Citect for Windows

Driver Specification Extract

INTERBUS Driver

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Contents

2. Target Device(s) and Protocol

2.1 Introduction

This section defines the types of I/O Devices that are targeted by this driver.

2.2 Device Manufacturer

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2.3 Device Definition

This driver supports any device that can be connected to an INTERBUS network. This includes analog and digital I/O modules and even PLCs (with the addition of an appropriate INTERBUS adaptor).

2.4 Communications Method

At a physical level, the RS-485 protocol is used for communication on the *remote bus*. The I/O devices are connected to the bus in a ring configuration, the exact details of which are discussed in *section* ***Error! Reference source not found.***. A proprietary controller board must be used within the Citect PC as much of the protocol interpretation is done by the hardware on this board. The protocol cannot be implemented purely in software due to its real time requirements. Currently, Citect is guaranteed to support the ***`IBS PC ISA SC/I-T`*** board, although older boards such as the `IBS PC CB/I-T or IBS PC CB/COP/I-T` may be supported in the future.

Citect communicates with the controller via an area of shared memory, called Multi-Port Memory (MPM). This shared memory is further divided into a Data Transmission Area (DTA), Signal Area (SGA) and a Mailbox Area (MXA).

The MPM size and location depend on the host configuration. Luckily, Citect doesn't need to know these details as an API provided by the manufacturer handles all communications with the shared memory. This API allows bilateral transmission of data through a mailbox type interface. The installation of this API is discussed in *section 0*.

2.5 Communications/Hardware Configuration

Network Topology Overview

Terminal I/O is connected to the controller card by means of a bus topology, which is presented in the diagram below:

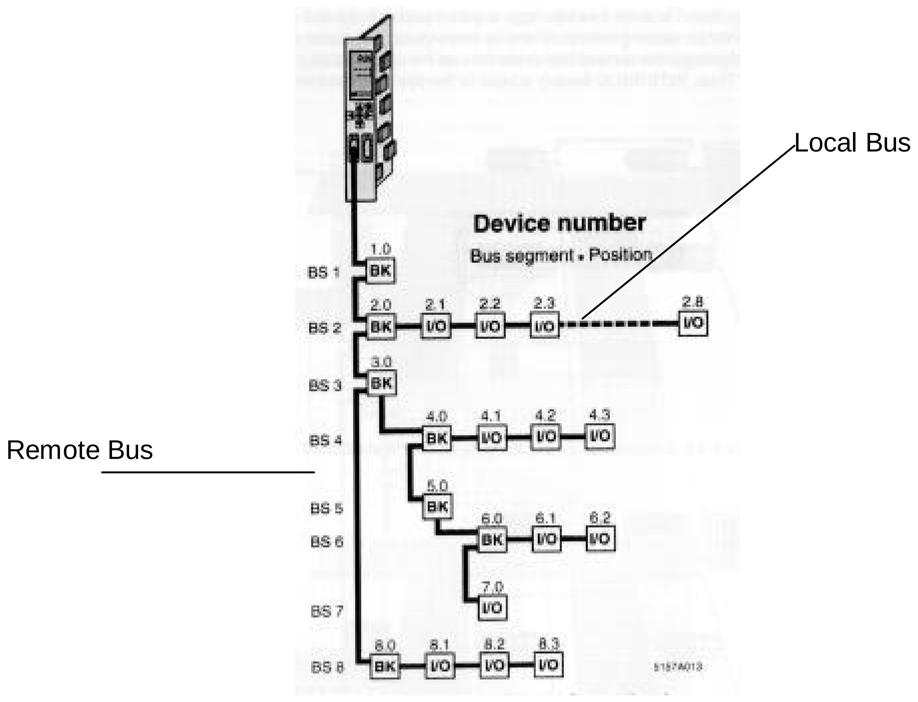


Figure 0.1
INTERBUS Topology

The *remote bus* connects the interface board in the PC with the remote bus terminals and the remote *bus terminals* with each other. The bus terminals are shown with a *BS* designation on the diagram above and are used to convert remote bus signals into *local bus* signals. The local bus is used for communications between devices on a *segment*. Otherwise stated, bus terminals provide a way of breaking up the remote bus into segments that use a local bus for communication.

The Controller Board

The INTERBUS distributed I/O system is connected to the controlling device by means of a controller board. There are two different types: passive and active connection. The controller board used by Citect implements a passive connection, i.e. the neutral representation of I/O data in a memory area accessible to the controller, which is better than active connection in that it requires little software intervention on the part of the control system. Standard tasks performed by an INTERBUS controller board are:

- the detection of the bus configuration
- the control of the cyclical INTERBUS protocol
- the transmission of I/O data from the transfer memory to the INTERBUS modules and vice versa
- the monitoring of the bus system
- the fault detection and localisation
- the activation of INTERBUS-specific operating and display units

2.5.1 The Remote Bus

The remote bus covers long distances within a system. The total length of the remote bus may be up to 12.8 km (measured from the controller board to the last remote bus device). For this, the entire remote bus is divided into individual bus segments with a maximum length of 400 m.

The remote bus has the following specifications:

- Max. length of a remote bus segment 400 m
- Max. bus cable length between:
  - controller board of the first remote bus device 400 m
  - controller board of the last remote bus device 12.8 km
- Transmission method RS 485
- Transmission media single-shielded two-wire line

The Local Bus

The local bus is a local branch of the remote bus. The local bus allows the variable and low-cost installation of a decentralised substation, preferably within the switch cabinet. Like the installation remote bus, the local bus line also carries supply lines for local bus devices and initiators connected to them. The local bus is coupled to the remote bus via a BK module. In the local bus itself, different I/O modules can be combined with one another. Local bus modules cannot be integrated in the remote bus or installation remote bus. Conversely, it is not possible to use remote bus devices on the local bus.

Note: *The local bus is abbreviated with LB.*

The local bus has the following specifications:

- Max. total current consumption 0.8 A
- Max. cable length between:
  - the BK module and the first local bus device 1.5 m
  - two devices 1.5 m
  - the BK module and the last local bus device 10 m
- Max. number of I/O devices in the local bus 8
- Transmission CMOS level

The INTERBUS Tree Structure

In addition to providing a remote and localised bus topology, cable routes can be further optimised by introducing a tree structure. INTERBUS BK units with a remote bus branch feature (such as the `IBS IP CBK` or `IBS ST 24 BK RB-T`) provide a branch output to the next remote bus level. This branch allows further I/O stations as well as further branching.

The tree structure is depicted in the diagram below:

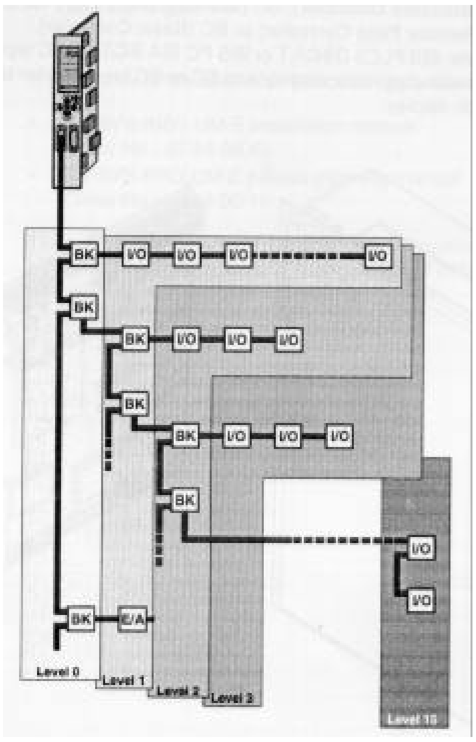


Figure 0.2
INTERBUS Branching

The use of branching is not only advantageous in terms of easier cabling but also with respect to the functional requirements of an application. A tree structure can implement branch lines for drum cable applications and individual branches can be switched in and out of the network.

Bus Terminal Module (BK Module)

The BK module is a remote bus device. It connects the local bus or the installation remote bus to the remote bus.

Other than providing a conversion from remote to local bus standards, a BK module provides the following services:

- Supplying the I/O modules connected to the local bus or installation remote bus with voltage.
- Regenerating data in the remote bus.
- Electrical isolation of the remote bus segments from each other.
- Switching the interfaces to the local bus and the outgoing remote bus on and off, a function that is initiated by the INTERBUS master.

2.5.2 INTERBUS I/O Modules

The respective I/O modules link the sensors/actuators to the bus system.

2.5.3 Wiring Diagrams

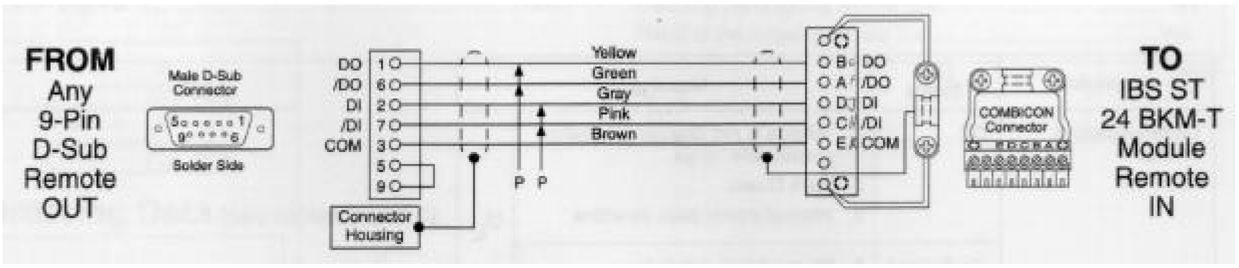
The cabling used not only differs between the remote bus and local bus but also depends on the type of Bus Terminal or I/O device being used.

2.5.3.1 Remote Bus Wiring

The connector which plugs into the interface card in the PC is always a 9 pin male D type connector. From here, the cable will terminate in a different type of connector depending on the specific BK unit. Only the most common configurations will be discussed here.

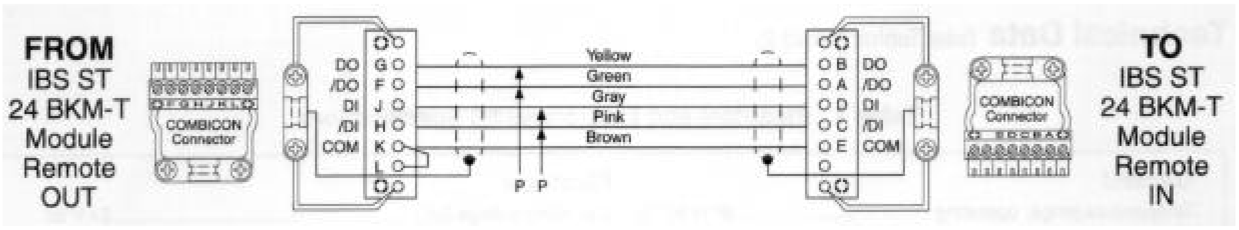
The `IBS ST 24 BKM-T` is a bus terminal for the green "lego" type INTERBUS modules. This device should be supplied with a 8 way screw connector which plugs into the *top*, remote IN connector. The connector *Remote Bus IN* connector on the BK unit will designate the letters A-E for the pins. The *Remote Bus Out* connector will designate the letters F-L.

To connect the INTERBUS interface card to an `IBS ST 24 BKM-T` module, the following cable should be used:



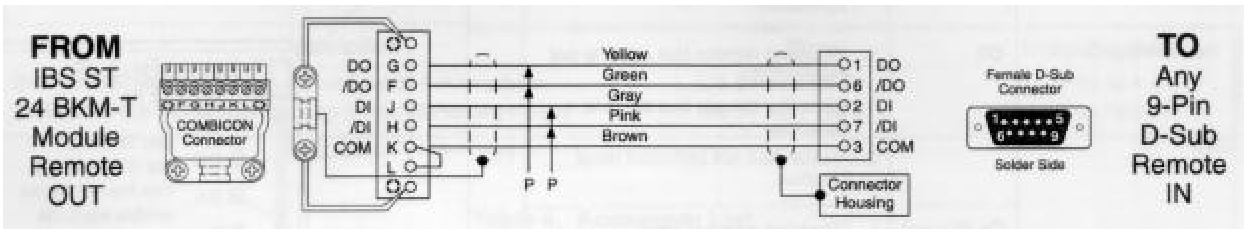
Note that this cable is also used for connecting the green *Lego* type BK modules (`IBS ST 24 BKM-T`) to the larger silver BK modules such as the `IBS 24 BK-T` which have a 9 pin D connector for the *remote bus out*.

In order to connect two `IBS ST 24 BKM-T` together, a cable with two COMBICON connectors must be used, and is presented in the diagram below:



Obviously, the output of the lower numbered device (pins G-L) will be connected to the input of the subsequent BK module (pins A-E).

The final option in `IBS ST 24 BKM-T` module wiring is the connection to a larger `IBS 24 BK-T` module. These larger BK modules use 9 pin D type connectors for local bus wiring (just like the controller board). The cable which should be used to connect a `IBS ST 24 BKM-T to a IBS 24 BK-T` module is presented below:



2.5.3.2 Local Bus Wiring

The local bus wiring, as mentioned previously, is used to connect the BK modules to the actual I/O units. In the case of the green "Lego" type units, a 5-way ribbon type cable is used to connect subsequent I/O units together and to connect them to the initial BK unit.

In the case of the larger silver BK units (such as the `IBS 24 BK-T`), 15 pin D connectors are used to connect the BK unit to the I/O modules and for interconnections between the I/O modules.

The pinouts for this cable are given below:

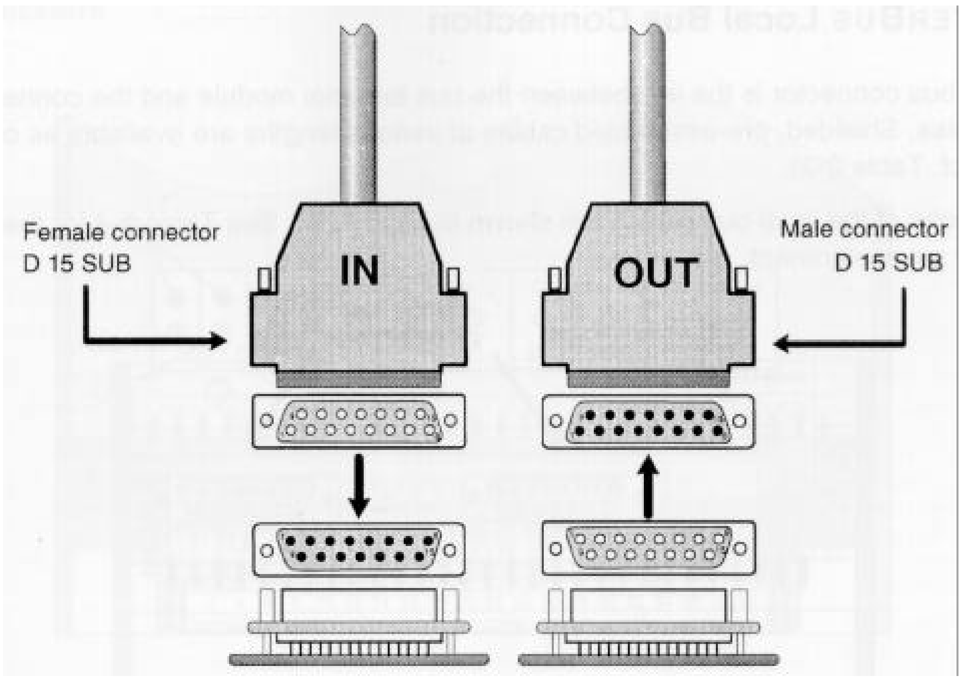


Figure 0

"15 pin D" type localbus Cable

Signal Name	*15 pin Male*	*15 pin Female*	*Colour*
U_{VO}	1	1	red
U_{VO}	2	2	white-green
	jumper 3-4	3	-
SLI	5	5	white
CKI	6	6	yellow
CRI	7	7	pink
DI	8	8	violet
COM	9	9	blue
COM	10	10	red-blue
RES	11	11	grey-pink
SLO	12	12	brown
CKO	13	13	green
CRO	14	14	grey
DO	15	15	black

Table 0

Connections for "15 pin D" type localbus Cable

2.5.4 I/O Device Settings

I/O device settings are very much dependant on the I/O module used. Normally, modules are set by writing to a particular register rather than by changing DIP-switch settings. If an I/O device needs to be configured by writing to a register, Citect can be programmed to do this upon startup.

2.5.5 Software Setup

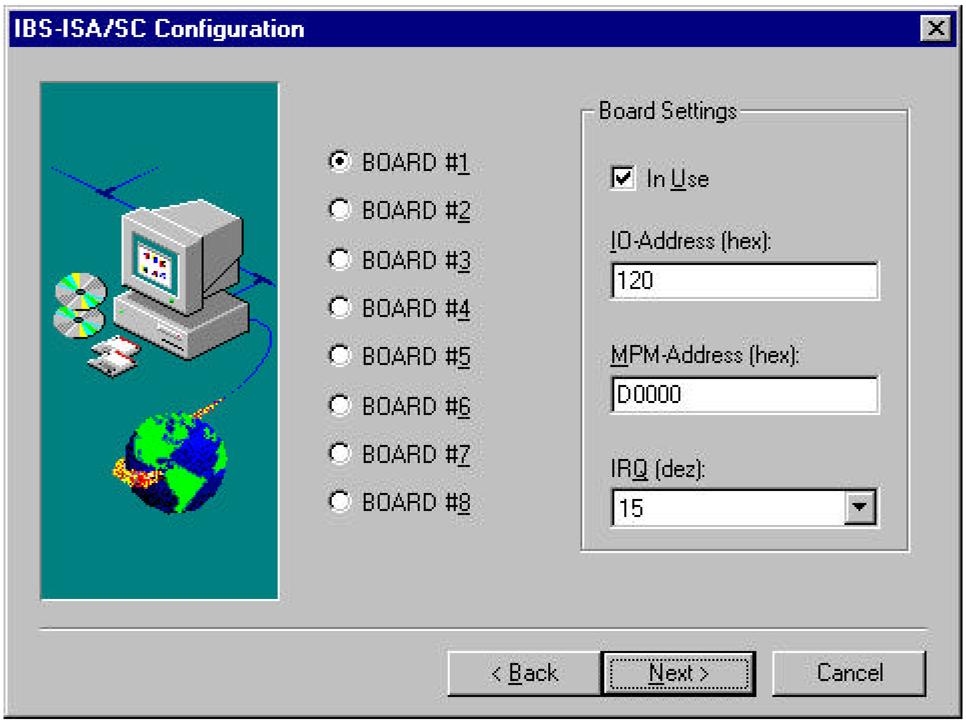
No special configuration should be needed to initiate communications with any of the I/O units as all hardware on the ring will be initialised by Citect during start-up. In some cases, various I/O modules will be required to be set to a particular mode of operation, depending on the project. This should be done from within the Citect project by writing to a tag that is associated with the register in the module that sets the mode of operation. Note that this action could either performed by a CiCode function which is executed upon start-up, or when a certain page is accessed.

2.6 Special Requirements

Citect requires the installation of a driver in order to access controller card. This software is supplied by the manufacturer, Phoenix Contact. The driver consists of a kernel level VxD which communicates directly with the hardware and a user level DLL which is used for communications with Citect (via the INTERBUS driver).

To install the driver, it is necessary to run the `SETUP.EXE` program in the `WINNT` directory of the *Software Windows Driver* disk. Citect has been tested with version 1.01 of this driver, so this and all later revisions of the driver should also work.

Upon commencing the installation of the driver, you will be presented with the following screen:


IBS-ISA/SC Configuration

(● BOARD #1) ○ BOARD #2 ○ BOARD #3 ○ BOARD #4 ○ BOARD #5 ○ BOARD #6 ○ BOARD #7 ○ BOARD #8

Board Settings

☑ In Use

IO-Address (hex): 120

MPM-Address (hex): D0000

IRQ (dez): 15

Diagram 0.1
Driver Installation

Note that the board number specified above will be the same as the board number specified during the configuration of the “boards” form in Citect. Thus, Citect must carry out this configuration process for each controller card in the PC before that card will be available for use. Note that Citect has no way of knowing which boards have been configured and will thus allow access to un-configured board, resulting in a run-time error. It is up to the user to ensure proper driver installation.

During the installation process, ensure that the I/O address corresponds to that set on the board. The configuration of the base address is shown in the *Diagram 0.2*. The I/O address and base address must also be set. Normally, it is simply a matter of selecting the default values for a given board. Ensure that the chosen interrupt value doesn’t conflict with any other hardware.

For further details concerning the installation process, consult the *“INTERBUS Quick Start Guide”*, order number 27 47 87 9 from Phoenix Contact.

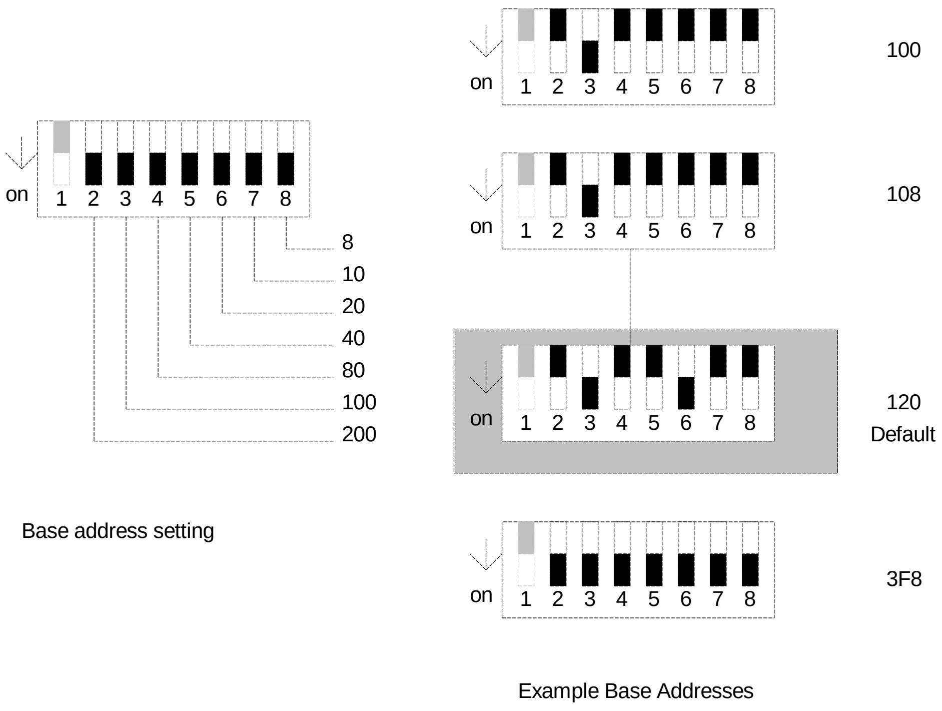


Diagram 0.2
I/O Address Configuration

The installation procedure will create a directory called "`IBS Driver`". Under this directory, there is a sub-directory called "`LIB`". It is necessary to copy the file `IBDDIWNT.DLL` from this directory to the `CITECT/BIN` directory. You can either use a DOS window or the Windows Explorer to complete this operation.

2.7 Maximum Request Length

Only the number of registers in the I/O device being accessed limits the maximum request length. It will be set to **`1024` bits** as this implies `64 x 16` bit registers. All INTERBUS devices have less than 64 registers. This assumption may need to be modified.

4. User Interface

4.1 Introduction

This section defines how the user will see the driver. This relates directly to how the Citect forms need to be filled out and any special `INI` options. For the kernel, the debug trace messages and the `Stats.Special` counters are documented.

4.2 Driver Name

INTERBUS

4.3 Boards Form

4.3.1 Board Type

INTERBUS

4.3.2 Address

N/A This doesn't work I had to use 0

4.3.3 IO Port

1 – 8 Although ports 1 – 8 are acceptable, the board specified must have been previously configured as described in *section 0*.

4.3.4 Special Opt

N/A

4.4 Ports Form

The ports form is not of any use for this driver as there is only one port per board.

4.4.1 Baud Rate

N/A

4.4.2 Data Bits

N/A

4.4.3 Stop Bits

N/A

4.4.4 Parity

N/A

4.4.5 Special Opt

N/A

4.5 IO Devices Form

N/A

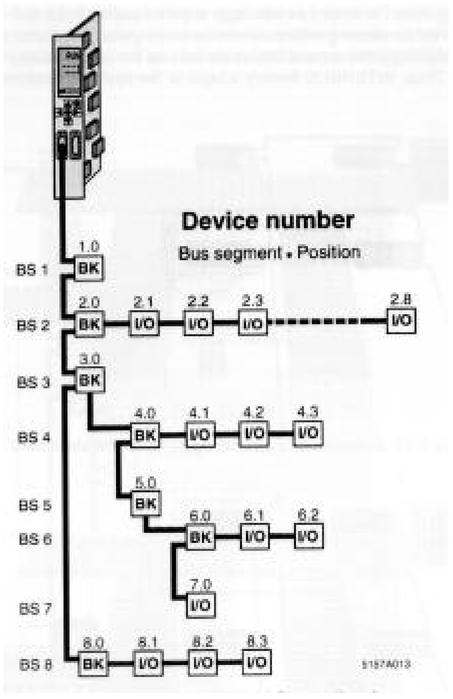
4.5.1 Protocol

INTERBUS

4.5.2 Address

Format: `S.P     (segment.position)`

The two numbers in the unit address represent a standard INTERBUS address: the segment number, **S**, (the number of the BK unit at the beginning of a local bus segment) and the position within the segment, **P**. The address format can be seen in the diagram below:



If the addressing is adversely affected due to the insertion of a new module between existing units, it is simply a matter of changing the mapping between the *I/O device name* and the *address* in the I/O devices form of the *Citect Project Editor*. In the example above, if we inserted a new module between modules 4.1 and 4.2, then it would be necessary to modify the I/O device names previously assigned to addresses 4.2 and 4.3 to refer to their new addresses: 4.3 and 4.4 respectively.

4.6 Pulldown lists Help

The following entries should be included in the Citect `HELP.DBF` spec file.

TYPE	DATA	FILTER
ADDRESS	0	INTERBUS

BOARDTYPE	INTERBUS	
IOPORT	1	INTERBUS
IOPORT	2	INTERBUS
IOPORT	3	INTERBUS
IOPORT	4	INTERBUS
IOPORT	5	INTERBUS
IOPORT	6	INTERBUS
IOPORT	7	INTERBUS
IOPORT	8	INTERBUS
PROTOCOL	INTERBUS	

4.7 IO Device Variable Types

4.7.1 Format

IO Device Type	Address Format	Citect data type	Description/Special Usage/Limitations/ Valid Ranges
Word Input Register	**WI***n[/O.L][.b]*	INTEGER	n = word number (1 – max) *O* = offset into the word (0 – 15) *L* = bit length to read (1 – 16) *b* = bit number within word (1 – 16) READ ONLY
Byte Input Register	**BI***n[/O.L][.b]*	BYTE	n = word number (1 – max) *O* = offset into the word (0 – 7) *L* = bit length to read (1 – 8) *b* = bit number within word (1 – 8) READ ONLY
Word Output Register	**WO***n [.b]*	INTEGER	n = word number (1 – max) *b* = bit number within word (1 – 16)
Byte Output Register	**BO***n][.b]*	BYTE	n = word number (1 – max) *b* = bit number within word (1 – 8)
Diagnostic Register	**D**D	INTEGER	D = diagnostic register (read only) number: 1 state register 2 parameter register

4.7.2 Explanation

The variable number, **n** represents the *word* or *byte* position within the module, depending on the Citect data type. **D** is a special bus diagnostic register. This will be discussed in *section 4.7.5*. Normally, an INTERBUS module will consist of a number of 16 bit words. Citect can access these as either words or bytes.

If there were 2 16 bit registers, each representing 16 digital inputs and the data type *byte* was used, the address **4** would refer to the high order byte in the second 16 bit register, i.e inputs 24 – 31 for the second group of inputs. However, if automatic data conversion is being used (see section 4.7.4) then word modules should be word addressed and byte modules byte addressed, because the offset and length parameters set using automatic data conversion are global to that module. In general, it is intended that word addressing be used with word modules and byte addressing be used with byte modules.

Some INTERBUS devices use registers where the data is offset by a certain number of bits or where not all the bits within the register are used. It is for this reason that the optional parameters **O** and **L** are used (`/O.L`). **O** represents the offset into the word and **L** represents the number of relevant bits.

For example, the `IB ST 24 AI 4/SF` *analog input* module supports 4 output channels each of 12 bit precision. These 12 bits are located within 16 bit registers where the bottom 3 bits aren't used and the top sign bit is always 0. The format of one of these registers is presented below in Citect tag address format:

WORD 1	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Output	0	12-bit DAC input value												Not used		

In this case, the address format would be `1/3.12`, as we must have an offset of 3 into the word, and only read the next 12 bits. Note that an **O**ffset of 5 with a **L**ength of 12 would be illegal, as it would extend past the end of the register.

4.7.3 Notes on the relationship between tag addresses and terminal addresses on the devices

As explained in section 4.7 (IO device variable types), Citect tag word addresses for INTERBUS modules always start at 1 (e.g WI1) and Citect tag bit addresses also always start at 1 (e.g. WI3.1).

A rule to remember is that the first word or byte shown in the data sheet for a particular INTERBUS module will match Citect tag word/byte address 1 (the first Citect tag address). Some INTERBUS data sheets start word addresses at 1 (usually analog modules) while other data sheets have word addresses starting from zero (usually digital modules).

To decide the relationship of terminal number to bit number for a particular *digital* INTERBUS module, the data sheet for the module must be referred to. While an INTERBUS data sheet for a digital module typically shows digitals in a word starting from zero, Citect INTERBUS digital tags start from 1. Taking this into account, then the relationship between terminal number and tag address for a digital can be found by reference to the data sheet. Generally terminal number addresses are reversed from bit addresses, but this varies from module to module. With some modules, for example IB ST 24 DO 32/2, more complex relationships exist.

4.7.4 Automatic Data Conversion

The optional file `INTERBUS.MAP` determines the bit offset and register width for known devices, identified by their unique *module ID*. This file is located in the Citect `BIN` directory. The format is as follows:

```
MODULE ID         OFFSET            LENGTH

126               3                 12
```

The module ID is a decimal number printed on the front of most INTERBUS modules (the example above is the `IB ST 24 AI 4/SF` *analog input* module). By specifying the necessary conversions (the bit offset and length) for a particular module, Citect can *automatically* apply this conversion whenever such a unit is addressed.

Continuing with the previous example of an analog input module, we know this device to have a module ID of 126, which has been specified in the `INTERBUS.MAP` file. If, for example, there is an analog input module at unit address `2.4`, Citect will interrogate the unit to determine its ID, check the `INTERBUS.MAP` file to determine the conversion process and apply it automatically. There is no need to specify the optional `/O.L` parameters as we had done previously.

NOTE 1- Currently the driver only supports automatic data conversion for Analog Input modules, because offset and length parameters are only supported for Analog Input Modules.

Analog Output modules, or modules that have both an *input and output* word should NOT be used with automatic data conversion.

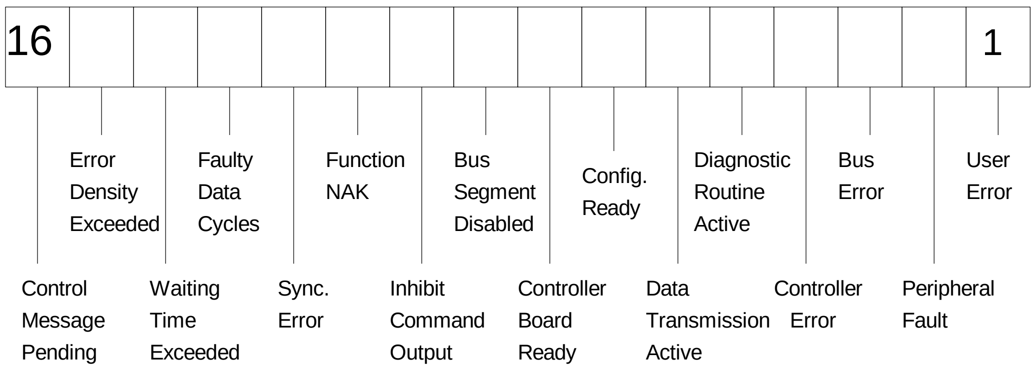
NOTE 2- For a tags relating to a particular module, it is not possible to use both the offset and length tag address option (e.g. WI1/3.12) and automatic data conversion. If this is done, then automatic data conversion will only have effect.

4.7.5 Diagnostic Registers

The diagnostic registers consist of a *status* register (word 1) and a *parameter* register (word 2).

The status register is a special register which can be read in order to determine the current state of the INTERBUS master board and thus the bus. Tags representing these registers can be associated with any I/O device, although they in actual fact relate to the board not the logical Citect device. It is normally most convenient to associate it with the address 1.1 since this is the first valid device address.

The format of the status register is as follows:



The parameter register is another 16 bit register. The meaning of its values will depend on the current state of the bus (reflected by the status register). If the *user bit* or *control bit* (bit 1 or 4) is set, the error type can be determined by the four digit hexadecimal code stored in the parameter register. If the *peripheral* or *bus* bits are set (bits 2 or 3) then the parameter register will contain the segment number and position of the error (in hex).

4.7.6 Analog/Digital Output display behaviour

Outputs tags are not valid untill written to, because they are not read from the device, but simply record what was written last to the device from Citect. All output word tags should be written to on a particular page before expecting to see any output tags displayed, as Citect makes read requests usually for blocks of tags rather than individual tags. See the InitZero parameter in section 4.9.2 for more information (Driver specific parameters). Note also that if an error causes re-initialisation of a Citect interbus channel (for instance by disconnecting a module from the local bus), then all units (IO modules) on that channel will be re-initialised and therefore outputs will need to written to again, if the InitZero parameter isnt used to automatically initialise the output words.

4.7.7 INTERBUS.DBF

The database file which implements the above addressing format is presented here. The only real distinction to make between data types is whether byte or word addressing is to be used. The use of the optional bit offset and length can be identified by the driver due to the fact that the unit type is either 3 or 4. When these optional parameters are being used, the bit offset is stored in the upper 4 bits of the *unit type* word (bits 28 – 31) and the length is stored in the next lowset 4 bits (bits 24 – 27).

TEMPLATE	UNIT_TYPE	RAW_TYPE	BIT_WIDTH	LOW	HIGH	COMMENT
WI%U(1,1,64)[.%u(1,1,16)]	1	1	16	1	64	Word Input
BI%U(1,1,128)[.%u(1,1,8)]	2	8	8	1	128	Byte Input
WO%U(1,1,64)[.%u(1,1,16)]	3	1	16	1	64	Word Output
BO%U(1,1,128)[.%u(1,1,8)]	4	8	8	1	128	Byte Output
WI%U(1,1,64)/%<12(0,0,15) .%<8(0,1,16)	1	1	16	1	64	Corrected Word Input
BI%U(1,1,128)/%<12(0,0,7). %<8(O,1,8)	2	8	8	1	128	Corrected Byte Input
~~WO%U(1,1,64)/%<12.%<8~~	~~3~~	~~1~~	~~16~~	~~1~~	~~64~~	~~Corrected word Output~~
~~BO%U(1,1,128)/%<12.%<8~~	~~4~~	~~8~~	~~8~~	~~1~~	~~128~~	~~Corrected byte Output~~
D%U(1,1,2)	5	1	16	1	2	Diagnostic

4.8 PROTDIR.DBF

MAX_LENGTH is set to be the maximum number of bits in a normal I/O module. No I/O module will have (in most cases) more than 64 x 16 bit registers, therefore it would be reasonable to set MAX_LENGTH to 1024 bits. There is a potential problem here in that some I/O devices may have registers as little as 8 bits. This turns out not to be a problem though as the driver will attempt to read as much information from each I/O module as possible. If there is less than 128 bits of information in a module, it will return as much as it can. As blocking does not occur across devices, there will never be the problem that two devices with 1 x 8 bit register each are blocked together and seen as a single device.

The optimum blocking, specified by BIT_BLOCK, will be determined by the number of registers in a I/O module. This is never more than 64, therefore the BIT_BLOCK is set to 1024 (64 x 16bits).

TAG	FILE	BIT_BLOCK	MAX_LENGTH	OPTIONS
INTERBUS	INTERBUS	1024	1024	~~0x0093~~[*1] 0x1093

[*1] - Supports DIGITAL, INT, BCD and BYTE, 8 BIT DIGITALS blocking formats

4.9 Parameters and INI options

4.9.1 Standard Parameters

Block	64
Delay	10 ms.

`MaxPending`	`2`	
`Polltime`	`0`	(The ***CPU*** function is not used. The ***Transmit*** function performs all operations immediately)
`Timeout`	`5000 (ms)`	
`Retry`	`3`	
`WatchTime`	`30 (sec)`	

4.9.2 Driver Specific Parameters

[INTERBUS]

`window`	If set to 1, this creates a debug window to indicate location and nature of bus errors. This is the default state. This parameter can be set to 0 to disable the debug window, although this is not advised. See also the Hints and Tips section (section 4.17).
`logfile`	If this parameter is set to 1, a file called "`INTERBUS.LOG`" is created in the windows system directory containing INTERBUS specific debug information. This file is erased at the beginning of each Citect session.
`ByteOrder`	This parameter specified whether Motorola (Big Endian) <-> Intel (Small Endian) byte swapping conversions should be performed. The default for this option is 0, which means that the byte swapping is performed. In the vast majority of cases, it will be necessary to use byte swapping as without it, the representation of integers derived from 16 bit registers will be incorrect. In addition, even when addressing byte oriented devices, the position of byte registers within a unit will seem illogical if byte swapping isn't performed. If special circumstances require byte swapping to be disabled, this parameter can be set to 1.
`InitZero`	Certain operations in Citect (such as sliders) require the ability to read from output devices. Normally this is impossible with INTERBUS. For this reason, the INTERBUS driver creates a memory image for each output device. Each time a new value is sent to the device, that value is stored in the memory image. In this way, when Citect attempts to ascertain the value of a particular register, it can simply refer to the memory image to determine the last value that was written to it. The only problem with this scheme is determining the initial input values for an output device. By default, if an attempt is made to read from a register in an output device which has not been previously written to, the driver will respond with an error and Citect will display `#COM`. This is, in fact, the safest mode of operation and therefore the default. Unfortunately, some features of Citect (notably sliders) need to be able to read from an output device (to determine their initial position) before they can be moved. This is effectively a Catch-22 situation and the only solution is to write some initial value to the output device (using a button linked to the tag, or CiCode) before the slider can be moved. In some cases, it is desirable to have Citect set all outputs to a zero value after a unit has been initialised. By setting the `InitZero` parameter to 1, Citect will perform this initialisation automatically, although the designer

should be aware of the implications. Using this option, sliders will work straight away as they can determine their initial position to be 0.

4.10 Driver Specific Errors

Driver Error Code (Hexadecimal)	Mapped to (Generic Error label)	Meaning of Error Code
E00700F0		ERR_NEG_CNF
E00700F1		ERR_WRONG_MSGCODE
C8		ERR_POSITION
C9		ERR_SEGMENT
CA		ERR_MODULE_NOT_FOUND
CB		UNIT_NON_EXISTANT
CC		ERR_PERIPHERAL_FAULT
CD	GENERIC_CHANNEL_OFFLINE	ERR_CHANNEL_DEAD
CE		ERR_INSUFFICIENT_MEMORY
CF		ERR_THREAD_RUNNING
109		No input data available.
110	GENERIC_CHANNEL_OFFLINE	User error
111	GENERIC_CHANNEL_OFFLINE	Peripheral fault
112	GENERIC_CHANNEL_OFFLINE	Bus error
113	GENERIC_CHANNEL_OFFLINE	Controller board error
114	GENERIC_CHANNEL_OFFLINE	Data transmission inactive
115	GENERIC_CHANNEL_OFFLINE	Configuration not active.
116	GENERIC_CHANNEL_OFFLINE	Controller board not ready
117	GENERIC_CHANNEL_OFFLINE	Bus segment disabled
118	GENERIC_CHANNEL_OFFLINE	Function negatively processed
119	GENERIC_CHANNEL_OFFLINE	Synchronisation error
11A	GENERIC_CHANNEL_OFFLINE	Faulty data cycles
11B	GENERIC_CHANNEL_OFFLINE	Synchronisation error
11C	GENERIC_CHANNEL_OFFLINE	Waiting time exceeded
11D	GENERIC_CHANNEL_OFFLINE	Error density exceeded
11E	GENERIC_CHANNEL_OFFLINE	Control message pending
E0070080		Impermissible or invalid board number
E0070081		Invalid I/O address
E0070082		Invalid address for the MPM window
E0070083		Invalid interrupt
E0070085		Invalid node handle specified

E0070086		Node handle previously closed
E0070087		Selected node not ready
E0070088		Wrong node handle
E0070089		INTERBUS controller not ready
E007008A		Access method not enabled
E007008B		Device driver not loaded
E007008C		Function not supported
E007008D		Function not supported
E0070090		Node not present
E0070091		Unknown device name
E0070092		Resources of driver exhausted
E0070096		Access exceeds limits of selected data area
E0070097		Invalid data consistency specified
E0070099		Access to MPM not possible
E007009A		Too many parameters.
E007009B		No message available
E007009C		No free mailbox of the required size
E007009D		Send vector register occupied
E007009E		Invalid node called
E007009F		Invalid node called
E00700B0		Notification mode activated twice for one node
E00700C0		Wrong process ID specified
E00700C1		Blocked mode already enabled
E00700C2		Another thready already using notification mode
E00700C9		Invalid receive buffer
E00700CA		Invalid notification mode
E00700CB		Waiting time for message exceeded
E00700D1		Invalid Windows handle
E00700D2		Board not entered in IBDDIWIN.INI
E00700D3		Invalid parameter in IBDDIWIN.INI
0C10		Remote bus device missing
0D10		Local bus device missing
0C14		Multiple errors in remote segment.
0D14		Multiple errors in local segment.
0C18		Multiple INTERBUS timeouts (remote bus)
0D18		Multiple INTERBUS timeouts (local bus)

0C1C		Transmission (CRC) error (forward data path) (remote bus)
0D1C		Transmission (CRC) error (forward data path) (local bus)
0C4C		Transmission (CRC) error (return data path) (remote bus)
0D4C		Transmission (CRC) error (return data path) (local bus)
0C20		MAU found interruption of forward data transmission (remote bus)
0D20		MAU found interruption of forward data transmission (local bus)
0C28		MAU found interruption of return data transmission (remote bus)
0D28		MAU found interruption of return data transmission (local bus)
0C2C		Unexpected change of the RBST or LBST signal (remote bus)
0D2C		Unexpected change of the RBST or LBST signal (local bus)
0C40		Length code of specified device differs from config. (remote bus)
0D40		Length code of specified device differs from config. (local bus)
0C44		ID code of specified device differs from config. (remote bus)
0D44		ID code of specified device differs from config. (local bus)
0C48		Only ID cycles can be run (remote bus)
0D48		Only ID cycles can be run (local bus)
0C4C		Invalid ID code (remote bus)
0D4C		Invalid ID code (local bus)
0D50		Device has RB ID but is in the LB.
0C54		Mode not supported (remote bus)
0D54		Mode not supported (local bus)
0C58		Data transmission interrupted at OUT1 (remote bus)
0D58		Data transmission interrupted at OUT1 (local bus)
0C5C		Data transmission interrupted at OUT2 (remote bus)
0D5C		Data transmission interrupted at OUT2 (local bus)
0C60		Data transmission temporarily interrupted at OUT1 (remote bus)

0D60		Data transmission temporarily interrupted at OUT1 (local bus)
0C64		CRC or MAU error detected (remote bus)
0D64		CRC or MAU error detected (local bus)
0C68		I/O timeout detected (remote bus)
0D68		I/O timeout detected (local bus)
0C6C		Module carried out a reset (remote bus)
0D6C		Module carried out a reset (local bus)
0C70		Data transmission aborted (remote bus)
0D70		Data transmission aborted (local bus)
0C74		Data transmission interrupted (remote bus)
0D74		Data transmission interrupted (local bus)
0C80		Multiple error at OUT1 (remote bus)
0D80		Multiple error at OUT1 (local bus)
0C84		Multiple timeout at OUT1 (remote bus)
0D84		Multiple timeout at OUT1 (local bus)
0C88		Unexpected device at OUT1 (remote bus)
0D88		Unexpected device at OUT1 (local bus)
0C8C		Only ID cycles possible (remote bus)
0D8C		Only ID cycles possible (local bus)
0C90		Device couldn’t activate segment (remote bus)
0C98		Device connected to OUT1 has invalid ID (remote bus)
0D98		Device connected to OUT1 has invalid ID (local bus)
0D9C		Local bus contains more than specified number of devices (local bus)
0CC0		Multiple error at OUT2 (remote bus)
0DC0		Multiple error at OUT2 (local bus)
0CC4		Multiple timeout at OUT2 (remote bus)
0DC4		Multiple timeout at OUT2 (local bus)
0CC8		Unexpected device at OUT2 (remote bus)
0DC8		Unexpected device at OUT2 (local bus)
0CCC		Only ID cycles possible (remote bus)
0DCC		Only ID cycles possible (local bus)
0CD0		After OUT2 opened, other devices added (remote bus)
0DD0		After OUT2 opened, other devices added (local bus)

0CD4		Error in local bus connected to device (remote bus)
0DD4		Error in local bus connected to device (local bus)
0CD8		Too many local bus devices (remote bus)
0DD8		Too many local bus devices (local bus)
0CDC		Device at OUT2 has invalid ID (remote bus)
0DDC		Device at OUT2 has invalid ID (local bus)

4.11 Driver Error Help

The following entries should be included in the Citect `ProtErr.DBF` spec file.

PROTOCOL	MASK	ERROR	MESSAGE
INTERBUS	0	E00700F0	ERR_NEG_CNF
INTERBUS	0	E00700F1	ERR_WRONG_MSGCODE
INTERBUS	0	C8	ERR_POSITION
INTERBUS	0	C9	ERR_SEGMENT
INTERBUS	0	CA	ERR_MODULE_NOT_FOUND
INTERBUS	0	CB	UNIT_NON_EXISTANT
INTERBUS	0	CC	ERR_PERIPHERAL_FAULT
INTERBUS	0	CD	ERR_CHANNEL_DEAD
INTERBUS	0	CE	ERR_INSUFFICIENT_MEMORY
INTERBUS	0	CF	ERR_THREAD_RUNNING
INTERBUS	0	109	No input data available.
INTERBUS	0	110	User error
INTERBUS	0	111	Peripheral fault
INTERBUS	0	112	Bus error
INTERBUS	0	113	Controller board error
INTERBUS	0	114	Data transmission inactive
INTERBUS	0	115	Configuration not active.
INTERBUS	0	116	Controller board not ready
INTERBUS	0	117	Bus segment disabled
INTERBUS	0	118	Function negatively processed
INTERBUS	0	119	Synchronisation error
INTERBUS	0	11A	Faulty data cycles
INTERBUS	0	11B	Synchronisation error
INTERBUS	0	11C	Waiting time exceeded
INTERBUS	0	11D	Error density exceeded

INTERBUS	0	11E	Control message pending
INTERBUS	0	E0070080	Impermissible or invalid board number
INTERBUS	0	E0070081	Invalid I/O address
INTERBUS	0	E0070082	Invalid address for the MPM window
INTERBUS	0	E0070083	Invalid interrupt
INTERBUS	0	E0070085	Invalid node handle specified
INTERBUS	0	E0070086	Node handle previously closed
INTERBUS	0	E0070087	Selected node not ready
INTERBUS	0	E0070088	Wrong node handle
INTERBUS	0	E0070089	INTERBUS controller not ready
INTERBUS	0	E007008A	Access method not enabled
INTERBUS	0	E007008B	Device driver not loaded
INTERBUS	0	E007008C	Function not supported
INTERBUS	0	E007008D	Function not supported
INTERBUS	0	E0070090	Node not present
INTERBUS	0	E0070091	Unknown device name
INTERBUS	0	E0070092	Resources of driver exhausted
INTERBUS	0	E0070096	Access exceeds limits of selected data area
INTERBUS	0	E0070097	Invalid data consistency specified
INTERBUS	0	E0070099	Access to MPM not possible
INTERBUS	0	E007009A	Too many parameters.
INTERBUS	0	E007009B	No message available
INTERBUS	0	E007009C	No free mailbox of the required size
INTERBUS	0	E007009D	Send vector register occupied
INTERBUS	0	E007009E	Invalid node called
INTERBUS	0	E007009F	Invalid node called
INTERBUS	0	E00700B0	Notification mode activated twice for one node
INTERBUS	0	E00700C0	Wrong process ID specified
INTERBUS	0	E00700C1	Blocked mode already enabled
INTERBUS	0	E00700C2	Another thready already using notification mode
INTERBUS	0	E00700C9	Invalid receive buffer
INTERBUS	0	E00700CA	Invalid notification mode
INTERBUS	0	E00700CB	Waiting time for message exceeded
INTERBUS	0	E00700D1	Invalid Windows handle
INTERBUS	0	E00700D2	Board not entered in IBDDIWIN.INI
INTERBUS	0	E00700D3	Invalid parameter in IBDDIWIN.INI

INTERBUS	0	0C10	Remote bus device missing
INTERBUS	0	0D10	Local bus device missing
INTERBUS	0	0C14	Multiple errors in remote segment.
INTERBUS	0	0D14	Multiple errors in local segment.
INTERBUS	0	0C18	Multiple INTERBUS timeouts (remote bus)
INTERBUS	0	0D18	Multiple INTERBUS timeouts (local bus)
INTERBUS	0	0C1C	Transmission (CRC) error (forward data path) (remote bus)
INTERBUS	0	0D1C	Transmission (CRC) error (forward data path) (local bus)
INTERBUS	0	0C4C	Transmission (CRC) error (return data path) (remote bus)
INTERBUS	0	0D4C	Transmission (CRC) error (return data path) (local bus)
INTERBUS	0	0C20	MAU found interruption of forward data transmission (remote bus)
INTERBUS	0	0D20	MAU found interruption of forward data transmission (local bus)
INTERBUS	0	0C28	MAU found interruption of return data transmission (remote bus)
INTERBUS	0	0D28	MAU found interruption of return data transmission (local bus)
INTERBUS	0	0C2C	Unexpected change of the RBST or LBST signal (remote bus)
INTERBUS	0	0D2C	Unexpected change of the RBST or LBST signal (local bus)
INTERBUS	0	0C40	Length code of specified device differs from config. (remote bus)
INTERBUS	0	0D40	Length code of specified device differs from config. (local bus)
INTERBUS	0	0C44	ID code of specified device differs from config. (remote bus)
INTERBUS	0	0D44	ID code of specified device differs from config. (local bus)
INTERBUS	0	0C48	Only ID cycles can be run (remote bus)
INTERBUS	0	0D48	Only ID cycles can be run (local bus)
INTERBUS	0	0C4C	Invalid ID code (remote bus)
INTERBUS	0	0D4C	Invalid ID code (local bus)
INTERBUS	0	0D50	Device has RB ID but is in the LB.
INTERBUS	0	0C54	Mode not supported (remote bus)
INTERBUS	0	0D54	Mode not supported (local bus)
INTERBUS	0	0C58	Data transmission interrupted at OUT1 (remote bus)
INTERBUS	0	0D58	Data transmission interrupted at OUT1 (local bus)
INTERBUS	0	0C5C	Data transmission interrupted at OUT2 (remote bus)
INTERBUS	0	0D5C	Data transmission interrupted at OUT2 (local bus)
INTERBUS	0	0C60	Data transmission temporarily interrupted at OUT1 (remote bus)
INTERBUS	0	0D60	Data transmission temporarily interrupted at OUT1 (local bus)
INTERBUS	0	0C64	CRC or MAU error detected (remote bus)
INTERBUS	0	0D64	CRC or MAU error detected (local bus)
INTERBUS	0	0C68	I/O timeout detected (remote bus)

INTERBUS	0	0D68	I/O timeout detected (local bus)
INTERBUS	0	0C6C	Module carried out a reset (remote bus)
INTERBUS	0	0D6C	Module carried out a reset (local bus)
INTERBUS	0	0C70	Data transmission aborted (remote bus)
INTERBUS	0	0D70	Data transmission aborted (local bus)
INTERBUS	0	0C74	Data transmission interrupted (remote bus)
INTERBUS	0	0D74	Data transmission interrupted (local bus)
INTERBUS	0	0C80	Multiple error at OUT1 (remote bus)
INTERBUS	0	0D80	Multiple error at OUT1 (local bus)
INTERBUS	0	0C84	Multiple timeout at OUT1 (remote bus)
INTERBUS	0	0D84	Multiple timeout at OUT1 (local bus)
INTERBUS	0	0C88	Unexpected device at OUT1 (remote bus)
INTERBUS	0	0D88	Unexpected device at OUT1 (local bus)
INTERBUS	0	0C8C	Only ID cycles possible (remote bus)
INTERBUS	0	0D8C	Only ID cycles possible (local bus)
INTERBUS	0	0C90	Device couldn’t activate segment (remote bus)
INTERBUS	0	0C98	Device connected to OUT1 has invalid ID (remote bus)
INTERBUS	0	0D98	Device connected to OUT1 has invalid ID (local bus)
INTERBUS	0	0D9C	Local bus contains more than specified number of devices (local bus)
INTERBUS	0	0CC0	Multiple error at OUT2 (remote bus)
INTERBUS	0	0DC0	Multiple error at OUT2 (local bus)
INTERBUS	0	0CC4	Multiple timeout at OUT2 (remote bus)
INTERBUS	0	0DC4	Multiple timeout at OUT2 (local bus)
INTERBUS	0	0CC8	Unexpected device at OUT2 (remote bus)
INTERBUS	0	0DC8	Unexpected device at OUT2 (local bus)
INTERBUS	0	0CCC	Only ID cycles possible (remote bus)
INTERBUS	0	0DCC	Only ID cycles possible (local bus)
INTERBUS	0	0CD0	After OUT2 opened, other devices added (remote bus)
INTERBUS	0	0DD0	After OUT2 opened, other devices added (local bus)
INTERBUS	0	0CD4	Error in local bus connected to device (remote bus)
INTERBUS	0	0DD4	Error in local bus connected to device (local bus)
INTERBUS	0	0CD8	Too many local bus devices (remote bus)
INTERBUS	0	0DD8	Too many local bus devices (local bus)
INTERBUS	0	0CDC	Device at OUT2 has invalid ID (remote bus)
INTERBUS	0	0DDC	Device at OUT2 has invalid ID (local bus)
etc…			More to be defined during testing…

- ▨ Local Bus error
- ☐ Remote Bus Error

Note: *Due to the limitations of error reporting between a driver and Citect, it is proposed that a non-blocking error message window be used to display more detailed information about remote and local bus errors. The INTERBUS protocol provides quite detailed information about errors, including the location of errors within the bus topology. This information should not be lost and should thus be made available to the operator.*

The error code could be used to reference a particular error message and solution which could then be displayed by means of a separate (but non-blocking) window. This window would remain active until confirmed, allowing the user to obtain the necessary information. It is possible that several errors could be active at the same time, leading to multiple error windows.

4.12 Debug Messages

The requests and reply relate to custom Requests, which are the requests actually transmitted but may not reflect Citect requests exactly because of optimisation.

4.12.1 Initialising

A “unit online” message from Citect is displayed when the unit comes online.

Read/Write Requests

After a read request is made, the TraceTx function displays information in the following form:

```
Mon Mar 17 10:57:31 1997 06:51:27.268 W> 2.2 | 1/3 (3.12) RT(1) UT(1) OFF8 Length 0
```

Command> - R> = Read, W>=Write

```
segment.position

segment     - segment number

position    - position in segment

byte/length

byte        Byte address in module

length      Number of bytes to read

(offset.numBits)

offset      Bit offset in word/byte

numBits     Number of significant bits after offset

RT          - Raw Type

UT          - Unit Type

OFF         - Address offset (for controller card)
```

```
Length       - Number of bytes to write / read
```

Read Replies

TraceRx displays information in the form.

```
Mon Mar 17 11:19:04 1997 07:13:00.988 R< 2.2 | 1/3 (3.12) RT(1) UT(1) OFF8 Length 0

00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ...............

00 00 00 00 00 00 00 00                              ........
```

Command<	- R< = Read response
Command>	- R> = Read, W>=Write

```
segment.position

segment      - segment number

position     - position in segment

byte/length

byte         Byte address in module

length       Number of bytes to read

(offset.numBits)

offset       Bit offset in word/byte

numBits      Number of significant bits *after* offset

RT           - Raw Type

UT           - Unit Type

OFF          - Address offset (for controller card)

Length       - Number of bytes to write / read
```

Below the summary line, is the actual response in hex form.

Error Replies

```
Mon Mar 17 11:19:12 1997 07:13:08.659 Err 23 R< A.1.0 NR2 NE0 RT1 CH0 U1 AD240  M5000 Length 0
```

As for the normal read/write request, however the error code is also included. The error will either be a driver specific error code, as described in this specification, or one of the following standard driver codes:

DRIVER_UNIT_OFFLINE	23
DRIVER_CHANNEL_OFFLINE	20
DRIVER_TIMEOUT	21

4.13 Stats Special Counters

Counters 0 – 7 are derived directly from the INTERBUS status register which can be read via the `GetIBSDiagnostic` API function.

Number	Label	Purpose/Meaning of this counter
0	USER_ERROR	Number of user errors
1	P_ERROR	Number of peripheral faults
2	BUS_ERROR	Number of bus errors
3	CONT_FAIL	Number of controller failures
4	FUNCT_NAK	Negative acknowledgment of standard function.
5	DS_FAULT	Faulty Data Cycle.
6	WARN_ERROR	Waiting time exceeded.
7	QUALITY_ERROR	Pre-defined error density exceeded.
8	DEVICE_MISSING	An INTERBUS device was disconnected
9	IBS_TIMEOUT	Multiple timeouts were experienced in a particular segment
10	CRC_ERROR	The interface card detected a CRC error.
11	MAU_ERROR	The MAU diagnosed an interruption of the data transmission
12	BST_CHANGE	Unexpected change of the RBST or LBST signal.
13	DATA_INTERRUPT	The data transmission was interrupted on the outgoing bus interface.
14	TEMP_DATA_INT	The data transmission was temporarily interrupted.
15	SUPI_ERROR	The SUPI 3 detected a CRC or MAU error.
16		
17		
18		
19		

For any of the above error counters, refer to *section 3.3* in the INTERBUS User Manual: 27 45 18 5.

4.17 Hints and Tips

Performance might be increased by reducing the *`delay`* from 10 ms or eliminating it altogether. The only reason for the *`delay`* is so that Citect doesn't spend all its time updating tags. If the delay is reduced or set to 0 then the *`scantime`* will have to be set to a non zero value.

The driver will reccomend the user restart Citect under some error conditions.

For example the driver will recommend, via a dialogue box, the user shutdown and restart Citect after the following errors occur:

-Attempting to read outside the address range of an IO module

-Attempting to write outside the address range of an IO module

Note that the driver will only display a dialogue box the first time this error occurs during a session. After that it will continue running. It is reccomended that the user follow the advice and restart Citect, because this type of error may indicate a change in hardware configuration after which restarting Citect is the safest option.

Note also that the driver Citect.ini parameter setting [INTERBUS] Window=1 will not have any effect unless an INTERBUS.MAP file exists in the Citect bin directory. The INTERBUS.MAP file does not have to have any module settings however.

5. Troubleshooting

5.1 Startup Errors

Any errors which appear at startup will usually produce a series of further errors. It is usually only the first of these messages which is significant. The associated causes and solutions are discussed below.

Message:	`Error opening handles to board` *`x`*`. Error code 0x2.`
Cause:	Citect can't initialise the board *x* which was specified in the "boards" form.
Solution:	Ensure that the card is correctly installed. Citect only supports the later half length INTERBUS cards. Make sure that the INTERBUS driver (refer to section 0 for details) has been correctly installed for the board number specified.
Message:	`Only one port per board please.`
Cause:	You have associated more than one port with a particular board.
Solution:	INTERBUS only supports one port per controller card. Remove any duplicate mappings to a board.
Message:	`Initializing Driver 'INTERBUS'. Error 'The specified module could not be found. (0x7e)'`
Cause:	The INTERBUS API DLL is missing from the CiTect bin directory.
Solution:	Copy the file "`ibddiwnt.dll`" into the Citect's `\bin` directory as described in *section 0*.
Message:	`Device non-existant for port`**`X`**`_bord`**`X`**
Cause:	A board hasn't been specified.
Solution:	Specify a board in the "boards" form of CiTect. Make sure this board is associated with a port. Also ensure that all ports are associated with properly configured boards.

5.2 Run-time Errors

Message:	`Peripheral fault: segment `**`X`**`, position `**`X`**`.`
Cause:	There was a hardware error at the position specified.
Solution:	The most common reason for this error is a blown fuse. Check all fuses on the specified device. A blown fuse will be indicated by a red light on most I/O modules. Note that if Citect is forced to reset the bus (due to some error) whilst an I/O module has a peripheral error, then the associated INTERBUS segment will not initialise properly.

Message:	`Serious controller error`
	`     Check controller, power down bus and`
	`     reset controller card.`

Cause: There was a loss of communications with the controller card.

Solution: In most cases, it will be necessary to re-start the bus and reset the controller card, although in some cases Citect will be able to re-establish communications. Wait for a couple of minutes and see if the bus comes back on-line. If not, power down the bus and reset the controller card by depressing the small black button indented in the back of the card next to the INTERBUS socket.

Message:

```
Serious error on bus.
     Check all units for hardware errors
     e.g. fuses blown. Disconnect bus segments
     with faulty units.
```

Cause: Citect is unable to initialise the bus.

Solution: In most cases, this error will be caused when a peripheral error occurred at some earlier time and the bus was re-initialised whilst the problem was still present. The solution is either to fix the peripheral error (possibly a blown fuse), disconnect the unit with the problem or disconnect the bus segment containing the faulty unit.

5.3 Debug Window Errors

5.3.1 Introduction

Many hardware errors will not produce individual message windows due to their frequency and the amount of detail which must be relayed to the user. If a Citect page indicates a #COM for any tag, it is advisable to initially check the INTERBUS debug window to establish the nature of the problem.

The most common errors will be discussed below, although the *INTERBUS User manual* (Order No. `27 45 18 5`) is a useful source of information for explanations of particular error codes. A useful piece of information is that a `0C`*XX* error code will relate to a *remote bus* error whilst a `0D`*XX* error will relate to a *local bus* error.

Hardware errors relate to the fact that the bus had stopped transmitting data. Whenever a bus error is detected, the driver interrogates the bus to try and establish the exact nature and location of the problem. The problem is best described by the error code (supplied in the debug message) which is discussed in section 3 of the *INTERBUS User Guide*

A *bus error* is probably the most common of all errors and indicates that there is a problem either with the physical wiring of the bus or with one of the connected units.

5.3.2 Common Errors

Message:

```
14:25:24: BUS ERROR
> Error code(0): 0xdcx
> An interface error occurred.
> Error at outgoing local bus interface
> Error location: segment 1
```

Cause: Multiple errors at the outgoing bus interface of the specified INTERBUS device. The line indicating "`Error at outgoing local bus interface`" tells us that the problem is on the outgoing data path of one of the modules. This could be caused by:

- An INTERBUS cable connected to an outgoing bus interface without an INTERBUS device connected to the other side.
- A local / remote bus cable being defective (on the segment indicated in the error message).

- A defective INTERBUS device being connected to the specified device.
- Failure of the module’s power supply.
- Failure of the BK unit’s power supply.

Solution: The line “`Error location: segment 1`” indicates the physical location of the error- somewhere on segment 1 in this case. Check all cables and modules in this vicinity.

Message:

```
15:04:17: BUS ERROR
> Error code(0): 0xc1x
> Error location: segment 2, position 0.
> Unit 0x202 not accessible.
```

Cause: A bus error indicating an error location with a position of 0 usually means that the BK unit for that branch (2 in this case) has become disconnected. The exact explanation for this error is given as: multiple timeouts in the segment of the specified INTERBUS device.

Solution: Make sure that none of the connecting cables have become disconnected. If this is not the case, check the specified segment for:

- Missing or incorrect shielding of the bus cables and connectors.
- missing or incorrect grounding
- poor connections in the connectors
- voltage dips on the communications power supply of the remote bus devices

The line indicating “`Unit 0x202 not accessible`“ tells us that the bus was re-initialised although as there a branch has been disconnected, some units are no longer assessable.

Message:

```
15:15:08: BUS ERROR
> Error code(0): 0xc8x
> An interface error occurred.
> Error at outgoing remote bus interface
> Error location: segment 1
```

Cause: This error is sometimes due to the fact that a previously disconnect bus segment has been re-connected, although it could also be a real error.

Solution: The problem is best described by the error code which is discussed in section 3 of the *INTERBUS User Guide*.

The line indicating “`Error at outgoing local bus interface`“ tells us that the problem is on the outgoing data path of one of the modules, the most probable cause being a disconnected cable.

The line “`Error location: segment 1`” indicates the physical location of the error- somewhere on segment 1 in this case.

Message:

```
16:43:13: BUS ERROR
> Error code(0): 0xdcx
> An interface error occurred.
> Error at outgoing local bus interface
> Error location: segment 2
```

Cause: This error is sometimes due to the fact that a previously disconnect bus segment has been re-connected, although it could also be a real error.

Solution: The problem is best described by the error code which is discussed in section 3 of the *INTERBUS User Guide*.

The line indicating "`Error at outgoing local bus interface`" tells us that the problem is on the outgoing data path of one of the modules, the most probable cause being a disconnected cable.

The line "`Error location: segment 1`" indicates the physical location of the error-somewhere on segment 1 in this case.

5.4 Hardware Alarm Page Errors

Message: `PLC Server Data not yet valid`

Cause: There has been an attempt to read an output which has not been previously written to. As it is normally impossible to read from an INTERBUS output device, the best Citect can do is to return the last value written when a read is requested for as particular output. When no value has been previously written to an output and a read is requested, then the state of the output is undefined and Citect will return this error message.

Solution: This error can be avoided by writing a value to an output before an attempt is made to read that output. The simplest way to do this is to set the `InitZero` parameter to `1` in the `citect.ini` file. This will effectively set all outputs to a known state (`0`) on start-up. See *section 0* for more details.

It is possible that you will make use of certain Citect features in a project which will inherently attempt to read from output devices, possibly without your knowledge. Two examples of these are "sliders" and the "toggle" command for digital outputs. In the case of sliders, the initial position must be determined by reading the output. For the toggle command, the initial state of a bit must be determined by a read before it can be set to the inverse state.

Thus, when using any Citect option which may attempt to read from an output device, be aware of the fact that the output should be initially set to some value before the feature is used.

9. References

9.1 References

INTERBUS Quick Start Guide
Phoenix Contact 27 47 87 9

Guide to installing the INTERBUS controller card

INTERBUS User Manual
General Introduction to the INTERBUS system
Phoenix Contact 27 45 21 1

Good introduction to the INTERBUS system. Discusses the physical protocol, the logical structure of the bus, the INTERBUS topology and system components.

INTERBUS User Manual
Generation 4 Controller Boards
Phoenix Contact 27 45 18 5

Discusses the Controller Card's firmware used for communication with all INTERBUS modules. Provides descriptions of the basic services upon which the Citect INTERBUS driver is constructed.

INTERBUS User Manual
Counter Module
Phoenix Contact 28 06 35 4

Discusses the installation, programming and operation of the `IBS CNT HB E` counter module.