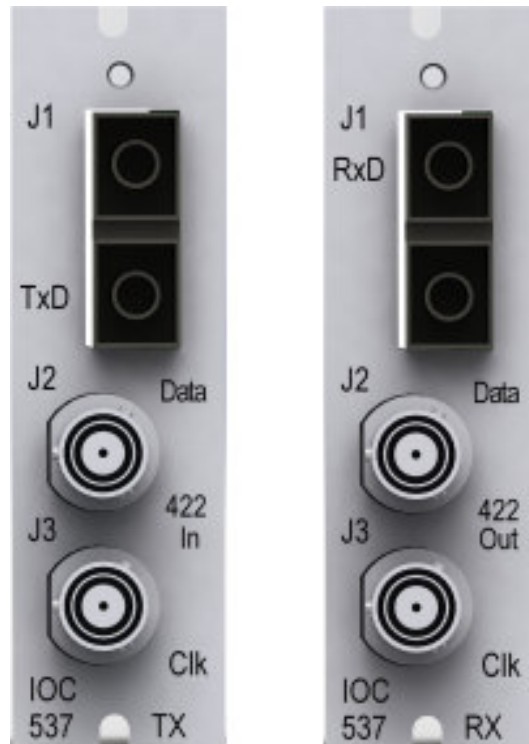




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INSTRUCTION MANUAL
FOR
MODEL IOC537
LOW LATENCY
FIBER OPTIC
TRANSMIT / RECEIVE MODULE



TO THE CUSTOMER

Thank you for purchasing this equipment from APOGEE LABS, Inc. Our intention is that the equipment meets your requirements and exceeds your expectations and you find our documentation adequately describes its operation and use. We continue to strive for higher levels of quality in our products, services and customer support and look forward to hearing from you if you have any comments or questions regarding these areas. We sincerely believe that the customer comes first.

WARRANTY

APOGEE LABS, Inc. warrants its products to be free from defects in materials and workmanship for a period of 18 months from the date of shipment to the original purchaser. APOGEE LABS Inc. obligation for any defect shall be limited to repair or replacement at our discretion of defective equipment. APOGEE LABS, Inc. assumes no liability if defects result from improper use, repairs not made by APOGEE LABS, Inc., negligence, accident, mishandling or misapplication of the equipment. No other warranty is expressed or implied and APOGEE LABS, Inc. assumes no liability for consequential damages. Should a warranty repair be required, please contact APOGEE LABS, Inc. for a Return Authorization Number.

EXTENDED WARRANTY

APOGEE LABS, Inc. offers an extended warranty plan to cover equipment beyond the normal Eighteen (18) month warranty plan. Under the extended warranty, APOGEE LABS will repair or replace equipment and/or components which have failed under normal use at its sole discretion. This extended warranty does not cover repair or replacement of equipment or components that failed because of improper use, repairs not made by APOGEE LABS, Inc., negligence, accident, misapplication of the equipment, or mishandling. A one-year or multi-year Extended Warranty may be purchased. Please contact our sales department for a price quotation.

Table of Contents	
Description	Page Number
<i>Module Overview</i>	
Features	1
Overview	1
Configuration	1
Input Termination	2
Input / Output Polarity	2
Operation	3
Data Clock Relationship	4
LED Status Indicators	4
Specifications	5
Application Information	5

FEATURES

- IOC537TX — serial RS-422 data and clock input (fiber out)
- IOC537RX — serial RS-422 data and clock output (fiber in)
- 100 bps to 20 Mbps data rate
- Asynchronous Data only mode up to 9 Mbps
- Less than 1/2 bit period plus 100 ns latency input to output using 1 meter fiber cable
- Channel to channel skew <20ns
- Less than 1ns induced jitter
- Instantaneous acquisition
- Multiple fiber mode and connectors available
- Single fiber moves both data and clock signals
- Provides electrically isolated link
- Input code - NRZ-L, NRZ-M, NRZ-S, RNRZ-L
- Input Clock, 0 degree or 180 degree clock
- Output Code - NRZ-L, NRZ-M, NRZ-S, RNRZ-L (same as input—does not translate)
- Output Clock: 0 degree clock

OVERVIEW

The IOC537 Pluggable Interface Module (PIM) provides the ability to transfer serial signals over a fiber optic cable with very low latency. These modules may be used to provide a DC isolated data link, a medium length (up to 10km standard) data path, and also to reduce radiated emissions. The transmitter accepts a serial synchronous data stream (data and clock) and converts it to an optical signal for transmission over single mode fiber optic cable. The encoded data is received by the receiver module, which converts the optical signal back to its original data and clock form. The IOC537 uses industry standard Triax connectors. Both operate from 100 bps to 20 Mbps and requires one of the 14 available slots in the 2073 or 2873 chassis. These modules are also supported by the single-slot AL2073-SL chassis.

CONFIGURATION

When installed in the AL2073/AL2873 chassis, the system functions as a NRZ input to NRZ output system. The data and clock polarity is automatically detected and adjusted to ensure that the data is sampled at a stable portion of the bit period.

The IOC537 modules have jumpers that allow the inversion of the input data and clock. This allows the user to define which contacts of the Triax connector are the positive (A) and negative (B) signal.

The Clock input and output can act as a low to medium rate data transport without the need for a synchronous clock. Connect the asynchronous data signal input to the IOC537TX Clock input connector and connect the clock output connector on the IOC537RX to the data signal destination. This provides for a maximum data rate of 9Mbps.

INPUT TERMINATION









The IOC537TX provides termination for both the data and clock signal of 120Ω across the A(+) and B(-) RS-422 signals.

INPUT / OUTPUT POLARITY

The IOC537TX provides the ability to define/invert the incoming data and clock signals. The IOC537RX provides the ability to define/invert the outgoing data and clock signals. This is done through jumper configuration on the module. See the diagram and table below for configuration:

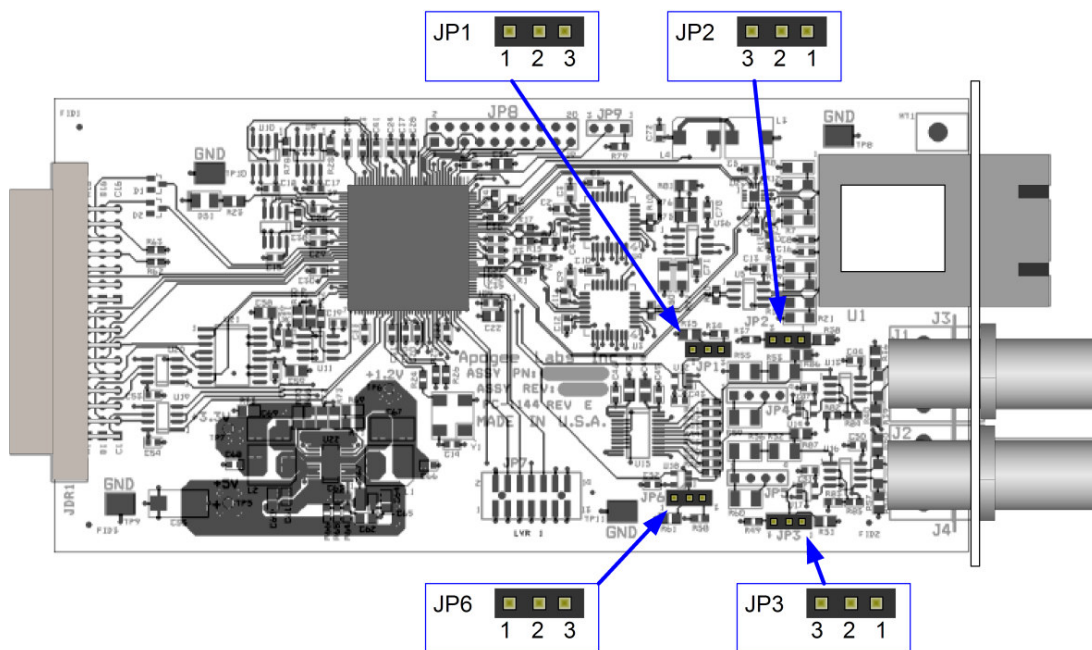
IOC537-TX		IOC537-RX	
Signal	Jumper	Signal	Jumper
Data In	JP1	Data Out	JP2
Clock In	JP6	Clock Out	JP3

The jumpers can accomplish two things. They can define the pin-out of the user's cable and equipment as well as invert the data or clock as required by the user.

IOC537-TX		IOC537-RX	
For cabling: Center connector: A (+) Ring connector: B (-)	For cabling: Center connector: B (-) Ring connector: A (+)	For cabling: Center connector: A (+) Ring connector: B (-)	For cabling: Center connector: B (-) Ring connector: A (+)
Normal: Pins 2-3 jumped 	Normal: Pins 1-2 jumped 	Normal: Pins 1-2 jumped 	Normal: Pins 2-3 jumped 
Inverted: Pins 1-2 jumped 	Inverted: Pins 2-3 jumped 	Inverted: Pins 2-3 jumped 	Inverted: Pins 1-2 jumped 

The default jumper position from the factory is to have all installed jumpers at location 1-2.

Refer to diagram below for jumper location.



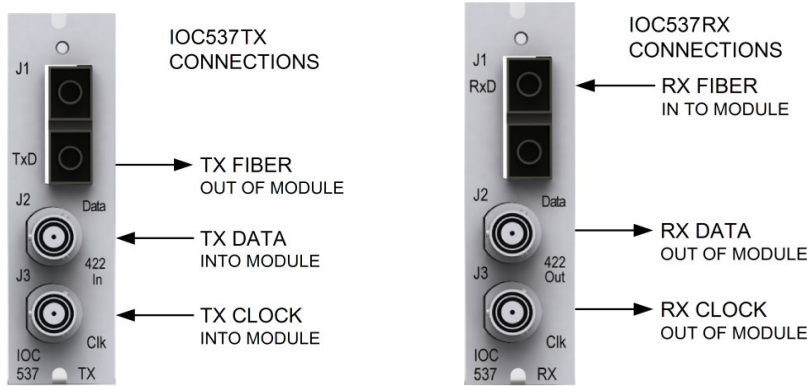
OPERATION

The IOC537 modules are simple plug and play modules. When placed in a chassis and powered on, they only need to be connected to their proper cable and let them transport their data.

IOC537 TX/RX CABLING

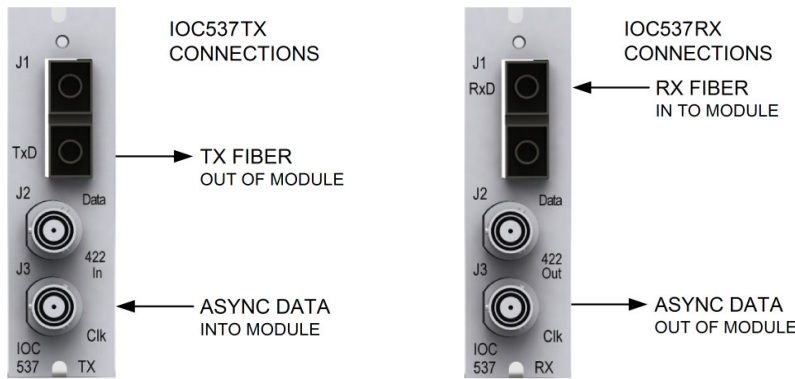
Synchronous mode

In synchronous mode, both the data and clock are transmitted by the user over the fiber optic cable. In this mode the user connects the data and clock to the IOC537TX module's inputs. The fiber optic cable is connected to the TxD port. The fiber optic cable is then run to the IOC537RX module's RxD fiber input. The data and clock are output on the IOC537RX Data and Clk connectors respectively.



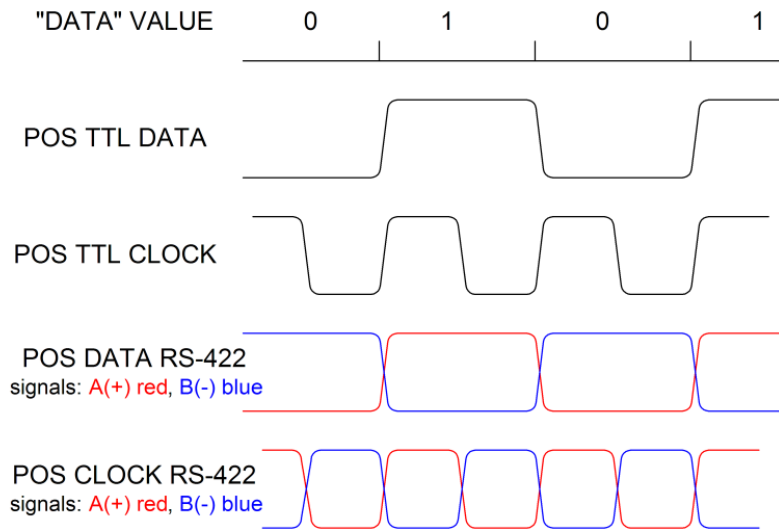
Asynchronous mode

In asynchronous mode, only the data is transmitted by the user over the fiber optic cable. In this mode the user connects the data to the IOC537TX module's clock (Ck) input. The fiber optic cable is connected to the TxD. The fiber optic cable is then run to the IOC537RX module's RxD fiber input. The data is output on the clock (Ck) connector.



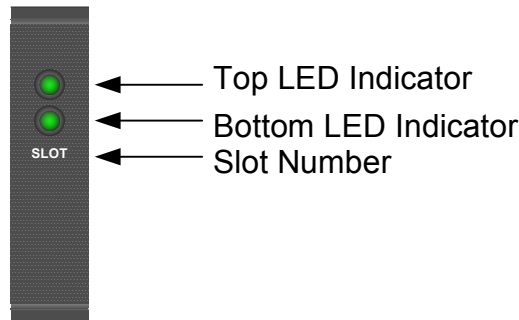
DATA / CLOCK RELATIONSHIP

The IOC537 modules operate on a 0 degree data and clock relationship. This means that the data transitions while the clock signal transitions from a “zero” to a “one” state (rising edge). This ensures the bit detection of the data is stable during the falling edge of the clock. The following image demonstrates this relationship. The IOC537 will detect if the edge alignment is improper and invert the clock to ensure clean data transmission.



LED STATUS INDICATORS

The AL2073 chassis has status LEDs to indicate status of signals and give an indication of the operation status of the modules. On the AL2073 chassis each slot has two status indicators.



Module	LED	Status	Definition
IOC537TX	Top LED	ON	Data transitions are seen on the data input connector
	Bottom LED	ON	Clock transitions are seen on the data input connector
IOC537RX	Top LED	ON	The fiber optic signal is detected on the fiber RX input
	Bottom LED	ON	Data and clock signals are being output
		BLINKING	Only clock signals are being output (no data transitions are seen)

SPECIFICATIONS

GENERAL

- IOC537: Triax connectors
- 1 Slot Module (3" x 6" x 0.9")
- Requires single slot in AL2073/AL2873 chassis

ELECTRICAL SIGNAL INPUT

- IOC537TX: RS-422 with 120Ω termination
- Supports NRZ Input codes
- Maximum Data rate 20Mbps (at 50% duty cycle)
 - Min clock edge-edge time: 25ns
- Automatically detects input data clock relationship

ELECTRICAL SIGNAL OUTPUT

- IOC537RX: RS-422 drives 100Ω load
- Supports NRZ Output codes
 - Output code same as input

OPTICAL SIGNAL I/O

- SC or ST type connector*
- Single-mode or multi-mode fiber*
- 1310 nm wavelength
- 10 km range
 - Minimum optical output power: -9.5dB
 - Maximum receiver sensitivity: -20dB
 - contact sales for longer distances

* contact sales for fiber configuration

POWER CONSUMPTION

- IOC537TX: 225mA (at 20 Mbps)
- IOC537RX: 430mA (at 20 Mbps)

ENVIRONMENTAL

- Operating temperature: 0° to 40° C
- Relative Humidity: 0 to 95% non-condensing

APPLICATION INFORMATION

The IOC537 modules transport data over long distances (10km or greater) of fiber optic cable. The IOC537 modules do this with very low latency allowing user data to get to its end point with minimal delay thus removing the variable of delay from being a data transport concern.

The IOC537 utilizes industry standards for both the electrical and optical signal interfaces. The units are self adjusting to any data rate within its specified range requiring no operator setup.