

ASTRA

OMRON Device Driver

www.renuelectronics.com

⌘ Tables of Contents ⌘

<u>Preface</u>	3
<u>1. Introduction</u>	3
<u>2. Technical and Communication Details</u>	4
<u>3. Data Types and Addressing</u>	6
<u>4. Optimisations</u>	9
<u>5. Errors</u>	9

⌘ Preface ⌘

This document introduces you to **OMRON** PLC device driver. This document give you a broad idea of how to use **OMRON** device driver with Astra.

This documnet broadly, tell you about the capabilities and technical details of **OMRON** device driver and how to use the driver.

⌘ Introduction ⌘

The intent of this document is to assist users of **OMRON** PLCs in conjunction with the Astra MMI software package. A general knowledge of the Protocol for **OMRON** PLC family is assumed. The addressing scheme is that of the programming software with some modifications which are explained. Description of the different data types and the addressing scheme should be understood before attempting to use the driver in the Astra project.

The driver is intended to use only on one PC serial port at a time.

The optimization features described in this document can improve performance, but they are not essential for use.

⌘ Technical & Communication Details ⌘

PLC Make :	OMRON
PLC Modles :	The driver supports the following PLC models OMRON K-Type, OMRON H-Type, OMRON CQM1-CPU-21E,
PLC Memory :	WORD Memory.
Communication Protocol :	OMRON (Host link communication by means of command & response between PC & PLC)
Communication Parameters :	
Baud Rate -	9600
Parity -	EVEN
Data Bits -	7
Stop Bits -	1
Cable Connections :	OMRON uses standard RS232C cable for serial communication.
Node ID :	CQM-1 model this node number is set for the PLC in the PLC setup (DM6648, DM6653) Data Memory Register.

⌘ Technical & Communication Details ⌘

Following table details the RS232-C pin names and signal descriptions for 9-pin connector to PC side:

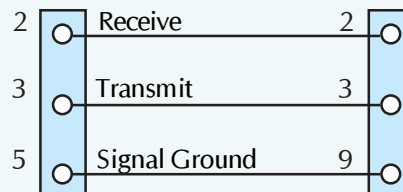
Pin Number	Name	Description
1	CD	Not used
2	RXD	Transmitted Data
3	TXD	Received Data
4	DTR	Not used
5	SG	Signal Ground
6	DSR	Not used
7	RTS	Not used
8	CTS	Not used
9	RI	Not used

Following table details the RS232-C pin names and signal descriptions for 9-pin connector to OMRON PLC side

Pin Number	Name	Description
1	CD	Not used
2	TXD	Transmitted Data
3	RXD	Received Data
4	DTR	Not used
5	RI	Not used
6	DSR	Not used
7	RTS	Not used
8	CTS	Not used
9	SG	Signal Ground

PC-Side
9-pin, D-Type
Connector

PLC-Side
9-pin, D-Type
Connector



⌘ Data Types and Addressing ⌘

Addressing Attributes :

Syntax : <CC> <Nnnnn> [. Xx]

- Where
- CC is Header Code.
 - Nnnn is word address / number.
 - .Xx is Relay / Bit number with dot separator essential in case discrete type tags only.

Address Range:

Model Name : OMRON CQM1-CPU-21E

Data Area	Header Code	Low Address	High Address	Bit Range	Read / Write	Data Types
I/O & Work Relays / Word	IR	0000	0243	00 - 15	RW	Discrete / Unsigned Integer
Special Relays / Word	SR	0244	0255	00 - 15	R	Discrete / Unsigned Integer
Auxiliary Relays / Words	AR	0000	0027	00 - 15	R	Discrete / Unsigned Integer
Holding Relays / Words	HR	0000	0099	00 - 15	RW	Discrete / Unsigned Integer
Link Relays / Words	LR	0000	0063	00 - 15	RW	Discrete / Unsigned Integer
Data Memory Registers	DM	0000	1023	NA	RW	Unsigned Integer
		6144	6655	NA	R	Unsigned Integer
Counter Accumulator Registers	CA	0000	0511	NA	RW	Unsigned Integer
Counter Preset Registers	CP	0000	0511	NA	RW	Unsigned Integer
Timer Accumulator Registers	TA	0000	0511	NA	RW	Unsigned Integer
Timer Preset Registers	TP	0000	0511	NA	RW	Unsigned Integer



Note: All the addresses are in decimal. (NA = Not Applicable).

⌘ Data Types and Addressing ⌘

Model Name : OMRON K-Type.

Data Area	Header Code	Low Address	High Address	Bit Range	Read / Write	Data Types
I/O & Work Relays / Word	IR	0000	0018	00 – 07	RW	Discrete / Unsigned Integer
Special Relays / Word	SR	Not Available	Not Available	NA	NA	NA
Auxiliary Relays / Words	AR	Not Available	Not Available	NA	NA	NA
Holding Relays / Words	HR	0000	0099	00 - 15	RW	Discrete / Unsigned Integer
Link Relays / Words	LR	Not Available	Not Available	NA	NA	NA
Data Memory Registers	DM	0000	0063	NA	RW	Unsigned Integer
Counter Accumulator Registers	CA	0000	0047	NA	RW	Unsigned Integer
Counter Preset Registers	CP	0000	0047	NA	RW	Unsigned Integer
Timer Accumulator Registers	TA	0000	0047	NA	RW	Unsigned Integer
Timer Preset Registers	TP	0000	0047	NA	RW	Unsigned Integer



Note: All the addresses are in decimal. (NA = Not Applicable).

⌘ Data Types and Addressing ⌘

Model Name : OMRON H-Type.

Data Area	Header Code	Low Address	High Address	Bit Range	Read / Write	Data Types
I/O & Work Relays / Word	IR	0000	0246	00 – 15	RW	Discrete / Unsigned Integer
Special Relays / Word	SR	0247	0255	00 – 15	R	Discrete / Unsigned Integer
Auxiliary Relays / Words	AR	0000	0027	00 - 15	R	Discrete / Unsigned Integer
Holding Relays / Words	HR	0000	0099	00 - 15	RW	Discrete / Unsigned Integer
Link Relays / Words	LR	0000	0063	00 - 15	RW	Discrete / Unsigned Integer
Data Memory Registers	DM	0000	0899	NA	RW	Unsigned Integer
		1000	1799	NA	R	
Counter Accumulator Registers	CA	0000	0511	NA	RW	Unsigned Integer
Counter Preset Registers	CP	0000	0511	NA	RW	Unsigned Integer
Timer Accumulator Registers	TA	0000	0511	NA	RW	Unsigned Integer
Timer Preset Registers	TP	0000	0511	NA	RW	Unsigned Integer



Note: All the addresses are in decimal. (NA = Not Applicable).



Optimizations



Use the following guidelines so that you can get an optimum performance from the driver PLC combination.

- ⦿ Whenever possible, use consecutive addresses, this reduces the overhead on the communication per requested data byte, word or double word.
- ⦿ When a same address is to be used for two different tags in Astra, make sure that the scan time is the same for both the tags, this ensures that the address is fetched only once for both the tags.
- ⦿ Use higher scan rates whenever the application allows to do so, this ensures that the critical tags with lower scan rates are fetched with minimum overhead.



Errors



The entire time a Astra project is running, the Event Logger displays the status and any errors that the program generates. The driver utilizes the Event Logger to display error messages regarding the driver. Below are the error messages, the probable cause and most likely solution to all the errors the driver can generate.

Errors displayed as strings

- | | |
|--------------------------------|----------------------------------|
| 1. NULL Pointer for Login Data | 2. NULL Pointer for Project Path |
| 3. NULL Pointer for Tag Table | 4. NULL Handle for Data Manager |

Explanation : Internal Fatal Error.

Action : Contact Astra support.

- | | |
|--|--|
| 5. Insufficient Memory for Request Manager | 6. Insufficient Memory for Transaction Manager |
| 7. Insufficient Memory for Device Manager | |

Explanation : Internal Fatal Error.

Action : Try making more memory available for the project.

8. Cannot Pagelock Tag Table

Explanation : Internal Fatal Error.

Action : Contact Astra support.



Errors



9. Cannot Open File PLCTAG.DAT

Explanation : Internal Fatal Error. The input file PLCTAG.DAT does not exist or is corrupt.

Action : Open the project in the configuration mode and close it, this process recompiles the PLCTAG.DAT file.

10. Cannot Read File PLCTAG.DAT

11. Insufficient Memory for Tag

12. Insufficient Memory for Tag2

13. Insufficient Memory for Tag Container

14. Insufficient Memory for Node

15. Insufficient Memory for Node Container

Explanation : Internal Fatal Error.

Action : Try making more memory available for the project.

16. No Tags in the Project

Explanation : Internal Fatal Error. The driver detected no valid tags in the project.

Action : Recheck the project in the configuration mode. See if any tags are assigned to this particular device. See if the Node details are correct.

17. No Valid Nodes in the Project

Explanation : Internal Fatal Error. The driver detected no valid nodes in the project.

Action : Recheck the project in the configuration mode. See if the Node details are correct.

18. Multidrop not Supported

Explanation : Internal Fatal Error. An attempt was made to attach two nodes on the same driver when Multidrop is not supported.

Action : Recheck the project in the configuration mode. See if the Node details are correct.

19. Multiple nodes with same ID

Explanation : Internal Fatal Error. An attempt was made to attach two nodes on the same driver with same Node IDs.

Action : Recheck the project in the configuration mode. See if the Node details are correct.

20. Insufficient Memory for Request

21. Insufficient Memory for Request2

22. Insufficient Memory for Request Container

23. Insufficient Memory for Dummy Request

24. Insufficient Memory for Action

25. Insufficient Memory for Action Container

26. Cannot Create Communication Window

Explanation : Internal Fatal Error.

Action : Try making more memory available for the project.



Errors



27. Cannot Open Communication Port

Explanation : Internal Fatal Error. Could not initialize the Communication port for the given settings.

Action : For the selected Communication port, check for -

- ⊙ If the port physically exists.
- ⊙ If the Communication hardware uses standard base addresses. COM1 uses hex 3F8 and COM2 uses hex 2F8.
- ⊙ If there is any IRQ contention at the hardware level. COM1 uses IRQ4 and COM2 uses IRQ3.
- ⊙ If any other program is already using the Communication port you have requested for
- ⊙ If any DOS level TSRs are running which are using the Communication port you have requested for.
- ⊙ If a mouse driver is installed on the same Communication port you have requested for in Windows environment.
- ⊙ If a mouse driver is installed on the same Communication port you have requested for on DOS environment.
- ⊙ If you have directly manipulated the PROJECT.INI file section [COM1] or [COM2], check if the settings for Baud Rate, Data Bits, Stop Bits and the Parity are standard. Try using the Communication port setting utility provided with Astra in case you are in doubts about the standard settings.

28. Cannot Build Communication DCB

Explanation : Internal Fatal Error. Could not initialize the Communication port for the given settings.

Action : If you have directly manipulated the PROJECT.INI file section [COM1] or [COM2], check if the settings for Baud Rate, Data Bits, Stop Bits and the Parity are standard. Try using the Communication port setting utility provided with Astra in case you are in doubts about the standard settings.

29. Cannot Set Communication State

Explanation : Internal Fatal Error. Could not initialize the Communication port for the given settings.

Action : If you have directly manipulated the PROJECT.INI file section [COM1] or [COM2], check if the settings for Baud Rate, Data Bits, Stop Bits and the Parity are standard. Try using the Communication port setting utility provided with Astra in case you are in doubts about the standard settings.



Errors



30.NULL Pointer for Model Names

Explanation : Internal Fatal Error.

Action : Contact Astra support.

31.Read Queue Full

32. Device Time Out

Explanation : The Device did not respond and the Device driver timed out. The Driver will retry the request to Device for a specified number of times and if the Device still does not respond the driver will HALT its transactions with the Device.

Action : If this happens during **initialization**, check –

- ⊙ Whether the Device power is on.
- ⊙ Whether the cable connections to the device are proper.
- ⊙ Whether the Node ID settings are proper in case the Device supports it.
- ⊙ Whether the Device model is the same as configured in the Node Configuration.
- ⊙ Whether the Communication hardware is proper and works.
- ⊙ Whether strong EMI or RFI fields are existent which cause noise on the Communication line.
- ⊙ Whether some turnaround delay is required, try changing the entries in the DRIVERS.INI file. This may be typically required for faster PCs on which Astra runs.

If this happens during the **Run**, check –

- ⊙ Whether other applications block the Windows, in such a case the retry mechanism will normally re-establish the Communication.
- ⊙ Whether the cable connections have been disturbed.
- ⊙ Whether the Device has malfunctioned.
- ⊙ Whether the Communication hardware is proper and works.

33. Invalid IEEE Format

Explanation : The 32 bits read from the Device contained bit values such that it could not be interpreted as a valid IEEE format.

Action : Use OEM software and initialize floating type tags in the plc.



Errors



34. Write Queue Full

Explanation : The write request sent by the Astra is queued for faster execution, the current limit for the queue size is 300. If the queue is full this message will be prompted and the latest request will be ignored.

Action : Go to the project configuration file and put an entry with section name "QueueSize". Under this section name, put a key name "WriteQueue", so that it looks like: [QueueSize]

WriteQueue = WXY

Where,

WXY can be upto 5000.

35.No Valid Tags in the Project

Explanation : Internal Fatal Error. The driver detected no valid tags in the project.

Action : Recheck the project in the configuration mode. See if any tags are assigned to this particular device. See if the Node details are correct.

36. Insufficient Memory for Register

37. Insufficient Memory for Tag Container2

38. Insufficient Memory for Register Container

Explanation : Internal Fatal Error.

Action : Try making more memory available for the project.

39. Tag Address Invalid

40. Tag Address Invalid2.

Explanation : The address entered for a Tag is invalid.

Action : Reconfigure the project and check.

41. Driver Scan Halted

42. Driver Scan Halted2

Explanation : The driver has stopped communicating with the device. This may happen in two situations –

⊙ When the initial scan is complete - in this case this is just a status information.

⊙ When time-out has occurred and retry for establishing communication has failed.

Action : In the second case check –

⊙ If the cable connections have been disturbed.

⊙ If the Device has malfunctioned.

⊙ If the Communication hardware is proper and works.



Errors



43. Cannot Find INI File Entry, Setting Default Port

Explanation : The [PROTOCOL] section in PROJECT.INI does not have the driver name against the COM1 or the COM2 entry. In such a case default COM1 is selected as the Communication port.

Action : Run the Communication port setting utility provided with Astra and set all the parameters properly.

44. Cannot Initialise Driver Twice

Explanation : Due to some abnormal termination in a previous run the Device Driver has not unloaded itself and hence could not reinitialise itself.

Action : Restart the project.

45. Cannot Run Without Initialisation

46. Cannot Run Without Initialization2

47. Cannot Write Without Initialisation

48. Cannot Build Frames Without Initialisation

Explanation : Due to some abnormal termination in a previous run, the Device Driver has not unloaded itself and hence could not reinitialise itself.

Action : Restart the project.

49. NULL Pointer for Queue

Explanation : Internal Fatal Error.

Action : Contact ASTRA support.

50. Invalid IEEE Format2

Explanation : The 32 bits read from the Device contained bit values such that it could not be interpreted as a valid IEEE format.

Action : Use OEM software and initialise floating type tags in the device.

51. Cannot Pagelock Buffer

Explanation : Internal Fatal Error.

Action : Contact ASTRA support.

52. Device Response Delay

Explanation : The Device did not respond and the Device driver timed out. The Driver will retry the request to Device for a specified number of times and if the Device still does not respond the driver will HALT its transactions with the Device.



Errors



- Action** : If this happens during **Initialisation** check –
- ⊙ If the Device is powered on.
 - ⊙ If the cable connections to the device are proper.
 - ⊙ If the Device model is the same as configured in the Node Configuration.
 - ⊙ If the Communication hardware is proper and working.
 - ⊙ If strong EMI or RFI fields are existent which cause noise on the Communication line.
- If this happens during the **Run** check –
- ⊙ If in case other applications block the Windows, in such a case the retry mechanism will normally re-establish the Communication.
 - ⊙ If the cable connections have been disturbed.
 - ⊙ If the Device has malfunctioned.
 - ⊙ If the Communication hardware is proper and working.

53. Response Check Sum Error

Explanation : The Device did respond but the bytes received were corrupt. The Driver will retry the request to Device.

- Action** : If this happens during **Initialisation** check –
- ⊙ If the Communication hardware is proper and working.
 - ⊙ If strong EMI or RFI fields are existent which cause noise on the Communication line.
 - ⊙ If the Communication port settings are proper.
- If this happens during the **Run** check –
- ⊙ If the cable connections have been disturbed.
 - ⊙ If the Device has malfunctioned.
 - ⊙ If the Communication hardware is proper and working.



Errors



54. Data Over Flow

Explanation : Unexpected data in large volume was received on the Communication port.

Action : Check –

- ⊙ If the cable connections have been disturbed.
- ⊙ If the Device has malfunctioned.
- ⊙ If the Communication hardware is proper and working.

55. Model Name Invalid

Explanation : Internal Fatal Error. The model name associated with a particular Node was invalid.

Action : Open the project in the configuration mode. Check the model in the Node Configuration and close it.

56. Cannot Open File PLCTAG.DAT 2

57. Cannot Read File PLCTAG.DAT 2

58. Cannot Read File PLCTAG.DAT 3

Explanation : Internal Fatal Error. The input file PLCTAG.DAT does not exist or is corrupt.

Action : Open the project in the configuration mode and close it, this process recompiles the PLCTAG.DAT file.

59. Invalid BCD Format for a WORD

Explanation : The 16 bits read from the Device contained bit values such that it could not be interpreted as a valid BCD format.

Action : Use OEM software and initialise respective tags in the device.

60. Invalid BCD Format for a DWORD

Explanation : The 32 bits read from the Device contained bit values such that it could not be interpreted as a valid BCD format.

Action : Use OEM software and initialise respective tags in the device.

61. Invalid number for conversion to BCD for WORD

Explanation : The 16 bits given for write from ASTRA to the Device contained bit values such that it could not be interpreted as a valid BCD format. Write will not be done in these cases.

Action : Avoid such values.

62. Invalid number for conversion to BCD for DWORD



Errors



Explanation : The 32 bits given for write from ASTRA to the Device contained bit values such that it could not be interpreted as a valid BCD format. Write will not be done in these cases.

Action : Avoid such values.

63. Error Composing Write Request

Explanation : Write request could not be composed. This may happen in two cases –

⊙ Invalid number for write.

⊙ Write Queue full.

Action : Avoid non interpretable values, Avoid writing too fast. Increase WriteQueueSize in project.ini file section [QueueSize]. Lower limit for WriteQueueSize is 300 and the upper limit is 5000.

64. Error Composing Read Request After Write

Explanation : A read request immediately following a write request could not be composed.

This may happen in two cases –

⊙ Invalid number for write.

⊙ Write Queue full.

Action : Avoid non interpretable values, Avoid writing too fast. Increase WriteQueueSize in project.ini file section [QueueSize]. Lower limit for WriteQueueSize is 300 and the upper limit is 5000.

65. Node Failed.

Explanation : Internal Fatal Error. The Node was not able to communicate. In case of Multidrop DEVICE system the node id given to the nodes may be same or cable from PC to DEVICE may be faulty.

Action : Open the project in the configuration mode check the Node Configuration and close it. For Multidrop communication check the node ID. Check the cable.

66. Cannot Open File NODES.DAT

67. Cannot Read File NODES.DAT 2

Explanation : Internal Fatal Error. The input file NODES.DAT does not exist or is corrupt.

Action : Open the project in the configuration mode and close it, this process recompiles the NODES.DAT file.

68. Node set on by user.

Explanation : Not an error . It indicates that node is selected by the user.



Errors



For ASTRA generated default tags for a DEVICE, in that if command tag is 0 then this message is displayed.

Action : None , as it indicates that node is selected by the user.

69. Node set off by user.

Explanation : Not an error . It indicates that node is unselected by the user. For ASTRA generated default tags for a DEVICE in that if command tag is 1 then this message is displayed.

Action : None, as it indicates that node is unselected by the user.

Following error Numbers will be displayed in Event logger of Astra, if appropriate error is encountered:

73. Node manager proc address not defined.

Explanation: Internal Fatal Error.

Action: Contact Astra support.

150. UNDEFINE_TAG

Explanation: This tag address is not defined in the plc. This error number is shown when user tries to write at those addresses.

Action : Define this tag address through ladder program.

151. INVALID_RESPONSE

Explanation: This tag address is not defined in the plc. This error number is shown when user tries to read at those addresses.

Action : Define this tag address through ladder program.

152. COMMUNICATION_ERROR :

Explanation: Indicates communication error (For example, checksum error).

Action : Check communication cable, COM port settings in the project.ini file.

500. NOWRITE_PERMISSION :

Explanation: If OMRON Device Driver is unable to set this bit, it gives error 500 in Event Logger window of Astra-32. While writing data to the PLC, we need to set write permission bit every time i.e. setting PLC to Monitor mode.



Errors



Action: Check the PLC using OEM software. Confirm that it gives access to set monitor bit & allow to modify PLC data.

501. FCS_ERROR:

Explanation: If OMRON Device Driver encounters any error in receipt of complete frame, it gives error 501 in Event Logger window of Astra-32.

This error will be due to following reasons:

- ⊙ Request sent by driver is not executable in MONITOR mode.
- ⊙ Request sent by driver is not executable in PROGRAM mode.
- ⊙ Received Frame Check Sequence error.
- ⊙ The command format sent by driver wrong.
- ⊙ The areas for reading & writing are wrong.
- ⊙ The specified command does not exist
- ⊙ The maximum frame length exceeded.

Action: For details please refer OMRON PLC User Manual for Host Link error topic.

502. INVALID_WRITE_DATA_RANGE:

Explanation: For writing data value of timer & counter's preset / accumulator if user inserts value beyond the range 0-9999, then it gives error 502 in Event Logger window of Astra-32.

Action : User should not enter the data value of timer & counter's preset / accumulator if user inserts value beyond the range 0-9999.



Renu Electronics Pvt Ltd.

S.No. 2/6, Baner Road,

Pune 411045, India.

Tel: + 91 20 2729 2840,

Fax: + 91 20 2729 2839

Email: info@renuelectronics.com

Website: www.renuelectronics.com



RWTUV