



MAQ[®]20

Industrial Data Acquisition and Control System

MA1059

MAQ20-DIV20

MAQ20-DIVC20

Hardware User Manual



MAQ20-DIV20/-DIVC20 Hardware User Manual
MA1059 Rev. A – April 2017
© 2017 Dataforth Corporation. All Rights Reserved.
ISO9001:2008-Registered QMS

The information in this manual has been checked carefully and is believed to be accurate; however, Dataforth assumes no responsibility for possible inaccuracies or omissions. Specifications are subject to change without notice.

The information, tables, diagrams, and photographs contained herein are the property of Dataforth Corporation. No part of this manual may be reproduced or distributed by any means, electronic, mechanical, or otherwise, for any purpose other than the purchaser's personal use, without the express written consent of Dataforth Corporation.

MAQ[®]20 is a registered trademark of Dataforth Corporation
ReDAQ[®] is a registered trademark of Dataforth Corporation
Modbus[®] is a registered trademark of the Modbus Organization, Inc.
LabVIEW[™] is a trademark of National Instruments Corporation

Table of Contents

1.0	System Features	1
2.0	System Description and Documentation	2
3.0	Unpacking	3
4.0	Module Dimensions and I/O Connections.....	3
5.0	Installation	5
6.0	Building a System	6
7.0	Maintaining a System	7
8.0	Expanding a System	8
9.0	MAQ20 I/O Module Registration	9
10.0	Reading Discrete Input Channels	13
11.0	Reset Functions	17
12.0	Module Identification and Status Registers.....	18
13.0	LED Indicators.....	18
14.0	Specifications	20
15.0	MAQ20-DIV20 & MAQ20-DIVC20 Address Map	21

About Dataforth Corporation

“Our passion at Dataforth Corporation is designing, manufacturing, and marketing the best possible signal conditioning, data acquisition, and data communication products. Our mission is to set new standards of product quality, performance, and customer service.” Dataforth Corporation, with more than a quarter century of experience, is the worldwide leader in Instrument Class® Industrial Electronics – rugged, high performance signal conditioning, data acquisition, and data communication products that play a vital role in maintaining the integrity of industrial automation, data acquisition, and quality assurance systems. Our products directly connect to most industrial sensors and protect valuable measurement and control signals and equipment from the dangerous and degrading effects of noise, transient power surges, internal ground loops, and other hazards present in industrial environments.

Dataforth spans the globe with more than 50 International Distributors and US Representative Companies. Our customers benefit from a team of over 130 sales people highly trained in the application of precision products for industrial markets. In addition, we have a team of application engineers in our Tucson factory ready to solve any in-depth application questions. Upon receipt of an RFQ or order, our Customer Service Department provides fast one-day delivery information turnaround. We maintain an ample inventory that allows small quantity orders to be shipped from stock.

Dataforth operates under an ISO9001:2008 quality management system.

Contacting Dataforth Corporation

Contact Method	Contact Information
E-Mail: Technical Support	techinfo@dataforth.com
Website:	www.dataforth.com
Phone:	520-741-1404 and toll free 800-444-7644
Fax:	520-741-0762
Mail:	Dataforth Corporation 3331 E. Hemisphere Loop Tucson, AZ 85706 USA

Errata Sheets

Refer to the Technical Support area of Dataforth’s website (www.dataforth.com) for any errata information on this product.

1.0 System Features

The MAQ20 Data Acquisition System encompasses more than 30 years of design excellence in the process control industry. It is a family of high performance, DIN rail mounted, programmable, multi-channel, industrially rugged signal conditioning I/O and communications modules.

Instrument Class Performance

- $\pm 0.035\%$ Accuracy
- Industry leading $\pm 0.3^\circ\text{C}$ CJC Accuracy over full operating temperature range
- Ultra low Zero and Span Tempco
- Over-range on one channel does not affect other channels
- 1500Vrms Channel-to-Bus Isolation
- 240Vrms Continuous Field I/O Protection
- ANSI/IEEE C37.90.1 Transient Protection
- Ventilated Communications and I/O Modules
- Industrial Operating Temperature of -40°C to $+85^\circ\text{C}$
- Wide Range 7-34VDC Power
- CE Compliant, UL/CUL Listing and ATEX Compliance pending

Industry Leading Functionality

- The system is a Modbus Server and can be operated remotely with no local PC
- Up to 4GB of logged data can be transferred via FTP during real-time acquisition
- Up to 24 I/O modules, 384 analog / 480 discrete channels, per system, per 19" rack width
- Per-channel configurable for range, alarms, and other functions
- Backbone mounts within DIN rail and distributes power and communications
- System firmware automatically registers the installation and removal of I/O modules
- I/O modules can be mounted remotely from the Communications Module
- Equal load sharing power supply modules allow for system expansion
- Hot Swappable I/O modules with Field-side pluggable terminal blocks on most models
- Sophisticated package enables high density mounting in 3U increments
- DIN Rail can be mounted on a continuous flat panel or plate

Distributed Processing Enables Even More Functionality

- Output modules are programmable for user-defined waveforms
- Discrete I/O modules have seven high level functions:
 - Pulse Counter
 - Frequency Counter
 - Waveform Measurement
 - Time Between Events
 - Frequency Generator
 - PWM Generator
 - One-Shot Pulse Generator

Multiple Software Options

- Intuitive Graphical Control Software
 - ReDAQ Shape Graphical HMI Design & Runtime Solution
 - IPEmotion Multi-Vendor and Multi-Language Solution
 - Programming examples and LabVIEW VIs
 - OPC Server
 - Application Program Interface (API)

2.0 System Description and Documentation

A MAQ20 Data Acquisition System must have as a minimum a Communications Module, a Backbone, and one I/O Module. Examples include:

[MAQ20-COMx](#) Communications Module with Ethernet, USB and RS-232 or RS-485 Interface

[MAQ20-xTC](#) Type J, K, T, R, or S Thermocouple Input Module

[MAQ20-mVDN, -VSN, -VDN](#) Voltage Input Module

[MAQ20-IxN](#) Process Current Input Module

[MAQ20-IO, -VO](#) Process Current Output and Process Voltage Output Module

[MAQ20-BKPLx](#) 4, 8, 16, or 24 Channel System Backbone

Refer to [Dataforth MAQ20 Industrial Data Acquisition & Control System](#) for a complete listing of available modules and accessories.

System power is connected to the Communications Module, which in turn powers the I/O modules. For systems with power supply requirements exceeding what the Communications Module can provide, the [MAQ20-PWR3](#) Load Share Power Supply module is used to provide additional power. When a MAQ20 I/O module is inserted into a system, module registration occurs automatically, data acquisition starts, and data is stored locally in the module. The system is based on a Modbus compatible memory map for easy access to acquired data, configuration settings, and alarm limits. Information is stored in consistent locations in module memory for ease of use and system design.

MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

The MAQ20-DIV20 module has 20 discrete input channels that interface to 10-120VDC/VAC signals. The MAQ20-DIVC20 module also has 20 discrete input channels, each with 10-24VDC input and a +24VDC compliance voltage for interfacing to relay contacts, solid state switches, or other devices that require an excitation. Discrete input states can be read individually or as a block. Logic polarity can be user defined as standard or inverted. The field inputs are designed for harsh industrial environments and have fast switching times. Pulses as narrow as 200us can be measured. Field input connections are made through high density spring cage terminal blocks.

Input-to-Bus isolation is a robust 1500Vrms and each individual channel is protected up to 150Vrms continuous overload in the case of wiring faults or inadvertent wiring errors. The high channel count within the narrow module package gives exceptional functionality while preserving valuable mounting space and the high density minimizes cost per channel resulting in an economical monitoring solution.

For details on hardware installation, configuration, and system operation, refer to the manuals and software available for download from the [MAQ20 Software & User Manual Download Center](#). This includes, but is not limited to:

MA1036	MAQ20 Quick Start Guide
MA1040	MAQ20 Communications Module Hardware User Manual
MA1041	MAQ20 milliVolt, Volt and Current Input Module Hardware User Manual
MA1038	MAQ20 ReDAQ Shape for MAQ20 User Manual
MA1064	MAQ20 API User Manual
MAQ20-940/-941	ReDAQ Shape Software for MAQ20 – Developer Version/User Version
MAQ20-951/952	IPEMotion Software for MAQ20
MAQ20-960	MAQ20 API (Python)

3.0 Unpacking

Each MAQ20 Data Acquisition System component is shipped in electro-static discharge (ESD) protective packaging. Use appropriate ESD protection measures while unpacking. Check visually for physical damage. If physical damage is noted, file a claim with the shipping carrier and contact the factory.

4.0 Module Dimensions and I/O Connections

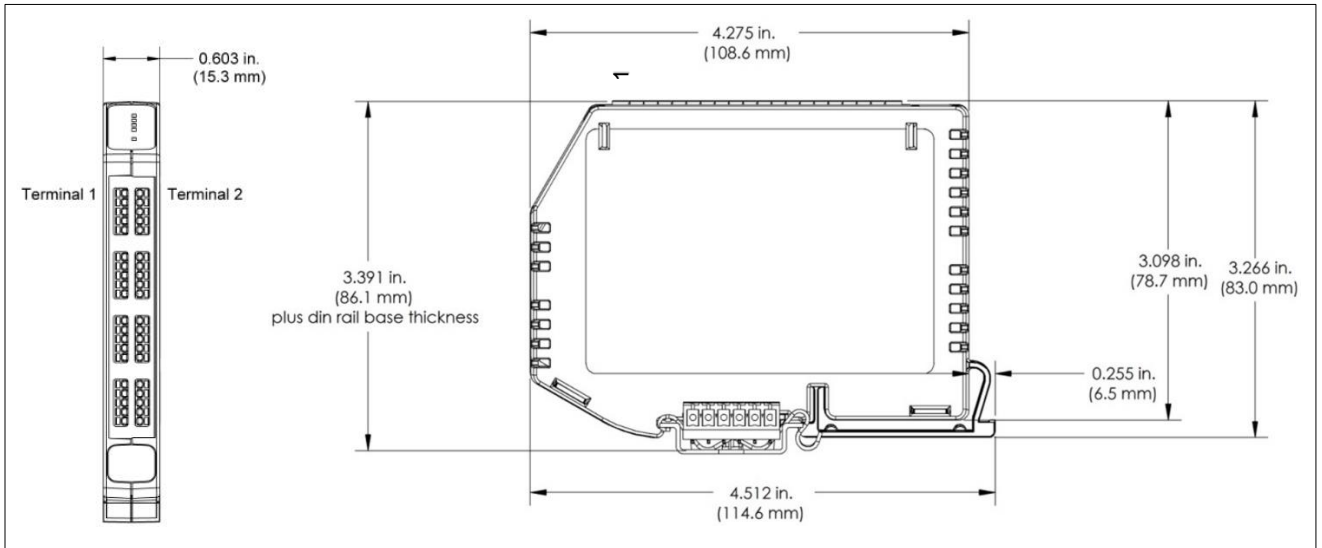
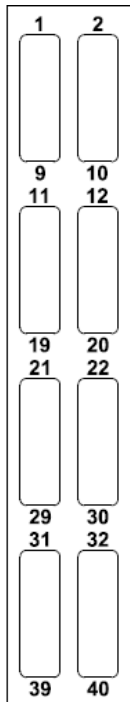


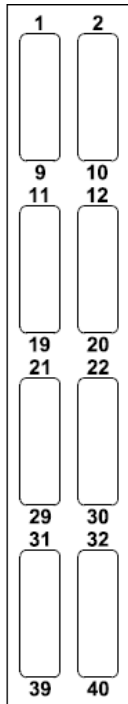
Figure 1: Module Dimensions

Table 1: MAQ20-DIV20 I/O Terminal Block Connections



FIELD CONNECTION	TERMINAL	TERMINAL	FIELD CONNECTION
CH0 +IN	1	2	CH0 -IN
CH1 +IN	3	4	CH1 -IN
CH2 +IN	5	6	CH2 -IN
CH3 +IN	7	8	CH3 -IN
CH4 +IN	9	10	CH4 -IN
CH5 +IN	11	12	CH5 -IN
CH6 +IN	13	14	CH6 -IN
CH7 +IN	15	16	CH7 -IN
CH8 +IN	17	18	CH8 -IN
CH9 +IN	19	20	CH9 -IN
CH10 +IN	21	22	CH10 -IN
CH11 +IN	23	24	CH11 -IN
CH12 +IN	25	26	CH12 -IN
CH13 +IN	27	28	CH13 -IN
CH14 +IN	29	30	CH14 -IN
CH15 +IN	31	32	CH15 -IN
CH16 +IN	33	34	CH16 -IN
CH17 +IN	35	36	CH17 -IN
CH18 +IN	37	38	CH18 -IN
CH19 +IN	39	40	CH19 -IN

Table 2: MAQ20-DIVC20 I/O Terminal Block Connections



FIELD CONNECTION	TERMINAL	TERMINAL	FIELD CONNECTION
CH0 +IN	1	2	CH0 Vcompliance
CH1 +IN	3	4	CH1 Vcompliance
CH2 +IN	5	6	CH2 Vcompliance
CH3 +IN	7	8	CH3 Vcompliance
CH4 +IN	9	10	CH4 Vcompliance
CH5 +IN	11	12	CH5 Vcompliance
CH6 +IN	13	14	CH6 Vcompliance
CH7 +IN	15	16	CH7 Vcompliance
CH8 +IN	17	18	CH8 Vcompliance
CH9 +IN	19	20	CH9 Vcompliance
CH10 +IN	21	22	CH10 Vcompliance
CH11 +IN	23	24	CH11 Vcompliance
CH12 +IN	25	26	CH12 Vcompliance
CH13 +IN	27	28	CH13 Vcompliance
CH14 +IN	29	30	CH14 Vcompliance
CH15 +IN	31	32	CH15 Vcompliance
CH16 +IN	33	34	CH16 Vcompliance
CH17 +IN	35	36	CH17 Vcompliance
CH18 +IN	37	38	CH18 Vcompliance
CH19 +IN	39	40	CH19 Vcompliance

The high density spring cage terminal blocks can accept the following wire sizes:

Solid Wire AWG 25 to AWG 21
 Stranded Wire AWG 24 to AWG 21

5.0 Installation

The MAQ20 I/O module package has been designed for easy insertion into and removal from a system and can mate with DIN rails mounted flush on continuous panels or plates.

To install a module:

1. Orient the module with the field connector facing out.
2. Align the angled surface on the top rear corner with panel or plate the DIN rail is mounted to.
3. Slide the module down to capture the DIN rail with the hook on the module.
4. Rotate the module and snap in place.

To remove a module, reverse the steps in the installation process. If space is available, the clip at the bottom of the module can be squeezed by hand to release. For tight installations, insert a flat blade screwdriver into the recess in the clip (5), place the shaft of the screwdriver against the curved part of the clip and gently pry the clip to release (6) as shown in Figure 2 below.

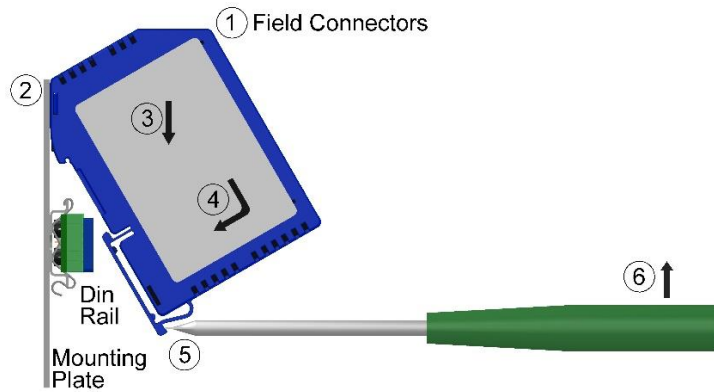


Figure 2: Installation and Removal

Multiple rows of MAQ20 modules can be mounted at a 3U vertical spacing interval. Backbones can be combined to add I/O modules to a system. A system is only allowed to have one MAQ20-COMx module. Some possible configurations in a 19" rack are shown in Figure 3 below.

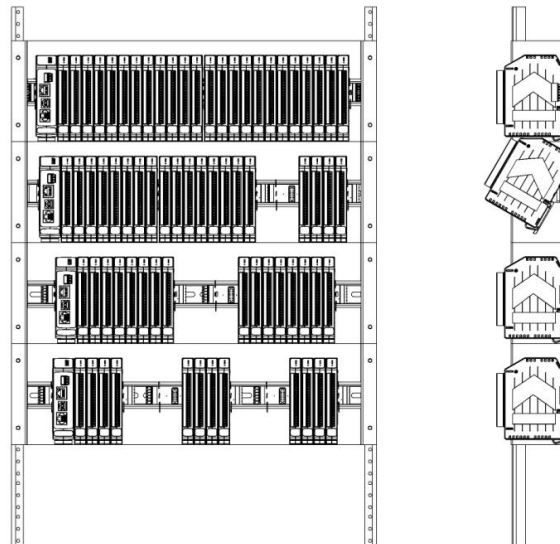


Figure 3: Possible System Configurations

6.0 Building a System

An automated I/O module registration process reduces system setup to three basic steps:

STANDARD SETUP PROCESS

- 1.) Install a MAQ20-BKPLx backbone in a DIN rail then insert a MAQ20-COMx module in the left-most position and apply power.
- 2.) Install any MAQ20 I/O Module in any vacant local or remote backbone position. Observe that the green Power LED is on and communications activity is seen on the TX and RX LEDs. Allow 1 second for registration. This module has now been assigned Registration Number 1.

Label and connect field wiring to the I/O Module. If desired, record module physical position in the system.

- 3.) Repeat Step 2 for all remaining MAQ20 I/O modules in the system. Subsequent modules installed are assigned Registration Number 2, 3, etc. The Registration Number sequence matches the physical sequence of module installation.

ALTERNATE SETUP PROCESS

- 1.) Do not apply power. Install a MAQ20-BKPLx backbone in a DIN rail then insert a MAQ20-COMx module in the left-most position and install all required MAQ20 I/O modules in any vacant local or remote backbone position. Label and connect field wiring to the I/O Module and if desired record physical position in the system.
- 2.) Apply system power and observe that each module has the green Power LED on and communications activity is seen on the TX and RX LEDs. Allow 5 seconds for full system registration. All modules have now been assigned Registration Numbers, but in a random sequence not associated with the physical position on the backbone.

NOTES:

Once the registration process is complete, Registration Numbers are permanent as long as I/O modules are not removed from or added to a system. When system power is cycled or the system is reset, I/O module Registration Numbers will always remain the same. If I/O modules are removed while the system is powered, they will be unregistered and the slots or registration numbers become available to register modules once inserted. If I/O modules are removed while the system is powered and then the power is cycled, the remaining modules will remain registered with their assigned Registration Numbers.

I/O modules in a system are identified in general by their model number (MAQ20-VDN, MAQ20-JTC, etc.) and uniquely by their Serial Number printed on the side label (i.e. 1234567-89). When I/O modules are installed in the system, only a general identifier is visible on the front of the module (V, I, TCPL, etc.). Wire tags or additional labeling applied to the module terminal block may be used for visible unique identification in an installed system.

MAQ20-940 ReDAQ Shape Software for MAQ20 automatically assigns tag names to each input and output channel. These can be changed by the customer to associate channels with input wiring or parameters measured and controlled.

The system does not identify I/O modules by physical position on a backbone, only by registration sequence. MAQ20-940 ReDAQ Shape Software for MAQ20 provided by Dataforth shows a graphical representation of a system based on registration sequence and not by physical position. Tools within the software package allow the user to reassign Registration Numbers thereby making graphical representations match physical location for a single, local backbone. For further details, see [Section 9.0](#).

Module Detect: A write to the Module Detect Register at I/O module address 98 plus the module offset based on Registration Number will blink the STAT LED on the top angled surface of the module at a 5Hz rate for 5 seconds so the module location in a system can be visually identified.

7.0 Maintaining a System

The MAQ20-COMx Communications Module periodically scans the system and will detect if a MAQ20 I/O module has been removed from the system or has lost communications. When this happens the module Registration Number will be released and available for reassignment.

Standard system maintenance involves a simple three step process:

STANDARD MAINTENANCE PROCESS

- 1.) Turn system power on and observe communications activity on the I/O modules.
- 2.) CASE 1: I/O module is replaced with one having a different model number or serial number

Remove a single MAQ20 I/O module from any local or remote backbone position. Replace the module with another having a different model number. This module can be installed in any vacant local or remote backbone position. Observe that the green Power LED is on and that there is communications activity on the TX and RX LEDs. Allow 1 second for registration. This module now has the same Registration Number as the one removed.

CASE 2: I/O module is suspected faulty and is to be replaced with the same model number

Remove a single MAQ20 I/O module from any local or remote backbone position. Replace the module with another of the same model number. This module can be installed in any vacant local or remote backbone position. Observe that the green Power LED is on and communications activity is seen on the TX and RX LEDs. Allow 1 second for registration. This module now has the same Registration Number as the one removed.

Label and connect input/output wiring to the I/O module and if desired record physical position in the system.

- 3.) Repeat Step 2 for any remaining MAQ20 I/O modules in the system requiring maintenance.

ALTERNATE MAINTENANCE PROCESS

- 1.) With system power off, remove any I/O modules which are to be replaced. Replace the modules with others of the same or different model numbers. Modules can be installed in any vacant local or remote backbone position.

Label and connect input/output wiring to the I/O module and if desired record physical position in the system.

- 2.) Apply system power and observe that each module has the green Power LED on and communications activity is seen on the TX and RX LEDs. Allow 5 seconds for full system registration. Replaced modules have now been assigned the Registration Numbers of those removed, but in a random sequence not associated with the physical position on the backbone. Modules which were not replaced retain their assigned Registration Numbers.

NOTES:

Once the registration process is complete, Registration Numbers are permanent as long as I/O modules are not removed from or added to a system. When system power is cycled or the system is reset, I/O module Registration Numbers will always remain the same. Tools within MAQ20-940 ReDAQ Shape Software for MAQ20 allow the user to reassign Registration Numbers. For further details, see [Section 9.0](#).

Module Detect: A write to the Module Detect Register at I/O module address 98 plus the module offset based on Registration Number will blink the STAT LED on the top angled surface of the module at a 5Hz rate for 5 seconds so the module location in a system can be visually identified.

8.0 Expanding a System

The MAQ20-COMx Communications Module periodically scans the system and will detect if a MAQ20 I/O module has been added. When this happens the next available sequential Registration Number is assigned to the module.

Standard system expansion involves a simple three step process:

STANDARD EXPANSION PROCESS

- 1.) Turn system power on and observe communications activity on the I/O modules.
- 2.) Add a single MAQ20 I/O module in any local or remote backbone position. Observe that the green Power LED is on and communications activity is seen on the TX and RX LEDs. Allow 1 second for registration. This module has now been assigned the next available sequential Registration Number.

Label and connect input/output wiring to the I/O module and if desired record physical position in the system.

- 3.) Repeat Step 2 for all remaining MAQ20 I/O modules to be added to the system. Subsequent modules installed are assigned the next sequential Registration Number.

ALTERNATE EXPANSION PROCESS

- 1.) With system power off, install all additional MAQ20 I/O modules in any vacant local or remote backbone positions. Label and connect field wiring to the I/O module and if desired record physical position in the system. Do not apply power.
- 2.) Apply system power and observe that each module has the green Power LED on and communications activity is seen on the TX and RX LEDs. Allow 5 seconds for full system registration. Added modules have now been assigned the next available sequential Registration Numbers, but in a random sequence not associated with the physical position on the backbone. Modules previously installed and registered in the system retain their assigned Registration Numbers.

NOTES:

Once the registration process is complete Registration Numbers are permanent as long as I/O modules are not removed from or added to a system. When system power is cycled or the system is reset, I/O module Registration Numbers will always remain the same. If I/O modules are removed while the system is powered, they will be unregistered and the slots or registration numbers become available to register modules once inserted. If I/O modules are removed while the system is powered and then the power is cycled, the remaining modules will remain registered with their assigned Registration Numbers. Tools within MAQ20-940 ReDAQ Shape Software for MAQ20 allow the user to reassign Registration Numbers. For further details, see [Section 9.0](#).

Module Detect: A write to the Module Detect Register at I/O module address 98 plus the module offset based on Registration Number will blink the STAT LED on the top angled surface of the module at a 5Hz rate for 5 seconds so the module location in a system can be visually identified.

9.0 MAQ20 I/O Module Registration

The MAQ20 Data Acquisition System uses an automated registration process which periodically scans the system and will detect when MAQ20 I/O modules are added and removed. Modules are assigned a sequential Registration Number based on the order in which they are detected. This order can be forced to occur in a given sequence by adding modules one at a time or it can be allowed to happen randomly. For further details, see [Section 6.0](#), [Section 7.0](#), and [Section 8.0](#).

The system does not identify I/O modules by physical position on a backbone, only by registration sequence. MAQ20-940 ReDAQ Shape Software for MAQ20 provided by Dataforth shows a graphical representation of a system based on registration sequence and not by physical position. Tools within the software package allow the user to reassign Registration Numbers thereby making graphical representations match physical location for a single, local backbone.

Module Detect: A write to the Module Detect Register at I/O module address 98 plus the module offset based on Registration Number will blink the STAT LED on the top angled surface of the module at a 5Hz rate for 5 seconds so the module location in a system can be visually identified.

Each module is assigned an address space of 2000 addresses based on the Registration Number and starting at address 2000. I/O module with Registration Number 1 is assigned address space 2000 – 3999, I/O module with Registration Number 2 is assigned address space 4000 – 5999 and so on. The starting address for the module is very important because this is the offset address that must be added to the addresses listed in the I/O module address map to know where data for that module is located within the system level address map. The MAQ20-COMx Communication Module is always assigned a Registration Number of 0.

The automated registration process can be disabled and I/O modules can be registered using a manual process if required by an application. Refer to [MA1040](#) MAQ20 Communications Module Hardware User Manual for details.

The [MAQ20-DIV20 and MAQ20-DIVC20 Address Map](#) is found at the end of this manual. An excerpt from the Address Map is shown on the next page. Channel Data is stored starting at address 1000.

NOTE:

THE MAQ20-DIV20 AND MAQ20-DIVC20 MODULES CAN BE SPECIFIED TO USE STANDARD OR INVERTED LOGIC.

FOR STANDARD LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS BELOW THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS ABOVE THE THRESHOLD.

FOR INVERTED LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS ABOVE THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS BELOW THE THRESHOLD.

NOTE: When a module is registered in a system, addresses are offset by $2000 * R$, where R is the Registration Number.

Address Range 1000 - 1299 : Module Data						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
1000	R	20	Discrete Input States, Binary Representation, Addr 1000 = LSB, Addr 1019 = MSB	Discrete Input States. Standard or Inverted Logic as defined in Register 1041.	DIO - DI19 Standard Logic 0 = Input < Threshold 1 = Input > Threshold DIO - DI19 Inverted Logic 0 = Input > Threshold 1 = Input < Threshold	INT16
1041	R/W	1	Logic Polarity	0 = Standard Logic (Default) 1 = Inverted Logic	0 or 1	INT16

Example: A MAQ20-DIV20 module with serial number 1234567-89 is installed in a system and has been assigned a Registration Number of 4. Read data from the discrete input channels.

The MAQ20-DIV20 module with s/n 1234567-89 has an address offset of $2000 * 4 = 8000$

Assume the factory default setting of standard logic polarity.
 Address $8000 + 1041 = 9041$ is set to 0

Read from the DI channels DI0 – DI19 at addresses $8000 + 1000$ to $1019 = 9000$ to 9019

If a 0 is returned, the logic state at the terminals is below the threshold.
 If a 1 is returned, the logic state at the terminals is above the threshold.

The MAQ20-940 ReDAQ Shape Software for MAQ20 has a utility which allows the user to reassign Registration Numbers to I/O Modules in a system. This can be used to rearrange the way I/O modules are displayed in the software if the Alternate Registration Processes have been used instead of the Standard Registration Processes. These are described in [Section 6.0](#), [Section 7.0](#) and [Section 8.0](#).

ReDAQ Shape Software for MAQ20 presents a graphical representation of the system on the Acquire panel as shown in Figure 4. I/O modules are displayed sequentially left to right in the order they were registered. The display does not represent physical position and will not show physical vacant positions between I/O modules. The system graphic shows a 24 position backbone regardless of the backbone or combination of backbones used in a system.

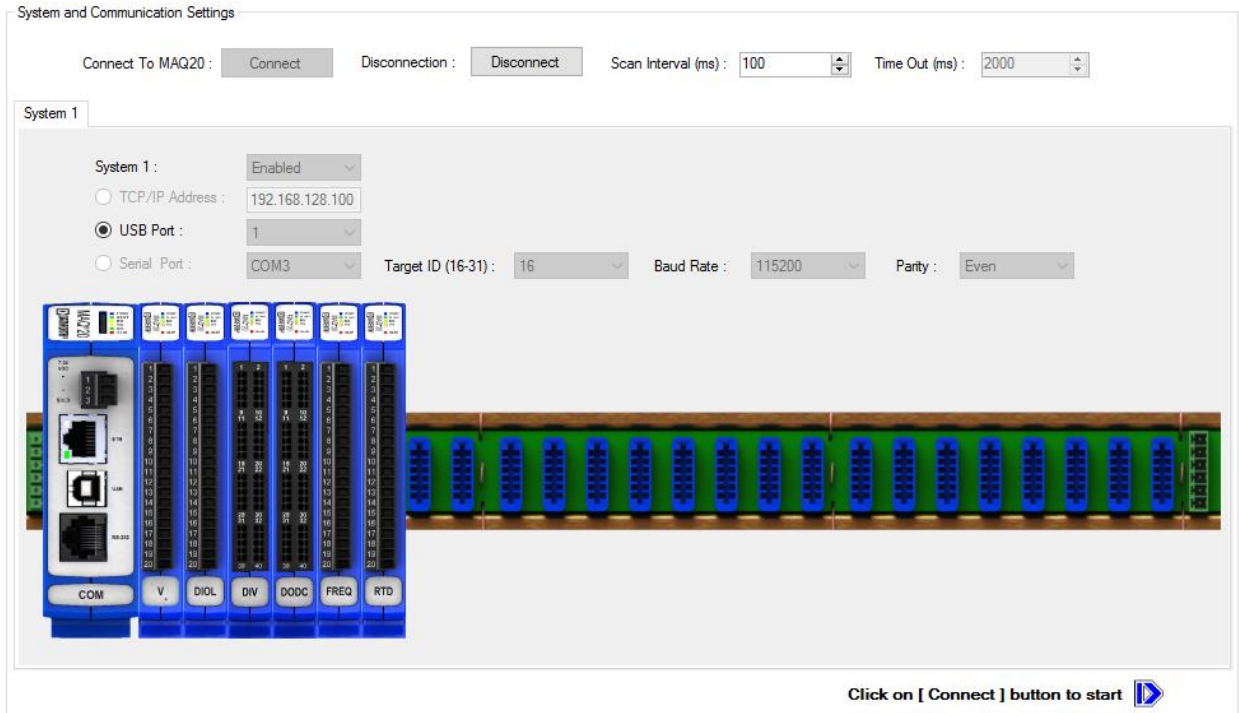


Figure 4: MAQ20-940 ReDAQ Shape for MAQ20 Main Configuration Screen

To view the registration sequence, double-click on the MAQ20-COMx graphic to obtain the listing shown in Figure 5.

COM Module Setting Return

Setup Modules Slot Setup COM SD Memory Card Data Converter

Up Down Save **MAQ20-COM4** Serial Number: 0083208-25, Date Code: D0815, Firmware version: F1.33, Temperature: 42°C

	Slot Number	Start Address	Model Number	Serial Number	Date Code	Firmware	Inputs	Outputs
▶	1	2000	MAQ20-VDN	0098692-18	D0515	F2.62	8	0
	2	4000	MAQ20-DIOL	0104527-01	D0415	F1.12	5	5
	3	6000	MAQ20-DIVC20	0116848-03	D0317	F1.02	20	0
	4	8000	MAQ20-DODC20SK	0104672-08	D0317	F1.02	0	20
	5	10000	MAQ20-FREQ	0000000-05	D0000	F1.10	16	0
	6	12000	MAQ20-RTD31	0103323-12	D0415	F2.15	6	0
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							

Figure 5: Module Registration using MAQ20-940 ReDAQ Shape for MAQ20

Registration Numbers are listed in the left column. The column title Slot Number is the same as the Registration Number and refers to the position where the software has registered the I/O module. Slot Number or Registration Number will not necessarily be the same as the physical position of the module in the system. To change the Registration Number of an I/O module, click the box in the left column next to the Registration Number, then use the Up and Down buttons to move the module within the sequence. The system automatically reassigns the I/O modules above and below the one moved. Repeat for other modules if desired. The MAQ20-COMx module always has Registration Number 0 and cannot be moved. Press 'Save' to save the new configuration. The new registration sequence is permanent as long as I/O modules are not removed from or added to a system.

10.0 Reading Discrete Input Channels

The MAQ20-DIV20 module has 20 discrete input channels that interface to 10-120VDC/VAC signals. Discrete input states can be read individually or as a block. Logic polarity can be user defined as standard or inverted. Pulses as narrow as 200us can be measured. Each individual channel has continuous overload protection in the case of inadvertent wiring errors.

FOR STANDARD LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS BELOW THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS ABOVE THE THRESHOLD.

FOR INVERTED LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS ABOVE THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS BELOW THE THRESHOLD.

Signals applied to discrete input channels are detected as HIGH when over 9.0V or LOW when below 5.5V. The basic circuit topology is shown in Figure 6.

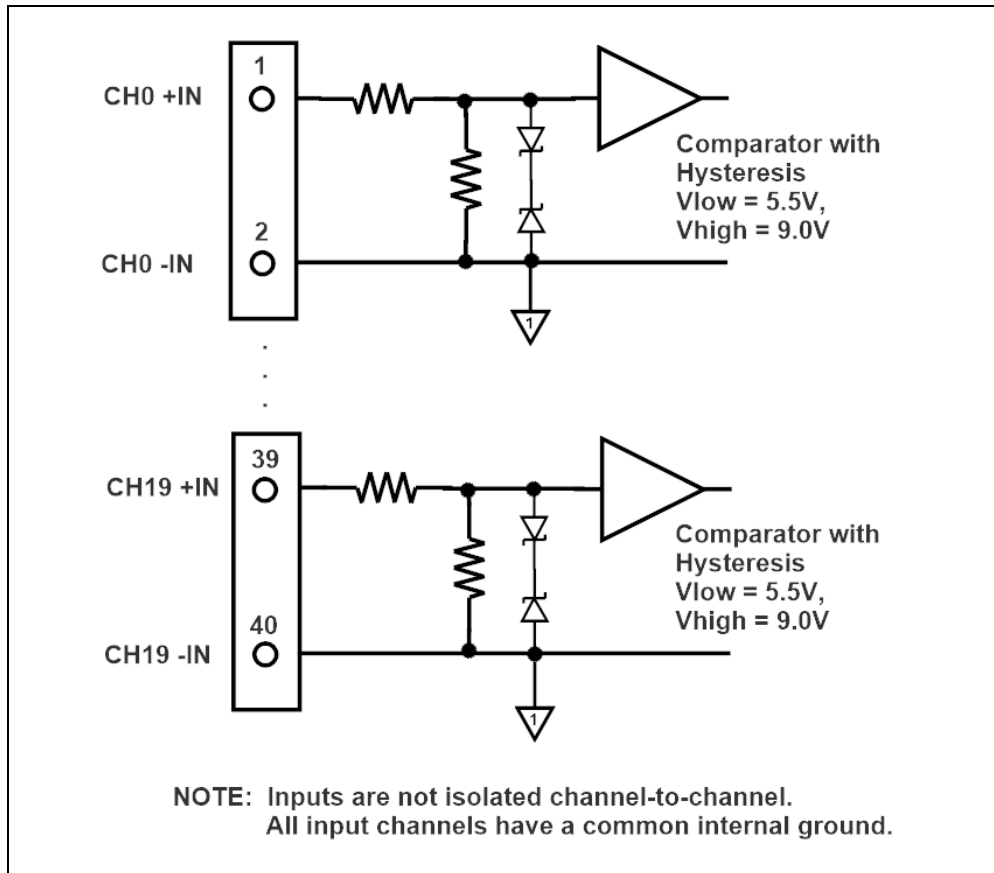


Figure 6: MAQ20-DIV20 Discrete Input Circuit Topology

The MAQ20-DIVC20 module has 20 discrete input channels, each with a +24VDC compliance voltage, for interfacing to relay contacts, solid state switches, or other devices that require an excitation. Discrete input states can be read individually or as a block. Logic polarity can be user defined as standard or inverted. Pulses as narrow as 200us can be measured. Each individual channel has continuous overload protection in the case of inadvertent wiring errors.

FOR STANDARD LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS BELOW THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS ABOVE THE THRESHOLD.

FOR INVERTED LOGIC, LOGIC 0 READ FROM A DISCRETE INPUT CHANNEL INDICATES THAT THE SIGNAL ON THE INPUTS IS ABOVE THE THRESHOLD AND LOGIC 1 INDICATES THAT THE SIGNAL IS BELOW THE THRESHOLD.

Signals applied to discrete input channels are detected as HIGH when over 9.0V or LOW when below 5.5V. The basic circuit topology is shown in Figure 7.

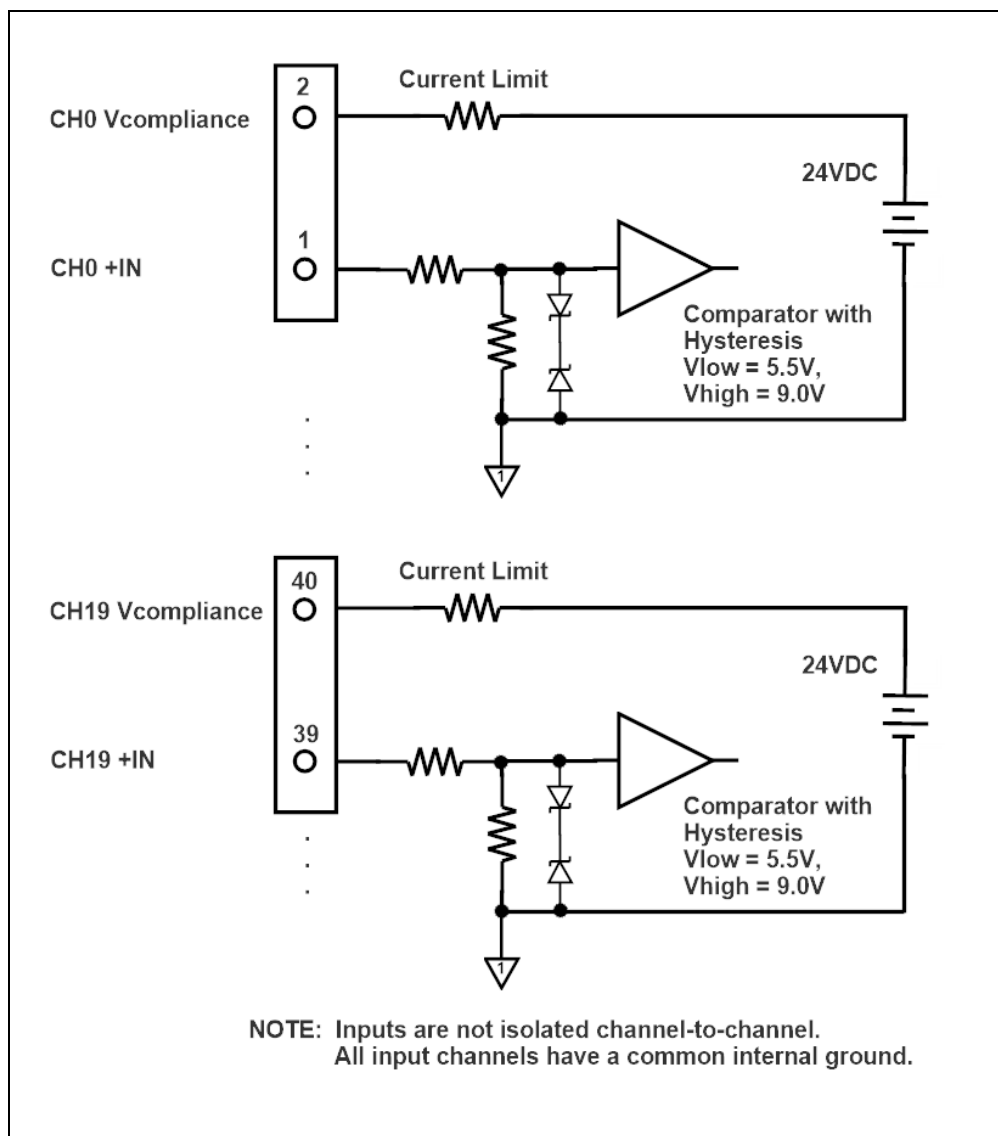


Figure 7: MAQ20-DIVC20 Discrete Input Circuit Topology

The [MAQ20-DIV20 and MAQ20-DIVC20 Address Map](#) is found at the end of this manual. An excerpt from the Address Map is shown below.

NOTE: When a module is registered in a system, addresses are offset by $2000 * R$, where R is the Registration Number. Refer to [Section 9.0](#) for further details on Registration Number.

Address Range 1000 - 1299 : Module Data						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
1000	R	20	Discrete Input States, Binary Representation, Addr 1000 = LSB, Addr 1019 = MSB	Discrete Input States. Standard or Inverted Logic as defined in Register 1041.	DIO - D119 Standard Logic 0 = Input < Threshold 1 = Input > Threshold DIO - D119 Inverted Logic 0 = Input > Threshold 1 = Input < Threshold	INT16
1035	R	2	Discrete Input States, Block Read, MSB	Decimal Equivalent of Discrete Input Data MSB (Channels 16-19)	0 to 15	INT16
1036	R	1	Discrete Input States, Block Read, LSB	Decimal Equivalent of Discrete Input Data LSB (Channels 0-15)	0 to 65,535	INT16
1037	R	1	Read	Reserved for Future	TBD	INT16
1041	R/W	1	Logic Polarity	0 = Standard Logic (Default) 1 = Inverted Logic	0 or 1	INT16

Input channel data is read using a series of 20 registers starting at reference address 1000. Input signal levels are stored in these registers in a 20-bit pattern with least significant bit at address 1000 and most significant bit at address 1019. In addition, data can be read in blocks. When block reading, the decimal equivalent of the 20-digit value representing current channel states is read from registers 1036 (least significant byte) and 1035 (most significant byte).

Example: A MAQ20-DIV20 module with serial number 1234567-89 is installed in a system and has been assigned a Registration Number of 4. Input signals are such that channels 5, 16, 17, and 18 are above the threshold and all other channels are below the threshold. Read the states of the input channels both bitwise and by using the block read decimal equivalent.

The MAQ20-DIV20 module with s/n 1234567-89 has an address offset of $2000 * 4 = 8000$

Note that channels are numbered starting at zero, so the 20 input channels are CH0 – CH19. Assume the module is using the factory default Standard Logic.

A read from register address $8000 + 1005 = 9005$ returns a value of 1 indicating signal > threshold
 A read from register address $8000 + 1016 = 9005$ returns a value of 1 indicating signal > threshold
 A read from register address $8000 + 1017 = 9005$ returns a value of 1 indicating signal > threshold
 A read from register address $8000 + 1018 = 9005$ returns a value of 1 indicating signal > threshold

A read from any other register address 9000-9019 returns a value of 0 indicating signal < threshold

The data in registers 1000 – 1019, MSB in register 1019 to LSB in register 1000, is now:

xxxx xxxx xxxx 0111 0000 0000 0010 0000

Read from register address $8000 + 1036 = 9036$ the decimal equivalent of relay states for CH0 through CH15. The value returned will be 32 (0000 0000 0010 0000).

Read from register address $8000 + 1035 = 9035$ the decimal equivalent of relay states for CH16 through CH19. The value returned will be 7 (xxxx xxxx xxxx 0111).

11.0 Reset Functions

Two types of firmware reset are supported in the MAQ20 I/O modules:

Standard Reset is used to put the module in a user-defined state. The parameters listed below will be set to the last state saved to EEPROM. Parameters stored in EEPROM are not affected.

Reset-to-Default reverts the module to the settings used at the factory during manufacture. It performs the standard reset actions plus resets most non-volatile parameters to default settings. Parameters stored in EEPROM are not affected.

Refer to the [MAQ20-DIV20 and MAQ20-DIVC20 Address Map](#) for further details on what parameters are affected by resets and what default values are.

Table 3: Parameters Affected by Standard Reset and Reset-to-Default

RESET TYPE	PARAMETERS
Standard Reset	Sets Logic Polarity to user defined state Clears all Status and Diagnostic registers
Reset-to-Default	All parameters listed under Standard Reset, plus: Sets Logic Polarity to 0 (Standard)

Reset Registers

Writing a valid data value to the Reset Register will force the module to perform a specified reset. Write 0 to perform Standard Reset or write 255 to perform Reset-to-Default.

NOTE: The MAQ20 I/O modules send a response to the reset register write before carrying out the reset. This means the module will be unresponsive to commands for approximately 3 seconds.

Power-On-Reset (POR) and Brownout

MAQ20 I/O modules utilize a brown-out detect circuit and watchdog timer to ensure reliable and predictable operation under all conditions. Upon power cycle, brown-out detect or any extreme circumstance under which the watchdog timer expires, a Standard Reset is performed and parameters stored in EEPROM are loaded to the appropriate registers.

12.0 Module Identification and Status Registers

Module identification including model number, serial number, date code and firmware revision are stored in registers at addresses 0 – 41.

I/O modules in a system are identified in general by their model number (MAQ20-DIOH, MAQ20-VDN, etc.) and uniquely by their Serial Number printed on the side label (1234567-89). When I/O modules are installed in the system, only a general identifier is visible on the front of the module (DIV, V, etc.). Wire tags or additional labeling applied to the module terminal block may be used for visible unique identification in an installed system. Additionally, the system has a utility to provide a visual indication of module response for identification. Any write to address 98 plus the offset based on the Registration Number will blink the STATUS LED on the top angled surface of the module at a 5Hz rate for 5 seconds.

For troubleshooting purposes, reset status, communications errors, and invalid data written to a module are monitored and made available to the user. Diagnostic registers at addresses 1900 – 1910 hold this information.

13.0 LED Indicators

A set of 5 LEDs on the top panel of the MAQ20 I/O modules indicate module power, operation, communication and alarm status.



LED Function and Troubleshooting Tips:

PWR

Normal operation: BLUE, solid lit

LED Off: Abnormal power situation

- Verify that a MAQ20-COMx is present in system
- Verify that the MAQ20-COMx module has 7-34VDC power connected and turned on
- Determine if the module is communicating by observing the TX and RX LEDs

STAT

Normal operation: GREEN, 1 Hz blinking

Module Detect: A write to the Module Detect Register will force this LED to blink at 5Hz rate for 5 seconds so the module location in a system can be visually identified. Referring to the Address Map, this register is at address 98 offset from the module base address.

LED Constant On or Constant Off: Abnormal operation

- Remove and reinstall module to force a reset
- Remove and reinstall module into another backbone position
- Determine if the module is communicating by observing the TX and RX LEDs

RX, TX

Normal Operation – YELLOW, rapid blinking during communication with MAQ20-COMx module

LED Constant Off: Abnormal operation or no communications to MAQ20-COMx module

- Verify communications by sending a request for data
- Verify that the PWR and STAT LED indicate normal operation
- Verify that there is only one MAQ20-COMx module installed in the system

ALM

Normal operation: Off

Alarm Condition Detected: RED, solid lit

- One or more alarms have been tripped
- Read Alarm Registers based on Alarm Configuration to determine system status

The following troubleshooting tips can be used to further diagnose and fix system problems:

- Remove and reinstall MAQ20 I/O module and/or MAQ20-COMx module to verify proper insertion into Backbone
- Remove and reinstall MAQ20 I/O module into another backbone position
- If a Backbone extension cable is used, ensure that the connections are made correctly

14.0 Specifications

Table 4: MAQ20-DIV20 & MAQ20-DIVC20 Specifications

MAQ20-DIV20 & -DIVC20 DISCRETE INPUT MODULE		Typical at Ta = +25°C and +24V system power
Model Number, Input MAQ20-DIV20 MAQ20-DIVC20	10 to 120 VDC / VAC Input, 24VDC Nominal 10 to 24 VDC Input, 24VDC Compliance Voltage Per Channel	
Number of Channels	20	
Input Resistance	1.3MΩ	
Switching Characteristics Turn-On / Turn-Off Time Switching Threshold, Turn-On/Turn-Off	50μs / 50μs 9.0V / 5.5V	
Input Protection Continuous Transient	150Vrms max ANSI/IEEE C37.90.1	
CMV Channel-to-Bus Channel-to-Channel Transient	1500Vrms, 1 min 0V ANSI/IEEE C37.90.1	
Input Functions Logic Selection Block Read	Standard / Inverted 20 Channel	
Scan/Update Rate	1300 Ch/s net, 65 Ch/s @ 20-Ch Simultaneous	
Power Supply Current	50mA	
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)	
Environmental Operating Temperature Storage Temperature Relative Humidity	-40°C to +85°C -40°C to +85°C 0 to 95%, non-condensing	
Emissions, EN61000-6-4 Radiated, Conducted	ISM Group 1 Class A	
Immunity EN61000-6-2 RF ESD, EFT	ISM Group 1 Performance A +/- 0.5% Span Error Performance B	
Certifications	Heavy Industrial CE Compliant ATEX Compliance Pending UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)	

15.0 MAQ20-DIV20 & MAQ20-DIVC20 Address Map

The table in this section outlines the MAQ20-DIV20 and MAQ20-DIVC20 address space. Data in these registers contains all permanent and user settable information for module configuration, status, operation of all functions, data read/write, and data storage. Table columns list the following information:

Start Address: Start address for the specified quantity of addresses. The start address is offset by 2000 * R where R is the module Registration Number.

Read/Write: Indicates whether data at the address is Read, Write or both.

Number of Registers: The number of 16 bit registers reserved for the specified contents.

Contents: Parameter stored at the specified address.

Description: Details, examples, limits, and default values for the parameter stored at the specified address.

Data Range: Valid data read from or written to an address range. Data not in this range which is written to an address may return a Modus Exception 3, Illegal Data, or may be ignored.

Data Type: The type of data stored at the specified address.

ASCII 0123456789ABCDEFGHIJKLMNPNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz, -, “ “

INT16 16 bit integer value, 0 to 65535, unless otherwise indicated. Stored at a single address.

INT32 32 bit integer value, 0 to 4294967295, unless otherwise indicated. Stored at two 16 bit addresses. MSB is stored at address N, LSB is stored at address N+1.

Table 5: MAQ20-DIV20 & MAQ20-DIVC20 Address Map

NOTE: When a module is registered in a system, addresses are offset by 2000 * R, where R is the Registration Number. Refer to [Section 9.0](#) for further details on Registration Number.

Address Range 0 - 99 : Module Information						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
0	R	15	Device Description	MAQ20-DIV20	Characters, Numbers, "-" and Space	ASCII
19	R	11	Serial Number	S1234567-89	Characters, Numbers, "-" and Space	ASCII
30	R	5	Date Code	D0317 (D<month><year>)	Characters, Numbers	ASCII
35	R	5	Firmware Rev	Fx.xx	Characters, Numbers and "."	ASCII
40	R	1	Input Channels	20 Input Channels	20	ASCII
41	R	1	Output Channels	0 Output Channels	0	ASCII
98	W	1	Module Detect	Any write will blink Status LED at 5Hz for 5 seconds	0 to 65,535	INT16
99	W	1	Reset Register	0 = Standard Reset 255 = Reset to Default	0, 255	INT16

Address Range 100 - 699 : Module Configuration						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
190	W	1	Save to EEPROM	0 = Save Default Out, Logic Polarity	0	INT16

Address Range 1000 - 1299 : Module Data						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
1000	R	20	Discrete Input States, Binary Representation, Addr 1000 = LSB, Addr 1019 = MSB	Discrete Input States. Standard or Inverted Logic as defined in Register 1041.	D10 - D119 Standard Logic 0 = Input < Threshold 1 = Input > Threshold D10 - D119 Inverted Logic 0 = Input > Threshold 1 = Input < Threshold	INT16
1035	R	2	Discrete Input States, Block Read, MSB	Decimal Equivalent of Discrete Input Data MSB (Channels 16-19)	0 to 15	INT16
1036	R	1	Discrete Input States, Block Read, LSB	Decimal Equivalent of Discrete Input Data LSB (Channels 0-15)	0 to 65,535	INT16
1037	R	1	Read	Reserved for Future	TBD	INT16
1041	R/W	1	Logic Polarity	0 = Standard Logic (Default) 1 = Inverted Logic	0 or 1	INT16

Address Range 1900 - 1999 : Status Registers						
Start Address	Read/Write	Number of Registers	Contents	Description	Data Range	Data type
1900	R/W	1	Watchdog Reset	0 = Normal 1 = Watchdog Reset	0 or 1	INT16
1901	R/W	1	Brownout Flag	0 = Normal 1 = Brownout Reset	0 or 1	INT16
1902	R/W	1	I2C Error	I2C TX Error Counter	0 to 65,535	INT16
1903	R/W	1	I2C Error	I2C RX Error Counter	0 to 65,535	INT16
1906	R/W	1	Numeric Error	Increments when a value received is outside of the allowed range	0 to 65,535	INT16
1908	R/W	1	UART RX Error	UART RX Error Counter. Command Too Short	0 to 65,535	INT16
1909	R/W	1	UART RX Error	UART RX Error Counter. Command Too Long	0 to 65,535	INT16
1910	R/W	1	UART RX Error	UART RX Error Counter. Command received in invalid state	0 to 65,535	INT16

DATAFORTH WARRANTY

Applying to Products Sold by Dataforth Corporation

a. **General.** Dataforth Corporation ("Dataforth") warrants that its products furnished under this Agreement will, at the time of delivery, be free from defects in material and workmanship and will conform to Dataforth's applicable specifications or, if appropriate, to buyer's specifications accepted in writing by Dataforth. DATAFORTH'S OBLIGATION OR LIABILITY TO BUYER FOR PRODUCTS WHICH DO NOT CONFORM TO THE ABOVE STATED WARRANTY SHALL BE LIMITED TO DATAFORTH, AT DATAFORTH'S SOLE DISCRETION, EITHER REPAIRING, REPLACING, OR REFUNDING THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT(S) PROVIDED THAT WRITTEN NOTICE OF SAID DEFECT IS RECEIVED BY DATAFORTH WITHIN THE TIME PERIODS SET FORTH BELOW:

i. for all software products including licensed programs, thirty (30) days from date of initial delivery;

ii. for all hardware products including complete systems, three (3) years from date of initial delivery;

iii. for all special products, sixty (60) days from date of initial delivery; and

further, all products warranted hereunder for which Dataforth has received timely notice of nonconformance must be returned FOB to Dataforth's plant in Tucson, Arizona USA within thirty (30) days after the expiration of the warranty periods set forth above.

The foregoing warranties shall not apply to any products which Dataforth determines have, by buyer or otherwise, been subjected to operating and/or environmental conditions in excess of the maximum value established therefore in the applicable specifications, or any products that have been the subject of mishandling, misuse, misapplication, neglect, improper testing, repair, alteration or damage. THE PROVISIONS OF THE FOREGOING WARRANTIES EXTEND TO BUYER ONLY AND NOT TO BUYER'S CUSTOMERS OR USERS OF BUYER'S PRODUCTS. THE DATAFORTH STANDARD WARRANTY IS IN LIEU OF ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE AND ALL OTHER WARRANTIES WHETHER EXPRESS, IMPLIED OR STATUTORY, EXCEPT AS TO TITLE. THE DATAFORTH STANDARD WARRANTY MAY BE CHANGED BY DATAFORTH WITHOUT NOTICE.

b. **Buyer Indemnity.** Buyer agrees to indemnify and hold Dataforth harmless from and against any and all claims, damages and liabilities whatsoever asserted by any person, entity, industry organization, government, or governmental agency of any country resulting directly or indirectly (i) from any acts not authorized by

Dataforth in writing or any statements regarding the products inconsistent with Dataforth's product documentation or standard warranty, or (ii) from any breach or threatened breach by buyer, or by any of its employees or agents, of any term, condition or provision of this Warranty or (iii) from any warranty, representation, covenant or obligation given by buyer to any third party and not expressly provided for in this Warranty or (iv) for any non-compliance (in any form) of the products with any necessary or mandatory applicable laws, regulations, procedures, government or industry policies or requirements related to the use, sale or importation of the products. Such indemnification shall include the payment of all reasonable attorneys' fees and other costs incurred by Dataforth in defending such claim.

c. **Limitation on Damages.**

(1) IN NO EVENT SHALL DATAFORTH, ITS SUPPLIERS, LICENSORS, SERVICE PROVIDERS, EMPLOYEES, AGENTS, OFFICERS, AND DIRECTORS BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, COVER, ECONOMIC, PUNITIVE, ACTUAL, EXEMPLARY, CONSEQUENTIAL OR OTHER DAMAGES OF ANY NATURE INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR REVENUES, COSTS OF REPLACEMENT PRODUCTS, LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE ANY DATAFORTH PRODUCT.

(2) IN NO EVENT SHALL DATAFORTH BE LIABLE FOR DIRECT, SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE RESULTING FROM BUYER'S NONCOMPLIANCE (IN ANY FORM) WITH ALL NECESSARY OR MANDATORY APPLICABLE LAWS, REGULATIONS, PROCEDURES, GOVERNMENT POLICIES OR REQUIREMENTS RELATED TO THE USE, SALE OR IMPORTATION OF PRODUCTS.

(3) IN NO EVENT WILL THE COLLECTIVE LIABILITY OF DATAFORTH AND ITS SUPPLIERS, LICENSORS, SERVICE PROVIDERS, EMPLOYEES, AGENTS, OFFICERS, AND DIRECTORS TO ANY PARTY (REGARDLESS OF THE FORM OF ACTION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT, OR OTHERWISE) EXCEED THE GREATER OF EITHER US\$1000.00 (ONE THOUSAND DOLLARS U.S.A. CURRENCY) OR THE AMOUNT PAID TO DATAFORTH FOR THE APPLICABLE PRODUCT OR SERVICE OUT OF WHICH LIABILITY AROSE.

(4) DATAFORTH'S LIABILITY ARISING OUT OF THE PRODUCTION, SALE OR SUPPLY OF PRODUCTS OR THEIR USE OR DISPOSITION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT OR OTHERWISE, SHALL NOT EXCEED THE GREATER

OF EITHER US\$1000.00 (ONE THOUSAND DOLLARS U.S.A. CURRENCY) OR THE ACTUAL PURCHASE PRICE PAID BY BUYER FOR DATAFORTH'S PRODUCTS. DATAFORTH'S LIABILITY FOR ANY CLAIM OF ANY KIND SHALL IN NO CASE EXCEED THE OBLIGATION OR LIABILITY SPECIFIED IN THIS WARRANTY.

d. **Technical Assistance.** Dataforth 's Warranty as hereinabove set forth shall not be enlarged, diminished or affected by, and no obligation or liability shall arise or grow out of, Dataforth's rendering of technical advice, facilities or service in connection with buyer's order of the products furnished hereunder.

e. **Warranty Procedures.** Buyer shall notify Dataforth of any products which it believes to be defective during the applicable warranty period and which are covered by the Warranty set forth above. Buyer shall not return any products for any reason without the prior authorization of Dataforth and issuance of a Return Material Authorization ("RMA") number. After issuance of a RMA number, such products shall be promptly returned by buyer (and in no event later than thirty (30) days after the Warranty expiration date), transportation and insurance prepaid, to Dataforth's designated facility for examination and testing. Dataforth shall either repair or replace any such products found to be so defective and promptly return such products to buyer, transportation and insurance prepaid. Should Dataforth's examination and testing not disclose any defect covered by the foregoing Warranty, Dataforth shall so advise buyer and dispose of or return the products in accordance with buyer's instructions and at buyer's sole expense, and buyer shall reimburse Dataforth for testing

expenses incurred at Dataforth's then current repair rates.

f. **Repair Warranty.** Dataforth warrants its repair work and/or replacement parts for a period of ninety (90) days from receipt by buyer of the repaired or replaced products or for the remainder of the warranty period for the initial delivery of such order as set forth in paragraph a above, whichever is greater.

g. **Critical Applications.** Certain applications using Dataforth's products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications"). DATAFORTH'S PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS, SAFETY EQUIPMENT, NUCLEAR FACILITY APPLICATIONS OR OTHER CRITICAL APPLICATIONS WHERE MALFUNCTION OF THE PRODUCT CAN BE EXPECTED TO RESULT IN PERSONAL INJURY, DEATH OR SEVERE PROPERTY DAMAGE. BUYER USES OR SELLS SUCH PRODUCTS FOR USE IN SUCH CRITICAL APPLICATIONS AT BUYER'S OWN RISK AND AGREES TO DEFEND, INDEMNIFY AND HOLD HARMLESS DATAFORTH FROM ANY AND ALL DAMAGES, CLAIMS, PROCEEDINGS, SUITS OR EXPENSE RESULTING FROM SUCH USE.

h. **Static Sensitive.** Dataforth ships all product in anti-static packages. Dataforth's Warranty as hereinabove set forth shall not cover warranty repair, replacement, or refund on product or devices damaged by static due to buyer's failure to properly ground.

Application Support

Dataforth provides timely, high-quality product support. Call 1-800-444-7644 TOLL-FREE.

Returns/Repair Policy

All warranty and repair requests should be directed to the Dataforth Customer Service Department at (520) 741-1404. If a product return is required, request a Return Material Authorization (RMA) number. The following information must be provided:

1. Complete product model number.
2. Product serial number.
3. Name, address, and telephone number of person returning product.
4. Special repair instructions.
5. Purchase order number for out-of-warranty repairs.

The product should be carefully packaged, making sure the RMA number appears on the outside of the package, and ship prepaid to:

Dataforth Corporation
6230 S. Country Club
Tucson, AZ 85706 USA

An RMA Request Form and instructions for processing are found here: [Dataforth RMA Procedure](#)

The information provided herein is believed to be reliable; however, DATAFORTH assumes no responsibility for inaccuracies or omissions. DATAFORTH assumes no responsibility for the use of this information, and all use of such information shall be entirely at the user's own risk. Application information is intended as suggestions for possible use of the products and not as explicit performance in a specific application. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. DATAFORTH does not authorize or warrant any DATAFORTH product for use in life support devices and/or systems.