

SkyWave

IDP-680/IDP-690

Hardware Guide

T200, Version 09



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Preface

CAUTION *Firmware release 3.x.x or higher does not support software GPS terminals (with modem hardware number 3).*



What's New?

Updates since the last release of this document are listed below.

- Updated Compliance section (Section 2)
- Updated average power consumption details (Section 3.3.2.1)
- Corrected input bandwidth value for digital input (Section 3.4.1)
- Added updated I/O block diagram for ignition detection (Section 3.4.1)
- Added turn-on delay details for open drain digital output (Section 3.4.2)
- Corrected the measurement voltage range for analog input (Section 3.4.3)
- Updated transmit and receive ESD protection value for RS-232 (Section 3.5.1)
- Added 1 PPS details (Section 3.7.1)
- Added terminal branding label information (APPENDIX I)

Purpose

This document provides an overview of the installation procedures as well as hardware characteristics and specifications for IDP-680/IDP-690 terminals.

Audience

This document is for technical readers. It provides information to ensure successful installation and operation of IDP-680/IDP-690 terminals.

Errata Sheet

Refer to the SkyWave Customer Support website for a possible Errata Sheet available after the release of this document. Always check the site for the most current documentation releases.

Notation

Hardware components and hardware labels in this document may not be exactly as shown and are subject to change without notice.

CAUTION *This safety symbol warns users of possible hazards to personnel, to equipment, or to both. It includes hazards that will or can cause severe personal injury, death, or substantial property damage if the hazard is not avoided; and hazards that will or can*



cause minor personal injury or property damage if the hazard is not avoided.

Note: A note indicates information with no potential hazard, but the user should make special note. A note is also used to indicate points of interest or to provide supplementary information about a feature or task.

Numbered lists indicate a series of steps required to complete a task or function.

Bulleted lists highlight information where order or sequence is not crucial.

Reference

The content of the following documents may be useful in conjunction with this guide. These documents are available from the IDP Toolkit or support.skywave.com.

[T202] IDP Terminal API Reference

Safety Disclaimer

SkyWave makes no warranties, representations or guarantees that the products and network services are suitable for any use in any hazardous environments requiring fail safe performance (including without limitation marine safety and distress systems, operation of nuclear facilities, aircraft navigation or communications systems, weapons systems, air traffic control and life support services) or any other application in which the failure of the products or network services could result in death or personal injury. Solution Providers assume all liability associated with selling any products and network services for any such applications, and Solution Provider will defend, indemnify, and hold SkyWave harmless against any claims against SkyWave for loss, damage, liability, or expense (including lawyers' fees) arising out of or related to the sale by Solution Providers or any Solution Provider Reseller, or the user by any end user, of any product or network service.

Please read all cautions and warnings throughout this document.

Safety Precautions

The terminal must comply with all safety precautions relating to the operation, usage, service and repair of the terminal. SkyWave assumes no liability for the customer's failure to comply with any of these precautions.

Caution warnings appear throughout this document.

Installation Warning

SkyWave recommends that this product be installed by the authorized distributor from whom it has been purchased. By carrying out the installation of the product, the installer assumes exclusive responsibility for, and agrees to indemnify SkyWave from, any injury or damage of any kind arising from the installation.

Installer Responsibility

The installer is responsible for all injuries or damages arising out of or relating to any wrongful or negligent act or omission of the installer (and/or any subcontractors) in connection with the installation of any SkyWave product, except any such injuries or damages arising solely from a defective SkyWave product. In addition to the liability imposed upon the installer on the account of personal or property injury or damage, bodily injury, including death, suffered as a result of the installer's wrongful or negligent installation of any SkyWave product, the installer assumes the obligation to defend, indemnify and hold SkyWave harmless, including its directors, officers, employees, agents and assigns, and to indemnify SkyWave, including its directors, officers, employees, agents and assigns, from and against every damage, expense, liability or payment arising out of or relating to such wrongful or negligent act or omission, including legal and court fees. The installer also agrees to defend, indemnify and hold SkyWave harmless, including its directors, officers, employees, agents and assigns, from and against any wrongful or negligent act or omission committed by any subcontractor or other person employed by or under the supervision of the installer for any purpose in connection with the installation of SkyWave products, and to indemnify SkyWave, including its directors, officers, employees, agents and assigns, from every damage, expense, liability or payment arising out of or relating to such wrongful or negligent act or omission, including legal and court fees. Every right, defence, and/or indemnity of whatsoever nature applicable to SkyWave shall also be available and shall extend to benefit and to protect the SkyWave's directors, officers, employees, agents and assigns and for such purposes SkyWave is or shall be deemed to be acting as agent or trustee on behalf of and for the benefit of such companies and persons.

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SkyWave provides a manufacturer's warranty to the original purchaser (Solution Provider) that its products and services will perform in accordance with SkyWave's specifications and will be free from defects in material and workmanship for a limited

period of time. This warranty is limited to the repair and/or replacement of any defective components experienced under normal specified operating use and storage conditions, at SkyWave's discretion. Please check your Solution Provider agreement for warranty details and conditions. It does not cover any damages caused or associated with the product's misuse. The end-user's only remedy or recourse is against the Solution Provider, and any experience with defective products should be communicated to your Solution Provider. Shipping of defective product, back to the Solution Provider will be in accordance with the Solution Provider's instructions and should be accompanied with a fault report. SkyWave is not responsible for corrosion damage caused by improperly assembled or installed cables. **Warranty is void if unit is opened.**

A fault report is required for each unit returned under warranty. Please contact SkyWave's Customer Support for additional information.

User Serviceable Parts

The terminals contain no user serviceable parts or replaceable fuses.

1 Product Overview

Each IDP-680/IDP-690 terminal consists of a single environmentally sealed mechanical enclosure containing an integral antenna, a satellite modem for communicating with the satellite, an integral GPS subsystem, four input/output ports, an RS-232 port, and an RS-485 port. The terminals are available in various configurations. Figure 1 shows the IDP-680 model.

Figure 1 IDP-680 Model



Each terminal is designed for industrial and fixed applications or to be mounted outdoors on a wide range of platforms such as vehicles or boats.

The terminal's built-in programmability allows it to work as a stand-alone data-messaging terminal, with built-in I/O data collection and processing capabilities. Feature-rich software tools make programming easy and shorten the design and testing time.

1.1 Overview of the Messaging System

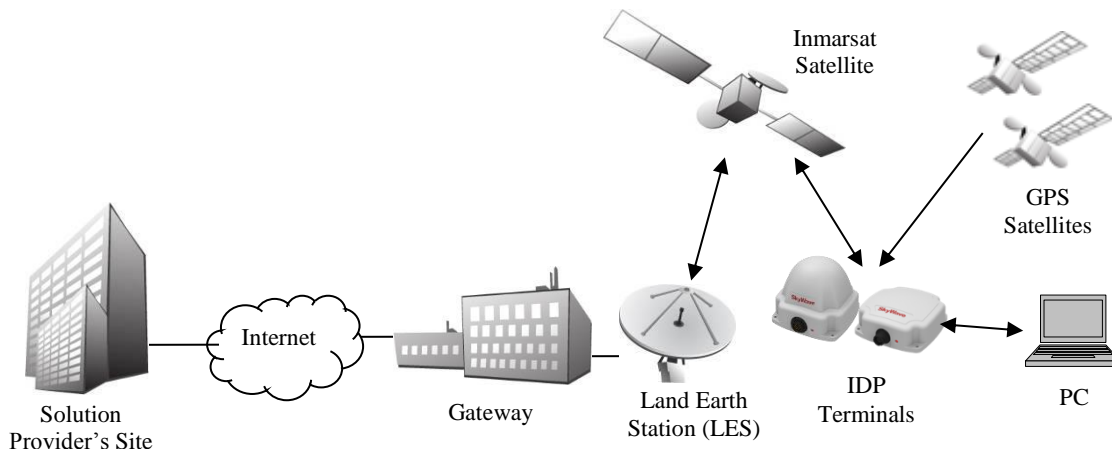
SkyWave's IsatData Pro satellite messaging system is designed to support the management of mobile or fixed assets located around the world. An asset fitted with one of SkyWave's satellite based mobile terminals can have its status and location monitored, as well as send large messages.

The network provides the following key features and benefits:

- Polling of terminal status and location
- Scheduled reporting of terminal status and location
- Transmission of text messages to and from a serial port on the terminal
- Two-way communication for messaging to and from the asset for near real-time control
- Up to 6,400 bytes from-mobile messages
- Up to 10,000 bytes to-mobile messages
- Broadcast messages

- Default acknowledged messages
- Global service

Figure 2 SkyWave's IsatData Pro Network



Service is provided to end users by Solution Providers (SPs) who use the SkyWave IsatData Pro network to offer particular applications and/or services to their clients. The SPs link their application services to the satellite terminals by connecting to the IsatData Pro gateway. This acts as the communications hub of the system, routing traffic to and from the terminals and the various service providers.

Configuration and data retrieval from the terminal can be easily accomplished through Internet-based application services provided by SPs or by integrating existing customer enterprise software to receive information from the Gateway.

1.2 Terminals

IDP-680/IDP-690 terminals (Table 1) operate on the IsatData Pro network. The terminals are self-contained, environmentally sealed, compact, and provide low power consumption.

Terminals include an omni-directional antenna, satellite modem, GPS, programmable microcontroller, and several I/O (input/output) feeds capable of monitoring and controlling external sensors and devices.

The terminal's built-in programmability allows it to work as a stand-alone terminal with built-in I/O data collection and processing capabilities. Each model is suitable for both mobile and fixed installations.

Feature-rich software tools make scripting easy, and shorten the script design and testing time. SkyWave also provides consulting services to SPs to help program the terminals and get customer applications running quickly.

Table 1 IDP-680/IDP-690 Models

Model	Elevation Angle	Connector
IDP-680	20° - 90°	10-pin side or bottom
IDP-690	-15° - 90°	10-pin side or bottom
IDP-680 CID2	20° - 90°	10-pin bottom
IDP-690 CID2	-15° - 90°	10-pin bottom

Part numbers are specified in Table 23.

Terminals are available in two configurations: bottom connector or side connector (see figures below). The terminals are also available with a bottom connector CID2 option (Figure 7 and Figure 8).

Figure 3 IDP-680 with Side Connector



Figure 4 IDP-680 with Bottom Connector



Figure 5 IDP-690 with Side Connector



Figure 6 IDP-690 with Bottom Connector



Figure 7 IDP-680 CID2 with Conduit Adaptor

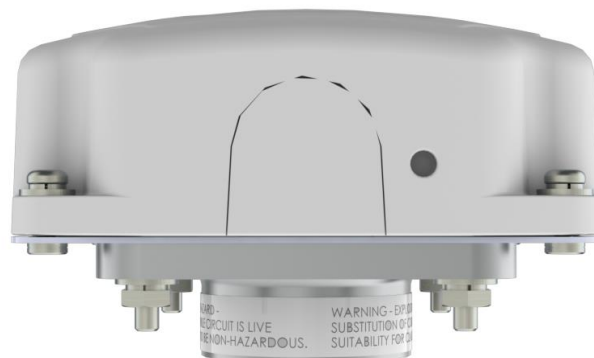


Figure 8 IDP-690 CID2 with Conduit Adaptor

1.3 Terminal Key Features and Benefits

CAUTION Do not rely solely on the terminal for emergency (SOS) calls.



IDP-680/IDP-690 terminals have the following key features and benefits:

- Designed to be used as a standalone or incorporated into an SP solution
- Built-in GPS/GLONASS receiver to calculate position, speed and heading
- Quick and easy installation reduces labor time and costs
- Ships with installed firmware
- Flexible custom scripting
- Wide operational temperature range
- Rugged construction

1.4 Pass-Through Mode

The terminal operates in pass-through mode when there is no valid application firmware present. In pass-through mode, the terminal connects the external RS-232 port to the serial port on its internal modem, making the terminal an IP67 modem that accepts a wide input voltage.

1.5 Operating Modes

The terminal operates in a number of modes while the application processor portion of the terminal has its own independent set of modes.

1.5.1 Satellite Modem

For the most part, the satellite modem operates independently of the application controller. Consequently, power consumed by the satellite modem must be added separately to determine a terminal's overall power consumption.

Table 2 Satellite Modem Operating Modes

Operating Mode	Description
Transmit Mode	In transmit mode the modem is transmitting a signal to the gateway.
Receive Mode	In receive mode the modem is attempting or actively listening to the satellite (listening on the bulletin board channel or on a traffic channel).
Sleep Mode	This is the power mode when the modem turns itself off between wake-up intervals. Both the terminal and gateway track the wake-up interval. Consequently, when a terminal is in sleep it does not miss incoming messages. If a modem has a message to send, it automatically exits sleep mode without waiting for the next wake-up interval.
Idle Mode	With IsatData Pro, a modem receives messages in one of the 10 half second sub-frames. Idle mode is when the modem turns off its receiver waiting for its next assigned sub-frame. The modem automatically enters Idle mode on its own, independent of the application.

1.5.2 Application Controller

Table 3 Application Controller Operating Modes

Operating Mode	Description
Processing	In its processing mode the Lua services are actively running.
Power Save	In power save mode, the application controller draws minimal current. It monitors its external inputs (digital and serial) for activity, and reacts as required by transitioning to processing mode with no loss of information such as incoming serial characters.

1.5.3 Application Peripherals

These peripherals are either on/off. Power consumption is affected when they are powered on.

Table 4 Application Peripherals

Operating Mode	Description
GPS and GPS/GLONASS	Can be powered on independently of the IsatData Pro receiver.
RS-232	When the RS-232 is on, the RS-232 transmit driver is enabled and the related serial clocks in the application controller are active.
RS-485	When the RS-485 is on, the RS-485 driver is enabled and active.
LED	The LED can be enabled by the software.
I/O Active/Inactive	The I/Os can be configured as inputs or outputs.

2 Compliance

The IDP terminals obtained the following certifications:

Inmarsat Type Approval

Industry Canada

- IC:3745A-IDP6XX
- RSS-170, Issue 2, Spectrum Management and Telecommunications Policy, Radio Standard

FCC Part 15

- CFR Title 47: Telecommunication, Part 15

FCC Part 25

- CFR Title 47
- FCC ID: B92IDP6XX
- OET 65 - Radiation Safety

CAUTION *Mount the terminal at least 20 cm away from humans.*



R&TTE Directive 1999/5/EC (CE Mark)

Safety (art3.1.a)	EN 60950-1:2006 + A11:2009 EN 62311:2008
EMC (art3.1.b)	EN 301 489-1 V1.9.2 (2008-04) EN 301 489-20 V1.2.1 (2002-11)
Spectrum (art 3.2)	EN 301 426 V1.2.1 (2001-10)

SAE J1455

- Recommended Environmental Practice for Electronic Equipment Design (Heavy-Duty Trucks), section 4.5.3.

IEC 60945 (only IDP-690 tested)

Compliant with the following sections of IEC 60945 (2002) - Maritime navigation and radio communication equipment and systems:

The normal input voltage for IEC 60945 compliance is declared as 12/24 V. With this nominal input voltage, the IDP-690 meets IEC 60945 requirements for power supply operation of -25%/+30% (9 to 32 V).

Equipment Performance	N/A
Dry Heat	IEC 60945 Section 8.2.2.2, IEC60068-2-2
Low Temperature	IEC 60945 Section 8.4.2.3, IEC60068-2-1
Humidity	IEC 60945 Section 8.3, IEC60068-2-30

Vibration	IEC 60945 Section 8.7.2, IEC60068-2-6
Insulation Resistance	IEC 60945 Section 8.3 and 8.4, IEC60092-504
Power Supply Variation	IEC 945 Section 10.7.1 and 10.7.2, IEC60092-504
Power Supply Failure	IEC 945 Section 10.8.2, IEC60092-504
Acoustic Noise	IEC 60945 11.1.2
Compass Safe Distance	IEC 60945 11.2.2 Compass Safe Distance 20 cm
Salt Mist	IEC 945 Section 8.12, IEC 60069-2-52 Severity 1
Radiated Emissions	EN 55016-2-3:2006
Radiated Immunity	IEC 61000-4-3:2006 + A1:2008
Conducted Emissions	EN 55016-2-1:2009
Conducted Immunity	IEC 61000-4-6:2009
Fast Burst Transients	IEC 61000-4-4:2004
Electrostatic Discharge	IEC 61000-4-2:2009
Surge (Applicable to AC powered equipment)	IEC 61000-4-5

RoHS

Restriction of Hazardous Substances (RoHS)¹

Ingress Protection

IP67

Anatel

Technical Compliant. Anatel homologation must be held by a Brazilian company.

SRRC China

State Radio Regulatory Commission ID issued by the People's Republic of China. This applies to the IDP-690 only.

- IDP-690: Certificate number 2100-7599

MSS Russia

- IDP-680: Registration number GSS-0045
- IDP-690: Registration number GSS-0046

RCM Australia

- The following compliance marks, C-Tick, A-Tick, and RCM have been consolidated into a single RCM mark.


¹ European Union's (EU) Directive 2002/95/EEC "Restriction of Hazardous Substances" (RoHS) in Electronic and Electrical Equipment.


Class I Division 2 (Groups A, B, C and D)

The IDP CID2 terminals are listed to the following:


- ANSI/ISA-12.12.01-2011 - Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

Important Information about the IDP-680/IDP-690 CID2 Terminals

CAUTION  **WARNING** *This equipment is suitable for use in Class I Division 2 (CID2), Groups A, B, C and D locations or non-hazardous locations only.*

CAUTION  **WARNING** *Explosion hazard – Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.*

AVERTISSEMENT – *Risque d’explosion – Avant de connecter ou de déconnecter l’équipement, couper le courant ou s’assurer que l’emplacement est désigné non dangereux.*

CAUTION  **WARNING** *Explosion hazard – Substitution of components may impair suitability for Class I, Division 2.*

AVERTISSEMENT – *Risque d’explosion – La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Class I, Division 2.*

3 Specifications

3.1 Hardware Versions

The IDP terminals are available in different hardware configurations as per Table 5. Current order part numbers can also be found in APPENDIX A.

Table 5 Hardware Comparison

Product Order Numbers	Application Hardware Revision Number ²	Modem Hardware Number ³	Features
SM201016 SM201079 SM201009 SM201080	3 ⁴	3	Software GPS, 1M terminal application SRAM 4M Flash
SM201085 SM201261 SM201087 SM201262	6	4	Hardware GPS, jamming detection, 2M terminal application SRAM 4M Flash
SM201205 SM201206	7	5	GPS/GLONASS jamming detection 2M terminal application SRAM 4M Flash

3.2 Connector

The terminals use a circular 10-pin connector.

Table 6 Terminal Connector

Parameter	Part Number
Mating Connector Kit	ST100030-001

² Use terminalinfo SIN 16, MIN 1 to query the number of the current application hardware revision number.

³ The modem hardware number is sometimes displayed as a major (e.g., 4) and minor (e.g., 0) number. Use terminalinfo SIN 16, MIN 1 to query the number of the current hardware.

⁴ This guide documents the specifications for application hardware revision number 6 and higher only.

3.2.1 Connector Pin-out

Figure 9 Terminal Connector Pin Assignment (Male)

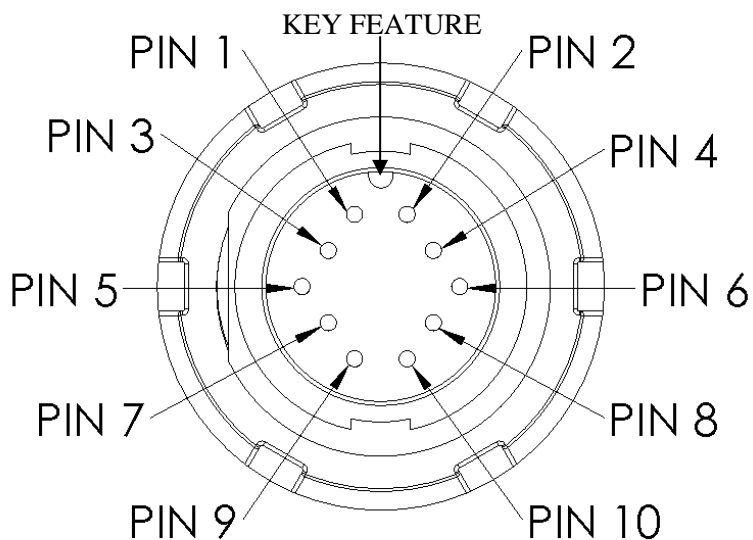


Table 7 Terminal Electrical Pin Assignment (IDP-680 and IDP-690)

Pin	Functionality	Pin	Functionality
1	RS-485 A	2	RS-485 B
3	GND	4	VIN
5	I/O 02	6	I/O 03
7	I/O 01	8	I/O 04
9	RS-232 Tx (Output)	10	RS-232 Rx (Input)

Figure 10 View of Terminal Male Connector



Figure 11 Face View of Mating Connector (Female)

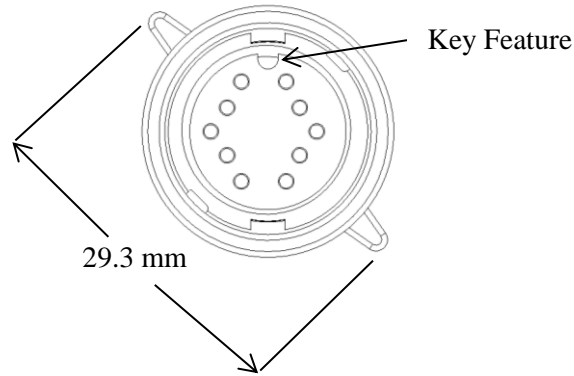
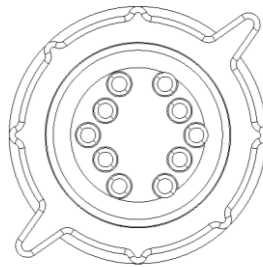


Figure 12 Rear View of Mating Connector (Solder Cups)



3.3 Power

3.3.1 Input Range

Parameter	Value
Power Supply Voltage	9 to 32 V DC
Reverse Polarity Protection	-40 V maximum

3.3.2 Power Consumption

Typical power consumption values at VIN=12 V and at room temperature (23°C)

Table 8 Terminal Power Consumption

Mode of Operation	Current
Transmit	700 mA
Satellite communications receive	45 mA
Processing	16 mA
Sleep + Power Save	60 µA
LED on	50 mA

Table 9 GPS/GLONASS Power Consumption

Parameter	Hardware GPS	GPS/GLONASS	
	GPS	GPS	GLONASS
Current	40 mA @12 V	30 mA @ 12 V	28 mA @ 12 V

3.3.2.1 Average Power Consumption

The satellite receive current is specified at 45 mA. At times, the receiver may be on continuously when the terminal is searching for a satellite signal, receiving network updates or waiting for acknowledgement responses. However, in normal operation the receiver is not on continuously, instead it wakes up once every five (5) seconds to receive which results in an average 8.3 mA consumption, at 12 V (200 mAh/day).

In low power mode, the average terminal power consumption is decreased further depending on the wake-up period which extends the modem wake-up period from a default five (5) seconds. Table 10 characterizes several scenarios and shows the estimated average power consumption assuming a 12 V power source. The overall power consumption depends on many factors including how often the modem wakes to receive to-mobile messages, how often GPS fixes are requested, the size and frequency of mobile messages and LED settings.

For assistance in estimating power consumption in different operating scenarios, SkyWave has provided a Power Estimator tool on the SkyWave Customer Support website⁵. Customers are encouraged to use this tool for guidelines on trade-offs with power consumption versus messaging rates and wake-up intervals.

⁵ To access the power estimator utility, log onto <https://support.skywave.com/Login.aspx> and select Online Utilities.

Table 10 Power Consumption Scenarios

Scenario	Baseline 5s Receive Mode	Fixed 1	Fixed 2	Mobile 1	Mobile 2
Wake to Receive Period	5 s	30 min	3 min	60 min	30 min
Tx/Day and Message Size/Tx	1X, 98 bytes	48X, 98 bytes	96X, 98 bytes	1X, 98 bytes	2X, 98 bytes
GPS Fix/Day	4 (network)	1 (network)	1 (network)	24	4 (network)
Power Mode	Mobile - powered	Fixed - battery	Fixed - battery	Mobile - powered	Mobile - battery
Average Power Consumption (mAh/day at 12 V)	200	24	111	16	11
Average Power Consumption (mA at 12 V)	8.3	1.0	4.6	4.0	0.46
Serial	None	On Rx Wake Up	On Rx Wake Up	On Rx Wake Up	None
Life of 10 A-hour battery (months)	1.8	14	3.0	20	30
Notes	-	-	-	10 seconds of application card geofence processing per fix (assumed) (terminal only)	-

3.3.2.2 Blockage Power

If an IDP-680/IDP-690 terminal is blocked so that it cannot receive the satellite signals, it must scan to reacquire the traffic channels. While scanning for traffic channels, the terminal's consumes more power than when it has acquired a traffic channel. For powered applications, the IDP-680/IDP-690 terminal continually scans for a satellite so that it can reacquire quickly when blockage is removed. For battery powered applications, the terminal doubles the duration of time between traffic channels scans and each unsuccessful attempt to minimize power. Refer to [N200] for additional details on network blockage behavior and [T202] for specifics on the power profile property which is used to define battery and powered modes.

Table 11 shows the IDP 680/IDP-690 terminal configured for MobileMinBattery power profile and with 3 minute and 1 minute GPS fix timeouts. The GPS fix time is a modem register that limits the amount of time the terminal waits for a GPS fix. A long GPS fix time as per the 3 minute default allows time for the GPS to acquire in a partially blocked location. However, GPS consumes considerable power and shortening the acquisition time saves power if terminal is blocked and will never acquire GPS. The GPS Fix time

can be restricted by two properties maxFixTimeout (PIN 20) and acquireTimeout (PIN 19) in the Position service (SIN 20). maxFixTimeout defines the timeout for any fix while acquireTimeout defines the timeout for the GPS to see at least one satellite.

Table 11 Blockage Power Consumption (Power Profile = MobileMinBattery)

Blockage Mode	Blockage Recovery Check Interval	3 Minute Maximum GPS Acquisition Time	1 Minute Maximum GPS Acquisition Time
No Blockage - Baseline operation with 1 report	-	Baseline Operation Power consumption as per Power Calculator	
Short Term Blockage (First 2.3 hours of blockage)	5 to 40 minutes. Interval starts at 5 and doubles each attempt.	5.5 times Baseline	
Medium Term Blockage (2.3 hours to 68 hours of blockage)	40 minutes to 24 hours. Interval starts at 40 minutes and doubles each attempt.	1.9 times Baseline	1.0 times Baseline
Long Term Blockage (more than 68 hours)	24 hours	1.2 times Baseline	0.8 times Baseline

3.3.2.3 Blockage Recovery

In the battery powered profiles, a consequence of the blockage algorithm is that the longer the terminal is blocked, the longer it takes for the terminal to detect that the blockage condition has been removed. However, an application could use external events such as digital I/Os (i.e., connected to ignition) to force the terminal to force a new satellite channel search if movement is likely to have occurred.

The satellite traffic channel check can be forced by writing any value, including the current value to the modem's wake-up interval. It is important that the application not write to the wake-up interval frequently, as each write will trigger a search which consumes significant power. When the application forces a check by writing to the wake-up interval, the terminal blockage algorithm resumes normal operation if the traffic channel is correctly received. If the terminal cannot find the traffic channel after the search, the terminal resumes the blockage algorithm.

A satellite traffic channel check can also be forced by changing the power mode. In this case, the blockage algorithm restarts all its timers and commences again from the beginning if traffic channels are not detected.

3.3.3 Load Dump Circuitry

The terminal's power supply input voltage range is 9 to 32 V. Above this range the load dump protection circuitry disconnects external power so that the terminal is not damaged, up to 150V. When the input voltage drops below the threshold, the terminal recovers, going through power on reset.

With this protection, the terminal is capable of withstanding load dumps as specified in SAE J1455 (rev JUN2006) paragraph 4.13.2.2.1.

3.3.4 Fuse

IDP-680/IDP-690 terminals have an internal 5 A fuse that provides protection in the event of an internal short on the terminal. The internal fuse cannot be reset and is not field repairable.

3.3.5 Inrush Current

Inrush current transients occur when the terminal is:

- First powered on.
- Preparing for transmit. This is when the terminal switches its internal voltage rail to a higher voltage for transmitting.
- Terminal starts to transmit. This is when the terminal's power amplifier is turned on.

Table 12 Inrush Current⁶

Operation Mode	Inrush Current on Input_Power		
	Amplitude (A)	Period (ms)	Charge (mC)
Power On	4.24	3.44	0.676
Receive On	0.192	0.94	0.057
Transmit	0.464	4.9	0.673

3.4 Input/Output

The terminal's four configurable I/O lines are each independently operable in one of following modes:

- Digital Input
- Digital Output
- Analog Input
- Disabled

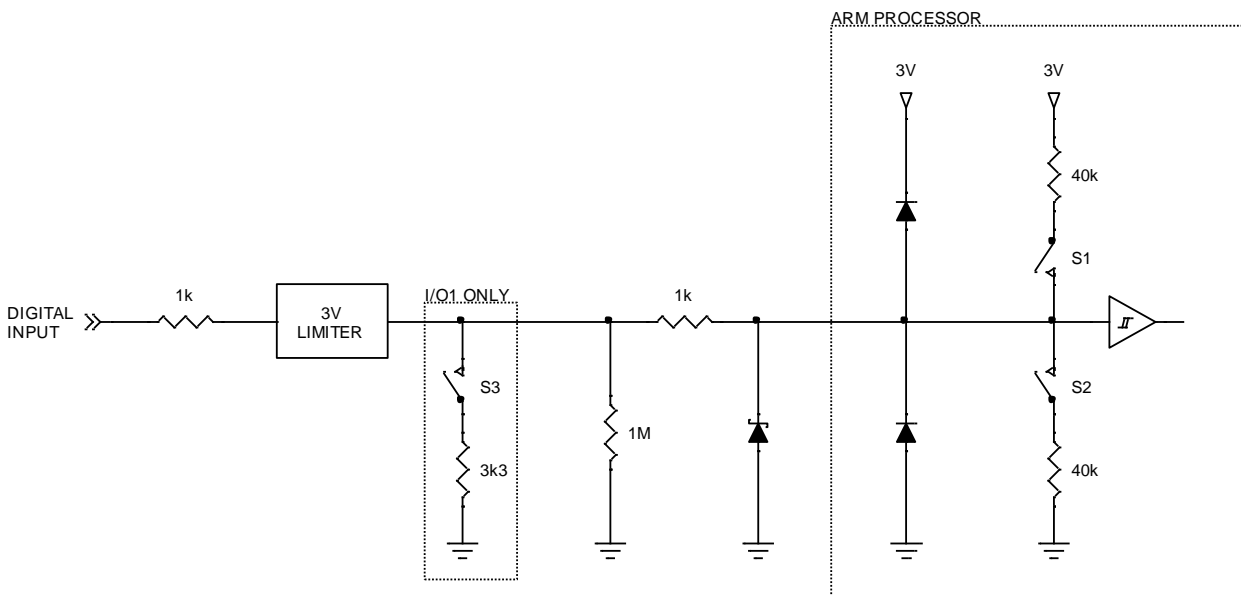
When disabled the I/O is physically configured as an analog input.

⁶ Input voltage is 12 V at 23°C.

3.4.1 Digital Input

Figure 13 shows a schematic of the I/O when configured as a digital input.

Figure 13 Digital Input



Input Type	S1	S2	S3
With weak pull-down	Open	Open	Open
With pull-down	Open	Closed	Open
With pull-up	Closed	Open	Open
Ignition Detection	Open	Open	Closed

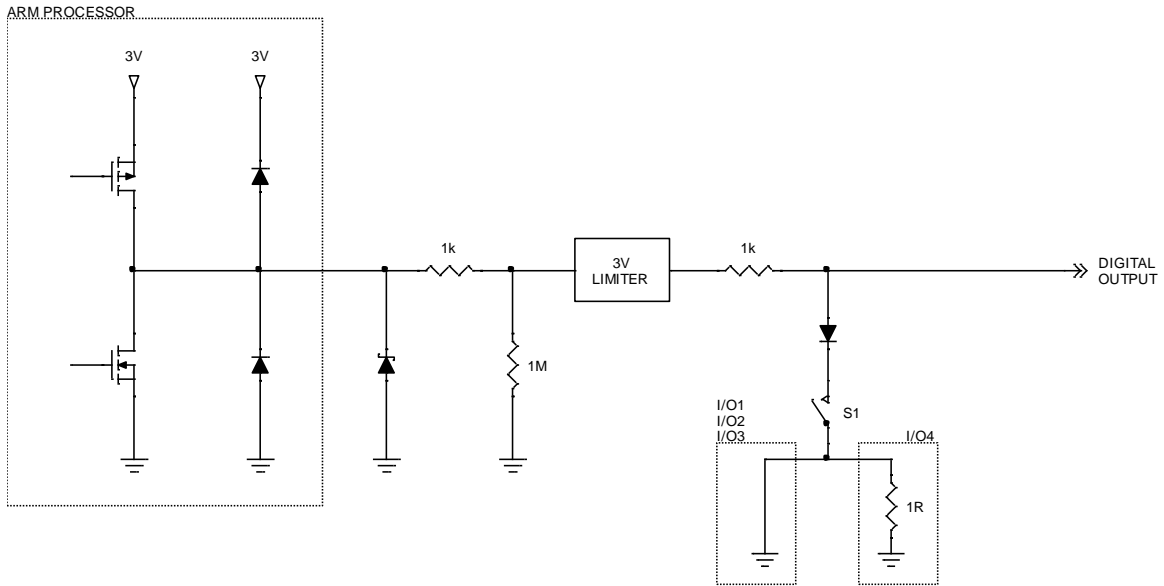
The input specifications are provided in the table below.

Parameter	Application Revision Number	Min.	Typical	Max.	Units
Input low range	-	-10	-	1.05	V
Input high range	-	1.95	-	150	V
Input current with weak pull-down (weak 1 MΩ pull-down still in place); V _{in} = 3.0 V	6 7	-	4.5 3	-	μA
Input source current with pull-up (V _{in} = 0.0 V)	-	-	75	-	μA
Input sink current with pull-down (V _{in} = 3 to 150 V)	6 and 7	-	81	-	μA
Input bandwidth	-	1	-	-	kHz

3.4.2 Digital Output

Figure 14 shows a schematic of the I/O when configured as a digital output. It must be noted that I/O 04 is the only I/O with built-in short circuit protection for open drain outputs.

Figure 14 Digital Output



Push-pull	S1 = Open
Open drain	S1 = Closed (Low Impedance) S1 = Open (High Impedance)

The following tables describe the output specifications.

Push-pull

In the push-pull configuration the output is driven directly from the microprocessor.

Parameter	Application Revision Number	Min.	Typical	Max.	Units
Output high voltage - open circuit	6	2.65	3.0	3.15	V
	7	2.85	3.0	3.15	V
Output high voltage (sourcing 25 μ A)	6	2.50	-	-	V
	7	2.80	-	-	V
Output low voltage (sinking 25 μ A)	-	-	-	0.05	V
Output pulse rate	-	-	-	10 ⁻⁷	Hz
Output bandwidth	-	100	-	-	Hz

⁷ This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the output bandwidth.

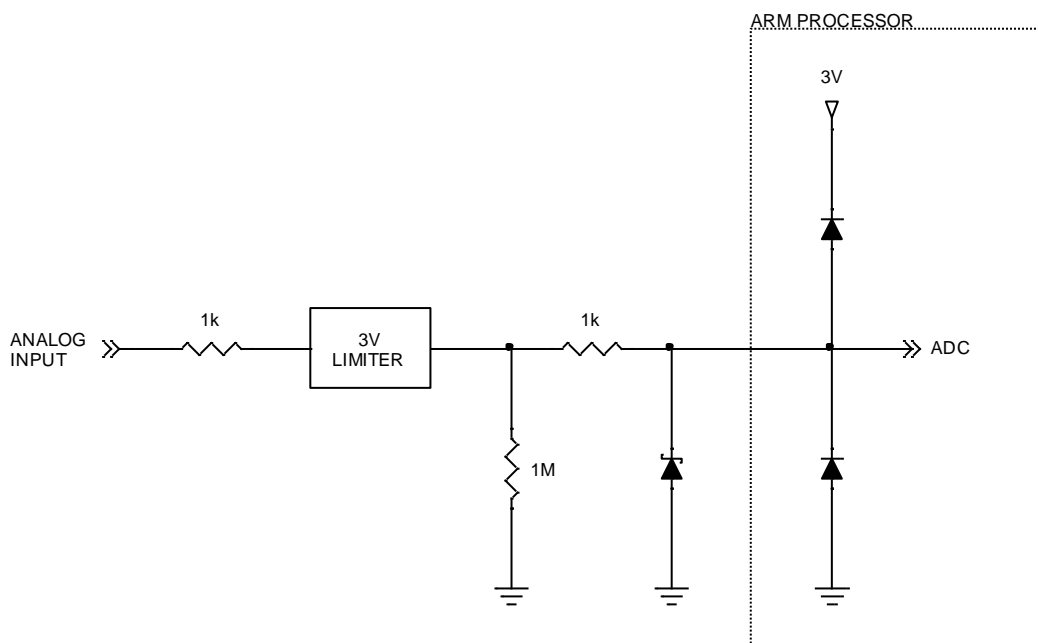
Open Drain

Parameter	Application Revision Number	Min.	Typical	Max.	Units
Sink current (do not exceed)	-	-	-	250	mA
Output voltage (sinking 250 mA)	6 and 7	-	1.15	1.35	V
I/O 1 to I/O 3		-	1.40	1.60	V
Turn-On Delay (I/O 04 only)	-	140	200	280	ms
Absolute limits (high impedance)	-	-10	-	150	V
Output pulse rate	-	-	-	10^8	Hz
Output bandwidth	-	100	-	-	Hz

3.4.3 Analog Input

Figure 15 contains a schematic of the I/O when configured as an analog input.

Figure 15 Analog Input



⁸ This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the output bandwidth.

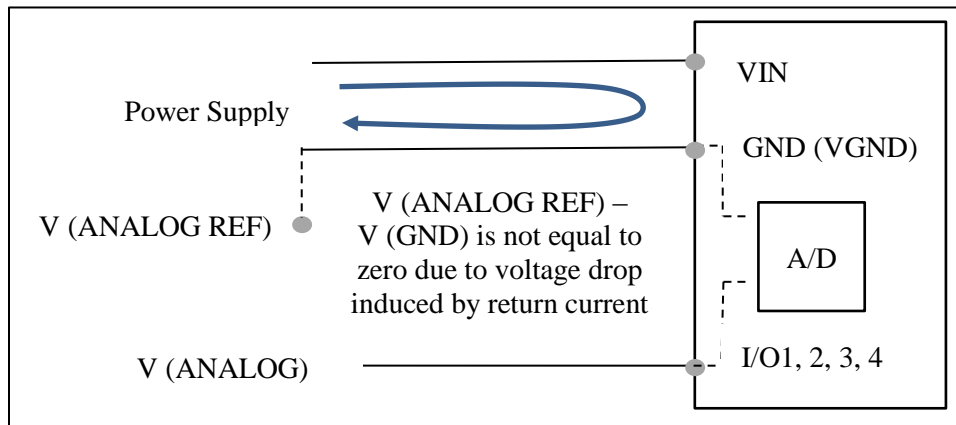
Parameter	Value
Input impedance	1 MΩ (typical)
Measurement voltage range	0 to 2.75 V
Resolution	0.7 mV (12 bits)
Accuracy	1.5 % + 2 LSB
Voltage limits	-10 to 150 V
Input sample rate	1 Hz ⁹
Input bandwidth	1 kHz minimum

3.4.3.1 Analog Accuracy

The IDP terminal measures the analog inputs using the GND pin as a reference. As the GND pin is shared with the power supply, return current can create a voltage drop between the GND pin and the power supply which in many cases changes the reference point for the analog voltage.

If analog accuracy is required, as per Figure 16, the power supply cables should be designed to limit voltage drop. As well, the application should be aware that current is a function of input voltage and the operating mode (i.e., receive, transmit, sleep)

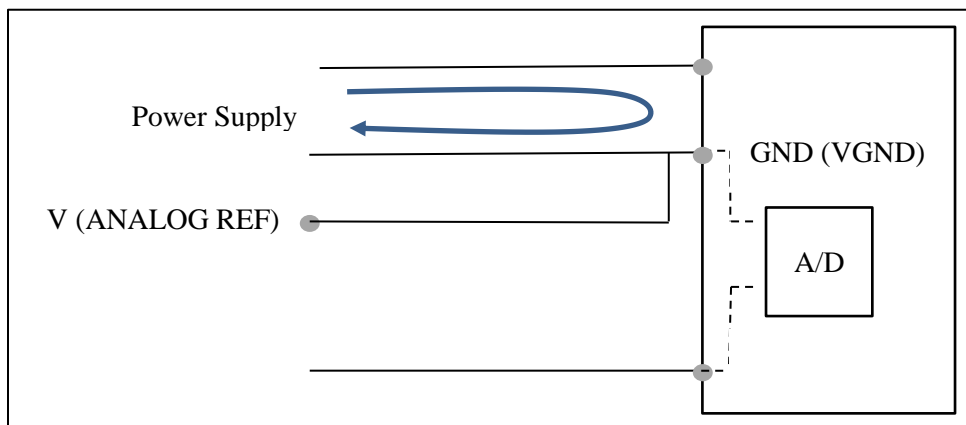
Figure 16 Analog Accuracy by Limiting Voltage Drop on Return Current



Alternatively for accurate analog measurements, the analog reference can be connected on a separate conductor to GND as per Figure 17. In this case, it is important that the power supply's return is fully isolated from the analog reference voltage to ensure return current does not flow to analog reference.

⁹ This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the input bandwidth.

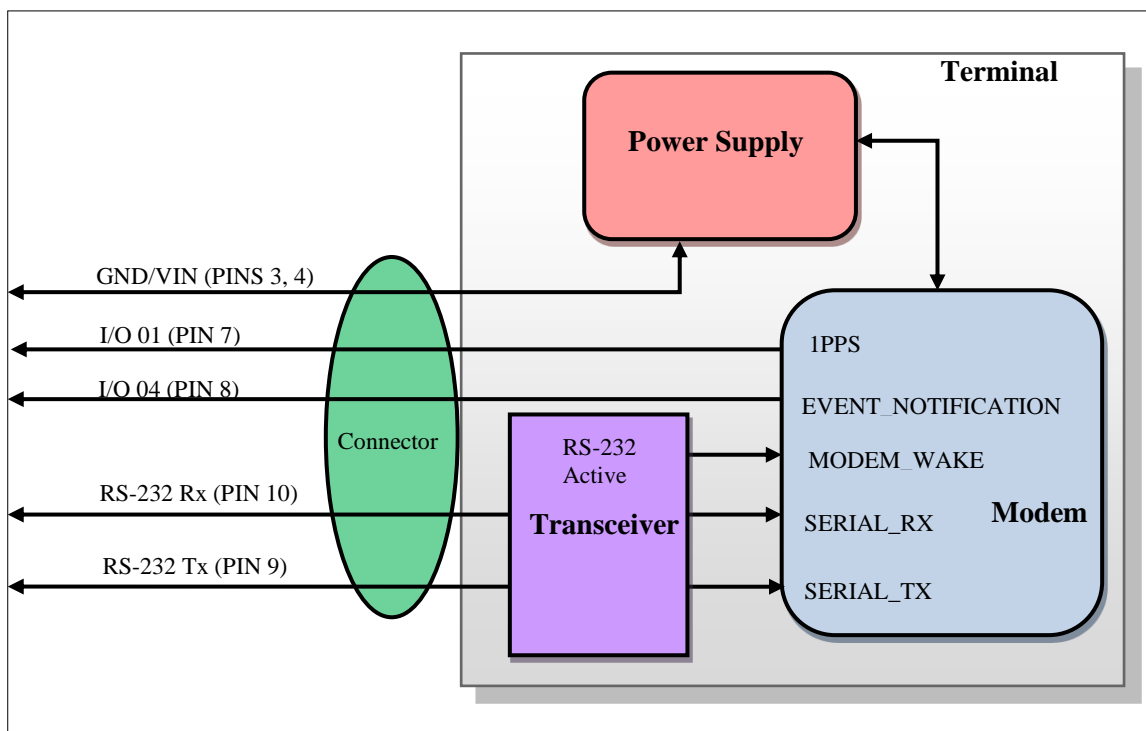
Figure 17 Analog Accuracy with Independent Analog Reference



3.4.4 Pass-Through Mode

A terminal can be configured for pass-through mode when there is no application firmware present. A block diagram of pass-through mode is shown in Figure 18. In pass-through mode, the terminal connects the modem's serial interface to the terminal's RS-232 port.

Figure 18 Pass-Through Mode Signals



The terminal's I/O lines are configured as per Table 13 when in pass-through mode. The modem's serial data and the EVENT_NOTIFICATION pins are connected to the terminal's external connector.

Table 13 Pass-Through Mode I/O States

I/O Pin	State	Specification
I/O 01	1 PPS	I/O configured as digital output Connected to 1 PPS from GPS/GLONASS The 1 PPS output is only present when GPS/GLONASS has a valid signal
I/O 02, I/O 03	Analog Input	Do not use
I/O 04	Output	Configured as Digital Output Connected to EVENT_NOTIFICATION
RS-485	Disabled	-
RS-232	RS-232	Disabled if no valid RS-232 level on receiver

When in pass-through mode, the application controller only provides basic signal routing to the modem. It does not sample or configure any I/Os.

For low power applications, it is recommended you disable the IDP-680's RS-232 receive. Without a valid RS-232 input, the terminal automatically disables its RS-232 transmit driver saving power. It also puts the internal IDP modem into a lower power mode as no incoming data is expected.

Pass-through mode time specifications are given in Table 14.

Table 14 Pass-Through Mode Timing Specifications

Parameter	Specification
Baud Rate	As per modem configuration
Maximum Jitter on Signals (Modem to External)	10 μ s
Maximum Jitter on Signals (External to Modem)	10 μ s

Table 15 Pass-Through Mode Power Consumption

Mode of Operation	Current ¹⁰
Pass-Through Mode	45 mA (only when RS-232 is driven)

3.5 Serial Interfaces

3.5.1 RS-232

The RS-232 interface defaults to the following settings: 9600 bps, 1 start, 8 data, 1 stop bit, no parity. The baud rate is configurable up to 115,200 bps.

- Rx is protected up to ± 25 V
- Tx is protected up to ± 13.5 V
- Rx and Tx have ± 13 V ESD protection

¹⁰ Drawn from a 12 V supply. Average time of receive and idle current, with the modem receiving IsatData Pro but not transmitting or receiving GPS.

The electrical characteristics of the interface are:

Parameter	Minimum	Typical	Maximum	Units
Serial Rx Input Low Threshold	0.6	-	-	V
Serial Rx Input High Threshold	-	-	2.4	V
Serial Tx Low Output (3 k Ω load)	-	-	-3.7	V
Serial Tx High Output (3 k Ω load)	3.7	-	-	V

3.5.1.1 Auto RS-232 Power On/Off

The terminal uses the input voltage to turn the RS-232 driver on/off when auto RS-232 mode is selected.

Table 16 Auto RS-232 Power On/Off

Parameter	Value
Valid Rx Input Threshold	$Rx > 2.7\text{ V}$ or $Rx < -2.7\text{ V}$
Invalid Rx	$-0.3\text{ V} < Rx < 0.3\text{ V}$

3.5.2 RS-485

The electrical characteristics of the two wire RS-485 interface are below.

Table 17 RS-485 Characteristics

Parameter	Minimum	Typical	Maximum	Units
Input Common Mode Voltage	-7.0	-	+12	V
Differential Input Threshold	-200	-125	-50	mV
Output Common Mode Voltage	-	1.5	3.0	V
Differential Drive Output, 54 Ω load	1.5	-	-	V

3.6 RF Specifications

3.6.1 Frequency

Table 18 RF Frequency Specifications

Parameter	Value
Receive	
Frequency Band	1525 to 1559 MHz
Modulation	OQPSK
Symbol Rate	3000 symbols/seconds
Polarization	RHCP
Transmit	
Frequency Band	1626.5 to 1660.5 MHz
Modulation	OQPSK

Parameter	Value
Symbol Rate	900 symbols/seconds (maximum)
Polarization	RHCP

3.6.2 IDP-680 Standard Antenna

Parameter	Value
Maximum EIRP	7 dBW
Elevation Angle	20 degrees
Maximum transmit antenna gain	4.5 dBic

3.6.3 IDP-690 Low Elevation Antenna

Parameter	Value
Maximum EIRP	5 dBW
Elevation Angle	-15 degrees
Maximum transmit antenna gain	2.5 dBic

3.7 GPS/GLONASS

The IDP terminal can be configured to use either GPS or GLONASS.

Table 19 GPS and GPS/GLONASS Specifications

Parameter	Software GPS (Modem HW #3)	Hardware GPS (Modem HW #4)	GPS/GLONASS (Modem HW #5)	
	GPS	GPS	GPS	GLONASS
Time to First Fix¹¹				
Cold Start	36 s	27s	29s	30s
Warm Start	8 s	27s	28s	25s
Hot Start	-	1s	1s	1s
Sensitivity				
Tracking	-146 dBm	-159 dBm	-162 dBm	-158 dBm
Hot Start	-	-156 dBm	-156 dBm	-156 dBm
Cold Start	-136 dBm	-147 dBm	-148 dBm	-140 dBm
Accuracy				
Horizontal Position (CEP) ¹²	4 m	2.5 m	2.5/2.0 m	4.0 m
Velocity	0.02 m/s	0.1 m/s	0.1 m/s	0.1 m/s
Heading	-	0.5 degrees	0.5 degrees	0.5 degrees

¹¹ All satellites at -130 dBm

¹² CEP, 50%, 24 hours static, -130 dBm

3.7.1 1 PPS Signal

The 1 PPS signal is available from the GPS modem. It is a CMOS/TTL output and outputs a pulse every second, providing a valid GPS signal is present. If the GPS signal is blocked, the 1 PPS stops.

By default the GPS is only on when requested by the application or the network. For constant time updates, the GPS must be on at all times (*continuous GPS*). Refer to [T204] for further details.

3.8 Physical Details

The terminal's mechanical enclosure is a rugged, impact, and chemical resistant plastic material. All dimensions are shown in millimeters (mm).

Figure 19 IDP-680 Top View Enclosure Dimensions (mm)

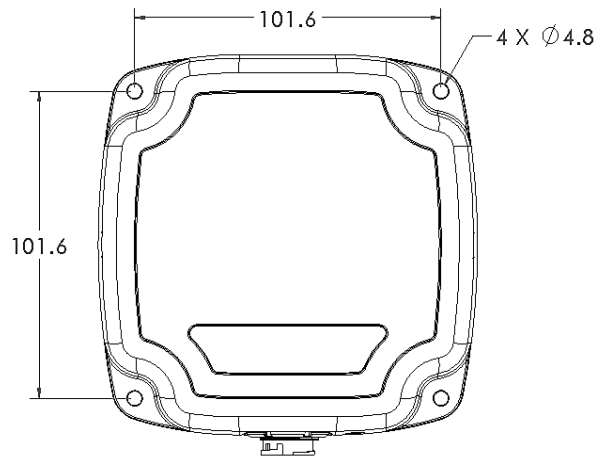


Figure 20 IDP-680 Side View Enclosure Dimensions (mm)

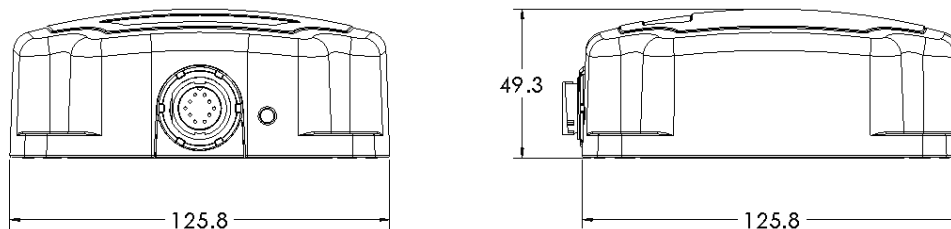


Figure 21 IDP-680 and IDP-690 Top View Enclosure Dimensions (mm)

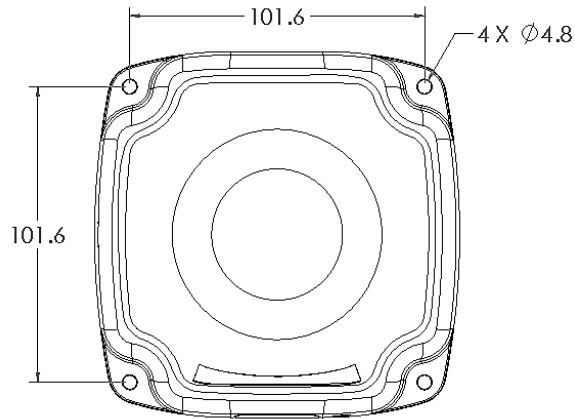


Figure 22 IDP-690 Side View Enclosure Dimensions (mm)

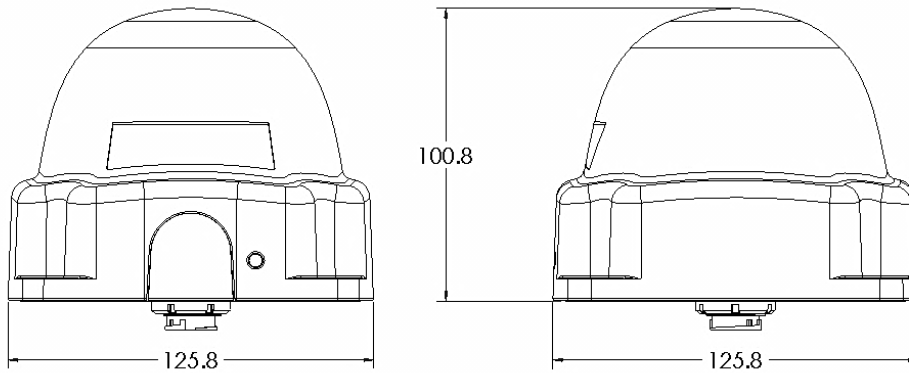


Figure 23 IDP-680/IDP-690 CID2 Bottom View Enclosure Dimensions (mm)

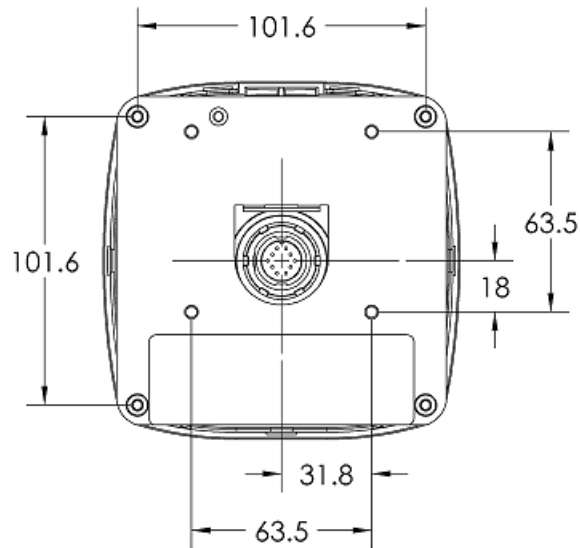


Figure 24 IDP-680 CID2 Side View Enclosure Dimensions (mm)

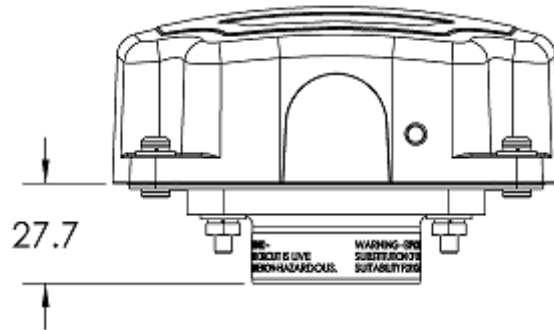
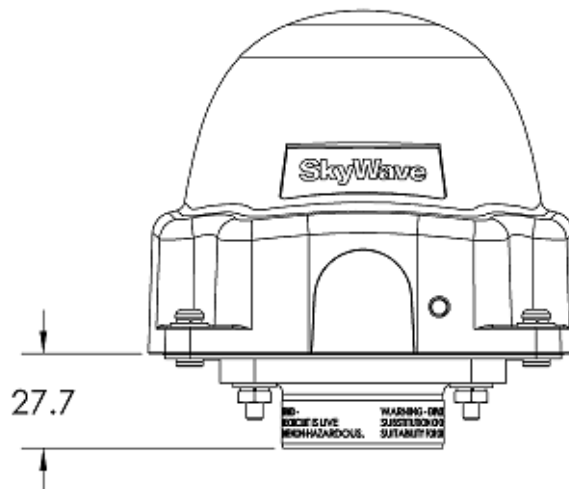


Figure 25 IDP-690 CID2 Side View Enclosure Dimensions (mm)



IDP-680/IDP-690 Terminals

Table 20 Terminal Mass and Materials

Parameter	Value
IDP-680 or IDP-690 terminal mass	460 g
IDP-680 CID2 or IDP-690 CID2 terminal, including adaptor bracket with lance and threaded studs mass	595 g
Conduit adaptor with gasket mass	110 g
Strain relief assembly mass	25 g
Enclosure Material	Lexan EXL9330 Resin

3.9 LED

The terminal has an integral LED to indicate that the terminal has successfully powered up (Section 4.8). Refer to [T204] for further details.

Parameter	Value
Color	Red

3.10 Non-Volatile Storage

The IDP-680/IDP-690 terminal has non-volatile flash memory that is shared by both the terminal firmware and user services.

Table 21 Non-Volatile Storage

Parameter	Value
Non-Volatile On-board Flash Storage	4 MB
Write-Erase Cycles (per operating life)	100 000

3.11 Environmental

3.11.1 Temperature

Table 22 Temperature Ratings

Parameter	Value
Operating Temperature	-40° to +85°C
Storage Temperature	-40° to +85°C

3.11.2 Environmental

Parameter	Description
Humidity	The IDP-680 meets all its specifications during exposure to 90% relative humidity at +85°C, per the test methodology of SAE J1455, section 4.2.3.
Vibration	The IDP-680 meets all its specifications during exposure to random vehicular vibration levels per SAE J1455, section 4.9.4.2 and MIL-STD-810G, section 514.6, fig 514.6C-1.
Mechanical Shock	The terminal meets all its specifications after exposure to positive and negative saw tooth shock pulses with peaks of 20G and durations of 11 ms as specified in MIL-STD-810G, section 516.6, Procedure I, section 2.3.2c, 3/axis/(positive and negative direction).
Altitude	The terminal meets all of its specifications after a non-operating 12.2 km altitude test as detailed in SAE J1455, section 4.9.3, except with an ambient temperature of -40°C.
Thermal Shock	The terminal meets all of its specifications after a thermal shock test as detailed in SAE J1455, section 4.1.3.2.
Salt Spray	The IDP-680 meets all of its specifications after a salt spray test

Parameter	Description
Atmosphere	as detailed in SAE J1455, section 4.3.3.1.
Immersion	<p>The terminal meets all of its specifications after a 6 hour alternating hot/cold salt water immersion test as detailed in SAE J1455, section 4.3.3.2.</p> <p>The terminal meets all of its specifications after a 30 minute, 1 m depth fresh water immersion test as detailed in IEC 60529, section 14.2.7.</p> <p>These immersions were performed without a cable mating with the circular connector.</p>
Exposure to Chemicals and Oils	<p>The terminal meets all of its specifications after a light to moderate splash test as detailed in SAE J1455 section 4.4.3.2, for the following chemicals:</p> <ul style="list-style-type: none"> Window Washer Solvent Gasoline Diesel Fuel Fuel Additives Alcohol Anti-Freeze Water Mixture Degreasers Soap and Detergents Steam Waxes Kerosene Freon Spray Paint Paint Strippers Ether Dust Control Agents (magnesium chloride) Moisture Control Agents (calcium chloride) Ammonia Aluminum brightener (acid wash)
Steam Cleaning and Pressure Washing	The terminal meets all of its specifications after a steam cleaning and pressure wash test as detailed in SAE J1455, section 4.5.3.
Fungus	The terminal meets all of its specifications after a fungus test as detailed in SAE J1455, section 4.6.3.
Dust and Sand Bombardment	<p>The terminal meets all of its specifications after a dust and sand bombardment test as detailed in SAE J1455, section 4.7.3.</p> <p>The terminal meets the acceptance conditions of IEC 60529, section 13.6.2 after a dust and sand bombardment test as detailed in IEC 60529, section 13.4.</p>
Drop Test	The terminal meets all its specifications after a handling drop test as specified in SAE J1455, section 4.11.3.1.
ESD	The terminal meets all its specifications after exposure of the enclosure to 6 kV ESD contact discharge per IEC 61000-4-2, level 3.

3.12 Temperature Sensor

Parameter	Value
Range	-40 to +85°C
Accuracy	±2°C (-25 to +85°C) ±3°C (below -25°C)

4 Installation

The following section contains SkyWave's recommended installation guidelines for the Solution Provider (SP). These recommendations should be incorporated into installation guidelines for end users.

CAUTION *The installer is responsible for following all safety guidelines during product installation. Refer to [Preface](#) section for details.*



The terminal uses very low power during transmission and therefore presents no radiation hazard during normal use, installation, testing, and troubleshooting.

4.1 Getting Started

Getting the terminals ready for operation requires doing the following:

1. Prepare for the installation (Section 4.2)
2. Identify the fuse panel location (Section 4.3)
3. Determine a suitable mounting location (Section 4.4)
4. Route the main cable (Section 4.5)
5. Mount the terminal (Section 4.6)
6. Protect the cables and cable connectors (Section 4.7)
7. Connect to power (Section 4.8)
8. Register the terminal (Section 4.9)

4.2 Prepare for the Installation

Check that you have the items and tools listed below before installing the terminal.

4.2.1 Shipping Box Contents

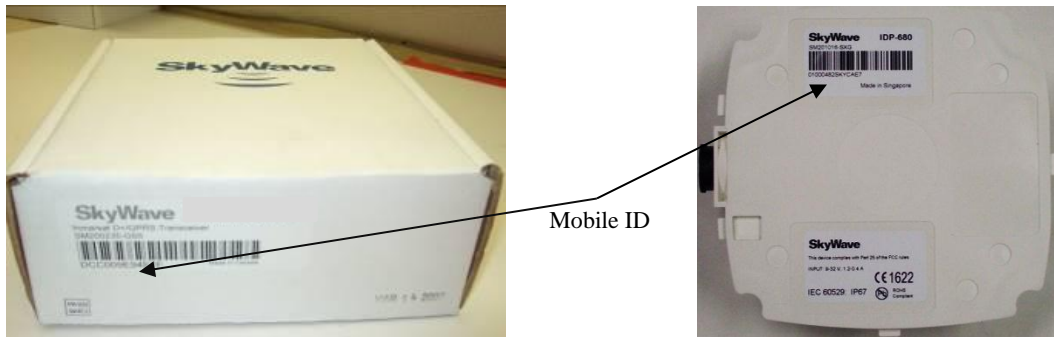
Unpack the contents of the shipping box and use the list below as a guide to check that you received the items you ordered.

- IDP-680, IDP-690, IDP-680 CID2, or IDP-690 CID2 terminal
- Mating cable connector kit
- Duplicate mobile ID labels and clear overlays
- Tube of dielectric grease (e.g., silicone lubricant)
- Installation Guide
- Optional kits (APPENDIX A)
- Conduit adaptor, strain relief bracket, and cable ties (CID2 terminals only)

4.2.2 Mobile Identification

Each terminal has a unique mobile ID used by SkyWave to register it on the IsatData Pro network. This is a 15-digit alphanumeric identifier in the format NNNNNNNNSKYXXXX. The mobile ID is located on the bottom of the terminal and on the shipping box.

Figure 26 Mobile ID Location



1. Record the mobile ID in APPENDIX E for future reference.

Note: SkyWave may activate terminals on the network prior to or after shipping based on the Purchaser (SP) agreement.

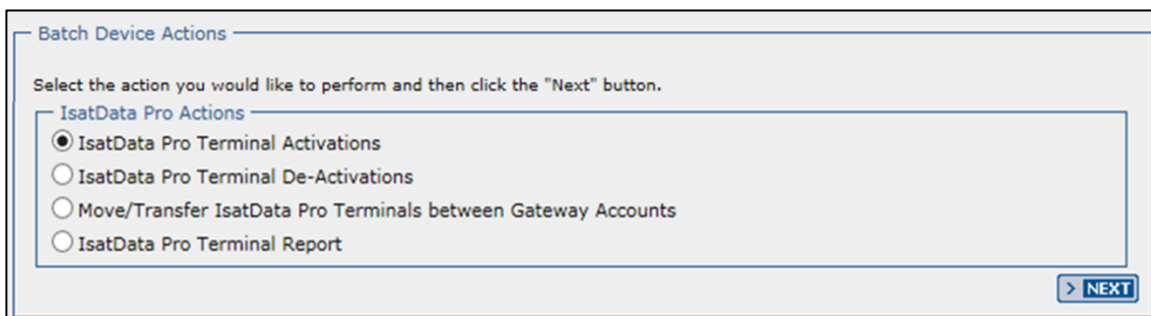
4.2.3 Activate the Terminal

In order to send or receive any message you must activate the terminal on the IsatData Pro network.

Follow the steps below to activate terminals.

1. Log onto support@skywave.com, enter your user name (registered email) and password, and then click **GO**. Contact SkyWave Customer Support at support@skywave.com if you do not have access to this site.
2. Click the Manage Mobiles icon. The Manage Terminals page appears.
3. Click the button next to *IsatData Pro Terminal Activations* and click **NEXT**.

Figure 27 Manage Terminals



4. Select your Gateway Account from the drop-down list.
5. Enter the terminal's mobile ID in the appropriate field and click **ADD**.
If you have multiple mobile IDs, you can use the **UPLOAD FILE** option.

6. Verify that at least one contact email address is shown in the Notification section on the data entry page.
Keep a copy (APPENDIX E) of the terminal's mobile ID along with the server access ID and password you receive in the activation report email (Figure 28) from SkyWave Customer Support. You need these to communicate remotely with the terminal.
7. Click **SUBMIT**.

Figure 28 Sample Activation Report

SkyWave SkyWave Support

Report

Report: Active Control Stations and Terminals
 Report generated: May-24-2011 14:57
 Report period: Current

Control Stations/Access IDs

Solution Provider: **SkyWave Internal**
 Solution Provider ID:

Gateway Account Name: **SkyWave Support**
 Gateway Account ID:

Access ID	Password	Activation Date
70000009		May-03-2011 15:09

Access ID and password required to securely access your messages over the Internet

Terminals/Devices

Solution Provider: **SkyWave Internal**
 Solution Provider ID:

Gateway Account Name: **SkyWave Support**
 Gateway Account ID:

Mobile/Broadcast ID	Mode	Feature Code	Description	Status	Activation Date
010001095KY6F9E	IsatData Pro	0x0002		Activated	May-23-2011 01:30
010001685KYDCC5	IsatData Pro	0x0002		Activated	May-03-2011 19:09
16777201GR031F2	IsatData Pro		Customer Support Broadcast	Activated	May-12-2011 13:37

The Mobile ID is the serial number which appears on the terminal and is used to uniquely identify the terminal when sending and receiving messages

4.2.4 Required Tools and Materials

You require the following tools materials to install a terminal. These do not ship with the terminal.

Non IDP CID2 Terminals

- Qty 4 - M4 (8-32) 18-8 stainless steel screws (length depends on mounting surface thickness)
- Qty 4 - M4 (8-32) nuts with 18-8 stainless steel flat and lock washers
- Waterproof sealing tape
- Waterproof sealing compound such as RTV silicone (bottom connector version only)

- Custom cable¹³
- Drill
- 5.5 mm drill bit
- 30 mm diameter hole punch or hole saw (bottom connector version only)
- Screwdriver
- Socket wrench set

IDP CID2 Terminals Only

- Socket or open-end wrench set
- CID2 hazardous location approved wiring enclosure, conduit and fittings/connections

Note: The adaptation of the terminal to conduit or other enclosure must comply with local requirements for hazardous location equipment. At a minimum all connections must maintain NEMA Type 4 protection of the cable route and associate connections.

SkyWave recommends that the Solution Provider supply the end-user with a custom built cable.

The CID2 terminal comes with an aluminum conduit adaptor with a standard 1¼” female thread. The Installer is responsible for integrating the terminal into an installation that meets the local code requirements for hazardous locations.

4.3 Identify the Fuse Panel Location

For installation in a truck, the cable from the terminal connects to the truck's fuse panel for power.

1. Locate the fuse panel in the truck. The location depends on the type, age, and model of the truck.
2. Identify an un-switched vehicle power source within the fuse panel for terminal power.
3. Ensure that the cable you ordered is of sufficient length to reach from the fuse panel to the final mounting location of the terminal.

4.4 Determine a Suitable Mounting Location

Before installing the terminal, consider the important guidelines provided below.

CAUTION *Most users install the terminals on a vehicle. It is very important for installers to install the terminals in a safe and secure way to avoid danger or damage to persons or property.*



¹³ Refer to Section 5 for instructions on making a custom cable.

- For fixed installations ensure that the antenna is pointing towards the equator, facing south if in the Northern Hemisphere and facing north if in the Southern Hemisphere, and its line of sight to the sky (satellite) is clear of obstructions.
- For a mobile installation, mount the antenna at the highest point on the vehicle or vessel where it has a clear view of the sky (satellite) in all directions.
- Mount the terminal on a flat surface for mobile installations such that the elevation angle does not change with rotation.
- Fasten the terminal securely so that it is not loose and does not move easily.
- Mount the terminal on a rigid, stable surface. If necessary, use a mounting bracket (not supplied) or other suitable support.
- Mount the terminal so that the top surface is horizontal (flat). Failure to do so may compromise line of sight between the satellite and the terminal.
- Mount the terminal on a surface that does not get hotter than the maximum operating temperature. If the surface may get hotter, mount the terminal with a thermal barrier between it and the mounting surface.

CAUTION *Mount the terminal at least 20 cm away from humans.*




- Do not mount the terminal close to other electrical equipment due to possible radiated and/or conducted electromagnetic interference.
- Do not mount the terminal close to radar or other communications antennas. Use the following guidelines:
 - > 1 m from VHF/UHF antenna
 - > 3 m from loop antenna
 - > 4 m from MF/HF antenna
 - > 5 m from other satellite antennas
 - Not within a radar beam
- Do not mount the terminal where water may build-up or collect.
- Ensure that any paint above the terminal is non-metallic and non-metallic flake, if the installation is under fiberglass or composite wind fairings.
- Check that the terminal's cable reaches the power source before you drill any mounting holes.
- Do not mount the terminal close to an exhaust pipe due to the excessive heat and the potential for the exhaust pipe causing satellite blockage.
- Do not mount the terminal close to air horns or any tractor roof hardware (e.g., emergency lights) that could interfere with satellite communications.
- Mount the terminal on the driver's side of the vehicle, if possible, when there is a possibility of strikes by overhanging tree branches.
- Do not install the terminal inside the truck under the roof liner.
- Ensure the IDP-680 CID2 or IDP-690 CID2 mounting surface is capable of mechanically supporting the terminal. It is recommended that the terminal be mounted on an NEMA Type 4 enclosure qualified for use in hazardous locations as


required for the specific application. A Galvanized Rigid Conduit (GRC) or Electrical Metal Tubing (EMT) tubing and/or metal GRC/EMT conduit fitting may be used to adapt the terminal.

Once you have picked the mounting location, mount the terminal (refer to Section 4.5).

4.5 Route the Main Cable

Consider the following guidelines before routing the cable assembly.

CAUTION  *Ensure the power cable will not be pinched, kinked or worn down by any objects or moving parts such as the door hinges. It is very important to secure the cable at many points along its path.*

CAUTION  *Prior to working on any cabling, ensure that the terminal is powered off and will not start while work is in progress.*

- Do not route the cable near the engine if routing through the engine compartment. This location can subject the cable to extreme heat.
- Keep the cable away from hot surfaces such as exhaust pipes as this may damage the cable.
- Do not run the cable over sharp or jagged edges.
- Place the cable in recesses and channels, whenever possible, to prevent potential damage or wear by foot traffic.

Note: *Remember to leave enough cable slack near the terminal for strain relief so as not to introduce any additional force on the connector. SkyWave recommends securing the cables during installation.*

Figure 29 Sample Cable Placement in a Vehicle Cab



Run the cable assembly following the steps below.

1. Use tape to temporarily secure the terminal in its final location while you run the cable.

CAUTION  *Do not drill any mounting holes at this time.*

2. Search for vehicle cab entry points on the side of the vehicle closest to the fuse panel. This helps to minimize the amount of cable routed along the floor of the cab.

Where possible route the cable through existing holes in the floor or the firewall of the engine compartment.

3. Route the cable starting from the terminal to the fuse panel or battery source.

Note: *SkyWave recommends that you tape cable ends to prevent dirt from collecting on the contacts.*

4.6 Mount the Terminal

These instructions apply to non-CID2 terminals. Refer to APPENDIX G for CID2 instructions.

CAUTION *Painting terminals may interfere with their performance.*



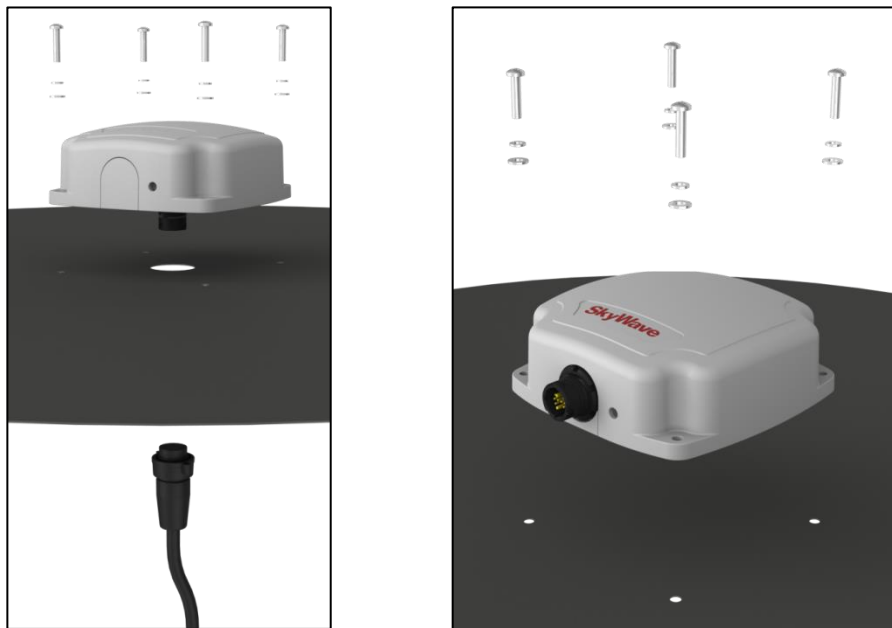
The terminal either has a bottom connector or a side connector.

The duplicate mobile ID labels, shipped with the terminal, can be placed on the asset where the terminal is mounted and/or on any customer paperwork. For outdoor applications these labels should be protected by applying the clear overlays provided.

Note: *The Solution Provider is responsible for providing mounting instructions if the mounting is to be done using tools or configurations that are different from the ones described in this document.*

Note: *It is the installer's responsibility to comply with local electrical codes.*

Figure 30 Bottom Connector and Side Connector (IDP-680 shown)



If installing an IDP-680 CID2 or IDP-690 CID2 terminal in a hazardous environment, refer to APPENDIX G before mounting the terminal.

4.6.1 Drill Mounting Holes (optional)

Note: *These steps are only needed if you do not require a mounting bracket (provided by the Solution Provider).*

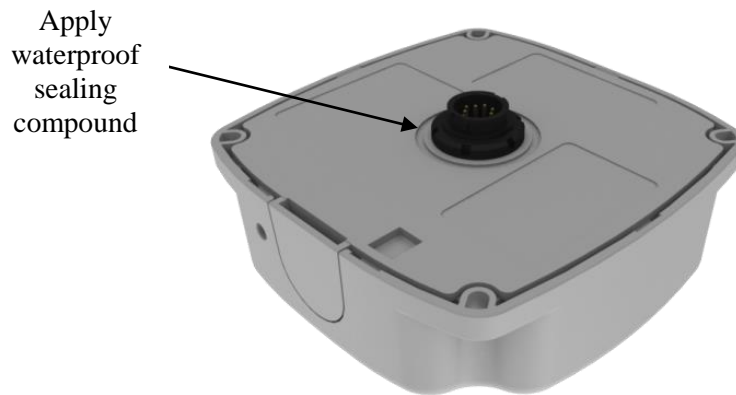
1. Use the drill template (APPENDIX F) to mark the location of the four mounting holes and the connector hole. The direction of the terminal with a bottom connector is not important.
2. Drill the four mounting holes using the drill with the 5.5 mm bit.
3. Punch or drill the 30 mm hole for the connector (bottom connector only).
4. Continue with the steps, below, for Mount the Terminal.

4.6.2 Mount the Terminal

1. Apply waterproof sealing compound, such as RTV silicone, to the locations shown in Figure 31 (bottom connector only).

Optional: You can also apply waterproof sealing compound to the drilled mounting holes before inserting the screws.

Figure 31 Location for Waterproof Sealing Compound



2. Use the screwdriver and socket set to lock the terminal in place with the mounting hardware.

CAUTION *Do not over-tighten.*

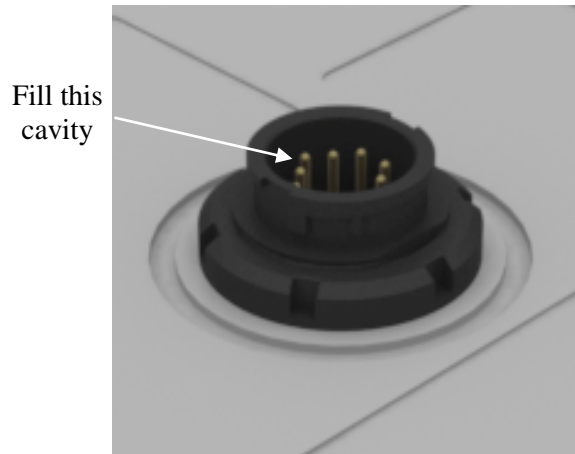


4.6.3 Apply Dielectric Grease

1. Cut off one end of the tube of silicone lubricant (Figure 32). Adding the silicone lubricant (grease) ensures that there is a watertight seal.
2. Insert the tube into the male end of the mating connector (Figure 32).

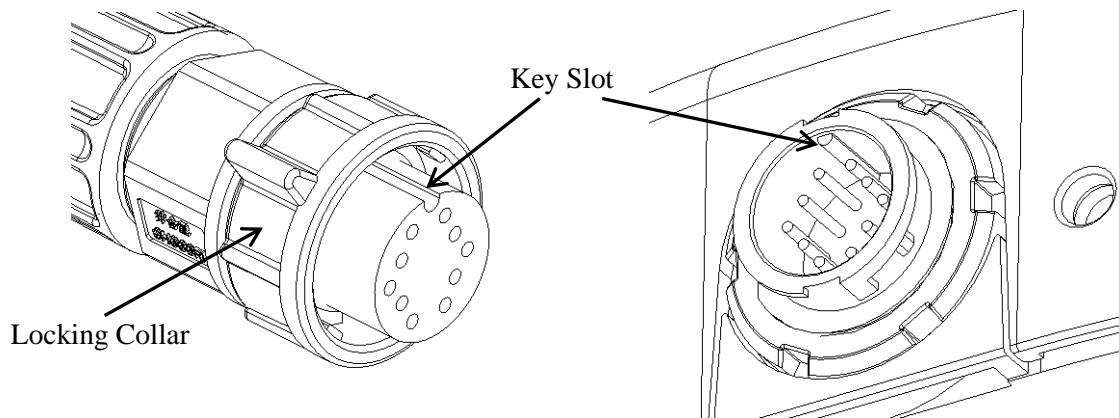
CAUTION *Do not apply pressure to the cable/connector during the installation.*



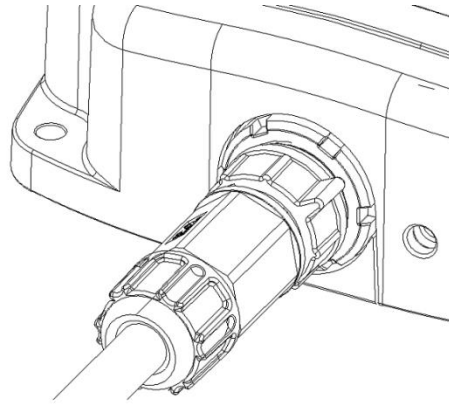
Figure 32 Apply Silicone Lubricant to Connector

3. Squeeze the lubricant into the mating connector opening until it is full. Some lubricant may spill out.
4. Connect the cable connector to the terminal by aligning the corresponding connector key slot (Figure 33) and gently squeezing together.

CAUTION *Do not force the connector pins to mate since this may damage the pins.*

**Figure 33 Key Slot**

5. Tighten the cable connector with hand pressure by rotating the locking collar on the cable connector clockwise. **Do not use a wrench.** A tactile click is felt when the collar is properly engaged.

Figure 34 Cable Connector and Locking Collar

6. Wipe off any extra lubricant around the connector.
7. Wrap the mating connector with waterproof sealing tape if using the connector in changing weather conditions.

4.7 Protect the Cables and Cable Connectors

CAUTION

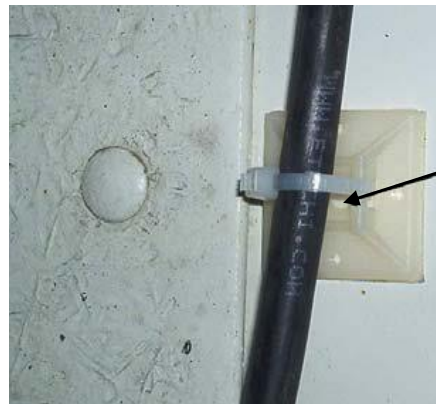


Cable management and connector strain relief must be incorporated in the installation. SkyWave highly recommends securing the cable at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the terminal connector. Damage to the terminal connector interface or cable may otherwise result leading to hardware failure.

To protect the terminal's connector interface, follow the guidelines below:

- Apply tape around the cable ends to help in routing the cable.
- Secure the cable such that it does not pull on the connector or strain the terminal connector.
- Tie the cable down so that the weight of a vibrating cable does not stress or strain the connection.
- Tie the cable down using cable ties and tie holders (Figure 35) at 300 to 600 mm intervals along the cable route to prevent chafing, wear, or strain.
- Secure the cable tie holder with a self-tapping screw (Figure 35) for best holder retention.

Figure 35 Cable Management



Adhesive cable tie holder. Apply a self-tapping screw here for added strength.

4.8 Connect to Power

CAUTION Apply power only after making ground connection.



CAUTION Before applying power to the terminal, make sure that your power supply's rated voltage follows the recommended values specified in Section 2.



CAUTION The installer is responsible for complying with local electrical codes.



Warnings below are for IDP-680/IDP-690 CID2 terminals only

WARNING This equipment is suitable for use in Class I Division 2 (CID2), Groups A, B, C and D locations or non-hazardous locations only.



WARNING Explosion hazard – Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



AVERTISSEMENT – Risque d'explosion – Avant de connecter ou de déconnecter l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux.

WARNING Explosion hazard – Substitution of components may impair suitability for Class I, Division 2.



AVERTISSEMENT – Risque d'explosion – La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Class I, Division 2.

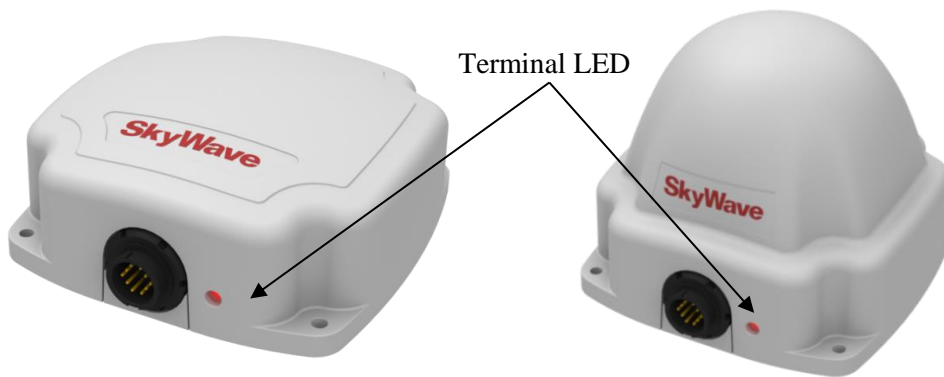
Note: SkyWave recommends that if possible the user wait until the terminal is unblocked (i.e., has a full view of the sky) before powering up the terminal.

1. Locate the main power input and the ground (GND) wires on the cable breakout. You can connect the terminal ground to ground in the fuse panel or to chassis ground. To do this, secure the ground wire on the cable assembly to a piece of metal electrically connected to the vehicle chassis using a sheet metal screw.

2. Ensure that the main power input and ground wires reach the vehicle fuse panel.
If the wires are not long enough, splice similar gauge wire to the main power input and ground wires so that they reach the fuse panel. Cover any splices with adhesive lined heat shrink.
3. Connect the ground wire to the grounding point selected in Section 4.3.
4. Connect the main power input wire to the un-switched vehicle power source within the fuse panel.
5. Loop and secure any excess cabling.

When connected to an external power source, the terminal gives an indication that it has power when the LED lights up.

Figure 36 LED Location



If your application requires extended cable lengths, it is necessary to calculate the cable voltage drop to determine if the terminal is receiving at least 9 V (with 1.7 A draw). Large cable voltage drops may adversely affect terminal operation.

Note: *Connect only SkyWave approved cables to the terminal. Use of other cables voids the terminal warranty.*

4.9 Register the Terminal

Note: *IDP-680/IDP-690 terminals must complete registration to operate.*

Once you apply power, the terminal goes into satellite search mode to acquire the SkyWave IsatData Pro network. This activity may take a few minutes to complete. If you experience difficulties, refer to Section 6 for troubleshooting suggestions.

1. Once the terminal synchronizes itself with the network, it sends a registration message to the SkyWave IsatData Pro network.

Note: *The terminal will not register until it has a clear line of sight to the satellite.*

2. The SkyWave IsatData Pro network records the registration message and forwards the registration message to the user's application.

The SkyWave IsatData Pro network sends an acknowledgement message over the satellite to the terminal. The terminal is now available to send and receive messages.

4.10 Cleaning Instructions

Wash the terminals with only mild soap or detergent.

4.11 Application Programming Interface

Refer to [T202] for programming information for the terminals.

5 Cable Assembly Instructions

This section provides the information necessary for the Solution Provider to assemble IDP power/interface cables for the end-user. The solder cup cable connector kit ships with the terminal.

The cable assembly procedures in this section are adequate for most installations. For particularly harsh environments such as maritime installations, SkyWave recommends using a cable with molded backfill as per the Blunt Cut cable in APPENDIX C. Please contact SkyWave if you need recommendations for a cable manufacturer.

Note: *It is recommended you choose a raw cable with the following properties:*

** The terminal accepts input ranges of 9 to 32 VDC. If your application requires extended cable lengths, it is necessary to calculate the cable voltage drop to determine if the terminal is receiving at least 9 V (with 1.7 A draw). Large cable voltage drops may adversely affect terminal operation.*

** Cable jacket and internal conductor installation rated for minimum temperature range of -40°C to 85°C, and UV compliant where exposure to UV is expected.*

Note: *For reliable operation, shield all cables used for power and data connections to the terminal.*

Figure 37 Basic Connector Parts for Soldering Configuration



5.1 Required Tools and Materials

The following tools and materials are required to build the cable using this method:

- A cable¹⁴ appropriate for the terminal's environment
- A knife
- A wire stripper
- Solder
- A fine-tip soldering iron
- A flexible high temperature silicone sealant for outdoor exposure

¹⁴ For cables exposed to extreme temperatures and sun, select a cable with a thermal rating of -40°C to +85°C and a UV resistant jacket.

5.2 Cable Assembly Steps

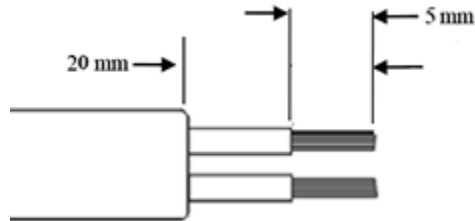
1. Use a knife to cut and remove the outer jacket of the cable, 20 mm from the end (Figure 38) and remove any foil shielding.

CAUTION *Be careful not to nick the wire insulation.*



2. Use a wire stripper to remove 5 mm of insulation from the wires (Figure 38).

Figure 38 Recommended Stripping Length



3. Twist the ends tightly to prevent stranded wires from fraying.

CAUTION *Do not solder dip.*



4. Slide the following items over the cable in sequence and as shown in Figure 39: a sealing nut, a back shell and a coupling ring.

Figure 39 Cable with Sealing Nut, Back Shell and Coupling Ring

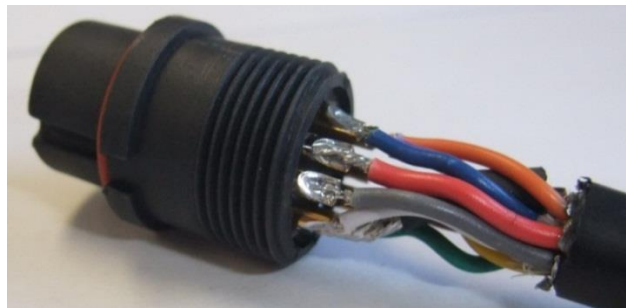


CAUTION *Ensure that the black back shell cable grommet is present inside the cable grip area (Figure 40) and the red gasket is present and oriented with flat face visible as shown in Figure 41.*



Figure 40 Cable Grommet**Figure 41 Red Gasket**

5. Using a soldering iron and solder, tin the wires and solder them to the connector solder cups (Figure 42) as per the proper pin-out.

Figure 42 Wires and Solder Cups

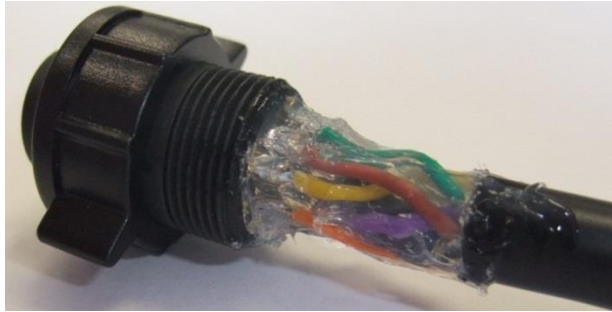
6. Ensure the O-ring is in place over the connector body as shown in Figure 43.

Figure 43 O-Ring over Connector Body

7. Slide the coupling ring over the connector body and give it a twist to prevent it from falling off.

- Use silicone sealant to completely fill the end of the connector and the area between the wires (Figure 44).

Figure 44 Silicone in the Connector



- Slide the back shell up the cable as close as possible to the connector body and fill it with silicone sealant (Figure 45).

Figure 45 Silicone in the Grommet



- Assemble the back shell to the connector body and wipe away any excess sealant (Figure 46). To aid in tightening the back shell, align the coupling ring key feature with the slot in the connector body (Figure 46).

Figure 46 Key Features in the Coupling Ring and Connector Body



- Apply sealant over the cable exit area as shown in Figure 47.

Figure 47 Cable Exit Area

12. Assemble the sealing nut over the back shell until the cable grip makes full contact with the perimeter of the cable jacket (Figure 48). Wipe away any excess sealant.

Figure 48 Assembled Sealing Nut

6 Troubleshooting the Terminal

The following section contains troubleshooting information for the Solution Provider (SP) to provide to end users.

6.1 Terminal Does Not Register or Report

On application of external power the terminal should register with the satellite and send a report.

Note: *The terminal must be visible to the satellite to register with the network and registration normally takes a few minutes.*

If the terminal fails to register or report:

- Ensure that the terminal's antenna has a clear line of sight to the satellite. The terminal must operate outdoors and be unobstructed by buildings, forest canopy, and rock cuts.
- Check that no objects or debris are on the antenna (i.e., atop the terminal) and blocking transmission.
- Verify with your SP that the terminal is assigned to your account and registered (i.e., that it is sending and receiving) and that the SkyWave IsatData Pro network is operating properly.
- Check the condition of the power cable.

Replace the terminal if the above checks fail to uncover the problem.

APPENDIX A Order Part Numbers¹⁵

Refer to Table 5 for a list of orderable hardware revision numbers and features.

Table 23 Order Part Numbers - IDP-680

Terminal	Part Number	
	Side Connector	Bottom Connector
IDP-680 with GPS/GLONASS	SM201205-SXG	SM201205-BXG
IDP-680 with GPS/GLONASS and CID2 approval	-	SM201291-BXG

Table 24 Order Part Numbers - IDP-690

Terminal	Part Number	
	Side Connector	Bottom Connector
IDP-690 with GPS/GLONASS and CID2 approval	-	SM201292-BXG
IDP-690 with GPS/GLONASS	SM201206-SXG	SM201206-BXG

Table 25 Order Part Numbers - Kits

Kits	
Mating Connector with Solder Cup Kit	ST100030-001
Contact your Account Executive for additional products and ordering codes.	

¹⁵ Refer to Table 5 for modem and terminal revision numbers.

APPENDIX B Activation Information

Server User Name: _____

Password: _____

Terminal Type/ Description	Mobile ID (NNNNNNNSKYXXXX)	Location

APPENDIX C IDP-680/IDP-690 Blunt Cut Cable

This cable connects the IDP terminal to external I/O lines and serial ports. There are a total of 10 pins on this blunt cut cable; two connect the terminal to an RS-232 console serial port or an RS-485, four wires to connect to external I/O lines, and one each for ground and voltage. The cable has an over-molded connector, a floating drain wire and is available in two models, either terminated or unterminated to ground.

Specifications

Parameter	Value
Part Number: ST301005	Cable drain wires (outer shield and I/O - Figure 50) terminated to ground at IDP terminal connector (PIN 3 - Figure 49).
Part Number: ST301025	Cable drain wires un-terminated/not connected (outer shield and I/O - Figure 50) to ground.
Length	ST301005-001 5 m ST301005-002 10 m ST301005-003 25 m ST301025-004 25 m For additional lengths, contact your Account Executive.
Temperature	-40°C to +85°C
Ultraviolet rating	UV stabilized

Figure 49 Face View of IDP-680/IDP-690 Blunt Cut Cable Connector

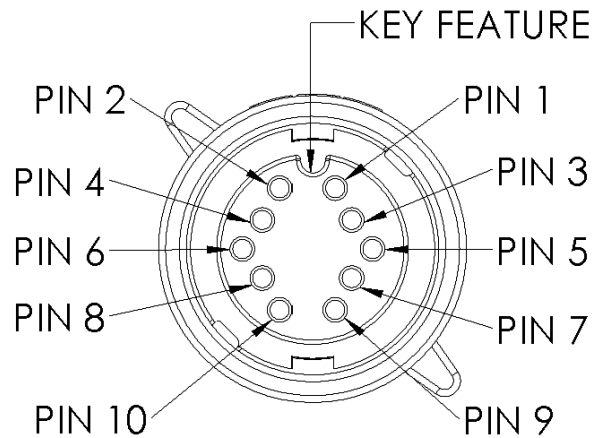
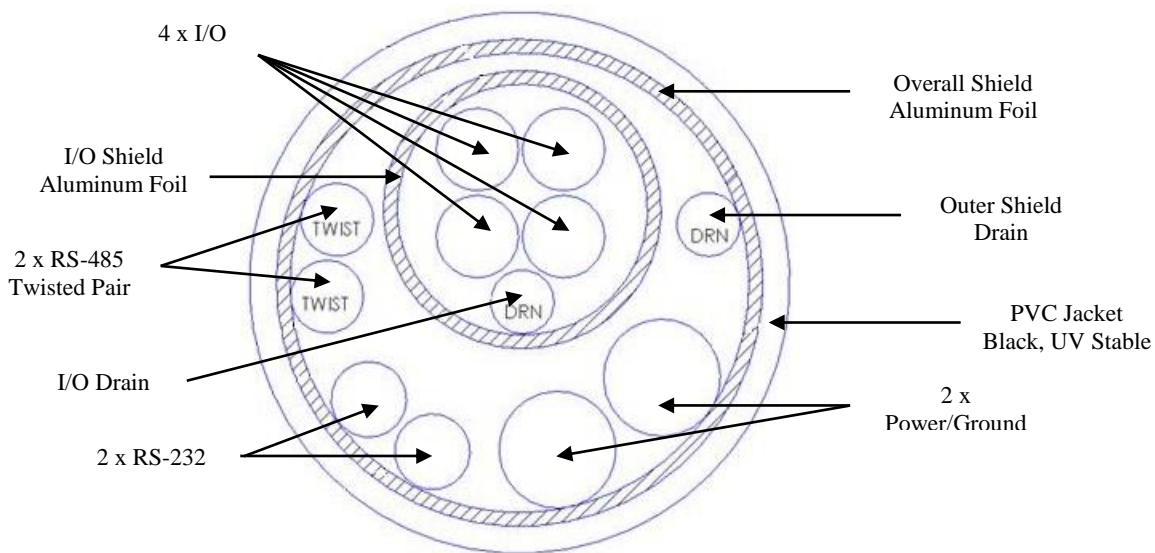


Table 26 IDP-680/IDP-690 Mating Blunt-Cut Cable Color Code

Position	Color	Wire Gauge	Functionality
1	White	22 AWG	RS-485_A
2	Grey	22 AWG	RS-485_B
3	Black	20 AWG	Ground
4	Red	20 AWG	VIN (Vbatt)
5	Green	22 AWG	I/O 02
6	Blue	22 AWG	I/O 03
7	Brown	22 AWG	I/O 01
8	Purple	22 AWG	I/O 04
9	Orange	22 AWG	RS-232 Tx (output)
10	Yellow	22 AWG	RS-232 Rx (input)

Figure 50 Raw Cable Details



APPENDIX D IDP-680/IDP-690 to DMR-800 Adaptor Cable

This cable (ST301006-001) allows an IDP-680/IDP-690 terminal to be installed in place of a DMR-800. The cable has eight connectors and the RS-485 connections on the IDP-680/IDP-690 terminal are left unconnected.

Figure 51 IDP-680/IDP-690 to DMR-800 Adaptor Cable



Specifications

Parameter	Value
Length	0.6 m
Temperature	-40°C to +85°C
Material	PVC jacket, 30 mils thick, black
Ultraviolet rating	UV stabilized

Figure 52 IDP Connector End Pin-Out

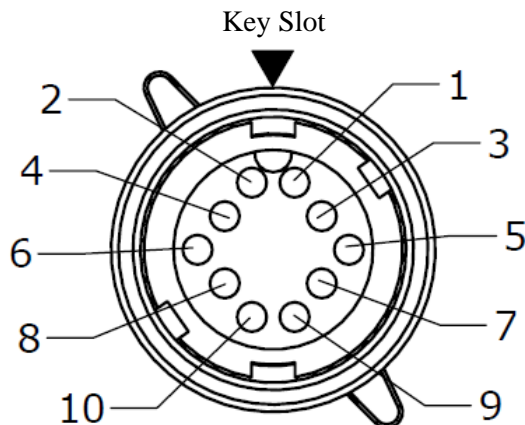


Figure 53 DMR-800 Mating Connector End Pin-Out

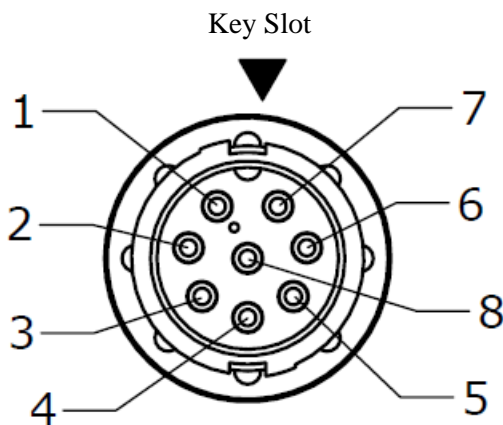


Table 27 Cable Connector Pin-Out

IDP Position	DMR-800D Position	Wire Gauge
1	N/C	-
2	N/C	-
3	4	18 AWG
4	5	18 AWG
5	6	20AWG
6	7	20 AWG
7	1	20 AWG
8	8	20 AWG
9	2	20 AWG
10	3	20 AWG

APPENDIX E IDP-680/IDP-690 Extension Cable

This cable (ST301017-001) allows an IDP-680/IDP-690 terminal to be installed in place of a DMR-800.

Figure 54 IDP-680/IDP-690 Extension Cable



Specifications/Guidelines

Parameter	Value
Length	5 m
Temperature	-40°C to +85°C
Material	PVC jacket, 30 mils thick, black
Ultraviolet rating	UV stabilized cable jacket
Rating	IP67 when mated
Minimum bend radius	25 mm

CAUTION

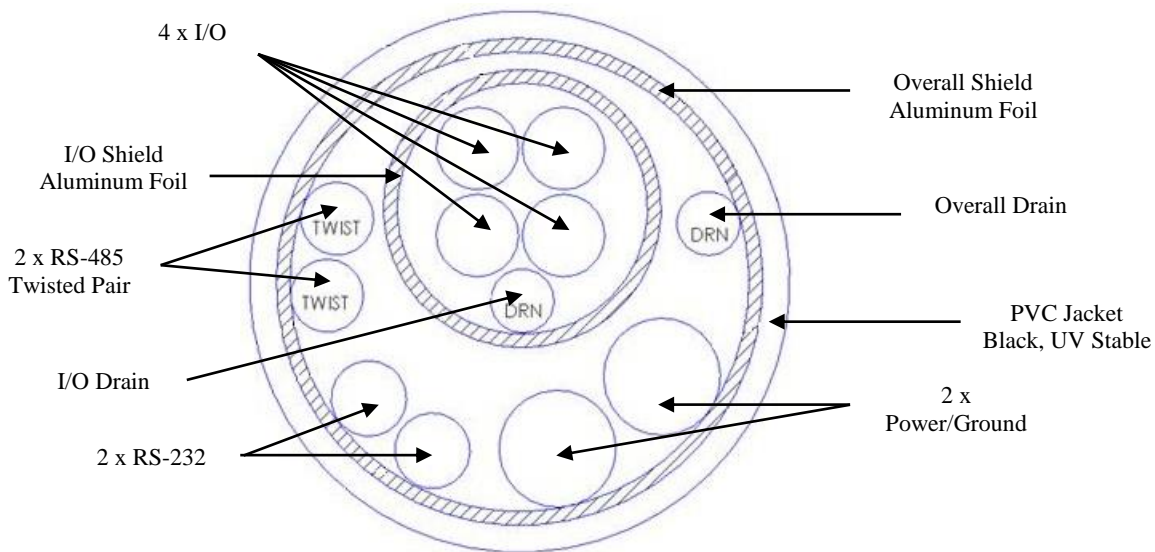


Cable management and connector strain relief must be incorporated in the installation. SkyWave highly recommends securing the cable at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the connector. Damage to the connector interface or cable may otherwise result leading to hardware failure.

Table 28 Extension Cable Wire Gauge

Functionality	Cable End A Position	Cable End B Position	Wire Gauge
RS-485_A	1	1	22 AWG
RS-485_B	2	2	22 AWG
Ground	3	3	20 AWG
VIN (Vbatt)	4	4	20 AWG
I/O 02	5	5	22 AWG
I/O 03	6	6	22 AWG
I/O 01	7	7	22 AWG
I/O 04	8	8	22 AWG
RS-232 Tx (output)	9	9	22 AWG
RS-232 Rx (input)	10	10	22 AWG

Figure 55 Raw Cable Details



APPENDIX F Installation Instructions for a Pole Mount Kit

Below are the instructions to mount a low elevation terminal vertically on a pole or horizontally on a rail. The kit (p/n ST900503) can accommodate a pole or rail between 57 and 80 mm

(2 ¼" - 3 ⅛") in diameter. The pole or rail must be of sufficient height to have line-of-sight to Inmarsat satellites.

This guide provides information required for a successful installation of the pole mount kit only. For terminal installation instructions refer to installation guide appropriate for your type of terminal.

Shipping Box Contents

SkyWave ships the Pole Mount with the following parts.

- Pole mount bracket¹⁶ - qty 1
- Clamps¹⁷ (high torque 18-8 stainless steel) - qty 2
- Cable ties (UV stable) - qty 2
- Screws (8-32 x ½", pan head, Phillips, 18-8 stainless steel) - qty 5
- Flat washers (#8, flat, 18-8 stainless steel) - qty 5
- Lock washers (#8, split, 18-8 stainless steel) - qty 5
- Installation instructions - qty 1

Required Tools and Materials

Installation of the pole mount kit requires the following tools and materials. These items do not ship with the kit.

- A torque screwdriver with N-m setting
- Cutting pliers
- A 5/16" socket, nut driver or slotted screwdriver
- Waterproof sealing compound
- Waterproof sealing tape
- Terminal (including silicone lubricant)
- Terminal cable

Installation Steps

1. Select a mounting location as per the installation instructions for your type of terminal.

¹⁶ The pole bracket shipped in the kit can accommodate up to 16 mm (5/8") wide clamps.

¹⁷ Clamps shipped in the kit can accommodate pipe diameters of 57 to 80 mm (2 ¼ to 3 ⅛").

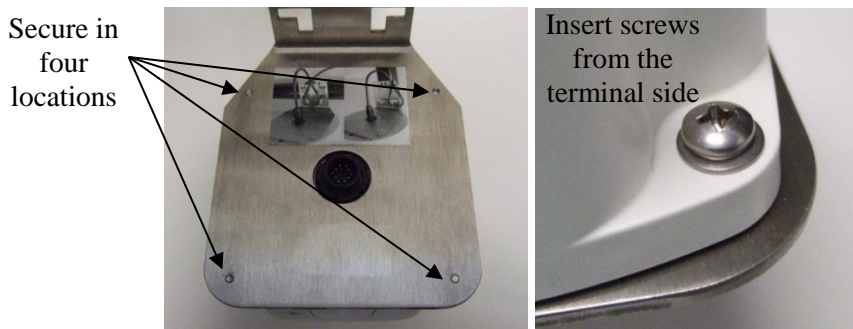
2. Attach the self-adhesive sticker found in the pole mount kit to the underside of the pole mount bracket. Write the terminal's mobile ID/serial number on the sticker so it is visible for future reference.
3. Cut off one end of the tube of silicone lubricant (ships with the terminal). Adding the silicone lubricant (grease) ensures that there is a watertight seal.
4. Insert the tube into the male end of the mating connector

CAUTION *Do not apply pressure to the cable/connector during the installation.*



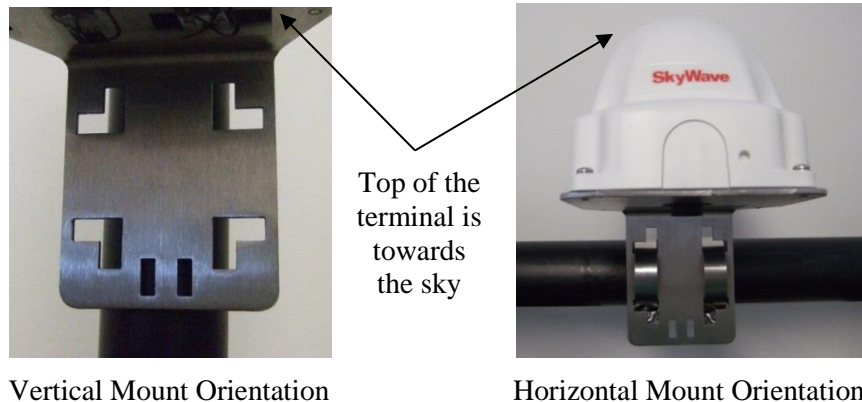
5. Squeeze the lubricant into the mating connector opening until it is full. Some lubricant may spill out.
6. Insert pan head screws, lock washers, and flat washers from the terminal side (Figure 56).
7. Screw the terminal to the bracket (four locations) (Figure 56).

Figure 56 Bracket and Screws



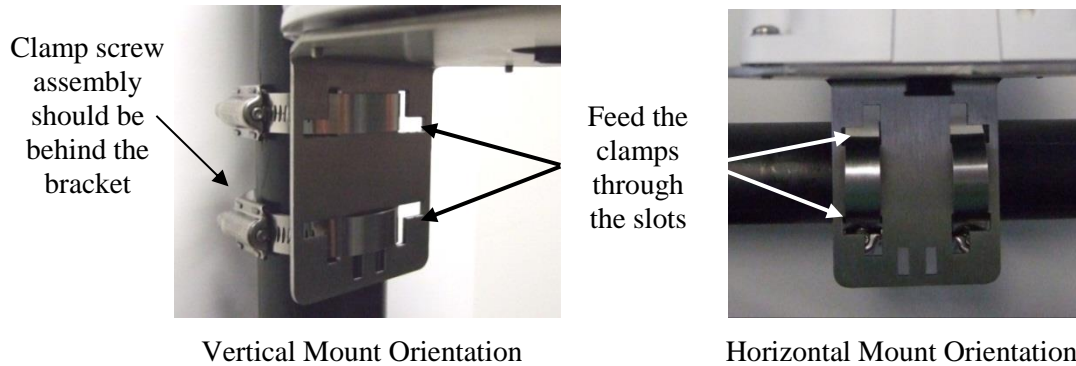
8. Torque screws to 1.4 N-m.
9. Position the terminal and bracket against the pole or rail as per the orientation shown in Figure 3.

Figure 57 Bracket Orientations



10. Open the two clamps and feed them around the pole or rail and through the slots (Figure 58) in the bracket.
11. Position the clamp screw assembly behind the mounting bracket as shown in Figure 58.

Figure 58 Feed the Clamps through the Slots



12. Tighten each clamp to 3.4 N-m with a 5/16" socket, nut driver, or slotted screwdriver (Figure 59). As you tighten the clamp it gets smaller. Do not cut the clamp.

Note: *Once the clamps are tightened, the bracket should not move on the pole if shaken back and forth.*

Figure 59 Tighten the Clamps

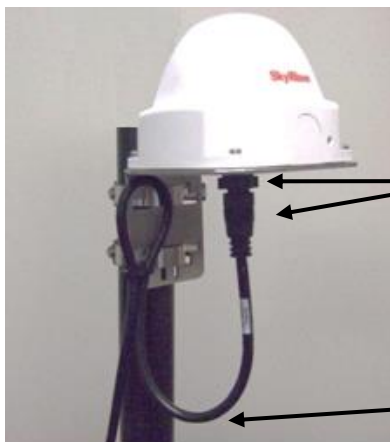


13. Connect the cable connector to the terminal by aligning the corresponding connector key slot and gently squeezing together (Figure 60).
14. Tighten the cable connector with hand pressure by rotating the locking collar on the cable connector clockwise. Do not use a wrench. A tactile click is felt when the collar is properly engaged.
15. Wipe off any extra lubricant around the connector.
16. Wrap the mating connector with waterproof sealing tape if using the connector in changing weather conditions.

CAUTION *Remember to leave enough cable for strain relief so as not to introduce any additional force on the connector.*

17. Ensure that the cable exits straight out of the terminal connector (Figure 60).

Figure 60 Cable Exit

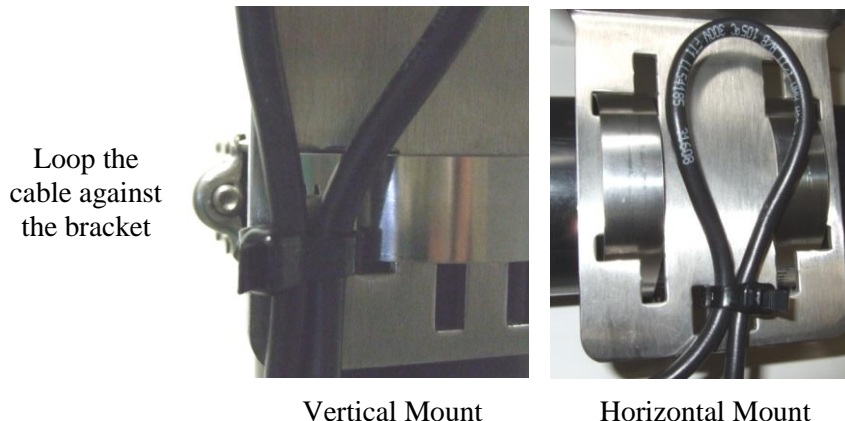


Terminal's locking collar and cable connector

CAUTION:
Ensure a cable loop hangs from the terminal connector

18. Route the cable as shown in Figure 61.

Figure 61 Secure the Cable



Loop the cable against the bracket

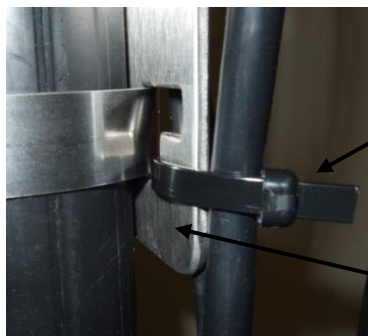
Vertical Mount

Horizontal Mount

19. Insert a cable tie through slot in the bracket (Figure 61) and then tighten. This reduces strain on the cable connection.

20. Cut off any excess cable tie length (Figure 62).

Figure 62 Tie the Cable



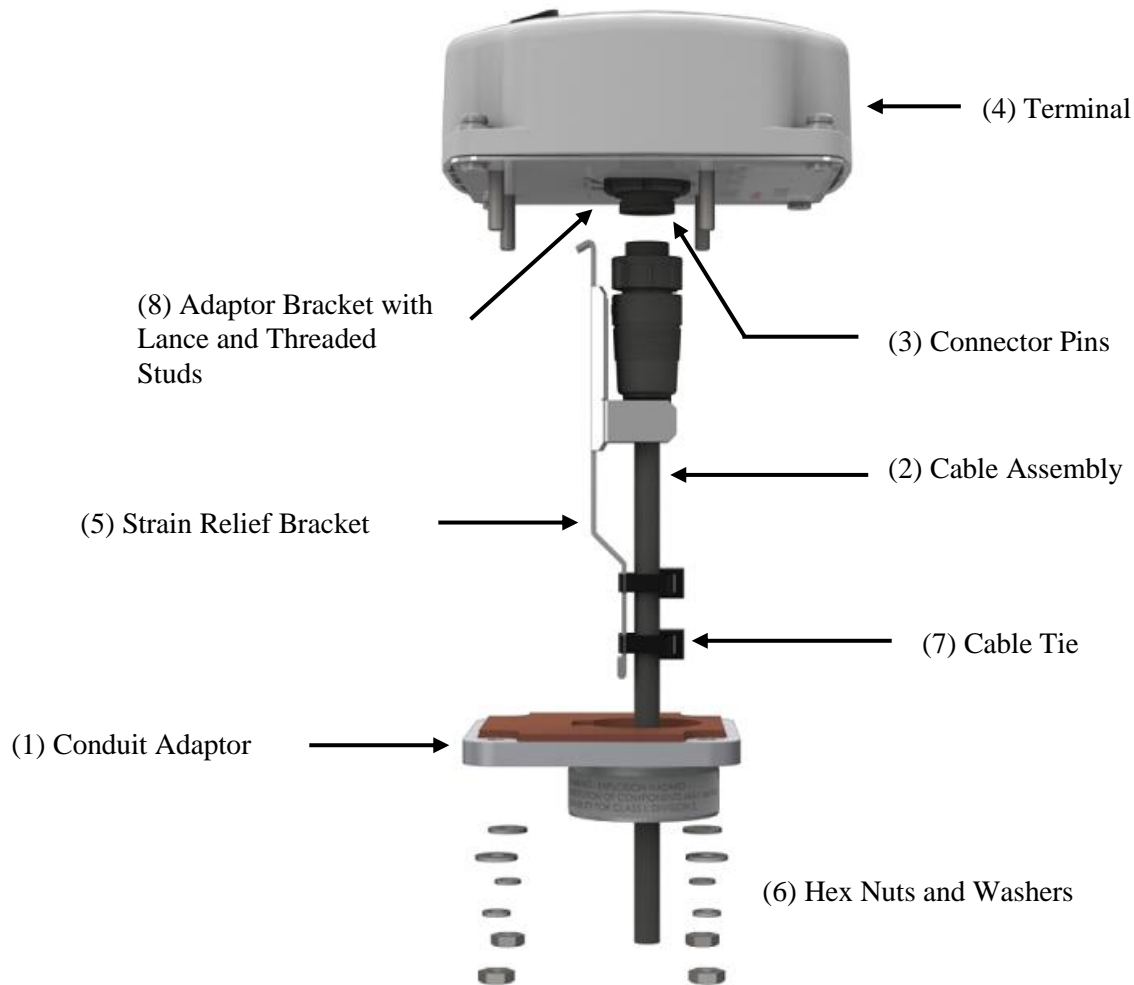
Secure cable using a cable tie and cut off any excess

Secure at widest point for a vertical mount

APPENDIX G Installation Instructions for the IDP-680 CID2 and IDP-690 CID2

Install the IDP-680/IDP-690 CID2 (for hazardous environments) following the steps below:

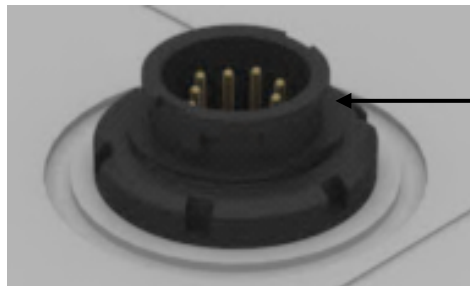
Figure 63 Installation Assembly Diagram



1. Secure the conduit adaptor (#1) to the asset using hazardous location approved 1¼" conduit and fittings. An example of appropriate fitting is shown in Figure 1. Use an outdoor grade flexible adhesive sealant at each connection to maintain a NEMA Type 4 watertight, dust tight protection.

Figure 64 Example Conduit Fitting

2. Pass the cable connector (#2) through the conduit adaptor base.
3. Apply the waterproof silicone lubricant, supplied with the terminal, over the terminal connector pins (#3).

Figure 65 Apply Silicone Lubricant to the Connector

Fill this cavity with
silicone lubricant

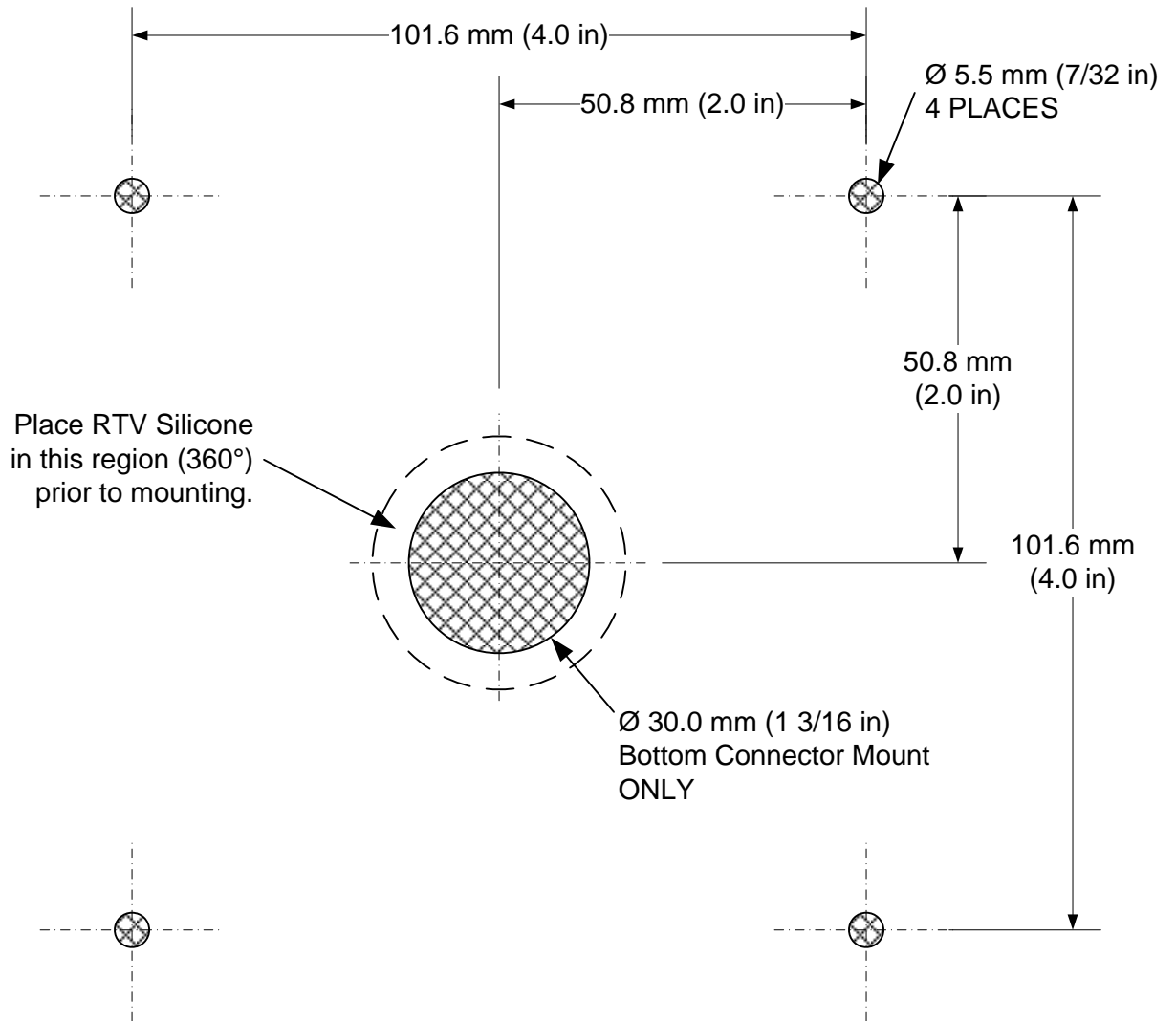
4. Secure the cable connector (#2) to the terminal (#4) by aligning the mating connector key features and engaging the cable connector locking collar. Remove any excess silicone lubricant.
5. Position the strain relief bracket (#5) in the adaptor bracket lance (#8) next to the terminal connector.
6. Assemble the conduit adaptor (#1) to the threaded studs in the terminal adaptor bracket (#8) using four (4) flat washers, lock washers and hex nuts (#6).
7. Position two cable ties (#7) around the cable at the notches in the strain relief (#5). Do not tighten at this time.
8. Tighten the cable ties (#7) while pulling down on the strain relief bracket (#5). This helps ensure that any stress on the cable does not stress the cable/connector joint.

Note: *To improve performance, point the terminal in the direction of the satellite.*

Note: *A duplicate ISN label is provided in the event that the ISN label on the terminal is obstructed from view once installed. Place the duplicate label in a convenient location.*

APPENDIX H Drill Template

CAUTION Before drilling check the template against actual hardware for dimensional accuracy. If it is not correct, **DO NOT USE THIS TEMPLATE.**



Nominal Dimensions Shown

APPENDIX I Terminal Branding Labels

The following section provides specifications and dimensional drawings for the branding labels on the terminal. All dimensions are shown in inches and images are not to scale. Please refer to the SkyWave Customer Support website (IsatData Pro - mechanical files folder) to download a .DXF file.

Figure 66 IDP-680 Branding Label

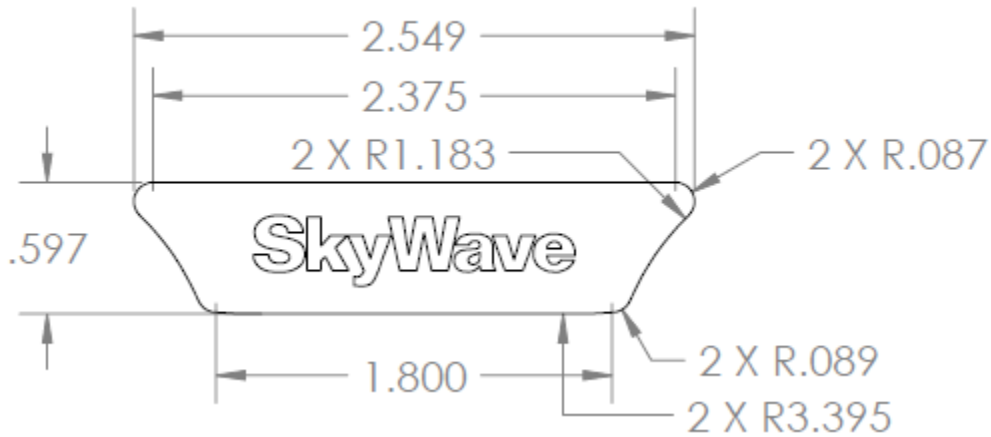
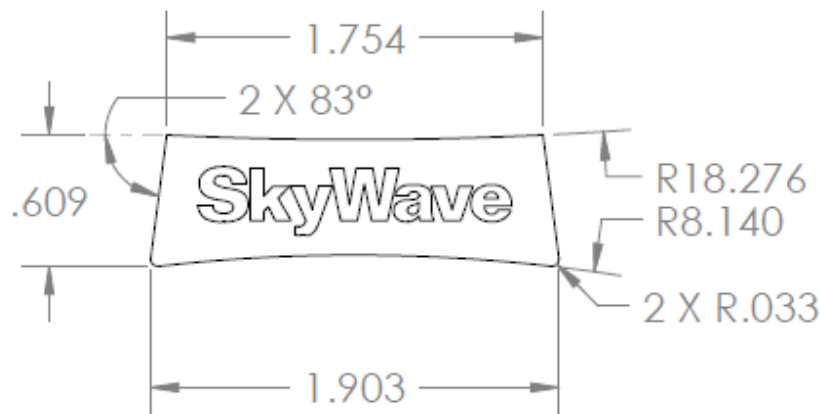


Figure 67 IDP-690 Branding Label



Parameter	Value
Overlay Material	GE Lexan 8A35 Film, .010" thick, velvet finish
Adhesive Backing	3M 7952, .002" thick
Colors	Background - GGI C-003794 (White)

Revision History

Version	Date	Details
09	Jun 2014	See What's New section for details
08	Feb 2014	IDP-680/IDP-690 terminals now available with GPS/GLONASS. Information added throughout the document; 4 MB of flash memory is standard on all IDP-680/IDP-690 terminals; Updated compliance section; Updated hardware comparison table; Updated terminal connector part number; Added inrush current values; Updated input/output section; Updated analog input accuracy; Added details about analog accuracy; General updates throughout the document
07	Jan 2014	See What's New section for details
06	Dec 2013	See What's New section for details
5.05	Jul 2013	Limited customer release. See What's New section for details
05	Jul 2012	Introduction of the IDP-680 CID2 and IDP-690 CID2 terminals with software GPS
04	Apr 2012	Added compass safe distance, Added hardware comparison table between existing hardware and new u-blox hardware, Updated certifications, Updated software GPS information and added new u-blox specifications, Updated order part numbers, Deleted references to J1708 throughout the document.
03	Mar 2012	Updated operating mode descriptions, IDP-690 now IEC 60945 compliant , Added input supply voltage , Added input frequency value for Digital Input , Updated power consumption values, Added average power consumption information , Added absolute limits for open drain and protected open drain Digital Outputs , Updated parameters and values for Analog Input , Updated RS-232 values for Serial Rx Input Low Threshold and Serial Rx Input High Threshold , Updated recommended stripping length figure , Updated order part numbers , New part numbers and details added for IDP-680/IDP-690 Mating Cables and Added instructions for the Pole Mount Kit.
02	Nov 2011	Updated elevation angle for IDP-690 (-5 to +90), Added new IDP-680/IDP-690 Extension Cable figure and updated details, added power consumption information.
01	Aug 2011	Official customer release
.18	Jul 2011	Limited customer release
.17	Jun 2011	Limited customer release
.13	Apr 2011	Limited customer release
.10	Feb 2011	Limited customer release

Acronyms/Glossary

DC	direct current
ESD	Electrostatic Discharge
FCC	Federal Communications Commission
GND	ground
GPS	Global Positioning System
I/O	input/output
IEC	International Electrotechnical Commission
kgf·cm	kilogram-force centimeter
LED	light-emitting diode
RF	radio frequency
RoHS	Restriction of Hazardous Substances
R&TTE	Radio and Telecommunications Terminal Equipment
Rx	receive
SP	Solution Provider
Tx	transmit

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