

simoco



PULSE AIR DATA MODEM

USER and INSTALLATION MANUAL

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PREFACE

DECLARATION

This User and Installation Manual covers the Pulse Air Data Modem.

Any performance figures quoted are subject to normal manufacturing and service tolerances. The right is reserved to alter the equipment described in this manual in the light of future technical development.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE.

The manufacturer is not responsible for any radio or television interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

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DOCUMENT HISTORY

Issue	Date	Comments
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RELATED DOCUMENTS

1. **TNM-M-E-0033. SDP600 Series DMR Portable Radio Transceiver – Service Manual.**
2. **TNM-U-E-0112_SDMT User Manual.**

To order printed copies of this or any of the above publications, please contact Simoco. See the Support page for contact information.

A comprehensive list of documentation is available for download on the Simoco website <http://www.simocogroup.com> via the Partner Portal.

TABLE OF CONTENTS

	Page
Title Page	1
Preface	2
Table of Contents (this list)	4
List of Figures	5
List of Tables	5
PERSONAL SAFETY	6
EQUIPMENT SAFETY	9
WEEE Notice	10
Simoco Support	11
Abbreviations	13
1 INTRODUCTION	14
1.1 SIMOCO PULSE AIR DATA MODEM	14
1.2 SPECIFICATIONS	14
1.2.1 General	14
1.2.2 Transmitter	15
1.2.3 Receiver	15
1.2.4 Environmental	15
2 DESCRIPTION	16
2.1 LED INDICATIONS	16
2.2 CONNECTIONS	17
2.2.1 Antenna Connection	17
2.2.2 Power Connection	18
2.2.3 COM Serial Port	18
2.2.4 LED Indications	19
3 MAINTENANCE	20
3.1 INSTALLATION INSTRUCTIONS	20
3.1.1 Install Using User Provided Cables and Materials	20
3.2 SYSTEM CONFIGURATION AND COMMISSIONING PROCEDURE	20
4 SPARES	21
4.1 SERVICE CONCEPT	21
4.2 LEVEL 2 SPARES SCHEDULE	21
4.2.1 Pulse Air Data Modem	21
4.3 WARRANTY	22
4.3.1 Service Within and Out Of Warranty	22
4.3.2 Ancillary Items	22
4.3.3 Unpacking Equipment	22
4.4 SOFTWARE POLICY	22

APPENDICES

A Nil.

LIST OF FIGURES

	Page
Figure 1. Data Modem Simple Block Diagram.....	16
Figure 2. Interface PCB Block Diagram.....	16
Figure 3. Data Modem Connectors.	17

LIST OF TABLES

	Page
Table 1. General Specifications.	14
Table 2. Transmitter Specifications.	15
Table 3. Receiver Specifications.	15
Table 4. Environmental Specifications.	15
Table 5. Details LED Indicators.....	16
Table 6. Data Modem Connections.....	17
Table 7. DC Power Connector Pin-outs.	18
Table 8. COM Serial Port Connector Pin-outs.....	18
Table 9. Details of LED Indications.	19
Table 10. Service Levels.....	21
Table 11. Service Level 2 Parts List.....	21

PERSONAL SAFETY

SAFETY PRECAUTIONS

These Safety Precautions, Warnings and Cautions advise personnel of specific hazards which may be encountered during the procedures contained in this document and that control measures are required to prevent injury to personnel, and damage to equipment and/or the environment.

Before commencing the installation or any maintenance of this equipment, personnel are to acquaint themselves with all risk assessments relevant to the work site and the task. They must then comply with the control measures detailed in those risk assessments.

References covering safety regulations, health hazards and hazardous substances are detailed under the **WARNINGS** section below. These are referred to in the tasks, when encountered.

Adequate precautions must be taken to ensure that other personnel do not activate any equipment that has been switched off for maintenance. Refer to the relevant Electrical Safety Regulations appropriate to the country of operation.

Where dangerous voltages are exposed during a task, safety personnel are to be provided as detailed in the relevant Electrical Safety Regulations. Where safety personnel are required for any other reason, management are to ensure that the personnel detailed are aware of the hazard and are fully briefed on the action to be taken in an emergency.

Where equipment contains heavy components or units that require lifting, lowering, pulling or pushing operations to be performed on them during maintenance tasks, all managers and tradesmen are to be conversant with the Manual Handling Operations Regulations.

HAZARDOUS SUBSTANCES

Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

- On the label of the container in which it was supplied.
- On the material Safety Data Sheet.
- In any local Safety Orders and Regulations.

WARNINGS

Radio Frequency Radiation




WARNING
RADIO FREQUENCY RADIATION. A RADIO FREQUENCY (RF) RADIATION HAZARD EXISTS IN THIS EQUIPMENT. TO AVOID RF INJURY, DO NOT TOUCH THE ANTENNA WHEN THE TRANSMITTER IS IN USE. DO NOT OPERATE TRANSMITTER WITH ANTENNA DISCONNECTED. REFER TO EU DIRECTIVE 2004/40/EC DATED 29 APRIL 2004.

INDUSTRY CANADA – RADIO EQUIPMENT WARNING STATEMENT


Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Equivalent Isotropically Radiated Power (EIRP) is not more than that necessary for successful communication.

To comply with Industry Canada RF radiation exposure limits for general population, the antenna(s) used for this transmitter must be installed on outdoor permanent structures and detailed RF exposure condition(s) are to be evaluated at the time of licensing. In addition, the antennas of this transmitter must not be collocated with other antennas or transmitters.

HUMAN EXPOSURE TO RADIO FREQUENCY RADIATION (FCC)

	<p style="text-align: center;">WARNING</p> <p>TO COMPLY WITH THE MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMITS REFERENCED IN 47 CFR 1.1310 TABLE 1, THE FOLLOWING MINIMUM SAFE OPERATING DISTANCES MUST BE OBSERVED FOR THE GENERAL PUBLIC:</p>
	<p>When using a 0dBd (2.14 dBi Dipole antenna)</p> <p style="padding-left: 40px;">150 to 174 MHz: 0.4 m</p> <p style="padding-left: 40px;">406.1 to 480 MHz: 0.35 m</p> <p style="padding-left: 40px;">480 to 512 MHz: 0.32 m</p>
	<p>If a directional antenna is used then the additional antenna gain must be taken into consideration.</p>
	<p>When using a 6dBd (8.14 dBi Dipole antenna)</p> <p style="padding-left: 40px;">150 to 174 MHz: 0.8 m</p> <p style="padding-left: 40px;">406.1 to 480 MHz: 0.7 m</p> <p style="padding-left: 40px;">480 to 512 MHz: 0.64 m</p>

HUMAN EXPOSURE TO RADIO FREQUENCY RADIATION (INDUSTRY CANADA)

	<p style="text-align: center;">WARNING</p> <p>TO COMPLY WITH THE MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMITS REFERENCED IN RSS-102 Issue 5, THE FOLLOWING MINIMUM SAFE OPERATING DISTANCES MUST BE OBSERVED FOR THE GENERAL PUBLIC:</p>
	<p>When using a 0dBd (2.14 dBi Dipole antenna)</p> <p style="padding-left: 40px;">138 to 174 MHz: 0.50 m</p> <p style="padding-left: 40px;">406.1 to 470 MHz: 0.45 m</p>
	<p>If a directional antenna is used then the additional antenna gain must be taken into consideration.</p>
	<p>When using a 6dBd (8.14 dBi Dipole antenna)</p> <p style="padding-left: 40px;">138 to 174 MHz: 1.00 m</p> <p style="padding-left: 40px;">406.1 to 470 MHz: 0.90 m</p>

FCC PART 15 COMPLIANCE

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 UNDESIRE
OPERATION.

INDUSTRY CANADA – RADIO EQUIPMENT WARNING STATEMENT

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage; et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

EQUIPMENT SAFETY

INSTALLATION AND MAINTENANCE

The Simoco Data Modem should only be installed and maintained by qualified personnel.

CAUTIONS



CAUTION

The Antenna System should be protected against lightning by means of an earthing system and surge protection device.

Do not connect Antenna Lightning conductors to the base station or Mains Earth.

MAINTENANCE PRECAUTIONS



CAUTION

Electrostatic Discharge Sensitive Devices (ESDS Devices). This equipment contains ESDS Devices, the handling procedures detailed in BS EN 61340-5-1:2007 or ANSI/ESD S20.20-1999 are to be observed.

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) NOTICE



The Waste Electrical and Electronic Equipment (WEEE) Directive became law in most EU countries during 2005. The directive applies to the disposal of waste electrical and electronic equipment within the member states of the European Union.

As part of the legislation, electrical and electronic equipment will feature the crossed out wheeled bin symbol (see image at left) on the product or in the documentation to show that these products must be disposed of in accordance with the WEEE Directive.

In the European Union, this label indicates that this product should not be disposed of with domestic or "ordinary" waste. It should be deposited at an appropriate facility to enable recovery and recycling.

SIMOCO SUPPORT

CONTACT INFORMATION

At Simoco we welcome your comments, feedback and suggestions. Departmental contacts have been provided for your quick reference below.

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In order to streamline support requests and better serve our customers, at Simoco we utilize a support ticket system. Every support request is assigned a unique ticket number, which customers can use to track the progress and responses online. For reference, Simoco provide complete archives and history of all customer support requests. In order to use the support ticket system, a valid email address is required.

A link to the online Simoco Group Support Centre Ticket Tracking system is provided below:

<http://www.simocogroup.com/ticket/supportcentre.htm>

If you still require further technical assistance after raising a support ticket, please contact us via the email addresses or via the Technical Support Helpline numbers below.

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Simoco Australasia: inquiry.aus@simocogroup.com

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ABBREVIATIONS

The following abbreviations are used throughout this document. Wherever practicable, whenever the abbreviation is first used, the full meaning is given with the abbreviation in parenthesis, after that only the abbreviation will be used.

Abbreviation	Meaning
AMBE	Advanced Multi Band Excitation
Com	Communication
DC	Direct Current
DIN	Deutsches Institut für Normung
DMR	Digital Mobile Radio
DNP3	Distributed Network Protocol 3
FM	Frequency Modulation
FPP	Field Personality Programmer
I ² C	Inter-Integrated Circuit
ID	Identification
I/O	Input/Output
IP	Internet Protocol
IP ⁽²⁾	Ingress Protection
LED	Light Emitting Diode
NC	Not Connected
PC	Personal Computer
PCB	Printed Circuit Board
PMR	Private Mobile Radio
RF	Radio Frequency
RSSI	Received Signal Strength Indication
RTU	Radio Telemetry Unit
Rx	Receiver, Receive
SCADA	Supervisory Control And Data Acquisition
SDMT	Simoco Digital Management Terminal
SDP	Simoco Digital Portable
SMA	SubMiniature version A
SQL	Structured Query Language
TBD	To Be Detailed
Tx	Transmitter, Transmit
UDP	User Datagram Protocol
USB	Universal Serial Bus
VAC	Virtual Area Controller
VSWR	Voltage Standing Wave Ratio

1 INTRODUCTION

1.1 SIMOCO PULSE AIR DATA MODEM

The Simoco Pulse Air Data Modem is one of the Simoco Pulse suite of products, which enable organisations to deploy Supervisory Control and Data Acquisition (SCADA) telemetry applications over narrowband Private Mobile Radio (PMR). Using wireless radio infrastructure as the communications carrier, Simoco's Pulse solutions enable SCADA applications to be quickly and cost effectively deployed across large operational areas.

The Simoco Pulse Air Data Modem is a DC powered, standalone unit based on the SDP600 Series Portables Radio Transceivers that connects to a local Remote Telemetry Unit (RTU) using a serial port. Distributed Network Protocol 3 (DNP3) control messages are wirelessly transported between Master and Slave over a PMR system using Digital Mobile Radio (DMR) modulation and Tier III trunking protocols.

The infrastructure end is comprised of a DMR base station that has an integrated RTU gateway, which, via a User Datagram Protocol (UDP) Internet Protocol (IP) connection to an IP to Serial converter, will relay any DNP3 message to and from its connected Master to and from the applicable Slave RTU unit within the radio coverage of the base station.

1.2 SPECIFICATIONS

The specifications of the Simoco Pulse Air Data Modem are detailed in the following paragraphs and tables.

1.2.1 General

The general specifications are shown below in **Table 1**.

Table 1. General Specifications.

Frequency Bands	AC: 136 MHz – 174 MHz. TU: 400 MHz – 480 MHz. UW: 440 MHz – 520 MHz.
Dimensions	80 x 162 x 62 mm
Power Supply	+12.0 to + 14.0V DC
Frequency Stability	0.5 ppm
Channel Spacing	12.5 kHz
Channel Capacity	Up to 2,000
Weight	550g
Emission Designators	7K60FXD (data)
Enclosure	Anodized aluminium with plastic ends according to DIN 43880.
Mounting	35 mm DIN rail.
Protocols	DNP3.
Power Consumption	<p>Maximum Current</p> <p>During Transmit: 2.0 Amps (@13.6V DC)</p> <p>Standby Current</p> <p>Typical: 160mA (@13.6V DC)</p>
RF Connector (SMA)	Recommend Torque: 0.34 to 0.57 nm.

1.2.2 Transmitter

The transmitter specifications are shown overleaf in **Table 2**.

Table 2. Transmitter Specifications.

RF Output Power	0.5 W, 2.5 W, 5.0 W (programmable)
Conducted/Radiated Emission	-36 dBm (≤ 1 GHz) -30dBm (>1 GHz)
Adjacent Channel Power	-60 dBc @ 12.5 kHz

1.2.3 Receiver

The receiver specifications are shown below in **Table 3**.

Table 3. Receiver Specifications.

Digital Sensitivity	-117.5 dBm (1% BER)
Intermodulation	65 dB (ETS method)
Adjacent Channel Sensitivity	60 dB @ 12.5 kHz (ETS method)
Spurious Rejection	70 dB (ETS method)
Conducted Spurious Emission	-57 dBm (≤ 1 GHz) -47dBm(>1 GHz)

1.2.4 Environmental

The environmental specifications are shown below in **Table 4**.

Table 4. Environmental Specifications.

Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)
Operating Temperature	-30 °C to +60 °C (-22 °F to +140 °F)
Sustainability	WEEE and Restriction of Hazardous Substances (RoHS)

2 DESCRIPTION

The Pulse Air Data Modem consists of three main Printed Circuit Boards (PCBs), these are:

- the RTU Modem Interface PCB;
- the Light Emitting Diode (LED) Display PCB; and
- the SDD690 Radio PCB based on the SDP600 Series Portable Radio. See the SDP600 Series DMR Portable Radio Transceiver – Service Manual[1] for more information.

A simple block diagram of the Pulse Air Data Modem is shown below in **Figure 1**.

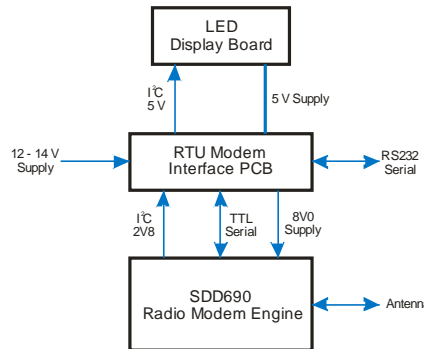


Figure 1. Data Modem Simple Block Diagram.

A block diagram of the Interface PCB is shown below in **Figure 2**.

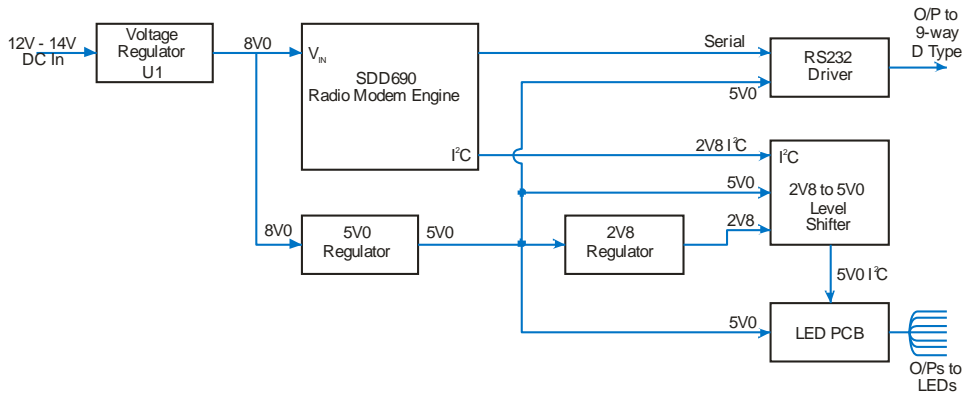


Figure 2. Interface PCB Block Diagram.

2.1 LED INDICATIONS

On the front of the Data Modem there are several LED indicators. There details are explained below in **Table 5**.

Table 5. Details LED Indicators.

Legend	Colour	Description
Radio	Tx	Activated for ~500 ms when radio is transmitting.
	Rx	Activated for ~500 ms when radio is receiving.
Com	Tx	Activated for min ~200 ms when serial data is input to the modem.
	Rx	Activated for min ~200 ms when serial data is output from the modem.
System	OK	Green Active (ON) when the radio is in its operational mode and has service. OFF when in FPP, error states, or not in service.

	Pwr	Green	Permanently on (not software controlled).
F1			For future use.
F2			For future use.
F3			For future use.
F4			For future use.
RSSI	-dBm		The LEDs are progressively activated as the signal level increases to the various levels, 120 – 50 in 10 dB steps.

2.2 CONNECTIONS

The connectors on the Pulse Air Data Modem are shown below in **Figure 3**. The functions of each connector are detailed in **Table 6**.



Figure 3. Data Modem Connectors.

Table 6. Data Modem Connections.

Connector #	Conn Type	Function
PWR		Power I/P
ANTENNA	SMA (female)	Antenna
COM	D Type (female)	Serial Port


2.2.1 Antenna Connection

The antenna connection on the Pulse Air Data Modem is provided with a 50 Ω female SMA socket.

The Voltage Standing Wave Ratio (VSWR) of the antenna connection should be tested prior to use by using of a suitable test set, e.g. an Anritsu/Wiltron S331A. A VSWR of 1.5:1 or better at the relevant frequencies should be ensured.

Mating connectors should be galvanically compatible with nickel outer and gold centre pin to minimise passive intermodulation.

It is recommended that a good quality flexible co-axial cable is used, e.g. with double-screening braid and multi-strand copper inner.

	<p>CAUTION</p> <p>The Antenna System should be protected against lightning by means of an earthing system and surge protection device.</p> <p>Do not connect Antenna Lightning conductors to the base station or Mains Earth.</p>
---	--

2.2.2 Power Connection

The DC power input is via a 3-way screw terminal connector (Weidmuller Onimate Signal – series BLA/SLA 5.08). The three pins are wired to suit the voltage range shown in **Table 7** below. Pin 1 of the 3-way screw connector is shown in **Figure 4** below.

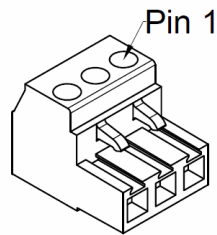


Figure 4: Pin 1 of the 3-way screw connector

Table 7. DC Power Connector Pin-outs.

Pin	Description
1	0V
2	+12.0 to +14.0 V
3	Not Connected

The equipment must be installed so that the power socket is readily accessible.

2.2.3 COM Serial Port

The connector pin-outs for the 9-way D Type 'COM' Serial Port are shown below in **Table 8**.

Table 8. COM Serial Port Connector Pin-outs.

Pin	Function
1	Data Carrier Detect (DCD). Connected to pin 4 and 6
2	Tx 1
3	Rx 1
4	Data Terminal Ready (DTR). Connected to pin 1 and 6
5	0 V
6	Data Set Ready (DSR). Connected to pin 1 and 4
7	NC
8	NC
9	NC

2.2.4 LED Indications

Table 9. Details of LED Indications.

LED		Details
System	Pwr	Permanently on (not software controlled).
	OK	Active (ON) when the radio is in its operational mode and has service. OFF when in FPP or error states.
Com	Tx	Activated for min ~200 ms when serial data is input to the modem.
	Rx	Activated for min ~200 ms when serial data is output from the modem.
RSSI		The LEDs are progressively activated as the signal level increases to the various levels. The 'L' LED is calibrated for -115 dBm, the lowest useful sensitivity for data comms.

3 MAINTENANCE

3.1 INSTALLATION INSTRUCTIONS

3.1.1 Install Using User Provided Cables and Materials

To install the Pulse Air Data Modem in your system, carry out the following:

1. Clip the Data Modem to a suitable DIN rail.
 - 1.1. Using a suitable test set, e.g. an Anritsu/Wiltron S331A, check the antenna connection for a VSWR of 1.5:1 or better at the relevant frequencies.
2. On the Data Modem, carry out the following:
 - 2.1. Using a suitable serial communications cable, connect the 'COM' socket to the relevant serial connection on your system.
 - 2.2. Using a suitable co-axial cable, connect the 'ANTENNA' socket to the antenna.
 - 2.3. Using a suitable DC Power Cable, connect the 'PWR' socket to a suitable DC power source. **Take care to observe the correct polarity and supply voltages.**

3.2 SYSTEM CONFIGURATION AND COMMISSIONING PROCEDURE

Please see the Pulse Air System and Configuration Commissioning guide for the full sequence of operations for commissioning all new Pulse Air Data Modem.

4 SPARES

4.1 SERVICE CONCEPT

It is a requirement that once the customer has purchased equipment, Simoco can follow this up by providing an ongoing, high level of customer support together with a competitive and professional servicing activity.

There are three levels of service available, these are detailed in **Table 10** below.

Table 10. Service Levels.

Level	Activity	Recommended Spares	Recommended Test Equipment and Tools
1	This is intended to achieve rapid turnaround by: <ul style="list-style-type: none"> Complete replacement of the Pulse Air Data Modem. Reprogramming. Faulty units are to be returned to a Level 2 service facility with an attached fault report. This level of service should not exceed 20 minutes.	Spare Pulse Air Data Modem.	PC with Programmer (FPP). Suitable Serial Cable.
2	Level 2 service includes Level 1 with the addition of fault rectification by: <ul style="list-style-type: none"> Replacement of PCB, mechanical component, or cable assembly. Cosmetic repair. 	Listed in Level 2 Spares Schedule. Spare parts available to order from Central Spares.	As above + service aids and test equipment.
3	Repair by PCB or mechanical component replacement, Cosmetic repair. Repair of PCB to component level in Central Repair Unit (CRU).	Listed in Level 2 Spares Schedule. Radio PCB components only available to CRU.	As above + service aids and test equipment.

4.2 LEVEL 2 SPARES SCHEDULE

4.2.1 Pulse Air Data Modem

The recommended spares schedule for Service Level 2 is shown below in **Table 11**.

Table 11. Service Level 2 Parts List.

Item	Part Number	Description		
1	6102 350 20101	RTU Radio Modem PCB Assembly	AC	136 – 174 MHz
	6102 350 20071		TU	400 – 480 MHz
	6102 350 20081		UW	440 – 520 MHz
	6102 309 65101	RTU Modem LED PCB		
	6102 339 65092	RTU Modem Interface PCB (Lower)		
	6102 349 65191	RTU Modem Interface PCB (Upper)		
	6102 350 20701	RF Cable (SMA – MCX)		
	6102 330 00555	Interface Flexi		
	6102 310 07931	RTU Modem Case End Cap (c/w shielding)		

4.3 WARRANTY

Unless superseded by specific contractual/supply agreements, the following warranty applies:

24 (twenty-four) months for transceivers from the date of supply.

4.3.1 Service Within and Out Of Warranty

Please contact our Customer Service department regarding support of either type. In some countries a local Simoco agent may be responsible for providing this service. See the Support page for contact details.

4.3.2 Ancillary Items

Please contact our Customer Service department regarding service, for replacement of these parts. See the Support page for contact details.

4.3.3 Unpacking Equipment

Any damaged or missing parts must be notified to Simoco or their agent in writing within 10 days of receipt.

4.4 SOFTWARE POLICY

Software provided by Simoco shall remain the Company's property or that of its licensors and the customer recognises the confidential nature of the rights owned by the Company.

The customer is granted a personal, non-exclusive, non-transferable limited right of use of such software in machine-readable form in direct connection with the equipment for which it was supplied only.

In certain circumstances, the customer may be required to enter into a separate licence agreement and pay a licence fee, which will be negotiated at the time of the contract.

The customer undertakes not to disclose any part of the software to third parties without the Company's written consent, nor to copy or modify any software. The Company may, at its discretion, carry out minor modifications to software. Major modifications may be undertaken under a separate agreement, and will be charged separately.

All software is covered by a warranty of three months from delivery and, within this warranty period, the Company will correct errors or defects, or at its option, arrange free-of-charge replacement against return of defective material.

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