

## 1 DESCRIPTION

The Optomux Driver allows the FieldServer to transfer data to and from devices over either RS-232 or RS-485 using the Optomux Driver protocol. The Optomux driver is a client only driver and can poll an Optomux protocol compliant device but not emulate one.

The Optomux protocol provides a large command set. Many of the commands are used for OPTO22 device configuration. This driver supports the full command set and thus the driver may be used to configure as well as to poll OPTO22 devices.

### 1.1 Operating Methods

The Optomux driver provides three methods of operation. Users may use any combination of methods.

#### 1.1.1 Static Operation

The devices to be polled/commanded are configured using the FieldServer CSV file. If the hardware configuration is fixed and known then this is a suitable method.

#### 1.1.2 Dynamic Operation

The commands set can be configured by changing the values in the FieldServer's Data Arrays. This data driven operating mode is suitable if the hardware configuration may change or if hardware settings may change dynamically or to change some aspect of the hardware configuration without changing the CSV file and resetting the FieldServer..

#### 1.1.3 Triggered Operation

This operating mode allows commands to be triggered by changing the value in the FieldServer's Data Arrays. This operating mode is useful if requiring an action triggered by a remote device.

### 1.2 Statistics and Command Responses

All FieldServer drivers report communication statistics that allow the operation of the driver to be monitored.

In addition to the standard statistics, this driver exposes the communication statistics for each port by presenting them in a user specified data array where they can be monitored by a remote device or HMI system.

The Optomux driver also exposes the response status to each poll and command (if required) by writing the response statuses to a user specified data array. This useful feature allows remote devices to check whether a command has been completed successfully.

Fieldserver Mode	Nodes	Comments
Client	256	
Server	N/A	Server side is not supported. See description.

## 2 FORMAL DRIVER TYPE

Serial  
Client Only

## 3 COMPATIBILITY MATRIX

FieldServer Model	Compatible with this driver
FS-x2010	Yes
FS-x2011	Yes
FS-x30	Yes
FS-x40	Yes

## 4 CONNECTION INFORMATION

Connection type: RS-485 (Two wire, Half-Duplex)  
Baud Rates: At the time of publication of this manual the OPTO22 devices support standard baud rates in the range 300-38400.  
Data Bits: 7,8  
Stop Bits: 1  
Parity: Odd, Even, None  
Multidrop Capability No

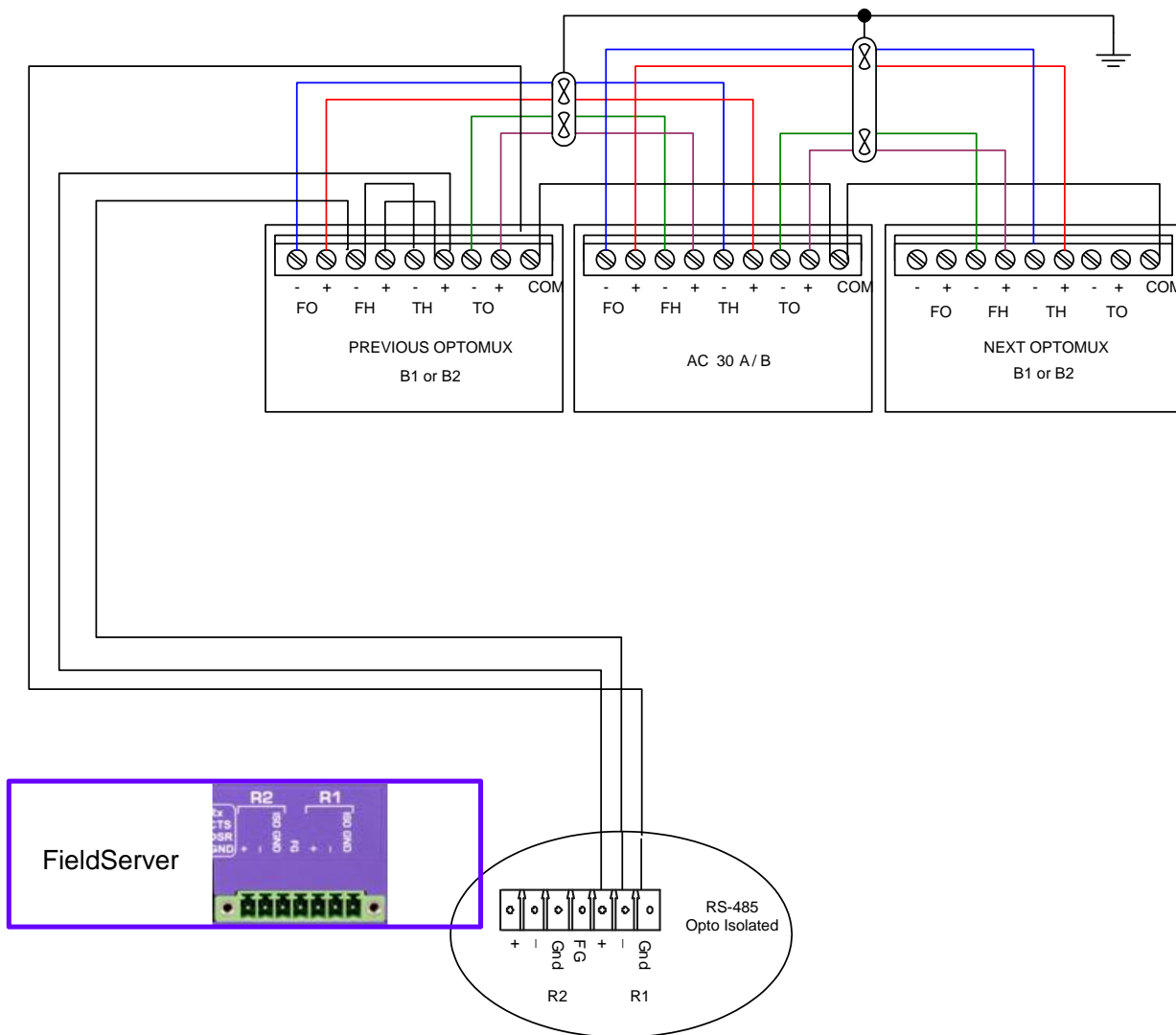
## 5 DEVICES TESTED

Device	Tested (FACTORY, SITE)
OptoMux (by Opto22 Inc.)	SITE

## 6 CONNECTION CONFIGURATIONS

The FieldServer is connected to the OPTO22 device as shown below.

Configure the OPTO22 device according to manufacturer's instructions.



### 6.1 Connection Notes

- B2 Communication connections are made to the rack (PB4AH, PA8AH, PB16AH), not to the brain board.
- COM points must not be connected to Earth Ground.
- Bridging 4-wire RS-422 to get 2-wire RS-485 may not work in certain applications, and in this case it is recommended that a RS-232 to RS-422 converter is used in between the FieldServer and the OPTO 22 devices .

## 7 COMMUNICATIONS FUNCTIONS - SUPPORTED FUNCTIONS AT A GLANCE:

### 7.1 The Optomux driver can perform the following commands / queries

POWER UP CLEAR	TRIGGER ON POSITIVE
RESET	TRIGGER ON NEGATIVE
SET TURN-AROUND DELAY	READ PULSE COMPLETE BITS
SET WATCHDOG DELAY	READ DURATION COUNTERS
SET WATCHDOG DELAY (Analog)	READ AND CLEAR DURATION COUNTERS
SET PROTOCOL	CLEAR DURATION COUNTERS
IDENTIFY Optomux TYPE	WRITE ANALOG OUTPUTS
SET ENHANCED DIGITAL WATCHDOG	READ ANALOG OUTPUTS
SET ENHANCED ANALOG WATCHDOG	UPDATE ANALOG OUTPUTS
SET TIMER RESOLUTION	READ ANALOG INPUTS
SET TEMPERATURE PROBE TYPE	READ AND AVERAGE INPUT
CONFIGURE POSITIONS	START INPUT AVERAGING
CONFIGURE AS INPUTS	READ AVERAGE COMPLETE BITS
CONFIGURE AS OUTPUTS	READ INPUT AVERAGE DATA
READ MODULE CONFIGURATION	READ TEMPERATURE INPUTS
WRITE OUTPUTS	READ AVERAGE TEMPERATURE INPUTS
ACTIVATE OUTPUTS	SET INPUT RANGE
DEACTIVATE OUTPUTS	READ OUT-OF-RANGE LATCHES
READ STATUS	READ AND CLEAR RANGE LATCHES
SET LATCH EDGES	CLEAR OUT-OF-RANGE LATCHES
SET LATCH OFF TO ON	READ LOWEST VALUES
SET LATCH ON TO OFF	CLEAR LOWEST VALUES
READ LATCHES	READ AND CLEAR LOWEST VALUES
READ AND CLEAR LATCHES	READ PEAK VALUES
CLEAR LATCHES	CLEAR PEAK VALUES
START/STOP COUNTERS	READ AND CLEAR PEAK
START COUNTERS	CALCULATE OFFSETS
STOP COUNTERS	SET OFFSETS
READ COUNTERS	CALCULATE AND SET OFFSETS
READ AND CLEAR COUNTERS	CALCULATE GAIN COEFFICIENTS
CLEAR COUNTERS	SET GAIN COEFFICIENTS
SET TIME DELAY	CALCULATE AND SET GAIN
INITIATE SQUARE WAVE	SET OUTPUT WAVEFORM R
HIGH RESOLUTION SQUARE WAVE	IMPROVED OUTPUT WAVEFORMS
RETRIGGER TIME DELAY	
GENERATE N PULSES	
START ON PULSE	
START OFF PULSE	
SET TRIGGER POLARITY	

## 8 UNSUPPORTED FUNCTIONS AND DATA TYPES

The driver was developed and tested using REV1 equipment. The basis for development was the OPTOMUX PROTOCOL USER'S GUIDE dated April 2000.

Baud rates From Rev1 onwards, additional baud rates were supported.

Command Set From Rev1 onwards, the following commands are supported.

Digital	Analog
SET ENHANCED DIGITAL WATCHDOG	SET ANALOG WATCHDOG USER-DEFINED VALUE
SET TIMER RESOLUTION	SET ANALOG WATCHDOG
READ MODULE CONFIGURATION	READ MODULE CONFIGURATION
HIGH RESOLUTION SQUARE WAVE	SET TEMPERATURE PROBE TYPE
RETRIGGER TIME DELAY	
GENERATE n PULSES	
START ON PULSE	
START OFF PULSE	

### 8.1 OPERATIONAL DIFFERENCES — OLD OPTOMUX BRAIN BOARDS

This protocol manual applies to Optomux units labeled "REV 1" and above. If the Optomux brain board (applies to B1 and B2 only) does not have a revision label, you have a very old Optomux unit and should be aware of the following differences. Brain board model B3000 is newer than "REV 1".

The following notes are extracted from the OPTOMUX PROTOCOL USER'S GUIDE - April 2000.

#### 8.1.1 Digital Brain Boards (B1)

- The "REV 1" (or greater) Optomux units will notify the host that a serial watchdog has timed out by responding to the first command after a serial watchdog time-out with an N06cr error code. The command will not be executed. This is similar to a power-up operation. This error code will not be sent in response to a "POWER UP CLEAR" command.
- Pulse duration counters are edge triggered with the newer Optomux brain boards. The previous versions were level triggered.
- Maximum counter frequency is now 400 Hz, 50 percent duty cycle (minimum ON or OFF pulse time is 1.25 milliseconds). Use of the "GENERATE n PULSES" command will degrade counter frequency to 350 Hz maximum.
- The baud rate may now be changed without cycling power to the Optomux. Additional baud rates of 600, 2,400, 4,800, and 38,400 are now supported when using "REV 1" brain boards or above.
- Two question mark characters (??) may be used instead of the calculated checksum characters in command strings.

### 8.1.2 Analog Brain Boards (B2)

- The “REV 1” (or greater) Optomux units will notify the host that a serial watchdog has timed out by responding to the first command after a serial watchdog time-out with an N06cr error code. The command will not be executed. This is similar to a power-up operation. This error code will not be sent in response to a “POWER UP CLEAR” command.
- With “REV 1” (or greater) brain boards, averaging is performed using a continuous running average with a sample rate of 100 milliseconds. The number of samples to average is set with the “START INPUT AVERAGING” command as before, however, there is no need to restart the averaging after the number of samples has been reached. The “READ AVERAGE COMPLETE BITS” command indicates that the number of samples to average has been reached. The running average calculation used by Optomux is as follows (where n is the number of samples):  $\text{New Average} = ((n-1) (\text{Old Average}) + (\text{New Reading}))/n$
- The baud rate may now be changed without cycling power to the Optomux. Additional baud rates of 600, 2,400, 4,800, and 38,400 are now supported when using “REV 1” brain boards or above.
- Two question mark characters (??) may be used instead of the calculated checksum characters in command strings.