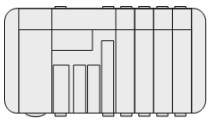
The OmronPLC Driver



The OmronPLC driver links Omron Programmable Logic Controllers (PLC) via the Host Link Protocol (also known as the SYSMAC WAY). Available for ObSys and Commander

This document relates to OmronPLC driver version 1.1

Please read the *Commander Manual* or *ObSys Manual* alongside this document, available from *www.northbt.com*

Contents

Compatibility with the OmronPLC System

The OmronPLC driver allows North to interface with the Omron Programmable Logic Controllers using the Omron 1:N Host Link protocol.

The driver either connects directly to an Omron PLC via an RS232 serial connection (Fig.1) or can connect to a network of up to 32 units via a Link Adapter using an RS422 interface.

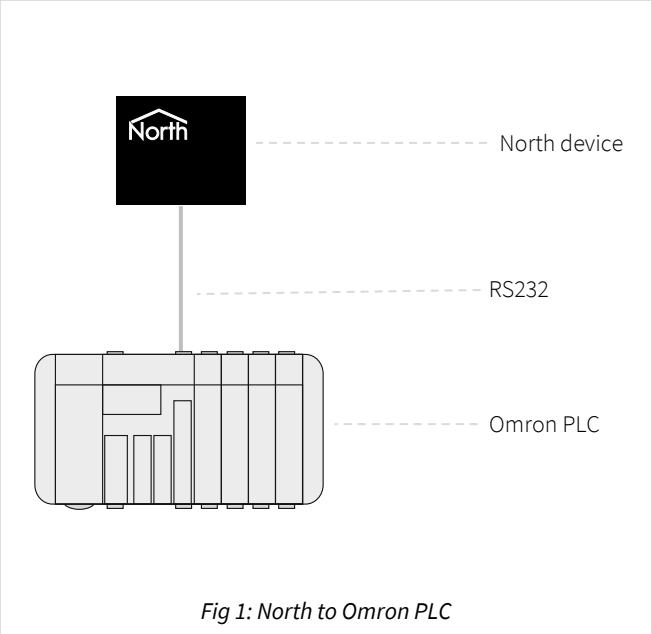


Fig 1: North to Omron PLC

Equipment

Omron PLCs compatible with the driver include:

- All C series PLCs (C120, CxxK, CxxH, CQM1, C200H/S, C500, C1000H, C2000H)
- CV series PLCs in C-mode
- CJ series

Values

The driver can typically access words from within the following areas:

- Channel IO
- Holding/Latch
- Link
- Auxiliary
- Timer PV
- Counter PV
- Data Memory

The values of each word can be decoded in a variety of ways, including:

- Unsigned binary
- Signed Binary
- ASCII Characters
- Bit Values

Prerequisites

An Omron PLC does not have a standard list of variables within it. The North engineering software shows an example set of areas/words/decodes. Other area words and decodes can be generated manually.

Omron PLCs do not report alarm events or store logged data.

Using the Driver

On ObSys, the OmronPLC driver is pre-installed. On Commander, the driver is available to download in the file 'Bank15 OmromPLC.cdm'. On all of these North devices, you can use the driver to create an interface to OmronPLC. Once started, you will need to set up the driver before it can communicate with the Omron system.

Making the Cable

Using the RS232 cable specification, connect the North Device COM port to the PLC 'RS232' port. Connector types at each end of the cable are shown.

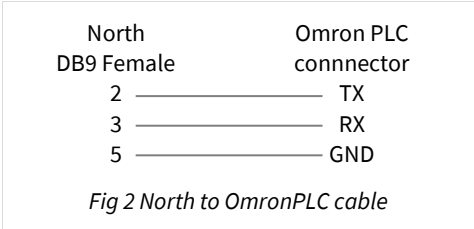


Fig 2 North to OmronPLC cable

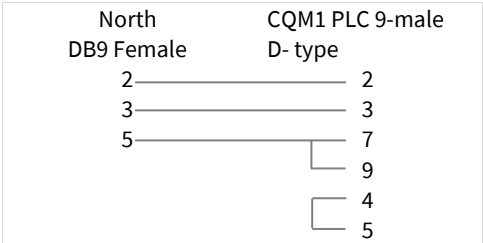


Fig 3 North to OmronPLC CQM1 Cable

Note: The Omron PLC RS232 9-way connector is non-standard.

The maximum RS232 cable length is 15m and should be as short as possible.

Cables are available from North, order code CABLE/OmronPLC/DB9.

Starting the Interface

To start an interface using the OmronPLC driver, follow these steps:

- → **Start Engineering** your North device using ObSys
- → Navigate to **Configuration, Interfaces,** and set a unused **Interface** to 'OmronPLC' to start the particular interface
- → Navigate to the top-level of your North device, then rescan it

The driver setup object (Mc), labelled **OmronPLC Setup**, should now be available. If this object is not available, check an interface licence is available and the driver is installed.

Setting up the Driver

To set up the driver, follow these steps:

- → Navigate to the **OmronPLC Setup** object (Mc). For example, if you started interface 1 with the driver earlier, then the object reference will be 'M1'
- → Set the **RS232 Com Port** (RS.COM) to select which serial port on the North Device is connected to the OmronPLC device.
- → Set Baud rate (RS.BR) to match that of the Omron PLC.

Checking Communications

You can check the driver is communicating with an Omron PLC by checking it responds to different area word requests. The particular area word to use may vary, depending on the programming of the PLC.

Omron PLC Operation

An Omron PLC usually runs a program that reads values from its inputs, calculates intermediate values, and then sets its output values. Originally designed for digital input/outputs, later versions supported analogue inputs and outputs.

Types of Data

A PLC supports different types of values, which are stored in different areas:

- Channel IO (CIO) values are the real-world inputs and outputs
- Holding/Latch (HR) values hold values that are non-volatile
- Link (LR) values are used to pass values automatically between PLCs
- Auxiliary (AR) values are used to hold special values
- Timers/Counters (TC) values are used to hold timing values
- Data Memory (DM) values provide general access to memory

Decodes

All areas contain 16-bit word values. These can be used in a variety of ways. For example, 16 digital input states may be stored in one 16-bit word, whereas a single counter value may require one (or more) complete word(s). The actual decoding to use on an individual word from an individual PLC can only be found if the PLC programming is known – the OmronPLC driver allows a word to be viewed with different decodes applied, to assist in object reference discovery.

Object Specifications

Once an interface is started, one or more extra objects become available within the top-level object of the device. As with all North objects, each of these extra objects may contain sub-objects, (and each of these may contain sub-objects, and so on) - the whole object structure being a multi-layer hierarchy. It is possible to navigate around the objects using the ObSys Engineering Software.

Each object is specified below, along with its sub-objects.

Example Object Reference

An example of a reference to an object in the same device: the OmronPLC (S1) contains Unit 1 (U1), which itself contains a Channel IO Area Word 3 (IR3), which itself has an unsigned binary value sub-object ('C'). Therefore, the complete object reference is 'S1.U1.IR3.C'.

An example of a reference to an object in a different device: the IP network object (IP) contains Default Commander object (CDIP), which contains the object above (S1.U1.IR3.C) – therefore the complete object reference is 'IP.CDIP. S1.U1.IR3.C'.

Device Top-Level Objects

When an interface is started using the OmronPLC driver, the objects below become available within the top-level object of the device. For example, if interface 1 is started, then the object references 'M1' and 'S1' become available.

Description	Reference	Type
OmronPLC Setup Set up the OmronPLC driver, started on interface *c* (*c* is the interface number)	M*c*	Fixed Container: On the Commander platform this will be *[CDM v10\OmronPLC v10]* On the ObSys platform this will be *[OSM v10\OmronPLC v10]*
OmronPLC System Access OmronPLC system connected to interface *c* (*c* is the interface number)	S*c*	Variable Container: *[OmronPLC v10]*

OmronPLC Driver Setup

Object Type: *[OSM v10\OmronPLC v10]*
Object Type: *[CDM v10\OmronPLC v10]*

The OmronPLC driver contains the following objects:

Description	Reference	Type
RS232 COM Port	RS.COM	Obj\Num:1…8; Adjustable
Baud rate	RS.BR	Obj\Num; Adjustable; in the 1200, 2400, 4800, 9600, 19200, 38400
Formula *x* *Setup* The Formula number, *x*, is in the range 1...20	F*x*	Fixed Container: *[Standard\AMFormula]*

Formula Setup

Object Type: *[Standard\AMFormula]*

A standard formula setup defines maths constants that allows values to be converted into engineering units.

These constants, M and A, allow a simple formula to be applied to an Omron Word value so that the resulting object value contains a meaningful value.

The constants are used in the formula:

```
real-value = (M x raw-value) + A
```

The constants M and A are engineer-defined. When writing, the driver applies the inverse formula below:

```
raw-value = (real-value – A) / M
```

There are 20 user-defined formula, and 20 predefined formula.

Example of Formula Use

A register value contains a temperature value, where value 0 = -50°C and value 65535 = +50°C.

The value-range is 100 (-50...50) and the value-offset is -50. The raw-range is 65535, and the M constant can be found from the formula value-range/raw-range, or 100/65535 = 0.0015259

If A is set to -50 (the value offset) and M=0.0015259, then the formula would be:

temperature = (0.0015259 x raw-register-value) + -50

So, the following temperatures can be calculated from the register values:

Register value	**Temperature**
0	-50°C
32767	0°C
49150	25°C
65535	50°C

The module contains the following objects:

Description	Reference	Type
Addition value	A	Obj\Float; Adjustable
Multiplication value	M	Obj\Float; Adjustable

OmronPLC System

Object Type: *[OmronPLC v10]*

The OmronPLC system contains the following objects:

Description	Reference	Type
Unit *x* The PLC unit address, x, can be in the range 0…31	U*x*	Fixed container: *[OmronPLC v10\Unit]*

Unit

Object Type: *[OmronPLC v10\Unit]*

A Unit object represents a PLC and contains the following sub-objects.

Description	Reference	Type
Type The type of the PLC, as returned in the protocol	T	Obj\Text: 21 chars; Adjustable
Mode Operating mode of the PLC	M	Obj\ENum; Adjustable where: 1=Run, 2=Monitor, 3=Program
Information Text containing 4 numbers separated by '|' character 1st: Start Switch Off – 0=false, 1=True 2nd: Error Diagnosis in progress – 1=True 3rd: Location of Prog Area – 0=ROM, 1=RAM 4th: Prog Area size in KB	I	Obj\Text
CPU Errors Shows a list of error statuses within the CPU	E	Fixed Container: *[OmronPLC v10\Error]*
Data Memory Word *w* Represents Data Memory Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	DM*w*	Fixed Container: *[OmronPLC v10\DecodeDM]*
Channel IO Area Word *w* Represents Channel IO Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	IR*w*	Fixed Container: *[OmronPLC v10\DecodeIR]*
Holding/Latch Area Word *w* Represents Holding/Latch Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	HR*w*	Fixed Container: *[OmronPLC v10\DecodeHR]*
Auxiliary Area Word *w* Represents Auxiliary Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	AR*w*	Fixed Container: *[OmronPLC v10\DecodeAR]*
Link Area Word *w* Represents Link Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	LR*w*	Fixed Container: *[OmronPLC v10\DecodeLR]*
Timer Area Word *w* **Counter Area Word *w*** Represents Data Memory Area word *w*, where *w* is in the range 0...9999. See Note 1 & 2.	TC*w*	Fixed Container: *[OmronPLC v10\DecodeTC]*

Notes:

1. The general protocol allows requests for word 0 to word 9999, although individual words may or may not respond depending on the type of PLC and the PLC setup.
2. PLC words can typically only be written when the PLC is in Monitor or Program mode.

CPU Errors

Object Type: [OmronPLC v10\Errors]

Description	Reference	Type
Memory Error	B0	Obj\NoYes
IO Bus Error	B2	Obj\NoYes
No End Instruction	B6	Obj\Text
System Error	B7	Obj\NoYes
Battery Error	B13	Obj\NoYes
Special IO Error	B14	Obj\NoYes
FAL Generated	B15	Obj\NoYes
IO Verify Error	B19	Obj\NoYes
Cycle Time Overrun	B20	Obj\NoYes
Number Duplication	B21	Obj\NoYes
IO Setting Error	B22	Obj\NoYes
SYSMAC Bus Error	B23	Obj\NoYes

Decode

Object Type: *[OmronPLC v10\DecodeIR]*
Object Type: *[OmronPLC v10\DecodeDM]*
Object Type: *[OmronPLC v10\DecodeAR]*
Object Type: *[OmronPLC v10\DecodeLR]*
Object Type: *[OmronPLC v10\DecodeCT]*

The various objects contain decodes of a particular word value, enabling the engineer to determine the relevant decode value. Some engineering view may show fewer decodes, but all are available.

Description	Reference	Type
TimerCounter Status [ONLY available in Timer PV and Counter PV Words]	S	Obj\OffOn
Word as Unsigned Binary Word decoded as an unsigned binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	C*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
Word as Signed Binary Word decoded as a signed binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	G*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
Word bit *b* The bit value of bit *b* of the word, where *b* is in the range 0...15	B*b*	Obj\NoYes; may be Adjustable depending on PLC Adjustable
Upper byte as Unsigned Upper byte of word decoded as an unsigned binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	E*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
Lower byte as Unsigned Lower byte of word decoded as an unsigned binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	F*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
Hexadecimal Text Word value as 4 hexadecimal characters	I	Obj\Text; Max chars: 4; may be Adjustable depending on PLC; may have range based on PLC
2 Words as Unsigned binary 2 Words (this and the following) decoded as an unsigned binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	D*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
2 Words as Signed binary 2 Words (this and the following) decoded as a signed binary value, with optional formula *f* applied. Formula *f* is in the range 1...40 (see note 1)	H*f*	Obj\Float; may be Adjustable depending on PLC; may have range based on PLC
***x* Words as ASCII characters** Each upper and lower byte decoded as an ASCII character to form a text value of up to (x*2) characters	A*x*	Obj\Text; may be Adjustable depending on PLC; may have range based on PLC

Notes:

1. An optional formula number, *f*, may be applied where indicated above. The formula number is in the range 1…40, where 1…20 refer to user-defined formulas (see *Formula Setup*), and 21…40 are fixed as follows:

Formula	Multiply	Add
21	10	0
22	100	0
23	1000	0
24	10000	0
25	100000	0
26	0.1	0
27	0.01	0
28	0.001	0
29	0.0001	0
30	0.00001	0

Formula	Multiply	Add
31	2	0
32	5	0
33	0.2	0
34	0.5	0
35	0.05	0
36	0.005	0
37	0.000001	0
38	1	0
39	1	0
40	1	0

Driver Versions

Version	Build Date	Details
1.0	23/2/1998	Driver released
1.1	16/1/2020	Updated driver for latest platforms. Added Error object

Next Steps…

If you require help, contact support on 01273 694422 or visit *www.northbt.com/support*

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Document issued 17/08/2020.