Section

1

3800 Information

1.1 General Description

The EF Johnson Technologies 3800 Series Digital Repeaters are designed specifically for radio trunking operations. The 3800 integrates the functions of radio repeater and trunking channel controller into one unit. See Figure 1.1.

Figure 1.1 3800 Series Digital Repeater

The radio component provides a transmitter and receiver with software programmable frequency and power selection. Transmitter and receiver signals are encoded and sampled by dual Digital Signal Processors DSP).

Channel controllers in each repeater manage the control and traffic channels for frequency assignments and transmitter power level. The local site controller is integrated into one of the repeaters. The Trunked IP25 System supports the ability to have backup site controllers, but only one site controller is required per site.

Multiple repeaters may be used per site to accommodate multiple frequencies, traffic level, and provide radio channel backup. One repeater is required for a control channel and one or more repeaters for traffic channels.

A built-in ethernet interface lets the repeater communicate over the Trunked IP25 System IP network to other system components.

1.1.1 Models & Features

The 3800 Series Repeater consists of various models and features. Please refer to the 3800 Digital Repeater Service Manual for descriptions of the different models, identification and part number information.

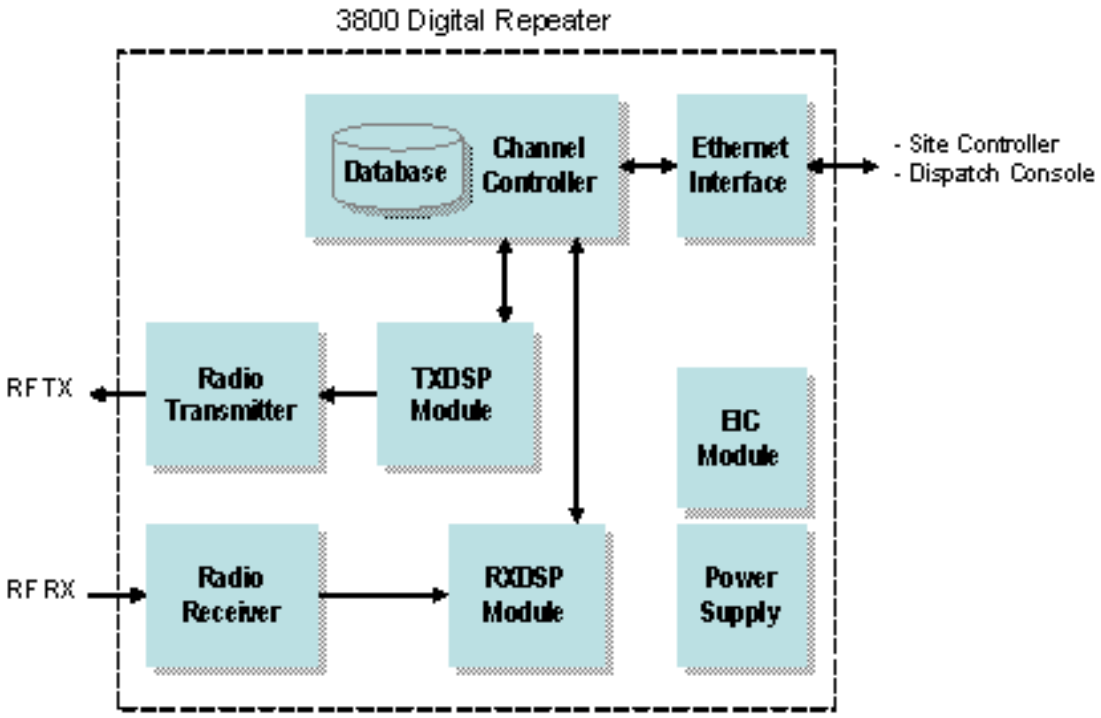
1.2 Functional Description

The EF Johnson Technologies 3800 Series Digital Repeater is a trunked repeater with built-in trunking control. The Trunked IP25 System Channel Controller function is integrated into the repeater subsystem.

The 3800 Repeater uses frequency synthesizer and Digital Signal Processor (DSP) technologies to provide digital control of the radio channels. Software defined configurations allow for quick updates and programmable operating frequency, output power, and other key functions.

Multiple repeaters may be used per site to accommodate multiple frequency bands and provide radio backup. The 3800 is comprised of the following functional modules
(Figure 1.2):

Figure 1.2 3800 Repeater Subsystem Functional Diagram



Channel Controller

All channels are managed by the integrated Channel Controller. The controller provides overall channel control for control and traffic channels in a repeater. It manages the radio transmitter and receiver frequency assignments and power levels. The Channel Controller checks channel status and reports any

channel failures or processing errors to the Site Controller. One Channel Controller is used for each radio repeater subsystem (in multiple repeater systems).

TXDSP Module

The TXDSP module manages the repeater radio transmitter interface. This module provides channel encoding with forward error detection and correction coding. It receives data packets from the channel controller and creates a signal for the transmitter.

Radio Transmitter

The Radio Transmitter is digital synthesizer based to ensure on-frequency and high stability operation. It converts the processed signal from the TXDSP module into a radio frequency (RF) signal for transmission.

Radio Receiver

The Radio Receiver is digital synthesizer based to ensure on-frequency and high stability operation. It receives and converts the radio frequency signals for processing by the RXDSP module.

RXDSP Module

The RXDSP module manages the repeater radio receiver interface. It processes the received signal samples from the radio receiver into data packets. The module then sends the data packets to the Channel Controller.

Ethernet Interface

The repeater communicates over its Ethernet interface with the Site Controller, Dispatch Console, and Network Management System (NMS).

EIC Module

The EIC module provides a user interface to the repeater including a 2-line display and push button rotary knob for menu navigation.

Power Supply

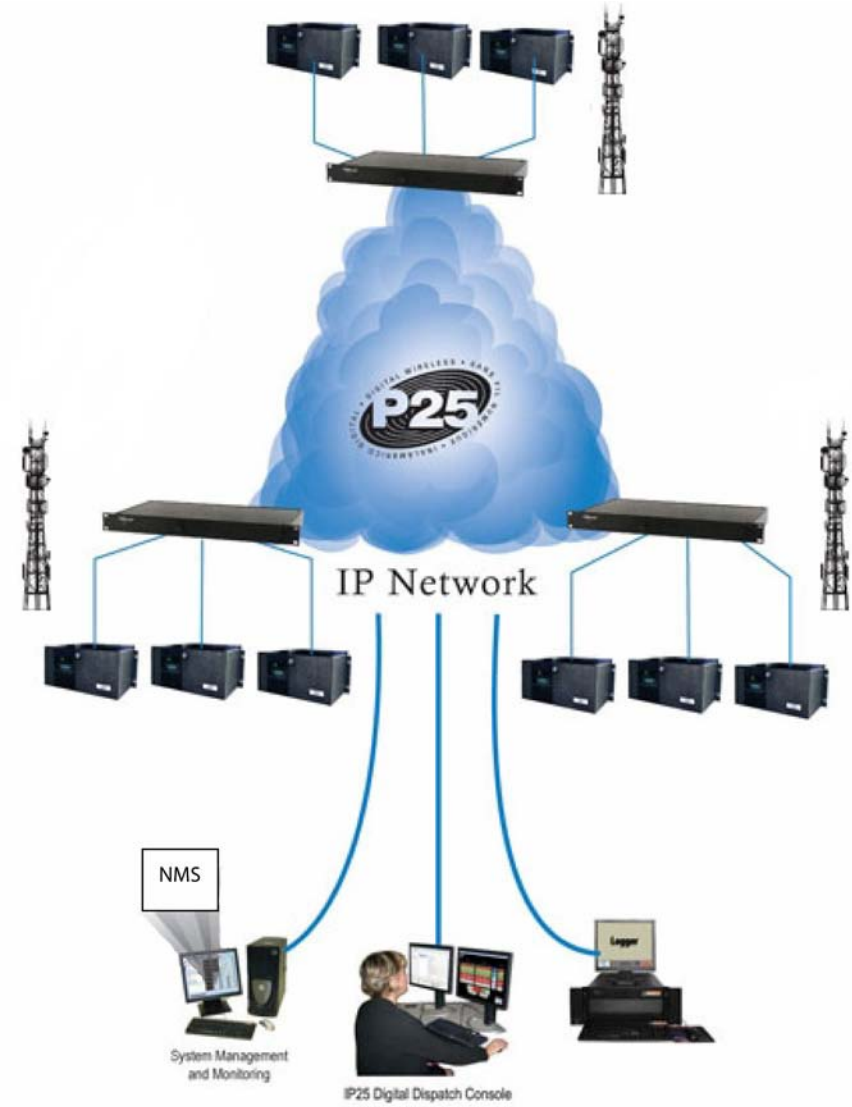
The power supply accepts the AC line power input and converts it into the various DC power requirements of the repeater.

1.3 System Configuration

The 3800 Repeater is typically used as the repeater component in an EF Johnson Technologies Trunked IP25™ System. This is an Internet Protocol (IP) Local Area Network (LAN) based radio system. Using a IP network configuration lets a system administrator manage the radios and system components exactly as if they were computers on a LAN. See Figure 1.3.

Configuration of 3800 repeaters is performed through the Network Management System (NMS). Refer to Section 3.3, “Trunked System Operation”in this manual for system operating information.

Figure 1.3 Trunked IP25 System



1.4 Safety Information

⚠ CAUTION *This repeater emits radio frequency (RF) energy when transmitting. Make sure to observe all RF energy exposure standards when installing, testing, repairing, and operating this radio equipment.*

The FCC has adopted a safety standard for human exposure to RF energy. Proper operation of this repeater under normal conditions results in user exposure to RF energy below the Occupational Safety and Health Act and Federal Communication Commission limits.

- Do not allow the antenna to touch or come in very close proximity with the eyes, face, or any exposed body parts while the repeater is transmitting.
- To comply with FCC RF exposure limits, do not operate the transmitter of a stationary radio (base station or marine radio) when a person is within fourteen (14) feet [four (4) meters] of the antenna.
- Do not operate the repeater in explosive or flammable atmospheres. The transmitted repeater energy could trigger blasting caps or cause an explosion.
- Do not operate the repeater without the proper antenna installed.
- Do not allow children to operate transmitter equipped repeater equipment.

Note *The above warning list is not intended to include all hazards that may be encountered when using this repeater.*

This device complies with Part 15 of the FCC rules. Operation is subject to the condition that this device does not cause harmful interference. In addition, changes or modification to this equipment not expressly approved by EF Johnson Technologies could void the user's authority to operate this equipment (FCC rules, 47CFR Part 15.19).

The information in this document is subject to change without notice. EF Johnson Technologies will not be liable for any misunderstanding due to misinformation or errors found in this document.

1.5 More Information

Additional information is available for the 3800 Digital Repeater. Contact your supervisor, site radio administrator or EF Johnson Technologies representative should you need one of these additional manuals. Refer to the following:

- *EF Johnson Technologies 3800 Digital Repeater Installation Manual*

- *EF Johnson Technologies 3800 Digital Repeater Service Manual*
- *EFJohnson Trunked IP25 System Installation & Configuration Manual*
- *EFJohnson Trunked IP25 System Administration & Maintenance Manual*

Section

2

Controls & Indicators

Most controls and indicators on the 3800 are located behind the front panel. Figure 2.1 shows the 3800 with its front panel removed. 3800 controls and indicators are located on the Site Controller card, Channel Controller card, and the External Interface card. These are described and illustrated in greater detail in the following sections.

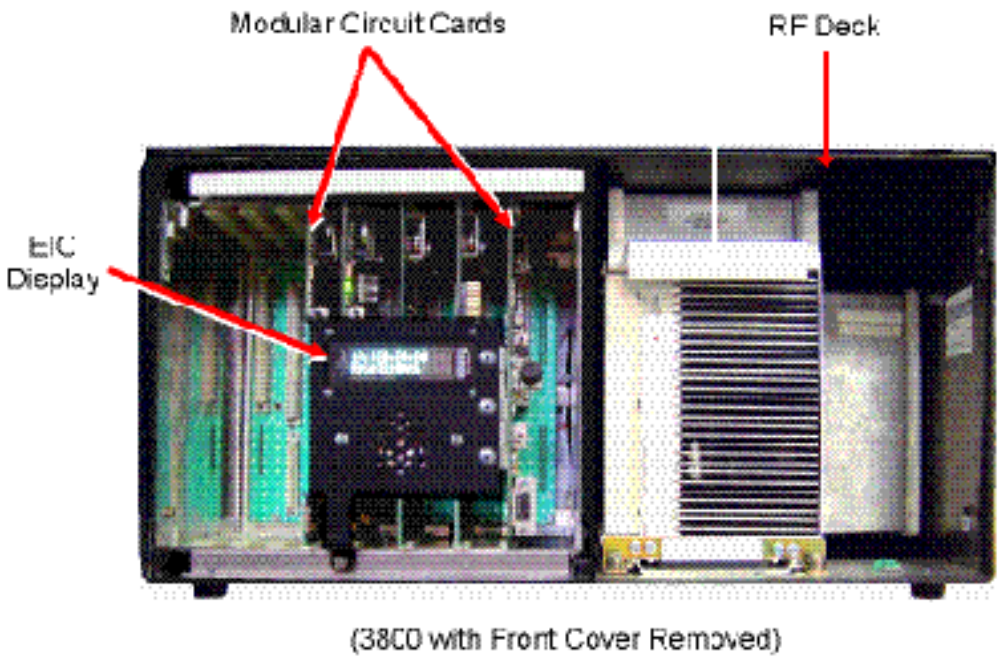
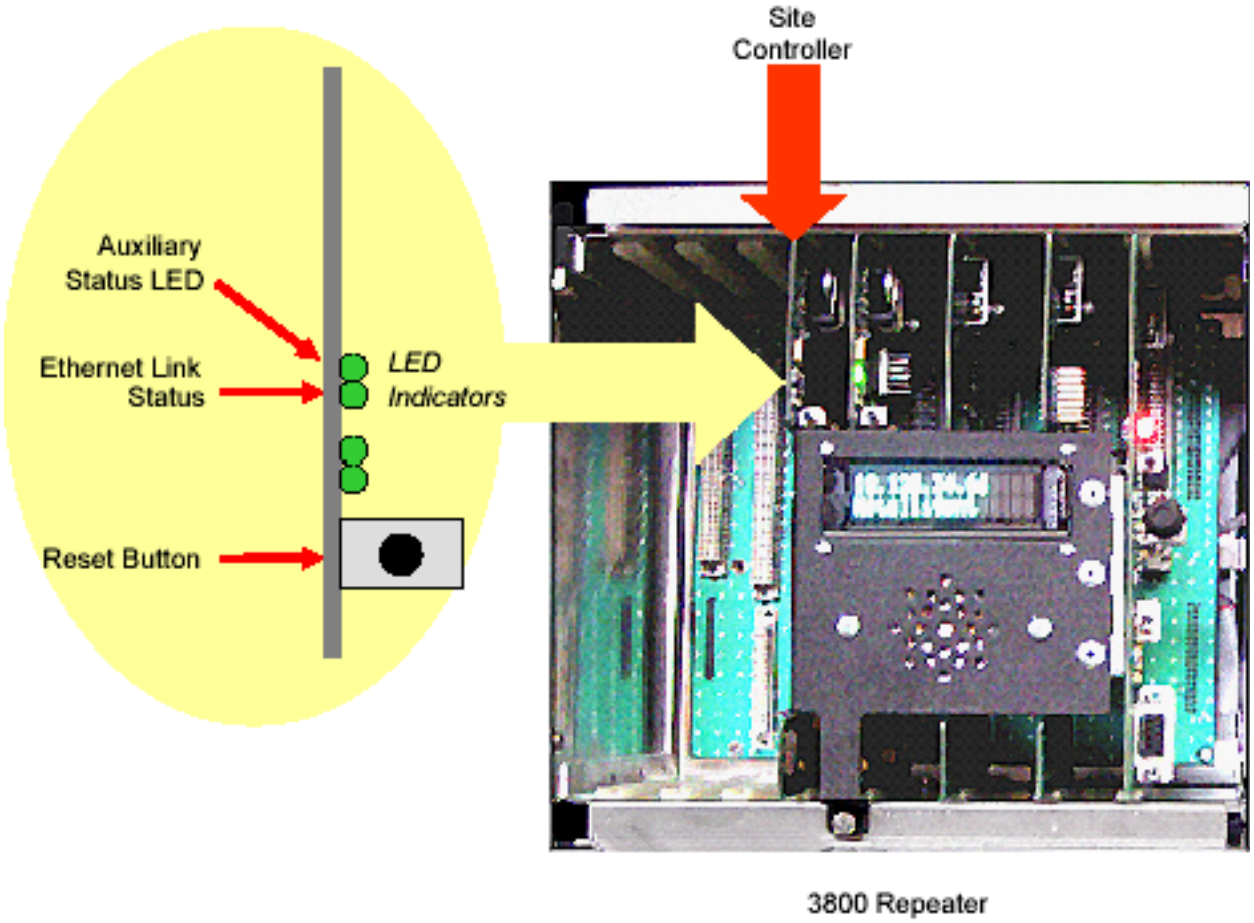


Figure 2.1 3800 Repeater with Front Panel Removed

2.1 Site Controller Card

The site controller card provides the high-level call processing for the entire site. Unless using backup site controllers, only one repeater in each system contains a site controller card. The Site Controller card's controls and indicators are illustrated in Figure 2.2 and described following.

Figure 2.2 Site Controller Controls and Indicators



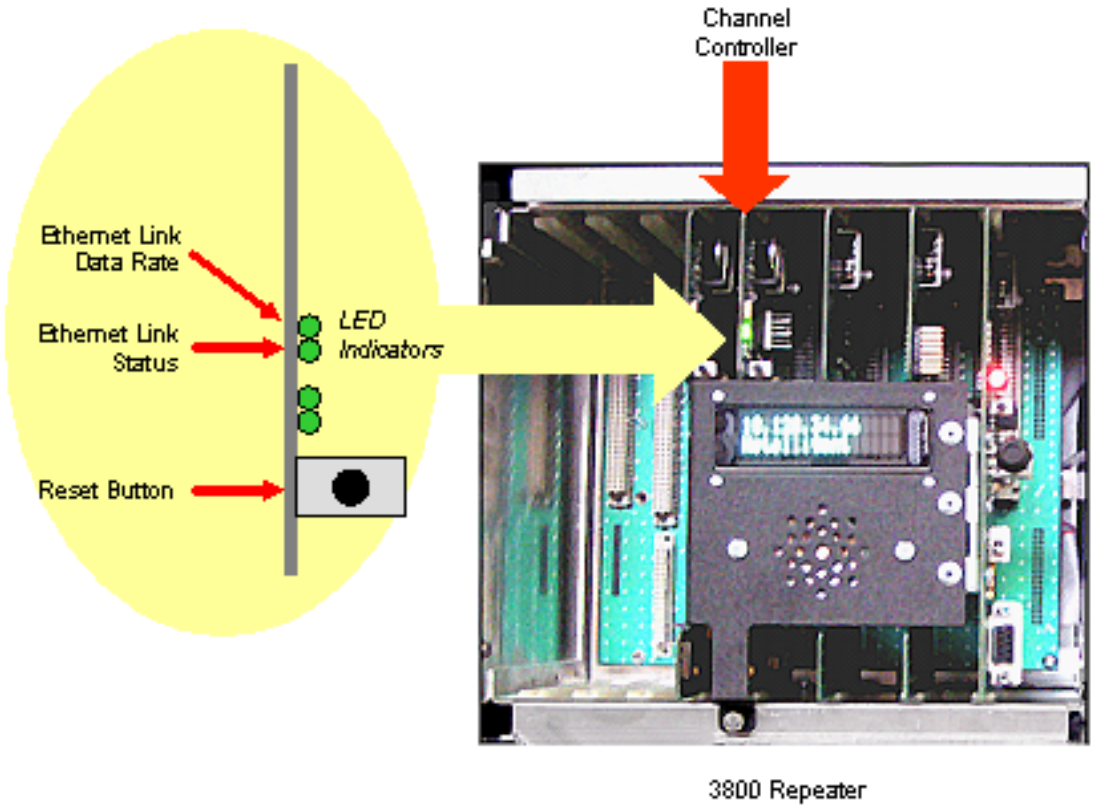
Site Controller Controls and Indicators			
Auxiliary Status LED	LED Indication	Software Version < 3.0	Software Version > or = 3.0
	On Solid	Ethernet link datarate = 100 Mbps	Site controller is in standby as redundant controller.
	Flashing	NA	Site Controller is active in Trunking Mode.
	Off	Ethernet link datarate = 10 Mbps	NA

Ethernet Link Status	This indicates the main Ethernet link data rate. If this LED is on, the rate is 100 Mbps. If this LED is off, the rate is 10 Mbps.
Reset Switch	Pressing this switch resets the controller card.

2.2 Channel Controller Card

The channel controller card controls either a single traffic channel or a single control channel for a particular 3800 repeater system. The Channel Controller card's controls and indicators are illustrated in Figure 2.3 and described following.

Figure 2.3 Channel Controller Card Controls and Indicators



Channel Controller Controls and Indicators	
Ethernet Link Data Rate LED	This indicates the main Ethernet link data rate. If this LED is on, the rate is 100 Mbps. If this LED is off, the rate is 10 Mbps.
Ethernet Status LED	If on, the repeater is connected to Ethernet.
Reset Switch	Pressing this switch resets the channel controller card.

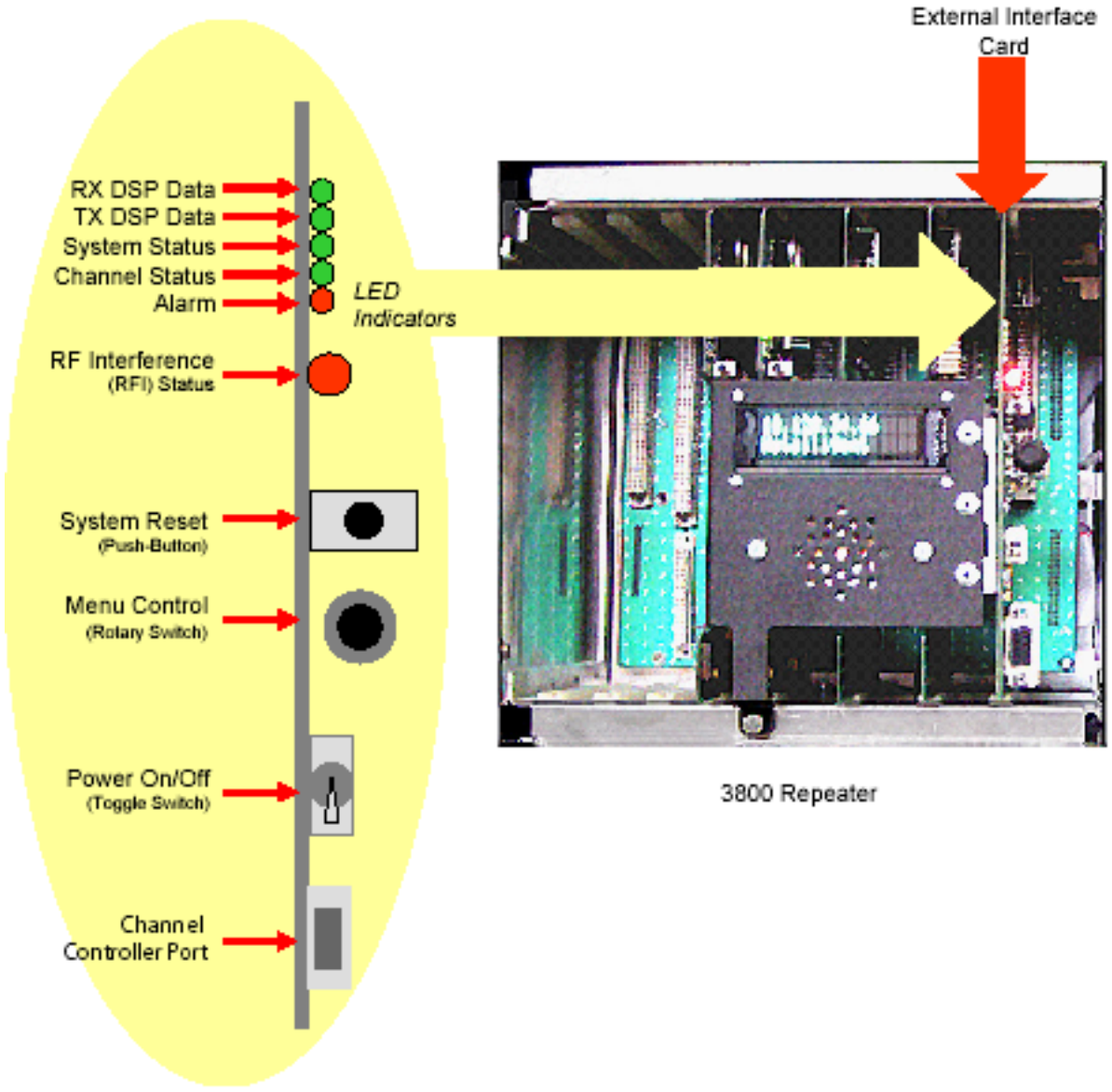
Note *Both of the Channel Controller card LEDs should be ON continuously after you initialize the repeater. (Two LEDs are not used in the field.)*

2.3 External Interface Card (EIC)

The External Interface Card (EIC) contains most of the switches and LEDs that you use to monitor and control the repeater. The EIC controls only the channel controller card. These controls and indicators are illustrated in Figure 2.4 and described as follows.

Note *LED indications discussed here apply only during normal operation (i.e., not during diagnostics)*

EIC Controls and Indicators



EIC Controls and Indicators

RX DSP Data LED

When ON, receiving decodable data.

- Control channel – RX synthesizer is locked, receiving decodable user registrations, affiliations or call requests
- Traffic channel – RX synthesizer is locked, receiving user voice traffic. This LED flickers as users key and dekey, enter and exit fades, etc.

TX DSP Data LED

When ON, transmitter is active.

- Control channel – TX synthesizer is locked, PA is keyed up, no RF deck alarms. This LED is on continuously unless there is a failure condition
- Traffic channel – TX synthesizer is locked, PA is keyed up with user voice, no RF deck alarms. This LED is on for the duration of a voice call. During fail-soft operation, this LED is on continuously.

System Status LED

When ON, system is operating properly.

This LED indicates that all tasks are reporting in to the watch dog timer. As long as all tasks are reporting in, this LED is on. If a failure occurs, the LED is off.

Channel Status LED

When ON, repeater is operationally active and in service.

This LED is on while a repeater is administratively and operationally active. If configuration is corrupted resulting in the repeater being unusable, the LED is off.

Alarm LED

When ON, a Critical alarm is pending.

This indicates that service is required. An example would be an RF transmitter failure.

RF Interference (RFI) Status

Flashing Green	RFI Detection Disabled
Solid Green	RFI Detection Enabled: no RFI detected
Solid Orange	RFI Detection Enabled: Alarm level RFI detected
Solid Red	RFI Detection Enabled: Disable level RFI detected
Flashing Red	RFI Detection not supported

System Reset Switch	This is the reset switch for both the channel controller and the site controller (if one is installed). Pressing this switch resets the control logic and restarts the operating program(s) from the beginning.
Menu Control Switch	Pressing or rotating this control enables the menu mode. When the menu mode is selected, pressing and rotating this control scrolls through and selects the various menus and parameters.
Power On/Off Switch	Turns repeater power on and off. It connects to the power supply remote enable line and switches the main power supply power sources.
Channel Controller Port	RS232-C jack that connects to channel controller processor.
Display	This 2 line x 16 character vacuum fluorescent display can indicate the following information: • On power-up, it indicates the various sequences that are executed by the control logic as the operating program starts. • During normal operation, the display indicates • The repeater name • Whether the repeater's channel is a voice channel (V) or a control channel (C) • The repeater's IP address

Section

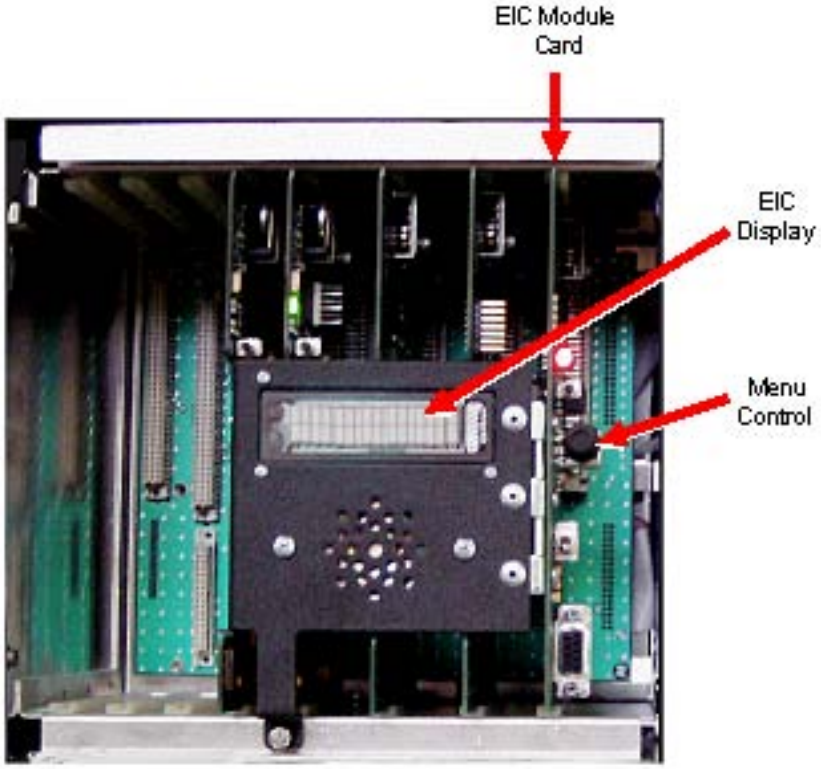
3

Operation

3.1 Operational Interface

The External Interface Card (EIC) module provides the primary manual interface to setup and operate the 3800 Repeater. Using the two-line display, the EIC provides a menu structure of functions and settings for operating the repeater. (See Figure 3.1.)

Figure 3.1 3800 EIC Interface



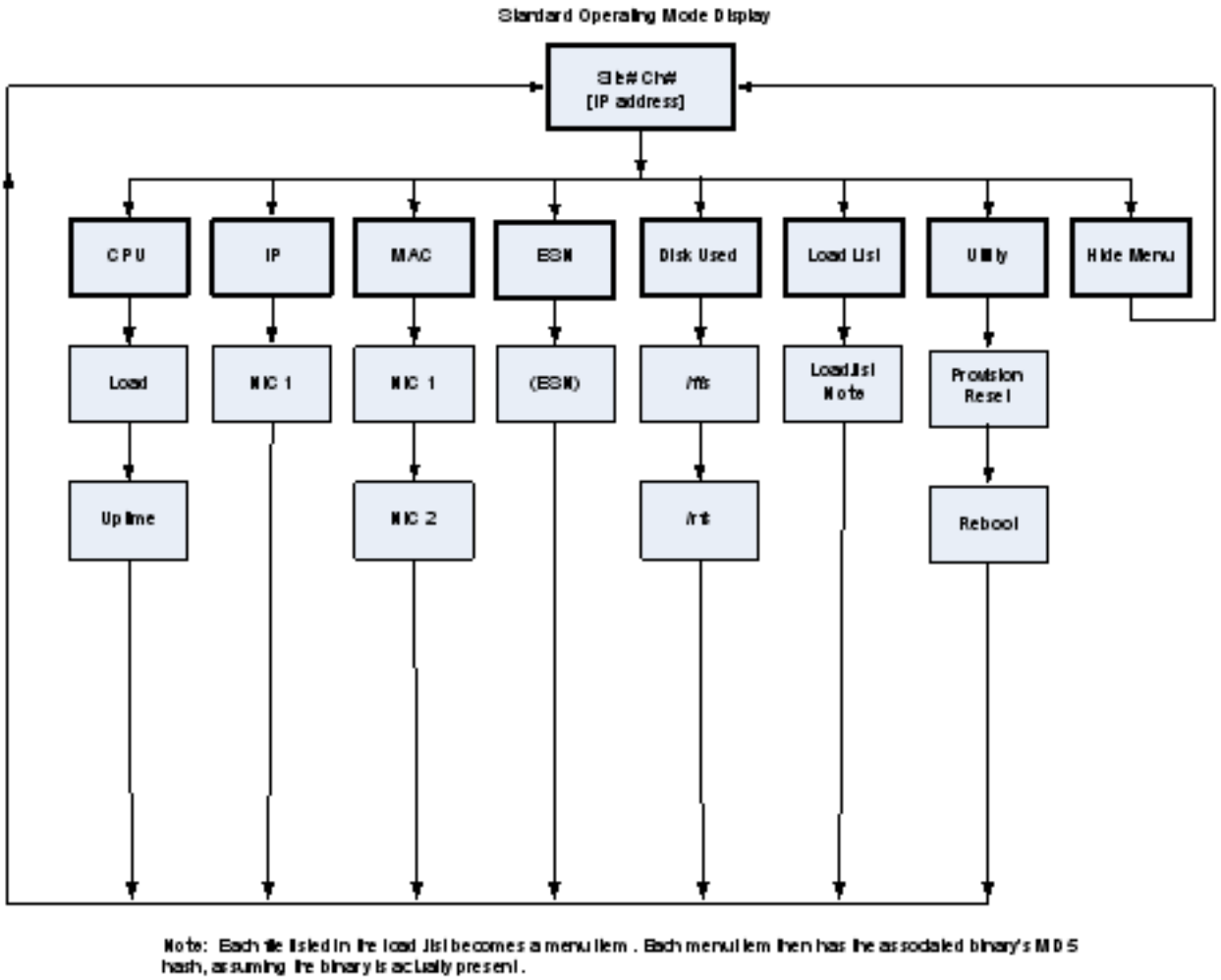
3.2 EIC Menu Modes

The main menu mode can be selected to display various repeater parameters. Figure 3.2 is a block diagram of the menu mode structure.

The menu mode is selected and controlled by the Menu Control knob as follows.

- To select the menu mode, press or rotate the Menu Control knob. The first main menu “CPU” is then displayed.
- In general, rotating the Menu Control scrolls through available parameters, and pressing it selects the displayed parameter.
- The ▼ icon in the upper right corner of the display indicates that if the knob is pressed, the next lower menu level is selected. Conversely, if ▲ is displayed, the next higher level is selected. The ↵ icon indicates that the displayed parameter or function is selected.
- The ◄ icon in the left-most position of the bottom line indicates that additional parameters have scrolled off to the left. Likewise, the ► icon in the right-most position indicates additional parameters have scrolled off to the right.
- Selecting [Back] returns a level up in menu hierarchy.

Figure 3.2 Main Menu Mode Block Diagram



Note *The repeater also has a diagnostic menu mode. Refer to Section 4 of this manual for a description of this mode.*

3.2.1 CPU Menu

This menu displays CPU information.

- **Load -** Current system load.
- **Uptime -** Length of time in seconds that the CPU has been running.

3.2.2 IP Menu

This menu displays the Internet protocol (IP) address associated with the repeater.

- **NIC1 -** The first network interface card. Some repeaters may have more than one network interface card.

3.2.3 MAC

This menu displays the MAC information for the repeater.

- **NIC1** - The first network interface card. Some repeaters may have more than one network interface card.
- **NIC2** - The second network interface card.

3.2.4 ESN

This menu displays Electronic Serial Number (ESN) information for the repeater.

- **(ESN)** - Electronic Serial Number for the repeater.

3.2.5 Disk Used Menu

This menu shows the amount of used disk space (disks) for each item in the menus below this menu.

- **/ffs -** Shows disks used for /ffs (Flash file system).
- **/rfs -** Shows disks used for /rfs (RAM file system).

3.2.6 Load List Menu

This menu displays the list of items in current load list.

- **load.lst -** Shows the last digits of the MD5 hash for the /ffs/etc/load.lst file. Each line in this file becomes a menu item. Each menu item then has the associated binary's MD5 hash, assuming the binary is actually present.

  Note *Shows the cumulative MD5 hash for all binaries listed in the load.list.*

3.2.7 Utility Menu

This menu provides access to various utility functions for the system.

- **Provision Reset** - Replaces manifest files currently installed on the board (*/ffs/etc/site.maf* and */ffs/etc/site.maf.md5*) with updated files from the NMS.
- **Reboot -** Reboots the channel controller without regard for the current state.

Tip *To reboot the channel controller, it is preferable to use this command rather than to press the Reset switch.*

Note *When you reboot the channel controller, the reboot may not happen immediately. The reboot may require several seconds.*

3.2.8 Hide Menu

This menu exits the menu mode.

3.3 Trunked System Operation

When used in a Trunked IP25 System infrastructure, the 3800 repeater communicates all control and status to the Network Management System (NMS). All system control setup is through the NMS.

Refer to the *EFJohnson Trunked IP25 System Administration & Maintenance* manual for additional information on 3800 Repeater operation in a system infrastructure.

Section1
Troubleshooting & Diagnostics

The 3800 repeater includes a diagnostic and troubleshooting mode. Running diagnostics is an alternate startup operational mode and is not available while the system is already running. During boot up, the normal boot up sequence can be aborted and an alternate boot personality may be selected. One alternate boot personality is the Diagnostic Personality.

.1 Repeater Troubleshooting

You can troubleshoot the 3800 repeater to the circuit board or module replacement level. If you experience problems with the 3800, first perform the following basic checks. If these checks do not correct the problem, continue with the troubleshooting chart procedures that apply to your problem.

- Perform a visual inspection:
  - Remove each card and check for bent pins.
  - Replace each card and be sure that all cards are properly seated into the card chassis.
  - Make sure the RF deck is securely seated into the chassis.
  - Confirm that the repeater's power supply is receiving enough AC power.
  - Confirm there is a properly-tuned antenna connected to the Transmit and Receive RF ports.
  - Confirm that environmental temperature is within specified limits.
  - Confirm that the repeater's location is properly ventilated.
  - Confirm that network cables are connected securely, and network equipment is on.

Repeater Troubleshooting Chart

3800 Repeater Troubleshooting (Continued)	
Problem	Test Action / Procedure / Solution
	If any action corrects the problem, return to normal equipment operation. If an action does not correct the problem, then proceed to the next test action.

Repeater does not power up	• Verify the repeater has supplied AC power • Check that the Power On/Off toggle switch on the EIC card module is set to the On position. When set to On, the EIC Power LED should be blinking. If not, replace the power supply module.
Repeater indicates powered on, but does not operate	• Reset the repeater by momentarily pressing the System Reset pushbutton on the EIC card module. • Perform a Power Supply Diagnostic: 1 From the diagnostics application, select Power Supply > PS Test > PS output > Start 1 Confirm that the power supply output is approximately 25.0 volts 1 Stop the test. 1 If the power supply test fails, then replace the power supply. 1 If the red EIC Alarm LED remains on, select the Faults menu item to view detected faults. 1 If the PS Temp- The power supply temperature has exceeded limits fault is detected, replace the power supply assembly.
Fault or multiple faults indicated	• If the repeater indicates it is powered on, it may be possible to reboot the repeater into the diagnostics mode to review any detected faults. 1 Activate the diagnostics application, and select the Faults menu item. 2 Review the indicated fault conditions and take the appropriate action. • If multiple faults occur, it is possible that the measurements themselves are at fault. Replace the Channel Controller card. If problem persists, replace the RF deck.
Repeater not transmitting	• Verify the repeater has supplied AC power. • Ensure that the TX DSP card is fully seated, with no bent pins. • Ensure that the Channel Controller card is fully seated, with no bent pins. • Reboot the Channel Controller card by momentarily pressing the Reset button on the card. If this does not correct the problem, continue to the Transmitter Test. • Perform a Transmitter Test - Connect a test receiver to the RF transmit port. Make sure that sufficient attenuation is provided to protect the test receiver. 1 From the diagnostics application, select TX > TX Test > Cont > Start 2 Verify that the Tx Frequency is within specified limits. 2 Verify that the Tx Power output is within specified limits. 2 Verify that the Tx Modulation level is within specified limits. 2 Verify that the test receiver can decode the P25 1011 Hz tone. 2 Stop the test. 2 If any of the TX tests fail, then replace the RF deck. 2 If the red EIC Alarm LED remains on, select the Faults menu item to view detected faults.

	2 If any of the following TX faults are detected, replace the RF deck. - TX Synth Lock –Transmit synthesizer out of lock. - TX Temperature –PA temperature has exceeded limits. - TX Fwd Power –Forward power is below limits when keyed. - TX NoFwdPower –Forward power is above limits when not keyed. - TX Power1 –Output of exciter is below limits. - TX Power2 –Output of exciter is below limits. - TX Power3 –Output of exciter is below limits. - TX Power4 –Output of exciter is below limits. - TX Imbal ½ Ratio of Tx Power 1 to Tx Power 2 is beyond limits. - TX Imbal ¾ Ratio of Tx Power 3 to Tx Power 4 is beyond limits. - TX Fan Op –Fan does not work. - TX Fan1 Cur –Fan current is beyond limits. - TX Fan2 Cur –Fan current is beyond limits. 2 A TX VSWR –The VSWR is beyond limits fault indicates an antenna problem. Check all antenna connections at the antenna, feed line, and at the repeater. If necessary, replace the antenna, and/or the feed line.
Repeater not receiving	• Verify the repeater has supplied AC power. • Ensure that the RX DSP card is fully seated, with no bent pins. • Ensure that the Channel Controller card is fully seated, with no bent pins. • Reboot the Channel Controller card by momentarily pressing the Reset button on the card. If this does not correct the problem, continue to the next item. • Verify that the proper options are installed in case of P25 or VoIP • Check the receive and transmit frequencies • Make sure the RF deck is tightly secured. • Verify NAC • Check the LO and RF cable connection on the receive board • Perform a Receiver Test - Connect an RF test signal to the RF receive port. This signal should be set to the repeater's receive frequency and modulated with a standard P25 1011Hz Tone. 1 From the diagnostics application, select RX > RX Test > BER > Start 2 Verify that receive sensitivity is within specified limits. 2 Stop the test. 2 If the BER test fails, then replace the RF deck. 2 If the display indicates "NO RSP", then replace the receive DSP card. 2 If the red EIC LED remains on, select the Faults menu item to view detected faults. 2 If the RX Synth Lock - Receiver synthesizer is out of lock fault is detected, replace the RF deck.
Repeater not communicating over	• Verify the repeater has supplied AC power

LAN	• Make sure that the site LAN is operating • Check the LAN connections to the repeater • Reboot the Channel Controller card and observe the LED indicators on this card. The green LEDs should remain on, indicating that a network connection is present. If not, replace the Channel Controller card.
SIte Controller not communicating over LAN	• Verify the repeater has supplied AC power • Make sure that the site LAN is operating • Check the LAN connections to the repeater • If this repeater has an installed Site Controller card, reboot the Site Controller card and observe the LED indicators on this card. The green LEDs should remain on, indicating that a network connection is present. If not, replace the Site Controller card.

Activating Diagnostics

During repeater boot up, the option of aborting the boot process is indicated as it counts down on the EIC display. Press and release the rotary knob during the countdown to abort the bootup process and activate diagnostics. Once the boot up process is aborted, the Personality Menu is activated. Navigation through the list of available personalities is performed by rotating the input control. If there exists only a single personality, rotating the knob will appear to have no effect. Once the desired personality is displayed on the front panel, pressing the input control knob will activate the currently selected personality.

.1.1 Navigation

Navigation is performed using the input control knob. All menu navigation is performed by both rotating the front panel control knob and by depressing and releasing it. The act of depressing and releasing the control knob is known as selecting. Rotating the knob clockwise is known as advancing or moving forward, while rotating the knob counter clockwise is known as moving backward.

.1.1 LEDs

The LEDs on the EIC card indicate the following: (LEDs are numbered 1-5 from top to bottom.)

Note *LED indications described here (see) apply only during diagnostics mode (i.e., not during normal operation).*

2) **Rx LED** -when illuminated, indicates receive activity. Only applicable during RX Tests.

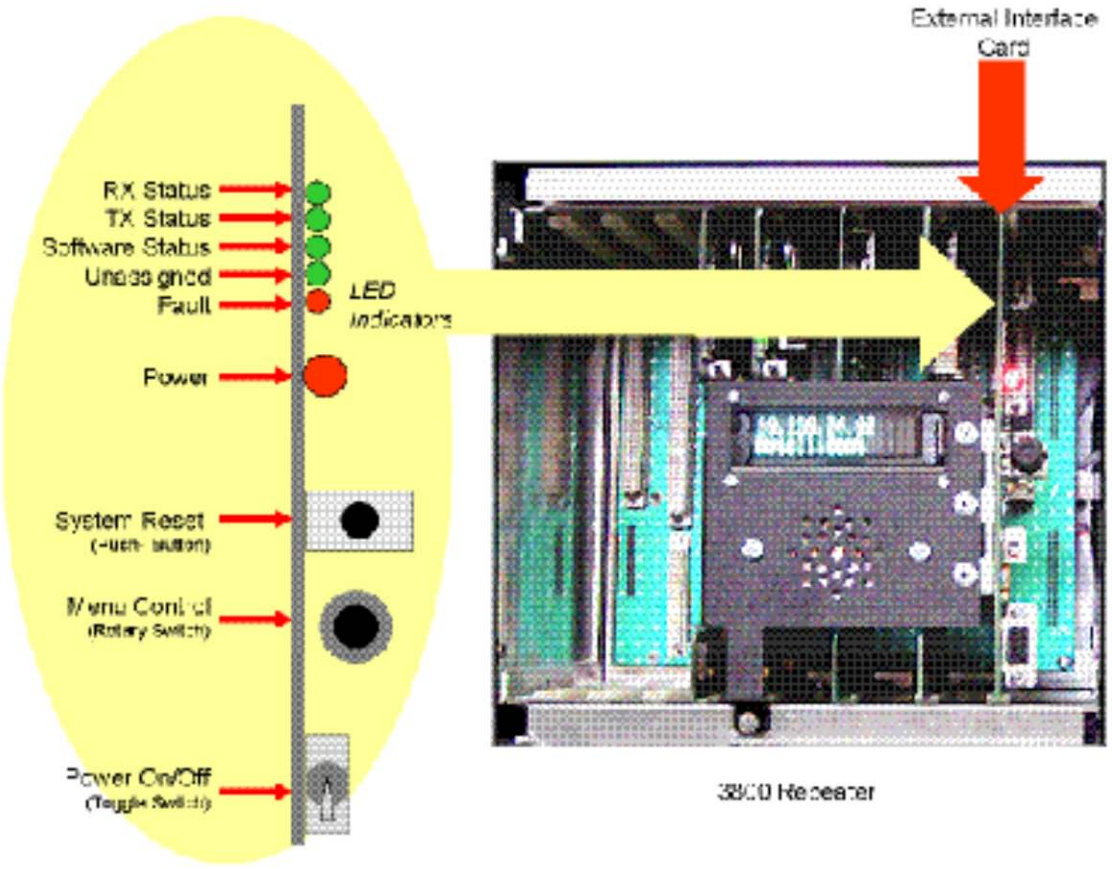
3) **Tx LED** -when illuminated, indicates the transmitter is in a keyed state.

4) **Software Operational LED** -when illuminated, indicates the software is operating properly.

5) **Unassigned LED** -This LED does not have a functional indication.

6) **Fault LED** -when illuminated, a fault has been detected. See *Monitors/Faults*.

EIC Controls and Indicators: Diagnostic Mode Indications



.0.1 Monitors/Faults

A monitor is a comparison of a sensor measurement to a predetermined limit or range. Monitoring of sensors is an ongoing process while running the diagnostics application. When a sensor measurement is out of range, a fault is generated. Detected faults result in the illumination of the red LED, and a corresponding message, which is viewable under the Faults menu.

Monitor tests are selectable via the menu items TX Monitors, RX Monitors, or PSMonitors. When selected, a measured value used by the sensor comparison, and a Pass ("P") or Fail ("F") indication will be displayed. The P/F indicates the results of the comparison to the valid range limits. If a monitor is not enabled, an "NA" will be displayed.

Monitors are enabled automatically according to the state of the transceiver. (i.e. some TX Monitors are enabled only when the transmitter is in the keyed state.) Even though monitors are always active when enabled, only one can be displayed at a time. Before starting the display of a monitor, a previously displayed monitor must first be stopped by selecting it a second time. The Fault LED is cleared on reboot.

Diagnostic Mode Menu Tree

The following lists the EIC menu tree available in diagnostic mode.

--> **TX -Transmitter menu**

>> **TX Tests** -Test the transmitter. Use the Tx Config menu to configure the transmitter test.

-- **Cont** [START/STOP] -Start or stop a continuous transmitter test

-- **Timed** [START/STOP] -Start or stop a timed transmitter test

-- **Cycle** [START/STOP] -Start or stop a cycled transmitter test

-- [TOP]

-- [BACK]

>> **TX Control** -Control the transmitter now.

-- **Turn PA** [ON/OFF]-Toggle transmitter state. The transmitter will be keyed at the currently configured frequency and power. No modulation will be applied.

-- **Turn Fan** [ON/OFF]-Toggle fan state. Note that this control is an "or" control with the hardware circuitry. i.e. The fan cannot be turned off by this control if the current PA temperature exceeds the default fan-on set point.

-- [TOP]

-- [BACK]

>> **TX Config** -Configure the Tx Test. Note that configuration changes will not take effect until the next time the Tx Test is started.

-- **TX Waveform** -Select the waveform used during the TX Test; refer to ANSI/TIA-102.CAAA-A-2002 “Digital C4FM/CQPSK Transceiver Measurement Methods” for details

- [P25 1011Hz Tn]
- Silence Tone
- P25 Interfrnce
- P25 Busy Patrn
- P25 Idle Patrn
- P25 Cal Patrn
- P25 Inner Dev
- P25 Outer Dev
- P25 c4fmMod Fid
- P25 Auto Freq
- Analog Low Dev
- Analog High Dev
- Silent Carrier
- Station ID
- [TOP]
- [BACK]

-- **TX Min Freq MHz** -Display minimum tuned TX frequency.

-- **TX Max Freq MHz** -Display maximum tuned TX frequency.

-- **TX Freq** -Review/Edit TX Frequency. This frequency is applicable for Tx Tests and Tx Control. By default, the center of the tuned frequency range is used.

-- **TX Min PA Watt** -Display minimum allowed power.

-- **TX Max PA Watt** -Display maximum allowed power.

-- **TX Power** -Review/edit TX Power in watts. This power setting is applicable for Tx Tests and Tx Control. By default, the maximum allowed power setting is used.

-- **Set Keyed** [OFF/ON]-Sets transmit state during Tx Tests.

-- **Station ID** -Review/edit Station ID. Only applicable when Tx Waveform = “Station ID”

-- **Dev Wfrm Param** -Configure the modulation amplitude and frequency.

- **Low Dev Frq Hz** -Configure the modulation frequency for the “Analog Low Dev” waveform.
- **Hi Dev Frq Hz** -Configure the modulation frequency for the “Analog High Dev” waveform.
- **Low Dev Amp Hz** -Configure the amplitude for the “Analog Low Dev” waveform.

- **Hi Dev Amp Hz** -Configure the amplitude for the “Analog High Dev” waveform.
- [TOP]
- [BACK]
    -- **Test Duration** -Set the Tx Test duration.
- **Timed** (sec) -Set the Tx Test duration in seconds. Only applicable when Tx Test is started as “Timed”
- **Cycled** - Set the Tx Test duration in number of Tx cycles, where a Tx cycle includes a duration of time where the transmitter is keyed, followed by a duration of time where the transmitter is dekeyed.
    - •• **Test Key Time** - Number of seconds to keep PA keyed
    - •• **Test Dekey Time** - Number of seconds to keep PA dekeyed
    - •• **Test Cycles** - number of iterations

- [TOP]
- [BACK]
    -- [BACK]

>> **TX Monitors** - Shows the result of a transmitter monitor. See Monitors/Faults for more detail. For many of the monitors, the transmitter must be in the keyed state as a result of actions under the Tx Control, or the Tx Tests menu items.

-- **TX Synth Lock** - Transmit synthesizer. The measurement is FALSE when locked, TRUE when not locked.

-- **TX Temperature** - Temperature of the PA in degrees C. This monitor checks that the PA does not get too hot.

-- **TX Fwd Power** - Output of forward power sensor in volts when keyed. This monitor checks for a minimum level of forward power when the transmitter is keyed.

-- **TX NoFwd Power** - Output of forward power sensor in volts when dekeyed. This monitor checks that power is not radiated when not keyed.

-- **TX Power1** - Output of Exciter current sensor. Not applicable in all models.

-- **TX Power2** - Output of Exciter current sensor. Not applicable in all models.

-- **TX Power3** - Output of Exciter current sensor. Not applicable in all models.

-- **TX Power4** - Output of Exciter current sensor. Not applicable in all models.

-- **TX Imbal ½** - Ratio of Tx Power1 to Tx Power2 or Tx Power2 to Tx Power1. Number will always be greater than 1. Not applicable in all models.

-- **TX Imbal ¾** - Ratio of Tx Power3 to Tx Power4 or Tx Power4 to Tx Power3. Number will always be greater than 1. Not applicable in all models.

-- **TX VSWR** - Voltage Standing Wave Ratio. This is the ratio of the forward power sensor to the reflected power sensor given that both measurements exceed the minimum measurement. The minimum measurement is defaulted to 0.9 volts. If either of the sensors is below the minimum measurement, the resulting sensor measurement will be 2.001.

-- **TX Fan Op** - Fan Operating sensor in volts.

-- **TX Fan1 Cur** - Fan Current sensor 1 in volts.

-- **TX Fan2 Cur** - Fan current sensor 2 in volts.

-- [TOP]

-- [BACK]

>> [BACK]

--> **RX -Receiver menu**

>> **RX Tests** - Test the receiver. Use the Rx Config menu to configure the receiver test.

-- **BER** [START/STOP] Bit Error Rate Test. Results displayed in%.

-- **RSSI** [START/STOP] Receive Signal Strength (relative). Results displayed in%. Not all RF decks support this feature.

-- [TOP]

-- [BACK]

>> **RX Config** - Configure the RX Tests.

-- **RX Min Freq MHz** - Display minimum tuned RX frequency.

-- **RX Max Freq MHz** - Display maximum tuned RX frequency.

-- **RX Freq** - Review/Edit RX Frequency. This frequency is applicable for Rx Tests. By default, the center of the tuned frequency range is used.

-- [TOP]

-- [BACK]

>> **RX Monitors** - Shows the result of a receiver monitor. See Monitors/Faults for more detail.

-- **RX Synth Lock** - Receiver synthesizer. The measurement is FALSE when locked, TRUE when not locked.

-- [TOP]

-- [BACK]

>> [BACK]

--> **Power Supply**

>> **PS Tests** - Test the power supply.

-- **PS Oput** [START/STOP] -Displays the primary output of the power supply in volts.

-- [TOP]

-- [BACK]

>> **PS Monitor** - Shows the result of a power supply monitor. See Monitors/Faults for more detail.

-- **PS Temp** [START/STOP]- Power supply temperature in degrees C.

-- **PS Batt Warn** - The measurement is TRUE when backup battery level is sufficient for operation, FALSE when belw the warning level. It is also TRUE if the backup battery option is not installed.

-- **PS Batt Fail** - The measurement is TRUE when backup battery level is at or above the failed threshold, FALSE when below the failed level. It is also TRUE if the backup battery option is not installed.

-- **PS AC Fail** - The measurement is TRUE when AC is present, FALSE when AC is not (assuming presence of backup battery).

-- [TOP]

-- [BACK]

-- [BACK]

--> **Alarms - This feature is currently not supported**

>> **Alarm Tests**

-- Alarm Input - Test the status of the alarm inputs on the rear of the chassis. This test is currently not supported.

-- [TOP]

-- [BACK]

>> **Alarm Control**

-- **Alarm Toggle** [Set/Reset] Control the alarm outputs on the rear of the chassis. This control is currently not supported.

-- [TOP]

-- [BACK]

>> [BACK]

--> **Sensor/Other**

>> **Sensor Tests** - Display the raw measurement of the corresponding sensor, in volts.

-- **TX Mod** - TX Modulation

-- **HS TX Syn Lock** - High Stability TX Synthesizer Lock

-- **TX Syn Lock** - TX Synthesizer Lock

-- **AGC** - Receiver Automatic Gain Control

-- **Gnd** - Ground (through resistor)

-- **PS Temp** - Power Supply temperature sensor.

-- **RX WB** - RX Wideband.

-- **RX RSSI/Q**- - Multiplexed RSSI or QRX

-- **Inj Lvl** - Receiver Injection Level

-- **HS RX Syn Lock** - High Stability RX Synthesizer Lock
-- **RX Syn Lock** - Rx Synthesizer Lock
-- **5 Volt** - Connected to 5 volt supply through R divider.
-- **Fan2 Cur** - Fan current sensor 2.
-- **Fan1 Cur** - Fan current sensor 1.
-- **26.5 Volt** - Connected to 26.5 volt supply through R divider.
-- **Fan1 Op** - Fan Operational sensor.
-- **Fwd Power** - TX Forward Power sensor
-- **Power 1** - Power 1 sensor.
-- **Power 2** - Power 2 sensor.
-- **Power 3** - Power 3 sensor.
-- **Power 4** - Power 4 sensor.
-- **Refl Power** - TX Reflected Power sensor.
-- **PA Temp** - PA Temperature Sensor
-- **2.5 Volt** - 2.5 volt through R divider.
-- [TOP]
-- [BACK]

>> **ESN** - Electronic Serial Number

>> **IP NIC 1**

>> **MAC Addr** - Hardware ethernet address

>> **Diag Version** - Version number of the diagnostic applications

>> **Diag Menu Ver** - Version number of the diagnostic menu

>> [BACK]

--> **Faults - Maintain a list of issued detected while running diagnostics**

-- (Updated as they occur)
-- [BACK]

--> **Exit Diag Menu – Allows for selection of another boot personality (if one exists)**

--> **Reboot - Reboots**

Menu Tips

These menu items will also be prefixed by the double up, menu item prefix. See above in this symbol table.

postfix down arrow	Selecting this menu item will navigate into a sub-menu
prefix up arrow	Current position is within a submenu, navigating “BACK” will go transition one menu level up.
prefix, double up arrow	Indicates the associated action will change the position to the highest level menu. This is a shortcut, which can save many navigation steps.
left arrow	Selecting the menu item performs an action; activates the association functionality. If an item supports editing, Edit/ Navigation mode will be enabled.
solid block	Edit/Navigation mode
underscore	Edit/Modify mode
[BACK]	Navigates on menu level up. Every menu except the top level menus will contain one of these.
[TOP]	Navigates to the top-most menu level. Only submenus two levels or greater will contain this navigation aid.

Section

5

Maintenance

5.1 Routine Maintenance

No routine maintenance is generally required for the 3800 repeater. Periodic visual inspections are recommended for adequate cooling, secure mounting, and secure connections and cabling.

It is also recommended that, using the repeater diagnostic mode, the repeater is checked for any recent fault conditions.

5.2 Firmware Updates

Periodically, firmware updates may be available for the repeater and repeater controller cards. You will be notified by EFJohnson Customer Service or your EF Johnson Technologies representative should updates be required for your equipment depending on your specific service agreements.

You may also contact EF Johnson Technologies directly to inquire of available updates for your equipment. See Section 6 in this manual for additional information on contacting EF Johnson Technologies Customer Service.

Section

6

Service Information

Should service be necessary for this equipment, EF Johnson Technologies can provide technical assistance, service support, and replacement parts.

6.1 Product Warranty

The warranty statement for this equipment is available from your product supplier or from

Warranty Department
EF Johnson Technologies
8050 Jetstar # 175
Irving, TX 75063

This information may also be requested from the Warranty Department by phone at the numbers listed in Section 6.2. The Warranty Department may also be contacted for warranty service reports, claim forms, or any other questions concerning warranties or warranty service.

6.1.1 Online Registration

EF Johnson Technologies offers greater convenience through online product warranty registration. Registering EF Johnson Technologies products online allows customers to receive warranty service and field service notices more quickly.

To register EF Johnson Technology products online, visit *www.efjohnsontechnologies.com*. Click the link at the bottom of the page that says "Warranty Registration"or go to *http://www.efjohnson.com/ WarrantyRegistration.asp*. Then, follow the instructions to register your products.

6.2 Factory Customer Service

The Customer Service Department of EF Johnson Technologies provides customer assistance on technical problems and the availability of local and factory repair facilities.

6.2.1 BEFORE Contacting Customer Service

It will be more efficient if you have critical information on hand before contacting customer support. Be sure to have the following:

- Any necessary equipment model numbers and configuration options.
- Description of the problem/symptoms
- Description of any troubleshooting actions performed.

6.2.2 Contacting Customer Service

The Customer Service Department of EF Johnson Technologies can be contacted during regular customer service hours of 8:00 a.m. - 5:00 p.m. Central Time, Monday- Friday. A technical support subscription service is available or support can be purchased on an as-needed basis. The Customer Service Department can be reached using the following telephone numbers:

Toll-Free:	(800) 328-3911 (all except Multi-Net)
	(800) 295-1773 (Multi-Net only)
Fax:	(972) 819-0639
E-Mail:	customerservice@efjohnson.com

You can also e-mail a person directly if you know their first initial/last name. For example, if John Smith is an EF Johnson Technologies employee, then his email address is probably jsmith@EFJohnson.com

Note

Emergency 24-hour technical support is also available at the preceding numbers during off hours, holidays, and weekends.

When your call is answered at EF Johnson Technologies, you will hear a brief message informing you of numbers that can be entered to reach various departments. This number may be entered during or after the message using a tone-type telephone. If you have a pulse-type telephone, wait until the message is finished and an operator will come on the line to assist you. When you enter some numbers, another number is requested to further categorize the type of information you need.

You may also contact the Customer Service Department by mail. Please include all information that may be helpful in solving your problem. The mailing address is as follows:

Customer Service Department
EF Johnson Technologies

8050 Jetstar # 175
Irving, TX 75063

6.2.3 Internet Home Page

EF Johnson Technologies has a site on the World Wide Web internet that can be accessed for information on the company, products, systems, and regulations. The address is:

http://www.efjohnsontechnologies.com

6.3 Returns for Repairs

Before returning equipment for repair, contact EF Johnson Technologies Service Department as described in the preceding section. They may be able to suggest a solution to the problem, making return of the equipment unnecessary.

Repair service is normally available through local authorized EF Johnson Technologies land mobile radio service centers. If local service is not available, the equipment can be returned to the EF Johnson Technologies repair depot for repair. However, before returning equipment, contact the Customer Service Department Repair Depot for the correct "Ship To" address.

Be sure to fill out a Factory Repair Request Form #271 for each unit to be repaired, whether it is in or out of warranty. You can obtain it in any of three ways:

- Download it from the EF Johnson Technologies Web site's "Service & Support" section.
- Call the EF Johnson Technologies Customer Service Department and request it. (See Section 6.2.)
- Request it when you send a unit in for repair.

Clearly describe the difficulty experienced in the space provided and also note any prior physical damage to the equipment. Include this form in the shipping container with each unit. Your telephone number and contact name are important as there are times when the technicians may have specific questions that need to be answered to completely identify and repair a problem.

When returning equipment for repair, it is also recommended that you use a PO number or some other reference number on your paperwork in case you need to call the repair lab about your unit. These numbers are referenced on the repair order and make it easier and faster to locate your unit in the lab.

Return Authorization (RA) numbers are not necessary unless you have been given one by the Field Service Department. RA numbers are required for exchange units or if the Field Service Department wants to be aware of a specific problem. If you have been given an RA number, reference this number on the Factory Repair Request Form sent with the unit. The repair lab will then contact the Field Service Department when the unit arrives. For additional information on factory service, the Depot Service Department can be contacted at the following e-mail address:

depotrepair@efjohnson.com

6.4 Replacement Parts

Replacement parts can be ordered directly from the Service Parts Department. To order parts by phone, dial the toll-free number as described in Section 6.2. When ordering, please supply the part number and quantity of each part ordered. EF Johnson Technologies dealers also need to give their account number. If there is uncertainty about the part number, include the designator (C512, for example) and the model number of the equipment the part is from.

You may also send your order by mail or fax. The mailing address is as follows and the fax number is shown in Section 6.2.

Service Parts Department
EF Johnson Technologies
8050 Jetstar # 175
Irving, TX 75063