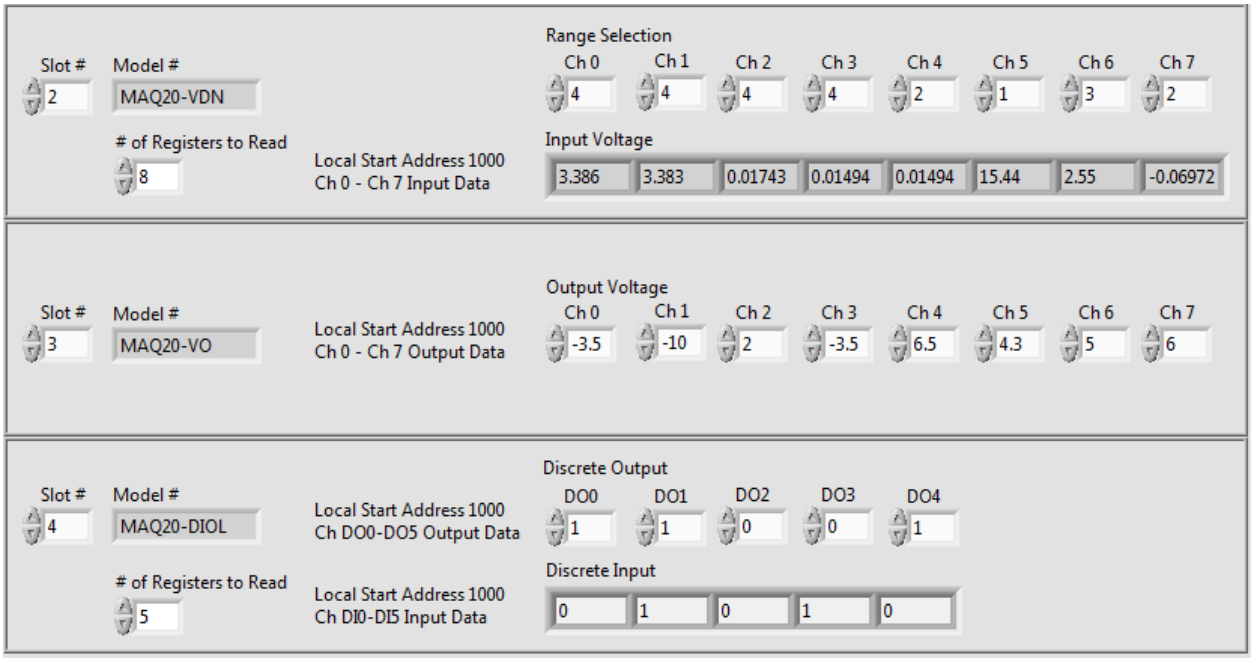
MAQ®20

Industrial Data Acquisition and Control System

MA1039

MAQ20 LabVIEW VI User Manual



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20 LabVIEW VI User Manual
MA1039 Rev. C – December 2022
© 2022 Dataforth Corporation. All Rights Reserved.
ISO9001:2015-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

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table of Contents

1.0 System Features 1
2.0 System Description and Documentation 2
3.0 General Description and Software Requirements 2
4.0 System Communications 3
4.1 Modbus TCP 4
5.0 MAQ20 System and Addressing Overview 5
6.0 MAQ20 VIs and LabVIEW Tools Used for Development 8
7.0 MAQ20 Communications Module Interface 18
8.0 MAQ20 Thermocouple Input Module Interface 18
9.0 MAQ20 Millivolt, Voltage & Current Input Module Interface 19
10.0 MAQ20 Voltage & Current Output Module Interface 20
11.0 MAQ20 Discrete Input & Output Module Interface 21
12.0 Reading and Writing Data with the MAQ20 LabVIEW VI 22
13.0 Modifying the Example VI for Use with Other Modules 25
13.1 Adding a New Module to the Example VI 25
13.2 Removing an Existing Module from the Example VI 28
14.0 References 30

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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 ISO9001:2015 quality management system.

Contacting Dataforth Corporation

Contact Method	Contact Information
E-Mail: Technical Support	support@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.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.0 System Features

The MAQ20 Data Acquisition System encompasses more than 25 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

- ±0.035% Accuracy
- Industry leading ±0.3C CJC Accuracy
- 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°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 8GB of logged data can be transferred via FTP during real-time acquisition
- Up to 24 I/O modules, or 384 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

- Free Configuration Software
- Intuitive Graphical Control Software
  - ReDAQ Shape Graphical HMI Design & Runtime Solution
  - Python API
  - LabVIEW VIs
  - OPC Server

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

Refer to www.dataforth.com/maq20.aspx 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 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 from module to module 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.

MAQ20 communications modules provide connection between a host computer and a MAQ20 Data Acquisition System over Ethernet, USB, RS-485, or RS-232. Ethernet communications use the Modbus TCP protocol, USB communications are based on the Modbus RTU protocol, and RS-485 and RS-232 communications use the Modbus RTU protocol. Serial communications over RS-485 can be either 2-wire or 4-wire. Each MAQ20-COMx module can interface to up to 24 MAQ20 I/O modules in any combination allowing high channel counts and great flexibility in system configuration. A removable microSD card can be used by the MAQ20-COMx module to log data acquired from the MAQ20 I/O modules.

For details on hardware installation, configuration, and system operation, refer to the manuals and software available for download from www.dataforth.com/maq20_download.aspx 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
MA1042 MAQ20 Voltage and Current Output Module Hardware User Manual
MA1043 MAQ20-DIOL Discrete IO Module Hardware User Manual
MA1047 MAQ20 TC Input Module Hardware User Manual
MA1038 MAQ20 ReDAQ Shape for MAQ20 User Manual
MAQ20-940/-941 ReDAQ Shape Software for MAQ20 – Developer Version/User Version

3.0 General Description and Software Requirements

The MAQ20 LabVIEW VIs provide a common interface to the MAQ20 Data Acquisition System usable by any SCADA, HMI or other application developed using LabVIEW. This simplifies communication with the MAQ20 and allows quick development of application specific, sophisticated data acquisition, and control systems.

The MAQ20 VIs were created using LabVIEW 2020 SP1 (32-bit) and require LabVIEW's Datalogging and Supervisory Control Module to run. The VIs are not compatible with versions of LabVIEW older than 2020.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Please contact Dataforth Technical Support if compatibility with a previous version of LabVIEW is required.

The following VIs are available for download from the Software Download Center at www.dataforth.com/maq20_download.aspx:

MAQ20 IO Module TCP Example.vi
MAQ20-COMX.vi
MAQ20-MVDN.vi
MAQ20-VSN.vi
MAQ20-VDN.vi
MAQ20-ISN.vi
MAQ20-IDN.vi
MAQ20-ISOMV1.vi
MAQ20-ISOV1.vi
MAQ20-ISOV2.vi
MAQ20-ISOV3.vi
MAQ20-ISOV4.vi
MAQ20-ISOV5.vi
MAQ20-ISOI1.vi
MAQ20-JTC.vi
MAQ20-KTC.vi
MAQ20-TTC.vi
MAQ20-RSTC.vi
MAQ20-RTD31.vi
MAQ20-RTD41.vi
MAQ20-BRDG1.vi
MAQ20-FREQ.vi
MAQ20-VO.vi
MAQ20-IO.vi
MAQ20-DIOL.vi
MAQ20-DIOH.vi
MAQ20-DIVX20.vi
MAQ20-DODC20SK.vi
MAQ20-DORLY20.vi

4.0 System Communications

The MAQ20 uses Modbus TCP protocol for communication over Ethernet and Modbus RTU protocol for communication over USB, RS-485 and RS-232. Refer to *MA1040 MAQ20 Communications Module Hardware User Manual* found at www.dataforth.com/maq20_download.aspx for detailed information on communications setup. VIs are set up for communication over Ethernet.

The Modbus TCP Master and Close VIs provide the basic communications interface.



Figure 1: Modbus TCP VIs

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

A single Modbus TCP Master VI is used for communication to all MAQ20 VIs that are present in a system.

4.1 Modbus TCP

The standard method of Ethernet connection to the MAQ20 is to use a static IP address. The factory default is:

MAQ20 factory default static IP address: 192.168.128.100

If desired, the IP address can be changed using ReDAQ Shape Software for MAQ20.

Configure the Ethernet port on the host computer to also use a static IP address. In Windows 7 and Windows 10, this is done by choosing Control Panel > Network and Internet > Network and Sharing Center. Next select Change Adapter Settings, select the network adapter to be used for the Channel and select Properties, then select TCP/IPv4 and Properties.

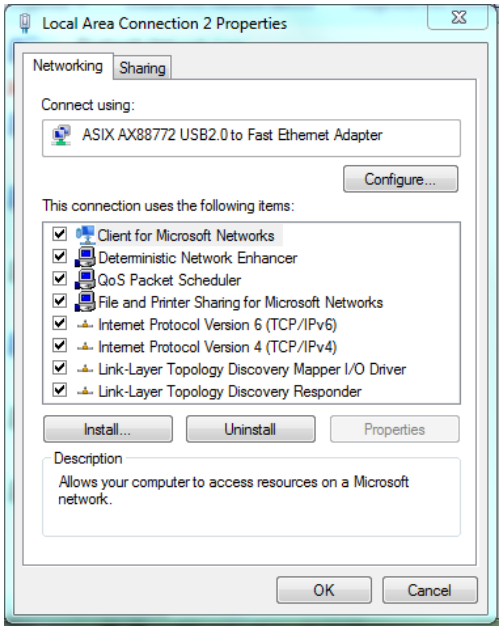


Figure 2: Host Computer Ethernet Port Configuration

Configure the port to use a static IP address.

Host computer static IP Address: 192.168.xxx.xxx
Choose any address that does not match the one set in the MAQ20. If the MAQ20 is set for 192.168.128.100, set the host computer to a lower address such as 192.168.128.095 for faster response.

Host computer Subnet Mask: 255.255.255.0

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

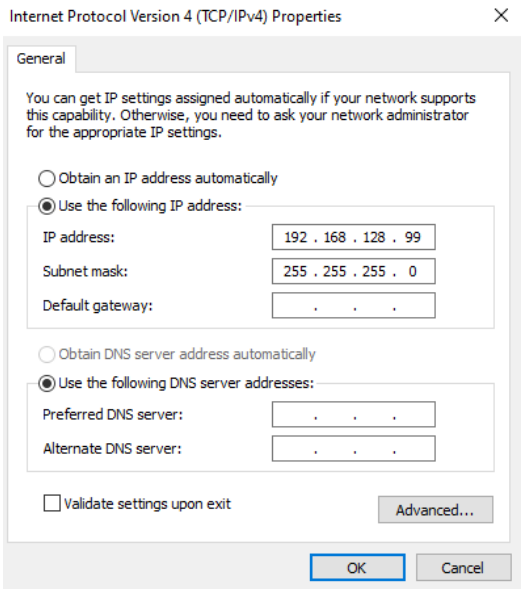


Figure 3: Host Computer IP Address & Subnet Mask

5.0 MAQ20 System and Addressing Overview

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. 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. Channel data for the MAQ20 Input and Output modules is stored starting at address 1000 within each module register space.

Address Maps for each module are found at the end of the individual MAQ20 I/O and Communication module hardware user manuals. A few of these are listed below.

MA1040 MAQ20 Communications Module Hardware User Manual
MA1041 MAQ20 milliVolt, Volt and Current Input Module Hardware User Manual
MA1042 MAQ20 Voltage & Current Output Module Hardware User Manual
MA1043 MAQ20-DIOL Discrete IO Module Hardware User Manual
MA1044 MAQ20 RTD-Potentiometer Input Module Hardware User Manual
MA1046 MAQ20 Strain Gage Input Module Hardware User Manual
MA1047 MAQ20 TC Input Module Hardware User Manual
MA1048 MAQ20 Frequency Input Module Hardware User Manual

The VI titled *MAQ20 IO Module Interface TCP Example* shows how to interface the provided VIs to create a MAQ20 system comprised of:

MAQ20-COM4	Communications Module
MAQ20-JTC	8-Channel J-Type Thermocouple Input Module
MAQ20-VDN	8-Channel Differential Voltage Input Module
MAQ20-VO	8 Isolated Channel Voltage Output Module
MAQ20-DIOL	5 Discrete Output / 5 Discrete Input Module

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

The system details can be viewed using ReDAQ Shape Software for MAQ20 available from the Dataforth website, www.dataforth.com/maq20_download.aspx.

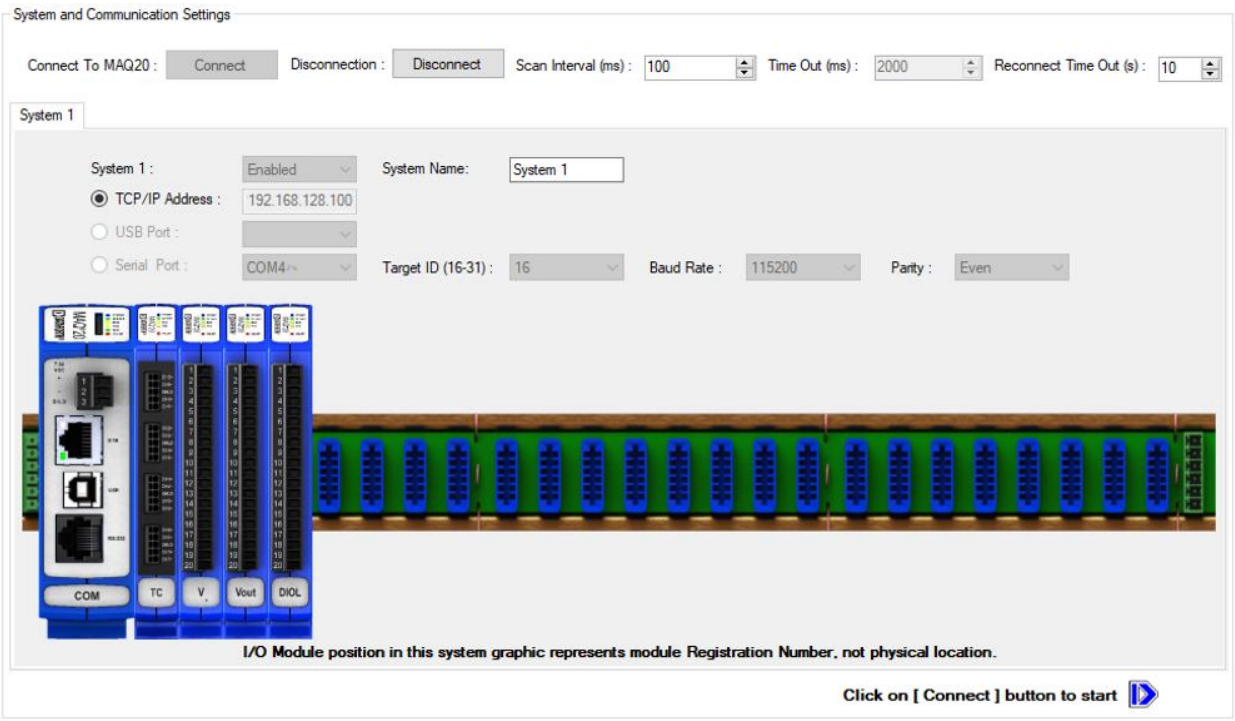


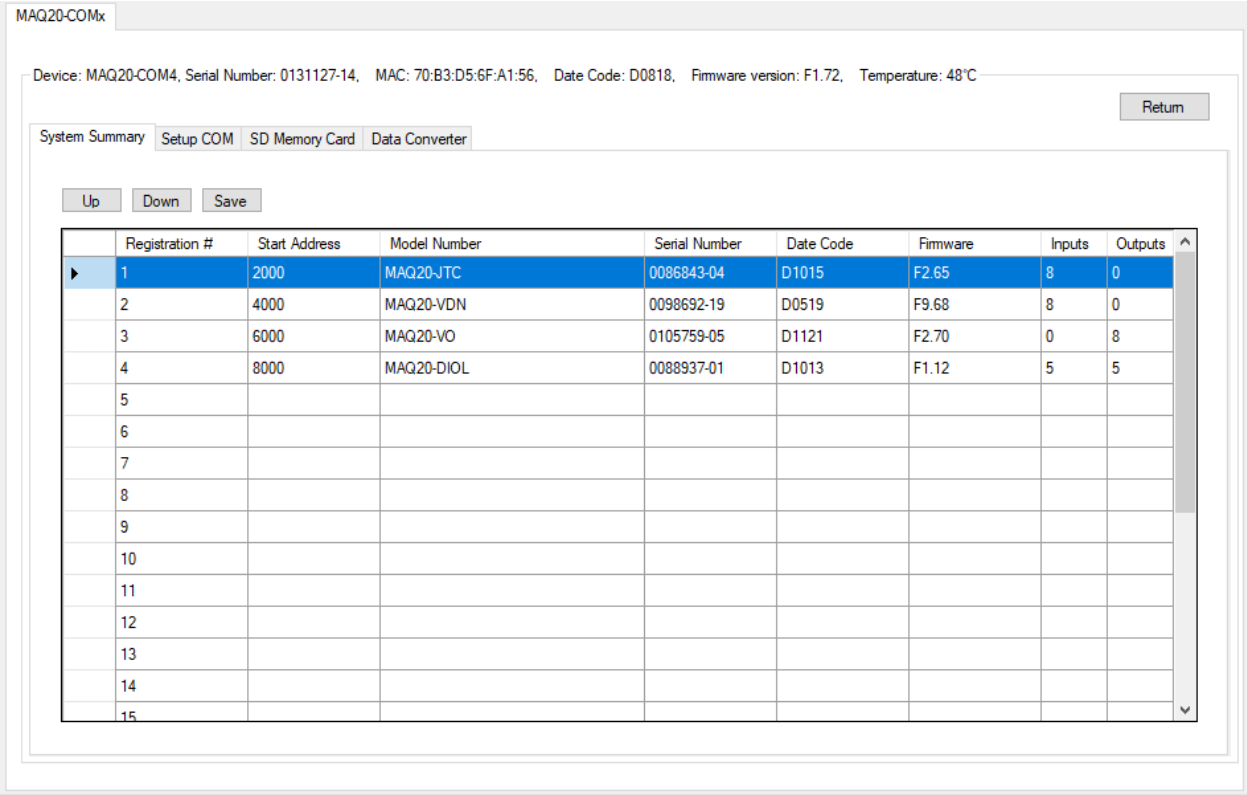
Figure 4: ReDAQ Shape System Display

For optimal VI operation of the MAQ20 IO Module Interface TCP Example VI, arrange the I/O modules in the system as follows using ReDAQ Shape Software for MAQ20.

Slot 0	MAQ20-COM4	Start Address 0000
Slot 1	MAQ20-JTC	Start Address 2000
Slot 2	MAQ20-VDN	Start Address 4000
Slot 3	MAQ20-VO	Start Address 6000
Slot 4	MAQ20-DIOL	Start Address 8000

When using ReDAQ Shape Software for MAQ20, click on the communications module graphic to view system configuration. Highlight a module and use the Up and Down buttons to make the Slot Number match the physical position on the backbone. Click the Save button once module positions are at their desired locations.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



	Registration #	Start Address	Model Number	Serial Number	Date Code	Firmware	Inputs	Outputs
▶	1	2000	MAQ20-JTC	0086843-04	D1015	F2.65	8	0
	2	4000	MAQ20-VDN	0098692-19	D0519	F9.68	8	0
	3	6000	MAQ20-VO	0105759-05	D1121	F2.70	0	8
	4	8000	MAQ20-DIOL	0088937-01	D1013	F1.12	5	5
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							

Figure 5: ReDAQ Shape Display of Modules by Slot Number

Modbus Function Codes

The MAQ20 Data Acquisition System supports the following Modbus function codes (commands):

- 3, Read Input Registers
- 4, Read Holding Registers
- 6, Write Single Register
- 16, Write Multiple Registers

Modbus Addresses

The system makes no distinction between Modbus Input registers and Modbus Holding registers. Read Input Registers will return the same data as Read Holding Registers as long as both commands use the same address and quantity.

Modbus addresses are 0-based, meaning the first address is 0x0000 (0) and the last is 0xFFFF (65535). Address values map directly to address fields of all Modbus commands. Although only a small percentage of available Modbus addresses are mapped to data and/or control functions, the system allows access to the entire range of Modbus addresses. If a Read command accesses an address that the system does not map, 0x0000 will be returned. If a Write command accesses an address that the system does not map, the write will have no effect.

Modbus Exceptions

The system will return the following Modbus exception codes under the given conditions:

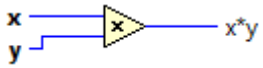
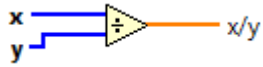
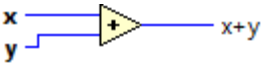
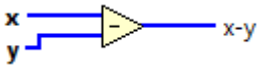
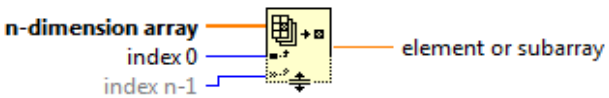
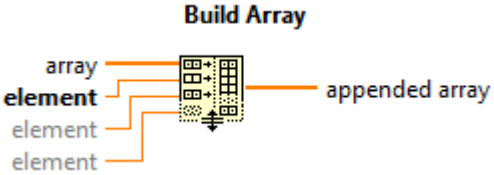
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- 1, Illegal Function: The received function code is unknown or not supported.
- 2, Illegal Address: The received address and quantity would access data beyond address 0xFFFF.
- 3, Illegal Data: The number of bytes in the request does not match that expected or one or more fields of the command contains an invalid value (i.e., a quantity field is zero or too large, a byte count field is zero or does not agree with the quantity field, etc.).
- 6, Server Busy: This exception only occurs with Modbus TCP and indicates that the MAQ20 Data Acquisition System is already processing its maximum number of simultaneous transactions and cannot accept more. The request should be re-issued after a response is received from one of the four active transactions.

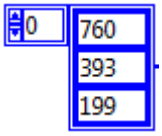
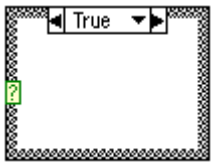
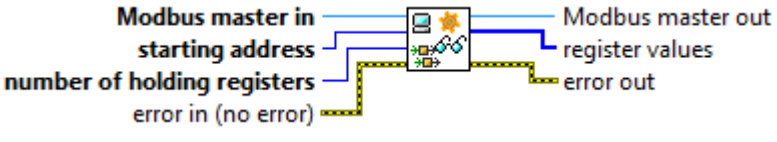
6.0 MAQ20 VIs and LabVIEW Tools Used for Development

Controls	
Unsigned 16-bit	
Signed 32-bit	
Unsigned 32-bit	
Signed 32-bit	
Double 64-bit	
Stop	
Data Containers	
Cluster	
Indicators	
Unsigned 16-bit Array	

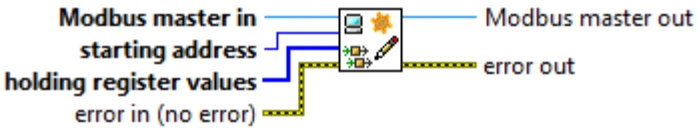
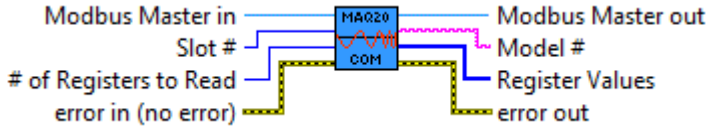
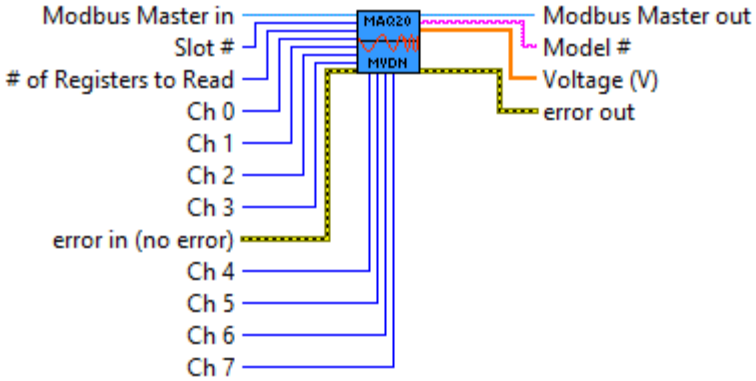
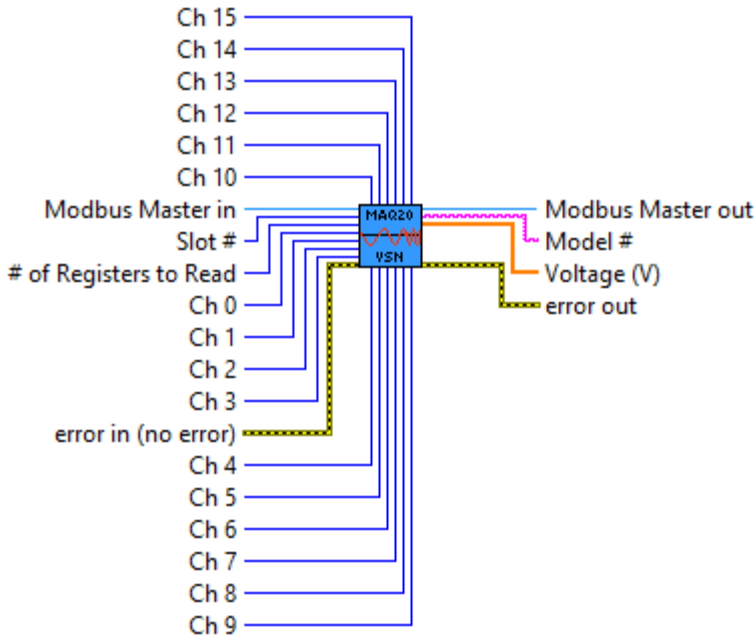
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Double 64-bit Array	
String	
Functions	
Wait	
Multiply	
Divide	
Add	
Subtract	
To Unsigned Byte Integer	
Byte Array to String	
To Word Integer	
Functions	
Index Array	
Build Array	

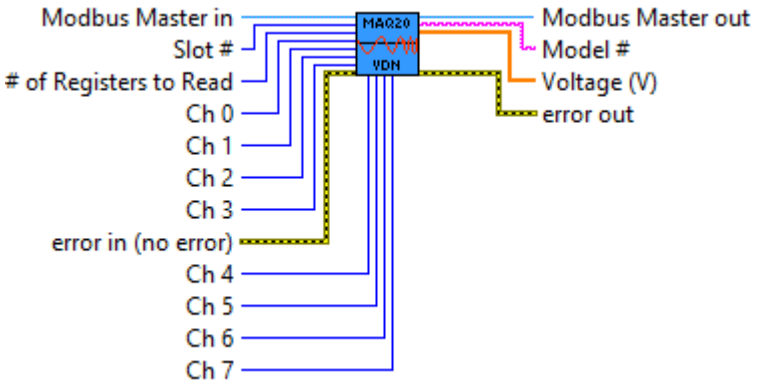
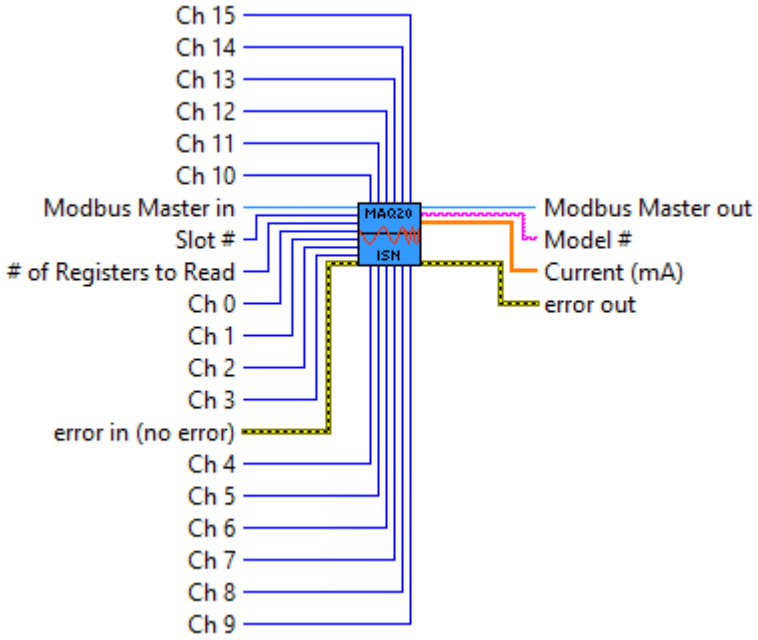
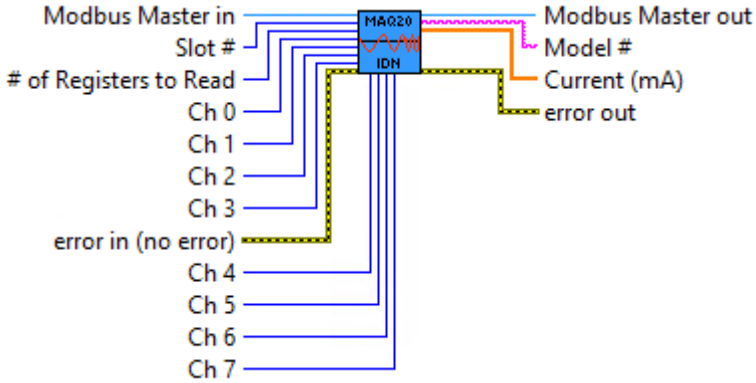
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Constants	
Numeric Unsigned 16-bit Integer	
Numeric Array	
Double Precision	
Structures	
While Loop	
For Loop	
Case Structure	
VIs	
New TCP Master	
Read Holding Registers	

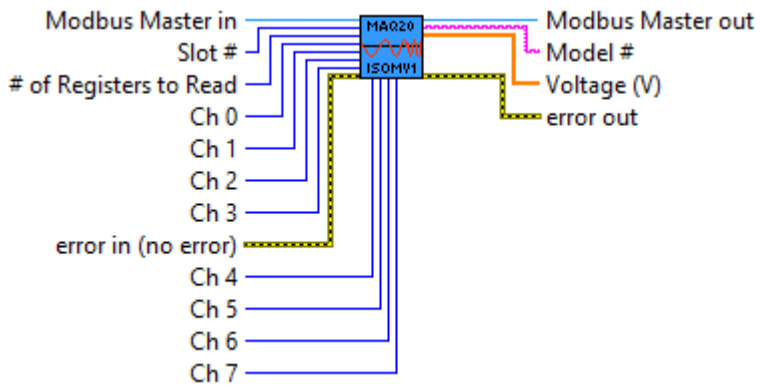
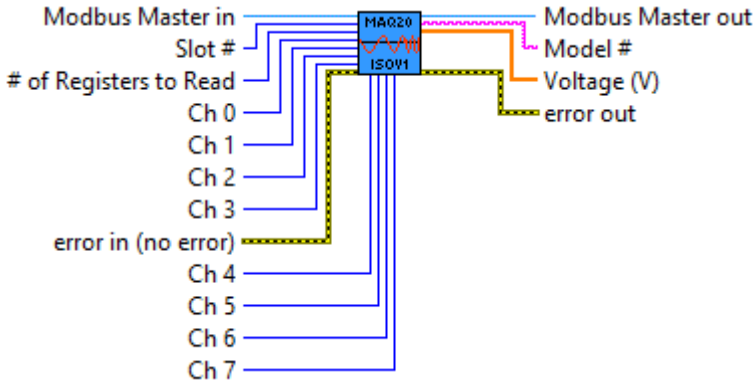
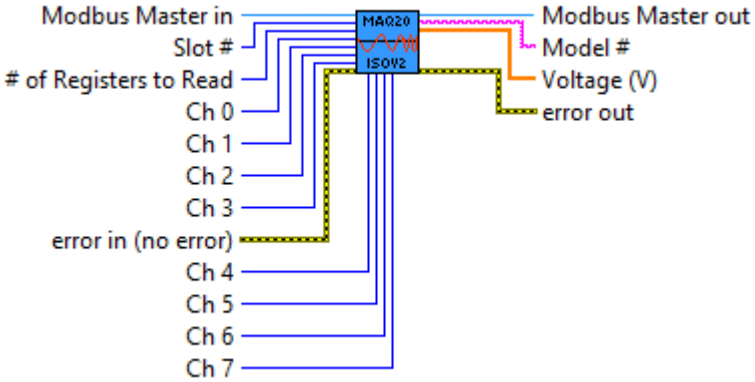
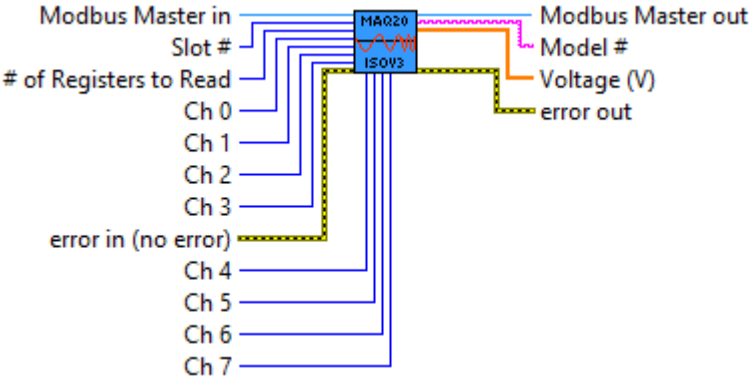
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Write Multiple Holding Registers	
Close Modbus Master	
MAQ20-COMX	
MAQ20-MVDN	
MAQ20-VSN	

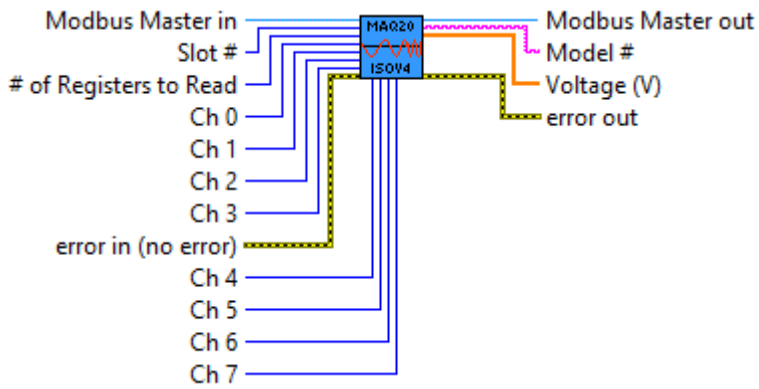
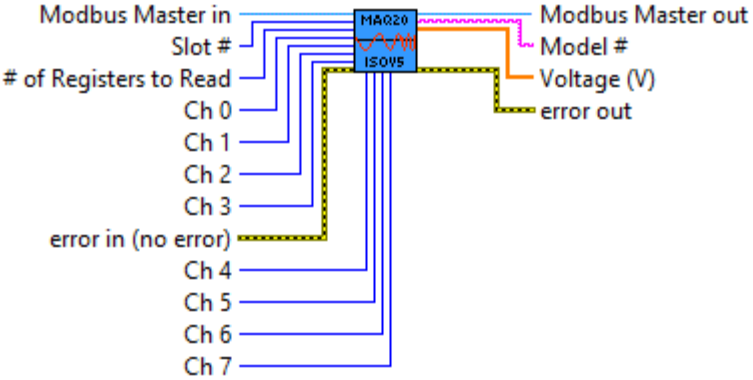
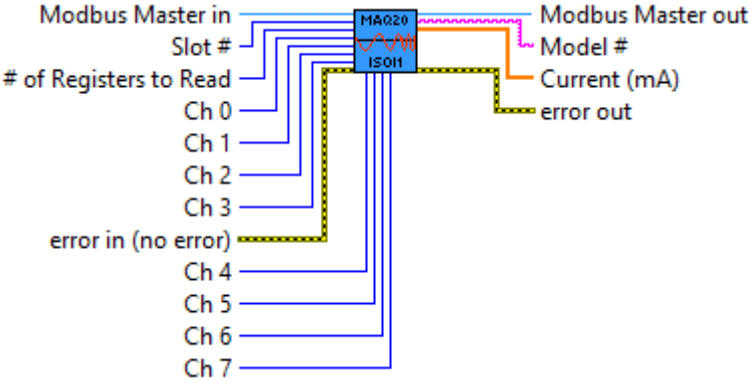
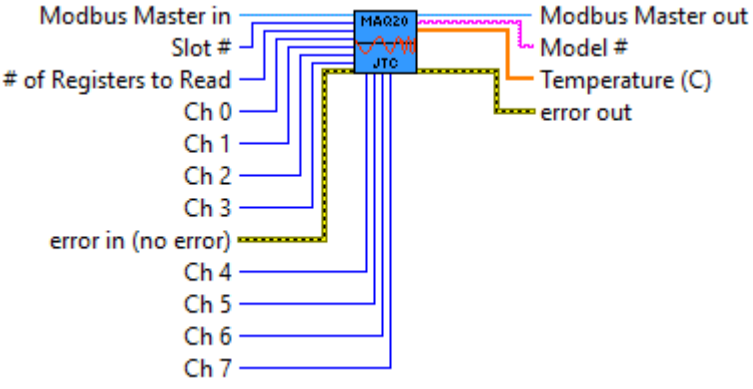
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-VDN	
MAQ20-ISN	
MAQ20-IDN	

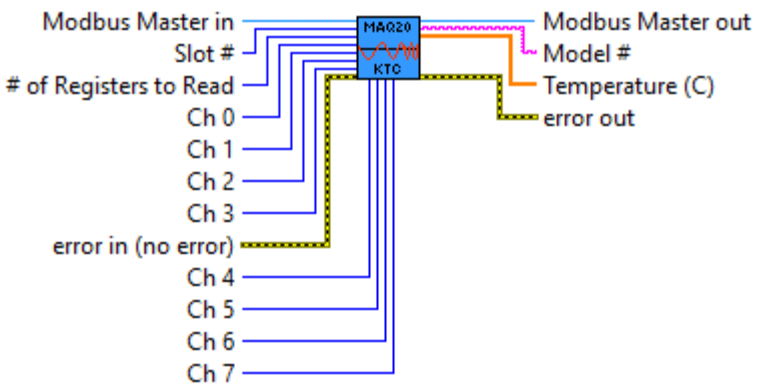
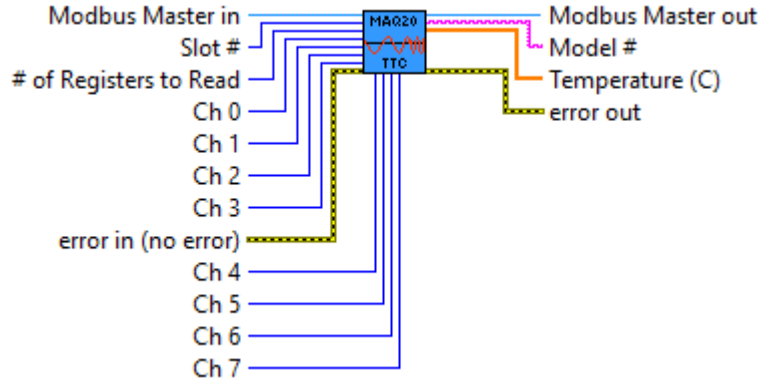
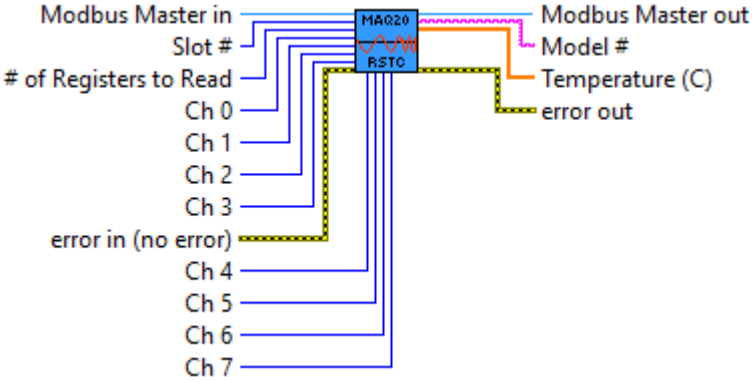
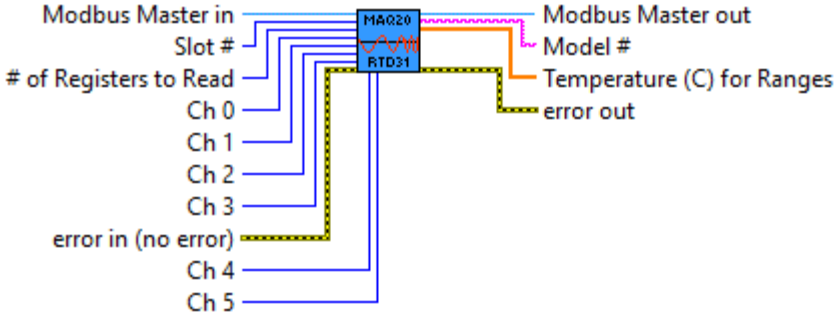
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-ISOMV1	
MAQ20-ISOV1	
MAQ20-ISOV2	
MAQ20-ISOV3	

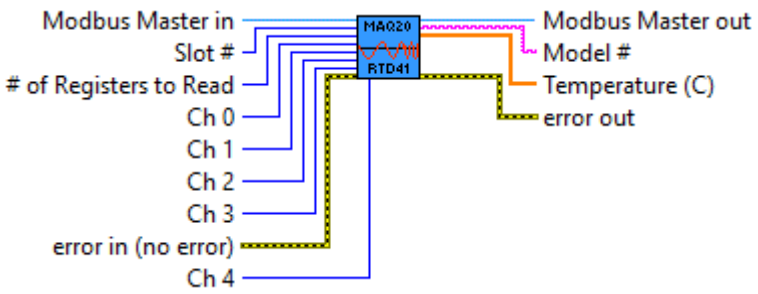
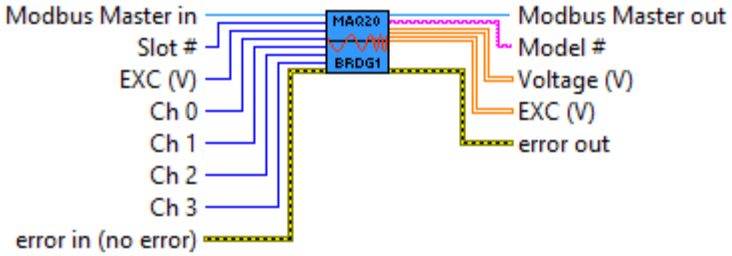
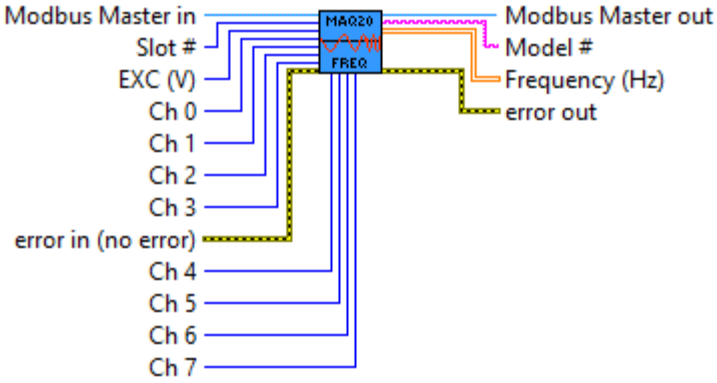
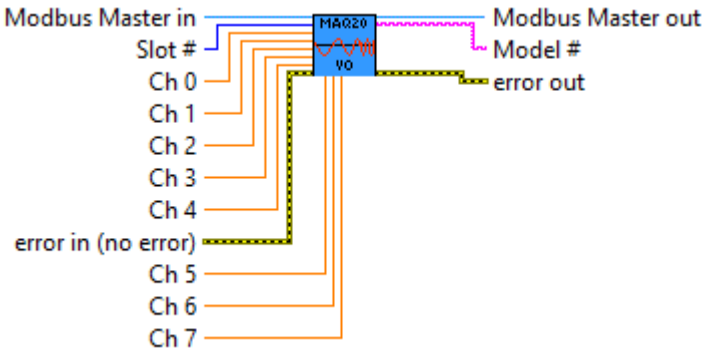
LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-ISOV4	
MAQ20-ISOV5	
MAQ20-ISOI1	
MAQ20-JTC	

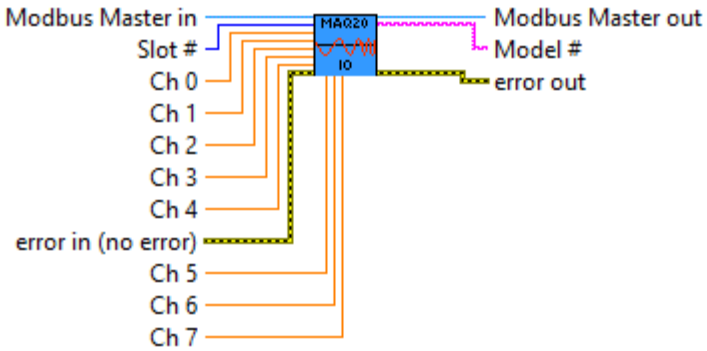
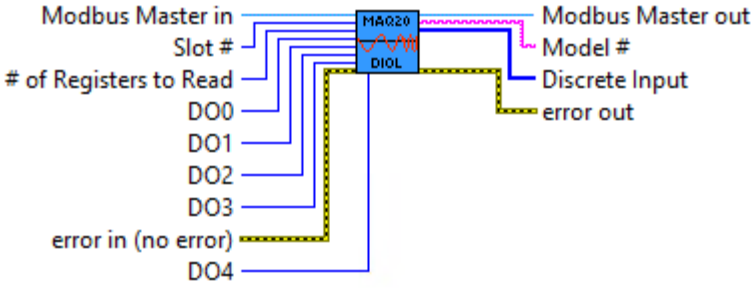
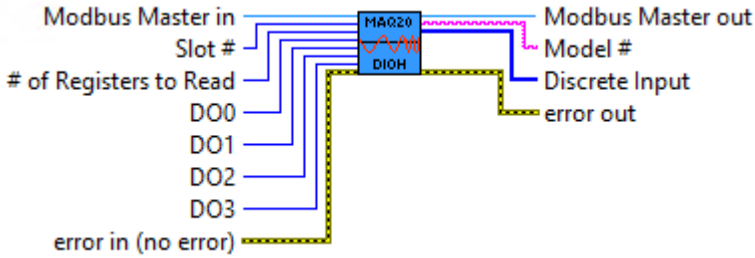
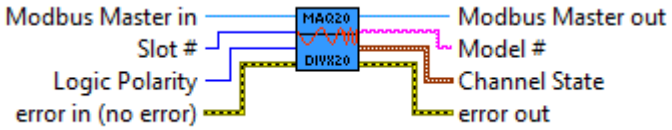
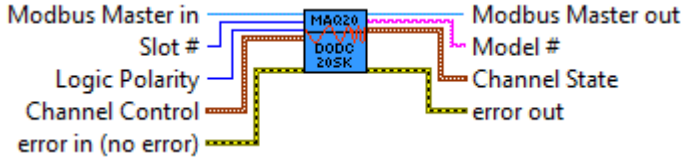
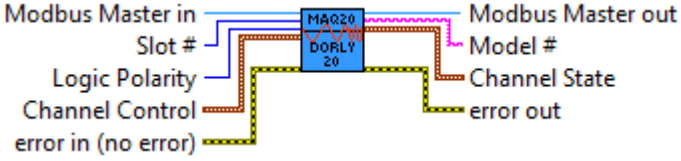
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-KTC	
MAQ20-TTC	
MAQ20-RSTC	
MAQ20-RTD31	

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-RTD41	
MAQ20-BRDG1	
MAQ20-FREQ	
MAQ20-VO	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

MAQ20-IO	
MAQ20-DIOL	
MAQ20-DIOH	
MAQ20-DIVX20	
MAQ20-DODC20SK	
MAQ20-DORLY20	

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7.0 MAQ20 Communications Module Interface

Internal to the MAQ20-COMX VI, one Read Holding Registers VI is used to read the module Model #, and a second is used to read the registers containing the data for the Real Time Clock. Slot # is multiplied by 2000 to generate the address offset.

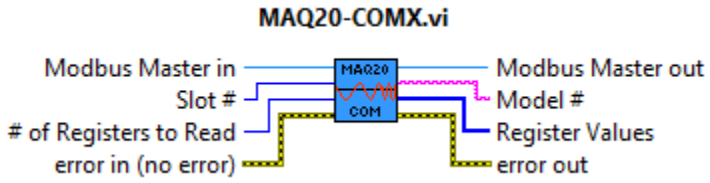


Figure 6: MAQ20-COM2 or –COM4 Basic VI Structure

The MAQ20-COM4 module in the demonstration system has a registration number of 0 and an address offset of 2000 * 0 = 0. The addresses to read from are 0 (address offset) + 1200 (RTC seconds) = 1200, through 0 (address offset) + 1206 (RTC year) = 1206.

Note: The MAQ20-COMx module will always be located in slot number 0.

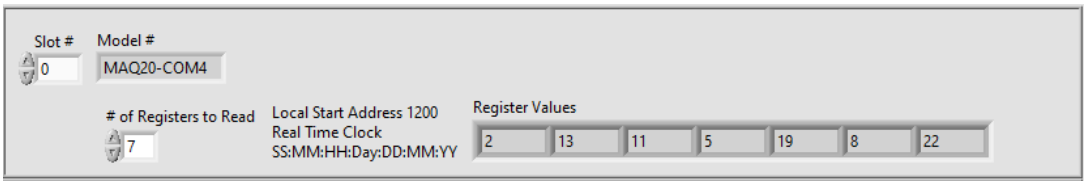


Figure 7: MAQ20-COM2 or –COM4 VI User Interface

8.0 MAQ20 Thermocouple Input Module Interface

Internal to the MAQ20-JTC VI, one Read Holding Registers VI is used to read the module Model #, a second is used to read the registers containing the data from the input channels, and a third is used to set the individual ranges for the channels. Slot # is multiplied by 2000 to generate the address offset.

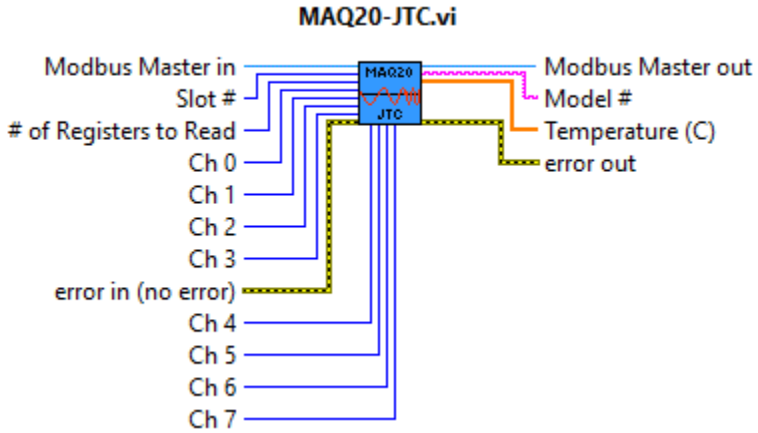


Figure 8: MAQ20-JTC Basic VI Structure

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

To obtain the optimum range and resolution for given measurements, MAQ20 input module input ranges can be configured on a per-channel basis using the VI.

Table 1: MAQ20-JTC Range Assignment

	Range	Standard Input Temperature	Equivalent Counts	Over/Under Range	Equivalent Counts	Deg C per Count
JTC	0	-100°C to +760°C (Default)	-539 to 4095	-102°C to +775°C	-550 to 4177	0.1855
	1	-100°C to +393°C	-1078 to 4236	-102°C to +401°C	-1100 to 4321	0.0928
	2	-100°C to +199°C	-2156 to 4290	-102°C to +203°C	-2199 to 4376	0.0464

Count mapping for the MAQ20-JTC module has been built into the VI. Range and count mapping are applied to the measured data and then the resulting measured temperature is displayed.

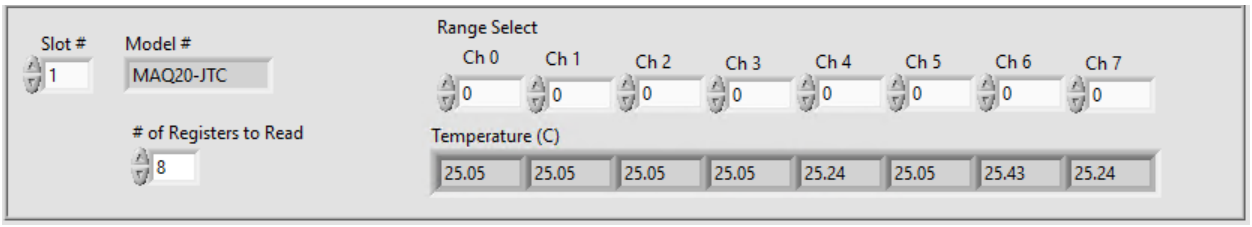


Figure 9: MAQ20-JTC VI User Interface

9.0 MAQ20 Millivolt, Voltage & Current Input Module Interface

Internal to the MAQ20-VDN VI, one Read Holding Registers VI is used to read the module Model #, a second is used to read the registers containing the data from the input channels, and a third is used to set the individual ranges for the input channels. Slot # is multiplied by 2000 to generate the address offset.

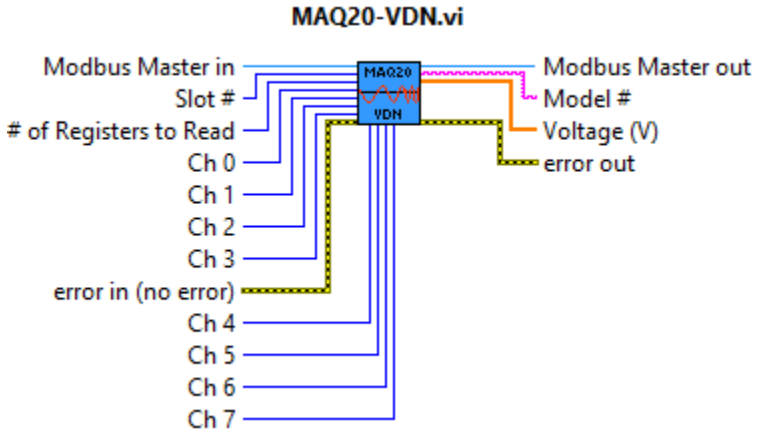


Figure 10: MAQ20-VDN Basic VI Structure

To obtain the optimum range and resolution for given measurements, MAQ20 input module input ranges can be configured on a per-channel basis using the VI.

Table 2: MAQ20-VDN Range Assignment

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

	Range	Standard Input Voltage	Equivalent Counts	Over/Under Range	Equivalent Counts	Volts per Count
MAQ20-VDN	0	-60V to +60V	-4016 to 4016	-61.2V to +61.2V	-4096 to 4095	0.01494
	1	-40V to +40V	-4016 to 4016	-40.8V to +40.8V	-4096 to 4095	0.009961
	2	-20V to +20V	-4016 to 4016	-20.4V to +20.4V	-4096 to 4095	0.004980
	3	-10V to +10V	-4016 to 4016	-10.2V to +10.2V	-4096 to 4095	0.002490
	4	-5V to +5V (Default)	-4016 to 4016	-5.1V to +5.1V	-4096 to 4095	0.001245

Count mapping for the MAQ20-VDN module has been built into the VI. Range and count mapping are applied to the measured data and then the resulting measured voltage is displayed.

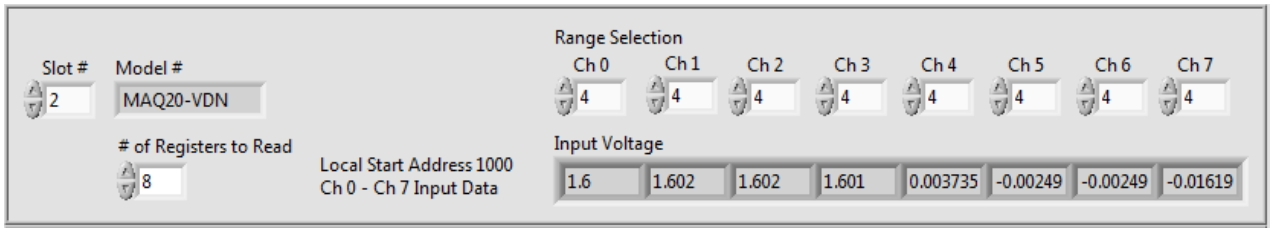


Figure 11: MAQ20-VDN VI User Interface

10.0 MAQ20 Voltage & Current Output Module Interface

Internal to the MAQ20-VO VI, one Read Holding Registers VI is used to read the module Model #, Slot # is multiplied by 2000 to generate the address offset.

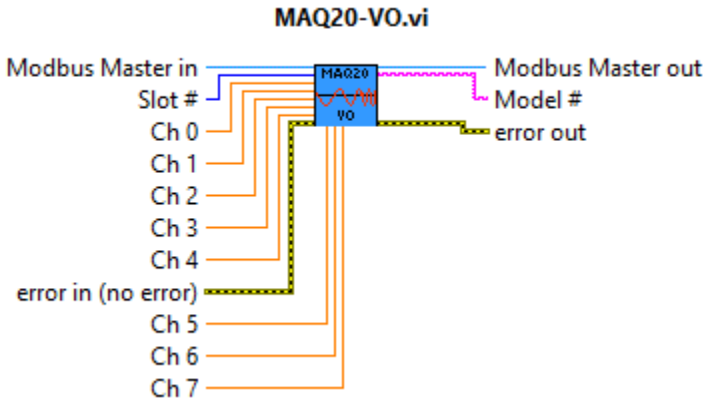


Figure 12: MAQ20-VO Basic VI Structure

The MAQ20-VO VI is hardcoded with a range setting of 0. This range was selected as the default range since its output voltage span covers the spans of all other ranges. The VI does not allow for the user to change the range during program execution. If a different range is required it can be set by changing the labeled constant within the VI's Block Diagram:

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

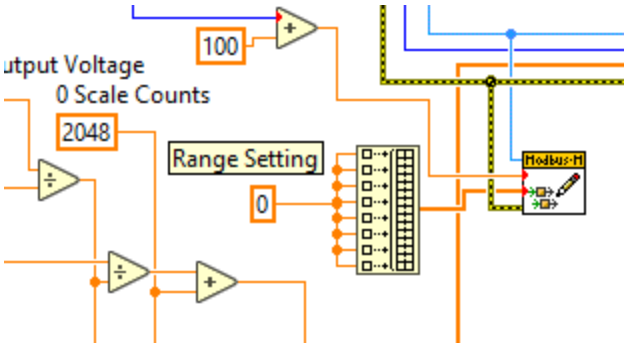


Figure 13: MAQ20-VO VI Block Digram for Range Implementation

Table 3: MAQ20-VO Range Assignment

Range	Standard Output Voltage	Equivalent Counts	Over/Under Range	Equivalent Counts	Volts per Count
0	-10V to +10V (Default)	98 to 3998	-10.5V to +10.5V	0 to 4095	0.005128
1	-5V to +5V	1073 to 3023	-5.25V to +5.25V	1024 to 3072	0.005128
2	-2.5V to +2.5V	1561 to 2536	-2.625V to +2.625V	1536 to 2560	0.005128
3	0 to +10V	2048 to 3998	0 to +10.5V	2048 to 4095	0.005128
4	0 to +5V	2048 to 3023	0 to +5.25V	2048 to 3072	0.005128
5	0 to +2.5V	2048 to 2536	0 to +2.625V	2048 to 2560	0.005128

To enter data to be written to the module in engineering units, count mapping for the MAQ20-VO module has been built into the VI. Range and count mapping are applied to the data to be written and then the resulting signal representation in counts is sent to the module.

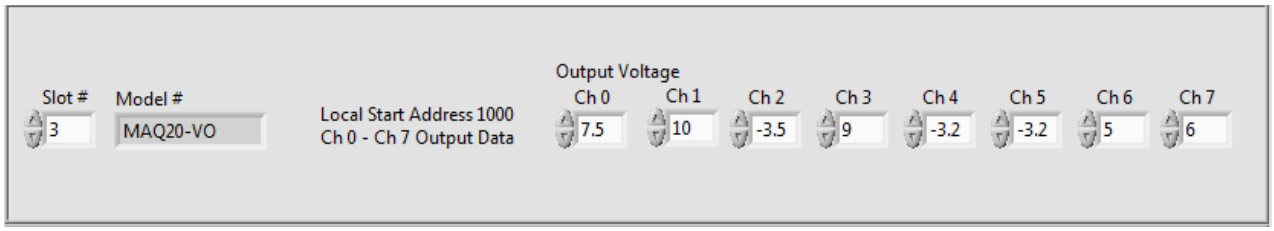


Figure 14: MAQ20-VO VI User Interface

11.0 MAQ20 Discrete Input & Output Module Interface

Internal to the MAQ20-DIOL VI, one Read Holding Registers VI is used to read the module Model # and a second is used to read the registers containing the data from the input channels. A Write Holding Registers VI is used for writing data to the registers controlling the channel discrete output states. Slot # is multiplied by 2000 to generate the address offset.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

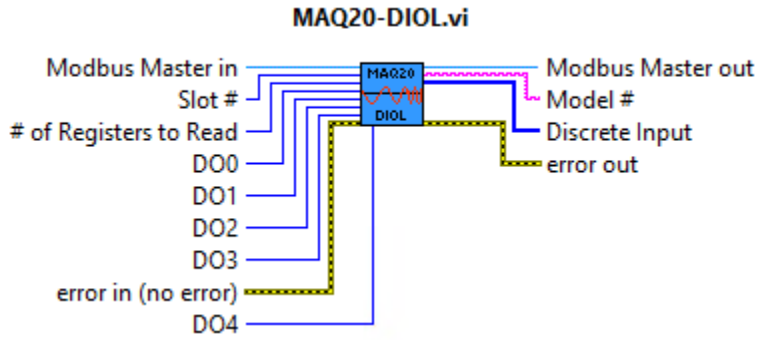


Figure 15: MAQ20-DIOL Basic VI Structure

The MAQ20-DIOL module in the demonstration system has a registration number of 4 and an address offset of 2000 * 4 = 8000.

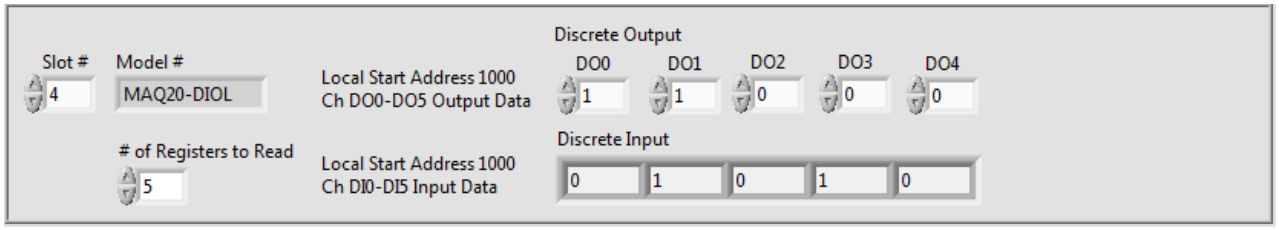


Figure 16: MAQ20-DIOL VI User Interface

12.0 Reading and Writing Data with the MAQ20 LabVIEW VI

The MAQ20 IO Module Interface TCP Example VI allows read/write operations to MAQ20 modules for 5 slots, or a MAQ20 data acquisition system comprised of one Communications Module and 4 I/O Modules.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

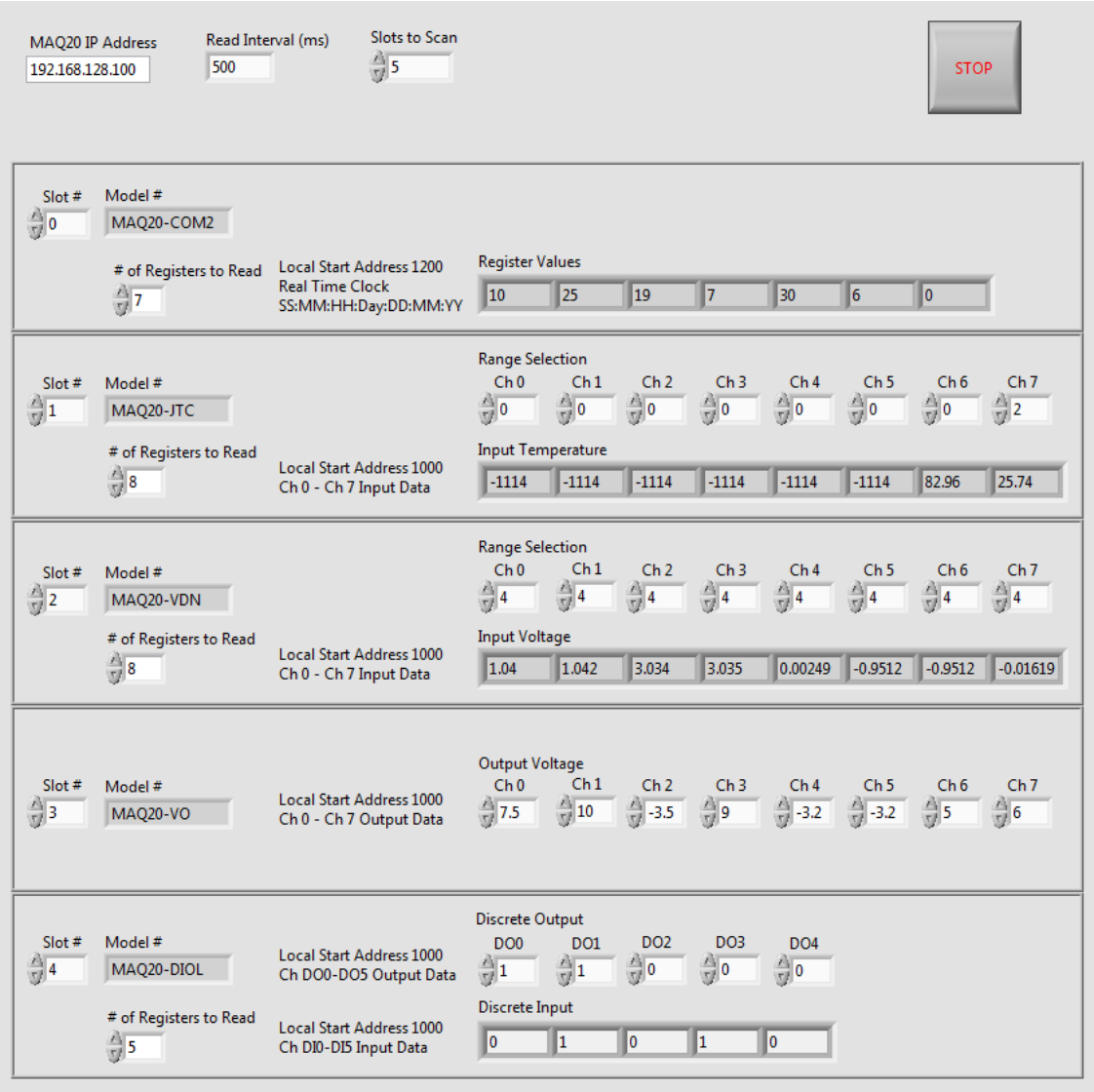


Figure 17: MAQ20 IO Module Interface TCP Example VI User Interface

The number of read interval, number of slots to scan, slot displayed, and the number of registers to read are all selectable by the user. This VI has a user interface optimized for the following system configuration:

Slot 0 MAQ20-COM4
Slot 1 MAQ20-JTC
Slot 2 MAQ20-VDN
Slot 3 MAQ20-VO
Slot 4 MAQ20-DIOL

The interface to each type of MAQ20 module has been built into a Case Structure, and this is embedded in a For Loop, so each module is scanned sequentially and continuously.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

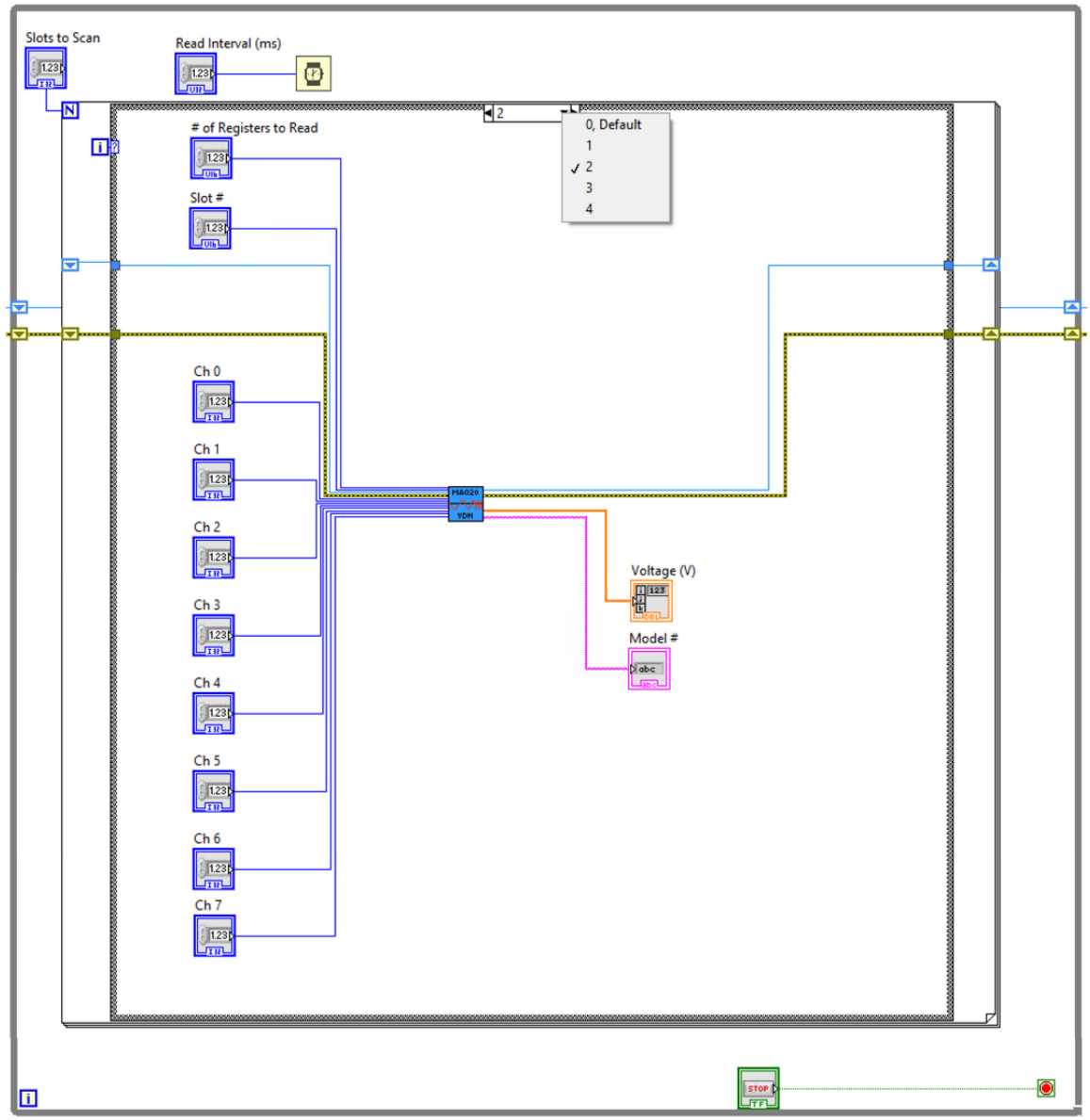


Figure 18: MAQ20 IO Module Interface TCP Example VI

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

13.0 Modifying the Example VI for Use with Other Modules

The MAQ20 IO Module Interface TCP Example VI can be modified to match any given MAQ20 system configuration. This can be done by adding or removing individual MAQ20 module VIs from the main case structure in the VIs Block Diagram window.

13.1 Adding a New Module to the Example VI

Open the example VI in LabVIEW and navigate to the VI Block Diagram by selecting Window > Show Block Diagram.

Use the case selector icon to select case #4 of the structure. Once on case #4, right clicking on the case selector icon will present the user with an option for adding a case after the current selection.

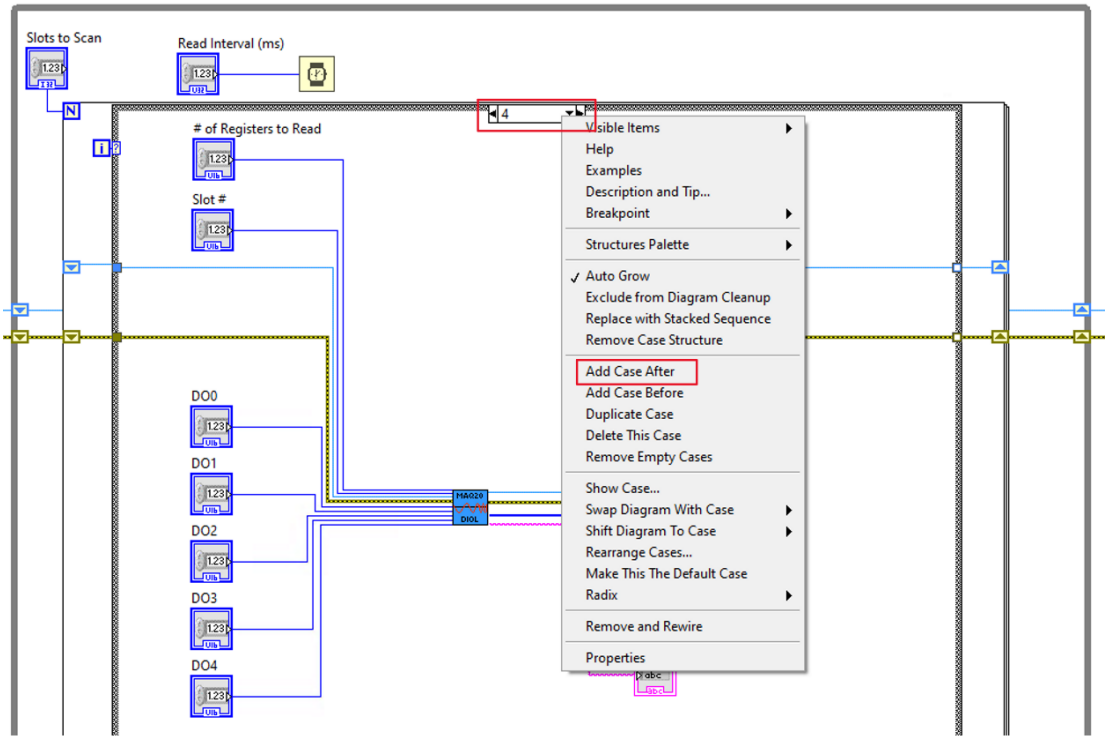


Figure 19: Modifying Cases Structure

After adding a new case to the case structure, the desired VI can be added to the example project by right clicking inside the new case's box outline and selecting the "Select a VI…" option from the dropdown menu.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

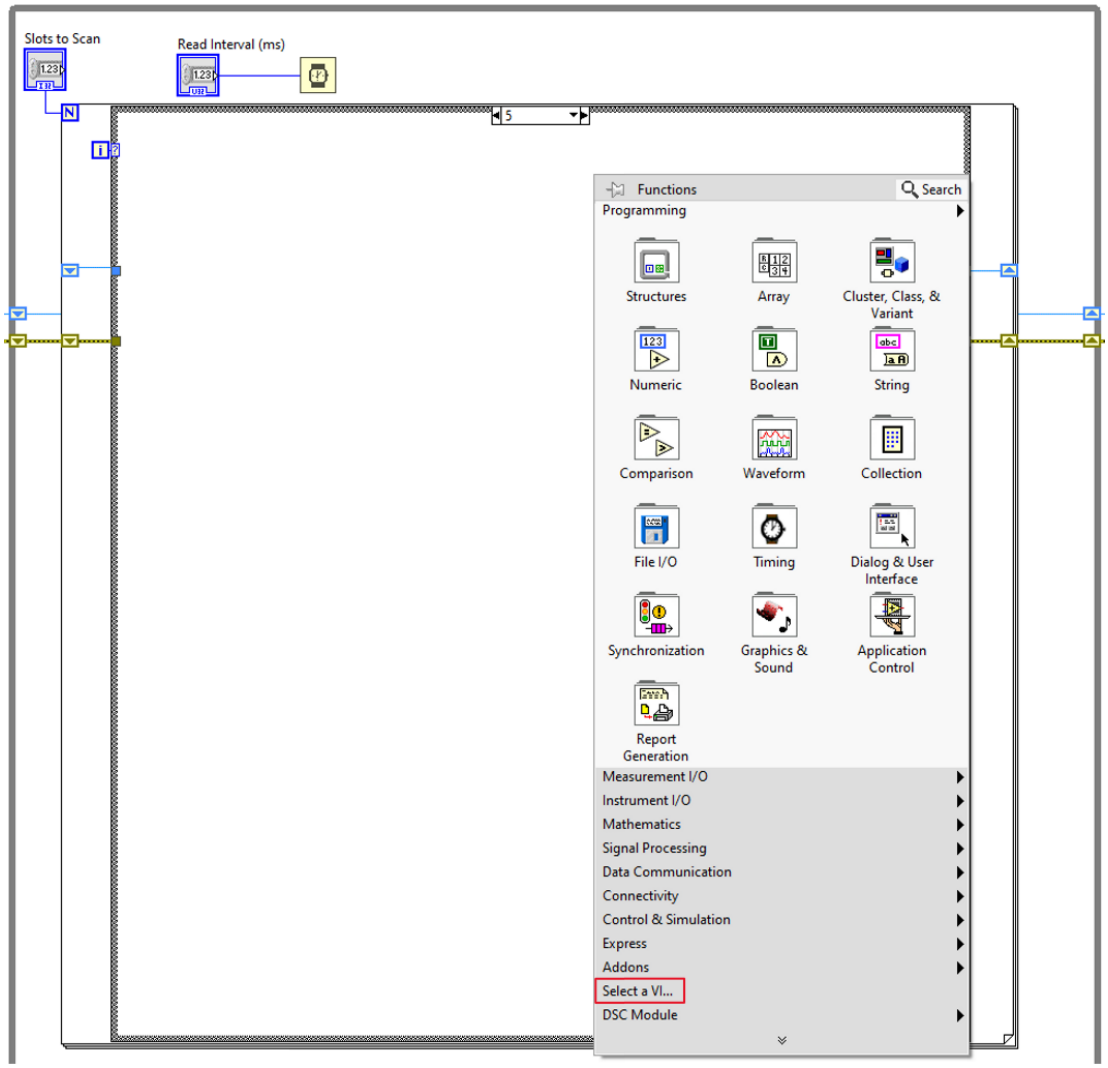


Figure 20: Selecting a VI for the added case.

Once the desired VI has been added to the case structure, inputs and outputs to the VI need to be configured. This can be done automatically by right clicking on the VI->Create->All Controls and Indicators.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

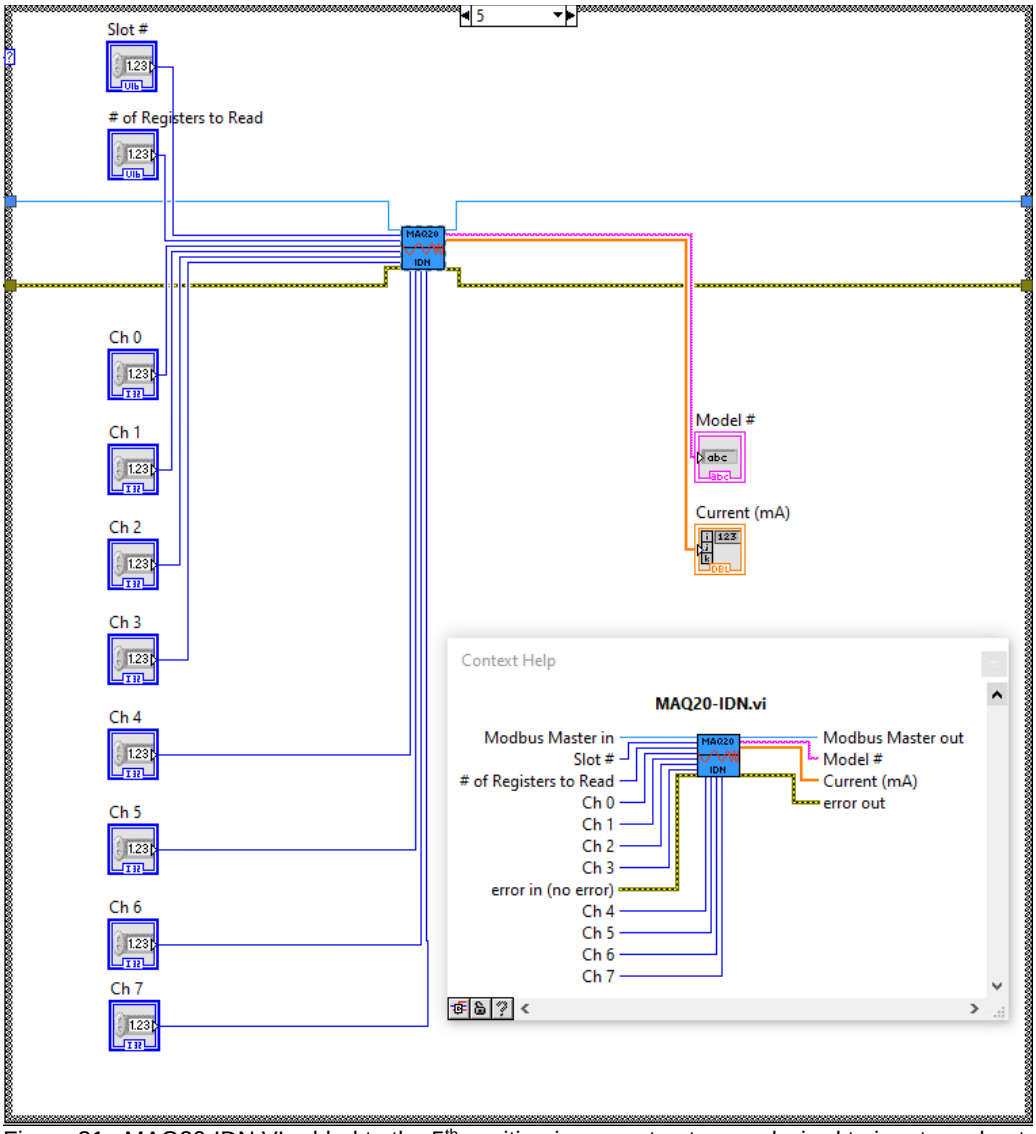


Figure 21: MAQ20-IDN VI added to the 5th position in case structure and wired to inputs and outputs.

Once all connections have been made to the VI in the Block Diagram, the values associated with the controls for “slots to scan” and “slot number” on the Front Panel need to be updated to accommodate the for the added module VI.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

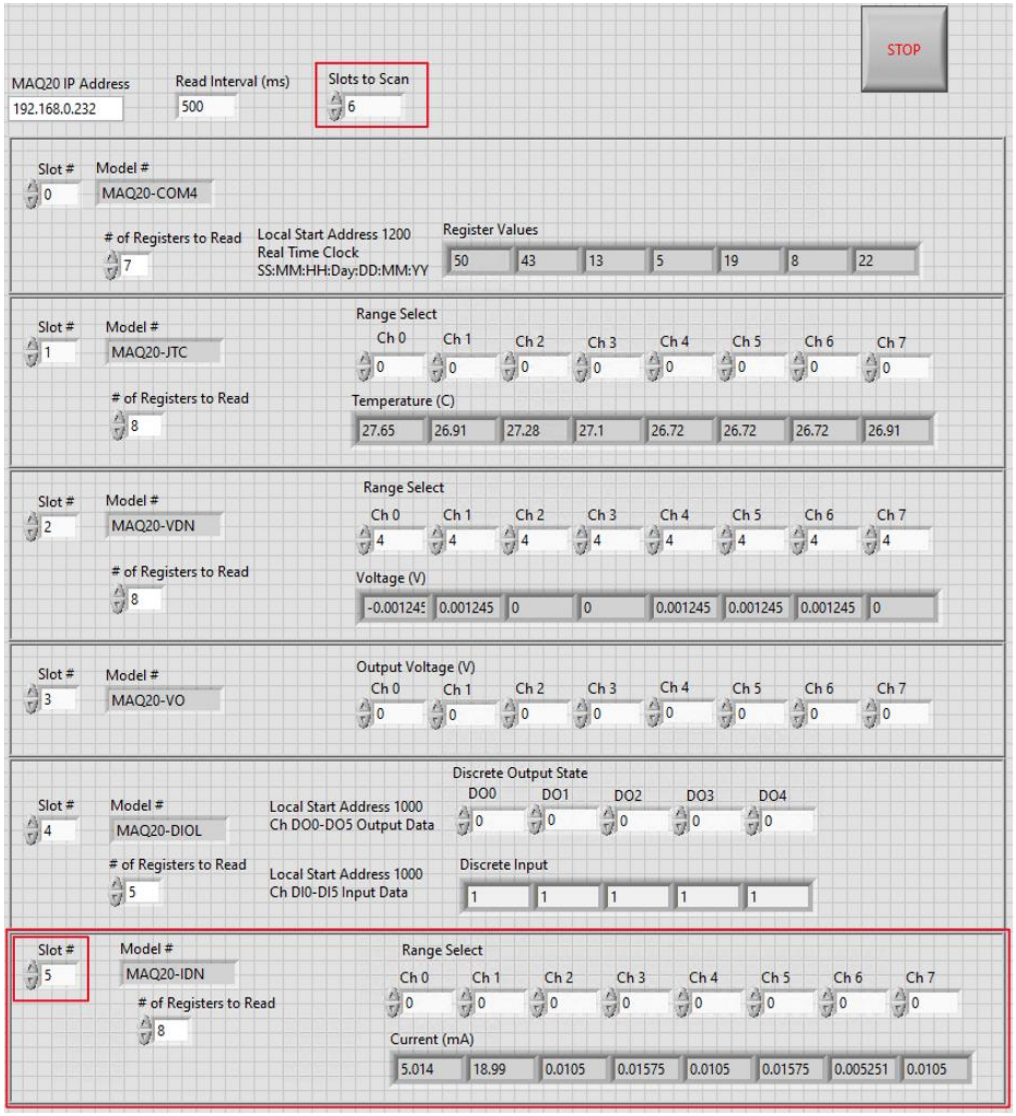


Figure 22: Front Panel updated to accommodate the VI for the added module.

13.2 Removing an Existing Module from the Example VI

Open the MAQ20 IO Module Interface TCP Example VI in LabVIEW and navigate to the Block Diagram by selecting Window > Show Block Diagram from the drop-down menu.

In the Block Diagram, use the case selector icons to navigate to the case statement that contains the module VI that is to be removed from the system.

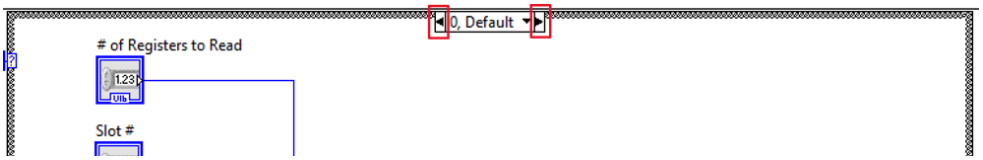


Figure 23: Case Selector Icons in Block Diagram of MAQ20 IO Module Interface Example VI

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Once on the specified case statement, right click anywhere on the case display/selector and select “Delete This Case” from the drop-down menu.

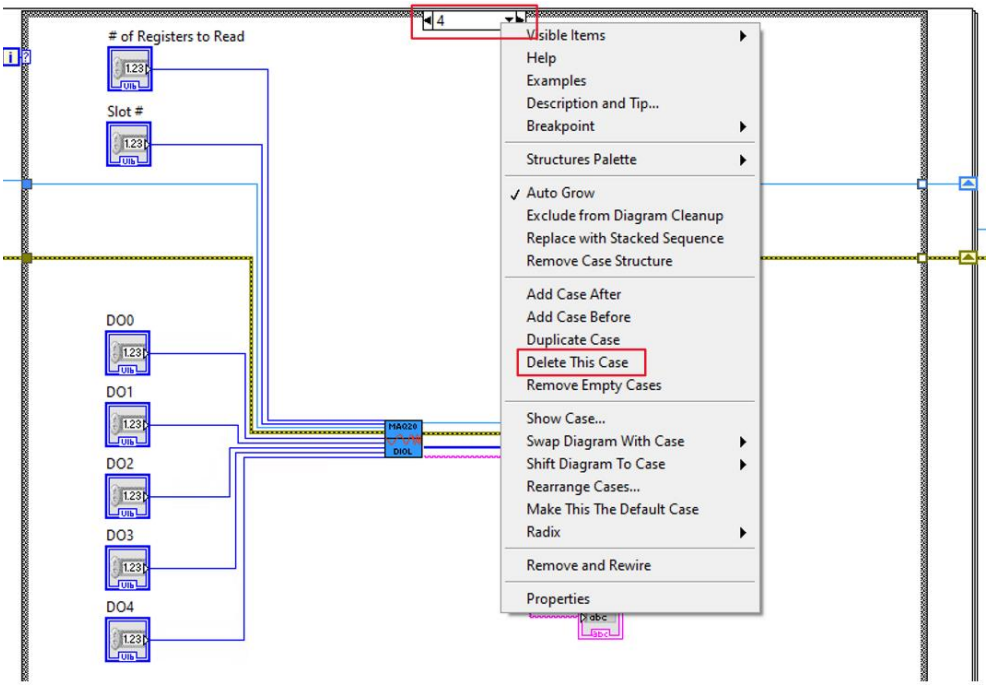


Figure 24: Removing the MAQ20-DIOL module from the system by deleting case #4 from the case structure.

Return to the Front Panel view by clicking Windows > Show Front Panel. Delete any remaining text associated with the removed module and update the number of slots to scan to one less than its previous value.

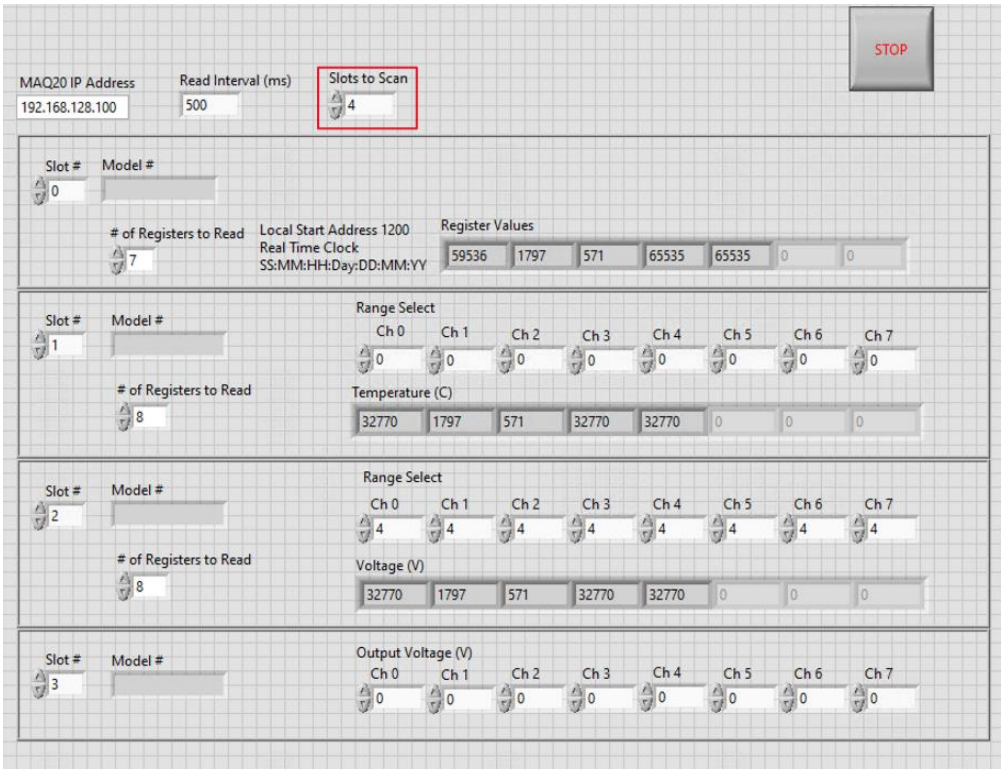


Figure 25: Front Panel with MAQ20-DIOL Module Interface Removed.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

14.0 References

Dataforth MAQ20 Software Download Center
ReDAQ Shape Software for MAQ20
MAQ20 Hardware and Software User Manuals

National Instruments, LabVIEW
www.ni.com/getting-started/labview-basics/

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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, one (1) year 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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(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.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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. You should be ready to provide the following information:

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
3331 E. Hemisphere Loop
Tucson, AZ 85706 USA

An RMA Request Form and instructions for processing are also found at www.dataforth.com/rma.aspx

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.

MAQ20 LabVIEW VI User Manual
MA1039 Rev. C – December 2022
© 2022 Dataforth Corporation. All Rights Reserved.
ISO9001:2015-Registered QMS

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000