
RX Modulation acceptance	±2.5kHz for 12.5kHz versions ±5kHz for 25kHz version
RX Intermodulation	55dB
RX Image and 1/2 if rejection	55dB
RX Selectivity	55dB (25kHz version) 55dB (12.5kHz version)
TX power output	2 or 4 watts. Selected via internal jumper.
Modulation limit	±4.5kHz or ±2.25kHz, programmable by channel.
FM hum and noise	38dB or better
Spurious emissions	-52dBc
Emission Designators	16K0F1D, 11K0F1D, 16K0F3E, 11K0F3E

The above specifications are preliminary product specifications, and are subject to change, without notice.

Ordering

6A373	-⇓	-⇓	PAGE CENTER Communication system
			Built-in Transceiver
		N	Narrow band transceiver (12.5kHz)
		W	Wide-band transceiver (25kHz)
	VA		VHF band, 136-150MHz*
	VB		VHF band, 150-174MHz
	VC		VHF band, 220-240MHz*
	VD		VHF band, 260-280MHz*
	UA		UHF band, 403-416MHz*
	UC		UHF band, 450-470MHz
	UD		UHF band, 470-480MHz*
	E		Encode only, no transceiver

* (For export only, not FCC approved)

For example, a VHF wide-band PAGE CENTER in the 150-174MHz band is part number 6A373-VB-W.

9 Alignment

9.1 Adjustments

The following table lists the internal adjustments.

Reference Designator	Function
R9	Squelch/carrier detect threshold level. Set so that busy LED comes on at 12dB SINAD point.
R20	Receive audio level.
R16	RX audio bias. Adjust it for a 2.5V DC reading at TP8.
R32	CTCSS encode level. Adjust for 10% of full-system deviation w/CTCSS encoder on.
R34	Paging data level. Adjust for 90% full system deviation w/POCSAG data being transmitted.
R41	Voice limiter. Adjust for 95% full system deviation with loud audio into the mic.
R60	Mic gain. Adjust for proper mic audio level.
R52	Telco audio to transmitter level. Adjust for proper voice deviaiton of the transmitter with signal from the telco interface.
R69	Telco line driver level. Adjust for proper level to the telco from the received audio.

9.2 Test Procedure

9.2.1 Radio Interface

This procedure assumes a properly tuned transceiver is installed in the unit. You will need a DC power source, service monitor, oscilloscope, and DVM. Full System Deviation =5.0kHz for wide-band versions, and FSD=2.5kHz for narrow-band versions. Depending upon the type bandwidth of the transceiver used, you will have to make slightly different adjustments.

1. Apply DC power to the unit. Connect the service monitor to the ANT port.
2. Program the unit's transmit and receive frequencies. Disable sub-audible signaling. Set the TX bandwidth to "wide band".
3. Generate an RF carrier on the receive frequency, 1kHz tone, 60% FSD. RF level 10uV.
4. Adjust R16 for a 1.5V p-p (530mV RMS) signal on TP8.
5. Adjust the RF generator to .35uV. Adjust R9 so that the carrier detect LED is on, and so that it goes off when the RF level is below .25uV.
6. Set the speaker volume level to normal level (about 25% full volume).
7. Key the transmitter using the F3 key.
8. Speak into the mic and adjust R41 (limiter) for 4.5kHz deviation and R60 (mic gain) for good audio level when speaking into the mic.
9. Generate a 600Hz square wave to the transmitter using Test Function 4. Adjust R34 for 4.0kHz deviation.
10. Unkey the unit.
11. Enable a 100Hz CTCSS encoder on the transmit frequency.
12. Key the transmitter with the F3 key. Adjust R32 for +/-500Hz deviation of the CTCSS tone.

9.2.2 Telco Interface

1. Generate an RF carrier on the receive frequency, 1kHz tone, 60% FSD. RF level 10uV.
2. Connect the TELCO line to the RX audio. (hold the 2 button down on power up to bring-up the audio-path functions)
3. Adjust R69 (telco line level) for a level of –9dBm on the line.
4. Disable the RX audio. And generate a DTMF tone from the PageCenter.
5. Verify that the line level is between –15 and -12dBm.
6. Generate a –9dBm 1000Hz tone onto the TELCO line from an external test instrument.
7. Using the internal audio-path connect routines, connect the TELCO to the transmitter.
8. Measure the p-p waveform at TP10 on an oscilloscope. Adjust R52 so that the 1000Hz sine wave is just below the clipping level.

9.2.3 Final Test

Once the unit is assembled and ready to ship, the following checks should be performed.

1. Program any customer-specific frequencies and databases into the unit.
2. Verify the LCD and keypad are working properly with Test Function 5 and 6.
3. Verify the backlight on the LCD is on.
4. Verify the TX LED works when pressing F3.
5. Verify the busy LED comes on when a carrier is on the channel.
6. Key the transmitter with the F3 key, speak into the mic and verify the audio level is set correctly.
7. Verify that PORT1 and PORT can be used to send a page in the TAP manual mode.
8. Verify all 8 alarm inputs work using Test Function 7.
9. Verify that the Wide/narrow setting in the TX Setup menu is set to match the type of radio that is installed in the unit.
10. Verify that a voice telephone call can be made from a two-way radio.
11. Send a numeric page from the keypad to a pager and verify that it is received and properly decoded by a pager.

10 Firmware Updating

The firmware in the PageCenter may be updated via the serial port number 1 (lower of the two serial ports).

You may need to reload the database of pagers if you load new firmware into the unit.

Connect a computer's serial port to the PageCenter, and on the computer, run a terminal emulation program such as Hyperterminal or ProCommm. Set the baud rate to 38.4kbps, 8 data bits, 1 stop bits, no parity.

When powering up the PageCenter, hold the "-" button down. You should see a sig