
# Pronghorn

# PFB Module

Author: Joe Teixeira
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# Overview

This document details the configuration interface for implementing a Pronghorn Profibus Slave module driver installation. This document assumes the reader is familiar with the Liaison's Pronghorn product. Refer to the ***Pronghorn Users Guide*** for more detailed information.

The main purpose of this module driver, named *pbslv*, is to provide connectivity to a Profibus (or compatible) devices via the Profibus DP protocol. The module driver uses the Woodhead Connectivity 5136-PFB interface card to access the DP network via the k5136-pfb Kernel device driver. Refer to the ***5136-PFB Hardware Guide***, for details on the interface card.

# Functionality

The module driver's main purpose is to obtain or provide slave data, contained on the 5136-PFB interface card. The module driver can only emulate 1 slave devices on the DP network Configuration of the slave is accomplished through the network configuration .csv file

## Registers

There is only one set of data registers on a DP slave device. Typically accessed as byte data. However the module drive an also access the same data area using word or bit offsets. In addition there are three other data areas that can be accessed on the 5136-PFB interface card.

| *Type* | *Pref* | *Size* | *Max Length* |
|---|---|---|---|
| Bit | Pxxxx | 1 bit | 1952 |
| Byte | Bxxxx | 8 bits | 244 |
| Word | Wxxxx | 16 bits | 122 |
| Status | Sxxxx | 8 bits | 28 |
| Diagnostic | Dxxxx | 8 bits | 25 |
| Extended Diagnostic | Exxxx | 8 bits | 98 |

The xxxx represents the address offset.

## Communication Interface

The Profibus DP protocol has specific electrical requirements for physical communication layer that is handled by the 5136-PFB interface card. Consult the hardware documentation for configuration options of the 5136-PFB interface card.

# Network Configuration

The configuration of this module and its network interface card is accomplished through the network comma separated values file (.csv) using software just as Excel or gnumeric. Additionally, slave configuration is included in the file. Some of the parameters are standard parameters used to access the interface card while others are particular to this module. Most parameters have a default value that will be used if the parameter does not exist. Additionally the parameters can be listed if any order.

| *Name* | *Valid Range* | *Default* | *Description* |
|---|---|---|---|
| Card | 1 - 8 | 1 | This identifies the interface card being used. Up to 8 cards can be installed in one processor. |
| Baud | 9k6 - 1m[i] | 1m5 | The communication speed being used. |
| IO_Port | 0 - 0xFFF | 0x250 | The port address used to access the hardware. |
| IO_Addr | 0xC000 - 0xEFFF | 0xC800 | The shared memory address for the card to use |

## Slave Configuration

Additionally the file contains another section, for each pbslv client, which contains slave configuration. Information for the slave being emulated must be listed. Only one slave can be configured. The *#TC* control character identifies the client name, for the slave being configured. So this value will be the same as the *name* parameter of the *PBSLV* configuration section.

| *Name* | *Valid Range* | *Default* | *Description* |
|---|---|---|---|
| Slave | 1 - 125 | 0[ii] | This identifies the slave number to emulate. |
| Active | True or False | False | True indicates that the slave is active on the network. |
| ID | 0 - 0xFFFF[iii] | 0 | This identifies the slave type. |
| TX_Len | 0 - 244 | 0 | This is the number of bytes that this slave will be transmitting to the Master device. |
| RX_Len | 0 - 244 | 0 | This is the number of bytes that this slave will receive from the Master device. |
| Watchdog | 10 - 655350 | 0 | Number of milliseconds before the slave timeouts |
| Ignore_Sts | True or False | False | If true the slave status will be ignored when reading/writing data |

### Errors

If any of the validation, for the network configuration parameters, fails a critical error message will be placed in the logs. In addition the module driver will not start. The following is a list of critical message that might be generated.

| *Msg ID* | *Mnemonic* | *Description* |
|---|---|---|
| 5007 | CRT_BAD_BAUD | Invalid baud specification (%s)<br>- The Baud rate does not match one of predefined values. |
| 5008 | CRT_ONE_SLAVE | Only one slave allowed, but %d slaves where specified<br>- More then one slave was attempted to be configured |

iValid values are:9k6, 19k2, 93k75, 187k5, 500k, 750k, 1m5, 3m, 6m, 12m Where 'k' represents 1000 and 'm' represents 1000000.

iiA value of zero is invalid and configuration of the slave will fail. So this parameter must be present.

iiiFor a 5136-PFB card this value should be 0x6715 (ISA) or 0x0856 (104)

# Mapping Configuration

The configuration of the module mappings is accomplished through the network comma separated values file (.csv) using software just as Excel or gnumeric. The parameters listed only pertain to this module. Refer the ***Pronghorn Users Guide*** for a list of the other common parameters used to configure a mapping. Most parameters have a default value that will be used if the parameter does not exist. Additionally the parameters can be listed in any order.

| *Name* | *Valid Range* | *Default* | *Description* |
|---|---|---|---|
| Offset | Refer to Register description | 0 | Identifies the data offset to access, within the slave data area |

## Errors

If any of the validation, for the mapping configuration parameters, fails an error message will be placed in the logs. In addition that particular mapping item will not be added to the internal mapping list. However the module continues with any remaining mappings.

| *Msg ID* | *Mnemonic* | *Description* |
|---|---|---|
| 5003 | ERR_BAD_OFF_TYPE | (Item %d) Offset type is invalid must be either 'W'ord, 'B'yte or 'P'oint<br>- The specified data type does not point to a valid Register type. |
| 5004 | ERR_ADDRESS_RANGE | (Item %d) Offset is out of range (off=%s, len=%d)<br>- The offset and length point beyond the supported range |

# Status Counters

This module driver maintains a set of status counter for recording the operational status of the module and the network.

| *Msg ID* | *Type* | *Description* |
|---|---|---|
| 5009 | CNT_READS | Number of reads<br>- Keeps track of the number of read requests performed. |
| 5010 | CNT_WRITES | Number of writes<br>- Keeps track of the number of write requests performed. |
| 5011 | CNT_READ_ERRORS | Number of reads failed<br>- Keeps track of the number of times a read request failed. |
| 5012 | CNT_WRITE_ERRORS | Number of writes failed<br>- Keeps track of the number of times a write request failed. |
| 5013 | CNT_STATUS_READS | Number of status counter reads<br>- Keeps track of the number of requests for status counters |
| 5014 | CNT_STATUS_FAILED | Number of status counter reads failed<br>- Keeps track of the number of status counter requests failed. |
| 5015 | CRD_BAD_REQUEST_LENGTH | Invalid request length errors |
| 5016 | CRD_FIFO_OVERFLOW | FIFO overflow errors |
| 5017 | CRD_RECV_OVERRUN | Receive overrun errors |
| 5018 | CRD_TOKEN_ERRORS | Double token errors (wiring or hardware error) |
| 5019 | CRD_RESP_ERRORS | Response errors (wiring or hardware error) |
| 5020 | CRD_SYNI_ERRORS | Syni errors (wiring or hardware error) |
| 5021 | CRD_NETWORK_TIMEOUT | Network timeout errors |
| 2022 | CRD_HSA_ERRORS | Station higher then highest Station Address |
| 2023 | CRD_DUPLICATE_STN | Duplicate station detected |
| 2024 | CRD_PASS_TOKEN_ERR | Unable to pass token (wiring or hardware error) |
| 2025 | CRD_ACTV_STN_LIST_ERR | Active station list invalid (wiring or hardware error) |
| 2026 | CRD_INTERNAL_ERROR | Internal error (hardware error) |
| 2027 | CRD_ARG_ERRORS | Argument errors |
| 2028 | CRD_EVENT_OVERRUN | New even occurred before the last one was cleared |
| 2029 | CRD_SLV_STATUS1 | Slave status byte 1 to Master |
| 2030 | CRD_SLV_STATUS2 | Slave status byte 2 to Master |
| 2031 | CRD_SLV_STATUS3 | Slave status byte 3 to Master |
| 2032 | CRD_MASTER_STN | Master station number |
| 2033 | CRD_SLV_ID_HI | Slave device ID high byte |
| 2034 | CRD_SLV_ID_LO | Slave device ID low byte |
| 2035 | CRD_DIAG_LEN | Slave Diagnostic length |
| 2036 | CRD_MASTER_STS | Master status |
| 2037 | CRD_WD_FACT1 | Watchdog factor 1, from master |
| 2038 | CRD_WD_FACT2 | Watchdog factor 2, from master |
| 2039 | CRD_READY_TIME | Response delay time, from master |
| 2040 | CRD_MST_ID_HI | Device ID high byte, from master |
| 2041 | CRD_MST_ID_LO | Device ID low byte, from master |
| 2042 | CRD_GROUP_ID | Group identifier, from master |

# Other Messages

In the normal operation of this module certain types of message may appear in the logs. Refer to the ***Pronghorn Users Guide*** for a list of the common messages that can be seen in the logs. In addition the *k5136-pfb* Kernel device driver can place errors to the system.log). The ErrNo and Mnemonic values are not Pronghorn defined codes. They are Unix system defined codes.

| *ErrNo* | *Mnemonic* | *Description* |
|---|---|---|
| 22 | EINVAL | Invalid Slave Number (1-125)<br>- The specified slave number is out of range. |
| 22 | EINVAL | Invalid TxLen %d (0-244)<br>- The slave transmit length is too large. |
| 22 | EINVA | Invalid InitWdog %u (10-655350, in steps of 10)<br>- The watchdog time is out of range. |
| 22 | EINVAL | Maximum number of PFB cards supported is 8<br>- The specified card number is not supported. |
| 5 | EIO | Failed to register device %s<br>- The kernel had problem create a device handle |
| 16 | EBUSY | PFB device '%s'[%d.%d] already opened<br>- The device is opened by another module |
| 19 | ENODEV | PFB device '%s'[%d.%d] does not exist<br>- The device did not get created or doesn't exist |
| 14 | EFAULT | Unable to access User space data<br>- Failed to transfer data between Kernel & User memory |
| 22 | EINVAL | I/O port (0x%x) Out of range Must be between 0x%x and 0x%x<br>- The I/O Port value specified is not valid |
| 16 | EBUSY | I/O port (0x%x) in use<br>- The I/O Port specified is not available |
| 22 | EINVAL | I/O memory (0x%x) Out of range Must be between 0x%x and 0x%x<br>- The specified shared memory address value is not valid |
| 16 | EBUSY | I/O memory (0x%x) in use<br>- The I/O address specified is not available |
| 16 | EBUSY | Unable to get I/O port (0x%x)<br>- Failed to get handle to device |
| 6 | ENXIO | Card ID(0x%x)/Module ID(0x%x) incorrect (0x%x/0x%x)<br>- The hardware at the specified I/O port is not a 5136-PFB card |
| 1 | EPERM | Card is already online, must be offline to be configured<br>- Card is in the wrong state for configuration |
| 14 | EFAULT | Baud parameter invalid (%d). Must be between %d and %d<br>- The specified Baud value is not valid. Refer to Baud |
| 6 | ENXIO | Can not perform command ... card not initialized<br>- Attempted to perform a command before card is ready |
| 16 | EBUSY | Failed to put card online<br>- Attempt to set card online failed |
| 14 | EFAULT | PBM device '%s' not open<br>- Attempt to read/write before card was opened |
| 14 | EFAULT | PBM device '%s' not initialized<br>- Attempt to read/write before card was initialized |
| 14 | EFAULT | Status Cntrs read length too long, req(%d) max(%d)<br>- Specified counter + length goes out of range |
| 14 | EFAULT | Slave %d not enabled<br>- The specified slave number was not previously configured |
| 14 | EFAULT | Slave %d status (%d) not OK<br>- The specified slave has an error |

| *ErrNo* | *Mnemonic* | *Description* |
|---|---|---|
| 90 | EMSGSIZE | Slave %d read length too long, req(%d) max(%d)<br>- The specified offset + length is out of range |
| 90 | EMSGSIZE | Slave %d read diagnostic length too long, req(%d) max(%d)<br>- The specified diagnostic + length is out of range |
| 90 | EMSGSIZE | Slave %d read ext diag length too long, req(%d) max(%d)<br>- The specified extended diagnostic + length is out of range |
| 14 | EFAULT | Slave %d unable to copy to user space<br>- Failed to transfer data between Kernel & User memory |
| 90 | EMSGSIZE | Slave %d write length too long, req(%d) max(%d)<br>- The specified offset + length is out of range |
| 14 | EFAULT | Slave %d unable to copy from user space<br>- Failed to transfer data between Kernel & User memory |
| 6 | ENXIO | Card ID (%x) not correct (%x)<br>- The hardware at the specified I/O port is not a 5136-PFB card |
| 6 | ENXIO | Config bytes read not what written. c=%x, m=%x<br>- Test pattern write failed |
| 14 | EFAULT | I/O memory (0x%x) in use by ROM<br>- The specified shared memory address already in use |
| 14 | EFAULT | I/O memory (0x%x) in use by RAM<br>- The specified shared memory address already in use |
| 14 | EFAULT | Unable to access I/O memory (0x%x)<br>- The specified shared memory address is not accessible |
| 6 | ENXIO | Card module failed to run<br>- Unable to set card to run mode. Refer to previous message to get the error reason from the card |