



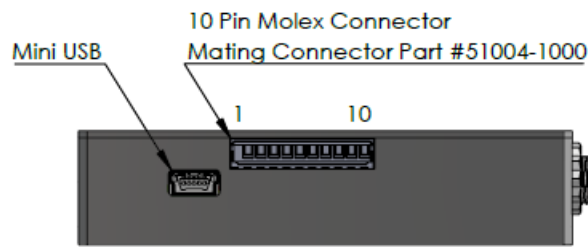
IPS Digital U-Type Module

QUICK START GUIDE

For IPS U-Type Modules with USB, I2C, or RS232 communication protocols. See
Table 2 at end of document for list of supported models

Initial Set-Up and Power On:

Image 1: Side view of Digital U-Type Module



1. Connect power supply to the U-type module via the Molex connector

To properly power the unit, connect the voltage source to pins 1 and 6. Connect GND to pins 5 and 10. Pins 1 and 6 must be tied together. Pins 5 and 10 must also be tied together. Two pins are used for each signal to ensure that sufficient current can be handled.

For lasers operating at less than 600mW, a minimum of 5V is required.

For lasers operating at or greater than 600mW, a minimum of 9V is required with 12V recommended. Do not exceed 14V on V+.

At full power, the device can consume up to 15W; an appropriate heatsink is required.

***Please note, a USB connection alone is not enough to power the laser. The laser must be powered via the Molex connector in the above listed manner to ensure adequate power.**

2. Connect TTL signal source to the U-type module via the Molex connector

Connect pin 7 (ENABLE) to a TTL signal source. In order to operate the unit, pin 7 (ENABLE) must be connected and must be driven high (>3.6V).

Pin 7 (ENABLE) can be used to turn the laser off in case of emergencies by driving low (GND).

3. Connect the U-type module to the host system

If using USB, connect the USB cable provided from the U-type module mini USB connector to the host system.

If communicating to the device via I2C or RS232, pins 3 (SCL/TX) and 4 (SDA/TX), need to be connected to the controller.

Please note, for boards with RS232 enabled, the USB and I2C busses will be disabled.

The customer should specify which I2c address they want before we ship to them if they plan to integrate more than 1 laser in the same system using I2c as the data interface.

If you have an I2c configured laser and try to use RS-232 on the TX/RX lines, it may damage the logic board.

Some customers might attempt to connect directly from USB to these TX/RX lines, this may also damage the logic board.

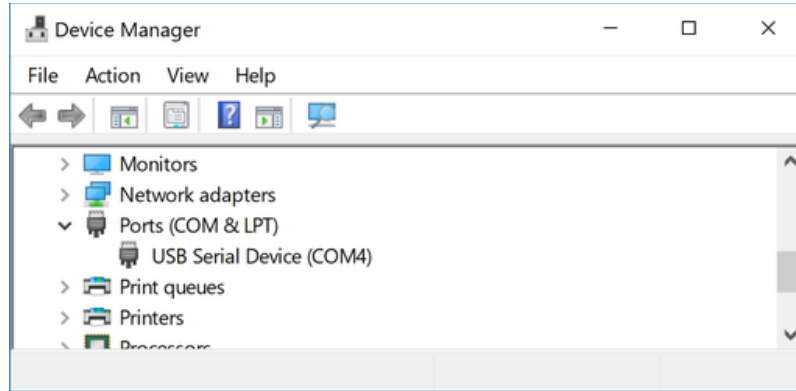
4. Ensure the U-type module is recognized by the host system by opening the Windows® Device Manager. If using an alternate Operating System, please contact IPS for additional details on verifying device recognition.

Locate "Ports (COM & LPT)" in the Device Manager. Ensure "USB Serial Device (COMX)" is present.

If "Ports (COM & LPT)" does not appear, it's possible it is hidden (select the "View" drop down and "Show hidden devices"). If "Ports (COM & LPT)" still does not appear, please visit the Microsoft® answers page to view steps to enable legacy hardware.

The U-type module uses a serial interface, with COM port settings of 115200 baud and 8N1 configuration.

Image 2: Digital U-type module recognized by Microsoft® Device Manager



5. Test the U-type module functionality

Use a serial port monitor program to test the device functionality.

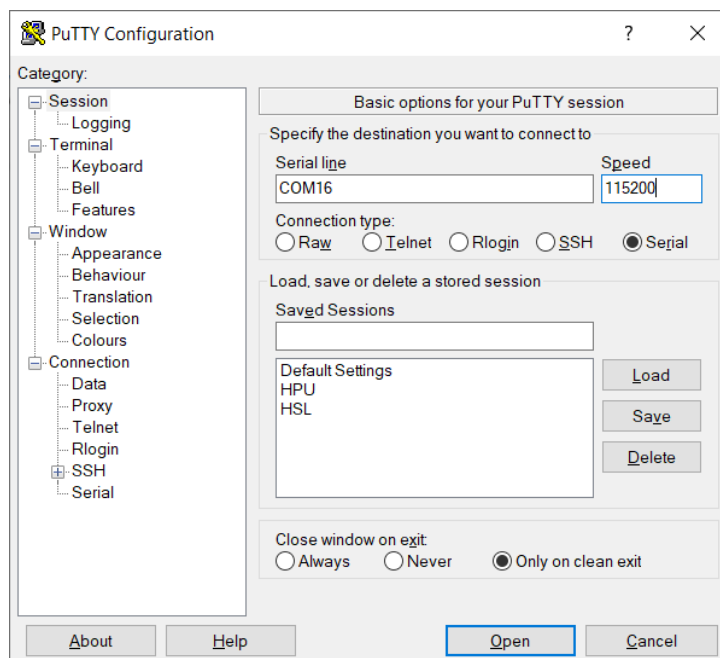
The open source program "PuTTY" (<https://www.putty.org/>) can be used to test the device manually.

6. Before starting the session, configure the "Session" via the "Session" menu and setting the following:

- Verify the correct COM port is populated in the "Serial line" input box
- Manually set "Speed" to 115200
- "Connection type" should be set to "Serial"

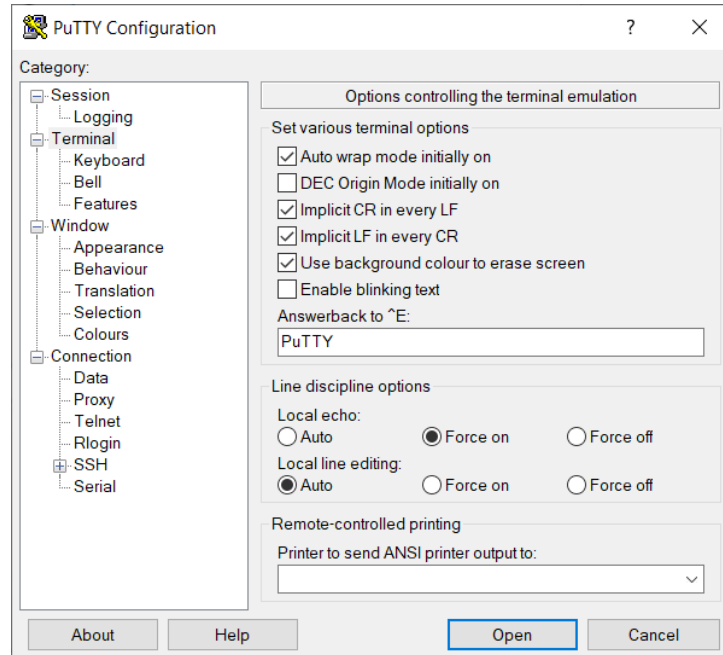
The Digital U-Type has a boot-up time of ~5 seconds before you can communicate with it. It will not respond to the laser enable pin during this time.

Image 3: "PuTTY" Session Configuration



7. Configure the "Terminal" by accessing the "Terminal" menu and enabling:
 - "Implicit CR in every LF"
 - "Implicit LF in every CR"
 - "Local echo:" Force On

Image 4: "PuTTY" Terminal Configuration



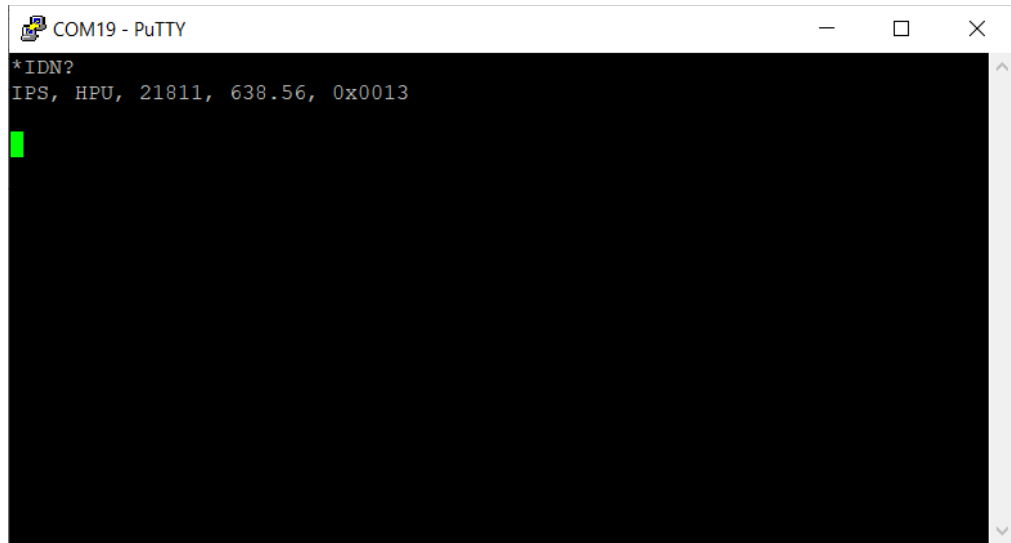
8. Ensure the device is correctly connected to the host system

***Any text command needs to be entered within 10 seconds or the device will time out. This is a function of IPS' firmware and is independent of terminal.**

Send the command `"*IDN?"`

The device should respond with "IPS, HPU, laser serial number, laser wavelength, firmware version". This confirms the device is correctly connected to the host system.

Image 5: "*IDN?" Command Line Example



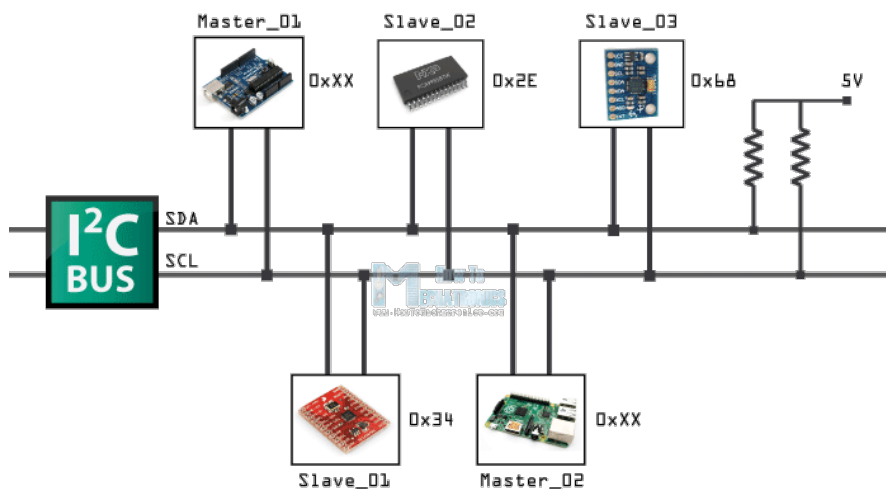
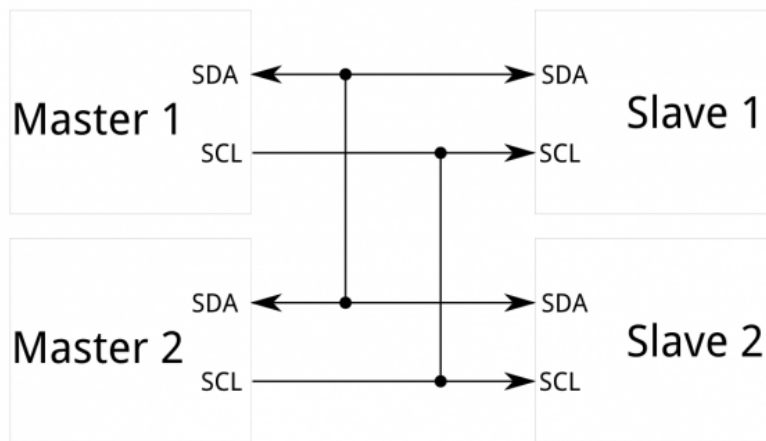
```
COM19 - PuTTY
*IDN?
IPS, HPU, 21811, 638.56, 0x0013
```

For a full list of command set instructions, please reference the “IPS Digital U-Type Technical Guidebook” located at:

<http://www.ipslasers.com/Digital U-Type Support/>

What is I2C?

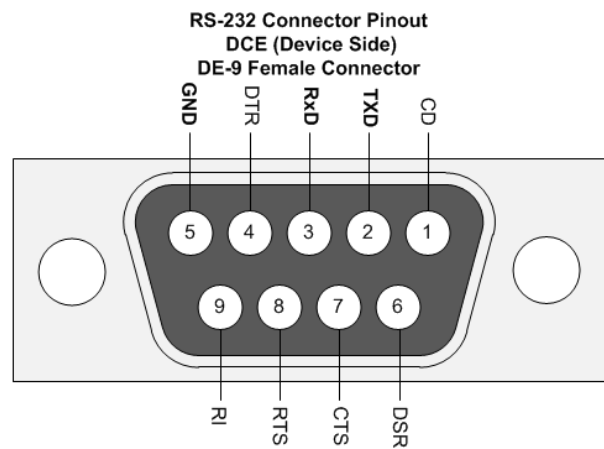
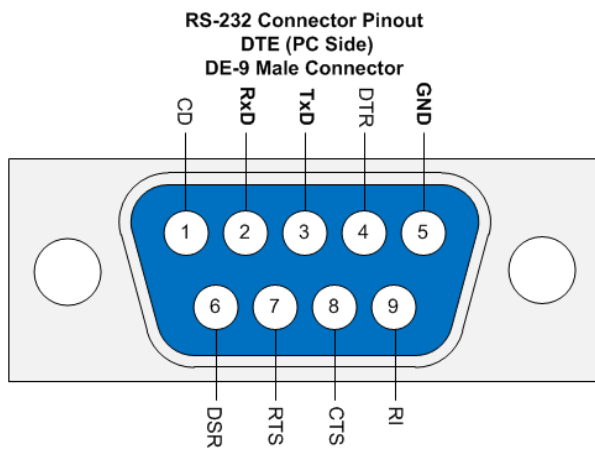
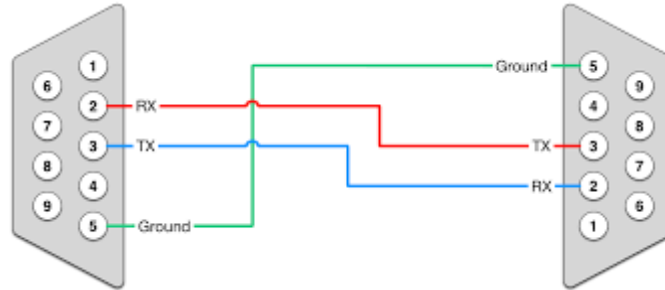
[I2C](#) is a serial communication protocol typically used for short range high speed connections between multiple devices. It stands for the Inter-Integrated Circuit (IIC, or "I-squared-C") bus. Two wires are required for an I2C bus, SDA and SCL. Each device connects to the same two lines. Because all the devices are connected to the same physical wires, each device on an I2C bus must have an address. The address is used so that each device knows when a message is being sent to that device. There can be multiple master and slave devices (nodes), each of which has a unique address. The addresses can be written as integers (like the decimal number 16, or hexadecimal numbers, like 0x10 where the "0x" prefix shows that it's a hexadecimal or base-16 number). Device addresses range from



What Is RS-232?

A minimal "3-wire" RS-232 connection consisting only of transmit data, receive data, and ground, is commonly used when the full facilities of RS-232 are not required. The RS-232 standard defines the voltage levels that correspond to logical one and logical zero levels for the data transmission and the control signal lines. Valid signals are either in the range of +3 to +15 volts or the range -3 to -15 volts with respect to the "Common Ground" (GND) pin; consequently, the range between -3 to +3 volts is not a valid RS-232 level.

Typical 3 wire RS-232 connection. A cable can be made with one end as shown below and the other connected to the TX, RX, and GND on the Digital U-Type. Note: TX on one side will connect to RX on the other side and vice versa. An RS-232 to USB adapter can be used as well.



The Female DE-9 connector is the mirror image of the Male DE-9 connector. These diagrams show the connectors face-on.

**Table 1: Digital U-Type Molex 53014-1010 Connector Pinout
(Mating connector part number: Molex 51004-1000)**

Pin Number	Pin Label	Function
1*	V+	Power Supply: 5V - 12 V. For lasers operating <600mW, a 5V minimum is required. For lasers operating ≥600mW, a minimum of 9V is required, 12V recommended.
2^	VBIAS ENABLE (Set Enable)	For analog control Enable external laser power control through pin 8 (LD VBIAS): High (>3.6V up to V+ supply voltage) = Enable Low (GND) = Disable The same functionality is emulated via software as a replacement for this analog control.
3	SCL/TX	I2C: SCL standard (RS232: TX; board by request)
4	SDA/RX	I2C: SDA standard (RS232: RX; board by request)
5**	GND	Ground
6*	V+	Power Supply: 5V - 12 V. For lasers operating <600mW, a 5V minimum is required. For lasers operating ≥600mW, a minimum of 9V is required, 12V recommended.
7	ENABLE	Laser enable: TTL High (>3.6V up to V+ supply voltage) = Enable TTL Low (GND) = Disable Pin may also be used for PW modulation at a rate of 1kHz
8^	LD VBIAS (LD Set)	Laser power setpoint – Enables analog external control of laser drive current. Drive VBIAS ENABLE (pin 2) high to enable this option. Drive a voltage between 0V and 1V. The voltage bias will be a 1:1 ratio to the laser drive current. Be aware that this approach may cause laser mode hopping behavior in single-mode lasers. Do not exceed maximum recommended drive current for given laser model. The same functionality is emulated via software as a replacement for this analog control.
9^	PD+	For analog readout Connect voltmeter to PD+ (pin 9) and GND for photo diode V output (0V – 3.3V) The same functionality is emulated via software as a replacement for this analog control.
10**	GND	Ground

**HPU OEM Connector
(Connector Part Number: 51004-1000)**

Pin Number	Pin Label	Function
1	VDC	Power supply, 5 - 12 V. Standard operation can use 5V. For units with > 1W output power, at least 9V is required. Pins 1 & 6 connected.
2	SET ENABLE	Enable external laser power control through pin 8 (LD SET): High = Disable Low = Enable
3	TX/SCL	I2C: SCL standard (RS232: TX, by request)
4	RX/SDA	I2C: SDA standard (RS232: RX, by request)
5	GND	Ground. Pins 5 & 10 connected.
6	VDC	Power supply, 5 - 12 V. Standard operation can use 5V. For units with > 1W output power, at least 9V is required. Pins 1 & 6 connected.
7	ENABLE	Laser enable (Modulation): High = Enable Low = Disable
8	LD SET	Laser power setpoint Apply a voltage bias in 1:1 ratio to drive current - be aware that this approach may cause laser mode hopping behavior in single-mode lasers. Ground Pin 2 to enable this option.
9	PD	Photo diode voltage output (0.0 - 3.3 V)
10	GND	Ground. Pins 5 & 10 connected.

Pins 1, 5, 6, 7, and 10 are required for laser operation

Notes:

*Power must be supplied to both V+ pins (pin 1 and pin 6)

**GND must be supplied to both GND pins (pin 5 and pin 10)

^ Pins 2, 8, and 9 are optional for analog control/readout

Table 2: List of Standard Supported Models

I0633SU0020PA-USB	I0638MU0300MF-USB
I0638SU0025PA-USB	I0638MU0300MS-USB
I0780SU0050PA-USB	I0647MU0150MF-USB
I0783SU0050PA-USB	I0647MU0150MS-USB
I07808U0050PA-USB	I0680MU0300MF-USB
I0830SU0050PA-USB	I0680MU0300MS-USB
I0976SU0220PA-USB	I0785MU0350MF-USB
I0976SU0500PA-USB	I0785MU0350MS-USB
I1030SU0100PA-USB	I0785MU0500MF-USB
I1030SU0250PA-USB	I0785MU0500MS-USB
I1053SU0050PA-IS-USB	I0785MU1200MF-USB
I1053SU0120PA-USB	I0785MU1200MS-USB
I1053SU0300PA-USB	I0808MU0350MF-USB
I1064SU0050PA-IS-USB	I0808MU0350MS-USB
I1064SU0120PA-USB	I0808MU0500MF-USB
I1064SU0300PA-USB	I0808MU0500MS-USB
	I0808MU1200MF-USB
	I0808MU1200MS-USB
	I0830MU0350MF-USB
	I0830MU0350MS-USB
	I0830MU0500MF-USB
	I0830MU0500MS-USB
	I0830MU1400MF-USB
	I0830MU1400MS-USB
	I1064MU0500MF-USB
	I1064MU0500MS-USB

For I2C enabled board, input “-I2C” in place of “-USB”. For RS232 enabled board, input “-RS” in place of “-USB”. Please note RS232 board will disable USB and I2C busses.