Citect for Windows, Version 5.xx
P_LINK driver, User information and design

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1. User information

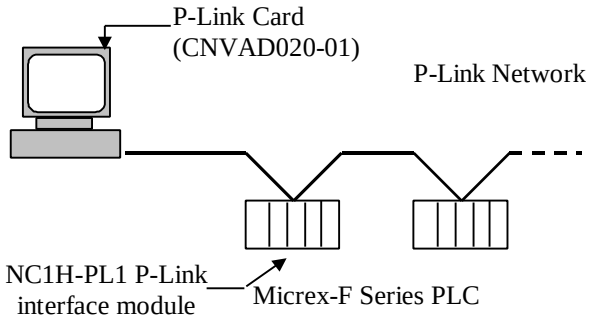
This driver aims to support the P-Link module (NC1H-PL1) through a P-Link Network Card (CNVAD020-01). The P-Link module is a component of Micrex-F Series PLCs to enable linking several processors distributed over a wide area.

1.1 Application notes for Device NC1H-PL1

	Detail
Manufacturer	FUJI ELECTRIC, JAPAN
Device name	NC1H-PL1, which is FUJI MIECREX-F series P-Link Interface Module
Communications method	FUJI Proprietary P-Link Protocol through P-Link Network Card (CNVAD020-01) and P-Link API

1.1.1 Overview

The NC1H-PL1 is mounted on the base module of the Micrex-F, and connects the FUJI Micrex-F series PLCs to the P-Link Network. The module uses P-Link protocol to exchange data with other nodes (such as a Citect PC).



1.1.2 Setup guide

Step 1. Hard switch Settings

1. Setting Mode Selection of the CPU module (For F70S)

RUN(Running Mode)

The processor is in the operation state. It does not accept the operation stop instruction or program writing from the program loader.

TERM(Terminal Mode)

The processor accepts the operation start or stop instruction or program writing from the program loader.

STOP(Stop Mode)

The processor is in the stop state. It does not accept the operation start instruction or program writing from the program loader.

TEST(Test Mode)

The test mode is used for debugging. The processor accepts various instructions and operation from the program loader.

Please set the Mode selection depending on the usage. Typically, this is set to the RUN Mode.

2. Setting the Station number of the P-Link module

ST No. switch. 0 to F on the dial correspond to station numbers 0 to 15.

MODE switch. Top position: Station Number setting switch. Bottom position: System definition.

a) When the station number setting switch position is selected, P-Link station numbers are set with the ST No. switch. When the power is turned on, the processor reads the setting switch data as the P-Link station numbers. These station numbers cannot be changed after the power is turned ON. Settings of local station numbers in the system definition are ignored

b) When the switch is set to system definition, the P-Link station numbers are set by P-Link registration in the system definition using the program loader.

Step 2. P-Link Network registration

1. Starting the VRIONT device

VRIREG P-Link registration program has to be successfully run first before running Citect with the P_LINK driver. The VRIREG program sets up the P-Link system so that the VRIONT service is started automatically upon system start-up. During this registration process, a device name string is assigned to the VRIONT device (allowable strings FMV2PLK0 ~ FMV2PLK9).

Note: Please take note that there is no English version of the VRIREG P-Link registration program as of the moment. Only Japanese version is available. Its accompanying manuals and instructions are also in Japanese. Please contact Fuji Electric, Japan regarding its availability.

2. Setting up the P-Link network

Before the Citect P_LINK driver can be used, the P-Link network should first be defined, including the definition of the P Link memory mapping. This should be done for all the MICREX-F devices which are interconnected through the P-Link

Network. **For setting up the P-Link memory of the MICREX-F device, the MICREX-F Programmer utility (supplied by Fuji Electric) should be used.**

Step 3. Citect Computer P-Link Setup

Before the driver is used, the Common P-Link Memory Configuration should be filled up properly. The settings should be put in Citect.ini.

1.1.3 Hints, Tips, and Frequently asked questions

1.1.3.1 Restarting the VRIONT device

There are instances when the VRIONT device will refuse to communicate through the P-Link API. This may be caused by more than one application using the VRIONT device at one time. As an example, while a Citect P-Link project is running, an application using the P-Link API (eg. test program) is run. This procedure will cause the VRIONT device to lock-up somehow, and further attempts running the Citect P-Link project will never bring P-Link communication online again. We could re-boot the Citect PC, but sometimes, this is not practical.

A simple workaround is to close all applications using the VRIONT device, go to Control Panel | Devices, select the VRIONT device, then restart (stop and start) it. After this operation, VRIONT will be ready to use.

1.1.3.2 Adding and Removing P_Link stations

LinkStations will be checked during runtime, in either during a read or a write command. On every read and write command, the LinkStation's configuration will be checked. If configuration did not change, read and write command return NORMAL. Otherwise if the LinkStation configuration changed, a WARNING message will be sent back to Citect. Take note that this warning is not considered an error, so this message will not appear in the kernel main page. This message will only appear in the Hardware alams page as: "I/O Device Warning". If this type of warning message appears in the hardware alarms page, this means that the LinkStations configurations may have changed. So the customer is urged to check the citect.ini for correct entry in the LinkStations parameter.

LinkStations will not be checked at initialisation.

When Citect sends initialise command to the driver, the driver can only reply in 2 ways. Either the initialisation request returns SUCCESS or FAILURE. If the return is SUCCESS, then the device is set ONLINE. If FAILURE, the device is set OFFLINE. Return values other than SUCCESS is treated as FAILURE, this includes the warning value returned by a change in LinkStations. This is the reason why we can't check LinkStations during initialisation. If we want the device to go to OFFLINE, then we can.

Workaround is to have a cicode function that reads a dummy tag every start-up of the project.

1.1.4 Reference: Required components

The VRIONT device should be started normally first before using this driver.

1.1.5 Reference: Communications forms

Boards form

Field	Default	Allowable values
Board Name	This field is user defined, and is not used by the driver.	
Board Type	P_LINK	
Address	0	
I/O Port	BLANK	
Interrupt	BLANK	
Special Opt	BLANK	
Comment	This field is user defined and is not used by the driver.	

Ports form

Field	Default	Allowable values
Port Name	This field is user defined and is not used by the driver.	
Port number	BLANK	
Board name	Refers to the board previously defined in 'boards' form.	
Baud rate	BLANK	
Data bits	BLANK	
Stop bits	BLANK	
Parity	BLANK	
Special Opt		
Comment	This field is user defined and is not used by the driver.	

I/O Devices form

Field	Default	Allowable values
Name	This field is user defined, and is not used by the driver.	
Number	Must be unique, but is not used by the driver.	
Address	BLANK	
Protocol	P_LINK	
Port name	Refers to the port previously defined in 'ports' form.	
Comment	This field is user defined and is not used by the driver.	

1.1.6 Reference: Wiring diagrams

Standard P-Link wiring connection.

Wiring must be connected in series, never branched. Wiring need not be made in the order of station numbers. Terminating resistors (75ohms) must be connected to both ends of the P-Link. If terminating resistors are not connected at the cable ends, or connected in another location, a P-Link transmission error may occur.

1.1.7 Reference: Data types

IO Device Type	Citect data format	Citect data types	Description/Special Usage/Limitations/ Valid Ranges
P-Link memory	WL.***a[.c]***	DIGITAL, INT, BCD, LONG	*a*:0-511, *c*: 0-F High-speed Bit Area, Station 0
P-Link memory	W21.***a[.c]***	DIGITAL, INT, BCD, LONG	*a*:0-1151, *c*: 0-F High-speed Word Area, Station 0
P-Link memory	W22.***a[.c]***	DIGITAL, INT, BCD, LONG	*a*:0-3071, *c*: 0-F Low-speed Word Area 1, Station 0
P-Link memory	W23.***a[.c]***	DIGITAL, INT, BCD, LONG	*a*:0-3071, *c*: 0-F Low-speed Word Area 2, Station 0

Note: Referring to the preceding table, under "Citect data format", the entry inside the square bracket, e.g.: WL.***a[.c]*** is optional. Each unit of P-Link memory is primarily a 16-bit INT data type, but can optionally be accessed as a bit in the word. Additionally, it may also be accessed as a LONG and as a BCD, as the driver will do necessary data conversion internally.

1.2 Driver reference

	Detail
Driver name	P_LINK
Maximum array size[1]	2048 bits

1.2.1 Description

This driver is used to communicate FUJI MICREX-F series P-Link interface module NC1H-PL1. The P-Link Interface Module is connected to a Personal Computer (and to Citect) through a P-Link Network Card CNVAD020-01.

1.2.2 Driver generated error codes

Driver Error Code (Hexadecimal)	Mapped to (Generic Error label)	Meaning of Error Code
0x00001000	GENERIC_UNIT_OFFLINE	DEVICE_API_GET_HANDLE_ERROR
0x00002000	GENERIC_UNIT_OFFLINE	DEVICE_API_PLINK_ERROR
0x00003000	GENERIC_UNIT_OFFLINE	DEVICE_API_INVALID_HANDLE
0x00004000	GENERIC_UNIT_OFFLINE	DEVICE_API_BUSY
0x00005000	GENERIC_UNIT_OFFLINE	DEVICE_LINKTSATIONS_CHANGED
0xE000FF28	GENERIC_UNIT_OFFLINE	DEVICE_API_PARAM_ERROR
0xE000FF42	GENERIC_UNIT_OFFLINE	DEVICE_API_SYSTEM_ERROR
0xE000FF43	GENERIC_GENERAL_ERROR	DEVICE_API_LENGTH_ZERO

[1] Equivalent to 'Maximum Request Length'

0xE000FF4A	GENERIC_UNIT_OFFLINE	DEVICE_API_BAD_PLINK_STATUS
0xE000FF4C	GENERIC_GENERAL_ERROR	DEVICE_API_INVALID_ADDR
0xE000FF4E	GENERIC_GENERAL_ERROR	DEVICE_API_LENGTH_INVALID
0xE000FF4F	GENERIC_UNIT_OFFLINE	DEVICE_API_PLINK_NOT_RUNNING
0x0000FFFF	GENERIC_UNIT_OFFLINE	DEVICE_API_ERROR

1.2.3 Parameters, options, and settings

Standard Parameters

Parameter	Default	Allowable values
Block (bytes)	212	4 to 212
Delay (mS)	0	0 to 300
MaxPending	2	1 to 32
Polltime (mS)	0	0 to 300
Timeout (mS)	1000	500 to 30000
Retry	1	0 to 8
WatchTime (Sec)	30	0 to 128

Driver Specific Parameters

Parameter	Default	Allowable values
MaxOutStanding	1	1
HSBA	2	0 to 15
HSBABlocks	2	1 to 2 blocks
HSWA	1	0 to 35
HSWABlocks	1	1 to 8 blocks
LSWA1	1	0 to 95
LSWABlocks	1	1 to 16 blocks
LSWA2	1	0 to 95
LSWA2Blocks	1	1 to 16 blocks
LinkStations	0,A	0 to F
FMV2PLK	0	0 to 9 0 for FMV2PLK0, 1 for FMV2PLK1, ……. 9 for FMV2PLK9.

Note:
Common P-Link Memory Configuration for the Local Station
HSBA – High Speed Bit Area Block start address
HSBABlocks – number of blocks of HSBA configured
HSWA – High Speed Word Area Block start address
HSWABlocks – number of blocks of HSWA configured
LSWA1 – Low Speed Word Area 1 Block start address
LSWA1Blocks – number of blocks of LSWA1 configured
LSWA2 – Low Speed Word Area 2 Block start address
LSWA2Blocks – number of blocks of LSWA2 configured

LinkStations – the P-Link stations which are to be linked in the network.
Eg; 0,1,2,3,4,5,B (means that Stations 0 to 5 and Station 11 will be connected to the network)

Example of a P-Link memory configuration in relation to settings in Citect.ini:

Station 0- P-Link Module for F70S CPU. The P-Link Module's memory is configured using the Micrex-F PLC Programmer software.

Station A- P-Link Network Card (CNVAD020-01) This station simulates a valid Micrex-F Station, this enables a PC to communicate to other Micrex-F stations through the P-Link Common Memory and Citect. This memory may be configured by using the P-LINK API, but is automatically done by the driver through the Common P-Link Memory Configuration for the Local Station settings in Citect.ini file.

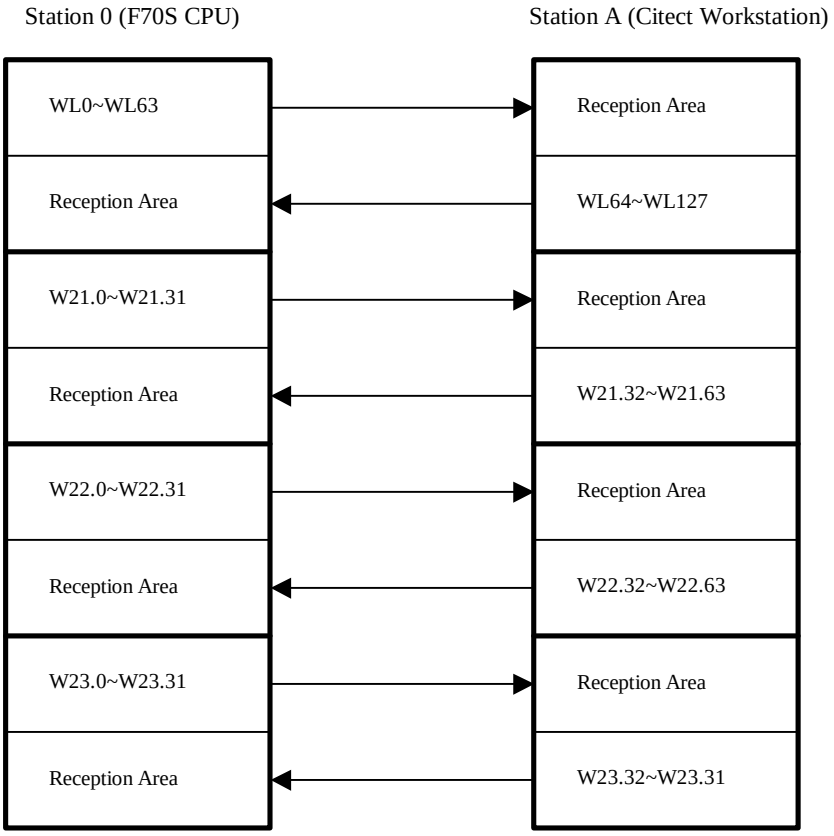
VRIONT device registered as FMV2PLK0.

Citect.ini setting for Station A:
FMV2PLK=0
HSBA=2
HSBABlocks=2
HSWA=1
HSWABlocks=1
LSWA1=1
LSWA1Blocks=1
LSWA2=1
LSWA2Blocks=1
LinkStations=0,A

Station 0 Transmission Area Configuration
WL0 ~WL63 (2 blocks)
W21.0 ~ W21.31 (1 block)
W22.0 ~W22.31 (1 block)
W23.0 ~ W23.31 (1 block)

Station A Transmission Area Configuration
WL64 ~WL127 (2 blocks)
W21.32 ~ W21.63 (1 block)
W22.32 ~W22.63 (1 block)
W23.32 ~ W23.63 (1 block)

Illustration:



Note that a station can only ever write to an address configured as its own Transmission area, though it can read from all areas. From Citect Workstation's point of view, all areas labelled as "Reception Area" under Station A in the preceding figure are all read only memories. Write access to address such as WL0~WL63 is not possible through Citect, since this area is configured as the Reception area, instead, this write must be done through Station 0, which have configured this address as its (Station 0's) Transmission area.

1.2.4 Advanced

Driver generated statistics

Number	Label	Description
0	Total Requests	Total number of requests
1	Total Responses	Total number of responses

Debug messages explained

The debug messages are from the standard driver TraceTx and TraceRx functions. The message data will be displayed as it is.

Driver Start-up

```
Tue May 29 11:30:42 2001 17:11:11.704 CMD:CTDRV_INIT_UNIT, ADR:WL0, CNT:1, RT:1 Length
2
C0 40                                                    .@
Tue May 29 11:30:42 2001 17:11:11.705 Response Init Length 0
Tue May 29 11:30:48 2001 17:11:17.373 Citect Startup 5.30 Rev. 00
```


Read Command & Response

```
Tue May 29 11:31:47 2001 17:12:16.391 CMD:CTDRV_READ, ADR:WL65, CNT:1, RT:1 Length 2
00 00                                                  ..
Tue May 29 11:31:47 2001 17:12:16.393 Response Read Length 0
```

Write Command & Response

```
Tue May 29 11:35:43 2001 17:16:12.589 CMD:CTDRV_WRITE, ADR:WL65, CNT:1, RT:1 Length 2
02 00                                                  ..
Tue May 29 11:35:43 2001 17:16:12.591 Response Write Length 0
```

Bit Read Command & Response

```
Tue May 29 11:36:52 2001 17:17:22.234 CMD:CTDRV_READ, ADR:WL1024, CNT:16, RT:0 Length
2
00 00                                                  ..
Tue May 29 11:36:52 2001 17:17:22.237 Response Read Length 0
```

Bit Write Command & Response

```
Tue May 29 11:38:06 2001 17:18:35.515 CMD:CTDRV_WRITE, ADR:WL1024, CNT:1, RT:0 Length
1
01                                                     .
Tue May 29 11:38:06 2001 17:18:35.519 Response Write Length 0
```

2. Driver implementation

2.1 Development resources

2.1.1 Contacts

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2.1.2 Documents

- MICREX-F User's manual instructions FEH160
- MICREX-F User's Manual communication FEH161

2.1.3 Software / Hardware

1. *Micrex-F Loader Ver3.00 (type:FLT-FDIAT3E)*, which is a programming software for Micrex-F series PLC

2. *Mircex-F FLT-ASFK Adapter*, which is used together with *Micrex-F Loader* software.
3. *F70S PLC* with *NC1H-PL1 installed*
4. *CNVAD020-01 P-Link network card attached to the PC where Citect is installed*
5. *VRIREG registration software*

2.2 Risk areas

N/A

2.3 Development plan

N/A

