# VISTEK V1679 SINGLE-MODE FIBRE DATA TRANSCEIVER USER GUIDE

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## Contents

# LASER SAFETY

The V1679 board is a Class 1 Laser Product under the **F**ood and **D**rug **A**dministration (FDA) / **C**enter for **D**evices and **R**adiological **H**ealth (CDRH) regulation. It cannot, under normal operating conditions (i.e., intended use), emit a hazardous level of optical radiation. No warning label or control measures are required by the FDA/CDRH. The IEC (International Electrotechnical Commission) standard (Publication 60825-1) requires a warning label and specifies that classification be made under fault conditions. Therefore, systems that are Class 1 under FDA/CDRH rules may not necessarily be Class 1 under the IEC.

The Laser wavelengths being used on V1679 boards may range from 1310nm to 1610nm. The average optical output power does not exceed 0 dBm (1mW) under normal operating conditions. Unused optical outputs are automatically covered with a shutter and prevent direct exposure to the laser beam.

Even though the power of these lasers is low, the beam should be treated with caution and common sense because it is intense and concentrated. Laser radiation can cause irreversible and permanent damage of eyesight. Please read the following guidelines carefully:

1. Make sure that a fibre is connected to the board's fibre outputs before power is applied. If a fibre cable (e.g. patchcord) is already connected to an output, make sure that the cable's other end is connected, too, before powering up the board.

2. **Do not** look in the end of a fibre to see if light is coming out. The laser wavelengths being used (most commonly 1310nm and 1550nm) are totally invisible to the human eye and will cause permanent damage. Always use optical instrumentation, such as an optical power meter, to verify light output.

# VISTEK V1679 single-mode fibre data transceiver

## 1. GENERAL

The V1679 SINGLE-MODE FIBRE DATA TRANSCEIVERS form part of the Vistek V1600 range of fibre interface products. Based on a 3U high baseboard, which is common to all members of the V1679 family, the board can be fitted into a V1603 or V1606 rack, from which it receives its power and control.
A passive rear module is required for all electrical and optical signal interconnections.
The V1679 module is fully compatible with the Vistek DART remote control system.

Available V1679 models to date:

**V1679/IO** Provides 8 General Purpose, opto-isolated Inputs and 8 General Purpose, earth-free Outputs. All GP I/O's can either be driven externally or internally (DART controlled). All Inputs can be monitored by DART.

**V1679/IP** Provides 16 General Purpose, opto-isolated Inputs, with the choice of 8 Inputs to be triggered either externally (Opto-Isolator Input) or internally (DART controlled). All 16 Inputs can be monitored by DART.

**V1679/OP** Provides 16 General Purpose Outputs, with the choice of 8 Outputs to be either driven externally, i.e. driven through a corresponding signal sent from the remote site via the fibre link, or internally (DART controlled).

Common to all models are two independently operating Serial Communication Ports, which can either be configured to comply with RS-232 (single-ended) or RS-422 (differential) electrical standards.

Numerous RS-422 or RS-232 serial control applications can be now extended over long distances, with the advantage of having an earth-free connection over fibre (no ground-loop problems) and negligible latency (speed of light!).

A good example for using the V1679's RS-232 port is to remotely control a V1606 Rack over a single-mode fibre link of up to 60km length.

With a wide choice of different CWDM Laser wavelengths available, the V1679 fits seamlessly in installations with fibre links already in operation.

Together with the existing range of Advanced Fibre Interfaces (V1673/74 Series) and Passive Fibre Distribution modules (V670x Series), the V1679 adds another building block to Vistek's total fibre solutions.

# 2. GENERAL PURPOSE OUTPUTS

## 2.1 Description

Depending on the actual board configuration, the V1679 supports up to 16 General Purpose Outputs. Each Output is implemented as an earth-free, dry contact Relay switch. Each switch can be configured to operate either in a 'Normally Open' (short: NO) mode, or in a 'Normally Closed' (short: NC) mode.

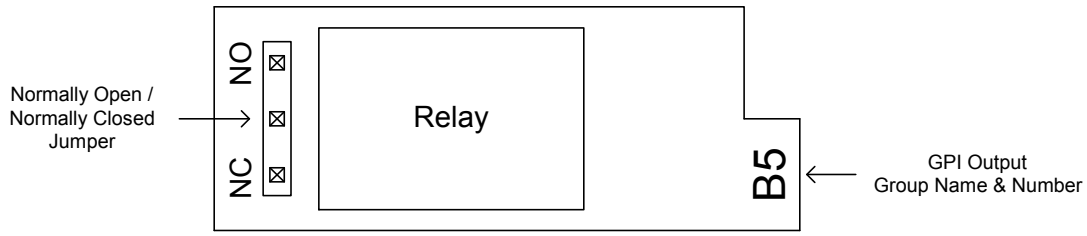
The Relays can be identified as little black cubes, lined up in either one group (**V1679/IO**, Group B only) or two groups (**V1670/OP**, Group A and B) at the rear connector end of the board. The output configuration Jumpers can be found in front of each Relay. Both Jumper positions (NC or NO) are clearly marked on the board's silk-screen. The factory default setting for each output is 'Normally Open'.

A Relay will change its state, i.e. its contact will be closed (or opened, depending on the actual Jumper position!), when either being triggered at the far end (remote site) by a state change of the corresponding General Purpose Input, or locally via DART.

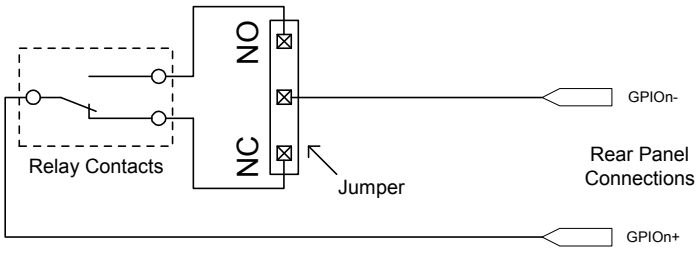
The polarity of the received control bit for any given output is application dependent, hence an unambiguous relationship between input and output polarities doesn't exist. One might have to experiment with the NO/NC Jumper settings in order to get the output polarity right. In case of a power failure however, the Relays will fall back into their default state as configured by the NO/NC Jumpers because they are non-latching. The last known 'good' state of each output will be latched in case of a broken transmission line or in case of disconnecting the transmitter at the far end. The Outputs will resume switching as soon as the connection is re-established. Note that the Relays are not suitable for switching high-current loads or RF signals.

## 2.2 Configuration

Each relay within a group is clearly numbered (A1..A8 or B1..B8). Please see section 5.2 'Electrical Interfaces' to find the corresponding signal pairs for each output at the rear connector.




Board Layout




Circuit Diagram

**Figure 1 : General Purpose Outputs (Circuit Diagram)**

## 2.3 Output Specification

Number of Outputs:

| | |
|---|---|
| V1679/IO: | 8 Earth-free, dry contact Relay switches |
| V1679/OP: | 16 Earth-free, dry contact Relay switches |

| | |
|---|---|
| Contact configuration: | Normally Open (NO) or Normally Closed (NC) |
| Contact material: | Ag + Au Clad |
| Contact rating: | 0.5A @ 24Vd.c. max. |
| Maximum operate time: | 5 ms |
| Maximum release time: | 5 ms |
| Maximum bounce time: | 6 ms |

# 3. GENERAL PURPOSE INPUTS

## 3.1 Description

Depending on the actual board configuration, the V1679 supports up to 16 General Purpose Inputs.
A **V1679/IO** features 8 General Purpose Inputs in addition to its 8 General Purpose Outputs, whereas a **V1679/IP** comes with 16 Inputs and no Outputs.
Each of the Inputs comprises an Opto-Isolator with integrated Schmitt-Trigger Buffer, amongst other features, such as:

- Jumper configurable on-board input biasing (+5V or +12V)
- Jumper configurable short to ground
- On-board, 100 Ohm current limiting resistor for Opto-Isolator
- Reverse polarity protection
- Wide input current range
- High speed (up to 1Mb/s)

Various configuration options allow straightforward interfacing of the GP Inputs to a variety of 'driving' sources'. A driving source can be as simple as a push button, an 'Open Collector' output or a TTL/CMOS-level buffer with a current-sinking/sourcing capability of as low as ±4mA. Extra series resistors might be required when using a voltage source of > 7V in order to limit the forward current of the Emitter Diode inside the Opto-Isolator. Please check with your technical department or contact Vistek for a suitable solution. Examples of different interfacing techniques will be shown later.

## 3.2 Configuration

The following circuit diagram shows the input circuit of each General Purpose Input. Understanding the diagram will help in finding the proper configuration for a specific application.

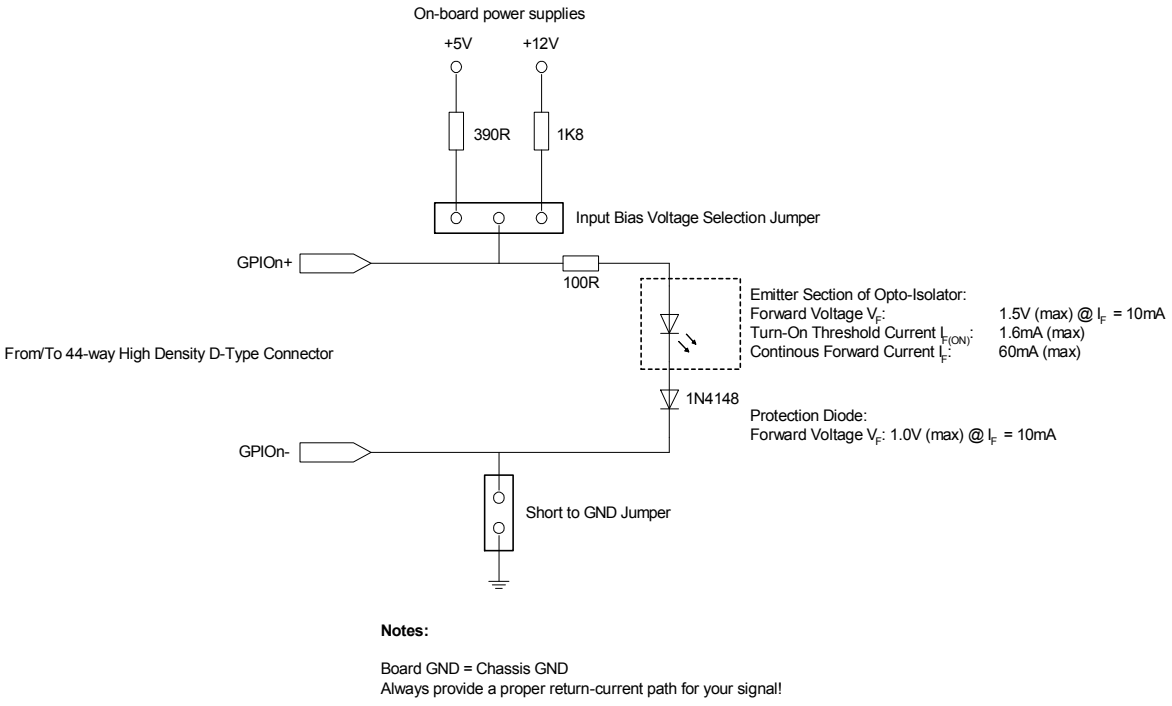



**Figure 2 : General Purpose Inputs (Circuit Diagram)**

When driving the Opto-Isolator from an external voltage source, one must check that the forward current through the Light Emitting Diode (LED) inside the Opto-Isolator does not exceed 60mA. Otherwise, the Opto-Isolator can be permanently damaged or even destroyed.

The current $I_F$ through the LED is determined by the Input Voltage $V_{IN}$ supplied between a GPIOn+ and GPIOn- connector pin pair, the forward voltage of the LED $V_{F\ LED}$, the forward voltage of the protection diode $V_{F\ 1N4148}$ (which is in series with the LED), and the on-board 100Ohm current limiting resistor. The reason for having an extra protection diode is because of the relatively low reverse (breakdown) voltage of the LED, which is 6V (typ), compared to 75V (min) of a 1N4148 silicon diode. This makes the GP Inputs fairly robust against accidentally reverse biased input pins.

By applying Ohm's law, the forward current $I_F$ through the LED can be calculated as follows:

$$I_F = \frac{V_{IN} - (V_{F\,LED} + V_{F\ 1N4148})}{100\Omega}$$

Considering the worst-case scenario, by taking $V_{F\ LED}$ (min) and $V_{F\ 1N4148}$ (min), $V_{IN}$ must not exceed 7.5V, unless an extra current limiting resistor in series to the 100 Ohm is provided.

## WARNING!

**The maximum, continuous current through the Opto-Isolator's LED must not exceed 60mA!**

Using the on-board generated forward bias supply for the LED (+5V or +12V), the current through the LED is limited to about 5mA. This means that driving an Input with an Open Collector Driver for instance, the Driver must be capable of sinking at least 5mA!

The silk screen on the PCB identifies each Input by its Group Name (A or B) and its number (1..8).
The configuration Jumpers for each GP Input are located closely to the corresponding Opto-Isolator IC. The Jumpers are positioned as follows:

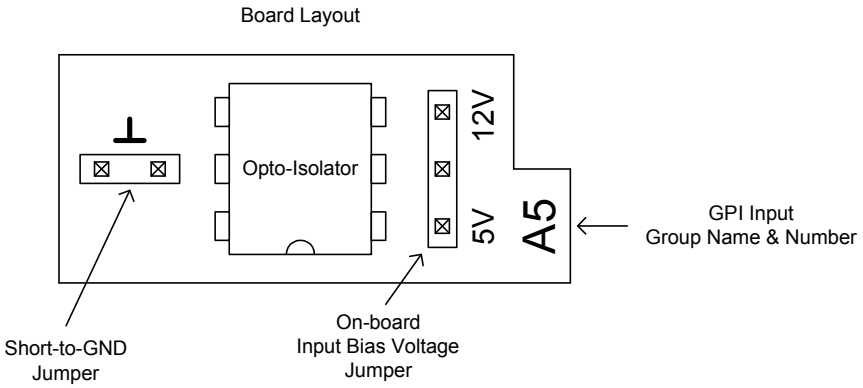


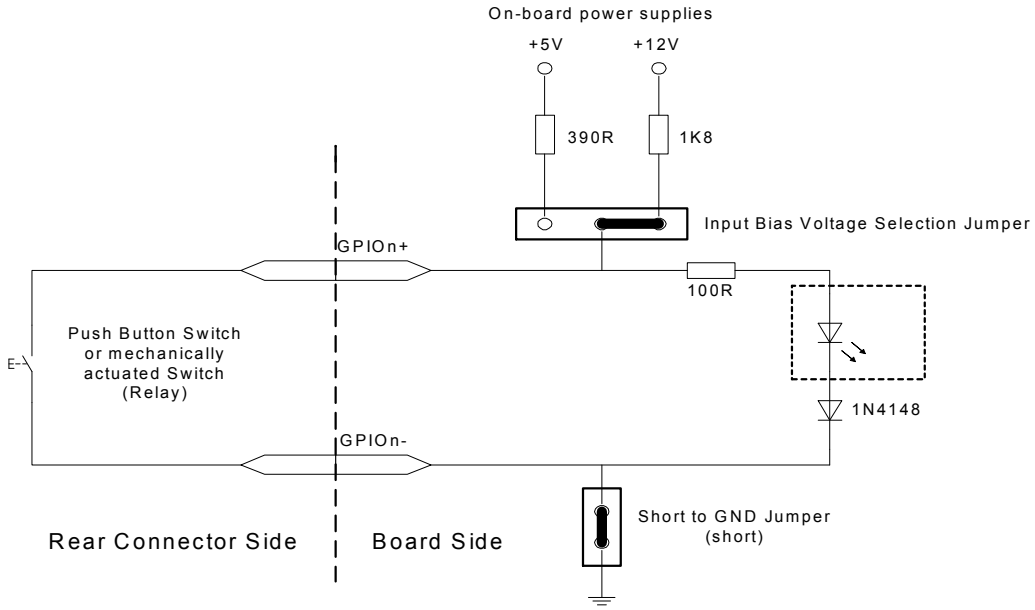

**Figure 3 : General Purpose Input Jumper Locations**

## 3.3 Examples for Driving V1679 GPI Inputs

### 3.3.1 Push Button or Relay Driven Switch

A Push Button is a simple example of how a GPI Input can be driven. One should be aware that when using any type of mechanically actuated switch, the input signal could bounce for several milliseconds before it reaches a stable state. This implies that the received bit at the far end of the fibre link is unstable for the same period of time.

The built in Schmitt-Trigger Buffer in the Opto-Isolator can only 'tidy up' slow rising edges, but it cannot suppress heavily bouncing input signals.



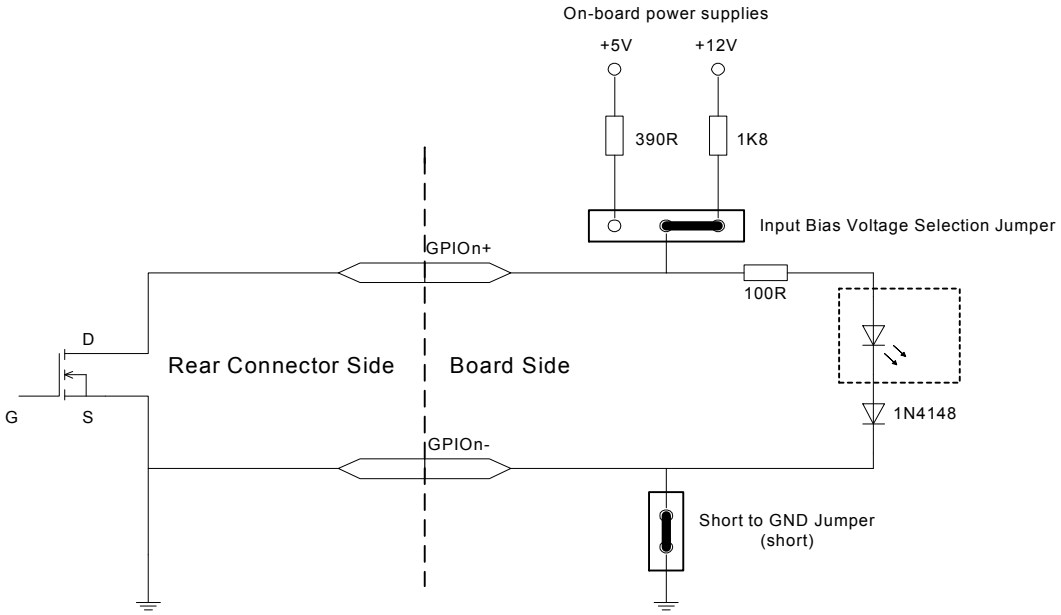

**Note:**

The LED is permanently 'ON' as long as the Push-Button is open.
By closing the switch, the LED will be shorted and goes 'OFF'.

**Figure 4 : Example 1**

### 3.3.2 N-Channel MOSFET Switch

The mechanical switch shown in the previous example can easily be replaced by an N-Channel MOSFET Switch, as illustrated in the diagram below. Using a FET not only eliminates possible bouncing problems, which are common to most mechanical switches, it also allows much faster switching cycles. A bounce-free output is subject to a 'clean' control signal applied at the FET's Gate input.




**Note:**

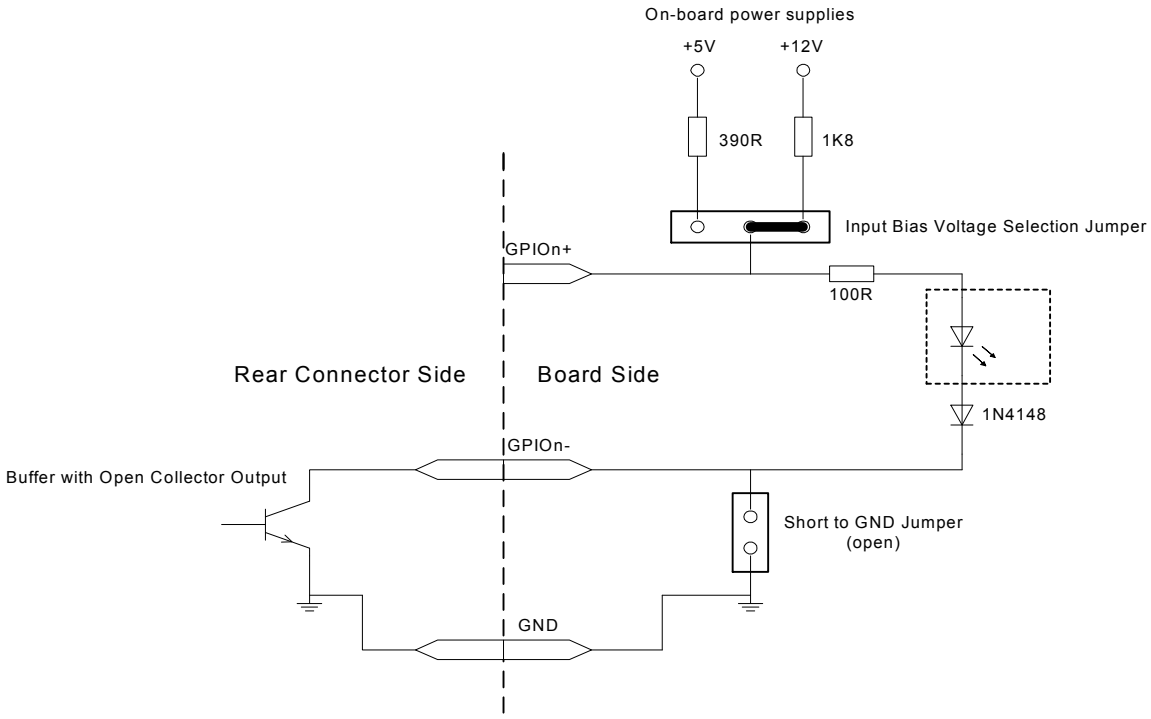
The LED is permanently 'ON' as long as the FET is switched off.
By applying a positive voltage between Gate and Source, higher than the FET's Gate-Source Threshold voltage $V_{GS(th),}$ the FET becomes conductive and the LED goes 'OFF'. The maximum Drain current $I_D$ is less than 7mA.

**Figure 5 : Example 2**

### 3.3.3 Open Collector Output

Open Collector Outputs can be found quite often in conjunction with GPI Outputs. They provide a flexible way of interfacing with 3rd party equipment without the need of modifications or for additional hardware.
As far as the V1679 GPI Inputs are concerned, the following guidelines apply when connecting to an Open Collector Output:

- The Open Collector Output must be capable of sinking at least 5mA (normally specified as $I_C$ or CollectorCurrent).
- The Transistor must withstand at least 12V (minus the voltage drop across the diodes, to be precise) in the 'off' state (normally specified as $V_{CE}$ or Collector-Emitter Voltage).
- A ground (GND) connection between the remote control unit (Open Collector Output) and the V1679 is essential.



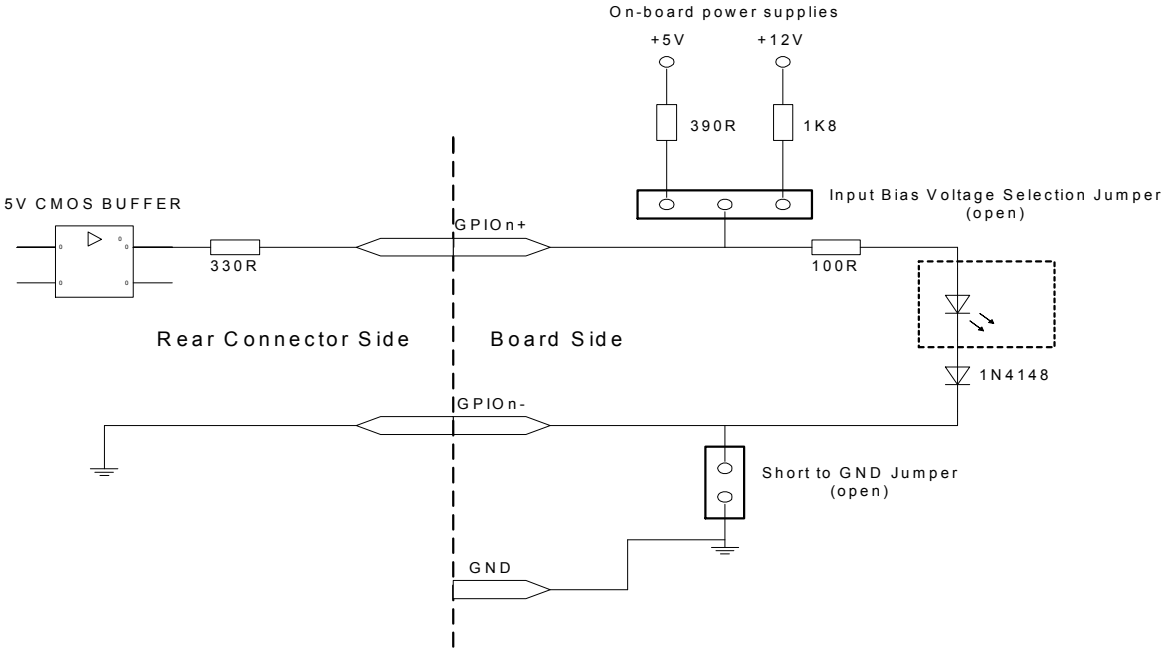

**Note:**

A common GND connection between the remote control (Open Collector Output) and the V1679 module (e.g. via dedicated GND PIN on Rear Connector) is essential.

**Figure 6 : Example 3**

### 3.3.4 CMOS Output

5V CMOS families with sourcing/sinking capabilities of as low as ± 4mA, such as HC or HCT, can be also used to drive a V1679 GPI Input. In order not to violate the CMOS Buffer's output specification, an additional current limiting resistor could be necessary. If the Buffer can source -24mA, (AC, ACT Families), no additional resistor is required since the on-board 100Ohm series resistor provides sufficient current limiting.




**Note:**

An extra series resistor is required in order to limit the current through the CMOS Buffer to comply with its specification. Note that the Buffer's output voltage in the high state ($V_{OH}$) is only guaranteed up to a certain current limit drawn from the output ($I_{OH}$).
As it can be seen in the diagram, using a CMOS Buffer can be implemented to be 'earth-free' (i.e. no GND connection between the control unit and the V1679's GND), which means no trouble caused by ground loop currents (which can prove to be rather difficult to cope with). However, cable-length and speed restrictions apply. The slower the selected CMOS output in terms of its slew rate, the better!

**Figure 7 : Example 4**

## 3.4 Input Specification

| | |
|---|---|
| Number of Inputs: | V1679/IO: 8 Opto-Isolators<br>V1679/IP: 16 Opto-Isolators |
| **Opto-Isolator Rating ($T_A$=25°C):** | |
| Emitter (LED) Continuous Forward Current: | 60mA |
| Input Forward Voltage $V_F$: | @ $I_F$=10mA: 1.2V (typ), 1.5V (max)<br>@ $I_F$=0.3mA: 0.75V (min), 1.0V (typ) |
| Turn-On Threshold Current $I_{F(on)}$:<br>Turn-Off Threshold Current $I_{F(off)}$: | 1.6mA (max)<br>0.3mA (min), 1.0mA (typ) |
| Turn-On Time $t_{on}$:<br>Fall Time $t_f$: | 4µs (max)<br>0.1µs (typ) |
| Turn-Off Time $t_{off}$:<br>Rise Time: $t_r$: | 4µs (max)<br>0.1µs (typ) |
| Data Rate (NRZ): | 1.0MHz (typ) |

# 4. SERIAL COMMUNICATION PORTS

## 4.1 Description

All V1679 models have two independently operating Serial Communication Ports, named COM1 and COM2. Both ports can be configured to comply either with RS-232 (single-ended) or RS-422 (differential) electrical standards as specified by the EIA (Electronics Industry Association).

Free and useful RS-232/422/485 publications can be found on Analog Device's website (www.analog.com) or on B&B Electronic's website (www.bb-elec.com).

A highly recommended reading on the RS-232 interface standard is Maxim's Application Note 83 'Fundamentals of RS-232 Serial Communications', which can be downloaded from Maxim's website (www.maxim-ic.com).

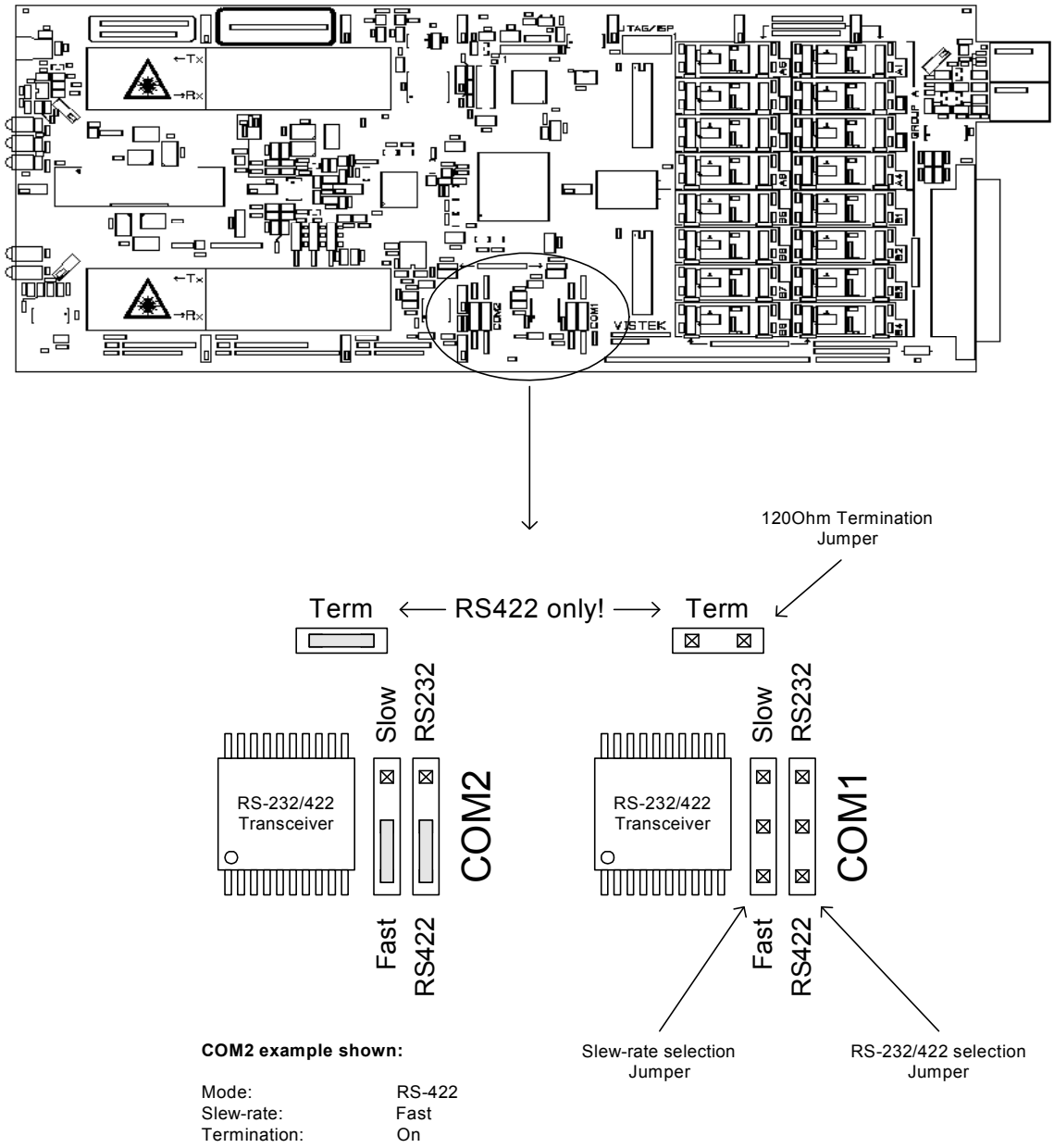
Mode of operation, slew rate and an optional line termination (RS-422 only) can be configured by setting Jumpers accordingly.

Data transfer rates of up to 1Mbps in RS-232 mode and 10Mbps in RS-422 mode can be achieved. The transmission length depends largely on the interface type (RS-232 or RS-422), the quality of the cable and the data rate itself. In theory, RS-422 can go as far as 4000 ft. @ 10Mbps. The single-ended RS-232 interface is generally speaking less robust and more susceptible to interference than its differential counterpart RS-422. With RS-232, typical cable lengths at low data rates (9600kbaud) are about 50 ft. In some cases, with the use of a special, high quality cable, this limit can be extended to as much as 150 ft.

The RS-422 receivers used on the V1679 are equipped with a failsafe circuitry that guarantees a logic high receiver output when the receiver inputs are open or shorted. Furthermore, receivers and transmitters are protected against wiring faults.

## 4.2 Configuration Options

The following illustration shows the position and meaning of all COM1 and COM2 related configuration Jumpers:




**Important:**

The 120Ohm Termination Jumper must not be installed when operating the serial ports in the RS-232 mode!

**Figure 8 : Serial Comms Port Configuration**

### 4.2.1 RS-232/422 Mode Selection Jumper

The Mode Selection Jumper is used to configure a port for RS-232 or RS-422 operation. The following combinations are supported:

COM1: RS-232 RxD/TxD, CTS/RTS
COM2: RS-232 RxD/TxD, CTS/RTS

COM1: RS-422 RxD/TxD only[1]
COM2: RS-422 RxD/TxD only[1]

COM1: RS-232 RxD/TxD, CTS/RTS
COM2: RS-422 RxD/TxD only[1]

COM1: RS-422 RxD/TxD only[1]
COM2: RS-232 RxD/TxD, CTS/RTS

COM1: RS-232 full Modem support (RxD/TxD, CTS/RTS, DSR/DTR)[2]
COM2: RS-232 RxD/TxD only[1]

**Notes:**
1. 'RxD/TxD only' means data transfer without hardware flow control (i.e. no CTS/RTS, DSR/DTR status lines). Data protocol must support e.g. Xon/Xoff scheme for high data rates.

2. For full Modem support, two control lines (DSR/DTR) are actually 'borrowed' from COM2. In this mode, COM2 can only operate as RS-232 with RxD/TxD lines only.

Factory default setting is RS-232 for COM1 and COM2.

### 4.2.2 Slew-rate Selection Jumper (Slow/Fast)

Slew-rate limiting (set Jumper to 'Slow') minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. Disabling slew-rate limiting (set Jumper to 'Fast') allows the Transceiver to transmit at data rates up to 10Mbps in RS-422 mode and up to 1Mbps in RS-232 mode. Factory default setting is 'Slow' for COM1 and COM2.

### 4.2.3 Line Termination Jumper (RS-422 Only)

At data rates higher than 250kbps, is strongly recommended to terminate the RxD line pair in RS-422 mode by shorting the 'Term' Jumper.

Note that the Termination Jumper must not be installed when a port is configured as RS-232.
Factory default setting is 'No Termination' for COM1 and COM2.

## 4.3 RS-232/422 Examples

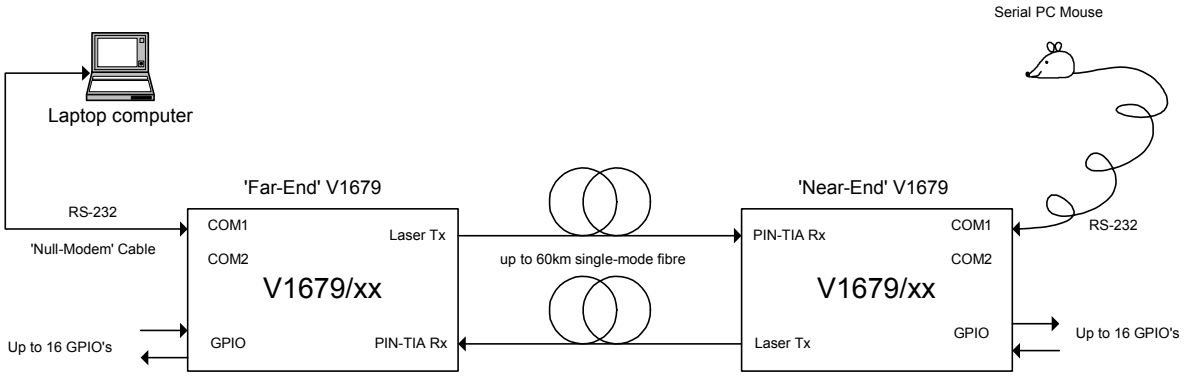
Always wanted to extend the cable of your Serial PC Mouse by up to 60kms?

A Serial PC Mouse only requires RxD/TxD and CTS/RTS, hence the second port can be used for something more useful. Although this is not a particular serious application, it shows how easy it is to demonstrate the V1679's serial communication ports without the need for a second PC or other bulky RS-232 peripherals.

The best way to wire it up is using Vistek's V1679 Breakout Adapter, which can be pushed onto the 44-pin high density D-type connector at the rear panel and gives instant access to both serial ports and all GPIO lines.

Please note that a so-called 'Null-Modem' cable (RxD/TxD, CTS/RTS and DSR/DTR signals crossed over) is required for the connection between the PC's Serial Port and the V1679 at the 'far' end. If the Serial PC Mouse is equipped with a 9-pin Dsub connector, it can be directly connected via a gender-changer (male/male) to either COM1 or COM2 at the V1679 sitting at the 'near' end.

60km Cable Extension for Serial PC Mouse
using two V1679 Fibre Data Transceivers

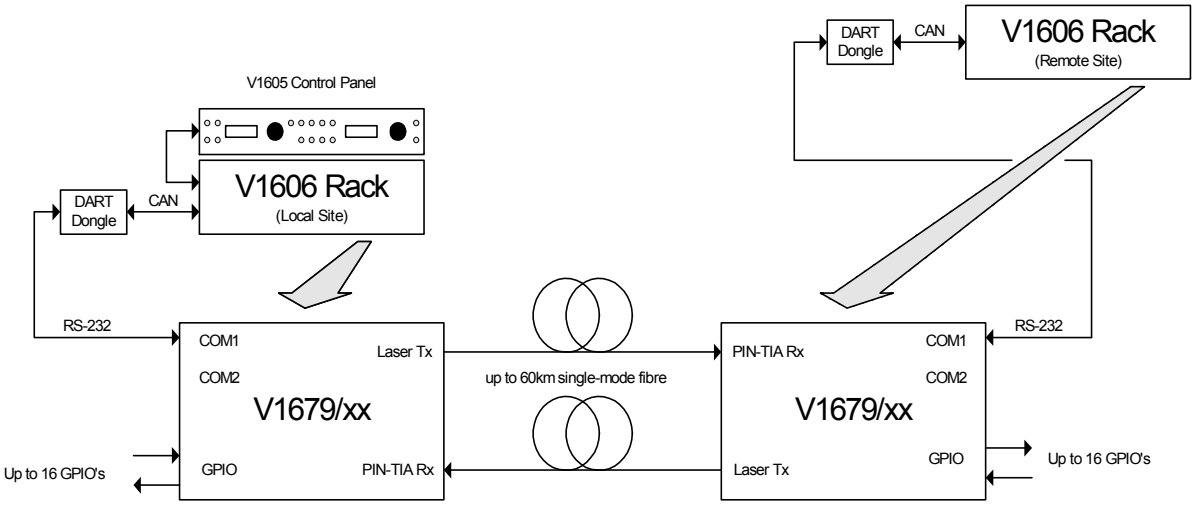



**Note:**
The two fibre links shown in the diagram can be replaced by a single fibre cable when using WDM modules on boths ends for multiplexing/de-multiplexing two distinct wavelengths (e.g. 1310nm and 1550nm).

**Figure 9 : RS-232 Example 1**

The example below shows an installation in which a Vistek V1606 rack is being remotely controlled over a long distance. Since the DART dongle (DIN 341) requires all modem control lines, COM1 has to be configured for full modem support. If only one fibre link is available, a WDM or CWDM module can be used on each end for multiplexing/de-multiplexing two distinct laser wavelengths.

V1606 Remote Control Example using
two V1679 Fibre Data Transceivers




**Note:**
The two fibre links shown in the diagram can be replaced by a single fibre cable when using WDM modules on boths ends for multiplexing/de-multiplexing two distinct wavelengths (e.g. 1310nm and 1550nm).

**Figure 10 : RS-232 Example 2**

This example illustrates the use of two V1679's for controlling camera tilt-heads through RS-422 at an outdoor venue. Assuming that only one fibre link is available, a CWDM module is used for multiplexing/de-multiplexing different laser wavelengths, in this case not only from the V1679's, but also from a V1673 Dual Fibre Transmitter (/TT) and Dual Fibre Receiver (/RR) pair for the actual video link back to the control room.

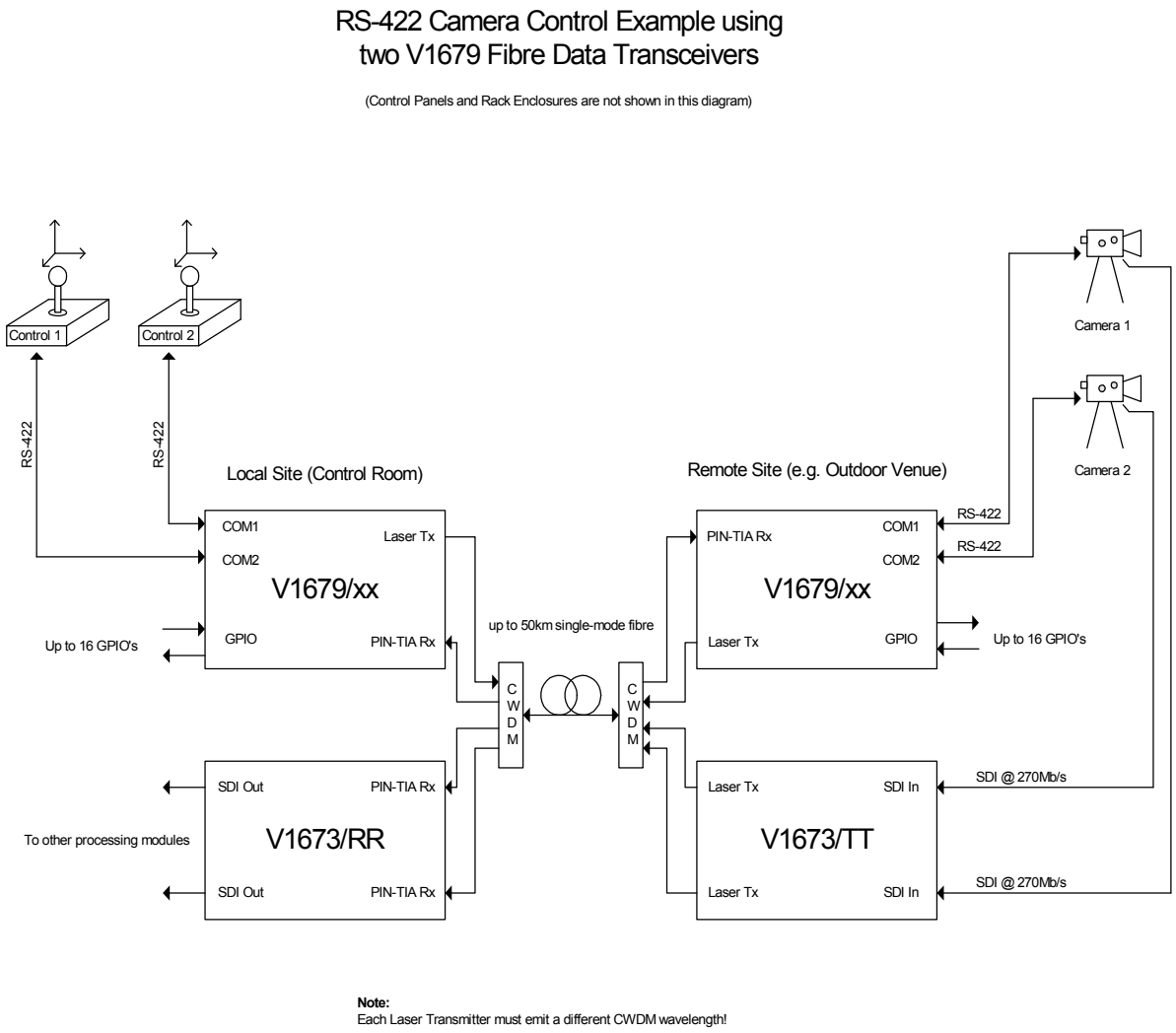



**Figure 11 : RS-422 Example**

## 5. REAR PANEL CONNECTIONS

The standard 3U rear panel is shown below. Note that all V1679 variants use the same rear panel.

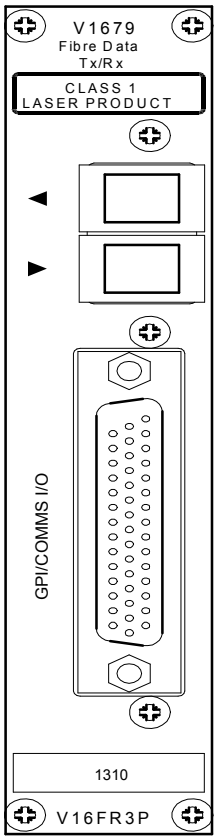



**Figure 12 : V1679 Rear Panel**

### 5.1 Silkscreen Legend and Markings

Optical Output (Transmitter): ►
Optical Input (Receiver): ◄

GPI Connector: GPI/COMMS I/O

A label at the bottom of the rear panel indicates the wavelengths (in nanometres) of the laser diode used on the module, e.g. 1310, 1550, 1510 CWDM, etc.

If a module is equipped with a CWDM laser, the label will show 'CWDM' next to the wavelength.

## 5.2 Electrical Interfaces

All General Purpose Interface (GPI) signals and the Serial Comms Port signals are available on a 44-pin, high density D-type connector. The following table shows the Connector Pinout:

Note that GPIO pin pairs (GPIO_Px, GPIO_Nx, x = 1..16) are either used as inputs or outputs. The naming convention is with reference to the opto-isolated inputs, where the '**P**' (positive) pin drives the LED's Anode and the '**N**' (negative) pin is either grounded internally or it drives the LED's Cathode.

| Pin | Signal | | | Pin | Signal | | | Pin | Signal | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | +15V (fused, 1A max.) | | | 16 | COM2_Rx2 | RS232 **RxD** | RS422 **Rx+** | 31 | **GND** | | |
| 2 | COM1_Rx2 | RS232 **RxD** | RS422 **Rx+** | 17 | COM2_Rx1 | RS232 **CTS** | RS422 **Rx-** | 32 | COM2_Tx2 | RS232 **RTS** | RS422 **Tx+** |
| 3 | COM1_Rx1 | RS232 **CTS** | RS422 **Rx-** | 18 | **GND** | | | 33 | COM2_Tx1 | RS232 **TxD** | RS422 **Tx-** |
| 4 | GPIO_N16 | Group B | | 19 | COM1_Tx2 | RS232 **RTS** | RS422 **Tx+** | 34 | **GND** | | |
| 5 | GPIO_P16 | Group B | | 20 | COM1_Tx1 | RS232 **TxD** | RS422 **Tx-** | 35 | GPIO_N15 | Group B | |
| 6 | GPIO_P14 | Group B | | 21 | GPIO_N14 | Group B | | 36 | GPIO_P15 | Group B | |
| 7 | GPIO_P13 | Group B | | 22 | GPIO_N13 | Group B | | 37 | GPIO_N12 | Group B | |
| 8 | GPIO_P11 | Group B | | 23 | GPIO_N11 | Group B | | 38 | GPIO_P12 | Group B | |
| 9 | GPIO_P10 | Group B | | 24 | GPIO_N10 | Group B | | 39 | GPIO_N9 | Group B | |
| 10 | GPIO_P8 | Group A | | 25 | GPIO_N8 | Group A | | 40 | GPIO_P9 | Group B | |
| 11 | GPIO_P7 | Group A | | 26 | GPIO_N7 | Group A | | 41 | GPIO_N6 | Group A | |
| 12 | GPIO_P5 | Group A | | 27 | GPIO_N5 | Group A | | 42 | GPIO_P6 | Group A | |
| 13 | GPIO_P4 | Group A | | 28 | GPIO_N4 | Group A | | 43 | GPIO_N3 | Group A | |
| 14 | GPIO_P2 | Group A | | 29 | GPIO_N2 | Group A | | 44 | GPIO_P3 | Group A | |
| 15 | GPIO_P1 | Group A | | 30 | GPIO_N1 | Group A | | | Screwlocks: **GND** | | |

**Table 1 : 44-Pin High Density Dsub Connector Pinout**

Legend:
Signals belonging to Group A
Signals belonging to Group B

## Notes:

**1. Grouping of General Purpose Inputs and Outputs:**

V1679/IO: GPI Inputs 1..8 are assigned to Group A. GPI Outputs 1..8 are assigned to Group B.
V1679/IP: GPI Inputs 1..8 are assigned to Group A. GPI Inputs 9..16 are assigned to Group B.
V1679/OP: GPI Outputs 1..8 are assigned to Group A. GPI Outputs 9..16 are assigned to Group B.

**2. Using COM1 and COM2 for a fully featured RS-232 port, supporting all Modem lines:**

Some RS-232 application may require all RS-232 control lines, such as CTS/RST and DST/DTR in addition to the data lines RxD and TxD.

COM1 or COM2 (unfortunately not both) can be configured to support additional control lines by 'borrowing' the lines from the other port. This means that control lines CTS/RTS from COM2 can be used to serve as DSR/DTR for COM1.

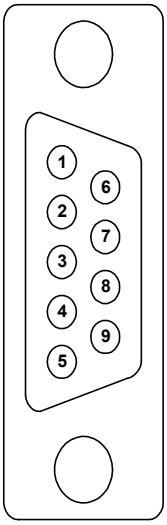
The two remaining signal lines at COM2, namely RxD and TxD, can still be used for a RxD/TxD only communication over COM2, where either no flow control is required or a software flow control (Xon/Xoff) is used instead.

## 5.3 V1679 Breakout Adapter

Vistek offers a special Breakout Adapter for the V1679, which gives instant access to all GPIO signals on so-called spring terminals and to all serial comms lines on two female 9-pin DSUB connectors (COM1 / COM2). The drawback when using the Breakout Adapter is that the adjacent slot in the rack will be blocked by the adapter, hence it becomes unusable. One has to consider making an application specific, customized breakout-cable when rack-space is precious.

Please note that the Breakout Adapter is neither CE nor FCC approved and that unshielded GPIO lines can cause interference problems with other equipment.

### 5.3.1 Serial Communications Ports




| Pin | RS-232 | RS-422 |
|---|---|---|
| 1 | NC | NC |
| 2 | RxD | Rx+ |
| 3 | TxD | Tx- |
| 4 | DTR (COM1 only) | NC |
| 5 | GND | NC |
| 6 | DSR (COM1 only) | NC |
| 7 | RTS | Tx+ |
| 8 | CTS | Rx- |
| 9 | NC | NC |
| Screw-locks | Shield | Shield |

(NC = Not Connected)

Note: Shield is connected to system GND via a 100Ohm resistor.

**Figure 13 : RS-232/422 Connector Pinout for COM1 and COM2**

The 9-pin DSUB connectors for COM1 and COM2 are clearly marked on the adapter. Note that only COM1 can be configured to function as a fully featured Modem port. For this purpose, a little slide switch is used to connect the extra lines, 'borrowed' from COM2, to the COM1 connector. If COM2 is used as a RS-422 interface, make sure that the switch is set to TxD/RxD only in order to avoid having COM2 signal lines routed to the COM1 connector. Although not used for COM1 in this mode, those lines would act as long stubs and would have a bad effect on signal integrity.

### 5.3.2 GPIO Terminals

The GPIO Terminals are grouped in two blocks (Group A, Group B); each GPIO signal comes as a pair (+/-). The conductor size may vary between 0.14 – 0.5 $mm^2$ (AWG 26-20). The recommended stripping length is 11mm.

### 5.3.3 Power Supply Output

The V1679 Breakout Adapter features a power supply output, which delivers unregulated +15V @ 1A (fused) on a 3-way PHOENIX Header with 3.5mm pitch (MCV1.5/3-G-3.5).

## 5.4 Optical Interfaces

**CAUTION**

The maximum optical input power must not exceed 5mW (average) or 10mW (peak) at wavelengths 1110nm ≥ λ ≤1650nm. Exceeding these limits may result in a permanent damage of the optical receiver unit.

**ATTENTION**

If the baseboard needs to be removed from the rack, never touch the fiber end face of the connectors! Use plastic dust caps to protect the ferrules of boards not in use. See Chapter 9 ‘Cleaning Instructions’ for further information.

### 5.4.1 Optical Input

| Parameter | V1679 Optical Input (Receiver) |
|---|---|
| Connector Type | SC/PC with Shutter, single-mode |
| Insertion Loss | < 0.3dB (< 0.15dB typ) |
| Backreflection | better than -45dB |
| Photodiode Type | InGaAs PIN-Photodiode |
| Detection Range | 1100nm – 1650nm |
| Saturation Power | >-3dBm (0.5mW), (typ) |
| Sensitivity | -3dBm to -28dBm (typ) |
| Bit Error Rate (BER) | $<10^{-12}$ |
| Fibre type | Single-mode (9/125µm) |

**Table 2 : V1679 Optical Input**

### 5.4.2 Optical Output

| Parameter | Optical Output (Transmitter) |
|---|---|
| Connector Type | SC/PC with Shutter, single-mode |
| Insertion Loss | < 0.3dB (< 0.15dB typ) |
| Backreflection | better than -45dB |
| Laser Diode Type | **F**abry **P**erot (FP) or **D**istributed **F**eed**B**ack (DFB) |
| Standard Laser Wavelengths | 1310nm, 1550nm<br>**Note:** The standard 1550nm wavelength is not suitable for CWDM applications! |
| CWDM Laser Wavelengths | 1470nm, 1490nm, 1510nm, 1530nm<br>1550nm, 1570nm, 1590nm, 1610nm |
| Optical Output Power | 2 user selectable options:<br>Medium: -7dBm (typ)<br>High: -3dBm (typ)<br>**Note:** Output Power may vary by ± 1dBm |
| Extinction Ratio | > 8dB (typ) |
| Fibre Type | Single-mode (9/125µm) |
| Transmission Length | up to 70 km @ 1550nm (622Mb/s)<br>(CORNING SMF-28 single-mode fiber) |

**Table 3 : V1679 Optical Output**

### 5.4.3 Encoding Scheme and Data Rate

The V1679/xx uses an 8b/10b encoding scheme with K28.5 sync characters for proper byte alignment at the receiving end. The 8b/10b encoding can be found in many of today's high-speed serial transmission standards, like InfiniBand, FibreChannel, Gigabit Ethernet or DVB-ASI, to name only a few of them.

The serial data rate is 622.08 Mb/s, which makes the V1679/xx, as far as its physical layer is concerned, compliant with SONET level OC-12.

## 6. FRONT PANEL LED INDICATORS

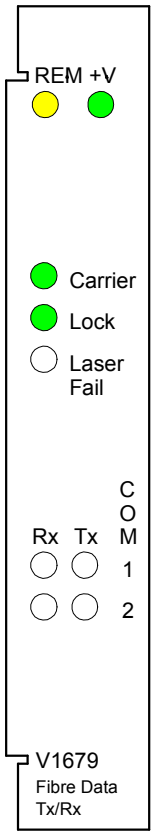



**Figure 14 : V1679 Front Panel**

### 6.1.1 Remote Control Access and Power Indicators

The green +V LED is lit when the unit's on-board power supply is delivering voltage. The yellow REM LED indicates with short blinks that the unit is accessed by the DART controller. It does not directly indicate that the unit is in remote control mode. If the rack frame does not have a Rack Controller fitted then this LED will not blink.

### 6.1.2 Carrier / Lock / Laser Fail Indicators

The meaning of these LEDs is as follows:

| | | |
|---|---|---|
| **Carrier:** | LED Off: | No Carrier (no or weak optical signal at input) |
| | LED Green: | Carrier is present |
| **Lock:** | LED Off: | Synchronization between two V1679 boards has failed |
| | LED Green: | Link has been established, Error free data transmission |
| **Laser Fail:** | LED Off: | Laser Transmitter is good |
| | LED Red: | Laser Diode Failure (Diode has reached end-of-life or ambient temperature is too high (> 70°C) and the Laser has shut down automatically) |

### 6.1.3 Serial Comms Activity Indicators

The serial comms activity LEDs show what's going on in the optical domain – and not in the electrical, i.e. RxD on the Dsub connector (electrical domain) becomes TxD in the optical domain and vice versa.

| | | |
|---|---|---|
| **COM1,2 Rx:** | OFF: | No activity |
| | | Green: Serial Data is being received from the module through the fibre link |
| **COM1,2 Tx:** | OFF: | No activity |
| | | Green: Serial Data is being sent from the module through the fibre link |

# 7. DART INTERFACE

## 7.1 General

The V1679 board is a Class 4 DART module with a serial EEPROM for reading and writing card details through the DARTbus in the same manner as other V1600 range cards. In addition, the unit has several read-only status ports, over which the board's operational status can be obtained.

## 7.2 DART Control Registers

The following table shows all used Control Bits:

| Bit | Description | | |
|---|---|---|---|
| 0 | *not used* | | |
| 1 | *not used* | | |
| 2 | *not used* | | |
| 3 | *not used* | | |
| 4 | *not used* | | |
| 5 | *not used* | | |
| 6 | *not used* | | |
| 7 | *not used* | | |
| 8 | DART driven GPI Input1 | '0': Reset | '1': Set |
| 9 | DART driven GPI Input2 | '0': Reset | '1': Set |
| 10 | DART driven GPI Input3 | '0': Reset | '1': Set |
| 11 | DART driven GPI Input4 | '0': Reset | '1': Set |
| 12 | DART driven GPI Input5 | '0': Reset | '1': Set |
| 13 | DART driven GPI Input6 | '0': Reset | '1': Set |
| 14 | DART driven GPI Input7 | '0': Reset | '1': Set |
| 15 | DART driven GPI Input8 | '0': Reset | '1': Set |
| 16 | Mask Bit for GPI I/O1 | '0': ext. controlled | '1': DART driven |
| 17 | Mask Bit for GPI I/O2 | '0': ext. controlled | '1': DART driven |
| 18 | Mask Bit for GPI I/O3 | '0': ext. controlled | '1': DART driven |
| 19 | Mask Bit for GPI I/O4 | '0': ext. controlled | '1': DART driven |
| 20 | Mask Bit for GPI I/O5 | '0': ext. controlled | '1': DART driven |
| 21 | Mask Bit for GPI I/O6 | '0': ext. controlled | '1': DART driven |
| 22 | Mask Bit for GPI I/O7 | '0': ext. controlled | '1': DART driven |
| 23 | Mask Bit for GPI I/O8 | '0': ext. controlled | '1': DART driven |
| 24 | DART driven GPI Output1 | '0': Reset | '1': Set |
| 25 | DART driven GPI Output2 | '0': Reset | '1': Set |
| 26 | DART driven GPI Output3 | '0': Reset | '1': Set |
| 27 | DART driven GPI Output4 | '0': Reset | '1': Set |
| 28 | DART driven GPI Output5 | '0': Reset | '1': Set |
| 29 | DART driven GPI Output6 | '0': Reset | '1': Set |
| 30 | DART driven GPI Output7 | '0': Reset | '1': Set |
| 31 | DART driven GPI Output8 | '0': Reset | '1': Set |

**Table 4 : DART Control Register Bits**

## 7.3 DART Status Registers

The following table shows all available Status Bits:

| Bit | Description | | |
|---|---|---|---|
| 0 | CFG0 – Configuration Bit0 | | '000': V1679 IO, no PIC<br>'001': V1679 IP, no PIC<br>'010': V1679 OP, no PIC<br>'011': reserved<br>'100': reserved<br>'101': reserved<br>'110': reserved<br>'111': reserved |
| 1 | CFG1 – Configuration Bit1 | | |
| 2 | CFG2 – Configuration Bit2 | | |
| 3 | *reserved* | | |
| 4 | Carrier Detect | | '0': No Carrier<br>'1': Carrier Present |
| 5 | Lock Detect | | '0': Unlocked (no sync)<br>'1': Locked |
| 6 | Laser Condition | | '0': Laser Fail<br>'1': Laser Good |
| 7 | *reserved* | | |
| | **V1679 IO (8 In/8 Out)** | **V1679 IP (16 In)** | **V1679 OP (16 Out)** |
| 8 | State of GPI Input1 | State of GPI Input1 | State of GPI Output9 |
| 9 | State of GPI Input2 | State of GPI Input2 | State of GPI Output10 |
| 10 | State of GPI Input3 | State of GPI Input3 | State of GPI Output11 |
| 11 | State of GPI Input4 | State of GPI Input4 | State of GPI Output12 |
| 12 | State of GPI Input5 | State of GPI Input5 | State of GPI Output13 |
| 13 | State of GPI Input6 | State of GPI Input6 | State of GPI Output14 |
| 14 | State of GPI Input7 | State of GPI Input7 | State of GPI Output15 |
| 15 | State of GPI Input8 | State of GPI Input8 | State of GPI Output16 |
| 16 | Mask bit for GPI I/O1 | Mask bit for GPI Input1 | Mask bit for GPI Output1 |
| 17 | Mask bit for GPI I/O2 | Mask bit for GPI Input2 | Mask bit for GPI Output2 |
| 18 | Mask bit for GPI I/O3 | Mask bit for GPI Input3 | Mask bit for GPI Output3 |
| 19 | Mask bit for GPI I/O4 | Mask bit for GPI Input4 | Mask bit for GPI Output4 |
| 20 | Mask bit for GPI I/O5 | Mask bit for GPI Input5 | Mask bit for GPI Output5 |
| 21 | Mask bit for GPI I/O6 | Mask bit for GPI Input6 | Mask bit for GPI Output6 |
| 22 | Mask bit for GPI I/O7 | Mask bit for GPI Input7 | Mask bit for GPI Output7 |
| 23 | Mask bit for GPI I/O8 | Mask bit for GPI Input8 | Mask bit for GPI Output8 |
| 24 | State of GPI Output1 | State of GPI Input9 | State of GPI Output1 |
| 25 | State of GPI Output2 | State of GPI Input10 | State of GPI Output2 |
| 26 | State of GPI Output3 | State of GPI Input11 | State of GPI Output3 |
| 27 | State of GPI Output4 | State of GPI Input12 | State of GPI Output4 |
| 28 | State of GPI Output5 | State of GPI Input13 | State of GPI Output5 |
| 29 | State of GPI Output6 | State of GPI Input14 | State of GPI Output6 |
| 30 | State of GPI Output7 | State of GPI Input15 | State of GPI Output7 |
| 31 | State of GPI Output8 | State of GPI Input16 | State of GPI Output8 |

**Table 5 : DART Status Register Bits**

## 8. BLOCK DIAGRAM

V1679 Single-Mode Fiber GPI/O and RS-232/422 Transceiver

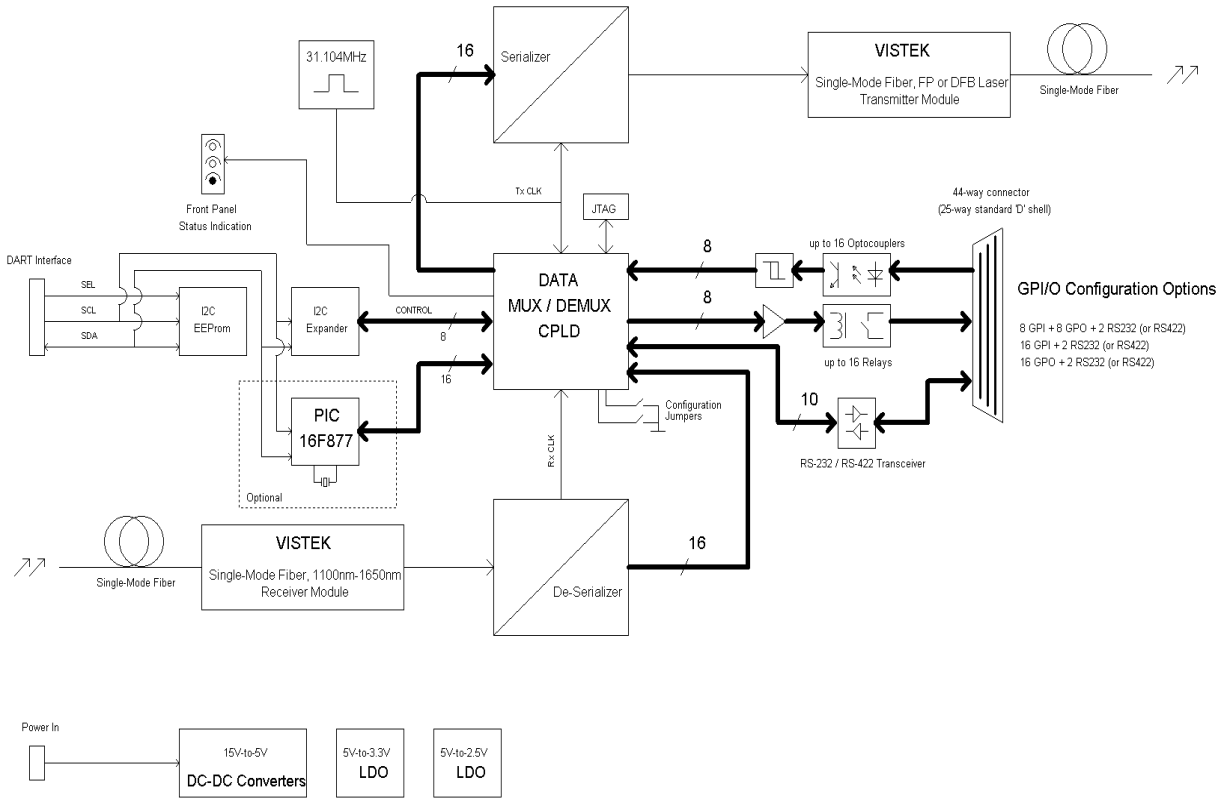



**Figure 15 : Single-Mode Fibre GPI/O and RS-232/422 Transceiver**

## 9. CLEANING INSTRUCTIONS

In order to maintain the performance of optical interconnections, fibre optic connectors must be cleaned before mating. A single-mode fibre's core diameter is only 8-9 µm, hence dust particles anywhere from 9 µm down to 1 µm in diameter can significantly decrease the system performance due to unwanted – but avoidable - optical loss!

For cleaning, only lens-grade, lint-free tissue (e.g. Kimwipes), saturated with 99.8+% pure, anhydrous Isopropyl Alcohol, shall be used.

Vistek recommends the use of pre-saturated wipes. One sachet, containing a pre-saturated wipe, can be found packed with each board.

**Cleaning Technique:**

Note that pre-saturated wipes dry out very quickly and they should be used only once.

1. Place the connector ferrule in the wipe and press the wipe firmly against the sides of the ferrule. Rotate the ferrule several times to remove possible contamination from the ferrule sides.
2. Now press a clean part of the wipe against the end of the connector ferrule. Scape the end of the connector until it squeaks.
3. Mate the connector immediately!

Remember these basic rules when handling fibre optic connectors:

**Do's**

✓ Always clean the connectors before mating.
✓ Mate the connector immediately.
✓ Cover unused connectors with dust protection caps.

**Don'ts**

**x** Never touch the end face of a connector.
**x** Do not let the connector lie around and collect dust before mating.