Citect for Windows
Driver Specification
Sseven Driver

Author	Date	Comment
Sean Ju	12/12/96	Original
Sean Ju	3/11/97	Add/Modify
Sean Ju	25/2/98	Add/Modify
Sean Ju	30/7/98	Add/Modify
Sean Ju	24/3/99	Add/Modify
Trevor Hudson	24/3/99	Basic Testing
Paul Nguyen	14/11/2003	New ini parameters added

Contents

1. Introduction

1.1 Scope.

This document follows the development of the new driver. It serves as a functional specification, design specification and test specification.

1.2 Outline.

The specification is broken down into the following sections:

Section 1 - Introduction.
This section defines the scope of a board driver specification and outlines the items addressed by the specification.

Section 2 - Quality Assurance.
The QA section defines the requirements and procedures for Quality Assurance Accreditation. It is important you read this if you want your driver integrated into Citect.

Section 3 - Physical Communication Method.
The Physical Communication Method section defines the physical communication method supported, hardware/software suppliers, how the method is setup, any wiring diagrams involved etc.

Section 4 - Protocol Requirements.
The Protocol Requirements section details the technical considerations required or incorporated by the driver.

Section 5 - User Interface.
The User Interface section defines how the user will see and setup the driver in Citect.

Section 6 - Basic Testing.
The Basic Testing section defines the items which should be addressed in Basic testing by the developer.

Section 7 - Performance Testing.
The Performance Testing section is used in full testing of the driver by the Citect Testing Department of CiT. Once complete, this will provide details on the reliability and stability of the driver, and point out where the driver needs to be improved.

Section 8 - References and Contacts.
The References and Contacts section should be used as a record of reference materials and contacts used in developing this driver.

2. QA

2.1 Developers Guidelines

These guidelines are meant as a rough indication of what options there are for developing Citect drivers and the advantages of these options. It is not a technical discussion of options, rather a marketing guideline.

Drivers fall into two categories, Accredited and Independent.

2.1.1 Accredited Drivers.

Accredited drivers are those drivers that have been put through the CiT Driver QA Scheme and have passed all stages of this accreditation process. It is a precondition to becoming accredited that these drivers will be included with Citect in a normal release.

Accreditation has the following advantages:

1. The driver will be included in the product and a certificate stating this driver has achieved Accreditation will be sent to the developer.
2. Accredited drivers will be honoured as part of the product in terms of Citect Support and receive full cooperation between Citect Support personnel and the developer. On the other hand, independent driver problems will immediately be referred on to the original developer.
3. Help documentation and Express Wizards is provided, free of charge, for all Accredited drivers. Help documentation for Independent drivers is the responsibility of the developer.
4. Accreditation is included in the cost of the DDK. A high level of quality is expected and if this is not met the driver will not be Accredited.
5. Citect Customers see value in Accredited drivers as there is some assurance that the driver will operate as documented. Some customers may only accept Accredited drivers.

2.1.2 Independent Drivers.

Independent drivers are those that have not completed or are not intended to complete the Accreditation process. These drivers will not be included in Citect, nor will they be given any support by Citect Support personnel. We would request all drivers be sent to CiT regardless, even if they are not to be included in the product. If this is done, we can try to ensure compatibility with future versions of Citect.

Independent Drivers have the following advantages:

1. Drivers may be written by or for an end user giving them an edge over their opposition by using Citect.
2. Drivers may be developed as part of a package offered by System Integrators or including pre-configured packages etc., thereby maintaining the intellectual and financial investment. This would be similar to value added or OEM style marketing.

2.2

Accreditation process

The following check list defines the QA steps for generating a new driver. This procedure must be followed for drivers to be integrated into Citect. It is advisable to ensure that items before each checkpoint are complete before proceeding to avoid rework if changes are required.

	Description	**Person**	**Date**
1	This specification document is written.	Sean Ju	12/12/96
2	Specification reviewed and accepted by CiT Driver Development.		
	At this checkpoint coding is ready to be commenced.		
3	Driver coded.		
4	Code and specification reviewed and accepted by CiT Driver Development.		
5	Testing with connection project, and performance test.		
6	Driver integrated into Citect source and built.		
7	Documentation is written.		
8	Documentation reviewed.		
	At this checkpoint coding is done and the driver is available as a beta.		
9a	Full testing is carried out.	Trevor Hudson	9/4/99
9b	Performance testing is carried out.	Trevor Hudson	9/4/99
9c	Specification and documentation updated from testing/performance tests		
	At this checkpoint the testing is complete.		
10a	Review for completeness by developer, tester, documenter and CiT Driver Development		
10b	Add driver to install disks		
10c	Add driver to drivers database		
10d	Support notified of new driver for training purposes		
11	Sales notified of new driver		
	The driver is now finished.		

The hand over of a driver requires that all the above steps are completed and checked off.

3. Target Device(s) and Protocol

3.1 Introduction

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

3.2 Device Manufacturer

Siemens

3.3 Device Definition

S7 - 300 PLCs and S7- 400 PLCs

3.4 Communications Method

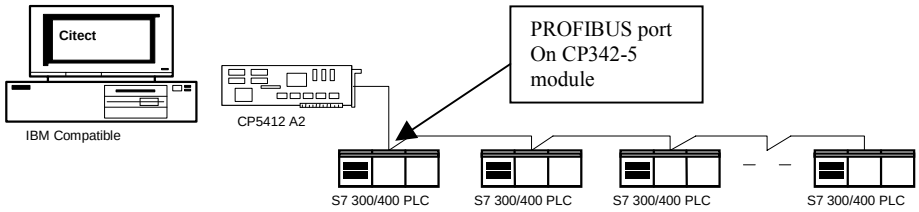
This protocol talks to Siemens S7-300 PLC and S7-400 PLC via Profibus communication module (eg. S7 342-5 DP module) or TCP/IP communication module (eg. CP 343 – 1 TCP module) or directly to MPI port on the CPU module. Operating system required are Microsoft Windows 95 or Microsoft Windows NT 4.0 (service pack 3 applied).

3.4.1 Comms method ---- Profibus (Sinec L2)

Note: “PROFIBUS” and “SINEC L2” are the same, they are interchangeable.

3.4.1.1 Wiring Diagrams

All wiring should be installed according to Siemens documentation.



3.4.1.2 Installing the communications processor

Software required to setup CP5412 A2 card

- SINEC S7-5412 for Windows 95 (S7_5412/95) or Windows NT (S7_5412/NT) protocol libraries v4.1.xx
- Authorisation disk.

The installation tool shipped with the Library software is a Windows program that helps install the drivers and define some important parameters for both software (the library) and hardware (the CP5412 A2 card).

3.4.13 CP5412 communications configuration steps

1. Start Sinec setup program (Start -> Programs -> SIMATIC NET -> COM S7)
2. Select File -> New or File -> Open DB

3. Fill in the dialogue box, see figure 1 bellow.
4. Save the configuration (File -> Save or File -> Save as).
5. Generate Binary DB (File -> Generate Binary DB as)
6. Exit (File -> Exit)

Note.

- The connection names in the connection name list will be used in CITECT IODevice form, Address field. **CASE sensitive.**
- The VFD names will be used in CITECT Ports form, Opt field. **CASE sensitive.**
- Use siemens suggested value for the local TSAP (F1 for on-line help).
- Use 03.02 for the remote TSAP, where 03 stands for other (not PG or OS), 02 stands for rack 0 and slot 2 (modify this value according to the real CPU model's position in the rack. F1 for on-line help).

IMPORTANT: One VFD should be associated with only one connection name.

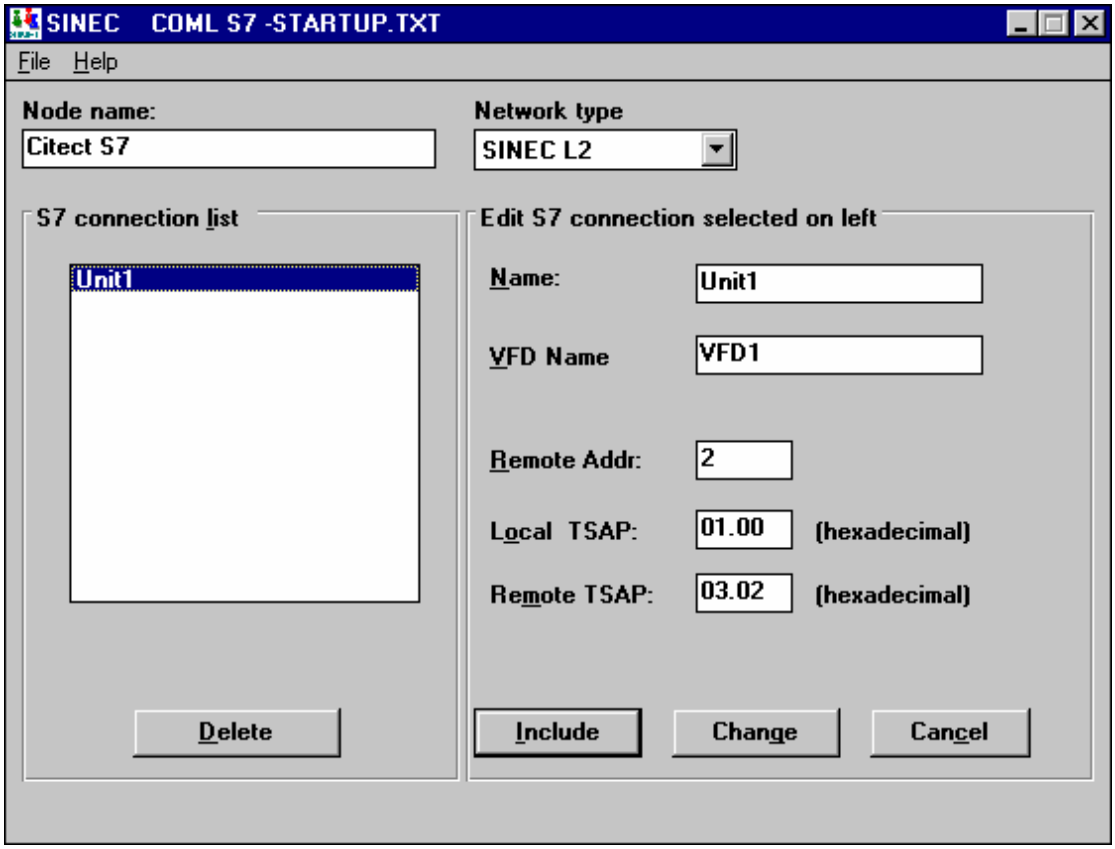


Figure 1.

9. Start Sinec setup program (Start -> Programs -> SIMATIC NET -> "Setting the PG/PC Interface")
10. Click Install button at the lower right corner of the dialogue box, see figure 2.
11. Select CP5412A2(PROFIBUS) from the left side list box and then click Install button in the middle and set the resources according to the hardware dip switches. Step back to top dialog interface.
12. Add a new (or use the existing one) Access Point of Application name. Eg. CP_L2_1:
13. Select CP5412A2(PROFIBUS) adopter in the lower list box.
14. Click PROPERTY button to setup other S7 protocol related parameters.
15. Click OK button to close the dialogue box.
16. Click OK if the Access Point of Application name is bind to CP5412A2(PROFIBUS) adopter, otherwise make the correction before close the dialogue box.

NOTE: The Access Point of Application Name (also known as Device Name in old version) is used in CITECT Project Editor | Communication | Boards | Special Opt field. Also the name is case sensitive.

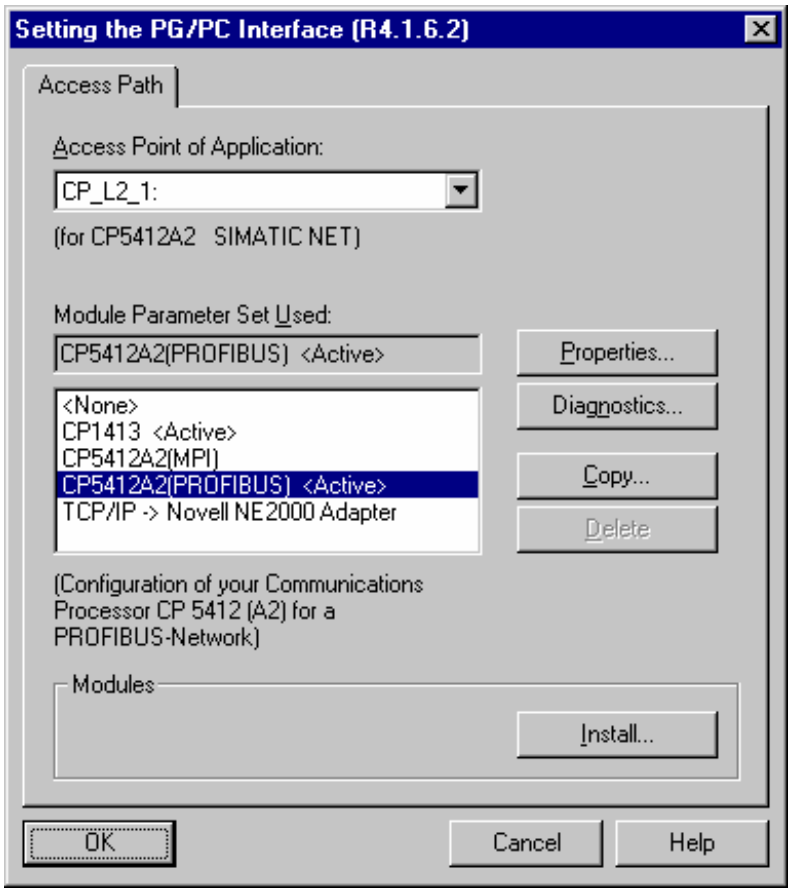


Figure 2.

See Siemens's manual and on-line help for more information

3.4.1.4 CP342-5 DP communications configuration

Required software

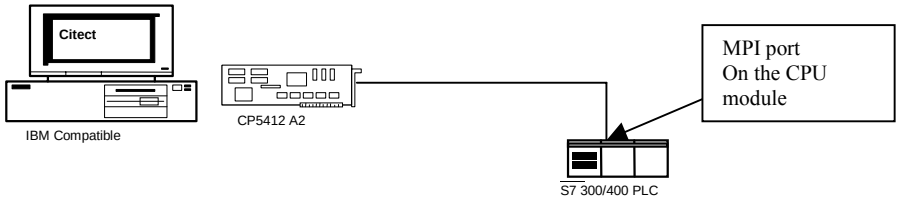
- STEP 7 V2.1 or newer version.
- NCM S7 for PROFIBUS v2.06 or newer version.
- Authorisation disks for above software.

S7 protocol does not require customer software (special function block) running in PLC's CPU module to be operational. See Siemens' manual and on-line help for the detailed configuration information.

3.4.2 Comms method ---- MPI

3.4.2.1 Wiring Diagrams

All wiring should be installed according to Siemens documentation. **Note: Sseven driver has not been tested on a MPI network. The heading "MPI" refers to Citect communicate to a single S7 (300 or 400) PLC via CPU module's MPI port (point-to-point).**



3.4.2.2 Installing the communications processor

Software required to setup CP5412 A2 card

- SINEC S7-5412 for Windows 95 (S7_5412/95) or Windows NT (S7_5412/NT) protocol libraries v4.1.xx
- Authorisation disk.

The installation tool shipped with the Library software is a Windows program that helps install the drivers and define some important parameters for both software (the library) and hardware (the CP5412 A2 card).

3.4.2.3 CP5412 communications configuration steps

1. Start Sinec setup program (Start -> Programs -> SIMATIC NET ->COM S7)
2. Select Edit -> S7 Configuration to start COML S7 dialogue window.
3. Select File -> New or File -> Open DB
4. Fill in the dialogue box, see figure 1 above.
5. Select **PROFIBUS** as the Network type
6. **Use the PLC CPU module's MPI address as the remote address**
7. Save the configuration (File -> Save or File -> Save as).
8. Generate Binary DB (File -> Generate Binary DB as)
9. Exit (File -> Exit)

Note.

- The connection names in the connection name list will be used in CITECT IO Device form, Address field. **CASE sensitive.**
- The VFD names will be used in CITECT Ports form, Opt field. **CASE sensitive.**
- Use siemens suggested value for the local TSAP (F1 for on-line help).
- Use 03.02 for the remote TSAP, where 03 stands for other (not PG or OS), 02 stands for rack 0 and slot 2 (modify this value according to the real CPU model's position in the rack. F1 for on-line help).

IMPORTANT: One VFD (Virtual field device) should be associated with only one connection name.

17. Start Sinec setup program (Start -> Programs -> SIMATIC NET -> "Setting the PG/PC Interface")
18. Click Install button at the lower right corner of the dialogue box, see figure 2.
19. Select CP5412A2(MPI) from the left side list box and then click Install button in the middle and set the resources according to the hardware dip switches. Step back to top dialog interface.
20. Add a new (or use the existing one) Access Point of Application name. Eg. CP_MPI:
21. Select CP5412A2(MPI) adopter in the lower list box.
22. Click PROPERTY button to setup other S7 protocol related parameters.
23. Click OK button to close the dialogue box.
24. Click OK if the Access Point of Application name is bind to CP5412A2(MPI) adopter, otherwise make the correction before close the dialogue box.

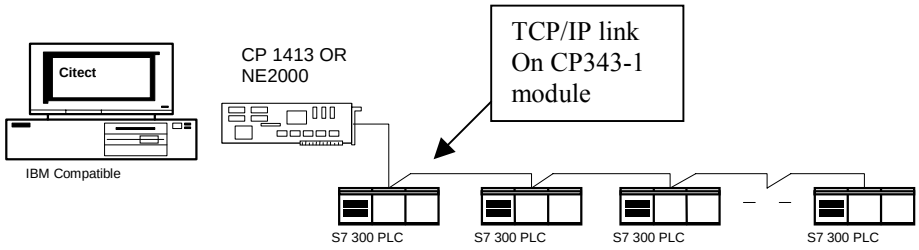
NOTE:
1. Select 187.5kbd as the transmission rate.
2. The Access Point of Application Name (also known as Device Name in old version) is used in CITECT Project Editor | Communication | Boards | Special Opt field. Also the name is case sensitive.

See Siemens' manual and on-line help for more information

3.4.3 Comms method ---- TCP/IP

3.4.3.1 Wiring Diagrams

All wiring should be installed according to Siemens documentation.



3.4.3.2 Installing the NE2000 network card (softare setup sample for S7 TCPIP library version 4.1.xx)

Software required to setup NE2000 card

- SINEC S7-5412 for Windows 95 (S7_5412/95) or Windows NT (S7_5412/NT) protocol libraries v4.1.xx or later version (tcpip library is included in this version)
- Authorisation disk.

Run the installation program which will copy the program files to the proper directories, setup the registry, etc.

3.4.3.3 NE2000 card configuration steps

If you have already configured NE2000 network card, then jump to step 5.

1. Start network setup program: (Start->Program->Settings->Control panel->network), see figure 3.
2. Click Adopters tab, add the Novell NE2000 adopter card and configure the resources required for that card
3. Click Protocol tab and add TCP/IP protocol if it hasn't been installed before.
4. Close the network setup dialogue, and re-boot the computer if necessary.

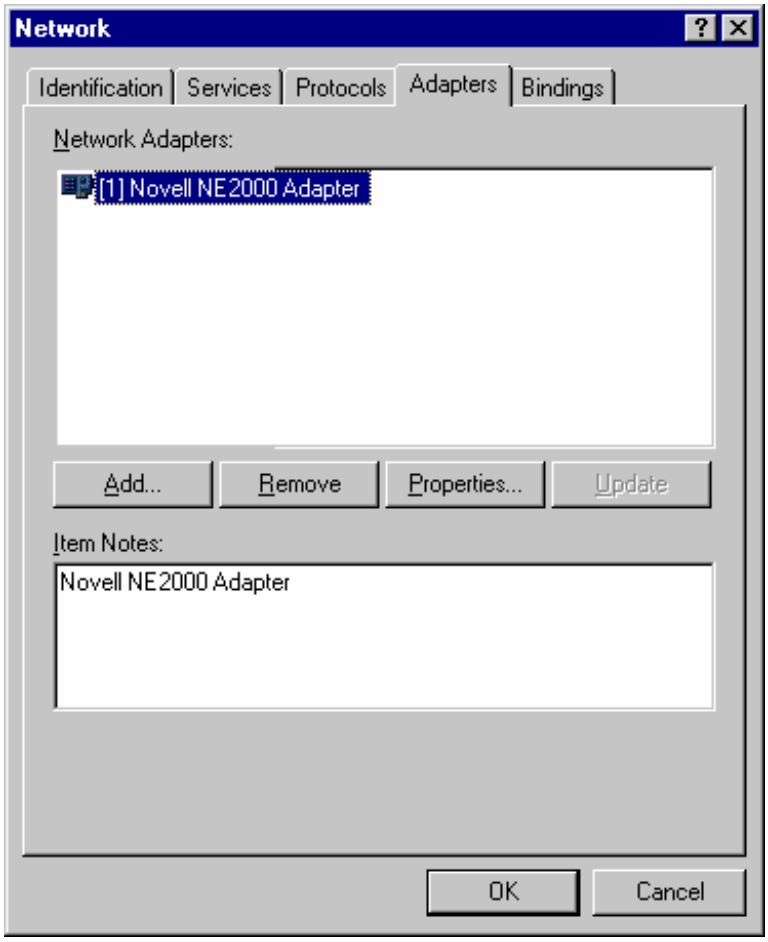


Figure 3

3.4.3.4 S7 communications configuration steps

5. Start Sinec setup program (Start -> Programs -> SIMATIC NET -> COM S7)
6. Select File -> New or File -> Open DB
7. Fill in the dialogue box, see figure 1.
8. Select **TCPIP** as the Network type
9. **Fill the Remote address using PLC's IP address. E.g. 203.19.130.253**
10. Fill the rest fields.
11. Save the configuration (File -> Save or File -> Save as).
12. Generate Binary DB (File -> Generate Binary DB as)
13. Exit (File -> Exit)

Note.

- The connection names in the connection name list will be used in CITECT IO Device form, Address field. **CASE sensitive**.
- The VFD names will be used in CITECT Ports form, Opt field, **CASE sensitive**
- Use siemens suggested value for the local TSAP (F1 for on-line help).
- Use 03.02 for the remote TSAP, where 03 stands for other (not PG or OS), 02 stands for rack 0 and slot 2 (modify this value according to the real CPU model's position in the rack. F1 for on-line help).

IMPORTANT: One VFD should be associated with only one connection name.

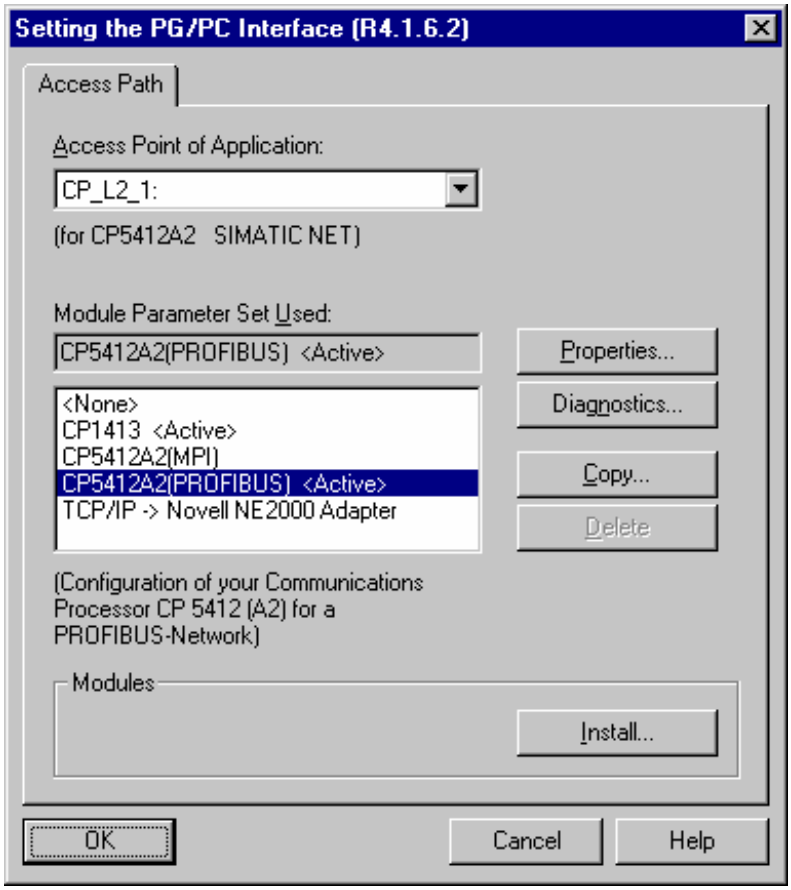


Figure 4.

14. Start Sinec setup program (Start -> Programs -> SIMATIC NET -> "Setting the PG/PC Interface")
15. Click Install button at the lower right corner of the dialogue box, , see figure 4.
16. Select TCP/IP from the left side list box and then click Install button in the middle. Step back to top dialog interface.
17. Add a new (or use the existing one) Access Point of Application name. Eg. S7_TCPIP
18. Select TCP/IP-> Novell NE2000 Adopter in the lower list box.
19. Click PROPERTY button to setup other S7 protocol related parameters.
20. Click OK button to close the dialogue box.
21. Click OK if the Access Point of Application name is bind to TCP/IP ->Novell NE2000 Adopter, otherwise make the correction before close the dialogue box.

NOTE: The Access Point of Application Name (also known as Device Name in old version) is used in CITECT Project Editor | Communication | Boards | Special Opt field. Also the name is case sensitive.

3.5 Maximum Request Length

~~1600 bits~~
512 bits

4. Protocol Requirements

4.1 Introduction

This section documents all the requirements of the protocol itself.

4.2 Initialising the Board

No special requirement.

4.3 Initialising the Port

No special requirement.

4.4 Initialising the IO Device

No special requirement.

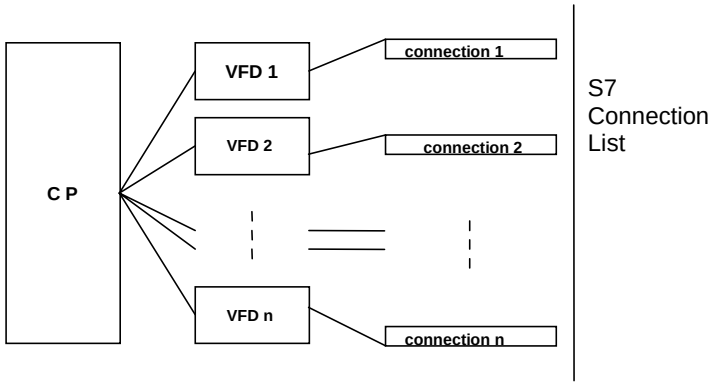
4.5 IO Device Online Test

A test read (PLC's memory area, address M0, one byte in length) is performed to determine communication status. The response (asynchronous) must be free of any errors for the unit to be accepted as online.

4.6 State Flow Description

The request process for reads and writes follows a simple request/response model. This driver supports multiple outstanding requests per channel according to the number of acknowledged jobs can be received on the PLC side, (User should set the MaxPending in Citect.ini file accordingly, default is 2 which is suitable in most cases)

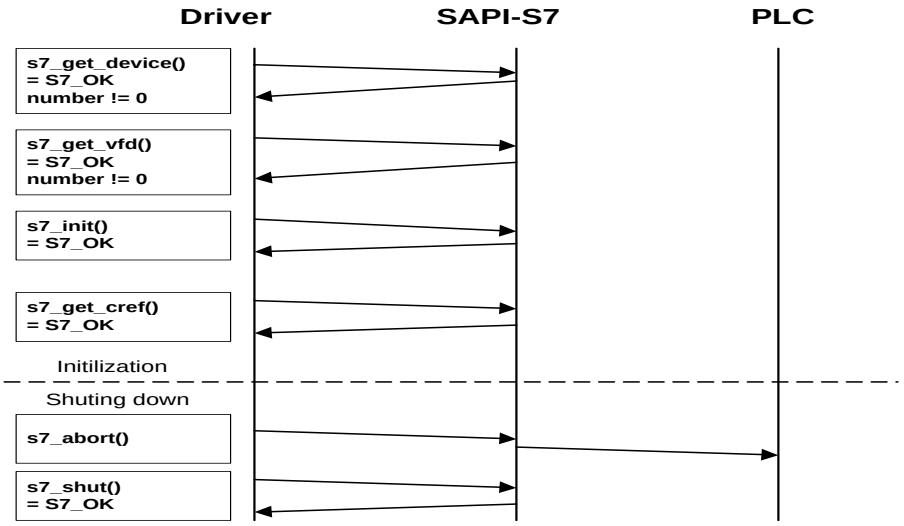
1. Assigning VFDs and the S7 Connection List



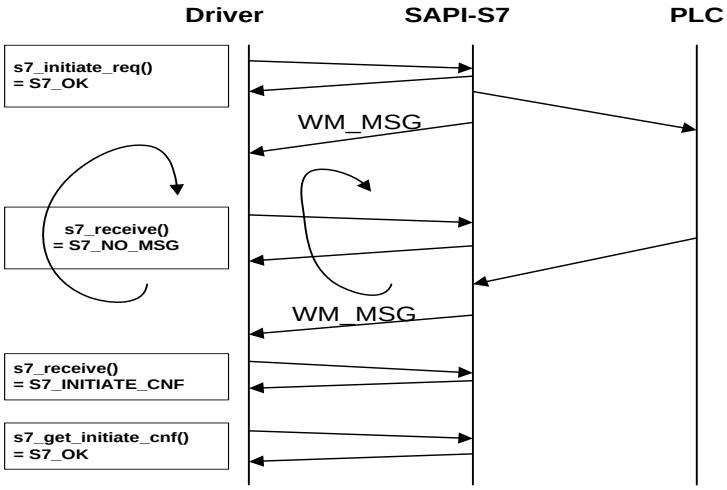
A CP (communication processor) is mapped to Citect Board, a VFD is mapped to a Citect channel (port), and a connection is mapped to a Citect unit. A Citect Channel should only have one Unit, which is equivalent to a VFD should only have one connection (strongly recommended, although not restricted to).

The following sequence will happen to each channel and each unit.

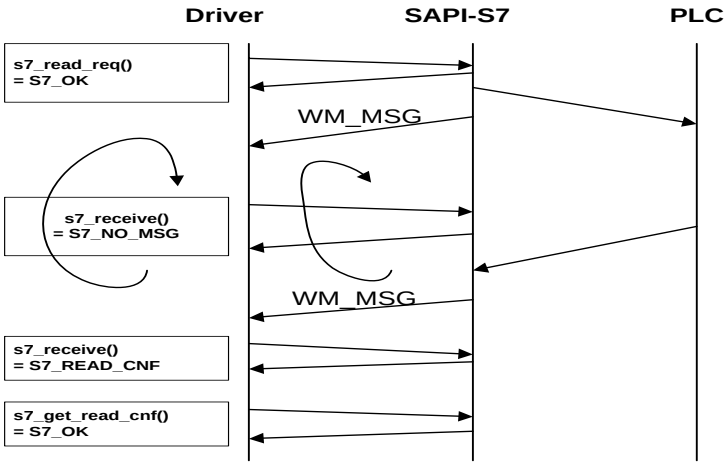
2. Initialisation and shut down sequence chart



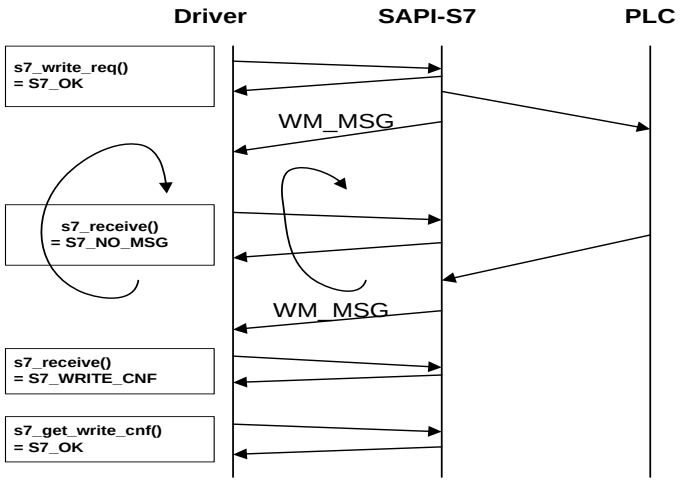
3.Active Connection establishment sequence chart



4. Read request sequence chart



5. Write request sequence chart



4.7 Message Structure

This driver uses the following API calls to the sapi_s7 library:
Administrative Services
s7_get_device()
s7_get_vfd()
s7_get_init()
s7_get_cref()
s7_abort()
s7_shut()

S7 connection management services
s7_initiate_req()
s7_get_initiate_cnf()

Receive Call
s7_receive()

Variable Services
s7_read_req()
s7_get_read_cnf()
s7_write_req()
s7_get_write_req()

Trace
s7_last_detailed_err_msg()
s7_last_detailed_err_no()

Special Features for Windows
s7_set_window_handle_msg()

Refer to the Siemens documentation (reference book No. 1) for a description of the API calls.

4.8 Data Format

N/A

4.9 Error Handling

Detailed error message will be displayed in Citect kernel window when debug option is turn on.
If the driver receive a connection aborted indication from s7 library on a given unit then that unit and the channel associated with this unit are placed offline.

5. User Interface

5.1 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.

5.2 Driver Name

SSEVEN

5.3 Boards Form

5.3.1 Board Type

S7NT, S7WIN, S7NTSP or S7WINSP

5.3.2 Address

0

5.3.3 IO Port

none

5.3.4 Special Opt

Device Name where Device Name is the hardware Device name including the colon (`CP_L2_1:` for example), it can be found in the SINEC Reconfiguration CP 5412 (A2) Dialogue, PC hardware parameters area in Siemens Library prior version 4.xx.

Or Access Point of Application for Simens library version 4.xx

5.4 Ports Form

5.4.1 Baud Rate

none

5.4.2 Data Bits

none

5.4.3 Stop Bits

none

5.4.4 Parity

None

5.4.5 Special Opt

VFD NAME where VFD NAME is the name specified in the VFD Name field in COML S7 setup dialog.

5.5 IO Devices Form

5.5.1 Protocol

S7NT, S7WIN, S7NTSP or S7WINSP

5.5.2 Address

Connection name Which can be found in the Connection List field in COML S7 setup dialog.

Note. Access Point of Application (or Device name), VFD name and Connection name can not exceed 32 characters in length and they are CASE SENSITIVE. No space(s) is allowed on both sides of the Name.

5.6 Pulldown lists Help

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

TYPE	DATA	FILTER
BOARDTYPE	S7NT	
PROTOCOL	S7NT	
BOARDTYPE	S7WIN	
PROTOCOL	S7WIN	
BOARDTYPE	S7NTSP	
PROTOCOL	S7NTSP	
BOARDTYPE	S7WINSP	
PROTOCOL	S7WINSP	
ADDRESS	0	S7NT
ADDRESS	0	S7WIN
ADDRESS	0	S7NTSP
ADDRESS	0	S7WINSP

5.7 IO Device Variable Types

IO Device Type	*Citect data Address*	*Citect data type*	*Description/Special Usage/Limitations/ Valid Ranges*
DB<no>,<index>[.<bitno>]	DB<no>,<index>[.<bitno>]	Digital, Byte, INT, BCD, LONG, LONG_BCD, REAL, STRING	Read/Write
DI<no>,<index>[.<bitno>]	DI<no>,<index>[.<bitno>]	Digital, Byte, INT, BCD, LONG, LONG_BCD, REAL, STRING	Read/Write
A<index>[.<bitno>]	A<index>[.<bitno>]	INT, BYTE, BCD, Digital	Read/Write
Q<index>[.<bitno>]	Q<index>[.<bitno>]	INT, BYTE, BCD, Digital	Read/Write
C<index>	C<index>	BCD (only lower 12 bits are used, range 000 - 999)	Read/Write
E<index>[.<bitno>]	E<index>[.<bitno>]	INT, BYTE, Digital	Read/Write
I<index>[.<bitno>]	I<index>[.<bitno>]	INT, BYTE, Digital	Read/Write
M<index>[.<bitno>]	M<index>[.<bitno>]	Digital, Byte, INT, BCD, LONG, LONG_BCD, REAL, STRING	Read/Write
PA<index>[.<bitno>]	PA<index>[.<bitno>]	INT, BYTE, Digital	Write Only
PQ<index>[.<bitno>]	PQ<index>[.<bitno>]	INT, BYTE, Digital	Write Only
PE<index>[.<bitno>]	PE<index>.<bitno>	INT, BYTE, Digital	Read Only
PI<index>[.<bitno>]	PI<index>.<bitno>	INT, BYTE, Digital	Read Only
T<index>	T<index>(10ms)	BCD (PLC s5time format)	Read/Write
T<index>	T<index>(100ms)	BCD (PLC s5time format)	Read/Write
T<index>	T<index>(1s)	BCD (PLC s5time format)	Read/Write
T<index>	T<index>(10s)	BCD (PLC s5time format)	Read/Write
Z<index>	Z<index>	BCD	Read/Write
T<index>	T<index>	REAL (PLC s5time format)	Read/Write
TDB<no>,<index>	TDB<no>,<index >	REAL (PLC s5time format)	Read/Write
TDI<no>,<index>	TDI<no>,<index >	REAL (PLC s5time format)	Read/Write
TM<index>	TM<index >	REAL (PLC s5time format)	Read/Write

Syntax:

The syntax is defined as follows (case insensitive)

DB<no> <index>
DI<no> <index>.<bitno>
<area>

where

DB or DI	data block or instance block	
<no>	number of the data block or instance block	
<area>	A	output
	Q	output
	C	counter
	E	input
	I	input
	M	bit memory
	PE	peripheral input
	PI	peripheral input
	PA	peripheral output
	PQ	peripheral output
	T	timer
	Z	counter
<index>	element number relative to start of block	
<bitno>	bit within the element number	

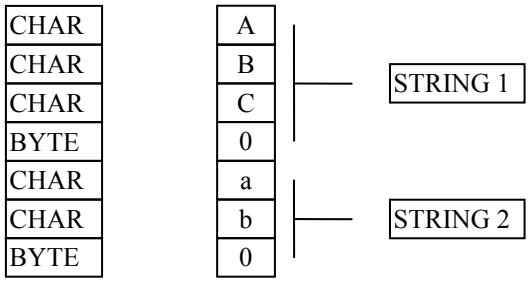
Notes:

1. Addressing format T, TDB, TDI, TM: When one of these address formats is used, Sseven driver will convert a time value (from Citect Real to Siemens S5Time or vice versa) using the smallest time base it can fit in. Range: 0 – 9990.00 seconds. (0 <= Values < 0.01 will be truncated to 0 and Values > 9990.01 will generate an Alarm). Precision may be lost in the conversion. Eg. 10.01 will be converted to 10.00 (1100 S5Time format).

2. Addressing: DB, DI, A, E, M, PA , PE, TDB, TDI and TM are using byte addressing. T, C and Z are using word (two bytes) addressing. They are the same as in STEP7.

3. STRING data type: Citect STRING data type is **not** the same as Siemens' STRING data type. It is equivalent to Siemens' CHAR data type. A NULL terminator (Siemens' BYTE data type, value = 0) is required. If Siemens' STRING is accessed, the result is unknown.

e.g.



4. A (German naming convention) and Q (International naming convention) are the same;
5. E (German naming convention) and I (International naming convention) are the same;
6. PE (German naming convention) and PI (International naming convention) are the same;
7. PA (German naming convention) and PQ (International naming convention) are the same

5.8 Dbase Files

5.8.1 SSEVEN.DBF

TEMPLATE	*UNIT_TYPE*	*RAW_TYPE*	*BIT_WIDTH*	*LOW*	*HIGH*	*COMMENT*
DB%<16(0,0,65535),%U(0,0,65535).%u(0,0,7)	0	0	8	0	0	DIGITAL
DI%<16(0,0,65535),%U(0,0,65535).%u(0,0,7)	1	0	8	0	0	DIGITAL
A%U(0,0,65535).%u(0,0,7)	2	0	8	0	0	DIGITAL
E%U(0,0,65535).%u(0,0,7)	3	0	8	0	0	DIGITAL
Q%U(0,0,65535).%u(0,0,7)	2	0	8	0	0	DIGITAL
I%U(0,0,65535).%u(0,0,7)	3	0	8	0	0	DIGITAL
M%U(0,0,65535).%u(0,0,7)	4	0	8	0	0	DIGITAL
PA%U(0,0,65535).%u(0,0,7)	5	0	8	0	0	DIGITAL
PE%U(0,0,65535).%u(0,0,7)	6	0	8	0	0	DIGITAL
PQ%U(0,0,65535).%u(0,0,7)	5	0	8	0	0	DIGITAL
PI%U(0,0,65535).%u(0,0,7)	6	0	8	0	0	DIGITAL
DB%<16(0,0,65535),%U(0,0,65535)	7	8	8	0	0	Note1
DI%<16(0,0,65535),%U(0,0,65535)	8	8	8	0	0	Note1
A%U(0,0,65535)	9	8	8	0	0	Note1
E%U(0,0,65535)	10	8	8	0	0	Note1
Q%U(0,0,65535)	9	8	8	0	0	Note1
I%U(0,0,65535)	10	8	8	0	0	Note1
M%U(0,0,65535)	11	8	8	0	0	Note1

PA%U(0,0,65535)	12	8	8	0	0	Note1
PE%U(0,0,65535)	13	8	8	0	0	Note1
PQ%U(0,0,65535)	12	8	8	0	0	Note1
PI%U(0,0,65535)	13	8	8	0	0	Note1
T%U(0,0,65535)(10ms)	14	3	16	0	0	BCD <---> S5TIME 10ms based
T%U(0,0,65535)(100ms)	15	3	16	0	0	BCD <---> S5TIME 100ms based
T%U(0,0,65535)(1s)	16	3	16	0	0	BCD <---> S5TIME 1s based
T%U(0,0,65535)(10s)	17	3	16	0	0	BCD <---> S5TIME 10s based
C%U(0,0,65535)	18	3	16	0	0	BCD <---> COUNTER
Z%U(0,0,65535)	19	3	16	0	0	BCD <---> COUNTER
T%U(0,0,65535)	41	2	32	0	0	REAL <---> S5TIME
TDB%<16(0,0,65535),%U(0,0,65535)	42	2	32	0	0	REAL <---> S5TIME
TDI%<16(0,0,65535),%U(0,0,65535)	43	2	32	0	0	REAL <---> S5TIME
TM%U(0,0,65535)	44	2	32	0	0	REAL <---> S5TIME

Note1: the data type supported are: BYTE, INT, BCD, LONG, LONG_BCD, REAL, STRING

-5.8.2 PROTDIR.DBF

TAG	*FILE*	*BIT_BLOCK*	*MAX_LENGTH*	*OPTIONS*
S7NT	SSEVEN	512	512	0x13FF
S7WIN	SSEVEN	512	512	0x13FF
S7NTSP	SSEVEN	32	32	0x13FB
S7WINSP	SSEVEN	32	32	0x13FB

5.9 Parameters and INI options

5.9.1 Standard Parameters

Block	64	for S7NT and S7WIN
Block	4	for S7NTSP and S7WINSP
Delay	0	
MaxPending	2	
Polltime	0	
Timeout	1000	(default = 1000ms)
Retry	1	(Siemens library will retry 3 time)
WatchTime	30 Seconds	

Calculations for Timeout parameter
Example 1.
[SSEVEN]
TimeOut=0
the Timeout will be set to S7 default value 300 x 51 ms (15 seconds)
Example 2.
[SSEVEN]
TimeOut=n where 0 < n and n x 51 ms < 30000 ms
the Timeout will be set to n x 51 ms

5.9.2 Driver Specific Parameters

nConnTimeout 1000 default 1000ms

The initial timeout period which the driver will wait on startup for the connection to be established before either putting the unit offline or the channel offline. Thus customers can seta longer ConnTimeout for projects with many PLCs and leave the Timeout parameter to a shorter value.

EnableFloatCheck 1 (default= 1)

0 – Will not perform valid IEEE float format check of PLC data
1 – Will check for valid IEEE float format of PLC data

5.10 Driver Specific Errors

Driver Error Code (Hexadecimal)	*Generic Error*	*Meaning of Error Code*
		Errors generated by Sseven Driver
0x2001	GENERIC_GENERAL_ERROR	GET CONNECTION NAME ERROR
0x2002	GENERIC_GENERAL_ERROR	BAD VARIABLE ADDR
0x2003	GENERIC_GENERAL_ERROR	INVALID BCD FORMAT ERROR
0x2004	GENERIC_GENERAL_ERROR	INVALID TIMER VALUE ERROR
0x2005	GENERIC_GENERAL_ERROR	INVALID TIMER BASE ERROR
0x2006	GENERIC_GENERAL_ERROR	THE BLOCKING SIZE IS TOO LARGE
0x2007	GENERIC_GENERAL_ERROR	REQUESTED DATA SIZE DOES NOT MATCH THE RESPONSE
0x2008	GENERIC_GENERAL_ERROR	ILEGAL REAL VALUE
0x2009	GENERIC_GENERAL_ERROR	BOARD NOT INITIALISED
		Errors generated by Siemens Library
0x2201	GENERIC_GENERAL_ERROR	S7_ERR_UNKNOWN_ERROR
0x2202	GENERIC_GENERAL_ERROR	S7_ERR_WRONG_CP_DESCR
0x2203	GENERIC_GENERAL_ERROR	S7_ERR_NO_RESOURCE
0x2207	GENERIC_GENERAL_ERROR	S7_ERR_INVALID_PARAMETER
0x2208	GENERIC_GENERAL_ERROR	S7_ERR_TOO_LONG_DATA
0x2209	GENERIC_GENERAL_ERROR	S7_ERR_TOO_MANY_DLL_USERS
0x220A	GENERIC_GENERAL_ERROR	S7_ERR_WRONG_IND_CNF
0x220B	GENERIC_GENERAL_ERROR	S7_ERR_SERVICE_NOT_SUPPORTED
0x2214	GENERIC_GENERAL_ERROR	S7_ERR_INVALID_CREF
0x2217	GENERIC_GENERAL_ERROR	S7_ERR_CONN_NAME_NOT_FOUND
0x221E	GENERIC_GENERAL_ERROR	S7_ERR_INVALID_ORDERID
0x221F	GENERIC_GENERAL_ERROR	S7_ERR_ORDERID_USED
0x2232	GENERIC_GENERAL_ERROR	S7_ERR_OBJ_UNDEFINED
0x2233	GENERIC_GENERAL_ERROR	S7_ERR_OBJ_ATTR_INCONSISTENT

0x2235	GENERIC_GENERAL_ERROR	S7_ERR_OBJ_ACCESS_DENIED
0x2250	GENERIC_GENERAL_ERROR	S7_ERR_INVALID_DATA_SIZE
0x2251	GENERIC_GENERAL_ERROR	S7_ERR_RECEIVE_BUFFER_FULL
0x225A	GENERIC_GENERAL_ERROR	S7_ERR_FW_ERROR
0x2264	GENERIC_GENERAL_ERROR	S7_ERR_MINI_DB_TYPE
0x2265	GENERIC_GENERAL_ERROR	S7_ERR_MINI_DB_VALUE
0x2270	GENERIC_GENERAL_ERROR	S7_ERR_SERVICE_VFD_ALREADY_USED
0x2271	GENERIC_GENERAL_ERROR	S7_ERR_SERVICE_CONN_ALREADY_USED
0x2278	GENERIC_GENERAL_ERROR	S7_ERR_CONN_ABORTED
0x2279	GENERIC_GENERAL_ERROR	S7_ERR_INVALID_CONN_STATE
0x227A	GENERIC_GENERAL_ERROR	S7_ERR_MAX_REQ
0x227B	GENERIC_GENERAL_ERROR	S7_ERR_CONN_CNF
0x228C	GENERIC_GENERAL_ERROR	S7_ERR_INSTALL
0x228D	GENERIC_GENERAL_ERROR	S7_ERR_INTERNAL_ERROR
0x228E	GENERIC_GENERAL_ERROR	S7_ERR_NO_SIN_SERV
0x228F	GENERIC_GENERAL_ERROR	S7_ERR_NO_LICENCE
0x2296	GENERIC_GENERAL_ERROR	S7_ERR_SYMB_ADDRESS
0x2297	GENERIC_GENERAL_ERROR	S7_ERR_SYMB_ADDRESS_INCONSISTENT

5.11 Stats Special Counters

Number	*Label*	*Purpose/Meaning of this counter*
0	cp_descr	S7 communication channel handle
1	cref	S7 communication unit reference number
2	Read req	total number of read request processed
3	Read Cnf	total number of read confirmation processed
4	Read Err	total number of reading error
5	Write req	total number of write request processed
6	Write Cnf	total number of write confirmation processed
7	write Err	total number of writing error
8	No Msg	total number of message (received from S7 library) which requires no further action to be taken
9	Unhandled Msg	total number of message (received from S7 library) which has not been handled by this driver
10	MaxPending	MaxPending number used in communication
11	PollTime	PollTime used in communication
12	TimeOut	TimeOut used in communication in ms
13	WatchTime	WatchTime used in communication
14	Number of Offline	Total number of broken communication

15	PDU Size	PDU size used in communication
16	InDCB	Current number of requests waiting in the InDCB queue
17	OutDCB	Current number of outstanding request
18	MaxInDCB	Peak number of requests waited in the InDCB queue
19	MaxOutDCB	Peak number of outstanding request

5.12 Debug Messages

```
Mon Nov 03 16:38:35 1997 02:17:05.838 Citect Startup 5.00 Rev. 00  Service Pack C

Mon Nov 03 16:38:36 1997 02:17:06.278 (Id: 0000) (PORT_1 ) [s7_init: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.278 (Id: 0000) (PORT_1 ) [s7_set_window_handle_msg: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.298 (Id: 0000) (PORT_1 ) [s7_get_cref: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.298 (Id: 0000) (PORT_1 , Unit1) [s7_initiate_req: OK] Length 0

Port1, Unit1, initialise CP 5412 A2 card is successful.

Mon Nov 03 16:38:36 1997 02:17:06.298 (Id: 0000) (PORT_2 ) [s7_init: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.298 (Id: 0000) (PORT_2 ) [s7_set_window_handle_msg: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.298 (Id: 0000) (PORT_2 ) [s7_get_cref S7_ERR] Length 117
connection name in CRL not found:<a>make sure the CR-name is correct, and <a>the CP
descriptor references the correct CP.
Mon Nov 03 16:38:36 1997 02:17:06.308 Error: Channel offline, cannot talk
  UINIT    0015       PORT_2       UNIT_2                          16
  Generic 000021 Driver 00000020 (0x00000014)

Port2, Unit2, initialise CP 5412 A2 card is NOT successful. Reason: connection name has not been defined yet.

Mon Nov 03 16:38:36 1997 02:17:06.589 (Id: ffff) (PORT_1 , Unit1) [s7_get_initiate_cnf: OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.609 (Id: 0002) (PORT_1 , Unit1) [s7_read_req: (M0,1) OK] Length 0
Mon Nov 03 16:38:36 1997 02:17:06.639 (Id: 0002) (PORT_1 , Unit1) [s7_get_read_cnf: OK] Length 0

Port1, Unit1, online test is successful. Normal operation starts.
Mon Nov 03 16:39:06 1997 02:17:36.241 (Id: 0003) (PORT_1 , Unit1) [s7_read_req: (DB2,INT0,1) OK] Length 0
Mon Nov 03 16:39:06 1997 02:17:36.241 (Id: 0004) (PORT_1 , Unit1) [s7_read_req: (DB2,REAL2,3) OK] Length 0

Mon Nov 03 16:39:06 1997 02:17:36.271 (Id: 0003) (PORT_1 , Unit1) [s7_get_read_cnf: OK] Length 0
Mon Nov 03 16:39:06 1997 02:17:36.271 (Id: 3) Received Data Length 2
00 02
                                  ..
Mon Nov 03 16:39:06 1997 02:17:36.281 (Id: 0005) (PORT_1 , Unit1) [s7_read_req: (DB2,CHAR14,4) OK] Length 0


Mon Nov 03 16:39:06 1997 02:17:36.291 (Id: 0004) (PORT_1 , Unit1) [s7_get_read_cnf: OK] Length 0
Mon Nov 03 16:39:06 1997 02:17:36.291 (Id: 4) Received Data Length 12
40 59 99 9A 40 D6 66 66 40 B3 33 33                  @Y..@.ff@.33

Mon Nov 03 16:39:06 1997 02:17:36.291 (Id: 0006) (PORT_1 , Unit1) [s7_read_req: (DB2,W18,4) OK] Length 0


Mon Nov 03 16:39:06 1997 02:17:36.422 (Id: 0005) (PORT_1 , Unit1) [s7_get_read_cnf: OK] Length 0
Mon Nov 03 16:39:06 1997 02:17:36.422 (Id: 5) Received Data Length 4
41 42 43 44                                    ABCD
```

5.13 Hints and Tips

1. Timer and Counter data type should not be used in remapping.
2. For the Siemens PLC users the following note is very important.

a.) How Citect blocking works:

* Request blocking

Optimisation of Citect requests is vital to achieving the best possible communications speed. Citect has two levels of optimisation: Compile-time and run-time. Both levels of optimisation are based on building requests of the most efficient size.

Consider a device which takes 100mS to read a single register and 150mS to read a block of 100 contiguous requests. If a registers 1 and 100 are required it is faster to read both registers in one go (ie read the block 1 - 100) taking 150mS than it would be to use two requests taking 100mS + 100mS.
The optimum size of a request for a given protocol needs to be determined by experiment (See Calculating the Blocking Constant in section 7) and then set as the blocking constant.

* Optimisation by the Citect Compiler

Citect assumes a simple model that has been found suitable with the majority of protocol for industrial devices. Citect specifies a devices available data into types, specified by the UnitType number and addresses specified by the UnitAddress number. This scheme is best suited for protocols which allow a number of registers contiguous in address to be read in one request. Citect blocks requests according to the UnitAddress. Variables of differing UnitType or differing RawType will not be optimised together. The compiler uses information from the specification file PROTDIR.DBF to determine what size of request to build. The value in the BIT_BLOCK field is the optimum size of a request in bits for a given protocol. The compiler assesses all the data required for a single client task (a page, a Cicode thread or another server such as alarms, reports or trends) and builds requests of the optimum size. Citect will never make a read request for a single bit of data. Digital read requests are normally blocked multiples of 16 bits starting on the 16 bit boundary. A driver may select 8 bit based blocking for digital read requests by setting the OPT_8_BIT_DIGITAL option in the PROTDIR.DBF file for the protocol.

* Optimisation by the Citect I/O Server

Citect is based on a true Client/Server architecture. The IO Servers must service requests from client tasks such as the Alarm Servers, Report Servers, pages displaying values, Cicode threads etc. The IO Server looks for opportunities to build further optimised requests from client requests. This is the same principal as the compile time optimisation but performed at runtime by the IO Server. The run-time system uses the Constants.Block value (in bytes) as the optimum size for a request. The user can modify this parameter from the INI file.

b.) Problems might be caused by blocking.

As we can see from a.) that Citect will always try to read data in blocks, this works fine with most of PLCs since users of these PLCs cannot define sophisticated data types (structured data type) in their memory area. However, Siemens PLCs are the exception as users can configure their memory area into any structured data types.

Let assume for a moment that we have an S7-300 PLC. We have created a data block called DB1.
Here is what we have in the DB1.

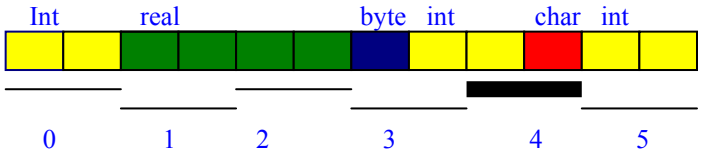
Byte Address	DataType	Length in Bytes
0	int	2
2	real	4
6	byte	1
7	int	2
9	char	1
10	int	2

Assume again that Citect has the two integers displayed on a graphic page.
Here is the slow motion.

1. the graphic page is activated.
2. Citect wants three integers' values at addresses (DB1, 0) , (DB1, 7), and (DB1, 10)
3. I/O server works out the address and length and blocked them together.
   Request: datablock=1, start address=0, number=6, data type = integer
4. Sseven driver gets the request from the I/O Server and translated it into Siemens language

DB1, INT0, 5 and send it to the PLC.

5. the PLC receives the request, and translated it into something like this. Citect wanted (5 - 0 + 1) * 2 = 12 bytes, starting from 0 in DB1. It responses with the data and specifies the length to be 6 (integers).
6. Sseven driver receives the data, and passes it on to the I/O Server and then Citect.
7. Citect retrieves the first integer from location 0, the second one from location 4 , and the third one from location 5.



8. It is obvious that the second integer at location 4 has an incorrect value.
9. If the data types are adjusted or padded properly, the user can get the correct reading, but the performance will suffer since there is a lot of unwanted data in the response packet.

Note this example is valid for other memory areas (M for instance) and It is valid for other data types (other than integer) as well.

c.) The correct way to configure a DB.

Let us re-organise the DB1 as following.

Address	DataType	Length in Bytes
0	int	2
2	int	2
4	int	2
4	real	4
8	byte	1
9	char	1

Now when Citect wants three integers, the I/O server will block it into DB1, address 0, number 3.
And will displayed the values correctly, and the performance will not be reduced.

Let's extend this example a bit further.

Address	DataType	Length in Bytes
0	byte	1
1	byte	1
2	byte	1
3 (padding dumy)	byte	1
4	real	4
8	real	4
12	real	4
60	real	4
64	real	4
68	some	
xx	other	x
xx	data	x
xx	types	x
xxx	real	4
xxx	real	4

…

Minimum distance has to be greater than Constants.Block

Users can adjust/padding the data type onto the right boundary, this way, the Citect boundary check can be left on, if there is a bad boundary warning, you will know that something is not right.

If you want to add (append at the end) some real data type after all the work has been done, you need to make sure that the Minimum distance has to be greater than the value specified by **Block** parameter (Standard citect.ini file parameter). Otherwise you need to pad enough bytes to meet this requirement.

If you just starting the project. Make sure reserve some space for the future expansion.

Address	DataType	Length in Bytes
0	byte	1
1	byte	1
2	byte	1
3	reserved	1
4	reserved	1
5 (padding)	reserved	1
6	real	4
10	real	4
14	real	4
…	…	…
62	real	4
66	real	4
70	reserved	4
74	reserved	4
78	reserved	4
82	reserved	4
xx	some	x
xx	other	x
xx	data	x
xx	types	x
xx	reserved	x
xx	reserved	x
xx	reserved	x
xx	reserved	x

6. Basic Testing

6.1 Introduction

The programmer will perform a minimum level of testing which is outlined here.
A sample Project is available which can be used as a starting point for the programmers test Project. When the programmer has completed basic testing and debugging this Project should by backed up and supplied to the Citect Testing department.

6.2 Procedure

The following are points should be covered by basic testing.

- On startup the IO Device comes online without errors.
- The driver supports IO Devices of addresses as documented in the specification.
- The driver reports the IO Device offline when the IO Device is a) powered down, b) disconnected.
- The driver will re-establish communication with the IO Device after a) power cycle, b) disconnection/ reconnection.
- Confirm that retries (if supported) and error reporting operate correctly.
- The driver reads all the device data types documented as readable in this specification.
- The driver writes to all the device data types documented as write-able in this specification.
- The driver reads and writes all data formats supported by the protocol, ie DIGITAL, INT, LONG, REAL, BCD, LONG_BCD.
- Test the limit of the IO Devices request size, this should be done for at least DIGITAL and an INT data formats.
- Let the driver run over night and check that no retries or other errors have occurred.
- If a multidrop or network protocol and if the hardware is available then the protocol should be tested with more than one IO Device connected.

6.3 Start of Testing

There are four Protocol DLL's for this device
S7nt.DLL S7ntsp.DLL S7win.DLL and S7winsp.DLL check that all exist in the Citect Bin directory

The hardware used for testing was as follows:

DESCRIPTION	MAKE	MODEL NO
Power Supply	Siemens	6EP1333-1SL11
CPU	Siemens	315-2DP
TCPIP MODULE	Siemens	343-1EX00-0XE0
Interface Card		CP5412-A2

Software used for testing:
External software Simatic Manager available in H:/Citect/external/Siemens/S7/Step7

Operating System	Citect Version	Other
NT4 serv pack 4	V521b2	Simatic Manager

The Protdir.dbf settings were

TAG	FILE	BIT_BLOCK	MAX_LENGTH	OPTIONS
S7NT	SSEVEN	512	512	0x13ff
S7NTSP	SSEVEN	32	32	0x13fb
S7WIN	SSEVEN	512	512	0x13ff
S7WINSP	SSEVEN	32	32	0x13fb

6.4 Introduction

.Installation of the CP5412-A2 card requires the Sinec setup program SINEC\TOOLS.NT\SETUPWNT.EXE and authorisation key. Also caution when allocating Port, memory and IRQ setting to avoid conflicts.
The CP5412-A2 card has 4 DIP switches to set the I/O address range, default is (0000 = 0x240)

NOTE: The DIP switch on the CP5412-A2 card we used for testing indicates that the 0 or OFF setting is with the switch away from the board. THIS IS NOT TRUE. The 0 or OFF setting is with the switch close to the board.

Switch Setting 1234	IO Address Range (hex)
0000	240-243
0001	244-247
0010	248-24B
0011	24C-24F
0100	280-283
0101	284-287
0110	288-28B
0111	28C-28F
1000	300-303
1001	304-307
1010	308-30B
1011	30C-30F
1100	390-393
1101	394-397
1110	398-39B
1111	39C-39F

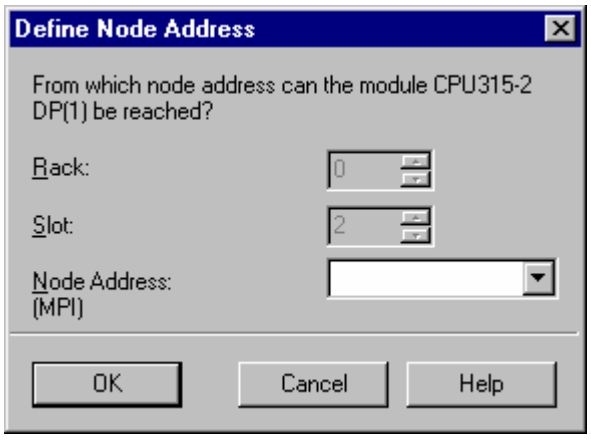
Caution A conflict message will also occur if other Softing software has been started eg. If you have an OPC server installed that automatically starts Softing software (check Control Panel Devices).

Use the External Software Simatic manager to Download the IP address
This is not easy and requires knowledge of Siemens software and products.

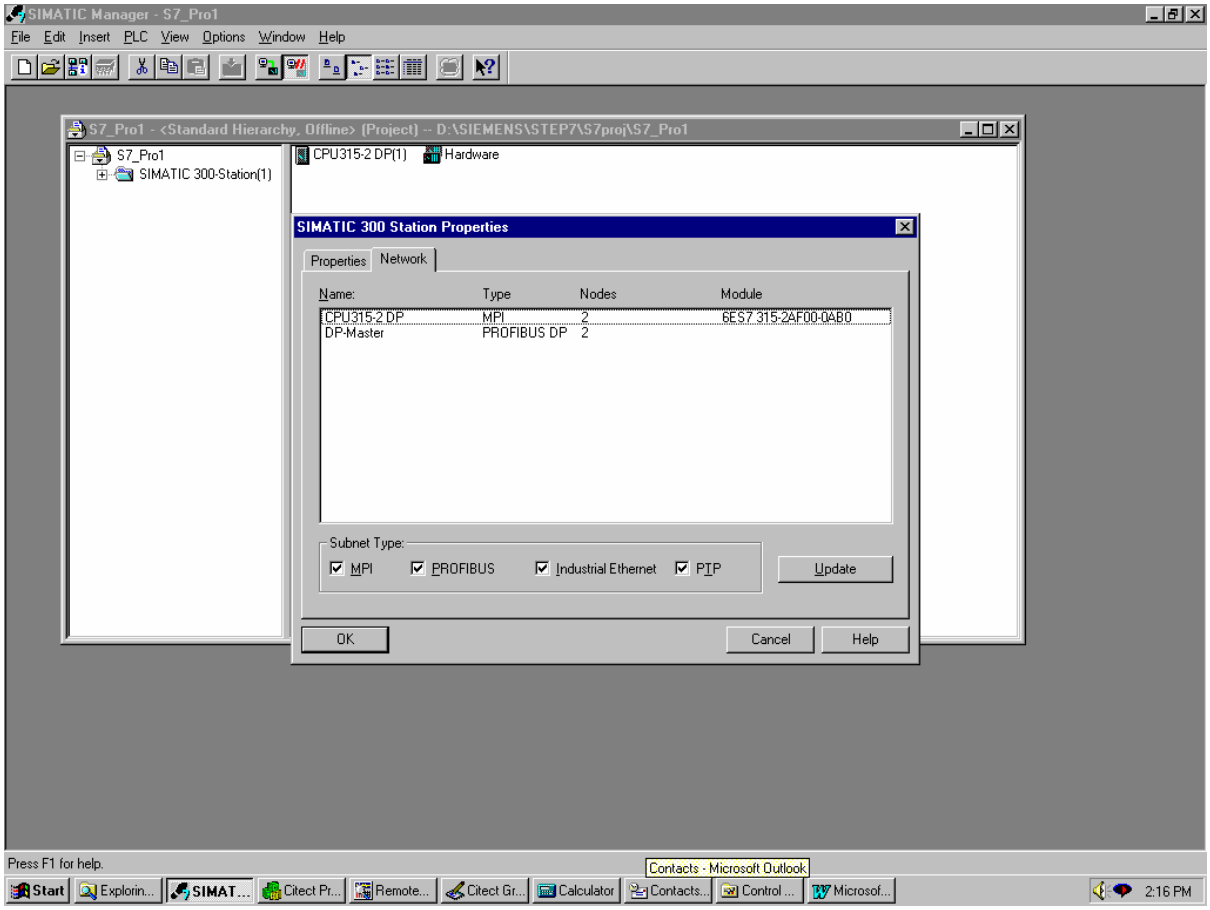
When attempting to run the CP5412-A2 card diagnostics received this error message
“Error 0x031a: No active PROFIBUS/MPI network found. If you want the CP of this PC to be the only active module (for example in DP master mode), the setting <Not the only active master> must be deactivated.”
This was fixed in the properties MPI network window.
Diagnostics to the A2 card now indicates that the card is installed correctly

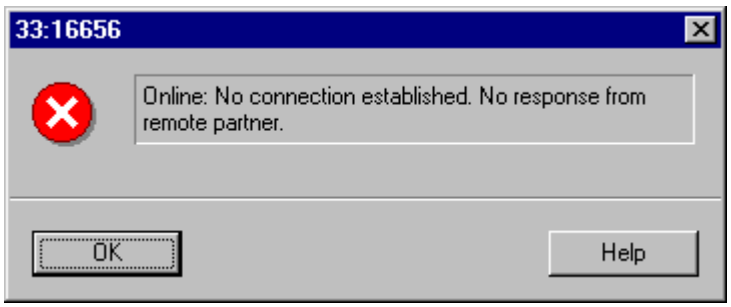
Now attempting to establish communications with the PLC via Simatic manager.

When attempting to run online diagnostics using SIMATIC manager received the following message



Found by right click on the SIMATIC 300-Station(1) then properties





Received this error when attempting to run online diagnostic hardware

Turned out to be a faulty cable.
Communicating OK now.

Attempting to set and down load the hardware rack configuration.
In the (Insert) Select hardware window, There is no 343-5 (Ethernet) Module!!
What was missing from STEP7 V3.2 Hardware Catalogue was the S7-300 CP343-1 TCPIP Module from the Hardware Setup program.

What one needs to do is to install the Siemens program called "Industrial Ethernet". (Note: this program is supplied on one CD called "Simatic Industrial Ethernet Communication" ????, I think) This program will install the necessary Industrial Ethernet protocols used and all comms modules required.

However, STEP7 V4 will have the TCPIP Module already included in the Hardware catalogue for insertion as well as several comms bugs fixed.
(Many thanks to Paul Nguyen)

The hardware is now set up and ready to start communicating with Citect.. The communication method used for the protocol testing was TCPIP. Note that the normal Citect method of setting the Boards form to TCPIP and the IP address in the Ports form is not used with this protocol. Follow the instructions in section 5 of this document.

6.5 Test 1: Basic Communication Test

Citect was set up to communicate with the PLC. This test was use to check that everything works fine before creating any other tests.
Test Checked ☒OK ☐FAIL

6.6 Test 2: Read/Write of each data type

All data types were written to and read from with Citect.
Peripheral registers not tested (No hardware available yet)
A backup of the main project that was used to test the Sseven protocol may be found in
H:\CITECT\DRIVERS\PROJECTS\
Test Checked ☒OK ☐FAIL

6.7 Test 3: Break in communication and recovery

The communication cable was pulled out from the PLC and Citect was observed to go offline and a hardware alarm was recorded. The cable was re inserted and Citect went back on line.
Test Checked ☒OK ☐FAIL

6.8 Test 4: Bulk Test

All supported variable tags were created to cover all the available IO addresses. Pages were created to read and write to each variable tag .When many blocks of addresses were available, the first group of words, the middle group of words, and the last group of words were tested. A backup of the main project that was used to test the protocol may be found in H:\CITECT\DRIVERS\PROJECTS\
Check all types read/write to the correct address ☒OK ☐FAIL

6.9 Test 6: Unusual or Illegal procedures Test

Attempted to set illegal data types, Write to read only tags and overload the PLC with continuous write commands.
Test checked ☒OK ☐FAIL

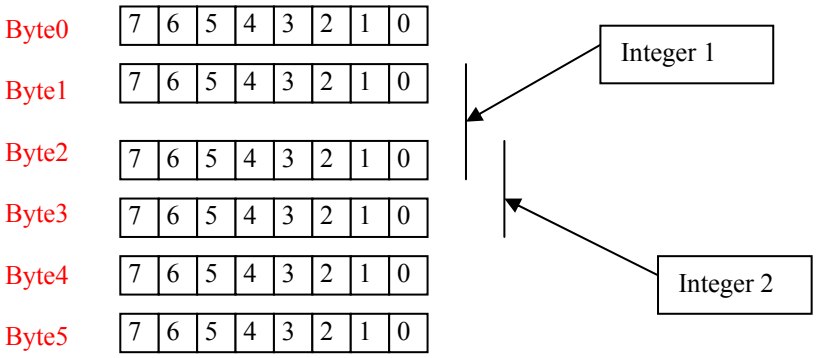
6.10 Test 7: Debug String captures

Problems Found

1. The bit addressing of an integer data type is applied to the upper byte. I would expect bit0 to bit7 by normal convention to be addressing the lower byte

This is not a problem since

1. The digital operation is byte based (bit 0 – 7) in the Sseven driver.
2. An integer requires two bytes, one will be high byte and the other will be the low byte of the integer, so there will be one bit0 for high byte and another bit0 for low byte.
3. Which one is the high byte and which is the low byte is depend on how an integer is defined (it all depends on the integer address). See picture 1.



Picture 1.

From the picture 1 above, we can see that Byte2 is the low byte of the integer 1 and is the High byte of the integer 2.

3. A and Q registers perform correctly when defined as BCD (Help Data Types should be modified)

Spec has been updated. Help hasn't.

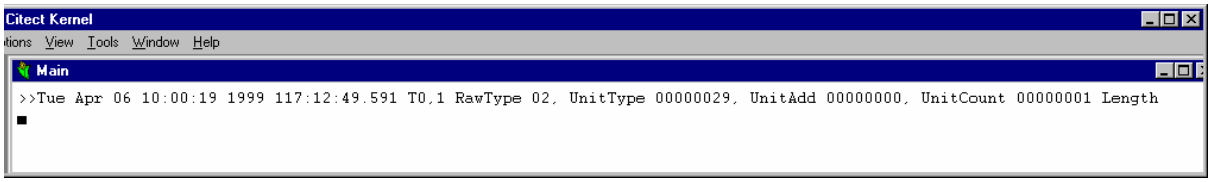
4. The C register with data type BCD (bit width supposed to be 16) will only accept data up to 999 (12 bits)

Spec has been updated. Help hasn't.

5. I would expect a compile error (Bad Raw data type) when setting C register as INT

Nothing can be done in the Sseven driver. It is purely a feature of the Citect Compiler.

6. Writing a value greater than 999 to the T register (REAL) does not generate an alarm (The write is not performed and the register holds the original value.) Uh this statement is only true if the corresponding page is being displayed!!! If the tag write is performed via "tagdebug' whilst the page menu is displayed



then the alarm **will** be generated.

7. Documentation required indicating that the T register set as BCD is only 12 bits wide (the top 4 bits being used to set the scale)
8. Protdir.DBF does not match the spec file

It does now.

7. Performance Testing

7.1 Introduction

Tests which give some indication of the drivers performance. The programmer needs to perform these tests since the results feed back into the Constants structure and the PROTDIR.DBF.

7.2 Calculating the Blocking Constant

The Performance test procedure is documented in the driver development kit in Appendix A, 'Calculating the Block Constant'. The results of the performance test are recorded here.

block size to read [words]	Average response time [mS]
1	**47**
{25% of maximun}	**50**
{50% of maximun}	**52**
{75% of maximun}	**53**
{maximun}	**55**

From these results the overhead and rate are determined and the ideal blocking constant is calculated

Overhead [ms] =47.53

Word Rate [words / ms] =.12

Blocking constant [words] =396

Note that the calculated blocking constant must now be set by the programmer in the Constants structure (the Block field) in bytes and in the PROTDIR.DBF (the BIT_BLOCK field) in bits.

8. References

8.1 References

1. SINEC *The S7 Programming Interface Description*
2. SINEC *CP 5412 (A2) Manuals for MS_DOS, Windows*
   Siemens AG
3. SIMATIC *L2/L2FO Network Manual*
   Release 02 Siemens AG
4. *NCM S7 FOR PROFIBUS*
   Siemens AG
5. SIMATIC *STEP 7 User Manual*
   Part of the standard STEP 7 Documentation Package.
   Siemens AG

8.2 Contacts

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