

User Manual
D.I.I.O. Motor Controller
Direct-On-Line, Variation 1
DIIO-MC-DOL1

Specifications, Wiring Diagrams and Modbus Register Addresses

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INTRODUCTION



The DIIO-MC-DOL1 is part of the D.I.I.O. (Distributed Intelligent I/O) family. These devices are built up with various cards:

- Power Supply Cards (24VDC or 12VDC amongst others)
- Input/Output Cards (Digital Input, Digital Output, Analogue Input, Analogue Output)
- Microprocessor Cards (Various CPUs depending on the function)
- Communications Cards (Modbus Non Isolated RS232 or RS485 and Isolated RS485)
- Auxiliary Power Supply Cards (Isolated 5V or +/- 15V)

These units are pre-assembled and programmed by the manufacturer (DoZeener Controls) according to the customer's specifications. There are also standard modules such as the DIIO-DI-A-8.

The D.I.I.O. family of products can either be used in a stand-alone system, having a network controller (Example: DIIO-Netcon1) to negotiate information across the system or the individual modules forming part of a third party system comprising of PLCs, BMS Controllers, monitoring systems etc.

When ordering this unit the jumper settings on the IO cards must be specified. Below is a breakdown of the part number of the DIIO-MC-DOL1.

Part Number:	DIIO-MC-DOL1 (12VDC/MI485/A)
Part Number Description:	Device Code (Power Supply/Comms Card/IO Card Configuration)
Power Supply Options:	12VDC: 12VDC Power Supply 24VDC: 24VDC Power Supply
Comms Card Options:	MI485: Isolated RS485 MN485: Non Isolated RS485 MN232: Non Isolated RS232
IO Card Options:	A: (Config. Type A: Isolated Internal 5VDC Supply for DIs) B: (Config Type B: Non-Isolated Internal Supply for DIs)

The IO Card Options are the jumper configurations on the IO cards. These can be changed by DoZeener Controls at manufacturing stage, but are not meant to be modified by the user. Opening the module casing will void the warranty of the product.

The digital input statuses are mapped into Modbus registers (Function 03). Appendix A shows a memory map of the Modbus registers.

Apart from the digital input statuses some statistics of the digital inputs are available. These are also shown in Appendix A.

This module as all the others in the DIIO family of products is configurable via the DIIO System Programmer. Please refer to the DIIO System Programmer Manual for more information (Document Code: DZC-DIO-08005EM-1).

DEVICE SCHEMATIC AND IO CONNECTIONS

TOP CONNECTIONS:

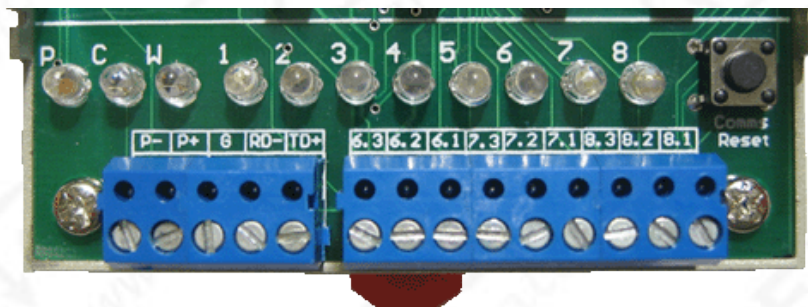


The Top Connections are for digital outputs 1 to 5

The Device Reset button resets the microcontroller. This is particularly useful when a new configuration has been downloaded to the device and needs to be restarted.

When new communication parameters such as baud rate, parity and Modbus address have been downloaded the device must be reset so that it acquires and starts using the new settings.

BOTTOM CONNECTIONS AND INDICATIONS



The bottom connections are for the power supply, communications and inputs 6 to 8.

Also on this side are indications for the following

- P:** Power Supply ON
- C:** Communication activity. Flashes when responding to a request.
- W:** Watchdog. Indicates the unit is healthy
- 1-8:** Input Statuses 1 to 8

The Comms Reset button should be used to reset the unit to default communication setting. When the unit is powered up while holding the button in the depressed position the following default settings are loaded:

Baud Rate: 9600

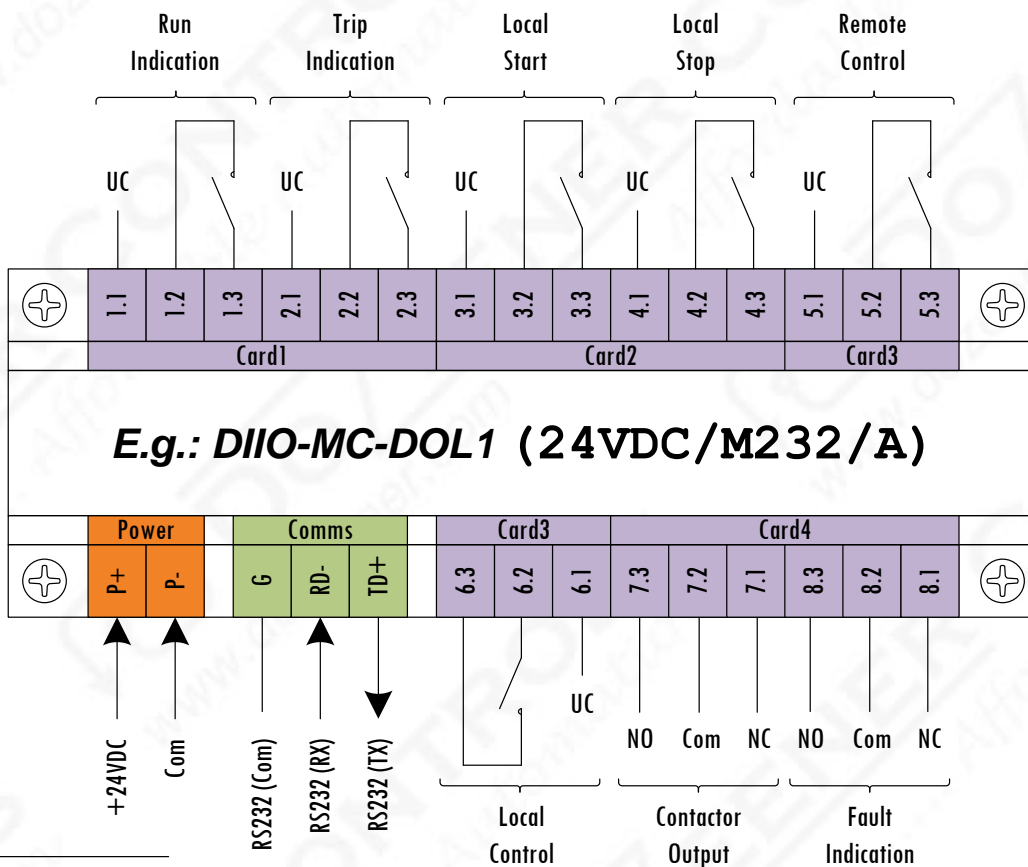
Parity: None

Modbus Address: 1

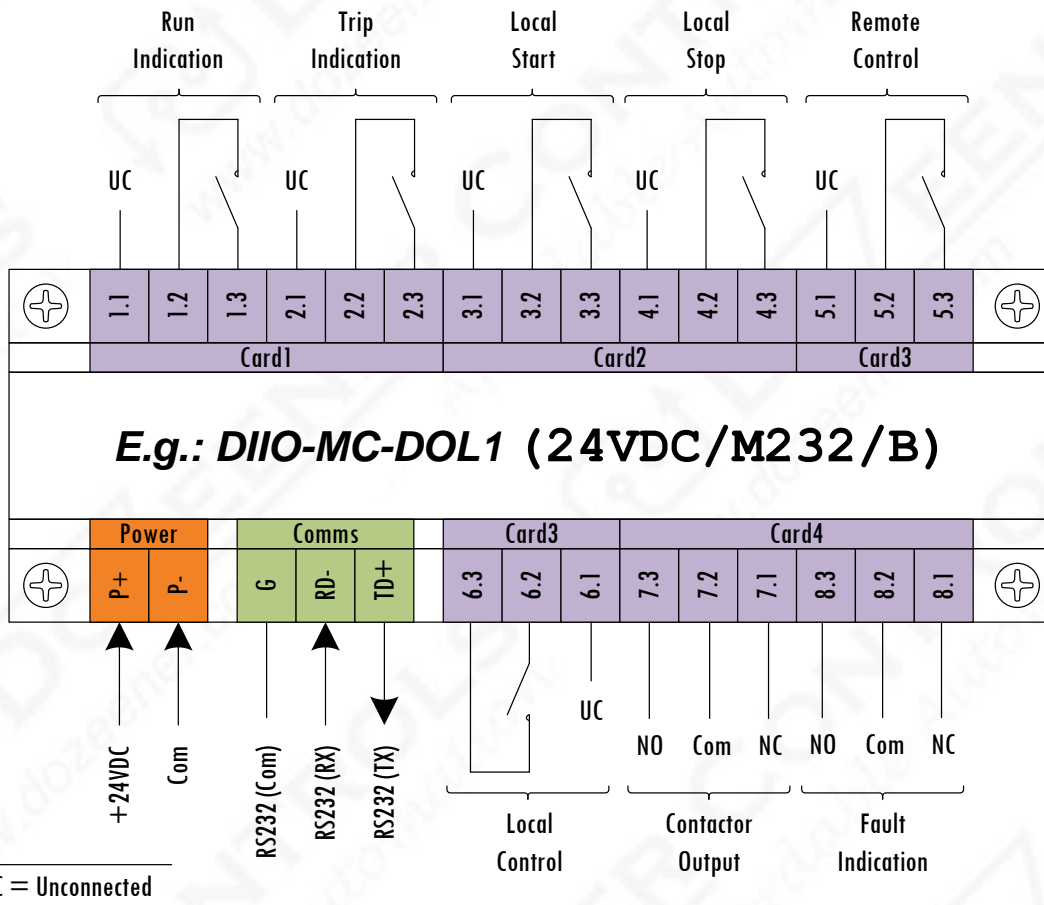
Stop bits is set to 1 and data bits to 8. These are not configurable

WIRING DIAGRAMS

Option A: Input Circuits are internally supplied by an isolated +5VDC Supply



Option B: Input Circuits are internally supplied by an non isolated +5VDC Supply



FUNCTIONALITY

All user controls are wired into the motor control module.

The Local Start and Local Stop signals should be pulse inputs, typically wired to START and STOP push buttons located on the front of a control panel

The Remote Control and Local Control signals should stay on when enabled, typically wired to a LOCAL/OFF/REMOTE selector switch.

The motor control module can have three modes of operation

1. Local:

Activated:

When the LOCAL input signal is On and the REMOTE input signal is Off

Start/Stop Commands:

The Motor is started and stopped via the hardwired Start and Stop signals.

2. Remote Manual:

Activated:

When the REMOTE input signal is On and the LOCAL input signal is Off
AND

The Remote Manual Set Command (Received Via Modbus Address 40012:02) is On and the Remote Auto Set Command (Received Via Modbus Address 40012:01 is Off)

Start/Stop Commands:

The Motor is started and stopped via the Remote Manual Start and Stop Command received via Modbus addresses 40011:01 and 40011:02 respectively

3. Remote Auto:

Activated:

When the REMOTE input signal is On and the LOCAL input signal is Off
AND

The Remote Auto Set Command (Received Via Modbus Address 40012:01) is On and the Remote Manual Set Command (Received Via Modbus Address 40012:02 is Off)

Start/Stop Commands:

The Motor is started and stopped via the Remote Auto Start Command received via one of the 16 bits in the Modbus register address 40016.

Refer to the next section 'Device Setup (DIIO System Programmer Setup Parameters)' on the configuration of the Auto Start Command Bit.

DEVICE SETUP (DIIO SYSTEM PROGRAMMER SETUP PARAMETERS)

The following parameters can be setup for the DIIO-MC-DOL1:

The following table shows the parameters as displayed in the DIIO System Programmer:

DIIO-MC-DOL1: Motor Controller, Direct On Line Starter				
Device Parameters				
No	Description	Range (From)	Range (To)	Default Value
1	Lock for Register 11 - Remote Manual Start\Stop Commands (0 = Unlocked \ 1 = Locked)	0	1	0
2	Lock for Register 12 - Remote Auto/Manual Set Command (0 = Unlocked \ 1 = Locked)	0	1	0
3	Lock for Register 13 - Reset Maintenance Hours (0 = Unlocked \ 1 = Locked)	0	1	0
4	Lock for Register 14 - Reset Alarms (0 = Unlocked \ 1 = Locked)	0	1	0
5	Lock for Register 15 - Reset Device (0 = Unlocked \ 1 = Locked)	0	1	0
6	Default for Register 11 - Remote Manual Start and Stop Commands	0	3	0
7	Default for Register 12 - Remote Auto \ Manual Set Command	0	3	0
8	Default for Register 13 - Reset Maintenance Hours	0	1	0
9	Default for Register 14 - Reset Alarms	0	1	0
10	Default for Register 15 - Reset Device	0	0	0
11	Remote Auto Start Command - Origin Bit	0	15	0
12	Remote Auto Start Command - Lock (1 = Locked)	0	1	0
13	Remote Auto Start Command - Default Value (0 = Off \ 1 = On)	0	1	0
14	Maintenance Running Hours Limit	0	65535	20000
15	Starts Per Hour High Limit	0	65535	30
16	Run Timer Per Hour High Limit	0	60	60
17	Remote Mode at Startup (0=Manual \ 1=Auto)	0	1	0

LOCKS AND DEFAULTS

As standard on all DIIO Devices, the writable registers can be locked so that they cannot be changed by the user or the network controller. When a lock is enabled the register will become read only. A default value can be assigned when a lock is enabled.

Item 1 is the lock for the Remote Manual Start/Stop Commands and Item 6 is the default value if the lock is enabled. The lock should be enabled and default value set to 0 to disable starting in remote manual mode.

Item 2 is the lock for the Remote Auto/Manual Command and Item 7 is the default value if the lock is enabled. The lock should be enabled to force the system in either Auto or Manual when the motor is in remote mode. If a default value of 1 is set, the system will always be in auto when remote mode is selected, otherwise if a default value of 2 is set, the system will always be in manual mode when the remote mode is selected.

Item 3 is the lock for the Resetting of maintenance hours and Item 8 is the default value if the lock is enabled. The lock should be enabled and default value set to 0 to disable the possibility of resetting the maintenance hours via the Modbus network.

Item 4 is the lock for the Alarms reset register and item 9 is the default value if the lock is enabled. This lock should be enabled and default value set to 0 to disable the possibility of resetting the alarms via the Modbus network

Item 5 is the lock for the device reset command and item 10 is the default value if the lock is enabled. This lock should be enabled and default value set to 0 to disable the possibility of resetting the device via the Modbus network.

SETTING THE ORIGIN OF THE AUTO START BIT

When the system is in Remote Auto Mode, starting of the motor can be achieved via the Auto Start Bit. This can be any of the 16 bits in the Modbus register with address 40016.

Item 11 sets the origin of the remote auto start Bit.

Items 12 and 13 are the lock and default value of this bit. If the lock is enabled and default value set to 0 the motor can never be started automatically. If the bit is set to 1 the motor will always start when set to remote auto mode.

ALARM SETPOINTS

MAINTENANCE RUNNING HOURS ALARM

The motor control module has an internal counter used for calculating the running hours of the motor. This counter can be reset by the user.

Item 14 is used to set the maintenance running hours limit. When the motor running hours exceed this value an alarm will be raised.

The following Modbus registers are associated with the Maintenance Running Hours:

- 40001:13 – Alarm Indicating maintenance is required
- 40008 – Current Maintenance Running Hours
- 40013:01 – Resets the maintenance hours

STARTS PER HOUR HIGH ALARM

Item 15 is used to set the limit for the starts per hour. When motor starts exceed this value an alarms is raised via a Modbus register

The following Modbus register are associated with the starts per hours:

- 40001:11 – High Starts Alarm
- 40009 – Current Starts Per Hour
- 40014:11 – Alarms Reset.

RUN TIME PER HOUR HIGH ALARM

Item 16 is used to set the limit for the run time high alarms. When the motor's running time per hour exceeds this value an alarm is raised. This is particularly useful for sump pumps in certain installations which if run more than a certain time might mean a major leak.

The following Modbus registers are associated with the run time high alarm:

- 40001:12 – Run time High Alarm
- 40010 – Run Time Per hour
- 40014:11 – Alarms Reset.

DEFAULT REMOTE MODE AT STARTUP

Item 17 is the default value of the remote mode of operation. This is set at startup.

Value = 0: At startup the remote mode will be set to Manual

Value = 1: At startup the remote mode will be set to Auto

If the Remote Mode is changed by the user and the device is reset, it will not retain the last value but the value entered in item 17.

SPECIFICATIONS

- Electrical:** Isolated or Non Isolated Digital Inputs *
5300 VRMS Optical Isolation Protection
Relay Outputs with switching capabilities of 2A @ 30VDC or 0.5A @ 125VAC
Power Supply 12VDC to 30VDC *
- Comms:** RS232 or RS485, Isolated or Non Isolated *
Modbus RTU Protocol, Baud: 9600-38400, Parity: None/Odd/Even/Mark/Space
Configurable Modbus Address via software
- Hardware:** Removable Plug-in Terminals. Wire Connection from 28 to 16 AWG (1.5mm²)
DIN Rail Mounted Metal Enclosure
Push Buttons for Communication Parameters Reset and Device Reset
Plug In Card Internal Configuration. Inputs paired in two channels per card.
Separate Comms Card, Power Supply and IO Cards.
- Software:** Communication parameters are configured via windows based software.

* Different Part Numbers have to be used for the various configurations

MODBUS ADDRESSES

STANDARD REGISTER SET

READ ONLY REGISTERS

Register Name	Modbus Address	Description	Type
RunIndication	40001:01	Running Indication	Bit
TripIndication	40001:02	Tripped Indication	Bit
FaultIndication	40001:03	Fault Indication	Bit
SSinRemoteMode	40001:04	Selector Switch in Remote Mode	Bit
SSinLocalMode	40001:05	Selector Switch in Local Mode	Bit
ModeinRemoteAuto	40001:06	Motor in Remote Auto	Bit
ModeinRemoteManual	40001:07	Motor in Remote Manual	Bit
StartedinLocMode	40001:08	Motor Started in Local Mode	Bit
StartedinRemAutoMode	40001:09	Motor Started in Remote Auto Mode	Bit
StartedinRemManMode	40001:10	Motor Started in Remote Manual Mode	Bit
StartsHigh	40001:11	Starts High	Bit
RuntimeHigh	40001:12	Runtime High	Bit
MaintenanceRequired	40001:13	Maintenance Runtime Reached	Bit
LocalStartReceived	40001:14	Local Start Command Received	Bit
RemManStartReceived	40001:15	Remote Manual Start Command Received	Bit
RemAutStartReceived	40001:16	Remote Auto Start Command Received	Bit
TimeTotalRun	40002	Total Running Time (Hours)	Register
TimeTotalTrip	40003	Total Tripped Time (Hours)	Register
TimeTotalControlFail	40004	Total Control Fail Time (Hours)	Register
TimeTotalLocalMode	40005	Total Time in Local Mode (Hours)	Register
TimeTotalRemAutoMode	40006	Total Time in Remote Auto Mode (Hours)	Register
TimeTotalRemManMode	40007	Total Time in Remote Manual Mode (Hours)	Register
TimeMaintenance	40008	Maintenance Running Time (Hours)	Register
StartsPerHour	40009	Starts Per Hour	Register
RunTimePerHour	40010	Run Time Per Hour	Register

READ/WRITE REGISTERS

Register Name	Modbus Address	Description	Type
CmdRemManStart	40011:01	Remote Manual Start Command	Bits
CmdRemManStop	40011:02	Remote Manual Stop Command	Bits
CmdRemoteAutoSet	40012:01	Remote Auto Set Command	Bits
CmdRemoteManSet	40012:02	Remote Manual Set Command	Bits
CmdResetMaintenance	40013:01	Reset Maintenance Running Time	Bits
CmdResetAlarms	40014:01	Reset Alarms	Bits
CmdResetDevice	40015:01	Reset Device	Bits
CmdRemAutoStr1	40016:01	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr2	40016:02	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr3	40016:03	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr4	40016:04	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr5	40016:05	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr6	40016:06	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr7	40016:07	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr8	40016:08	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr9	40016:09	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr10	40016:10	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr11	40016:11	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr12	40016:12	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr13	40016:13	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr14	40016:14	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr15	40016:15	Remote Auto Start Command (Selectable)	Bits
CmdRemAutoStr16	40016:16	Remote Auto Start Command (Selectable)	Bits

EXTENDED REGISTER SET

READ ONLY REGISTERS

Register Name	Modbus Address	Description	Type
StartsHighLimit	40021	Starts High - Limit	Register
RunTimeHighLimit	40022	Run Time High - Limit	Register
MaintenanceRunLimit	40023	Maintenance Running Time Limit	Register
TimeTotalRunHrs	40024	Total Running Time (Hours)	Register
TimeTotalRunMins	40025	Total Running Time (Minutes)	Register
TimeTotalTripHrs	40026	Total Tripped Time (Hours)	Register
TimeTotalTripMins	40027	Total Tripped Time (Minutes)	Register
TimeTotalControlFailHrs	40028	Total Control Fail Time (Hours)	Register
TimeTotalControlFailMins	40029	Total Control Fail Time (Minutes)	Register
TimeTotalLocalModeHrs	40030	Total Time in Local Mode (Hours)	Register
TimeTotalLocalModeMins	40031	Total Time in Local Mode (Minutes)	Register
TimeTotalRemAutoModeHrs	40032	Total Time in Remote Auto Mode (Hours)	Register
TimeTotalRemAutoModeMins	40033	Total Time in Remote Auto Mode (Minutes)	Register
TimeTotalRemManModeHrs	40034	Total Time in Remote Manual Mode (Hours)	Register
TimeTotalRemManModeMins	40035	Total Time in Remote Manual Mode (Minutes)	Register
TimeMaintenanceHrs	40036	Maintenance Running Time (Hours)	Register
TimeMaintenanceMins	40037	Maintenance Running Time (Minutes)	Register
RunningSeconds	40038	Running Seconds	Register
RunningMinutes	40039	Running Minutes	Register
RunningHoursLSB	40040	Running Hours LSBs	Register
RunningHoursMSB	40041	Running Hours MSBs	Register

READ/WRITE REGISTERS

Register Name	Modbus Address	Description	Type
None			