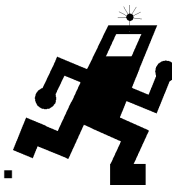# PKLR2400 Radio

Hardware and Software
Interface Specification
Version 3.2

13256 W. 98th Street
Lenexa, KS 66215
(800) 492-2320
www.aerocomm.com
wireless@aerocomm.com

Copyright Information/FCC User's Notice

Copyright Information

FCC USER'S NOTICE

> ⚠ **WARNING:** **This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:**
>
> - **Reorient or relocate the receiving antenna**
> - **Increase the separation between the equipment and receiver.**
> - **Connect the equipment into an outlet on a circuit different from the one the receiver is connected.**

FCC NOTICE

> ⚠ **WARNING: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.**

Revisions	*Description*
Version 1.0	Initial Release Version - 2/4/99
Version 1.1	page 24 - System ID Address corrected from 30h to 34h
Version 2.0	Add transparent serial modes – 5/25/1999
	Added EEPROM Write Protect
	Changed Pin 27 Definition to Forced API Mode 03
Version 3.0	Add broadcast packet attempts – 6/10/1999
	Broadcast Packet size increased from 256Bytes to 2KBytes
Version 3.1	Correct number of channels from 75 to 77 – 7/22/1999
	Change nomenclature for Serial Packet Mode 03 to Serial API Mode 03
Version 3.2	Updated FCC Statement – 9/8/1999

Table of Contents

1. Overview

This document contains information about the hardware and software interface between an AeroComm PKLR2400 Radio and an OEM host. Information includes the theory of operation, system issues, and a basic command set for operational control of the system and radio.

The Radio is designed to allow flexibility at the hardware interface level with a minimum number of actual hardware pins connecting the radio and the OEM Product. The radio is controlled by a Dallas 87C520 microcontroller providing program storage. A separate EEPROM provides user definable parameter storage.

The RF system is a Client/Server (Slave/Master) architecture. Data can be transmitted from client to server or server to client, but not from client to client, or server to server. Clients can only hear servers and servers can only hear clients.

The Serial Interface Modes provide four main serial user interfaces. This protocol provides significant flexibility to the OEM allowing them to provide data in many forms including packet, end character and fixed-length with and without timeouts.

2. PKLR2400 Specifications

GENERAL

Bus Interface	Serial (TTL Level Asynchronous) or Parallel through 40 pin mini connector. Amp P/N 177986-1 or Berg
Interface Data Rate	
Serial	Prog to 800 kbps. Supports PC rates to 57.6 Kbps
Parallel	4 Mbps
Compliance	Certifiable under:
	US - FCC15.247
	Canada - DOC
	Europe - ETSI
	Japan - MKK
Power Consumption	
TX/RX Active (All Modes)	115mA typical
Interface ON/RF OFF (API Mode Only)	45mA typical
Sleepwalk (All Modes)	35mA typical
Standby (API Mode Only)	30mA typical
Channels	Supports 77 non-interfering channels
Security	User assigned System ID. Unique IEEE address on each radio.

RADIO

Frequency Band	2.402 – 2.478 GHz
Radio Type	Spread Spectrum Frequency Hopping
Output Power	10mW
Voltage	5V nominal $\pm$5%, $\pm$ 50mV ripple
Sensitivity	-90dBm
Data Rate	1Mbps
Range	Indoors up to 300ft, Outdoors up to 3000ft
	Can be extended with directional antenna

ENVIRONMENTAL

Temperature (Operating)	0 to +60 C
Temperature (Storage)	-50 to +85 C
Humidity (non-condensing)	10% to 90%

PHYSICAL

Dimensions	1.65" x 2.65" x 0.20"
Antenna Connector	Standard MMCX jack
Weight	Less than 0.5 ounce

SOFTWARE

User Configurable Options	
Host Interface Data Rate	Up to 800Kbps
Variable Packet Length	Up to 2Kbyte
Serial Interface Modes	(3) Transparent and (1) API
Diagnostic Error Counters	
User Programmable Attempts	Up to 255

3. Theory of Operation

3.1 Definitions

Server Host: The server host is the OEM device controlling the server radio

Client Host: The client host is the OEM device controlling the client radio

Host: Host refers to both the server host and the client host

Server Radio: The server radio is the "master" radio. It is the hub of communications

Client Radio: The client radio is a "slave" radio. It is controlled by it's own Host, but is a slave to the server radio

Authentication: The acquisition of the IEEE 802.3 address of the Server Radio by the Client Radio and the subsequent issuance of an _**In-Range***_ command by the Client Radio to the Client Host.

Unicast Address: A frame that is directed to a single recipient as specified in IEEE 802.3.

Broadcast Address: A frame that is directed to multiple recipients as specified in IEEE 802.3.

3.2 Serial Interface Modes

The PKLR2400 provides four Serial Interface Modes with programmability within each mode allowing maximum system flexibility. These four Serial Interface Modes include three transparent modes and one API mode. The radio-to-radio protocol is identical on all three Transparent Serial Interface Modes. This allows all three Transparent Serial Interface Modes to coexist within the same network. The API Serial Interface Mode 03 is not interoperable with the Transparent Serial Interface Modes 01, 02 and 04.

3.2.1 Serial Interface Mode 01 – Transparent, Fixed Length, with Timeout

Mode 01 specifies Transparent mode with fixed length packets and active timeout. Packets will be transmitted over the RF interface when one of the following conditions occurs:
- The number of data bytes received over the interface is equal to the buffer specified by the user in EEPROM address locations 43H and 44H.
- A byte gap larger the timeout specified by the user in EEPROM location 4DH occurs.

3.2.2 Serial Interface Mode 02 – Transparent, End Character

Mode 02 specifies Transparent mode with End Character. Packets will be transmitted over the RF interface when the user-defined End Character is received by the radio over the interface. The End Character is defined by the user at EEPROM location 3EH.

3.2.3 Serial Interface Mode 03 – API

Mode 03 specifies API Mode. In this mode, the OEM has control of the radio command set detailed in Section 6.2. Packets are transmitted upon completion of the *Send_Data* command.

In API Serial Interface Mode 03, the OEM host may utilize a set of basic commands to control the radio and system. These commands allow the customer to establish system parameters through the programming of variables in EEPROM as well as monitoring system performance. **These commands can only be exercised when the radio is in API Serial Interface Mode 03**. It is important to understand two aspects of the software commands.

1. There are only three commands that are issued *from* the client radio *to* the Client Host. These three commands are *Out_of_range**, *In_range** and *Receive_data**. The *Receive_data** command is the only command issued from the Server radio to the Server Host.   It is important to note that these commands will **NOT** get an acknowledgement, they are signals to the Host to alert it to incoming data, or a change of status.

2. All remaining commands initiated by the Host *MUST* receive an acknowledge from the radio to signal completion of the assigned task. This works as flow control for the information going to the radio.

The server radio can receive data from a total of 75 different clients, but from only 8 different clients in any 30 millisecond interval. It is possible that there will be multiple *Receive_data** commands at the same time. Since there is no reply command at the completion of *Receive_data**, the Host must be capable of handling up to 8 *Receive_data** commands at one time.

Note: This means that whenever a command is initiated by the radio to the Host, the Host must be ready to accept the command and any data following the command.

Note: A full list of commands, definitions, and implementation can be found in Section 6.

3.2.4 Serial Interface Mode 04 – Transparent, Fixed Length, No Timeout

Mode 04 specifies Transparent mode with fixed length packets and no timeout. Packets will be transmitted over the RF interface when the number of data bytes received over the interface is equal to the buffer specified by the user in EEPROM address locations 43H and 44H.

3.2.5 Serial Interface Buffer

The serial interface buffer provides 8Kbytes of memory broken into four dynamic regions. In the API Serial Interface Mode 03, only one region is utilized. In the Transparent Serial Interface Modes 01, 02 and 04, a buffer region is used each time a packet release condition is met. As an example, in End Character Mode 02, if 500 bytes are transmitted followed by the specified end character, 500 bytes will be stored in the first region and the remaining 7.5Kbytes will be dynamically allocated for the next three packets. It is strongly recommended that CTS or upper layer protocol with acknowledgements be used by the OEM when operating in Transparent Serial Interface Control Modes to eliminate the following system issues:

Note: If all four buffers are filled and the OEM host continues to send data over the interface, it will be discarded by the radio. This can be eliminated if the OEM utilizes CTS.

3.3 Initialization Sequence

When operating in the three Transparent Serial Interface Modes, the initilization sequence is managed by the AeroComm protocol. In-Range commands are not issued and there is no acknowledge from the radio on data delivery unless the OEM protocol has built-in acknowledgement.

When operating in the API Serial Interface Mode 03, the following initialization sequence occurs. During the power up sequence or upon a **Reset*** command, the Clear to Send (CTS) line is set high (5V TTL logic levels). While CTS is high, initialization occurs, and when finished, CTS is put low indicating successful initialization is complete.

Note: At this point, the only command that can <u>not</u> be issued is the *Send_data** command. This command can only be issued after the *RF_enable** and *In_range** commands have been issued.

Before data communications can begin, a client radio needs to be authenticated. The client host must issue an **RF_enable*** command to activate the client radio and receive an acknowledgement from the client radio. The server radio transmits a beacon containing it's IEEE 802.3 address. Once the client radio has been activated by use of the **RF_enable*** command, it will receive the server radio IEEE 802.3 address once it is in range. Upon receiving the IEEE 802.3 server radio address, the client radio will issue an **In_range*** command to the Client Host containing the IEEE 802.3 server radio address.

The client host must receive the **In_range*** command from the client radio before the **Send_data*** command is invoked. Broadcast mode, as defined by IEEE 802.3, is supported and can be used to send data to all radios that are within range but its use should be limited because reception of the message is not guaranteed.

When the last bit of data is transferred from the Host to the radio, the Host must wait for the CTS line to transition high (meaning that the radio has found the end of the data packet) and then transition back low (meaning that the radio is ready for the next command).

*Note: If level translators are used the CTS signal will be inverted coming from the radio.

Delay for reply command

CTS from Radio

TXD LSB First From Host

Command Length Data Checksum

(1) (2)
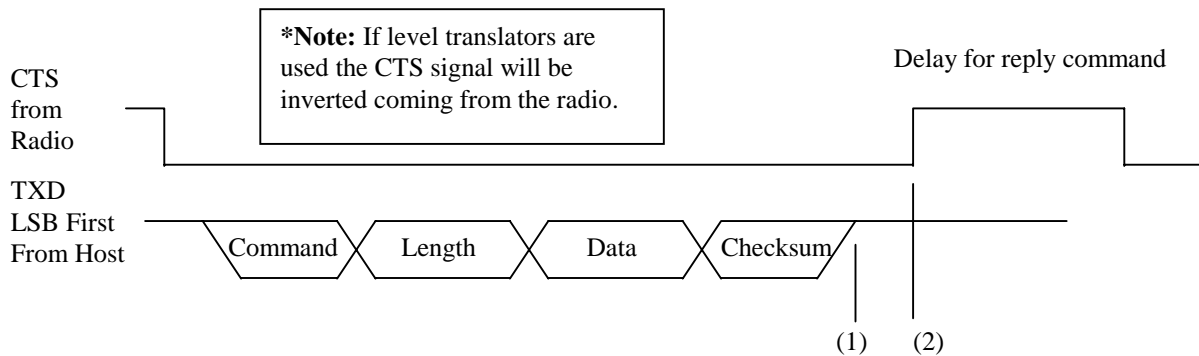
Clear To Send minimum delay of 40μs between (1) and (2) after end of data packet

Note: All serial data must be transmitted LSB first.

Note: These radios are designed to be single threaded, meaning that for every command issued, there is a reply command that signifies the completion of the command issued. There can be no interleaving of commands.

4. Hardware Interface

4.1 Mechanical Overview

The PKLR2400 measures 1.65" x 2.65". Critical parameters are as follows:

J1 – 40 pin OEM interface connector (Amp P/N 177986-1) mates with Amp P/N 177985-1

J2 – High frequency MMCX style antenna connector (Huber + Suhner P/N 85-MMCX-S50-0-51) mates with any manufacturer MMCX plug

(4) Mounting holes are 0.100" diameter.

Figure 1. Mechanical Overview of PKLR2400
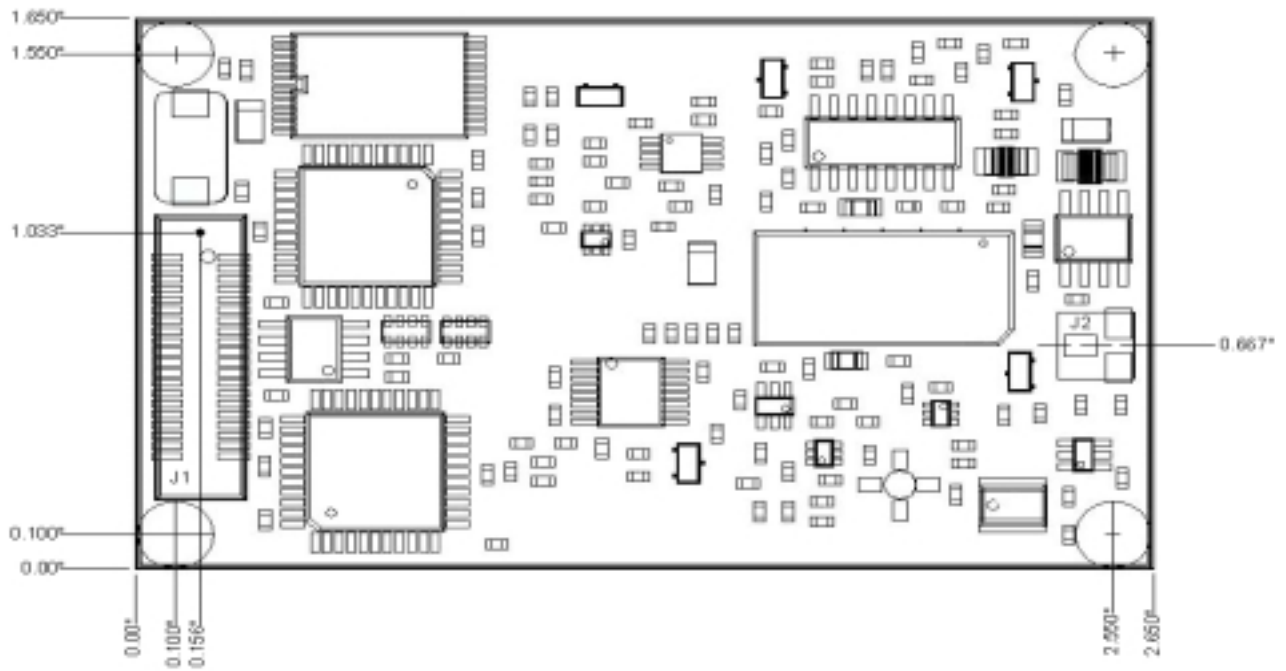
4.2 Pin Definitions for Connector J1

The following pinout summary is achieved through a 40 pin mini connector J1 (Amp P/N 177986-1).

Pin	Serial	Parallel*	Definition
1	GND	GND	Ground
2	NC	NC	No Connect
3	VCC	VCC	5V $\pm$ 5%
4	NC	NC	No Connect
5	VCC	VCC	5V $\pm$ 5%
6	NC	NC	No Connect
7	NC	NC	No Connect
8	NC	NC	No Connect
9	NC	NC	No Connect
10	NC	NC	No Connect
11	NC	NC	No Connect
12	NC	NC	No Connect
13	NC	D7	No Connect/Data 7
14	TXD	NC	Transmit/No Connect
15	NC	D6	Data 6
16	RXD	NC	Receive/No Connect
17	NC	D5	Data 5
18	NC	NC	No Connect
19	NC	D4	Data 4
20	GND	GND	Ground
21	GND	GND	Ground
22	NC	D3	No Connect/Data 3
23	CTS	DIR1	Clear To Send/Bidir Handshake 1
24	Reserved	Reserved	Reserved Processor
25	Reserved	Reserved	Reserved Crystal
26	BDSEL	STROBE'	Baud Select/Strobe Not
27	PKTMODE	DIR2	Force API Mode 03/Bidir Handshake 2
28	NC	BUSY	No Connect /BUSY
29	NC	NC	No Connect
30	NC	NC	No Connect
31	NC	NC	No Connect
32	NC	D0	No Connect/Data 0
33	NC	NC	No Connect
34	NC	D1	No Connect/Data 1
35	NC	NC	No Connect
36	DCD	D2	Data Carrier Detect/Data 2
37	E2WP	E2WP	EEPROM Write Protect
38	uP_RESET	uP_RESET	Microprocessor Reset
39	VCC	VCC	5V $\pm$ 5%
40	GND	GND	Ground

Note: The AeroComm radio provides 5Volt logic levels at the interface connector, J1
Note: DCD is not utilized.
Note: * Parallel interface not implemented at this time.

4.3 Pin Descriptions for Connector J1

Special considerations for the hardware interface at connector, J1, are described in this section. All remaining pin descriptions are standard for serial hardware interfaces.

4.3.1 No Connect

All No Connect pins 2, 4, 6-19, 22, 28-35 and 37 must not be connected to logic high or low levels, but must be left floating.

4.3.2 Vcc

All Vcc pins 3, 5 and 39 require power of 5Vdc $\pm$ 5% with ripple of less than 50mv p-p.

4.3.3 Clear To Send (CTS)

Clear To Send (CTS), pin 23, requires a minimum delay of 40µs between (1) and (2) after end of each data packet.
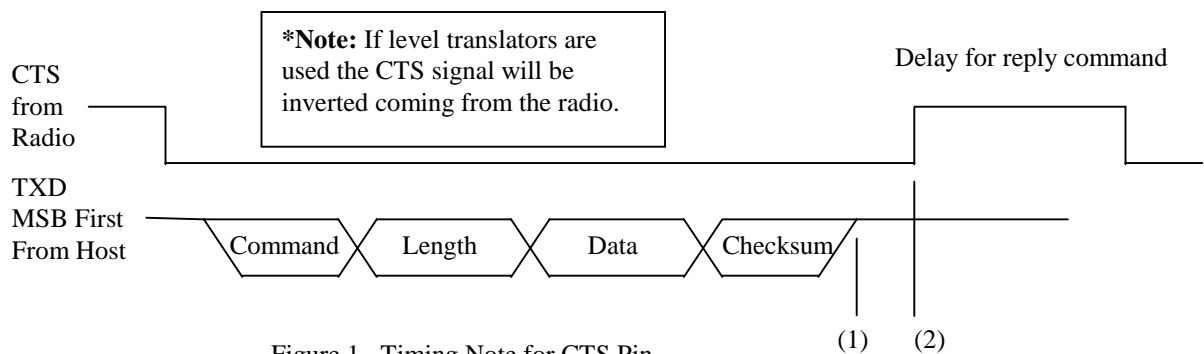
Figure 1. Timing Note for CTS Pin

4.3.4 Reserved

The reserved pins 24 and 25 are used by AeroComm for internal testing and/or future radio enhancements. These pins should be treated as No Connect pins and must not be connected to logic high or low levels, but must be left floating.

4.3.5 Baud Rate Selector (BDSEL)

The Baud Rate Selector (BDSEL), pin 26, provides the user a default method of communicating with the radio in the event the EEPROM baud rate parameters become corrupted. If pin 26 is logic high level or not connected, the baud rate will default to the variables specified in EEPROM. If pin 26 is logic low level, the baud rate will default to 9600 baud.

4.3.6 Forced API Mode 03 (PKTMODE)

Forced API Mode 03 (PKTMODE), pin 27, provides the user a method of programming the radio from any of the Transparent Serial Interface Modes to the API Serial Interface Mode. **It is required that**

the radio be in API Serial Interface Mode to execute the Command Set or to configure any of the EEPROM parameters. To force the radio into API Serial Interface Mode 03, pin 27 must be held at logic low level and the radio reset. The radio can not be placed into any of the Transparent Serial Interface Modes 01, 02 or 04 until pin 27 is held at logic high level and reset.

4.3.7 Microprocessor Reset (uP RESET)

Microprocessor Reset (uP RESET) is achieved by holding pin 38 at logic high level for a minimum of 2ms. If uP RESET is performed after power has been applied to the radio and is stable, the reset time will be significantly less. At all other times, pin 38 should be logic low level. If pin 38 is not connected, the microprocessor will hold pin 38 at logic low level.

4.3.8 EEPROM Write Protect (E2WP)

EEPROM Write Protect (EEWP) is enabled when pin 37 is at logic high level or left floating. Pin 37 must be logic low level to Write to the EEPROM.

5. Developers Kit

SDK-PKLR2400P (Parallel) and SDK-PKLR2400S (Serial) Developer Kits help system designers implement radio designs quickly. The kit offers all the cables, power supplies, circuit schematics, documentation and accessories needed to begin using the PKLR2400 quickly.

The kit includes:

- (2) PKLR2400 Data Radios either serial or parallel
- (2) Serial Adapter Boards with 40 pin interface, 40 pin header, LED indicators, power connector and DB9 connector. (SDK-PKLR2400S includes RS232 transceivers)
- (2) AC Power Adapters
- (2) DB9 to DB9 or (2) DB9 to DB25 for the SDK-PKLR2400S and SDK-PKLR2400P respectively
- Hardware and software interface specification
- (2) Antenna cables with patch antenna (monopole or dipole antenna optional)
- Software utilities
- Technical Support

5.1 Serial Adapter Board

The Serial Adapter Board allows the use of different forms of communication with the OEM radios. The user must choose between using RS-232 levels or 5 Volt TTL logic levels for interfacing with the OEM radio when using the adapter board.

Figure 2. Serial Adapter Board Assembly Drawing
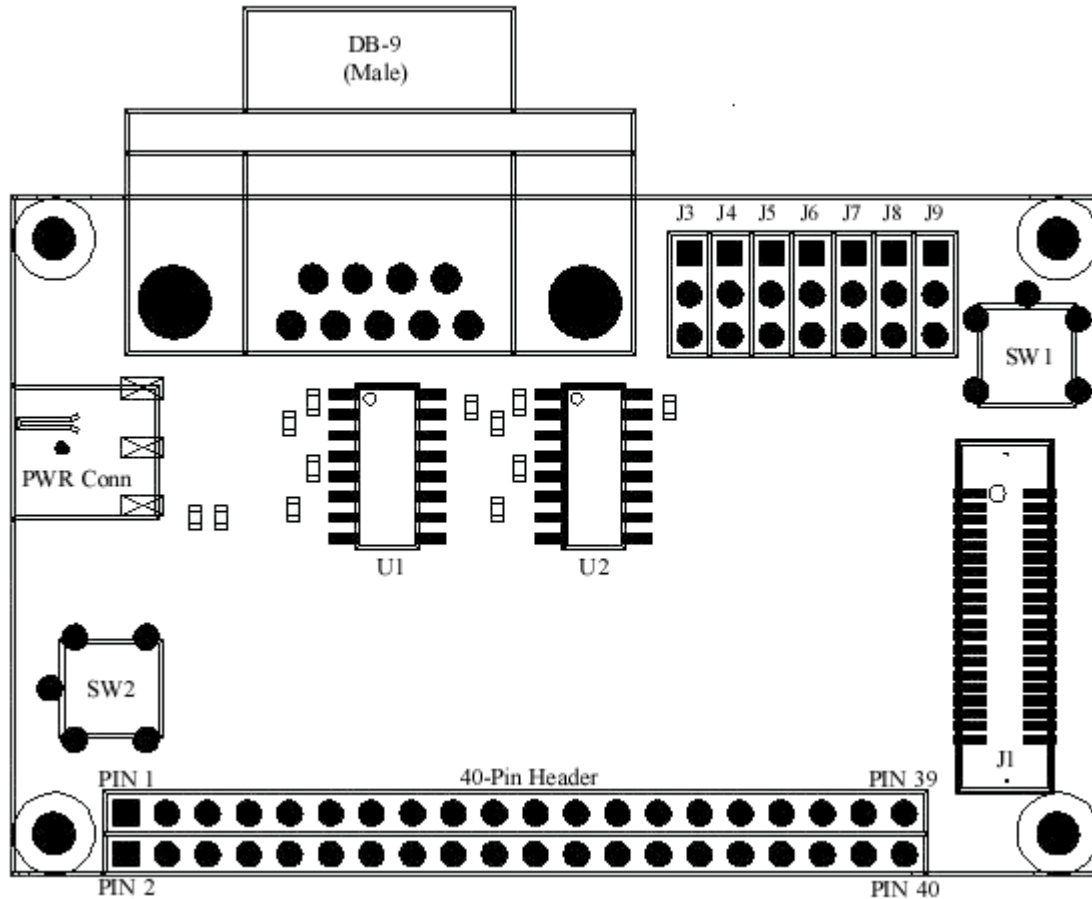
Item	Qty	Reference	Description
1	1	J1	Amp 40 Pin Connector (**177985-1)** mates directly with J1 on Radio
2	1	J2	DB9 Male connector mates with provided cable to PC or OEM Host
3	1	P1	Power Connector provides power to entire kit with provided 5Vdc PS
4	2	J10	Generic 40 Pin Dip Header 0.100 Centers for test points
5	7	J3-9	Generic 3 Pin Sip Header 0.100 Centers for level translator selection
6	2	U1-2	Max202 Voltage Level Conversion Chips
7	1	SW1	SPST Switch for Reset
8	1	SW2	EEPROM Write Enable when Depressed

NOTE: The pins on the 40 pin header strip match up 1 to 1 with the pin-out of the OEM Connector J1.

J3-J9 Level Translator Settings

If a PC will be used as the OEM server or client host, then level conversion must be enabled to convert from the RS-232 levels at the PC to the 5 Volt TTL logic levels used on the radio. To enable level conversion, place jumpers J3-J9 on pins 2 and 3, see Figure 3. If another device (0-5 volt TTL logic levels) is to act as the Host for the radio then the user must disable level conversion. To disable level conversion, place jumpers J3-J9 on pins 1 and 2 see figure 4. **If running under Windows, jumper J6 (PKTMODE/RTS) must be removed.**
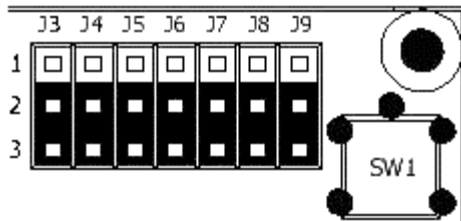
Figure 3. Level Translation Enabled   **Figure 4. Level Translation Disabled**
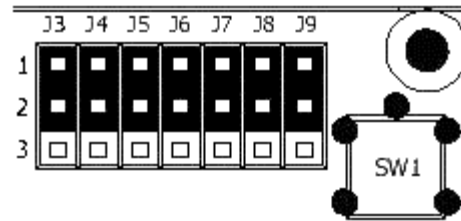
Note: If level translation is enabled it is important to note that the signal level will be inverted at the interface connector, J1, between the OEM radio and the Serial Adapter Board.

Figure 5. Jumper Definitions.

Jumper	Associated Serial Signal From DB-9
J3	RX Data
J4	TX Data
J5	Clear to Send
J6	PKTMODE/RTS
J7	NA
J8	NA
J9	DCD not used

5.1.1 Serial Adapter Board Pin Definitions

DB-9 Pin #	Signal Name (RS-232C) At DB-9 Connector	Associated Level Translation Jumper	40-pin connector to radio Pin #	40-Pin Header Strip Test Points Pin #
1	DCD not used	J9	NC	35
2	RX Data	J3	14	14
3	TX Data	J4	16	16
4	NC			
5	Ground		1,20,21,40	1,20,21,40
6	NC			
7	PKTMODE/RTS	J6	27	27
8	Clear to Send	J5	23	23
9	NC		NC	NC

5.2 Software Utilities

The developer kit includes a 3.5" diskette of software utilities allowing the customer to exercise the radios upon receipt. **The software utilities are written for a DOS environment. The software utilities will not operate properly under a DOS shell in Windows or Windows.** The software includes several files as follows:

- OEM.EXE – Interactive Command/EE Edit Software/Transmit Receive Emulator.
- *.RTC – Script files that automate radio mode setup and demonstrates operation.
- PORTS.CFG – Com port address and baud rate information
- README.TXT – Further utility software documentation and latest release notes
- OEM.CFG – Configuration file for OEM.EXE
- OEMRWSP.INI – **AeroComm Use Only**

These files are located in each of three directories as follows:
1. **OnePC** – This directory contains all the files required to run the Client and Server radios on a single PC. The Client Radio must be connected to Com1 (3F8) and the Server Radio must be connected to Com 2 (2F8)
2. **ClientPC**- This directory contains the Client Radio files that are required to run the Client Radio on one PC and the Server Radio on a separate PC. The Client Radio should be connected to Com 1 (3F8)
3. **ServerPC**- This directory contains Server Radio files that are required to run the Client Radio on one PC and the Server Radio on a separate PC. The Server Radio should be connected to Com 1 (3F8)

5.2.1 OEM.EXE

This software contains three unique utilities to exercise, monitor and setup modes in the radios. These utilities are: Transmit/Receive Emulator, Single Line Command Interface, and EEPROM Viewer/Editor.

5.2.1.1 Transmit/Receive Emulator

This software allows (1) Server and (1) Client radio to communicate with each other. The software comes pre-configured for the two radios in the development kit.

When connecting the Client and Server Radios to the same PC, connect the Server Radio to Com 2 (2F8), then connect the Client Radio to Com 1 (3F8). Copy the OnePC directory and contents to the PC.

When connecting the Client and Server Radios to separate PCs, connect the Server Radio to Com 1 (3F8) on one PC, then connect the Client Radio to Com 1 (3F8) on a separate PC. Copy the ClientPC directory and contents to the PC with the Client Radio attached. Copy the ServerPC directory and contents to the PC with the Server Radio attached.

Note: The factory default for the Client Radio and Server Radio is API Serial Interface Mode 03.

Run OEM.EXE on one or both PCs as dictated by your setup. Press the 'F3' key to perform a RESET and RF_Enable on all PCs. Press the 'F9' key to run the script files and demonstrate continuous data transfers between radios. Press the 'Esc' key to stop. Pressing the 'Esc' key again will exit from the program.

Note: The "F3" key should be used only when the radios are in API Serial Mode 03. Use "Alt R" to perform a RESET of the radios in Transparent Serial Modes 01, 02 and 04.

While running, the screen will display transmit timeouts, receive timeouts, and run number. The Emulator program is controlled by script files. The script files can be edited by the user and detailed

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instructions on how to write a script file can be found in the section below describing ***.RTC**. While in the Emulator, pressing the 'Alt' key will bring up a window with 7 choices: File, Settings, Window, Reset, Enable, Help and About. The **File** option allows the user to load a script file or execute a mode setup script to ports 1 or 2. The **Settings** option allows the user to change baud rate and other settings. The **Window** option allows the user to view the trace buffer or a list of the script commands. The **Reset** command issues a Reset command to all ports configured in **PORTS.CFG**. The **Enable** command sends a RF_Enable to all ports configured in **PORTS.CFG**.

Note: The factory default for the Client Radio and Server Radio is API Serial Interface Mode 03. Therefore, both radios must receive an RF_enable before scripts can be run.

Note: Receive commands expecting more than 16 bytes will fail in 'F10' single-step mode.

The Transmit/Receive Emulator can also be used to execute the setup scripts provided with the program. For a full list of the scripts, see the readme.txt file in the directory labeled 'Scripts' on the disk. To execute a script, press 'alt-F' and then 'Enter' to bring up a selection window. You can enter the name of the setup script to be run, or hit 'Enter' to see a list of all the available script files. It is important to note that when you hit 'Enter' it will show all the script files that are in the same directory as the executable oem.exe. Once you have a script file loaded, then you will need to depress the write protect tab on the serial adapter board while you single step ('F10') through the commands in the script. Once you have executed all the commands in the set-up script you must press the reset button on the serial adapter board before any of the changes will be implemented.

5.2.1.2 Single Line Command Interface

While in the Transmit/Receive Emulator press the 'F5' key to enter into the One Line Command Interface. The one line Command Interface allows the user to command the radios into various operation modes. The command set has already been entered. To invoke a command, scroll to the appropriate command, using the up/down arrows on the keyboard, until the appropriate command is highlighted. Press the 'F10' key to send the command to the radio. Press the 'F9' key to continuously retransmit the same command until the 'Esc' key is pressed. Press the 'F8' key to toggle between ports 1 and 2 (com1 and com2). You will see the active port and address displayed at the top of the screen

Upon successfully receiving and executing the command, the radio will send back a acknowledge displayed in the "Receive Data" window. At the end of each command sequence line, a highlighted checksum is displayed. When entering a new command, it is not necessary to enter a checksum. The program automatically calculates and enters the checksum. On exit, changes to the command interface can either be saved or ignored. Press the 'Esc' key to exit.

5.2.1.3 EEPROM Viewer/Editor

Press the 'F2' key to enter the EEPROM viewer/editor screen. To edit a value on this screen, simply move the cursor to highlight the appropriate value, type in the new value and press the 'Enter' key. To undo an edit, either press the 'Esc' key to return to the Command Interface, or press any arrow key. To update the radio with the new EEPROM values, press the 'F10' key. An EEPROM read can be performed on this page by pressing the 'F9' key.

5.2.2 *.RTC

---

*.RTC files contain all of the configuration information for OEM.EXE. *.RTC files can be modified to change timeouts, ports, and commands. *.RTC files require very specific format as detailed below:

* -- begins and ends each command sequence
T -- invoke transmit sequence over serial host/radio interface (API Mode 3)
R -- invoke receive sequence over serial host/radio interface (API Mode 3)
C -- invoke transmit sequence over serial host/radio interface (Transparent Modes 1,2,4)
S -- invoke receive sequence over serial host/radio interface (Transparent Modes 1,2,4)
D -- invoke delay
> Note: Any line beginning with a "space" character is interpreted as a comment
> Note: The first line in PING.RTC is always interpreted as a comment

Example Command Format

*T[transmit port number] [timeout]
[transmit port number] is either "1" or "2" as designated in PORTS.CFG
[timeout] is between "0000" and "9999" and is measured in milliseconds
> [Command] [Length Low] [Length High] [Data] [Checksum automatically provided]
> *

5.2.3 PORTS.CFG

Before attempting to run the executables, the user must ensure the development kit radios are attached to the two ports specified in PORTS.CFG. The default configuration for PORTS.CFG assumes that both developer kit radios are connected to the same computer.

The default baud rate in PORTS.CFG is 57600. **This should not be changed unless the EEPROM has been corrupted**. In the event of corrupted EEPROM, hit "AltS" in the OEM.EXE program to change the baud rate to 9600 and pin 26 on the interface connector, J1, of the radio must be logic low level to communicate.

Note: If the EEPROM parameters for baud rate are changed, and the radio is reset, these utilities will not communicate with the radio until pin 26 is held at logic low level and the third line of PORTS.CFG is changed to 9600.

5.2.4 Setup Scripts

AeroComm provides several scripts to allow easy setup and configuration for different modes. These setup scripts are as follows:

S1AC.RTC – Setup client radio to Mode 1 Addressed
S1AS.RTC – Setup server radio to Mode 1 Addressed
S1NC.RTC– Setup client radio to Mode 1 Non-Addressed
S1NS.RTC– Setup server radio to Mode 1 Non-Addressed
S2AC.RTC– Setup client radio to Mode 2 Addressed
S2AS.RTC– Setup server radio to Mode 2 Addressed
S2NC.RTC– Setup client radio to Mode 2 Non-Addressed
S2NS.RTC– Setup server radio to Mode 2 Non-Addressed
S4AC.RTC– Setup client radio to Mode 4 Addressed
S4AS.RTC– Setup server radio to Mode 4 Addressed
S4NC.RTC– Setup client radio to Mode 4 Non-Addressed

S4NS.RTC– Setup server radio to Mode 4 Non-Addressed
SP3CS.RTC –This file is used to configure both the client and server radio into Mode 3 Receive mode 1
        (Unicast/Broadcast).
SP3CS02.RTC – This file is used to configure both the client and server radio into Mode 3, receive mode 2
        (unicast only)
SP3CS03.RTC – This file is used to configure both the client and server radio into Mode 3, receive mode 3
        (Promiscuous)

        In general, the filenames are defined as follows: S – Setup; X – Mode (X= mode1-4); A or N – Addressed or Non-addressed; C or S – Client or Host. Example script name: S2NC.RTC, this would be the setup script to set up the client radio in Mode 2, with Non-addressed broadcast mode enabled.

        Also included are ping files which provide data to the radios so that out of the box, the radio's can be demonstrated. The included ping files are:

PINGT1B.RTC – This file is used when the radios are in Mode 1. This has big packet size just about 1K
PINGT1S.RTC – This file is used when the radios are in Mode 1. This has small packet size, < 256 Bytes
PINGT2.RTC – This file is used when the radios are in Mode 2. Has 0D as the end character
PINGT22.RTC – This file is used when the radios are in Mode 2. Has 27 as the end character.
UNICAST.RTC – This file is used when the radios are in Mode 3. As the name implies this utilizes unicast
        packet structure.
BCAST.RTC – This file is used when the radios are in Mode 3. As the name implies this utilizes broadcast
        packet structure.
JUNK.RTC – This is a junk packet with no accurate destination or source address, this is used to test
        promiscuous mode as well as can be used to prove that such a packet is disregarded in receive
        mode 1 & 2.
PINGP3B.RTC – This file is a joint packet structure to be used in Mode 1 or Mode 3. It has a broadcast
        packet followed by a unicast packet.
PINGT4B.RTC – This file is used when the radios are in Mode 4. This has a big packet size..just about 1K
PINGT4S.RTC – This file is used when the radios are in Mode 4. This has a small packet size, < 256 Bytes

5.3 Antenna Board

The developer kits are provided with (2) patch antennae mounted on a ground plane.   In addition, (2) SMA male to MMCX plug, cables are provided to interface the antenna boards to the radio. Optional antennae are available for testing. Antenna selection is instrumental to and will impact overall system performance.

5.4 Power Supply Specification

(2) power supplies are also provided to power both units in the developer kit. These supplies are rated at regulated 5Vdc and 300ma.

6. Command Set

The basic command set consists of several commands from the Host and Radio. **The command set can be used ONLY when the radio is in Serial Interface API Mode 03 determined by the EEPROM address at 4AH (See Chapter 7, Configuring the PKLR2400).** The command set is designed as follows:

Command	Length	Data	Checksum

Command -- 1 Byte. This is the actual command from the appropriate processor.
Length -- 2 Bytes. This is the total size of the remaining data for this command. The length field is in little endian format.(i.e. low byte/hi byte). This length does not include the checksum.
Data -- N Bytes. The actual data associated with the command.
Checksum -- 1 Byte. The checksum is a byte-by-byte, bitwise "EXCLUSIVE OR" of the Data block beginning after the Length.

6.1 System Command Set Summary

The System Commands allow the user to initialize the system and perform general system analysis when operating in API Serial Interface Mode 03.

Name	Command	Length	Data	Checksum
Reset*	AAH	0H	0H	AAH
Control*	86H	1 to 5 (depends of sub command)	As Required	As Required
Diagnostic Result*	87H	As Required	As Required	As Required
Standby*	88H	No yet supported		
Reset EEPROM*	89H	0H	0H	89H
Status Request*	8AH	1H	0-reset error counter 1-don't do anything	8AH
Status Reply*	8BH	14H-611H	See 5.1.16	
Update EEPROM Checksum*	8CH	0H	0H	8CH
Check EEPROM Checksum*	8DH	0H	0H	8DH
EEPROM Checksum Status*	8EH	1H	0-Checksum invalid 1-Checksum valid	8EH
Acknowledge*	As Required	0H		As Required

6.1.1 Reset*

This command is issued from the Host processor to the Radio. This command provides a software reset to the PKLR2400 Radio initializing the code at the same location as a hardware reset. This must be followed by an RF Enable.

6.1.2 Control*

The Host processor will issue this command to Write and Read EEPROM as well as for NOP.

Sub Command one byte	Description
2H*	Read EEPROM. Additional data: first two bytes specify starting address. Second two bytes specify ending address.
8H*	NOP.
9H*	Write EEPROM. Additional data first two bytes specify starting address. Second two bytes specify ending address. Remaining bytes specify data to be written. (Range 00 to 7F)

Data Frame:

86H	Length Low	0H	Data	Checksum

Note: Any additional subcommands are reserved by the system and if used may cause system operation problems.

Note: Following and *EEPROM Write* Command, the user should invoke the *Update EEPROM Checksum* command.

Note: Following the *EEPROM Write* Command, the user MUST invoke the *Reset* command before any EEPROM changes will become active.

6.1.3 Diagnostic result*

The Radio will issue this command upon completion of the diagnostic process.

Sub result one byte	Description
2H*	Read EEPROM. Additional data: first two bytes specify starting address. Second two bytes specify ending address.
8H*	NOP. Returns 6 bytes (87 02 00 08 00 8D)
9H*	Write EEPROM status. 0 - Write was successful. 1- Write failed.

Data Frame:

87H	Length Low	Length High	Data	Checksum

6.1.4 Standby* (THIS COMMAND NOT YET SUPPORTED)

This command is issued by the Host processor to put the Radio in one of two low power modes. For mode 0, the Radio should disable the radio and enter a low power state. The hop synching is the only allowed operation in this mode. For mode 1, the Radio should go into deep sleep mode. The Radio should come out of low power modes when a command is issued from the Host processor. This command requires an acknowledge.

Command: 88H
Length: 01H
Data: 0 - indicates low power mode, 1 - indicates sleep mode.

Data Frame:

88H	01H	00H	Data	Checksum

6.1.5 Reset EEPROM*

This command is sent by the OEM Host to the Radio, the result of which sets the various locations/parameters in the EEPROM to their default values. The execution of this command does NOT affect the IEEE Address and Operation Mode parameters in the EEPROM. This command returns a generic positive acknowledgment.

6.1.6 Status Request*

This command is sent by the OEM Host to the Radio to find out the various statistics associated with the RF Data Link Layer. The Radio sends back the values of the various parameters/statistics as part of the Status Reply command. 1 byte of data is supplied along with the command that determines whether the Radio resets the various Error Counters or not.

6.1.7 Status Reply*

This command will be sent by the Radio to the OEM Host in response to a Status Request command. All the different parameters pertain to the data link layer and are cumulative totals. Once this command has been sent back to the OEM Product, depending on whether the OEM Product desired an error counter variable reset, the reset operation is carried out. The different statistics and their sizes are shown below:

Name	Type	Description	Size
Radio Time	Time Counter	Incremented by 1 every 250ms. Initialized to 0 at power on or reset.	Unsigned Byte – 3 bytes, Low Byte first
Tx Failures	Error Counter	Number of times the Radio was not able to deliver a data frame to the destination	Unsigned Long - 4 bytes
Tx Retries	Error Counter	Number of times the Radio had to retry before delivering a data frame to the destination	Unsigned Long - 4 bytes
Rx Failures	Error Counter	Number of times the Radio had to throw away a received data frame because of bad CRC/checksum	Unsigned Long - 4 bytes
Rx Retries	Error Counter	Number of times data frames had to be retransmitted before a valid data frame was received	Unsigned Long - 4 bytes
Num Active Radios	Data Counter	Number of clients registered to a Server Radio. If the Radio under consideration is a Client radio, just return 0	Unsigned Byte - 1 Byte
List of Registered Radios	Identity	A list of 6 byte IEEE Addresses of all the radio devices + 3 byte time stamp + 3 byte packet count. Time stamp and packet counter are reset at power on or RESET.	12 bytes * Num Reg Client Radios

Status Reply Example

Name	Type	0 Active Radios	2 Active Radios
Radio Time	Time Counter	1 Byte – TL 1 Byte – TM 1 Byte – TH	1 Byte – TL 1 Byte – TM 1 Byte – TH
Tx Failures	Error Counter	4 Bytes	4 Bytes
Tx Retries	Error Counter	4 Bytes	4 Bytes
Rx Failures	Error Counter	4 Bytes	4 Bytes
Rx Retries	Error Counter	4 Bytes	4 Bytes
Num Active Radios	Data Counter	0	2
List of Registered Radios	Identity		6 bytes IEEE Address 3 bytes time stamp 3 bytes packet count 6 bytes IEEE Address 3 bytes time stamp 3 bytes packet count
Checksum		Actual	Actual

Data Frame:

8BH	17H	00H	Data	Checksum

6.1.8 Update EEPROM Checksum*

This command is sent by the Host to the AeroComm module to tell it to recalculate the checksum. This is typically done by the Host CPU after it has completed writing data to the EEPROM on the AeroComm module. The response to this command is an acknowledge.

6.1.9 Check EEPROM Checksum*

This command is sent by the Host CPU to the AeroComm module to validate the EEPROM checksum. This is typically done after bringing up the AeroComm module out of reset. The AeroComm module reports either a good or a bad checksum, by sending back a response called *EEPROM Checksum Status*

6.1.10 EEPROM Checksum Status*

This command is sent by the AeroComm module in response to a *Check EEPROM Checksum* command from the Host CPU. The data portion of the command indicates whether the checksum is good or bad, based on which the Host CPU takes the appropriate action.

6.1.11 Acknowledge*

Some commands in the above set have an implied positive response. The generic positive response is defined as the command sequence just received retransmitted back with a zero length.

6.2 Radio Command Set Summary

The Radio Commands allow the user to control the flow of data into and out of the radio as well as initialization of the radio in API Serial Interface Mode 03.

Name	Command	Length	Data	Checksum
RF enable*	80H	0H	0H	80H
Send Data*	81H	1 to 7f0h (includes 802.3 Header)	As required	As Required
Send Data Complete*	82H	1H	0 or 1 (see 5.1.4)	As Required
Received Data*	83H	1 to 7f0h (includes 802.3 Header)	As Required	As Required
In range*	84H	06H	IEEE address of Server Radio	As Required
Out of Range*	85H	0H	0H	85H

6.2.1 RF enable*

This command is issued from the Host processor to the Radio. The Radio must have this command issued to it prior to any RF data transfers. This is a command with no data. Typically, this command is issued to the Radio just after it has been brought out of reset. This enables the RF portion of the Radio and turns the transmitter/receiver ON. This command requires an acknowledge.

6.2.2 Send data*

This command is issued by the Host to the Radio to send a data frame. The data frame here is the actual frame that the transport/network protocol wants to send out. The data portion will be delivered to the appropriate RF device. Broadcast frames will be delivered to all registered Client Radios without a RF data link ACK. Broadcast frames are not required to reach all destinations. They are typically sent to everyone at once.

Data Frame:

81H	Length Low	Length High	Data	Checksum

Destination Address	Source Address	Data
MS Byte…LS Byte	MS Byte…LS Byte	
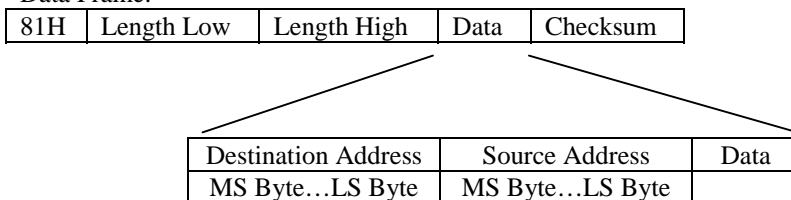
Note: The Data must include header information as follows:
  (6)Bytes for the IEEE 802.3 standard _destination_ address and
  (6)Bytes for the IEEE 802.3 standard _source_ address.
  These unique IEEE addresses are provided by AeroComm. See Section 4 for
  EEPROM location

Note: The Length must include the IEEE 802.3 Header

6.2.3 Send data complete*

The Radio will issue this command upon completion of the data transmission process, as indicated by a RF-layer Acknowledgment from the destination RF-device. An additional byte of data indicates a success or a failure code. This command must be returned for every send data command unless the device power fails.

Command: 82H
Length: 01
Data: 0 - indicates success. 1 - Can't send packet.
Checksum: As required

Data Frame:

82H	01H	00H	Data	Checksum

6.2.4 Received data*

The Radio will issue this command upon reception of data from the RF link. The information in the data frame is the received data.

Data Frame:

83h	Length Low	Length High	Data	Checksum

Destination Address	Source Address	Data
MS Byte…LS Byte	MS Byte…LS Byte	
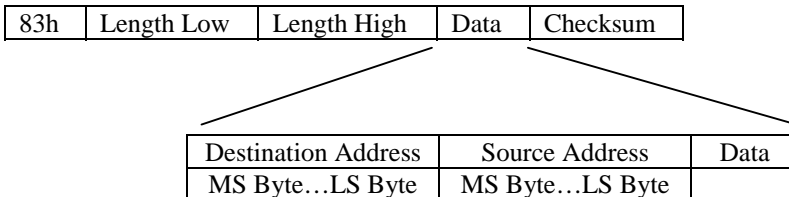
6.2.5 In range*

The Client Radio will issue this command upon detecting that it is in range of a Server Radio. This command is only valid after reset or after an out of range command has been issued. This command should have some hysterisis so that the Host processor isn't flooded with these commands in a fringe coverage area. The state of the RF link should be **updated with the frequency specified in the Protocol EEPROM Parameters, Chapter 7.2,** to provide the needed hysterisis. This command includes the Server Radio IEEE802 Address.

Data Frame:

84H	06H	00H	Data	Checksum

Server IEEE Address
MS Byte…LS Byte
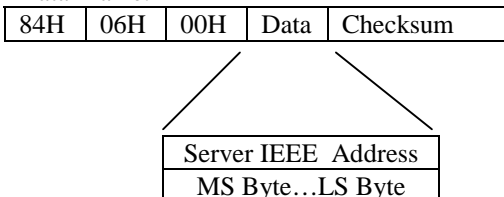
Note: This is only valid from the viewpoint of Client Radio.

6.2.6 Out of range*

The Radio will issue this command upon detecting that it is out of range of a Server Radio. This command is only valid after reset or after an in range command has been issued to the Host processor. This command should have some hysterisis so that the Host processor isn't flooded with these commands in a fringe coverage area. The state of the RF link should be **updated with the frequency specified in the configuration command** to provide the needed hysterisis.

Note: This is only valid from the viewpoint of a Client Radio.

7. Configuring the PKLR2400 Radio

The various configurable parameters are stored in the EEPROM in the Radio. These parameters are read by the AeroComm firmware on power-up reset. These parameters can be configured **by AeroComm** as AeroComm defaults or customer defaults. These parameters can also be configured **by the customer** using a PC and an AeroComm provided adapter. If the customer is writing to the EEPROM, they must use the Write EEPROM Command and enable E2WP, pin 37, or switch 2 on the serial adapter board included with the developer kit. The different configurable parameters and their respective EEPROM locations are highlighted in this chapter.

7.1 System EEPROM Parameters

The system EEPROM parameters provide general system configuration information for the radio. These parameters can be monitored and changed independent of the serial interface protocol. **These parameters can only be changed when the API Serial Interface Mode 03, described in Section 7.1, is active.**

EEPROM Address	Size	Description
0H	40 bytes	Product identifier string/Version Info
28H	6 bytes	IEEE assigned MAC Address
2EH	1 byte	Channel number; Range = 01- 75; Default = 00;
33H	1 byte	Client/Server mode 01 – Server Radio mode 02 – Client Radio mode (default)
34H	8 bytes	System ID - used to demarcate RF networks (default=00 00 00 00 00 00 00 01)
40H	1 byte	Baud High (BH) – Default is FF
41H	1 byte	Baud Low (BL) – Default is F7

7.1.1 Product Identifier String/Version Information

EEPROM Address: 0H
Size: 40 bytes

Useful for OEM to read AeroComm version information. This information should not be overwritten by the OEM. Original information is restored when a **RESET EEPROM** command is issued.

7.1.2 IEEE assigned MAC Address

EEPROM Address: 28H
Size: 6 bytes

This is the unique, 6-byte, IEEE 802.3 ethernet address assigned by AeroComm to each radio. This unique address should not be changed.

7.1.3 Channel Number

EEPROM Address: 2EH
Size: 1 byte
Default: 00
Range: 01-75

This provides 75 unique and non-interfering pseudorandom hopping sequences or channels. This allows for up-to 75 independent, co-located data networks. Default shipped at 00. It is highly recommended that this be changed to a channel number other than 00.

Note: Channel Number AND System ID between clients and server must be identical for radios to communicate.

7.1.4 Client/Server Mode

EEPROM Address: 33H
Size: 1 byte
Default: 02
Range: 01-02

Specifies whether the radio is operating in the Client Mode (02) or Server Mode (01)

7.1.5 System ID

EEPROM Address: 31H
Size: 8 bytes
Default: 00 00 00 00 00 00 00 01
Range: 00 00 00 00 00 00 00 00 to FF FF FF FF FF FF FF FF

Note: Channel Number AND System ID between clients and server must be identical for radios to communicate.

7.1.6 Baud High (BH) and Baud Low (BL)

EEPROM Address: 40H and 41H respectively
Size: 1 bytes
Default: FF for BH and F1 for BL
Range: 00-FF for BH and BL

      Baud High (BH) along with Baud Low (BL) is used to establish the data rate over the interface between the OEM radio and host as follows:

Sample BHBL selections for common Baud Rates
(Using a 28.224 MHz Crystal)

Baud Rate	BH	BL
300	F4	84
2,400	FE	91
4,800	FF	48
9,600	FF	A4
19,200	FF	D2
28,800	FF	E1
57,600 (default)	FF	F1
115,200	Not Supported	Not Supported

Custom baud rates can be obtained through the use of the following formula:

$$\text{BAUD RATE} = \frac{28.224 * 10^6}{32.0 * (65,536 - BH,BL)}$$

Note: The calculated value must be within 3% of the actual value.

7.2 Protocol EEPROM Parameters

The protocol EEPROM parameters are related to the Serial Mode interface selection. A summary of the required EEPROM settings is illustrated in Section 7.3**.**

Note: These parameters can only be changed when the API Serial Interface Mode 03 is active. When in Transparent Serial Interface Modes, this can be accomplished by holding pin 27, PKTMODE, low and resetting.

Note: When writing to EEPROM using the developer kit, remember to hold the EEPROM write protect switch during the write command.

EEPROM Address	Size	Description
2FH	1 byte	Transmit data link attempts; Range = 01 - FF; Default = 10H;
31H	1 byte	Receive mode - determines what type of data frames are received by the OEM Product, based on MAC address of received frame 01 - unicast/broadcast data (default) 02 - unicast only 03 - all (promiscuous mode)
32H	1 byte	In-Range, Out-of-Range Refresh. This byte specifies the number of 250 ms ticks between range indications. This gives a range of .05 seconds to 12.5 seconds.
3EH	1 byte	End Character Definition. This byte specifies the character that will be used to signify the end of a packet.
43H	1 byte	Fixed Packet Length HIGH BYTE
44H	1 byte	Fixed Packet Length LOW BYTE
4AH	1 byte	Serial Interface Modes 01 – Transparent, Fixed Length, with Timeout 02 – Transparent, End Character 03 – API 04 – Transparent, Fixed Length, No Timeout
4BH	1 byte	Destination Address Control 00 – Addressed Mode: Destination address is the IEEE 6 bytes at 50H. This mode utilized RF-Layer acknowledges to guarantee delivery of the packet. 01 – Broadcast Mode: No RF-Layer acknowledge, must set Attempts (2FH) to 01.
4DH	1 byte	Interface Timeout Control 00 – 4 mS 40 – 40 mS 80 – 300 mS C0 – 2.6 S
4EH	1 byte	Broadcast Attempts; Range 01-FF; Default 04

7.2.1 Transmit Data Link Attempts

EEPROM Address: 2FH
Size: 1 byte
Default: 10H
Range: 01-FF

      This parameter specifies the maximum number of attempts over the RF interface. Serial Interface mode 03 will respond with a Send Data Failure when maximum Data Link attempts is achieved. All other modes will not receive an acknowledge.

Note: Transmit Data Link Attempts must be set to 01 when operating in the Broadcast Mode of the Address Transparent Control.

7.2.2 Receive mode

EEPROM Address: 31H
Size: 1 byte
Default: 01
Range: 01-03

      This parameter applies only to API Serial Interface Mode 03. The default, 01, specifies Unicast/Broadcast. Unicast will receive all packets that match the receiving unit IEEE assigned address. Broadcast is achieved by placing FF in all six bytes of the IEEE assigned destination address sent from sender. In Broadcast mode, the receiver will accept all data with a destination address that has FF in all six bytes. **It is important to note that there is no RF acknowledge on Broadcast packets**. Mode 01 will accept Unicast and Broadcast data packets and discard all others. In Unicast only mode, 02, The receiving radio will receive only Unicast packets and discard all others. In Promiscuous mode, 03, the receiving radio will accept all packets with the same System ID.

Note: The Receive Mode must be set to 03 in all Transparent Serial Interface Modes including 01, 02 and 04 at EEPROM location 4AH.

7.2.3 In-Range, Out-of-Range Refresh

EEPROM Address: 32H
Size: 1 byte
Default: 14H
Range: 01-FF

      This parameter is used only when the radio is operating in API Serial Interface Mode 03. The In-Range, Out-of-Range Refresh parameter allows the user to select the interval between which the client radio searches for Server beacon that includes the Server IEEE source address. This parameter is very useful when operating in a fringe condition to minimize the In-Range and Out-of-Range commands that may flood the host. AeroComm has established a default value of 5 seconds through extensive testing.

7.2.4 End Character Definition

EEPROM Address: 3EH
Size: 1 bytes
Default: 0D
Range: 00-FF

       This parameter is used only when the radio is operated in Serial Interface Mode 02 specified by EEPROM address 4AH. Otherwise, this parameter is ignored by the system. The parameter specified by the user will indicate the last character in a data packet. When this end character is seen by the radio, the packet will be transmitted. **The packet length including the end character can not exceed 2Kbytes.**

7.2.5 Fixed Packet Length High Byte/Low Byte

EEPROM Address: 43H/44H
Size: 1 byte each
Default: 01/00
Range: 00/01 to 07/FFH

       This parameter is active only when the radio is in Serial Interface Modes 01 or 04 specified by EEPROM address 4AH. This parameter is ignored in all other modes. **The fixed packet length can not exceed 2Kbytes or it will not be received.**

7.2.6 Serial Interface Modes

EEPROM Address: 4AH
Size: 1 bytes
Default: 03
Range: 01-04

       There are four Serial Interface Modes for the OEM radio including one packet mode and three transparent modes. All modes are differentiated by the definition of when data will be transmitted by the radio.

       Mode 01 specifies Transparent mode with fixed length packets and active timeout. Packets will be transmitted over the RF interface when one of the following conditions occurs:
- The number of data bytes received over the interface is equal to the buffer specified by the user in EEPROM address locations 43H and 44H.
- A byte gap larger the timeout specified by the user in EEPROM location 4DH occurs.

       Mode 02 specifies Transparent mode with End Character. Packets will be transmitted over the RF interface when the user-defined End Character is received by the radio over the interface. The End Character is defined by the user at EEPROM location 3EH.

       Mode 03 specifies API Mode. In this mode, the OEM has control of the radio command set detailed in Section 6.2. Packets are buffered and transmitted at the direction of the OEM.

Mode 04 specifies Transparent mode with fixed length packets and no timeout. Packets will be transmitted over the RF interface when the number of data bytes received over the interface is equal to the buffer specified by the user in EEPROM address locations 43H and 44H.

Note: EEPROM parameters can not be programmed once the radios are programmed and reset in any of the Transparent modes 01, 02 or 04. The radio must be programmed to API mode 03 to access EEPROM parameters. This can only be accomplished by holding pin 27 low during and after reset.

7.2.7 Destination Address Control

EEPROM Address: 4BH
Size: 1 bytes
Default: 00
Range: 00-01

This parameter sets the destination address for **Transparent Serial Interface modes only**. The API Serial Interface Mode 03 utilizes the Receive Mode at EEPROM address 31H to specify address modes. With Destination Address Control set at the default, 00, the radio will determine if the six byte IEEE address at 50H matches. If the destination address matches, the data packet is forwarded to the OEM host. Otherwise the data is discarded. This addressed mode guarantees delivery of the data packet over the radio link by using aknowledgements.

With Destination Address Control set to Broadcast Mode, 01, clients will receive all data packets. There are no acknowledgements and no data packet retries in this mode.

Client radios can operate in Destination Address Control Mode 00, providing more reliable delivery of data to the Server radio. At the same time, the Server radio can operate in Destination Control Mode 01, acting as a broadcasting server without guaranteed delivery. This provides a unique method of implementing a data network of many-to-one or one-to-many.

7.2.8 Interface Timeout Control

EEPROM Address: 4DH
Size: 1 bytes
Default: 00H
Range: 00, 40, 80 or C0

The Timeout parameter applies only to the Transparent Serial Interface Mode 01 with fixed length packets and timeout. This parameter specifies the amount of time between bytes that the radio will wait before transmitting the data packet.

7.2.9 Broadcast Attempts

EEPROM Address: 4EH
Size: 1 bytes
Default: 04H
Range: 01-FF

The Broadcast Attempt parameter applies only to the Broadcast modes for all four serial packet modes and specifies the number of times that the RF will broadcast every packet. The receiving radio will discard duplicate packets.

7.3 EEPROM Parameter Summary

EEPROM PARAMETERS
BY
SERIAL INTERFACE MODES

Address	Description	A	B	C	D	E	F	G	H	I
4AH	Serial Interface Mode	01	01	02	02	03	03	03	04	04
2FH	Transmit Attempts	01-FF	01	01-FF	01	01-FF	01-FF	01-FF	01-FF	01
31H	Receive Mode	03	03	03	03	01	02	03	03	03
32H	Range Refresh	NA	NA	NA	NA	01-FF	01-FF	NA	NA	NA
3EH	End Char Definition	NA	NA	00-FF	00-FF	NA	NA	NA	NA	NA
43H	Fixed Pkt Length-HB	01-07	01-07	NA	NA	NA	NA	NA	01-07	01-07
44H	Fixed Pkt Length-LB	00-FF	00-FF	NA	NA	NA	NA	NA	00-FF	00-FF
4BH	Dest Address Control	00	01	00	01	NA	NA	NA	00	01
4DH	Interface Timeout	Table	Table	NA	NA	NA	NA	NA	NA	NA

Mode Definitions

A. Mode 01 – Transparent, Fixed Length Packet, Timeout, **Addressed**
B. Mode 01 – Transparent, Fixed Length Packet, Timeout, **Broadcast**
C. Mode 02 – Transparent, End Character, **Addressed**
D. Mode 02 – Transparent, End Character, **Broadcast**
E. Mode 03 – API, **Unicast/Broadcast**
F. Mode 03 – API, **Unicast Only**
G. Mode 03 – Packet, **Promiscuous**
H. Mode 04 – Transparent, Fixed Length, No Timeout, **Addressed**
I. Mode 04 – Transparent, Fixed Length, No Timeout, **Broadcast**

8. Initializing the PKLR2400 Radio

Following is an example of the initialization sequence for both the Client and Server Radios following AeroComm or customer configuration of the EEPROM configuration parameters. This occurs only in the API Serial Interface Mode 03.

```
┌─────────────────────────┐
│      Apply Power         │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Wait for CTS logic low (if 5V) │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Host issues RF enable command │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│  Host awaits Acknowledge │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Host reads EEPROM for IEEE │
│      source address      │
└─────────────────────────┘
```

Client Radio

```
┌─────────────────────────┐
│ Await Server Radio Beacon with │
│  IEEE Server Radio address │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Client Radio issues In range │
│ command to Host with Server │
│     Radio address        │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Client Radio can now transmit or │
│      receive data        │
└─────────────────────────┘
```

Server Radio

```
┌─────────────────────────┐
│ Issue Server Radio beacon every │
│ 5ms – 500ms with IEEE Server │
│     Radio address        │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Server Radio can now transmit or │
│      receive data        │
└─────────────────────────┘
```