Intelligent Devices

IDI 1100 Series Technical Manual

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Table of Contents

1. Revision History

Revision Number	***Details***	***Date***
1.0	Initial Version	6 Dec 2007

2. Overview

The IDI 1100 Series of NTCIP Field Device Controller is one of a family of controllers designed by Intelligent Devices for use in real-time control of Intelligent Transportation System devices.

The base model, the 1100, includes the following features:

- Single processor
- One RS-232 serial port (RX, TX, GND)
- One RS-485 four-wire serial port
- One RS-232/RS-485 jumper-selectable serial port
- Battery-backed RAM and real-time clock

3. Features

Refer to **IDI 1100 Controller - Parts Locations** at the end of this document for a pictorial representation of the locations of the controller parts referenced in the following sections.

3.1. Power

The 1100 board receives power through J1. The board accepts 9-30 volts, either AC or DC. Jumper JMP1/JP1, located near J1, should have the jumper set to the proper position based on whether AC or DC is being applied to J1. Pin 1 (square solder pad on bottom of board) is AC Neutral or DC negative. Pin 2 is AC live or DC positive, and is closest to edge of board. The board draws no more than 0.25 amp.

3.2. LEDs

The board has four LEDs located on the motherboard, labeled LED1 through LED4. LED1 is the Main Processor Heartbeat LED, and will blink at a steady rate whenever the Main Processor is operating properly. The operation of LED2 through LED4 will vary based on the firmware loaded into the Main Processor.

3.3. DIP switches

The DIP switches (S1) perform multiple functions. If all DIP switches are set to their OFF positions, and power is cycled, upon powering up the Processor will clear all of its memory and return all parameters to their factory default values.

Most firmware uses the DIP switches to set the serial communications address. Refer to Section 4.2, Setting the Serial Communications Address, for details of how to set this address.

3.4. Serial Communications

Refer to **IDI 1100 Controller – Cable Connector Details** at the end of this document for details of the connector pinouts.

The 1100 series controllers support one RS-232 serial port, one RS-485 serial port, and a jumper-selectable RS-232/RS-485 serial port. The tables below for Port C indicates the names for the ports, the pins that each port use on J3, and the jumpers that must be set to select between RS-232 and RS-485. Ports B and C support RS-485 and RS-232 respectively.

The RS-485 ports (Port B, and Port C if configured for RS-485) each support four-wire communications. To connect one of the RS-485 ports to a two-wire network, simply jumper TX+ to RX+ and TX- to RX-.

Port C (Port 0) – RS-232 Configuration

RS-232/RS-485 Jumper positions (JMP2-5): 232

J3 Pin	Signal Name	Signal Description
1	Ground	Signal Ground
6	TX	Transmit Data
7	RX	Receive Data
8	DSR	Data Set Ready
9	CTS	Clear to Send
10	RTS	Ready to Send

Port C (Port 0) – RS-485 Configuration

RS-232/RS-485 Jumper positions (JMP2-5): 485

J3 Pin	Signal Name	Signal Description
2	TX+	Transmit Positive
3	TX-	Transmit Negative
4	RX-	Receive Negative
5	RX+	Receive Positive

Port B (Port 1) – RS-485

J2 Pin	Signal Name	Signal Description
2	TX+	Transmit Positive
3	TX-	Transmit Negative
4	RX-	Receive Negative
5	RX+	Receive Positive

Port D (Port 2) – RS-232

J2 Pin	Signal Name	Signal Description
1	Ground	Signal Ground
6	TX	Transmit Data
7	RX	Receive Data

The function and communications parameters of each serial port vary based on firmware, but the RS-232 port on J3 typically supports PMPP NTCIP communications at 9600 baud, with 8 data bits, no parity and 1 stop bit.

4. Configuring the Controller

4.1. Controller Firmware Update Procedure

The Controller Firmware can be updated in the field using a Rabbit programming cable, Rabbit Field Update software, and a computer running Windows. A Field Upgrade Kit, consisting of the Rabbit programming cable, Field Update software, and instructions, is available from Intelligent Devices.

Programming the Main Processor:

1) Apply power to the IDI Controller.
2) Connect the DB9 end of the programming cable to an IBM-compatible computer.
3) Connect the 10-pin plug of the programming cable that is labeled “PROG” to the 10-pin header on the Main Processor board. The red stripe on the cable should be aligned with the cutout corner of the silkscreened decal surrounding the 10-pin header on the processor board.
4) Start the Rabbit download utility by double-clicking the RFU.EXE file. Select File->Load Flash Image..., then browse to the provided Main Processor firmware file. The file will have a “.bin” extension. Once selected, click the OK button to start the download.
5) Upon completion of the file download, remove the programming cable from the Main Processor board and cycle power on the controller. LED4 (the one closest to the board edge) should come on steady for a few seconds while the translator reinitializes its memory. Wait for LED1 to start blinking to indicate that the processor is running properly.

NOTE: When a new version of firmware is loaded into the Main Processor the controller will clear its memory, and all settings will revert to factory defaults.

4.2. Setting the Serial Communications Address

Most firmware uses the DIP switches to set the PMPP communications address. This is the address that is used when communicating with the controller via NTCIP over any of the RS-232 or RS-485 serial ports. The address is set in binary, with each switch being assigned a value as follows:

DIP Switch Address Settings

Switch	Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

For any switch that is closed, the value associated with that switch is added to the Address. For example, closing switches 3 and 5 will result in the address being set to 20 (switch 3 = value 4; switch 5 = value 16; 4 + 16 = 20). In this way, addresses from 1 to 255 can be set. Note that some firmware use switches 7 and 8 for configuration purposes; in these systems, the maximum address that can be set is 63.

Once the desired address has been set on the DIP switches, power to the controller should by cycled to have the controller read and apply the new address.

5. Communicating with the Controller

5.1. Communicating with the Controller via the Serial Ports

The serial ports of the controller that have been configured to support NTCIP communications use PMPP. An NTCIP-compliant central such as Intelligent Devices' Intelligent Control is required to communicate to the controller using these ports. The RS-232 port on J3 is typically configured as a port that supports NTCIP, and is configured for 9600 baud, with 8 data bits, no parity, and 1 stop bit. The table below gives the pinout for connecting the RS-232 port on J3 to a standard IBM PC serial port. Note that the PMPP address is set on the DIP switches as detailed in Section 4.2, Setting the Serial Communications Address.

Serial Cable, J3 to IBM PC

J3	Signal	Female DB9 connector	Signal
1	GND	5	GND
6	TX	2	RX
7	RX	3	TX
8	DSR	n/c	
9	CTS	n/c	
10	RTS	n/c	

6. Troubleshooting / FAQS

Why did the controller lose all its information/settings/messages?

On a power up or reset, the controller will reinitialize its memory (and lose all downloaded messages) in these cases:

1) DIP switches are all off (address is zero)
2) The software version number is different since last startup (new code downloaded)
3) The database checksum is bad (usually caused by a dead battery)

Note that just changing the address on the DIP switches won't reinitialize the controller (unless they are set to zero at power up).

The controller does not respond to communications over an RS-232 serial port.

1. Verify that the cable is the correct type. For connecting a standard PC to the controller, a null modem cable should be used.
2. Verify that the jumpers for the port are set to RS232. Refer to Section 3.4 – "Serial Communications" for details of the jumper settings.
3. Verify that the PMPP address is properly set on the DIP switches. Refer to Section 4.2 – "Setting the Serial Communications Address" for details.
4. Verify that the serial port supports NTCIP communications.
5. Verify that the communications settings are correct for the serial port. The parameters are typically 9600 baud, 8 data bits, no parity, and 1 stop bit, but these can be different in custom firmware.

The controller does not respond to communications over an RS-485 serial port.

1. Verify that the jumpers for the port are set to RS485. Refer to Section 3.4 – "Serial Communications" for details of the jumper settings.
2. Verify that the PMPP address is properly set on the DIP switches. Refer to Section 4.2 – "Setting the Serial Communications Address" for details.
3. Verify that the serial port supports NTCIP communications.
4. Verify that the communications settings are correct for the serial port. The parameters are typically 9600 baud, 8 data bits, no parity, and 1 stop bit, but these can be different in custom firmware.

7. Specifications

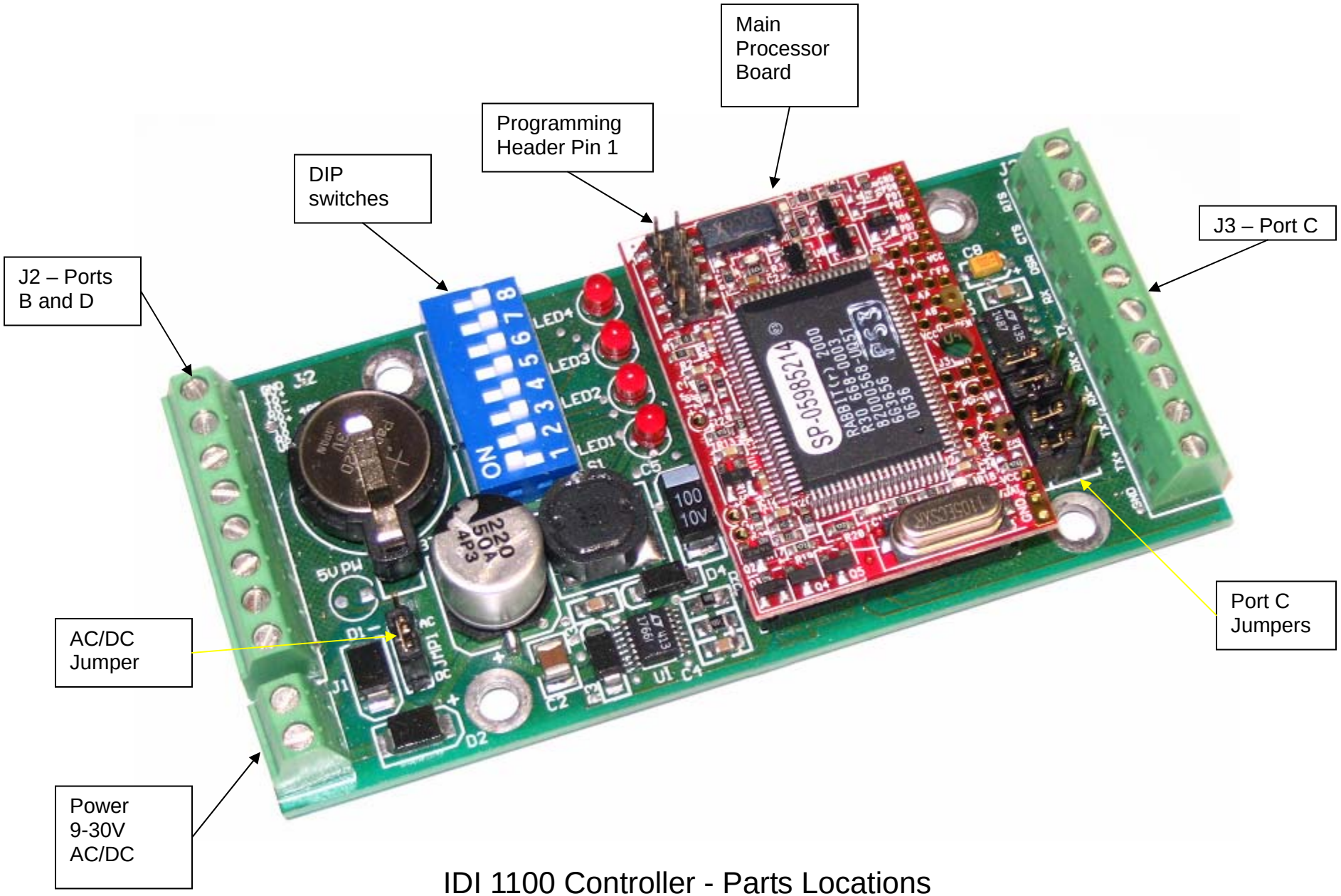
7.1. Hardware

Module Size (overall, including connectors)	3.74” x 1.77” x .63” 95mm x 45mm x 16mm
Attachment	Qty 4 0.156” (4mm) holes
Operating Temperature:	-40C to +74C
Humidity	5-95% non-condensing
Power Requirements	9-30 V AC or DC, @ 250mA max.
Processor Speed	22.1 MHz
SRAM	128 kB (standard)
FLASH	256 kB (standard)
Serial Ports	3 total 1 – RS232 TX, RX, GND 1 – RS485 4-wire 1 – RS232 full hardware flow control or RS485 4-wire
Watchdog Supervisor	Yes
Time / Date Clock	Yes
Battery Backup	Yes
Temperature Sensor	Yes
LED	4 – Heartbeat, RX, TX, Diagnostics
Switches	8 Position DIP

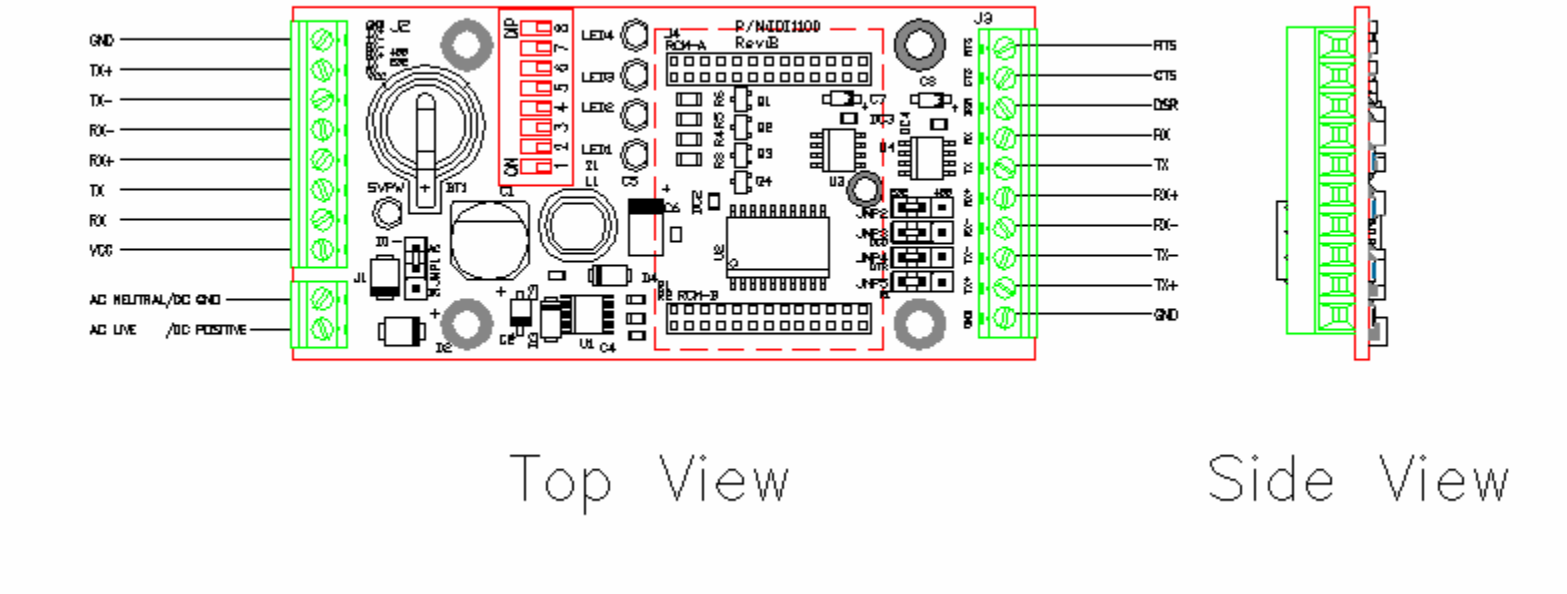
7.2. Software

Protocol Stacks Supported

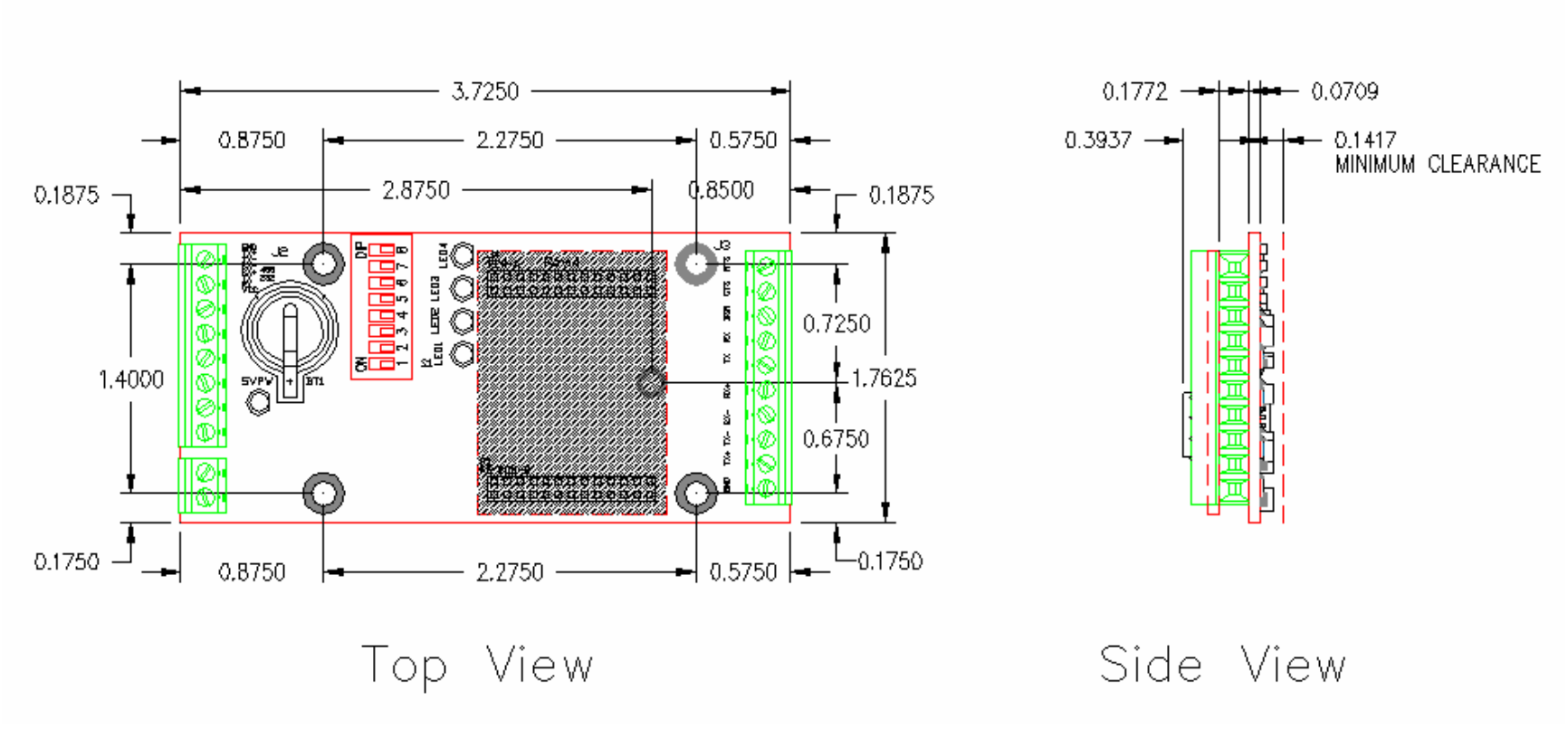
Direct Connect Data Objects -> SNMP -> Null -> PMPP -> Twisted Pair



IDI 1100 Controller - Parts Locations



IDI 1100 Controller – Cable Connector Details



IDI 1100 Controller - Physical Dimensions