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User's Guide

for the

PerComm OMNIDATA Telemetry Device - PT1005A (DRAFT)

Document Change Record

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1 INTRODUCTION

1.1 Document Identification

"User's Guide for the PerComm OMNIDATA Telemetry Device - PT1005A (DRAFT)", Document Number 9400.01484-USG01.

1.2 Document Overview

This document is intended for a technical audience installing or operating the PerComm OMNIDATA Telemetry Device (model number PT1005A).

This document is organized as follows:

- Chapter 1 provides an overview of this User's Guide.

- Chapter 2 provides an overview of the OMNIDATA device.

- Chapter 3 provides the technical specifications of the OMNIDATA device.

- Chapter 4 provides procedures and guidelines for the installation and operation of the OMNIDATA device.

This document has been carefully reviewed for accuracy. However, no responsibility is assumed for any inaccuracies. The information in this document and the products described in this document are subject to change at any time and from time to time without notice.

1.3 Contact Information

Any questions or comments regarding this manual or the PerComm OMNIDATA Telemetry Device can be addressed to one of the following:

> **PerComm Customer Service**
> Phone: 888-PERCOMM
> Phone: 781-860-7700
> Email: CS@Percomm.com

> **PerComm Technical Support**
> Phone: 866-619-4992
> Email: Tech@Percomm.com

> **PerComm Web Site**
> http://www.percomm.com/contact

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1.5   Safety and Limitations

The installation and operation of the products described in this document may present unsafe conditions that may result in equipment damage, personal injury or death. Read all instructions before using the products described. The procedures described should be performed by qualified personnel only. Follow all safety guidelines including reasonable judgment. Do not proceed if there is any doubt regarding procedures, contact PerComm Technical support (see Section 1.3).

The products are not designed, manufactured or intended for use in hazardous environments requiring fail-safe or mission-critical performance, such as in the operation of nuclear facilities, aircraft navigation or aircraft communication systems, medical situations, or military, defense or weapons environments, or by end users in any such areas.

The products should not be used on board an aircraft. The products should not be used near to any medical devices including pacemakers and hearing aids. The products should not be used in any potentially explosive atmospheres. The products should not be used near any blasting areas.

Failure to follow safety guidelines could result in equipment damage, personal injury or death.

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1.6   RF Exposure Information

READ THIS INFORMATION BEFORE INSTALLING THE TELEMETRY DEVICE

The OMNIDATA device contains a transmitter and a receiver. When it is turned on, it receives and it may transmit radio frequency energy in the 900MHz band. During transmission, the output power level at the antenna port varies over a range from 0.125 to 1 watt. The paging carrier service provider controls the output power level.

The antenna used for this transmitter must be fixed mounted in a permanent structure providing a separation distance of at least 20 cm from all persons during normal operation. The OMNIDATA is provided without an external antenna. PerComm used the Larsen quarter-wave dipole antenna model SPWH20918 with a 4-inchx4-inch metallic ground plane during measurements for FCC certification. If another antenna is used its maximum gain should not exceed the theoretical dipole gain of 2.15dBi.
The maximum radiated output power of the antenna satisfies the maximum permissible exposure (MPE) limits as specified in §1.1310 of FCC regulations for general population/uncontrolled exposure as long as the minimum separation distance of 20cm between the radiating element and the person is maintained and the maximum gain is less than 2.15dBi.

1.7   References

Refer to Table 1 for a list of referenced documents.

Table 1: Reference Documents

Document Reference	Document Title	Document Number
[1]	ReFLEX Protocol Specification Document – Version 2.7.1.1	Motorola 68P81139B02-B
[2]	HCI Interface Specification	PerComm 9400.01484-IRS01
[3]	Communication Linking Protocol (CLP™) Serial Interface – Reference Manual – ReFLEX 25 and 50 Technology	Motorola 6881033B20
[4]	FLEXsuite of Enabling Protocols Specification Document – Version 2.1.1	Motorola 6881139B10

2   OMNIDATA OVERVIEW

2.1   Introduction

The PerComm OMNIDATA Telemetry Device is a device designed for wireless two-way communication on a ReFLEX network. The main conceptual features of the OMNIDATA device are described below.

2.2   Physical Features

The OMNIDATA device is built on a single PCB containing both baseband and RF sections. Please refer to Section 3.5 for mechanical specifications of the OMNIDATA device.

The physical interfaces (connectors) are described in Table 2.

Table 2: OMNIDATA Connectors

Connector	Use	Connector Description	Manufacturer	Manufacture Part Number
P2	Host and power interface.	10-pin (2x5) 2mm pitch milligrid shrouded SMT header. Refer to Table 5 and Figure 1 for the pin out definition.	MOLEX	87332-1020
J2	Over-the-air interface.	End launch jack receptacle - surface mount female SMA connector.	Johnson Components	142-0721-882

Operation of the OMNIDATA device requires the following user supplied components:

- Power supply and associated cabling.

- Host and associated cabling.

- Antenna and associated cabling.

- Physical mounting.

The following crimp connector and ribbon cable may be used to mate with P2:

- Cable Crimp Connector: 2.00mm (0.79") Pitch Milli-Grid Cable-to-Board Receptacle Dual Row, IDT. MOLEX 87568-1071.

- Ribbon Cable: 1.0mm Round Conductor Flat Cable, 10 Contacts, 28 AWG Stranded, PVC. 3M 3625/10.

2.3 Over-The-Air Interface

The OMNIDATA device provides an over-the-air interface via connector J2. J2 is a female SMA connector for an appropriate 50 ohm antenna. The antenna is an external component and is not an integral part of the device.

The OMNIDATA device receives on the *forward* channel (929-932, 935-941 MHz). The OMNIDATA device transmits on the *reverse* channel (896-902 MHz). The receiver and transmitter are driven by a ReFLEX 2.7.1.1 protocol stack.

2.4 ReFLEX 2.7.1.1 Protocol Stack

The OMNIDATA device features a ReFLEX 2.7.1.1 protocol stack. The protocol stack contains all functionality required to register and operate on the ReFLEX network. Note however, that not all features and capabilities of the ReFLEX 2.7.1.1 protocol are necessarily implemented.

The protocol stack is also compatible with ReFLEX 25 networks.

2.5 Host Interface

The OMNIDATA device provides a host interface via connector P2. The host itself is an external entity and is not considered an integral part of the device.

The host interface allows a host to perform the following functions:

- Sending ReFLEX messages through the OMNIDATA device.
- Receiving ReFLEX messages through the OMNIDATA device.
- Monitoring the OMNIDATA device.
- Controlling the OMNIDATA device.
- Configuring the OMNIDATA device.
- Updating the embedded software in the OMNIDATA device.

The OMNIDATA device supports multiple host interface protocols including HCI [2] and CLP [3].

2.6 FLEXsuite Encoder

FLEXsuite [4] is a set of protocols used to encode messages on ReFLEX networks. The OMNIDATA device provides a built in FLEXsuite UAR encoder when using the HCI host interface protocol.

Alternatively, the host can also perform its own FLEXsuite encoding.

2.7 Configurable Database

The OMNIDATA device contains a FLASH based database of critical parameters. The database has been configured by your service provider. Please contact your service provider for any questions regarding the device configuration.

2.8   Embedded Software

Many of the OMNIDATA features including the ReFLEX protocol stack are implemented in the device's embedded software. The device has been programmed with the most up-to-date software at the time of manufacture. Please contact your service provider for any questions regarding updated software.

2.9   Power Input

Power is provided to the OMNIDATA device via connector P2. Refer to Section 3.3 for the P2 connector pin out. Refer to Section 3.4 for power supply requirements.

3   SPECIFICATIONS

3.1   Introduction

This chapter provides technical specifications of the PerComm OMNIDATA Telemetry Device (model number PT1005A).

3.2   Product Specification

Please refer to Table 3 for a summary of the OMNIDATA device's general specifications.

Table 3: PerComm OMNIDATA Telemetry Device General Specifications

Specification	Min	Typical	Max	Notes
Radio Protocol	ReFLEX 2.7.1.1			
Weight			50 g	
Temperature	-30°C		75°C	Operating
	-30°C		80°C	Storage
Vibration	0.5G from 5 to 500 Hz continuous sine-wave vibration frequencies.			
Input Voltage	5VDC		16VDC	Refer to Section 3.4 for detailed requirements
Transmit Duty Cycle			10%	
Current Consumption		15 mA		Idle
		68 mA		Receive (average)
		1A		Transmit
Humidity	10%		95%	Non-condensing
Physical	3.74″ x 1.74″ (95mm x 44.2 mm)			

3.3   Connector Specifications

Please refer to Table 4 for the antenna port specification (J2).

Table 4: J2 Antenna Port Specification

Specification	Description
Connector	Female SMA
Impedance	50 ohms

Please refer to Table 5 and Figure 1 for the host and power connector specification (P2).

Table 5: P2 Header Specification

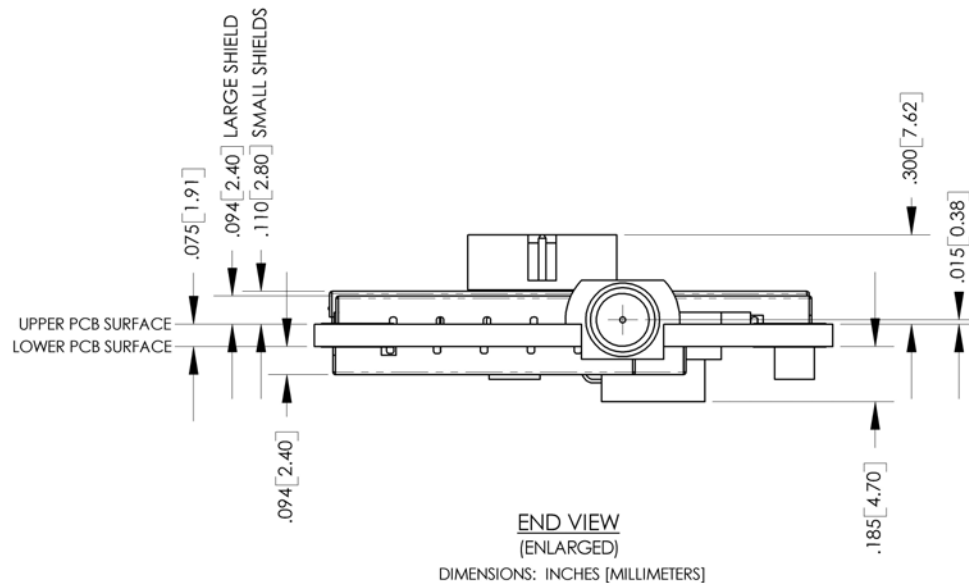| Specification	Signal Name[1]	Electrical Specification[2]	Type[3]
Pin 1	Power_In	Refer to Section 3.4.	Power
Pin 2	Ground	Ground	Power
Pin 3	Power_In	Refer to Section 3.4.	Power
Pin 4	Ground	Ground	Power
Pin 5	Tx_Data	LVTTL	Output
Pin 6	Rx_Data	LVTTL	Input
Pin 7	N/C	N/C	N/A
Pin 8	N/C	N/C	N/A
Pin 9	Ground	Ground	N/A
Pin 10	Reset*	LVTTL	Input
Notes			
Note 1	An asterisk (*) suffix indicates an active low signal.		
Note 2	N/C indicates that no connection should be made to this pin.		
Note 3	Direction is referenced to the OMNIDATA point of view.		

Figure 1: Header Pin Out (Top View)

Power_In	1	2	Ground
Power_In	3	4	Ground
Tx_Data	5	6	Rx_Data
N/C	7	8	N/C
Ground	9	10	Reset*
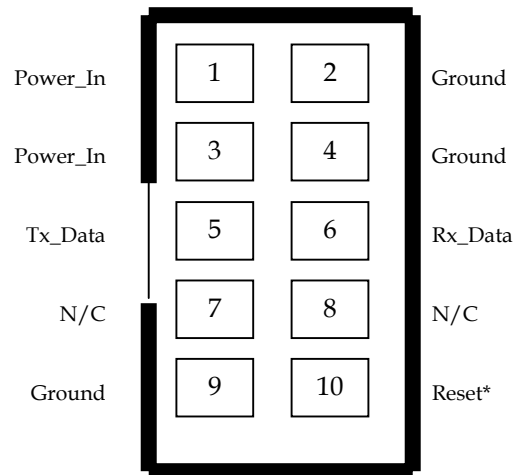
3.4　Power Supply Requirements

The power supply should provide 5-16VDC. The power supply should be well regulated and able to deliver 1.1A without dropping below 4.75V. The admissible ripple on the DC power lines is less than 50mV from 0Hz to 10MHz.

3.5　Mechanical Specifications

Please refer to Figure 2 and Figure 3 for mechanical specifications of the OMNIDATA device.

Figure 2: OMNIDATA Mechanical Drawing – Top View

TOP VIEW
DIMENSIONS: INCHES [MILLIMETERS]
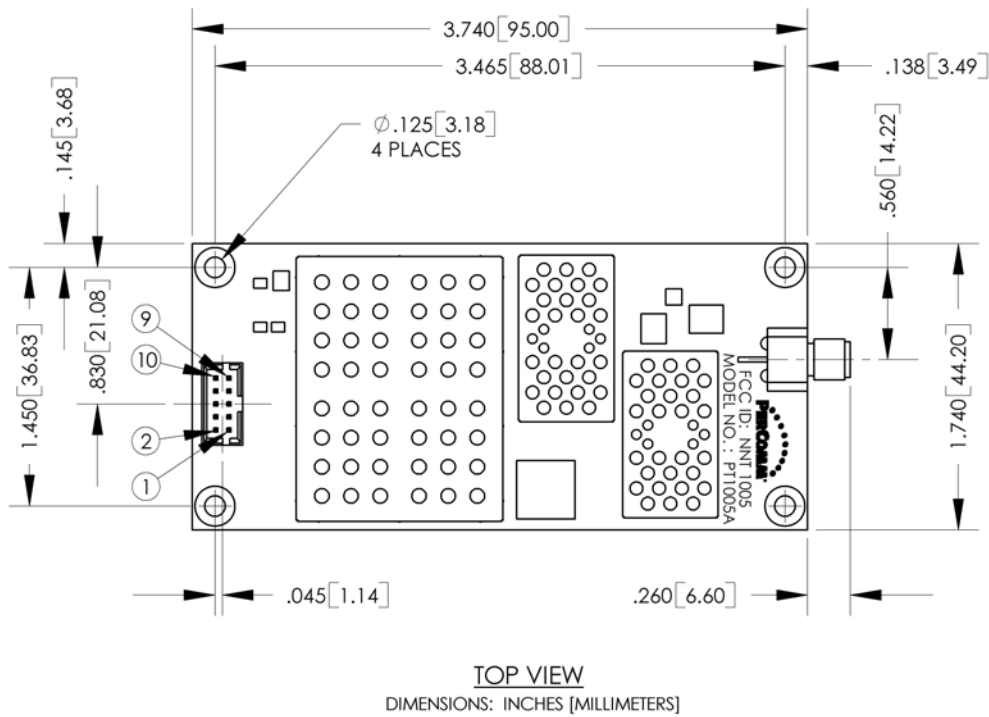
Figure 3: OMNIDATA Mechanical Drawing - End View

END VIEW
(ENLARGED)
DIMENSIONS: INCHES [MILLIMETERS]

4   INSTALLATION AND OPERATION

4.1   Introduction

This chapter provides guidelines and procedures for correct installation and operation of the PerComm OMNIDATA Telemetry Device.

4.2   Installation Setting

The installation setting must observe the guidelines listed below. Failure to comply with these guidelines may cause the OMNIDATA device to operate improperly.

- The external antenna must be mounted in a location such that no person will ever come within 8 inches of the antenna. This is required to comply with FCC RF hazard regulations.

- The antenna must be installed in such a way that the main radiation pattern generates vertical polarization. The antenna must conform to guidelines given in Section 4.5.

- The device should be installed far from any switch mode power supply or digital switching circuitry.

- The power supply should conform to requirements identified in Section 3.4.

- The device should not be subject to permanent vibrations.

- The device should not be subject to high magnetic fields.

- The device should be mounted in such a way that it makes no contact, or it is not very close to any metallic object even if that object is connected to the ground. There should be no other electrical contact to anything other than the antenna and the flat cable for the power supply and host interface.

4.3   Installation Procedure

Follow the procedure outlined below to install the OMNIDATA device.

1. **Install the External Antenna**
    a. The external antenna assembly consists of the following:
        i. Larsen quarter wave antenna – part number SPWH20918
        ii. Pasternack Enterprises (PE) SMA male to SMA female bulkhead cable – part number PE3956-60
        iii. 4″ x 4″ ground plane, aluminum or brass, 0.063 inches thick
    b. Select a high, horizontal mounting surface for optimal performance. The mounting surface must be no thicker than 1/8″ (3mm) or problems with the connector assembly may result.
    c. Drill a 0.25 inch diameter hole in the mounting surface and the ground

plane.

d. Insert the SMA female bulkhead end of the PE cable through the hole from below.

e. Secure the PE cable to the mounting surface and the ground plane with a lockwasher and nut (supplied with the cable). Tighten the nut firmly enough to solidly fix the connector, but take care not to overtighten.

f. Screw the Larsen antenna to the SMA female end of the cable just installed. Firmly finger tighten. Do not attempt to use any tools to tighten

2. **Install the OMNIDATA Device**

a. The OMNIDATA device consists of a single printed circuit board assembly.

b. Install the OMNIDATA device using appropriate standoffs (e.g. Richco part number LMSP-4-01).

c. Ensure that sufficient space is available to connect the antenna cabling, host cabling and power supply cabling. Mechanical drawings of the OMNIDATA device are shown in Section 3.5 to assist in this process.

d. Attach the SMA male end of the cable installed in step 1 above, to the SMA female connector on the OMNIDATA device. Tighten the SMA connector to 8-10 inch-pounds of torque. Over tightening can damage the connector and reduce the performance of the OMNIDATA device.

3. **Install the Host and Power Supply**

a. Install the host and power supply. The host must conform to the following guidelines:

   i.   The host supports the pin out specified in Table 5.

   ii. The power supply must conform to the specifications identified in Section 2.9.

   iii. The host implements a supported host interface protocol (HCI [2] or CLP [3].) Contact your service provider to determine which protocol is enabled on your OMNIDATA device.

b. Connect the host and power supply to the OMNIDATA device's host interface header.

4. **Turn on the Power Supply**

a. Follow the instructions in Section 4.4.

4.4   Power-On Procedure

After power has been applied, follow the instructions listed here to verify operation of the OMNIDATA device. Please refer to the appropriate host interface protocol document (HCI [2] or CLP [3]) to determine how to execute these instructions.

1. Query the OMNIDATA device with the host. Verify that the host is able to communicate with the OMNIDATA device.

2. Periodically poll the OMNIDATA device until the device has registered on the ReFLEX network for full two-way service.

3. Use the host and OMNIDATA device to send a message to the PIN or email address associated with the OMNIDATA device being used. Verify that the message is successfully accepted by the ReFLEX network. Verify that the message is successfully received by the OMNIDATA device.

4.5   External Antenna Impedance

The OMNIDATA transmitter was designed for a 50 ohms external antenna. The same antenna is used for transmit and receive, hence the antenna has to work from 901MHz to 941MHz.

It is possible to connect the external antenna directly to the device or through a coaxial cable. The external antenna should be mounted close enough to the OMNIDATA unit to limit the length of the cable and the losses in it. The external antenna assembly must have a standard male SMA connector.

If the load presented by the external antenna assembly at the SMA port is not 50 ohms, the output power of the transmitter and the DC current consumption during transmit time may vary from theirs nominal values. The VSWR of the external antenna assembly in the transmit band 901 to 902 MHz should be less than 1.7. If the VSWR is greater than 1.7 the transmitter might be permanently damaged. The solution is to have the antenna re-matched or to impose restrictions on the length of the cable between the external antenna and the unit. Please contact PerComm for further details.