

ASTRA

DirNet 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>	11
<u>5. Errors</u>	12

⌘ Preface ⌘

This document introduces user to the **DirNet** Protocol Device Driver. It contains technical information about **DirNet** Device Driver. This document gives you a broad idea of how to use DirNet Device Driver with Astra.

⌘ Introduction ⌘

The intent of this document is to assist users of the **DirNet** Protocols PLC Driver in conjunction with the Astra MMI software package. A general knowledge of the **DirNet** (Koyo N sequence) Protocols PLC family is assumed. The addressing scheme of the programming software with some slight modification is explained in the subsequent chapters. Description of the different data types and the addressing scheme should be understood before attempting to use the driver in Astra project.

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

⌘ Technical & Communication Details ⌘

PLC Make :	_____
PLC Modles :	The driver supports Model TI335 (DL 330) DL330-1Jr, DL330-1, D330-1 Plus, D330-3, DL340
PLC Memory :	_____
Communication Protocol :	DirNet (Koyo N sequence) (Multidrop, RS232 , 3 Wire Half-Duplex)
Communication Parameters :	
Baud Rate	- 9600
Parity	- None
Data Bits	- 8
Stop Bits	- 1
Cable Connections :	The DirNet driver uses the RS232C standard for serial communication.
Node ID :	Use a node ID from 01 to 255.

⌘ Technical & Communication Details ⌘

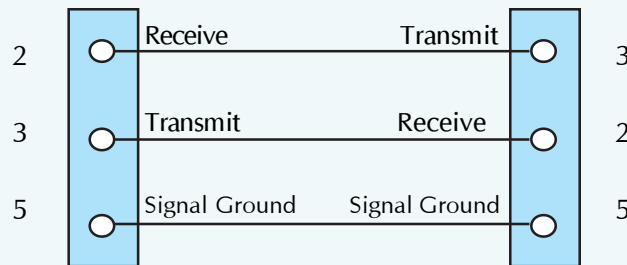
RS232 Cable Diagram:

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

Pin Number	Name	Description
2	RXD	Received Data
3	TXD	Transmitted Data
4	<u>DTR</u>	Data Terminal Ready
5	SG	Signal Ground
6	<u>DSR</u>	Data set ready
7	<u>RTS</u>	Request to send
8	<u>CTS</u>	Clear to send

PC-Side
9-pin, D-Type
Connector

PLC-Side
25-pin, D-Type
Connector



⌘ Data Types and Addressing ⌘

Data Types :

The following is a description of how the DirNet interprets the information from the PLC as different data types. The user is responsible for ensuring that the referenced locations can logically be interpreted as correct type. This is particularly important for floating point numbers, as there are such bit configurations, that are incompatible with the IEEE floating point format.

Data Types

I/O	IO	Boolean
Devices	C, SP, CT, SR	Boolean
8-bit Registers	R	Unsigned Integer.



1. In Data Words
Only even registers are valid. Odd register is equal to its previous even register.
e.g. R501 = R500



2. Discrete type IO0 – IO7 & register R0 represent the same memory location in PLC.

⌘ Data Types and Addressing ⌘

Series One Junior

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
Input / Output Points Corresponding Registers	IO	0	137	Boolean	R/W	Discrete
	R	0	13	Decimal	R/W	Unsigned Integer
Control Relays Corresponding Registers	C	140	377	Boolean	R/W	Discrete
	R	14	37	Decimal	R/W	Unsigned Integer
Shift Registers Corresponding Registers	SR	140	377	Boolean	R/W	Discrete
	R	14	37	Decimal	R/W	Unsigned Integer
Timer / Counter Current Values	R	0	13	Decimal	R/W	Unsigned Integer

⌘ Data Types and Addressing ⌘

Series One

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
Input / Output Points Corresponding Registers	IO	0	157	Boolean	R/W	Discrete
	R	0	15	Decimal	R/W	Unsigned Integer
Control Relays Corresponding Registers	C	160	373	Boolean	R/W	Discrete
	R	16	37	Decimal	R/W	Unsigned Integer
Special Registers Corresponding Registers	SP	374	377	Boolean	R/W	Discrete
	R	37	37	Decimal	R/W	Unsigned Integer
Shift Registers Corresponding Registers	SR	400	577	Boolean	R/W	Discrete
	R	40	57	Decimal	R/W	Unsigned Integer
Timer / Counter Current Values	R	600	677	Decimal	R/W	Unsigned Integer

⌘ Data Types and Addressing ⌘

Series One Plus

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
Input / Output Points	IO	0	157	Boolean	R/W	Discrete
	IO	700	767			
Corresponding Registers	R	0	15	Decimal	R/W	Unsigned Integer
	R	70	76			
Control Relays	C	160	373	Boolean	R/W	Discrete
	R	16	37			
Special Relays	SP	374	377	Boolean	R/W	Discrete
	SP	700	777			
Corresponding Registers	R	37	37	Decimal	R/W	Unsigned Integer
	R	77	77			
Timer/Counter Up status bits	CT	600	677	Boolean	R/W	Discrete
	R	60	67			
Shift Registers	SR	400	577	Boolean	R/W	Discrete
	R	40	57			

⌘ Data Types and Addressing ⌘

Series One Plus

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
Timer/Counter current values	R	600	677	Decimal	R/W	Unsigned Integer
Data Words	R	400	563	Decimal	R/W	Unsigned Integer
Special Registers	R	564	577	Decimal	R/W	Unsigned Integer

⌘ Data Types and Addressing ⌘

Series Three

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
External Input/ Output	IO	0	617	Boolean	R/W	Discrete
Corresponding Registers	R	0	61	Decimal	R/W	Unsigned Integer
Internal Input / Output (Coils)	IO C	4000 7000	4457 7077	Boolean Boolean	R/W R/W	Discrete Discrete
Corresponding Registers	R R	400 700	445 707	Decimal	R/W	Unsigned Integer
Timer/Counter Up status bits	CT	000	177	Boolean	R/W	Discrete
Corresponding Registers	RC	0	17	Decimal	R/W	Unsigned Integer
Shift Registers	SR	1000	1177	Boolean	R/W	Discrete
Corresponding Registers	R	100	117	Decimal	R/W	Unsigned Integer
Timer / Counter Accumulators	R	200	377	Decimal	R/W	Unsigned Integer
Data Words	R	500	677	Decimal	R/W	Unsigned Integer

⌘ Data Types and Addressing ⌘

DL340

Memory Reference Types	Selector / Segment	Low Address (Octal)	High Address (Octal)	Representation	Read / Write	Data Types
Input / Output Points	IO	0	157	Boolean	R/W	Discrete
	IO	700	767			
Corresponding Registers	R	0	15	Decimal	R/W	Unsigned Integer
	R	70	76			
Control Relays	C	160	373	Boolean	R/W	Discrete
	C	1000	1067		R/W	
Corresponding Registers	R	16	37	Decimal	R/W	Unsigned Integer
	R	100	106		R/W	
Special Relays	SP	374	377	Boolean	R/W	Discrete
	SP	777	777			
	SP	1077	1077			
Corresponding Registers	R	37	37	Decimal	R/W	Unsigned Integer
	R	77	77			
	R	107	107			
Timer/Counter Up status bits	CT	600	677	Boolean	R/W	Discrete
	R	60	67			
Shift Registers	SR	400	577	Boolean	R/W	Discrete
	R	40	57			
Timer / Counter current values	R	600	677	Decimal	R/W	Unsigned Integer
Data Words	R	400	563	Decimal	R/W	Unsigned Integer
Special Registers	R	564	577	Decimal	R/W	Unsigned Integer
	R	700	777			



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. Error numbers are displayed in the event logger in case of the error situation.

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.

9. Cannot Open File PLCTAG.DAT
10. Cannot Read 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.

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.



Errors



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.

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.



Errors



- ⊙ 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.

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.



Errors



- ⊙ 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.

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 up to 5000.

35. This error number is no more in use !!! 36. 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.



Errors



37. Insufficient Memory for Register 38. Insufficient Memory for Tag Container2
39. Insufficient Memory for Register Container

Explanation : Internal Fatal Error.

Action : Try making more memory available for the project.

40. Tag Address Invalid 41. Tag Address Invalid2.

Explanation : The address entered for a Tag is invalid.

Action : Reconfigure the project and check.

42. Driver Scan Halted 43. 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.

44. 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.

45. This error number is no more in use !!! 46. Cannot Run Without Initialization
47. Cannot Run Without Initialization2 48. Cannot Write Without Initialisation
49. 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 deinitialize itself.

Action : Unload Windows and restart again.



Errors



50. NULL Pointer for Queue

Explanation : Internal Fatal Error.

Action : Contact ASTRA support.

51. Invalid IEEE Format2

Explanation : This might be caused due to –

- ⊙ Presence of junk values at a particular memory area of your PLC.
- ⊙ Accessing a particular type of tag with improper data type, say accessing a floating point data type as a word.

Action : Doing the following actions in case of above mentioned causes, should help

- ⊙ Using your OEM software, you can fill in proper values at places which have junk values.
- ⊙ Use proper data types for your tags.

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.

Action : If this happens during **Initialisation** check –

- ⊙ If the Device power is 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.



Errors



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

54. 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.

55. 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.

56. 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 .



Errors



57. Cannot Open File PLCTAG.DAT 2

58. Cannot Read File PLCTAG.DAT 2

59. 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.

60. This error number is no more in use !!!

61. This error number is no more in use !!!

62. 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.

63. Invalid number for conversion to BCD for DWORD

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.

64. 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.

65. Invalid number for conversion to BCD for DWORD

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.

66. 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.



Errors



67. 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 : Follow the following actions –

⊙ Avoid non interpretable values.

⊙ Kindly refer to error number 34 to increase the size of the write queue.

68. Node Failed.

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

69. Cannot Open File NODES.DAT

70. 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.

71. Node set on by user.

Explanation : Not an error . It indicates that node is selected by the user. For Astra generated default tags for a PLC, in that if command tag is 0 then this message is displayed.

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

72. 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 PLC in that if command tag is 1 then this message is displayed.

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

73. Node manager proc address not defined.

Explanation : Internal Fatal Error.

Action : Contact Astra support.



Errors



74. The function code received in the query is not an allowable action for the slave ,
Function Code Not supported by device.

Explanation : The user has tried to perform an action which is not allowed by the device.
e.g. If the device does not support WRITE_MULTIPLE_REGISTERS function and user has tried to write then this error will occur. To elaborate if the model is defined as GENERIC and TAG is float/real , which is 4 bytes or 2 registers. And the device connected is CHAM6 . Now CHAM6 does not support simultaneous write on two registers . In such case this error will be reported by the device.

Action : Verify the project and PLC model. Ensure that the device model and Tag defined are supported by the device.

75. The data received in the query is not an allowable address for the slave ,
Invalid address for the Device

Explanation : The request send by the user for the tag is with invalid address. The address specified by the user is an invalid address for the device. This will happen if the Tags are not defined properly or different Model is used.

Action : Ensure that correct model is used and the tag giving the error is defined properly.

76. A value contained in the query data field is not allowable value for the slave ,
Invalid value for the data.

Explanation : The request send by the user for the tag is with invalid data. The data specified by the user is an invalid data for the device. This will happen if the data entered is in invalid format. Normally this will happen in case of floating point data

Action : Ensure that correct model is used and the tag giving the error is defined properly.

77. An unrecoverable error occurred while the slave was attempting to perform the action ,
Exception code 4 from device

Explanation : There was error while performing the action requested

78. The slave has accepted the request and is processing it

Explanation : Response from the device is going to take some time.

Action : Wait till response comes from the device.



Errors



79. Slave is engaged in processing a long-duration program command .

Explanation : The request is received by the device and is engaged in long duration processing and is unable to process the requested query.

Action : The same query should be sent after some time interval.

Received NAK

Explanation : Some tags which are not supported by the device are defined.

Action : Remove the tag. Refer PLC manual for more details.



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

