![FieldServer Technologies logo]

# Driver Manual
## (Supplement to the FieldServer Instruction Manual)

# FS-8700-114 DeviceNet Master Adapter Driver

---

**APPLICABILITY & EFFECTIVITY**

**Effective for all systems manufactured after November 2013**

---

| | |
|---|---|
| Driver Version: | 1.02 |
| Document Revision: | 5 |

## TABLE OF CONTENTS

## 1    DEVICENET MASTER DESCRIPTION

The DeviceNet Master Adapter driver can be used to emulate a single Master Scanner station on a DeviceNet network.  The FieldServer DeviceNet adapter is implemented as an ODVA profile 12 communications adapter. Standard DeviceNet Baudrates of 125k, 250k and 500kbit/s are supported.  The DeviceNet Master Scanner can open IO connections of up to a total of 1536 Bytes in each direction to DeviceNet Slaves.

**Max Nodes Supported**

| FieldServer Mode | Nodes | Comments |
|---|---|---|
| Client | 1 | The FieldServer can only emulate one DeviceNet Master station |
| Server | 63 | The driver can communicate with up to 63 Slaves as long as the FieldServer point count license is not exceeded |

## 2    DRIVER SCOPE OF SUPPLY

### 2.1    Supplied by FieldServer Technologies for this driver

| FieldServer Technologies PART # | Description |
|---|---|
| DeviceNet-Master | Anybus-M DeviceNet Card |

### 2.2    Provided by the Supplier of 3rd Party Equipment

#### 2.2.1   Required 3rd Party Software

RSNetWorx, RSLogix or another Network Scheduling Tool.
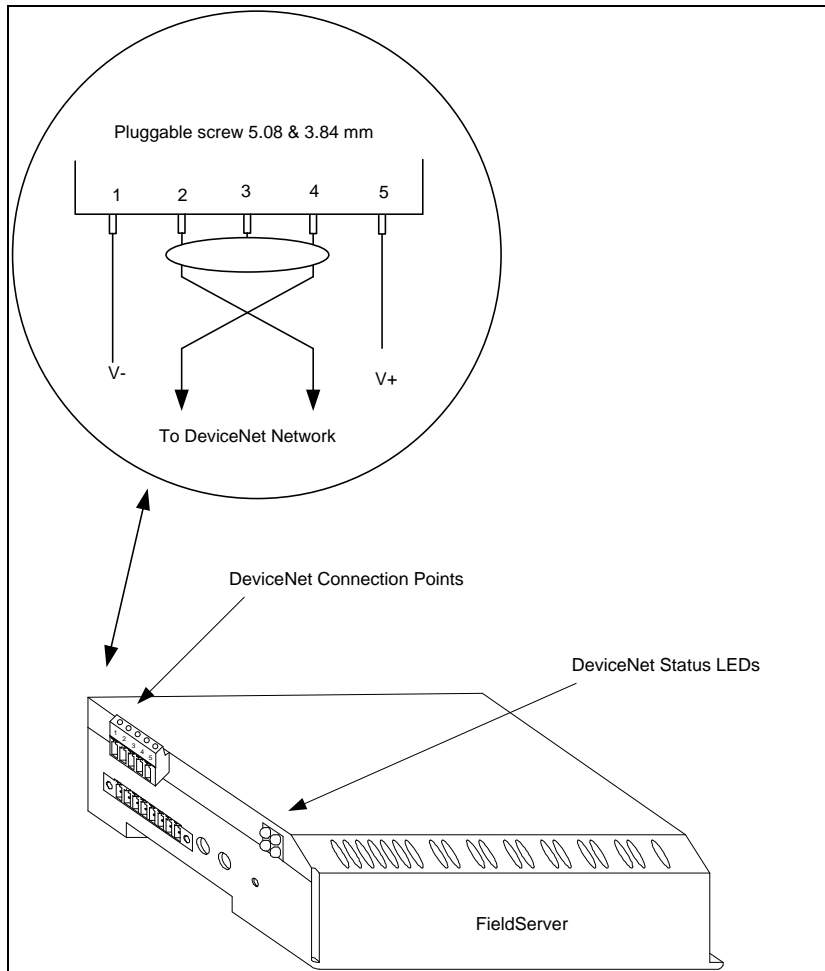
#### 2.2.2   Required 3rd Party Configuration

Connection to a properly terminated DeviceNet network.

#### 2.2.3   Optional Items

| PART # | Vendor/Manufacturer | Description |
|---|---|---|
| - | HMS-Networks | Anybus-M DeviceNet eds file |

## 3    HARDWARE CONNECTIONS

The FieldServer is connected to the DeviceNet network as shown in the connection drawing below.



**Connector Pinouts**

| Pin | Signal | Description | Wire color |
|-----|--------|-------------|------------|
| 1 | V- | Negative supply voltage | black |
| 2 | CAN_L | CAN_L Bus line | blue |
| 3 | SHIELD | Cable Shield | (bare) |
| 4 | CAN_H | CAN_H Bus line | white |
| 5 | V+ | Positive Supply Voltage | red |

### 3.1    Hardware Connection Tips / Hints

- Use the recommended network cable and terminators as specified by the DeviceNet network organization and/or the manufacturer of your network equipment.

- Terminate each end of the DeviceNet network with a 121 Ω resistor

- The bus interface shall be supplied with 24DC ± 10% on the Fieldbus connector

- The DeviceNet Master Card's network current consumption is maximum 50mA  = 0.05 Amps

## 4    DATA ARRAY PARAMETERS

Data Arrays are "protocol neutral" data buffers for storage of data to be passed between protocols.  It is necessary to declare the data format of each of the Data Arrays to facilitate correct storage of the relevant data.

| Section Title | | |
|---|---|---|
| Data_Arrays | | |
| Column Title | Function | Legal Values |
| Data_Array_Name | Provide name for Data Array | Up to 15 alphanumeric characters |
| Data_Array_Format | Provide data format. Each Data Array can only take on one format. | Float, Bit, Uint16, Sint16, Uint32, Sint32, Byte. |
| Data_Array_Length | Number of Data Objects. Must be larger than the data storage area required by the Map Descriptors for the data being placed in this array. | 1-10, 000 |

**Example**

```
//   Data Arrays
Data_Arrays
Data_Array_Name     , Data_Array_Format    , Data_Array_Length
DA_AI_01            , UInt16               , 200
DA_AO_01            , UInt16               , 200
DA_DI_01            , Bit                  , 200
DA_DO_01            , Bit                  , 200
```

## 5    CONFIGURING THE FIELDSERVER AS A DEVICENET MASTER

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Configuration Manual.  The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See ".csv" files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a DeviceNet Slave.

The configuration file tells the FieldServer about its interfaces, and the routing of data required.  In order to enable the FieldServer for DeviceNet communications, the driver independent FieldServer buffers need to be declared in the "Data Arrays" section, the FieldServer virtual node(s) needs to be declared in the "Server Side Nodes" section, and the data to be provided to the Clients needs to be mapped in the "Server Side Map Descriptors" section. Details on how to do this can be found below.

Note that in the tables, * indicates an optional parameter, with the bold legal value being the default.

## 5.1    DeviceNet Settings

| Section Title | |
|---|---|
| FieldServer | |
| **Column Title** | **Function** | **Legal Values** |
| System_Station_Address* | DeviceNet MAC ID of the FieldServer | 0-63 |

**Note:**

The DeviceNet MAC ID can also be set via the DIP switches on the side of the FieldServer but then the system station address parameter must be removed from the configuration file.

Refer to Appendix C.1 for more information.

**Example**

```
// FieldServer

FieldServer
Title              , System_Station_Address
DeviceNet_Test,    , 5
```

## 5.2    Server Side Connection Parameters

| Section Title | | |
|---|---|---|
| Connections | | |
| **Column Title** | **Function** | **Legal Values** |
| Adapter | Adapter Name | DNet |
| Protocol | Protocol name | X30_DNet_Master |
| DNet_Master_Baudrate1 | Baudrate | 125K , 250K , 500K |
| Command_DA_Name | Commanding Scanner | Name of a data array declared under Section 4, length of 8 - Bit data array type recommended |
| Status_DA_Name | Provide    Scanner status | |

**Example**

```
//   Server Side Connections

Connections
Adapter  ,Protocol            , DNet_Master_Baudrate  , Command_DA_Name  , Status_DA_Name
DNet     , X30_DNet_Master    , 500K                  , Command_Reg      , Status_Reg
```

---

[1] If System_Station_Address has not been defined in the CSV file, the DIP switch value for both MacID and Baudrate will be used and the baud parameter in the CSV file will be ignored.

## 5.3 Server Side Node Parameters

| Section Title | | |
|---|---|---|
| Nodes | | |
| **Column Title** | **Function** | **Legal Values** |
| Node_Name | Provide name for node | Up to 32 alphanumeric characters |
| Node_ID | MAC ID of Slave to scan | 0 - 63 |
| Protocol | Specify protocol used | X30_DNet_Master |

**Example**

```
//  Server Side Nodes


Nodes
Node_Name    , Node_ID    , Protocol
DN1          , 01         , X30_DNet_Master
```

## 5.4 Server Side Map Descriptor Parameters

### 5.4.1 FieldServer Related Map Descriptor Parameters

| Column Title | Function | Legal Values |
|---|---|---|
| Map_Descriptor_Name | Name of this Map Descriptor | Up to 32 alphanumeric characters |
| Data_Array_Name | Name of Data Array where data is to be stored in the FieldServer | One of the Data Array names from Section 4 |
| Data_Array_Offset | Starting location in Data Array | 0 to maximum specified in Section 4 |
| Function | Function of Server Map Descriptor | RDBC -Reads data from the remote input buffer<br>WRBC -Writes data to the remote output buffer |
| Scan_Interval | Buffers Update Period | > 0.001s |

### 5.4.2 Driver Specific Map Descriptor Parameters

| Column Title | Function | Legal Values |
|---|---|---|
| Node_Name | Name of Node | One of the Node names specified in Section 5.3 |
| DeviceNet_Data_Type | Data Type of remote buffer | Byte, Word, Dword, Float, Bool |
| Address | Byte offset into remote buffer | RDBC: 0 – 1535<br>WRBC: 0 – 1535 |
| Length | Number of DeviceNet_Data_Type items in remote buffer | BYTE: 1 – 1536<br>WORD: 1 – 768<br>DWORD: 1 – 384<br>FLOAT: 1 –384<br>BOOL: 1 – 12288 |

### 5.4.3   Map Descriptor Example.

```
//   Server Side Map Descriptors

Map_Descriptors
Map_Descriptor_Name     , Data_Array_Name   , Data_Array_Offset   , Function   , Node_Name   , DeviceNet_Data_Type   , Address   , Length   , Scan_Interval
Get_Data                , Input_Data        , 0                   , RDBC       , CN1         , WORD                  , 0         , 10       , 1s
Put_Data                , Output_Data       , 0.                  , WRBC       , CN1         , WORD                  , 0         , 10       , 1s
```

Read function map descriptor gets data from the DeviceNet network and stores it in the Input_Data data array.

Write function map descriptor puts data from the Output_Data data array onto the DeviceNet network.

Note that each address refers to an individual remote input and output buffer. Each buffer can contain up to 1536 bytes.

## Appendix A. USEFUL FEATURES

## Appendix A.1. DeviceNet X30 LED indicators
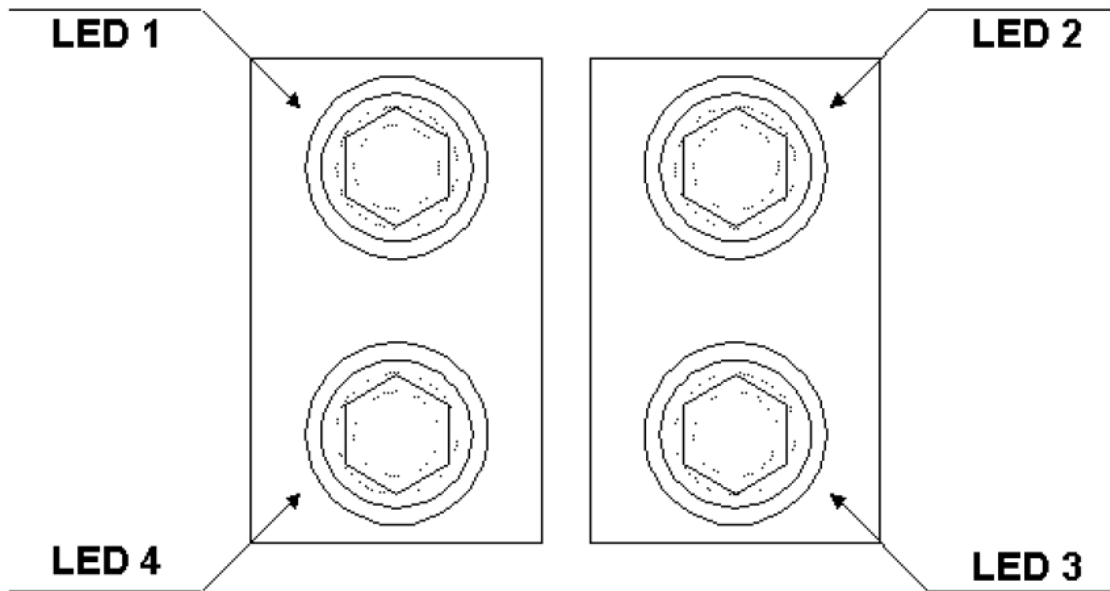


**LED 1 – Reserved**

**LED 2 – Network Status**

| Color | Frequency | Description |
|-------|-----------|-------------|
| - | Off | No power, not initialized or no connections established |
| Green | On | Online, one or more connections established |
| Green | Flashing | Online, no connections established |
| Red | On | Critical link failure |
| Red | Flashing | Minor fault, one or more connections have a minor fault |

**LED 3 – Module Status**

| Color | Frequency | Description |
|-------|-----------|-------------|
| - | Off | No power or not initialized |
| Green | On | Module status is OK |
| Red | On | Major fault |
| Red | Flashing | Minor fault |

**LED 4 – Operation Mode**

| Color | Frequency | Description |
|-------|-----------|-------------|
| - | Off | No power or not initialized |
| Green | Flashing | Idle mode |
| Green | On | Run mode |

## Appendix A.2. Using RSNetWorx

Please refer to the following document on the HMS website, www.anybus.com

ANYBUS-M DEVICENET MASTER/SCANNER APPENDIX Revision 1.02 - Section 5.3 "Configuration with RSNetworx".

## Appendix A.3. Configuring the FieldServer as a DeviceNet Secondary Master using Shared Inputs

Shared inputs are a function of a scanner (Master) that allows it to listen to devices that are in another scanner's scanlist. When the shared inputs function is enabled, the scanner will not open a Master/Slave connection with that device. It merely listens for the inputs from that device over the predefined Master/Slave Connection Set. Note that a slave device still can only have one master.

A Sample network configuration using the HMS Anybus NetTool for DeviceNet is shown below.  In this example the FieldServer's MAC ID is 6 and it is setup as a Secondary Master or Passive Scanner.  The DeviceNet network's name or Active Scanner is implemented by the device with MAC ID 7.

Note:  A Secondary Master Device is not allowed to produce outputs on the DeviceNet Network, and therefore only RDBC Map Descriptors may be used in the FieldServer's configuration file. (See the RDBC Map Descriptor in Section 5.4.3)
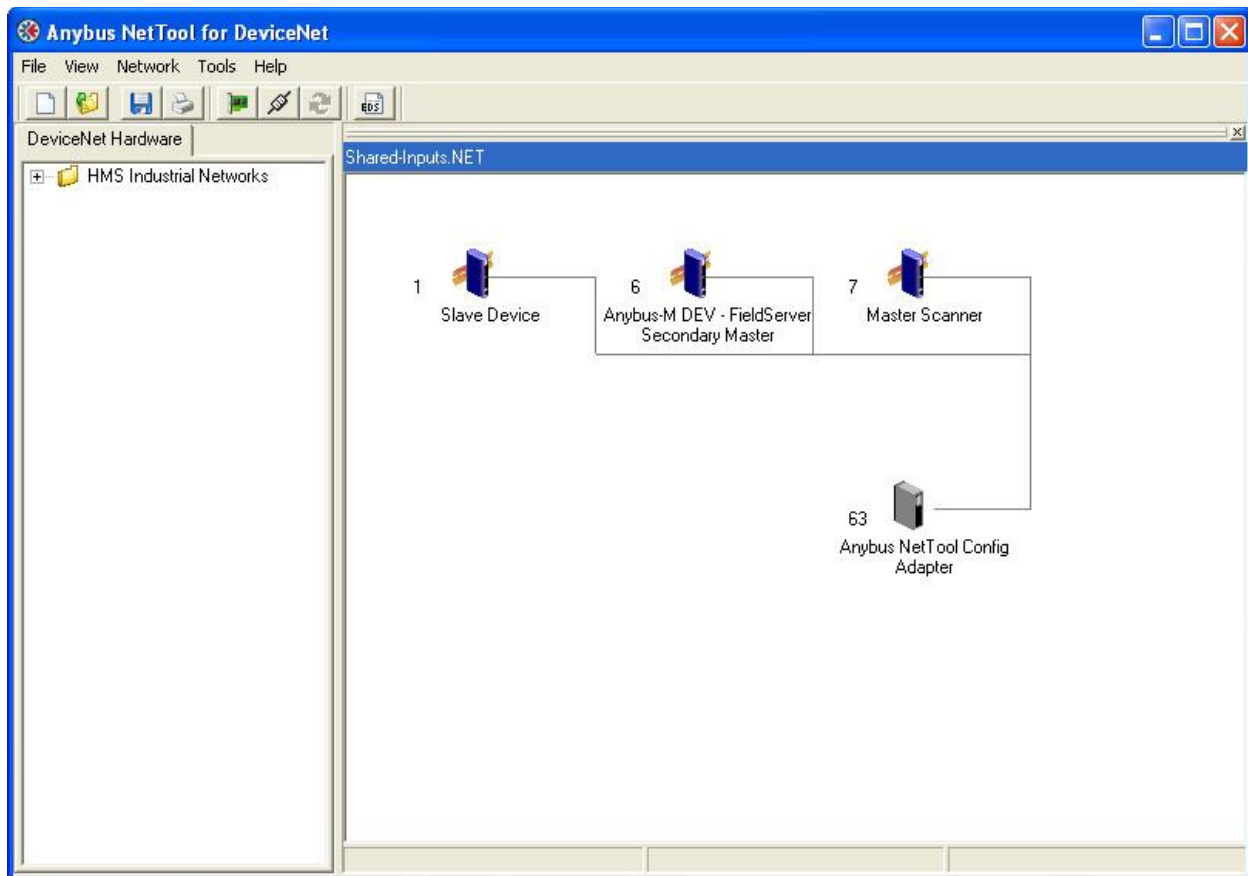


To enable the use of shared inputs, select the Slave Device at MAC ID 1 and the FieldServer Device at MAC ID 6, and add both to the FieldServer's Scanlist as shown below.

Note:  The red arrow 🔧 indicating the use of shared inputs will only show up if the FieldServer DeviceNet card and Electronic Data Sheet (.eds file) supports this function.  Insure using the latest EDS file.
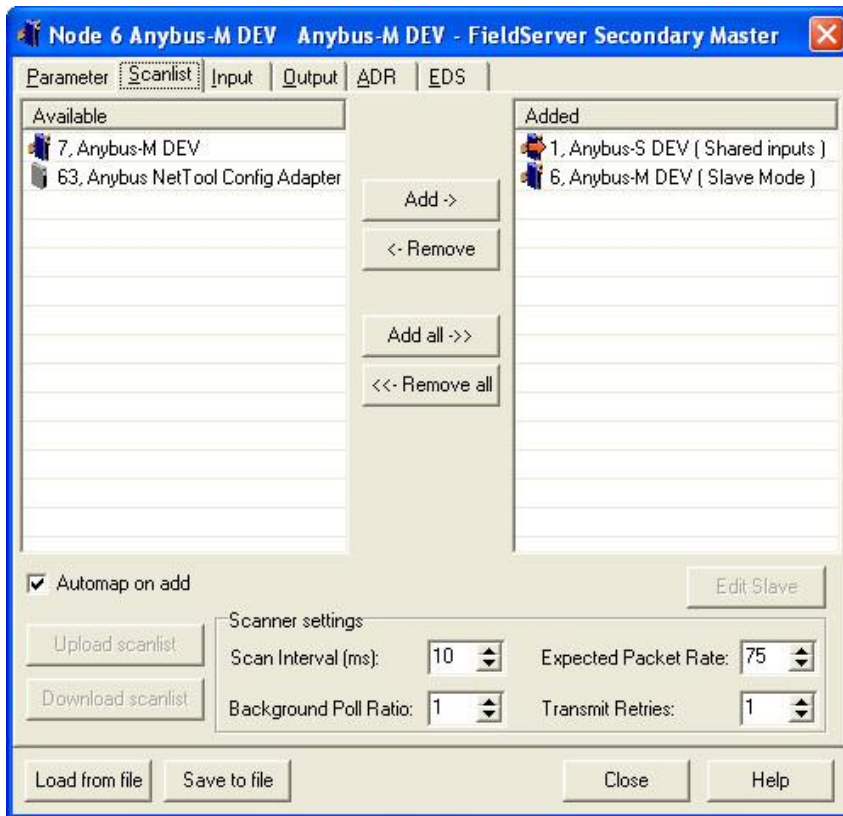
The Main Network Scanner is configured normally by just scanning Slave Devices as shown below.
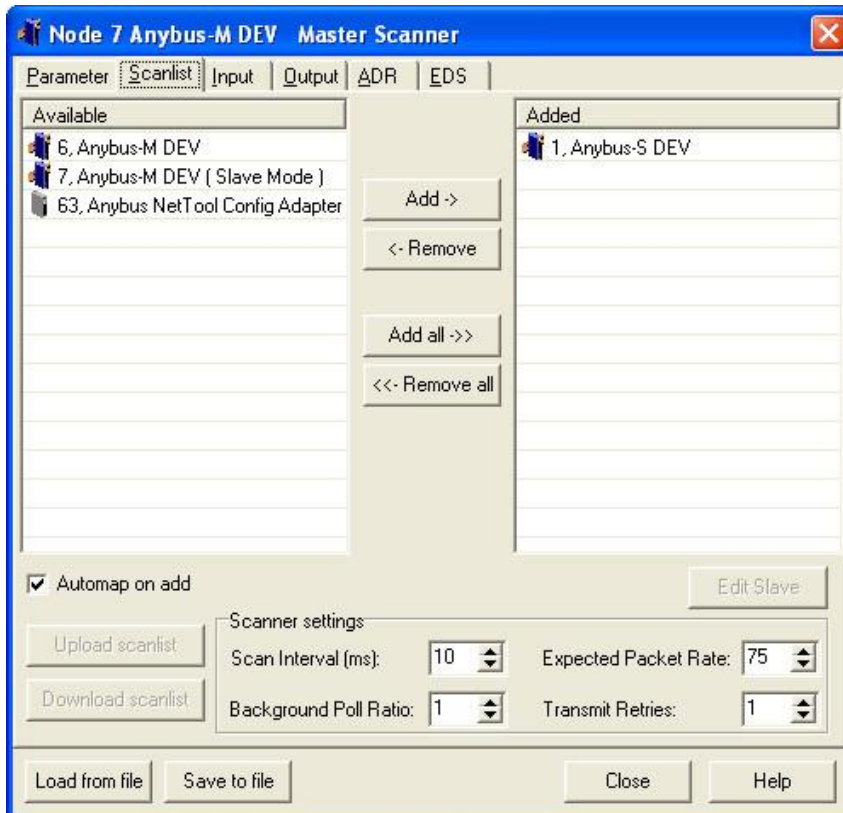
## Appendix B. TROUBLESHOOTING

If there is no 24VDC supply on the DeviceNet Network or if the power supply current is not enough to support the entire network, then the FieldServer will report that any device configured in the config file is not in the master scan list, regardless if it is in the scan list or not.

## Appendix C. REFERENCE

### Appendix C.1. Setting the FieldServer's DeviceNet MAC ID and Baudrate

The MAC ID and Baudrate can be set in the FieldServer's CSV file using the System_Station_Address and DNet_Master_Baudrate parameters or it can be set with DIP switches as depicted below.

Note:

The System_Station_Address parameter must be removed from the configuration file if the DIP switch setting is to be used.

If System_Station_Address has not been defined in the CSV file, the DIP switch value for both MacID and Baudrate will be used and the baud parameter in the CSV file will be ignored.
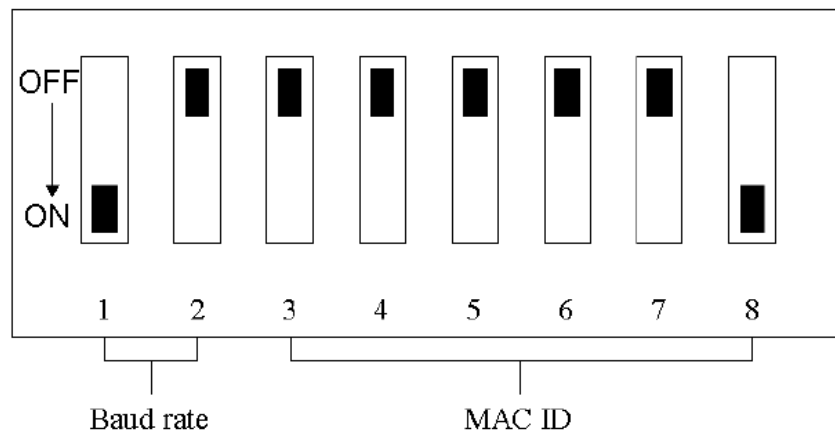


( ON = "1", OFF = "0" )

| Baudrate [ kBit/sec ] | DIP 1-2 |
|---|---|
| 125 | 0 0 |
| 250 | 0 1 |
| 500 | 1 0 |
| Reserved | 1 1 |

| Address | DIP 3 - 8 |
|---|---|
| 0 | 0 0 0 0 0 0 |
| 1 | 0 0 0 0 0 1 |
| 2 | 0 0 0 0 1 0 |
| 3 | 0 0 0 0 1 1 |
| … | |
| 62 | 1 1 1 1 1 0 |
| 63 | 1 1 1 1 1 1 |

## Appendix C.2. Using the Command and Status Data Arrays

The Command Data Array controls the Scanner's mode which can be either Run or Idle. The Scanner can only be configured when in Idle mode.  A non-zero value at offset zero in the Command Data Array will place the Scanner in Run mode; a value of zero will place it in Idle mode.  The Scanner always powers up in Idle mode and can be set to Run mode automatically with a preload section or from the Server side protocol of the FieldServer.   The following preload section can be placed in the configuration file to place the scanner in Run mode at power-up:

```
Preloads
Data_Array_Name    , Preload_Data_Format    , Preload_Data_Value    , Location
Command_Reg        , Bit                     , 1                      , 0
```

Offset zero of the Status Data Array indicates the Scanner's actual mode achieved.  A non-zero value indicates the Scanner is in Run mode and a value of zero indicates the scanner is in Idle mode.
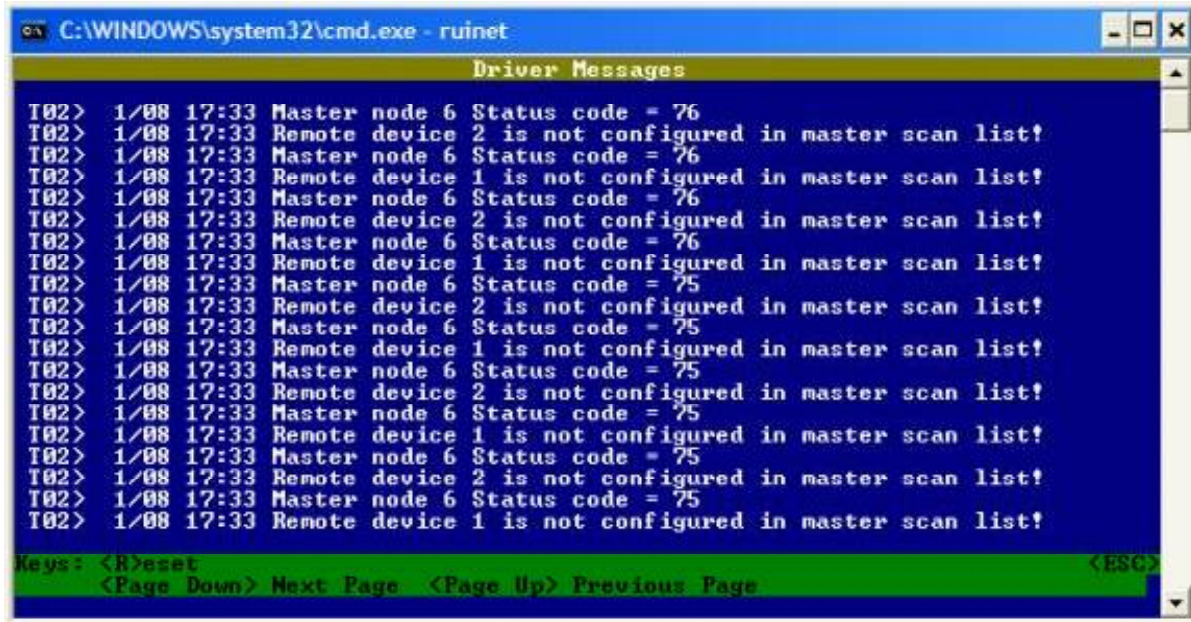
## Appendix C.3. Master Status Codes

The Master Status codes displayed on the F-screen are depicted below:

| Value Dec | Value Hex | Meaning |
|-----------|-----------|---------|
| 00 | 0x00 | OK or Not in scan list |
| 70 | 0x46 | Duplicate MAC ID failure |
| 71 | 0x47 | Scanner configuration error |
| 72 | 0x48 | Device communication error |
| 73 | 0x49 | Wrong device type |
| 74 | 0x4A | Port over-run error |
| 75 | 0x4B | Network failure |
| 76 | 0x4C | No CAN messages detected |
| 77 | 0x4D | Wrong data size |
| 78 | 0x4E | No such device found |
| 79 | 0x4F | Transmit failure |
| 80 | 0x50 | Node in IDLE mode |
| 81 | 0x51 | Node in fault mode |
| 82 | 0x52 | Fragmentation error |
| 83 | 0x53 | Unable to initialise node |

| Value Dec | Value Hex | Meaning |
|-----------|-----------|---------|
| 84 | 0x54 | Node not yet initialised |
| 85 | 0x55 | Receive buffer overflow |
| 86 | 0x56 | Node changed to IDLE mode |
| 87 | 0x57 | Shared master error (not used) |
| 88 | 0x58 | Shared choice error (not used) |
| 89 | 0x59 | Keeper object failure (not used) |
| 90 | 0x5A | CAN port disabled (not used) |
| 91 | 0x5B | Bus off |
| 92 | 0x5C | No bus power detected |
| 95 | 0x5F | Updating flash (not used) |
| 96 | 0x60 | In test mode (not used) |
| 97 | 0x61 | Halted by user cmd. (not used) |
| 98 | 0x62 | Firmware failure (not used) |
| 99 | 0x63 | System failure |
|  |  |  |

**Example:**

If the Master reports a network failure the following screenshot will be displayed:

## Appendix C.4. Understanding buffer types and Map Descriptor functions

The diagram below explains the data flows for both buffers when using the FieldServer as a DN Master:

Note that for the Input buffer, the data is coming from the external DN Slave and is transferred into the DN Master card's internal input buffer. The Rdbc (Read Data Block Continuous) Map Descriptor transfers the data from the card buffer into the FieldServer's Data Array packing it correctly according to the specified DeviceNet_Data_Type.

For the Output buffer, the data is written from the FieldServer's Data Array by the WRBC function Map Descriptor (Write Data Block Continuous) into the DN Master card's internal output buffer from where it is transferred across the DeviceNet network to the external DN Slave's input buffer.
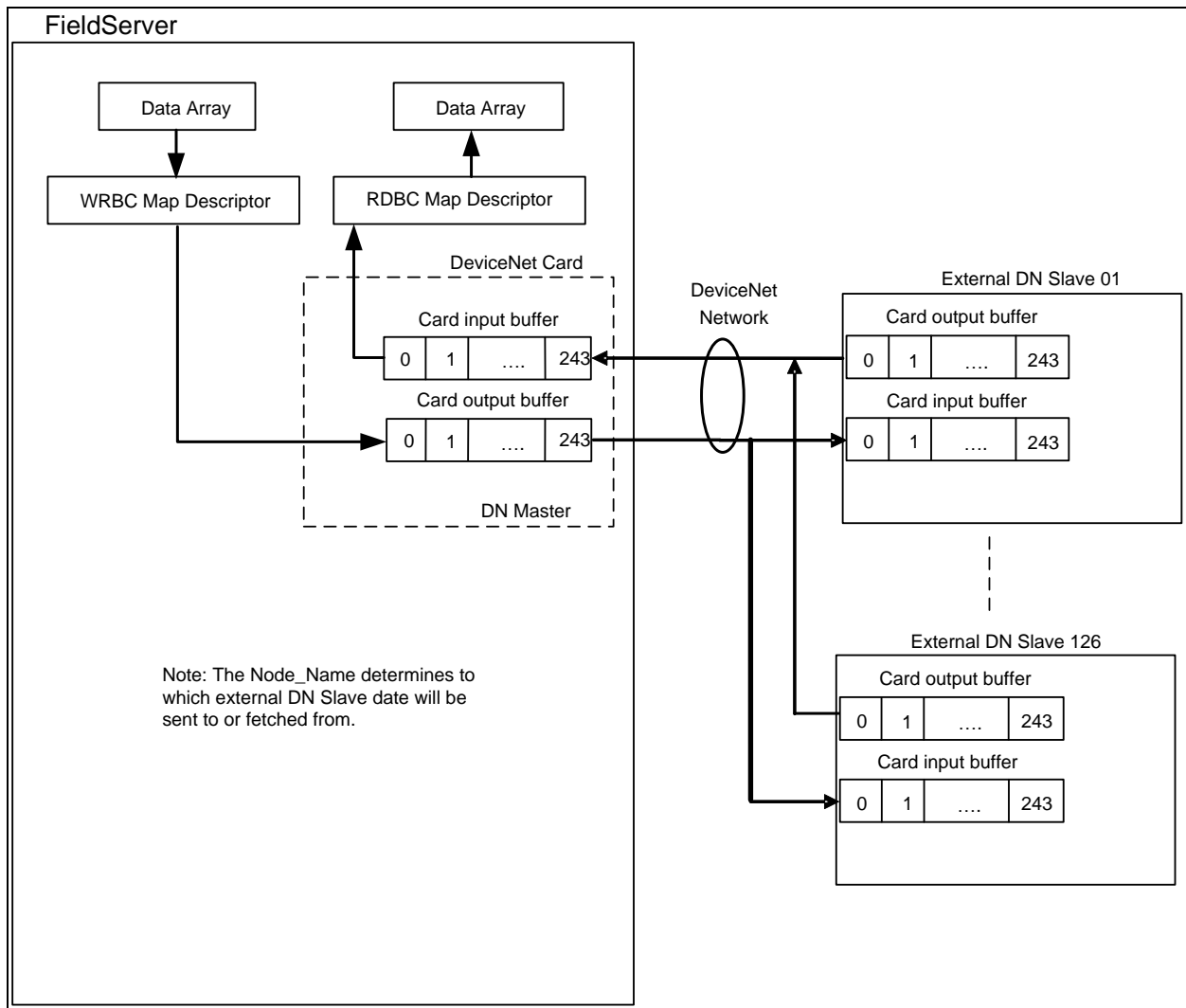


## Appendix C.5. Accessing Parameter Data in Remote Slaves

The DeviceNet driver only supports IO data. To access parameter data on Slaves it is necessary to refer to the Slave device's user manuals for information on how to map their parameter data to IO data locations.