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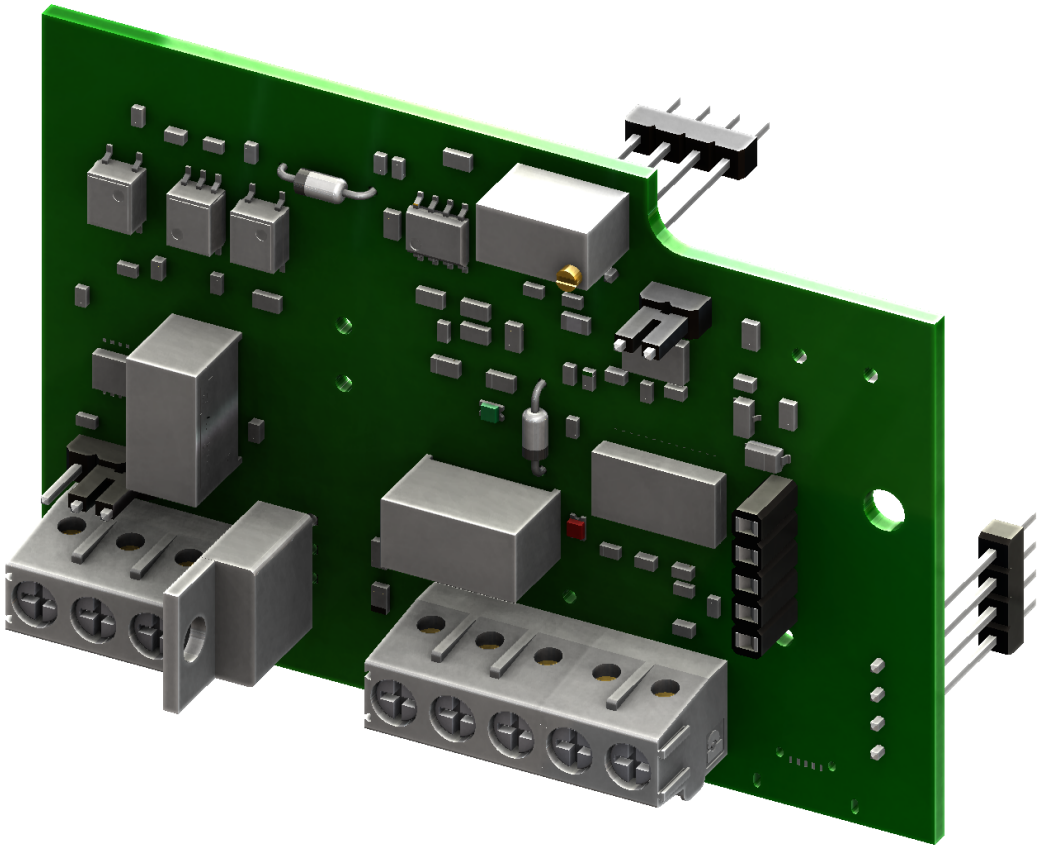
GSDA-RTU-4A Modbus Communications Card User Manual

User Manual Number: GSDA-RTU-4A



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Publication History

User Manual Publication History		
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GSDA-RTU-4A User Manual Overview

Overview of this Publication

The IronHorse GSDA-RTU-4A User Manual describes the installation, configuration, and methods of operation of the GSDA-RTU-4A Modbus Communications Card.

All information contained in this manual is intended to be correct. However, information and data in this manual are subject to change without notice. AutomationDirect (ADC) makes no warranty of any kind with regard to this information or data. Further, ADC is not responsible for any omissions or errors or consequential damage caused by the user of the product. ADC reserves the right to make manufacturing changes which may not be included in this manual.

Who Should Read This User Manual

This manual contains important information for those who will install, maintain, and/or operate the GSDA-RTU-4A Modbus Communications Card.

Technical Support

By Telephone: 800-633-0405 (Mon.–Fri., 9:00 a.m.–6:00 p.m. E.T.)

On the Web: www.automationdirect.com

Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call Technical Support at 800-633-0405. We are available weekdays from 9:00 a.m. to 6:00 p.m. Eastern Time.

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NOTE: When you see the "notepad" icon in the left-hand margin, the paragraph to its immediate right will be a special note.

WARNING: When you see the "exclamation mark" icon in the left-hand margin, the paragraph to its immediate right will be a WARNING. This information could prevent injury, loss of property, or even death (in extreme cases).

IronHorse GSDA-RTU-4A General Information

Standard Features

- *Modbus RTU*
- *Set and get control data*
- *Supports multi-drop*

Controls

- *Set speed, accel, decel*
- *Inihbit drive output*
- *Power up preset*
- *Read actual motor speed (encoder required)*
- *Set comm's baud rate*
- *Drive fault status*
- *Drive ambient temperature*
- *Drive in current limit*
- *Drive status - auto/manual*

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NOTE: Carefully check the GSDA-RTU-4A for shipping damage. Report any damage to the carrier immediately. Do not attempt to install the card if visible damage is evident to either the circuit or to the electronic components.

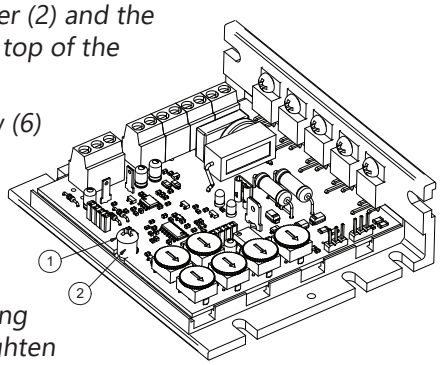
Overview

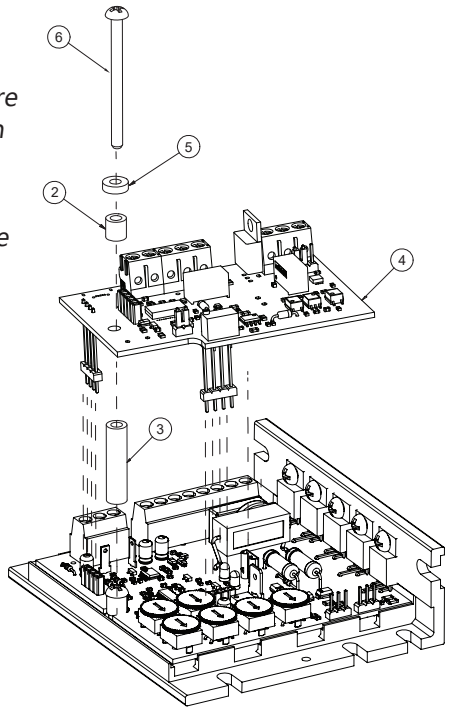
The GSDA-RTU-4A option card utilizes Modbus RTU, an RS-485 serial communication protocol, to establish master-slave communication between the GSD4A DC Drives and a variety of intelligent devices. A single master device can send commands to individually addressed GSD4A DC Drives that are wired together. Commands include set speed, acceleration, deceleration, inhibit, power up configuration settings, and a variety of diagnostic features.

GSDA-RTU-4A Installation and Operation

Installation of GSDA-RTU-4A

1) *Remove #6-32 5/8 zinc screw and the plastic spacer (2) from the GSD4A DC drive. (Keep the spacer for use in steps below.*
2) *Place the GSDA-RTU-4A onto the GSD4A DC Drive, making sure that both of the 4-position header pins and the 1/4" spade pin are properly aligned and inserted into the female headers on the GSD4A DC Drive.*
3) *Slide the 1" spacer (3) between the main control board and the GSDA-RTU-4A.*
4) *Place the plastic spacer (2) and the plastic washer (5) on top of the GSDA-RTU-4A.*
5) *Plact the 1-3/4" screw (6) through the spacers and board to secure the GSDA-RTU-4A to the GSD4A DC Drive. Tighten screw (6), being careful not to over tighten (max torque 5.3 in-lbs).*



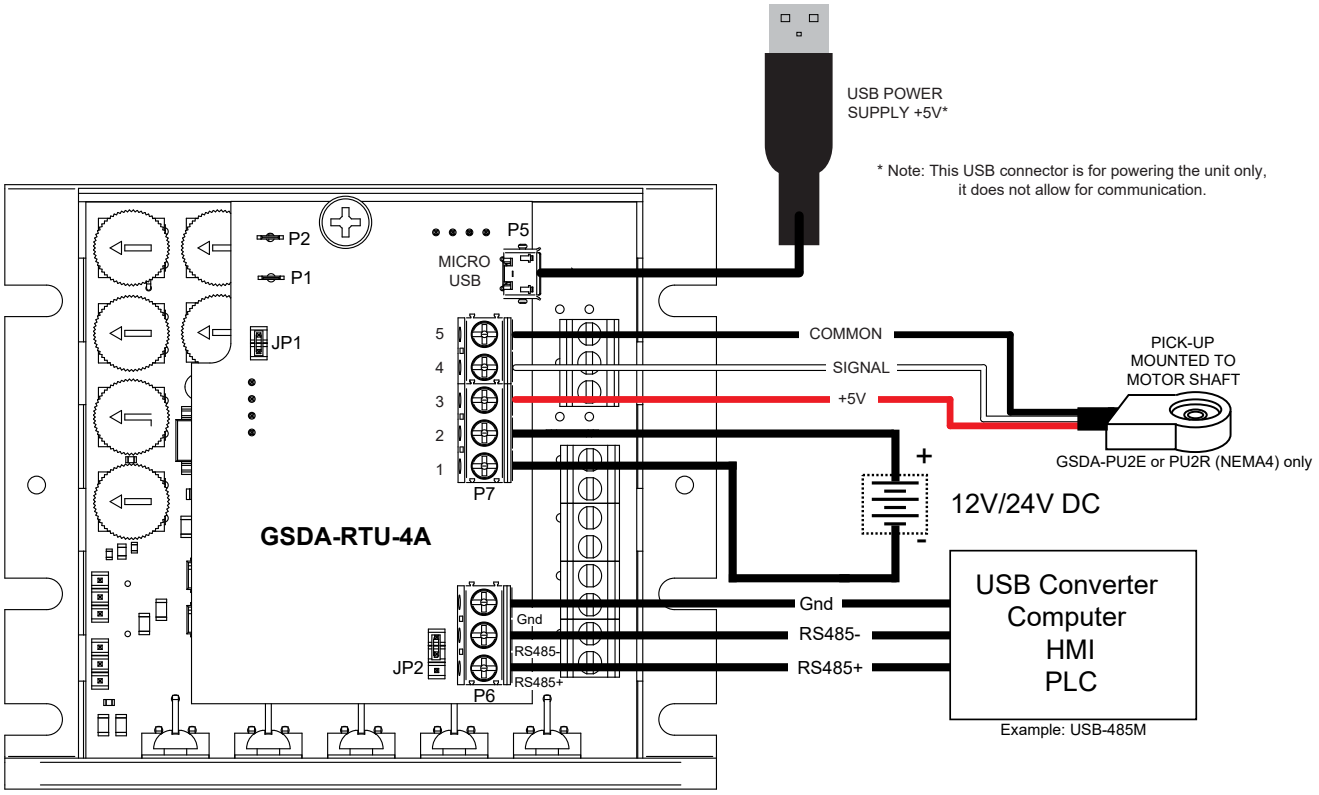


Auto/Manual Modes

In order for the GSD4A DC Drives to respond to the master device, the GSDA-RTU-4A must be in "Auto" mode. By connecting spade connectors P1 and P2, the GSDA-RTU-4A enters "Auto" mode. In "Manual" mode, the base GSD4A DC Drive will function as a normal GSD4A DC Drive without the GSDA-RTU-4A.

The GSDA-RTU-4A option card includes one potentiometer, R29. The potentiometer is used to adjust the input voltage level from the drive to the option card if the option card is in manual mode. Turning the potentiometer clockwise will increase the gain, while turning it counter–clockwise will decrease the gain. This potentiometer has no effect on the operation of the drive when in auto mode.

Wiring Diagram



Device Power

The GSDA-RTU-4A requires an external power supply to operate. There are two different options for powering the GSDA-RTU-4A; a 12V–24V DC power supply wired into terminals P7-1 and P7-2, or a 5V, 1A micro-USB power supply plugged into P5.

WARNING: Both supplies should not be used at the same time, to prevent any potential damage to the GSD4A DC Drive.

Device Addressing

Each GSD4A DC Drive needs its own individual address to communicate with the master device. The available addresses for the GSD4A DC Drives are 1-247. 0 is reserved as a broadcast command for all devices. Each GSD4A DC Drive must be addressed separately before connecting them together. No two GSD4A DC Drives can have the same address.

Max Number of Devices

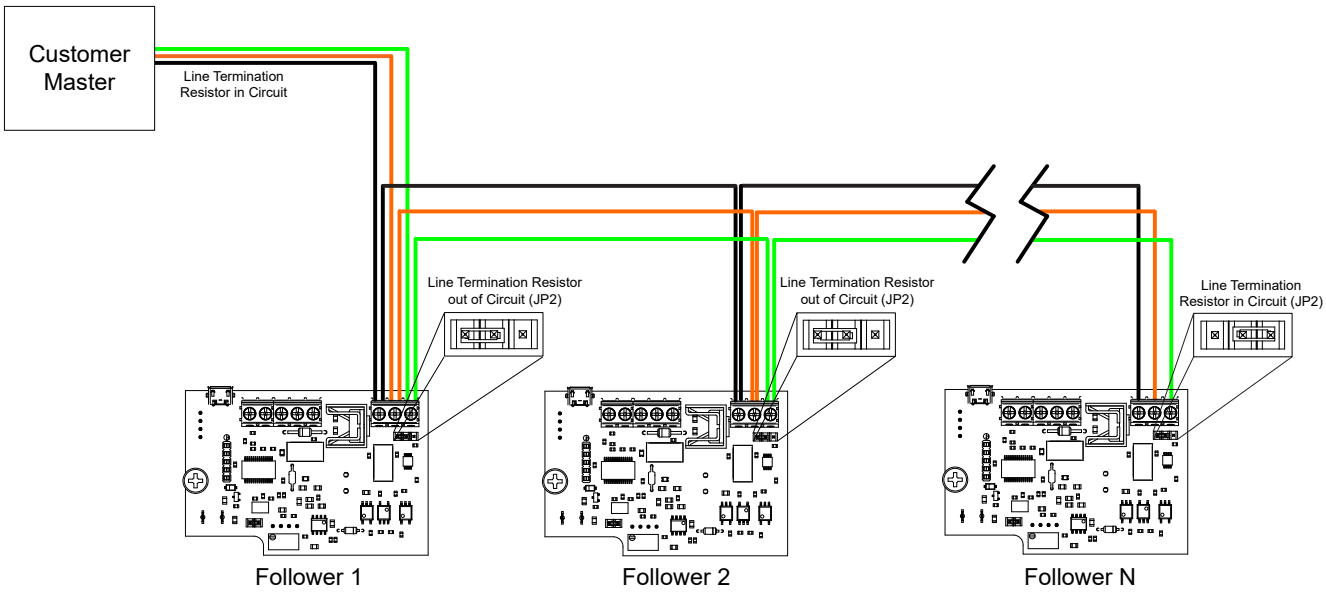
While there are 247 available addresses, only 32 GSD4A DC Drives may be wired together per EIA/TIA-485 standards. A repeater may be used to connect more than 32 GSD4A DC Drives if needed as long as there are no more than 32 GSD4A DC Drives per repeater and no more than 247 GSD4A DC Drives total.

Cable Length

The total cable length should be less than 1000m with connections between devices being no longer than 20m.

Line Termination

A line termination (LT) resistor has been added to each board to minimize reflection from the ends of the RS-485 network with multiple GSD4A DC drives connected. In a network with multiple GSD4A drives; those drives at the physical ends of the network should have the line termination resistor added on those GSDA-RTU-4A option cards. Line termination resistors should only be installed at the physical ends of the RS485 network. When GSD4A DC Drives are daisy-chained, the LT resistor on each end of the network needs to be placed in the circuit. Jumper JP2 is used to place the LT resistor in circuit.



Cables

MODBUS communications over serial cable should implement a “Two-Wire” electrical interface in accordance with EIA/TIA-485 standard.

On a two wire implementation, only one station has the right transmit at any given time. A third conductor; the common, must also interconnect all the devices of the bus.

A serial cable of wire gauge AWG 24 is recommended with a characteristic impedance greater than 100 ohms. We recommend cable L19954-1, available at www.automationdirect.com.

Reset

Jumper JP1 acts as a reset switch for each individual GSDA-RTU-4A. Lift the header off the board for 3 seconds, then place back on the board. This will reset the GSDA-RTU-4A to factory default settings. If a GSD4A DC Drive is reset, it will need to be re-addressed before it can be used again (unless initial address was default 1).

P5 Connector Description

P5 (Micro-USB) This is a micro USB type-AB input. A micro-USB cable can be plugged in here to provide power to the GSDA-RTU-4A. See “Wiring Diagram” on page 6. This port is for power only, not communication/configuration.

P6 Connector Description

P6-1 (RS485+). TxD+/RxD+, Non-inverting pin. This terminal will connect to the RS485+ terminal on additional GSD4A DC Drives, or to the RS485+ terminal of the master device.

P6-2 (RS485-). TxD-/RxD-, Inverting pin. This terminal will connect to the RS485- terminal on additional GSD4A DC Drives, or to the RS485- terminal of the master device.

P6-3 (GND).Signal and Power Supply Common. This terminal will connect to the common terminal on additional GSD4A DC Drives, or to the common terminal of the master device.

See “Wiring Diagram” on page 6.

P7 Terminal Block Descriptions

P7-1 (GND) This terminal will connect to – (negative) supply on the external power supply.

P7-2 (+VDC) This terminal will connect to + (positive) supply on the external power supply.

P7-3 (Signal) This is the signal input terminal for the motor's digital pickup or encoder. This signal is internally "pulled-up" to +5VDC via a 4.7k ohm resistor.

P7-4 (+5V) This is a self-contained +5VDC power supply capable of up to 50mA. The speed sensor supply lead can be connected to this terminal for its power source.

P7-5 (COM) This is the common point for the GSD4A DC Drive logic. The speed sensor common lead as well as any other source needing to reference the GSD4A DC Drive common will be connected to this terminal.

See "Wiring Diagram" on page 6.

GSDA-RTU-4A Communications

Serial Communications

The GSDA-RTU-4A ships with its serial communication port set at 19200 baud, 8 data bits, even parity, and 1 stop bit. Flow should also be set to none, and transmit delay should be at 0 for both settings.

RS485 Connection to Terminal Block

Depending on what the GSDA-RTU-4A will be connected to will determine where the +485/-485/GND connections will go. Users should look up the manufacturers' specifications to determine proper pinouts to connect to the GSDA-RTU-4A. Adapters may be required to interface with some devices.

Format for Messages

All messages sent to the GSDA-RTU-4A follow a common structure, or "format". The command message format is shown below:

<address><function code><start address><quantity><Cyclical Redundancy Check>

<address> Represents the address of the GSD4A DC Drive the command is being sent to. 00 for a broadcast command to all GSD4A DC Drives.

<function code> Represents the function to be performed by the command E.g. Read Coils, Read Input Registers, Write Holding Registers.

<start address> Represents the register address of the command E.g. Target Speed – 07, Acceleration – 09, Deceleration – 0A.

<quantity> This can represent the number of registers to be read or written, or the specific number to be written to a register depending on which function code is being used.

<CRC> The CRC field is calculated by the transmitting device and appended to the command. The receiving device recalculates the CRC value and compares it with the value of the received message. If the values do not match, an error results.

Example: "Set the motor speed of device 3 to 50% duty cycle"

Format: 03 06 00 07 13 88 34 BF

03	06	00	07	13	88	34	BF

03		Node Address: 3
06		Function Code: 6 Write Single Register (Used w/ Holding Registers)
00	07	Write to Address: 0x0007
13	88	Value to write: 0x1388 (5000 decimal = 50.00 duty cycle)
34	BF	CRC

For more information on the format of Modbus messages and how to calculate the CRC value go to www.modbus.org/specs.php and select 'MODBUS Protocol Specifications', and 'Modbus Serial Line Protocol and Implementation Guide V1.02'. CRC calculation can also be done using online calculators (https://www.lammertbies.nl/comm/info/crc-calculation.html). Just set the input type to hex and use the CRC-16 (Modbus) value. The high and low bytes in the resulting hex number will need to be switched when added to the message. In general the CRC is handled by most modern Modbus master devices and will only need attention if the user is writing their own Modbus control logic.

Example: CRC-16 (Modbus) = 0x4B37. In message - XX XX XX XX XX XX 37 4B

Communications Parameters Summary

A summary of the GSDA-RTU-4A Communications Parameters is listed below.

Summary – Serial Communication Parameters

GSDA-RTU-4A RS485 Serial Communication Parameters Summary								
Parameter(1)		***Discrete Input (R), F. Code: 2***	***Input Register (R), F. Code: 4***	***Coil (R/W) F. Code (R): 1, F:Code (W) 5, 15***	***Holding Register (R/W), F. Code (R): 3, F. Code (W): 6, 16***	***Range***	***Factory Default***	***Modicon(3)***
1) ♦ indicates a parameter that can be changed only with a stopped motor *2) Modicon Modbus addressing for the GSDA-RTU-4A is 10001 + the Parameter Address;* *Example: P222 Modicon Modbus address would be 10001 + 222 = 10223*								
P1-2	Auto/Manual State	1	-	-	-	0 or 1	-	10002
P3-1	Actual Speed (RPM)	-	0	-	-	0 to 65535	-	30001
P3-4	Ambient Temperature (°C)	-	3	-	-	-	-	30004
P1-20	Accel/Decel Ramp in Progress	19	-	-	-	0 or 1	-	10020
P1-23	Target Speed = 0	22				0 or 1		10023
P1-24	S1 (Main) Pickup is Stalled	23				0 or 1		10024
P1-27	Inhibit Function is Activated	26				0 or 1		10027
P1-29	Drive is at Maximum Output	28				0 or 1		10029
P1-30	"Run" Condition	29				0 or 1		10030
P0-1	Inhibit	-	-	0	-	0=Inhibit off 1=Inhibit on	0	00001
P4-1	Power Up Target Speed Selection	-	-	-	0	0=Zero 1=Prev. value 2=Power Up Target	1	40001
P0-37	Enable access exceptions for unimplemented addresses	-	-	36	-	0=Access exceptions will not be generated 1=Access exceptions will be generated	1	00037
P0-38	Enable PID	-	-	37	-	0=PID disabled 1=PID enabled	0	00038
P4-8	Target Speed	-	-	-	7	0 to 10000	0	40008
P4-9	Power Up Target Speed	-	-	-	8	0 to 10000	0	40009
P4-10	Accel	-	-	-	9	0 to 9999	4999	40010
P4-11	Decel	-	-	-	10	0 to 9999	1	40011
P4-12	Sensor PPR	-	-	-	11	1 to 60	1	40012
P4-14	Device Address	-	-	-	13	1 to 247	1	40014
P4-15	Baud Rate	-	-	-	14	0=110 1=300 2=600 3=1200 4=2400 5=4800 6=9600 7=14400 8=19200 9=38400 10=57600	8	40015
P4-16	Parity	-	-	-	15	0=No parity 1=Odd parity 2=Even parity	2	40016
P4-28	Proportional Gain	-	-	-	27	-	32	40028
P4-29	Integral Gain	-	-	-	28	-	13	40029
(table continued next page)								

GSDA-RTU-4A RS485 Serial Communication Parameters Summary[1] – (continued)								
Parameter[2]		***Discrete Input (R)***	***Input Register (R)***	***Coil (R/W)***	***Holding Register (R/W)***	***Range***	***Factory Default[3]***	***Modicon[4]***
1) ♦ indicates a parameter that can be changed only with a stopped motor *2) Modicon Modbus addressing for the GSDA-RTU-4A is 10001 + the Parameter Address;* *Example: P222 Modicon Modbus address would be 10001 + 222 = 10223*								
P4-30	Derivative Gain	-	-	-	29	-	16	40030
P4-75	Inhibit at Start-up	-	-	-	74	0=Off 1=Prev. value 2=On	1	40075
P4-76	Speed Max	-	-	-	75	-	2400	40076
P4-77	Speed Min	-	-	-	76	-	0	40077

GSDA-RTU-4A Parameter Descriptions

GSDA-RTU-4A RS485 Serial Communication Parameters Descriptions		
Item #	***Parameter Name***	***Description***
P1-2	Auto/Manual State	GSDA-RTU-4A P1-P2 Jumper Position, if Closed=0 (Auto), if Open=1 (Manual).
P3-1	Actual speed (RPM)	Actual motor speed in RPM.
P3-4	Ambient Temperature	Ambient temperature in degrees celsius.
P1-20	Accel/Decel Ramp in Progress	Drive is accelerating or decelerating
P1-23	Target Speed = 0	Drive Speed Reference=0, then 1, else 0.
P1-24	S1 (Main) Pickup is Stalled	Encoder Feedback is stalled. If Target Speed > zero and Actual Speed=0, then 1, else 0.
P1-27	Inhibit Function is Activated	Drive Inhibit Status, IF P0-1=1, then 1, else 0.
P1-29	Drive is at Maximum Output	Indicates if the drive is running at maximum speed.
P1-30	"Run" Condition	Run=1 if the drive is not inhibited and the Target Speed is > 0 If the drive is powered on, but has a Target Speed = 0, then Run=0. If decelerating to zero, Run=1 until drive comes to a complete stop, then Run=0.
P0-1	Inhibit	Inhibit Command, Inhibit OFF=0, Inhibit ON=1. (ONLY available when the drive is powered and running.
P4-1	Power Up Target Speed Selection	Power Up Target Speed Enable Selected, if (P4-9)=1
P0-37	Enable access exceptions for unimplemented addresses	Used with Block reads and writes to Enable/Disable access exceptions for unimplemented addresses. Disable=0, Enable=1.
P0-38	Enable PID	PID - Enable/Disable Command, Disable=0, Enable=1.
P4-8	Target Speed	Motor Speed Setpoint in percent, 0 to 100.00%
P4-9	Power Up Target Speed	Motor Speed Setpoint in percent, 0 to 100.00%, at startup IF P4-1=1
P4-10	Accel	Acceleration rate in percent change/second. Example: 4999 = 49.99% change/second
P4-11	Decel	Deceleration rate in percent change/second. Example: 4999 = 49.99% change/second
P4-12	Sensor PPR	IF using GSDA-PU2x - Mag Disc #2=1PPR, Mag Disc #20=10PPR, Mag Disc #40=20PPR
P4-14	Device Address	Modbus Station Address (1 ~ 247)
P4-15	Baud Rate Index	Entered value determines baud rate: Where 0~10 = 110 ~57,600 Baud, (Default = 19,200)
P4-16	Parity	Entered value determines communications parity: None, ODD, EVEN
P4-28	Proportional Gain	Proportional gain value determines the amount of drive output change proportional to the current value of the SP − PV error. If the error is large and positive, the drive output will be proportionately large and positive, taking into account the gain value. Using proportional control alone will result in an error between the setpoint and the actual process value, because it requires an error to generate the proportional response. If there is no error, there is no corrective response.

GSDA-RTU-4A RS485 Serial Communication Parameters Descriptions (continued)		
Item #	***Parameter Name***	***Description***
P4-29	Integral Gain	Integral gain accounts for past values of the SP − PV error and integrates them over time to produce the integral term. For example, if there is a residual SP − PV error after the application of proportional control, the integral term seeks to eliminate the residual error by adding to drive output due to the historic cumulative value of the error. When the error is eliminated, the integral term will cease to grow. This will result in the proportional effect diminishing as the error decreases, but this is compensated for by the growing integral effect.
P4-30	Derivative Gain	Derivative gain is a best estimate of the future trend of the SP − PV error, based on its current rate of change. Derivative gain anticipates change as it effectively seeks to reduce the effect of the SP − PV error by exerting a control influence generated by the rate of error change. The more rapid the change, the greater the controlling or dampening effect.
P4-75	Inhibit at Start-up	When selected, "Inhibit at start-up", will override the "Power Up Target Speed", (P4-9), Accel, (P4-10) and Decel, (P4-11). To Disable, set=0, to follow the previous value, set=1. If the drive is inhibited when turned off, it will remain inhibited when turned on. If the drive is not inhibited when turned off, it will not be inhibited when turned back on. To Enable this function, set=2.
P4-76	Speed Max	Limits drive maximum speed, IF PID is DISABLED from 70% to 100%. If set to 70%, driven motor speed cannot be greater than 70%. IF PID is ENABLED, "Speed Max" minimum value = "Speed Min" +1.
P4-77	Speed Min	Limits drive minimum speed, IF PID is DISABLED from 0% to 30%. If set to 30%, driven motor speed cannot be less than 30%. IF PID is ENABLED, "Speed Min" maximum value <= "Speed Max" -1.

GSD4A PID Enable Setup

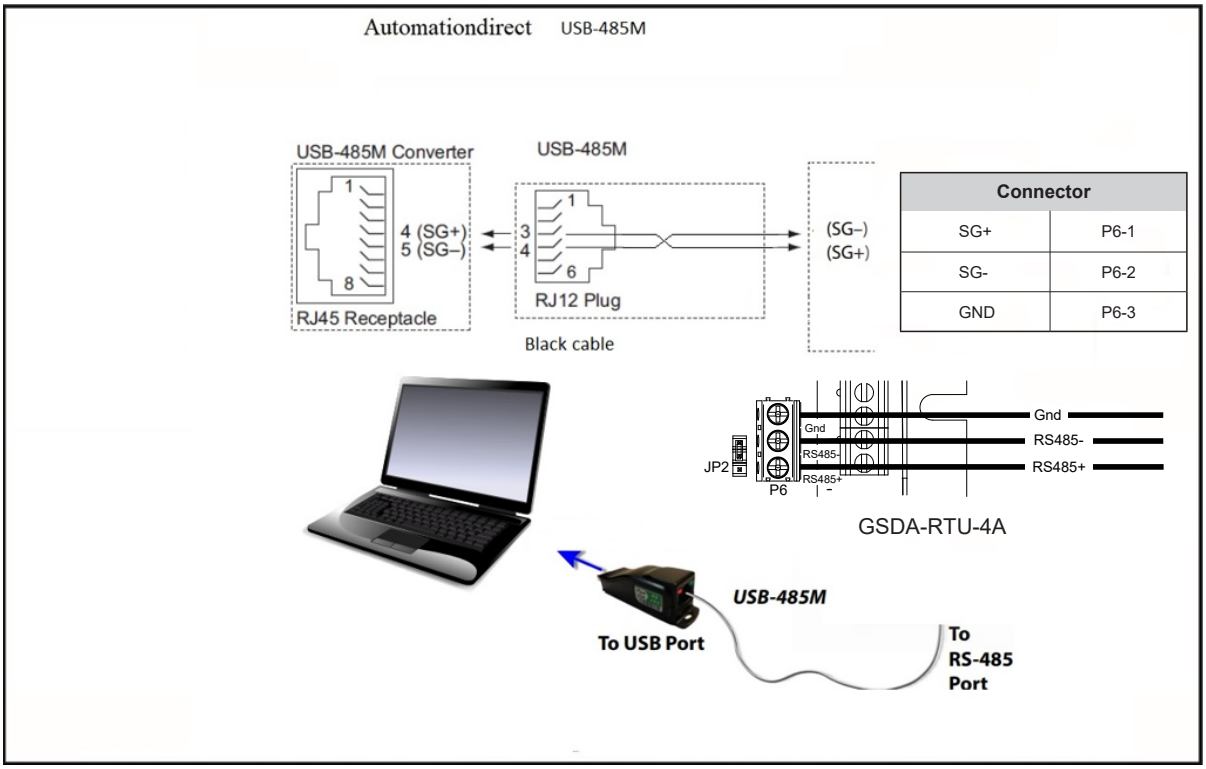
GSD4A PID Enable Setup with GSDA-RTU-4A		
Parameter	***PID Enable "LOW" (% Duty Cycle)***	***PID Enable "HIGH" (RPM)***
Target Speed	Min - Max	Min - Max
Accel	(%/sec) 0.1 - 6553.4 Default: 6553.4 Pot. - Range set in hardware	(RPM/sec.) 0.1 – 6553.4 Default: 6553.4 Pot. – Range set in hardware
Decel	(%/sec.) 0.1 – 6553.4 Default: 6553.4 Pot. – Range set in hardware	(RPM) 0.1 – 6553.4 Default: 6553.4 Pot. – **Must be set to max
Max	(%) 70.00 – 100.00 Default: 100.00 Pot. – Range set in hardware	(RPM) 0.0 – 6553.5 Default: 2400.0 Pot. – Range set in hardware
Min	(%) 0.00 – 30.00 Default: 0.00 Pot. – Range set in hardware	(RPM) 0.0 – 6553.5 Default: 0.0 Pot. – **Should be set to min
Proportional (P)	Disabled	0.00 – 100.00 Default: 0.32
Integral (I)	Disabled	0.00 – 100.00 Default: 0.13
Derivative (D)	Disabled	0.00 – 100.00 Default: 0.16

GSD4A Control Modes

GSD4A Control Modes with GSDA-RTU-4A					
Parameter	***Auto Mode w/Internal PID w/o External PID***	***Auto Mode w/o Internal PID w/o External PID***	***Auto Mode w/o Internal PID w/External PID***	***Manual Mode w/Internal PID***	***Manual Mode w/o Internal PID***
Pickup	Connected	NA	Connected	Connected	NA
PPR	Set to pickup device	NA	Set to pickup device	Set to pickup device	NA
Auto/Manual Jumper	Set to Auto	Set to Auto	Set to Auto	Set to Manual	Set to Manual
Accel/Decel Pots	Maximum	Maximum	Maximum	Maximum	Application specific
Accel/Decel Registers	Application specific	Application specific	Infinite	NA	NA
Max Pot	Application specific	Application specific	Application specific	Application specific	Application specific
Min Pot	NA	NA	NA	Application specific	Application specific
Max Register	Motor max RPM	Max allowable duty cycle	100.00	Motor max RPM	NA
Min Register	Motor min RPM	Min allowable duty cycle	0.00	Motor min RPM	NA
PID Registers	Application specific	NA	NA	Application specific	NA
PID Enable coil	Active (High)	Deactivated (Low)	Deactivated (Low)	Active (High)	Deactivated (Low)
Speed Control	Target Speed register	Target Speed register	Target Speed register	Speed Pot	Speed Pot

Connecting PC to GSDA-RTU-4A Using AutomationDirect Cable USB-485M

An AutomationDirect cable, part number USB-485M, provides a quick and easy method of communicating to a GSDA-RTU-4A from a PC.

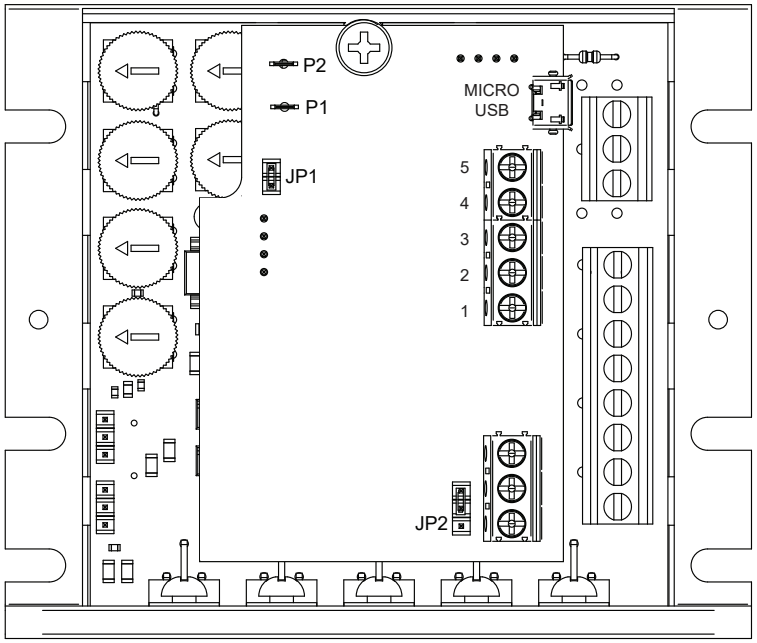


Connecting Communication Cables to GSDA-RTU-4A Communication Card

The GSDA-RTU-4A communication module incldues a jumper (JP2) that will switch in a 120Ω terminating resistor for the RS-485 network. An external terminating resistor is not required for the drive end. An external terminating resistor may be required on the other end of the RS-485 network, especially on long runs. Select resistors that match the impedance of the cable (between 100Ω and 500Ω).

The GSDA-RTU-4A communication port is an RS-485 input. RTU to RTU serial connections can be accomplished with standard RS-485 cable (L19827-1 or similar). RS-232 signals can be converted to RS-485 by using a separate converter (see the FA-ISOCON drawings on page 17 and page 17.

GSDA-RTU-4A RS485 Serial Communications Module



1 SAFETY INFORMATION

1.1 SAFETY WARNINGS

NOTE!
- Only use the GSDA-RTU-4A RS485 communication card with GSD4A series DC drives.
- It is recommended reading the GSDA-RTU-4A user's manual before installing or operating this accessory.
- The content of this guide provides important information for the full understanding and proper operation of this module.

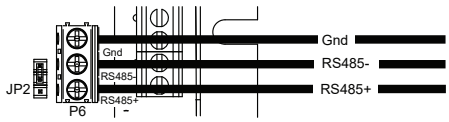
1.2 PRELIMINARY RECOMMENDATIONS

ATTENTION!
- Always disconnect the general power supply before connecting or disconnecting the accessories of the GSDA-RTU-4A.
- Wait for at least 10 minutes for the full discharge of the inverter.

5 CONFIGURATIONS

The RS485 interface connections must be done on the P6 connector as shown:

GSDA-RTU-4A Connector P6 signals of the RS485 interface



The location of the JP2 jumper to select the RS485 network termination can be better viewed in the figure to the left. The JP2 jumper must be installed across the center and right hand pins in order to plact the networking terminating resistor on the network.

Recommended RS-485 cable: Belden 9842, AutomationDirect L19954 series, or equivalent.

AutomationDirect PLCs as Modbus Master

Communication Cable Connections

Serial Modbus-capable AutomationDirect PLCs can communicate with GSD4A DC drives which have an optional GSDA-RTU-4A communication card installed.

Serial Modbus control is easier to accomplish from a PLC that supports dedicated Modbus messaging. [Older PLCs may require programming to construct the Modbus strings.] We recommend PLCs with dedicated Modbus serial commands: CLICK (with RS-485 ports), P1000, P2000, P3000, BRX/Do-more, or DirectLogic (DL06 or D2-260). Other PLC-Drive connectivity is possible: Please refer to the "Typical ADC PLC to GSDA-RTU-4A Serial Connectivity Matrix" below.

Typical ADC PLC to GSDA-RTU-4A RS-485 Serial Communications Connectivity

Typical ADC PLC to GSDA-RTU-4A Serial Communications Connectivity Matrix					
Recommended PLC Connectivity			***Communication***	***Direct Cable***	***Port Type***
PLC	***Port #***	***Port Type***			
CLICK	3	3 screw terminals	RS-485	L19954 cable	GSDA-RTU-4A screw terminals P6-1 RS485+ P6-2 RS485- P6-3 GND
D2-260/D2-262	2	HD15	RS-485	D2-DSCBL-2	
DL06	2	HD15	RS-485	D2-DSCBL-2	
BRX/Do-more	RS-485	3 screw terminals	RS-485	L19954 cable	
Do-more H2-DM1	RS-232	RJ12	RS-232 to RS-485	FA-ISOCON with L19954 cable	
Do-more H2-DM1 + H2-SERIO-4	3	5 screw terminals	RS-485	L19954 cable	
Do-more T1H-DM1	RS-232	RJ12	RS-232 to RS-485	FA-ISOCON with L19954 cable	
P2-550	RS-485	3 screw terminals	RS-485	L19954 cable	
P3-530	RS-485	3 screw terminals	RS-485	L19954 cable	
P3-550	RS-485	3 screw terminals	RS-485	L19954 cable	
P3-550E	RS-485	3 screw terminals	RS-485	L19954 cable	
Other PLC Connectivity			–	–	
D2-250-1	2	HD15	RS-485	D2-DSCBL-2	
D4-450/D4-454	1	DB25	RS-232 to RS-485	FA-ISOCON with L19954 cable	
DL05	2	RJ12	RS-232 to RS-485	FA-ISOCON with L19954 cable	
DL06 + DCM	2	HD15	RS-485	D2-DSCBL-2	
P2-SCM	4	4 screw terminals	RS-485	L19954 cable	
P3-SCM	4	4 screw terminals	RS-485	L19954 cable	

RS-232C to RS-485 Conversion

An RS-485 network cable can span up to 1000 meters (4000 feet). However, many AutomationDirect PLCs have only RS-232C communication ports, and require an FA-ISOCON (RS-232C to RS-422/485 network adapter) in order to make an RS-485 connection.

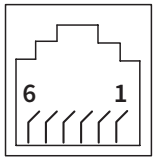
If an FA-ISOCON module is used, set the module dipswitches as required.
Refer to the FA-ISOCON manual for more detailed information.

FA-ISOCON Switch Settings:

- *S21–S23: OFF, ON, ON (19200 baud)*
- *S24–S27: OFF (Automatic Network Transmit Enable)*
- *Terminate: ON (end of run term resistors)*
- *Bias (2): ON (end of run bias resistors)*
- *1/2 DPX (2): ON (RS-485 TXD/RXD jumpers)*

Helpful Hint: Some applications require that the FA-ISOCON baud rate is set faster than the drive/network baud rate.

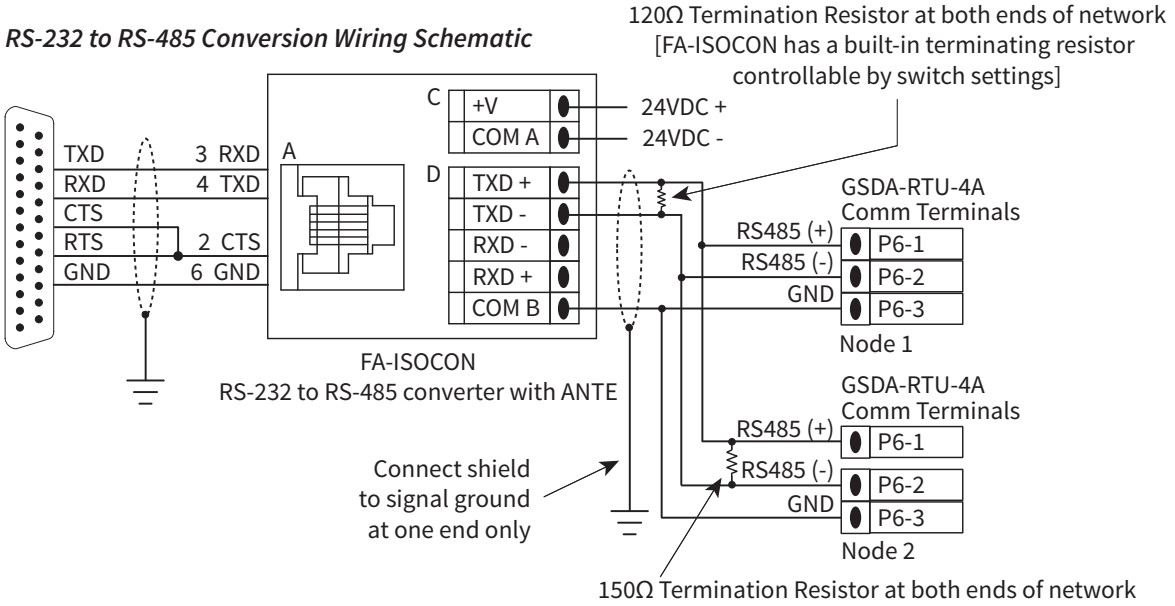
FA-ISOCON RJ-12 Serial Comm Port A
RS-232 Input Port



1: Signal Ground
2: CTS (input)
3: RXD (input)
4: TXD (output)
5: +5VDC in
6: Signal Ground

FA-ISOCON Wiring

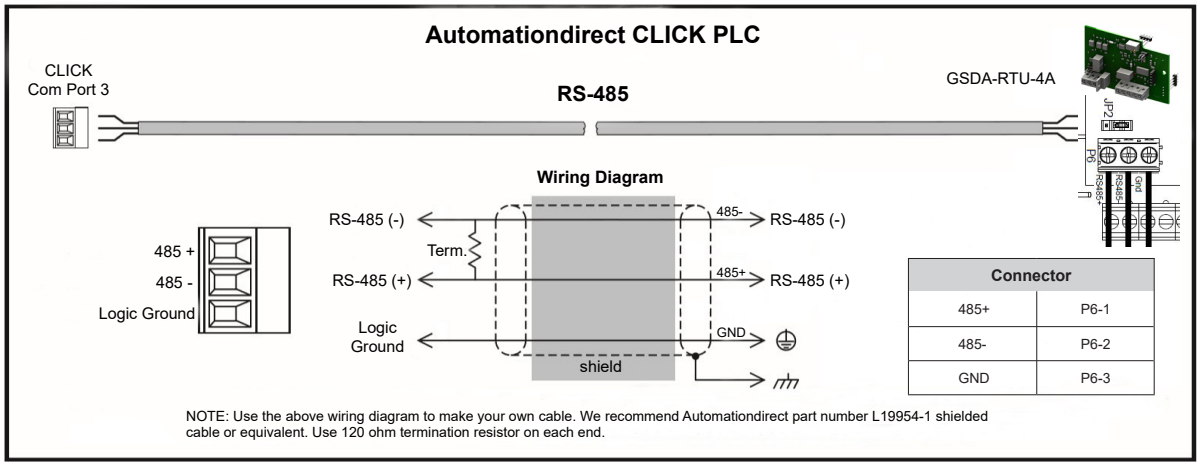
RS-232 to RS-485 Conversion Wiring Schematic



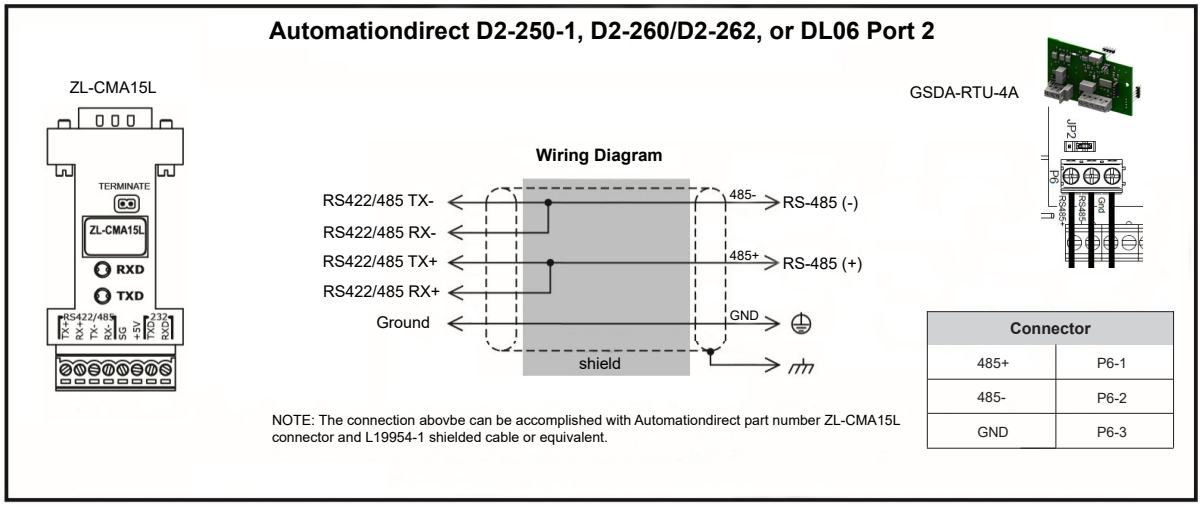
For information regarding configuration of AutomationDirect PLCs or other PLCs, please refer to the applicable PLC user manual for your application.

AutomationDirect PLC Cable Connections

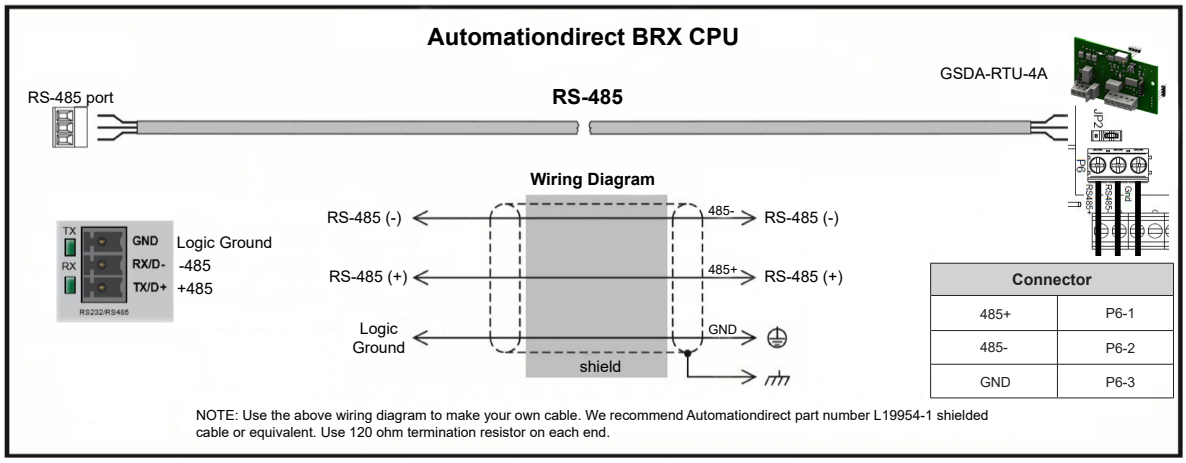
CLICK Series Port 3 via RS-485



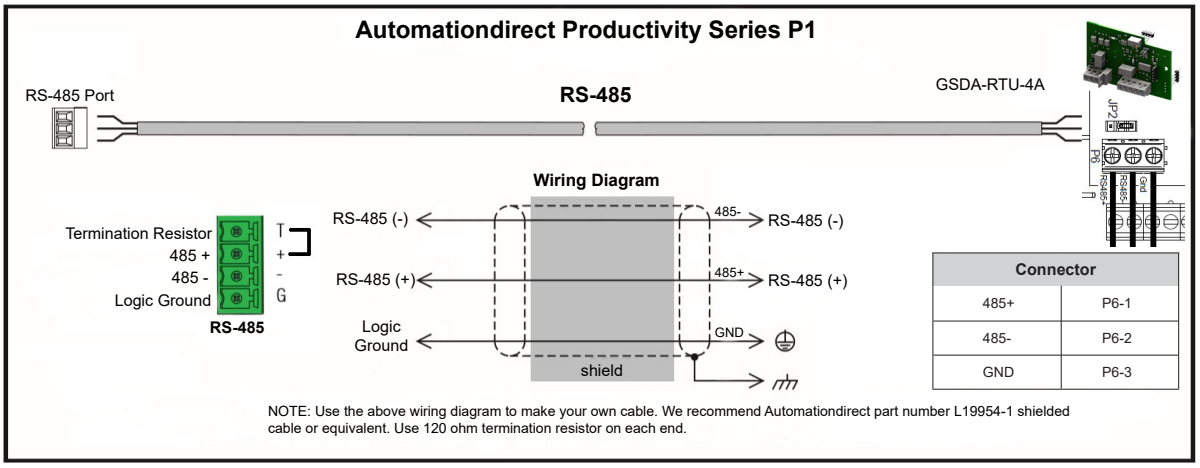
DirectLogic Series D2-250-1, D2-260/D2-262, DL06 Port 2 via RS-485



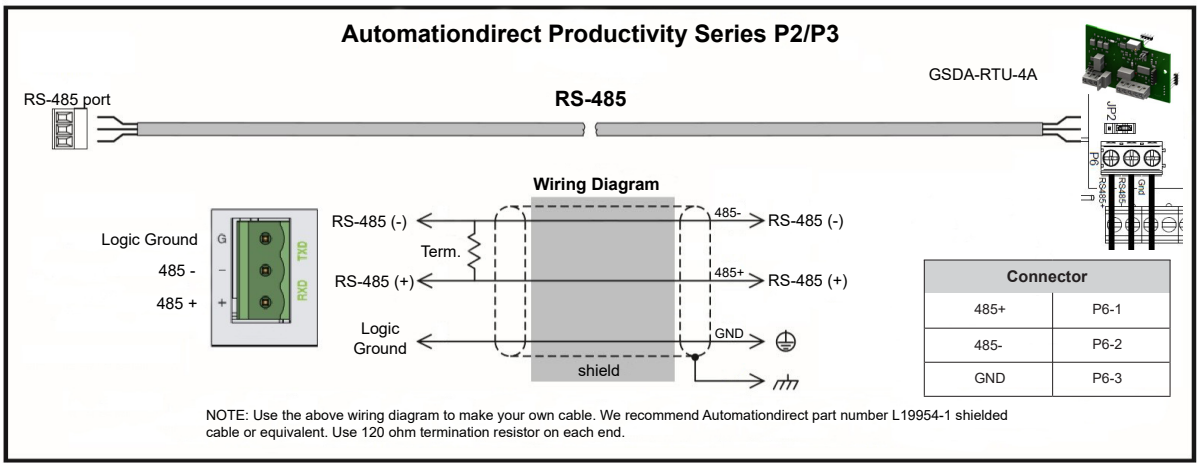
Do-more BRX Series via RS-485



Productivity Series P1 via RS-485



Productivity Series P2/P3 via RS-485



AutomationDirect PLC Example Programs for GSD4A DC Drive

Example programs for various AutomationDirect PLCs are available for free download from AutomationDirect: https://support.automationdirect.com/examples.html.

Also, example CLICK, BRX, and Productivity PLC ladder diagrams are shown in the following section.

CLICK PLC Example Program for GSD4A DC Drive

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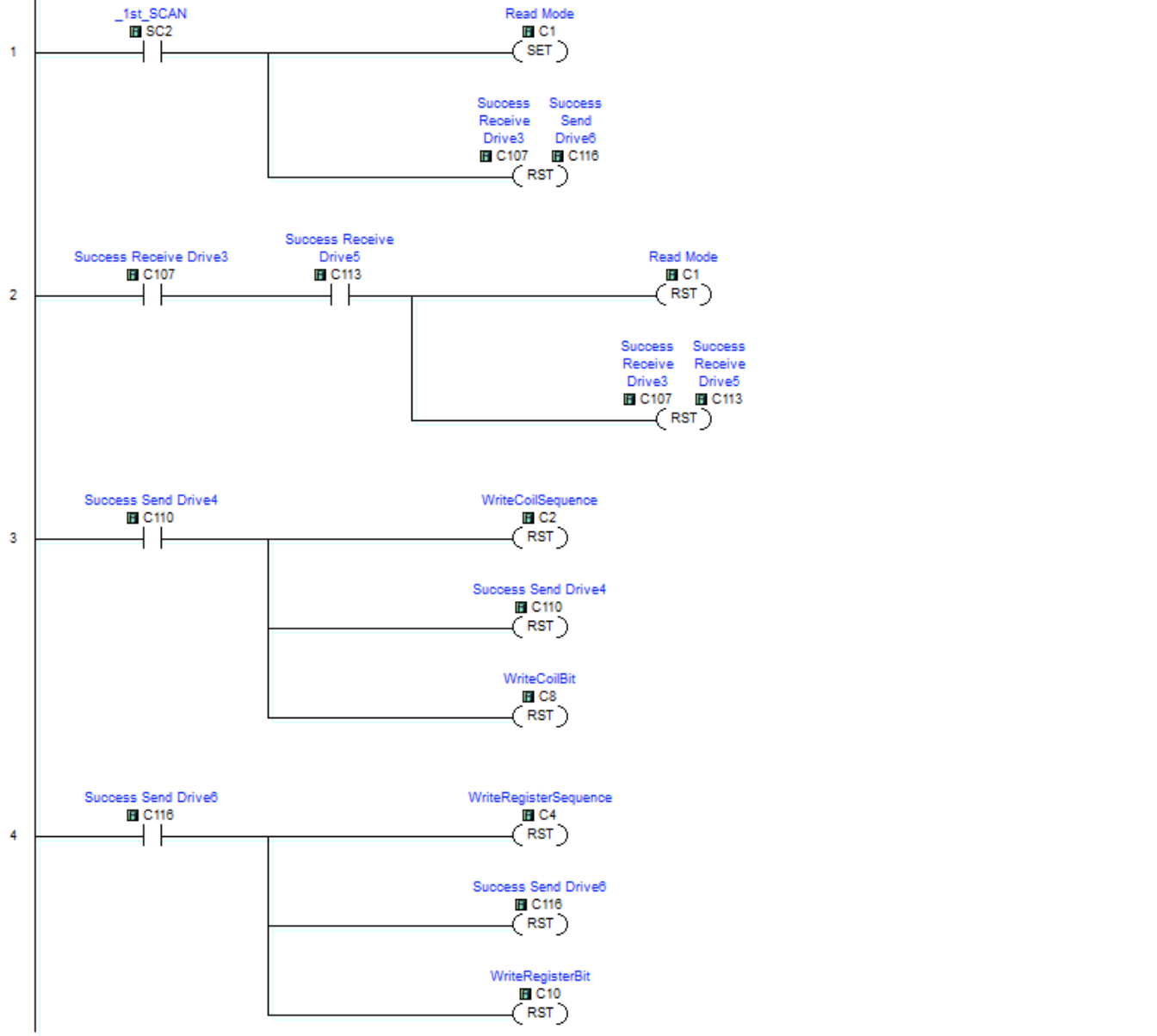
This example program demonstrates network communications using the GSD4A drive with the GSDA-RTU-4A, Modbus RTU option card.
Baudrate is 19.2Kbps 8,1,E (by default).
Rungs one and two manipulate Read Mode bit C1. This initialization logic sets Read Mode C1 = 1 to read data from the drive. After the read is complete, the bit changes to write mode C1 = 0 and control of the drive is possible. (for instance changing the value for speed from Data view)

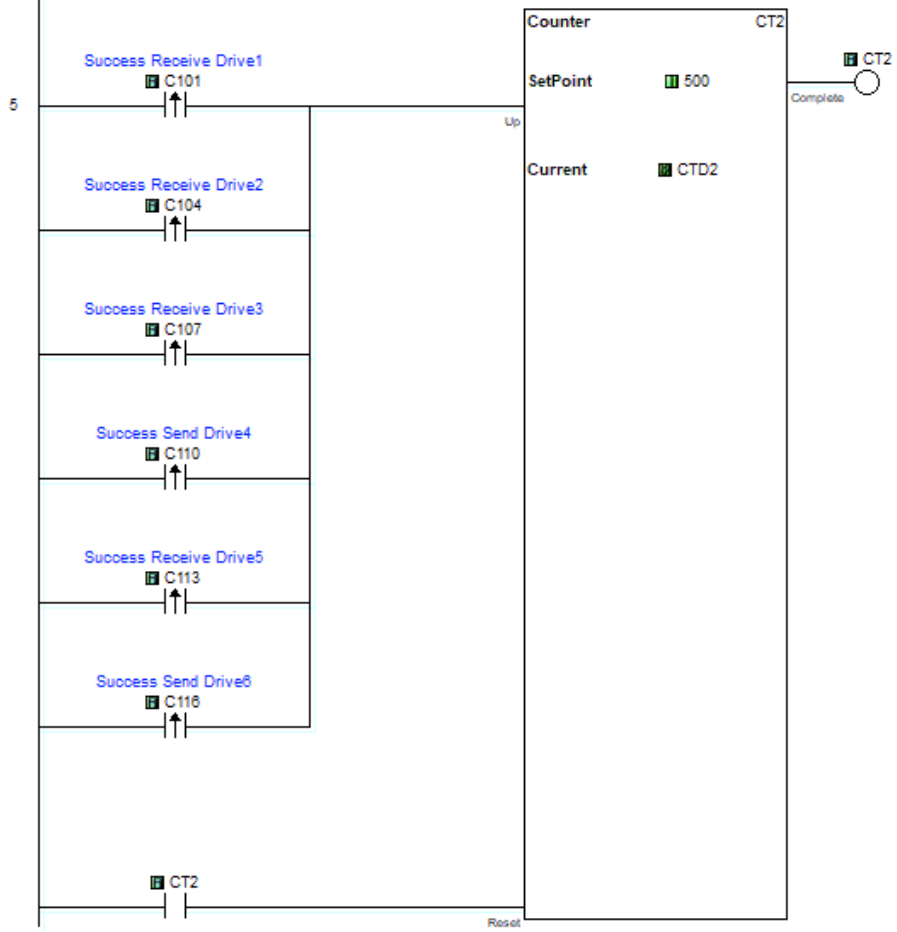
Special attention should be giving to Device Address = V1023. If this value is changed from a value of 1 (Node address 1), the application will stop working and Reset to Factory default will be required to restore communication.
This module uses EEPROM to save register values. To avoid exceeding the maximum number of write cycles, use WriteCoilSequence for bits and WriteRegSequence for registers.



CLICK PLC Example Program, continued

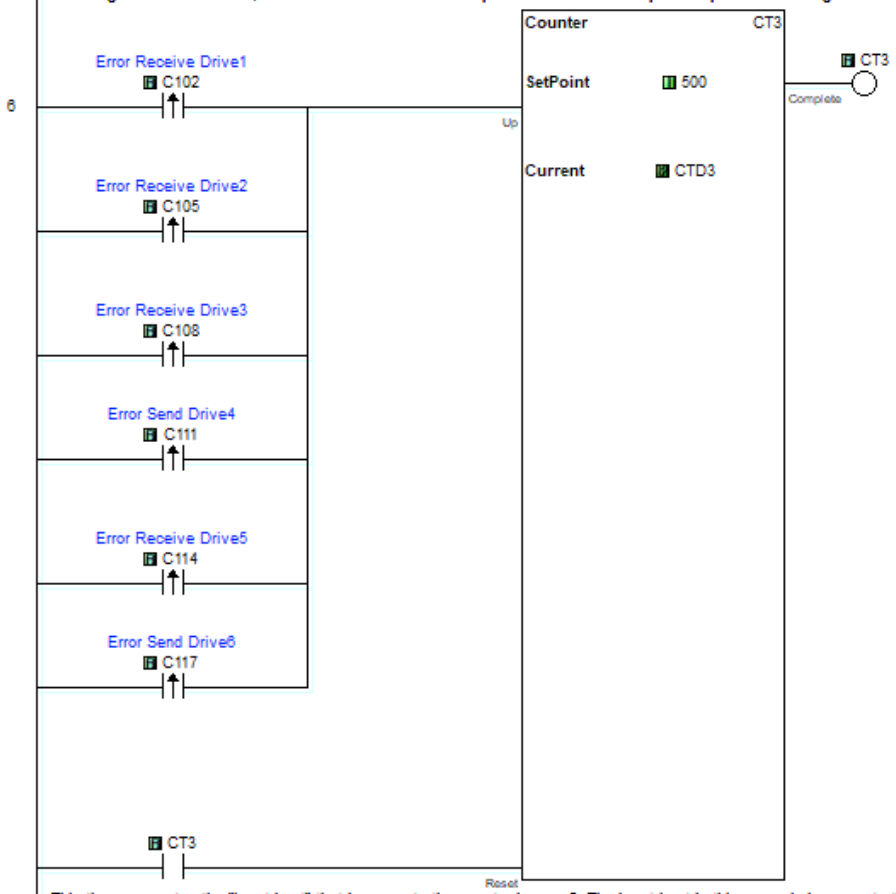
This rung is an success activity counter, which records the comm attempts. This is the first step in setup/troubleshooting. Attempts must be occurring or there is an error in the program/setup/cabling.

The counter will reset after it counts to 500.

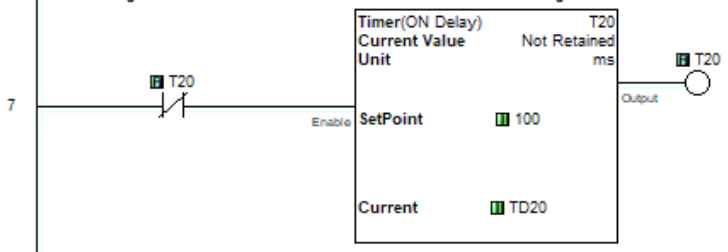


CLICK PLC Example Program, continued

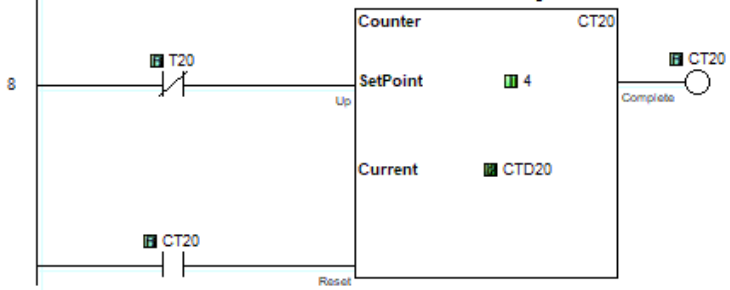
This rung is an Error counter, which records the comm attempts. This is the first step in setup/troubleshooting. If number is increasing there is an error in the program/setup/cabling



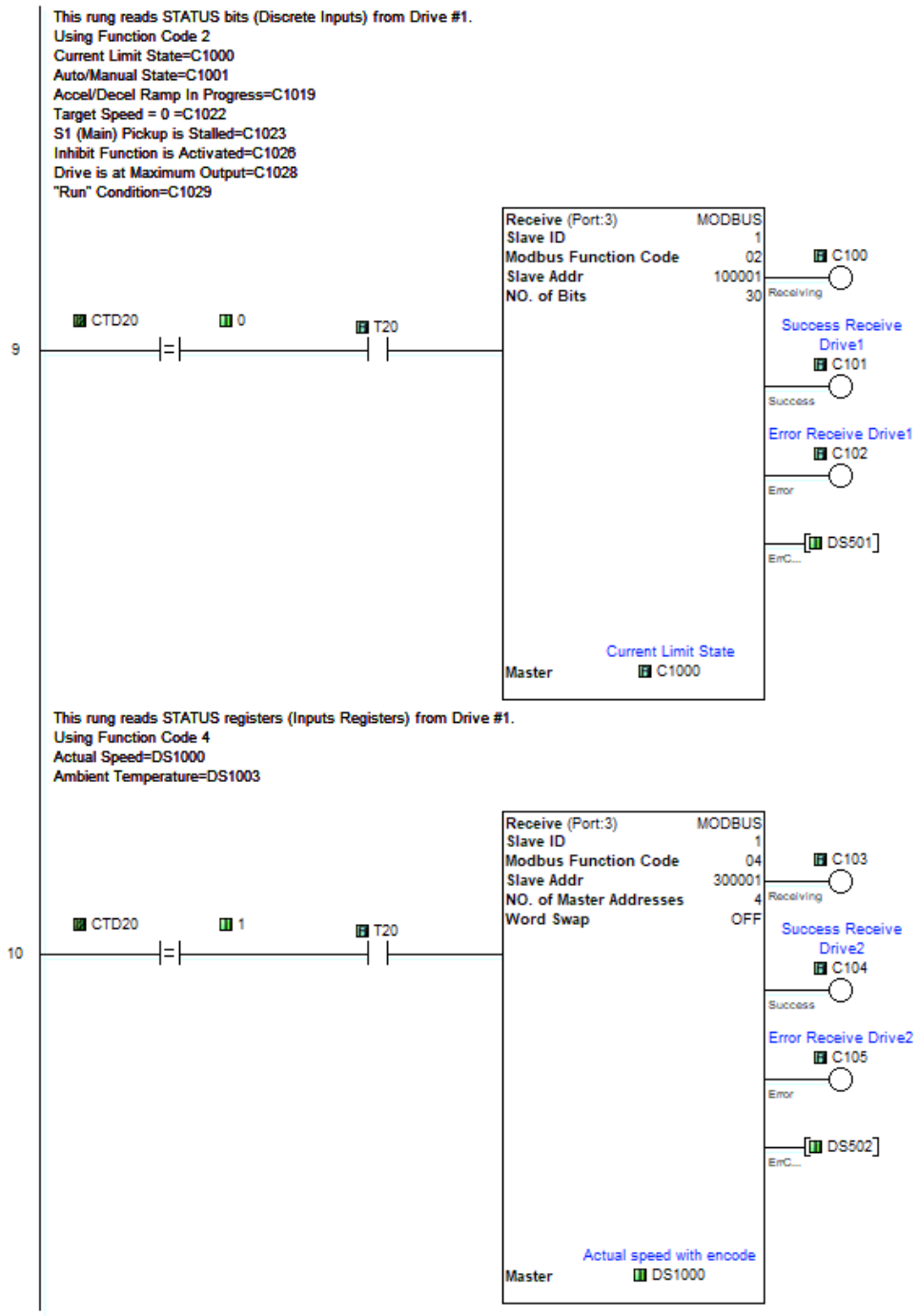
This timer generates the "heart beat" that increments the counter in rung 8. The heart beat in this example increments the counter every tenth of a second.



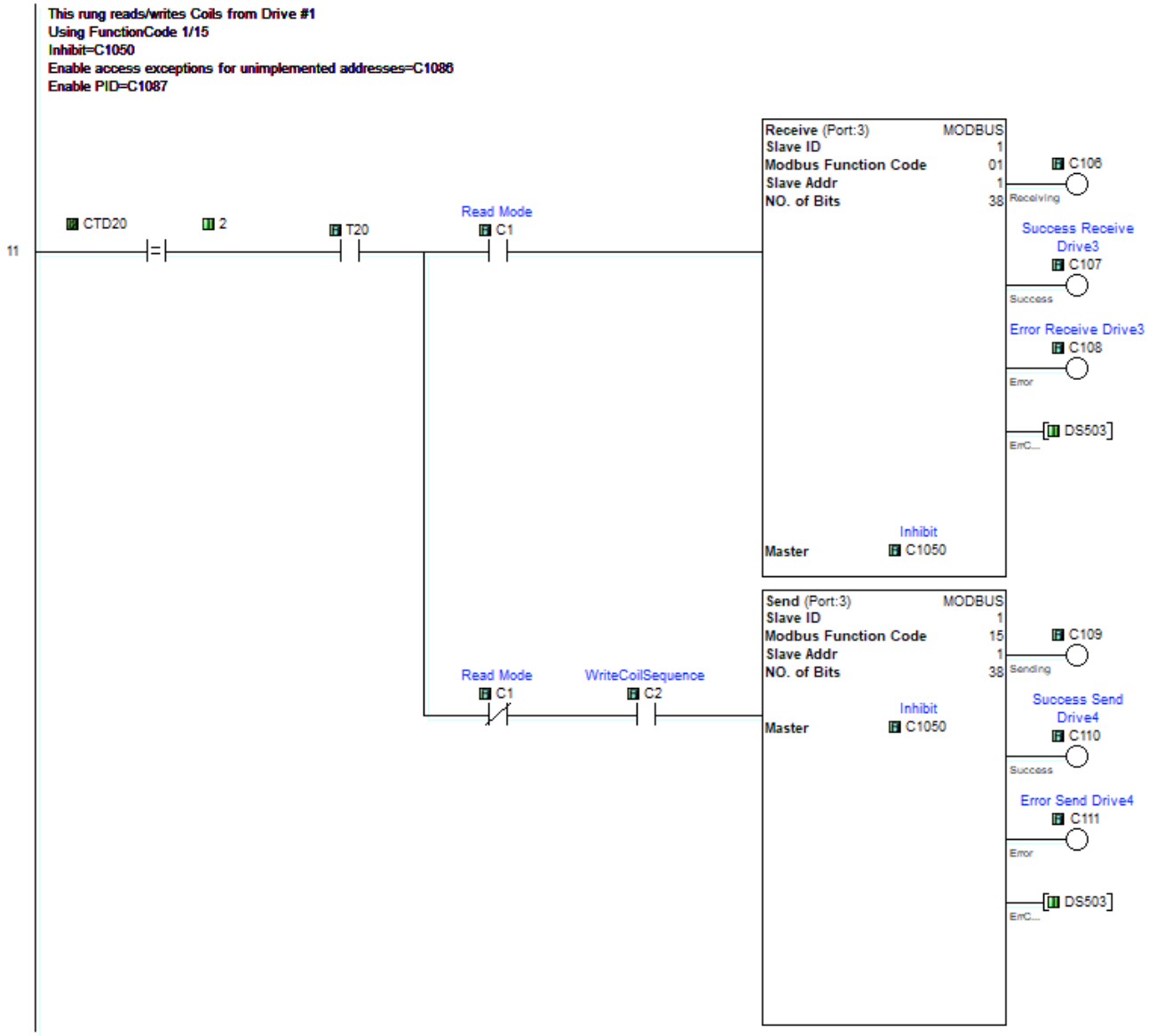
Counter CT20 controls the order in which message instructions in the subsequent rungs are enabled. Incremented by the heart beat timer T20, counter CT20 will increment count from 0 to 4. The counter accumulated value is used to enable one message and then another at one tenth second intervals.



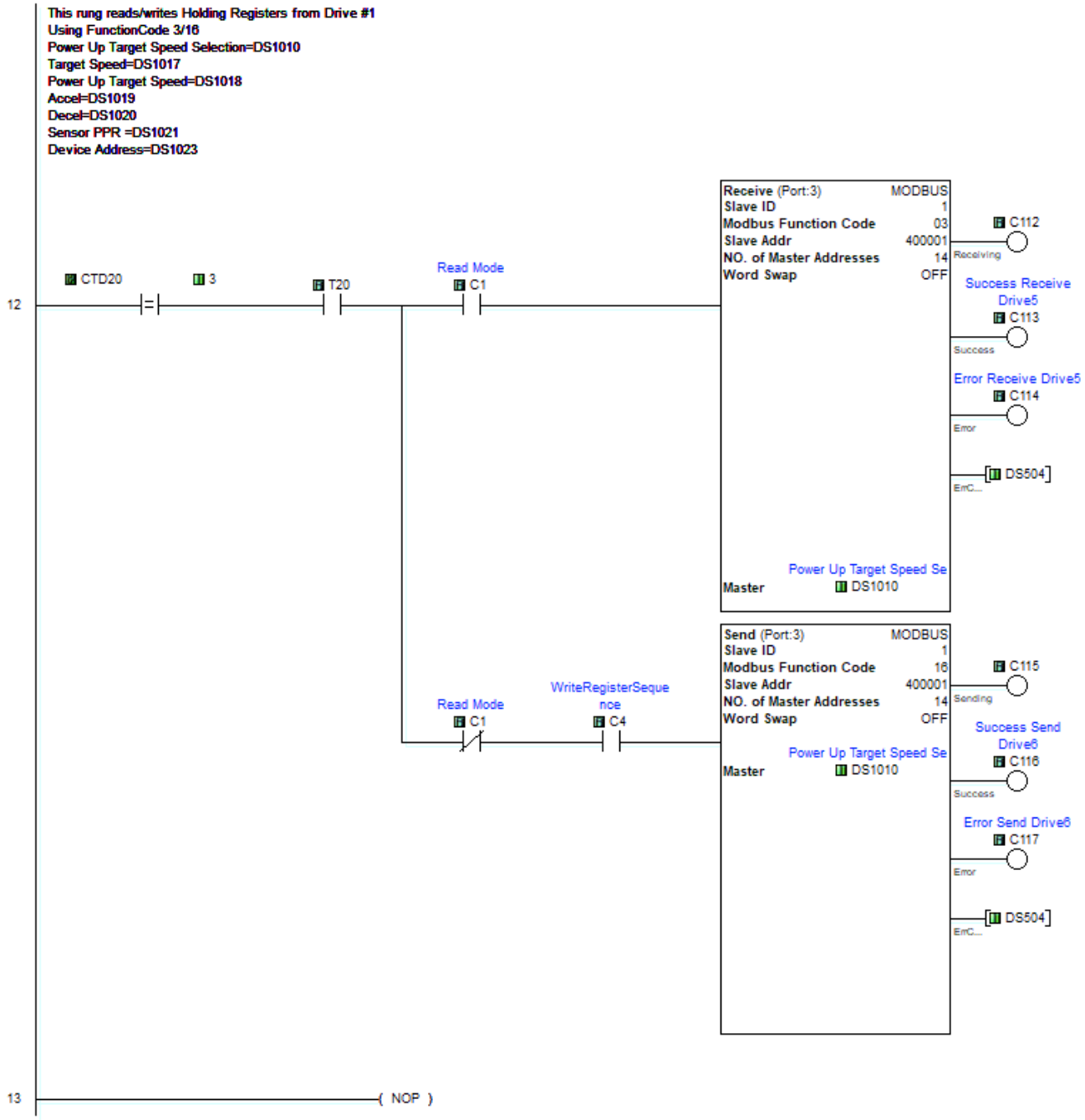
CLICK PLC Example Program, continued



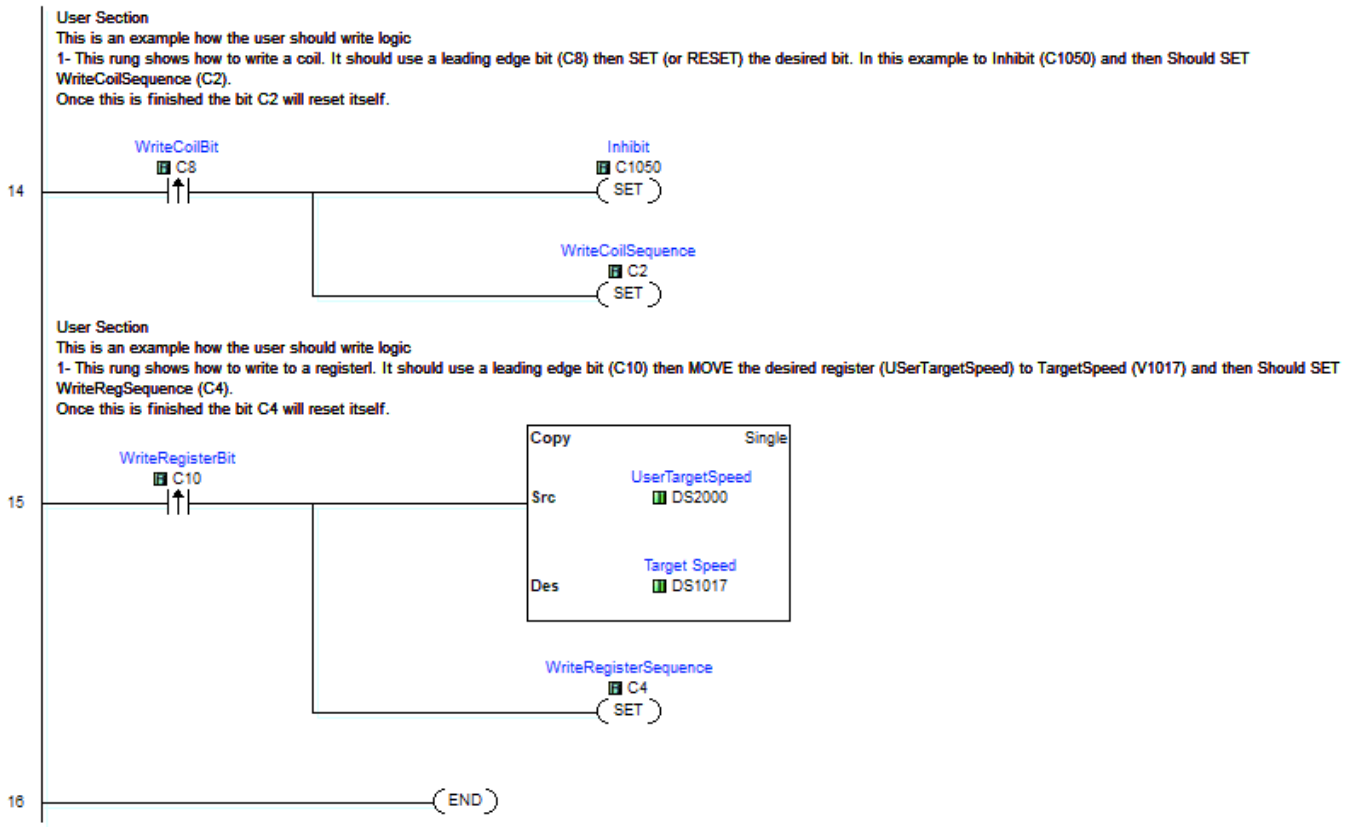
CLICK PLC Example Program, continued



CLICK PLC Example Program, continued



CLICK PLC Example Program, continued



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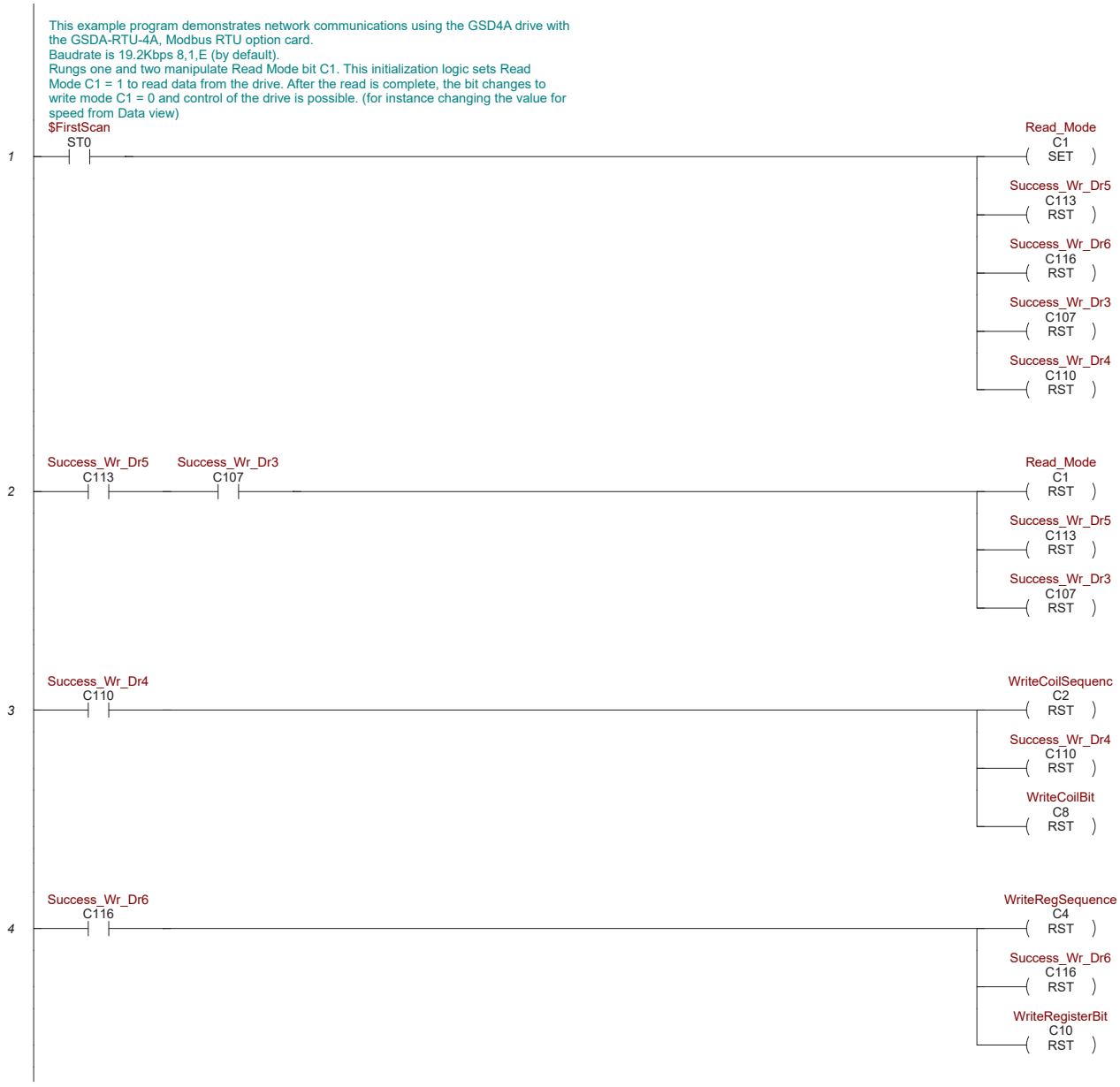


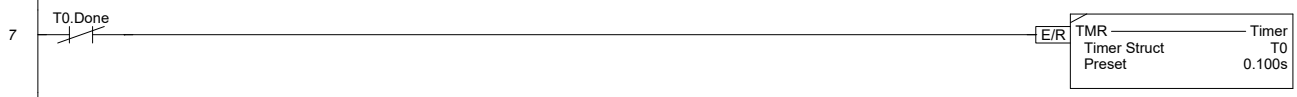
BRX PLC Example Program, continued

This rung is an success activity counter, which records the comm attempts. This is the first step in setup/troubleshooting. Attempts must be occurring or there is an error in the program/setup/cabling.

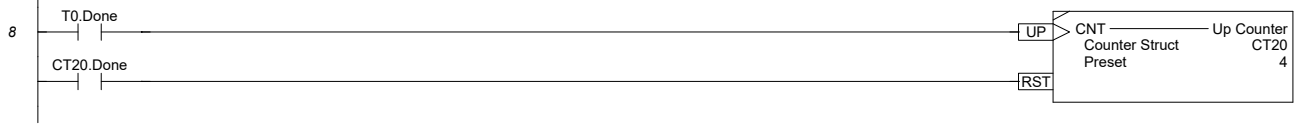
The counter will reset after it counts to 500.

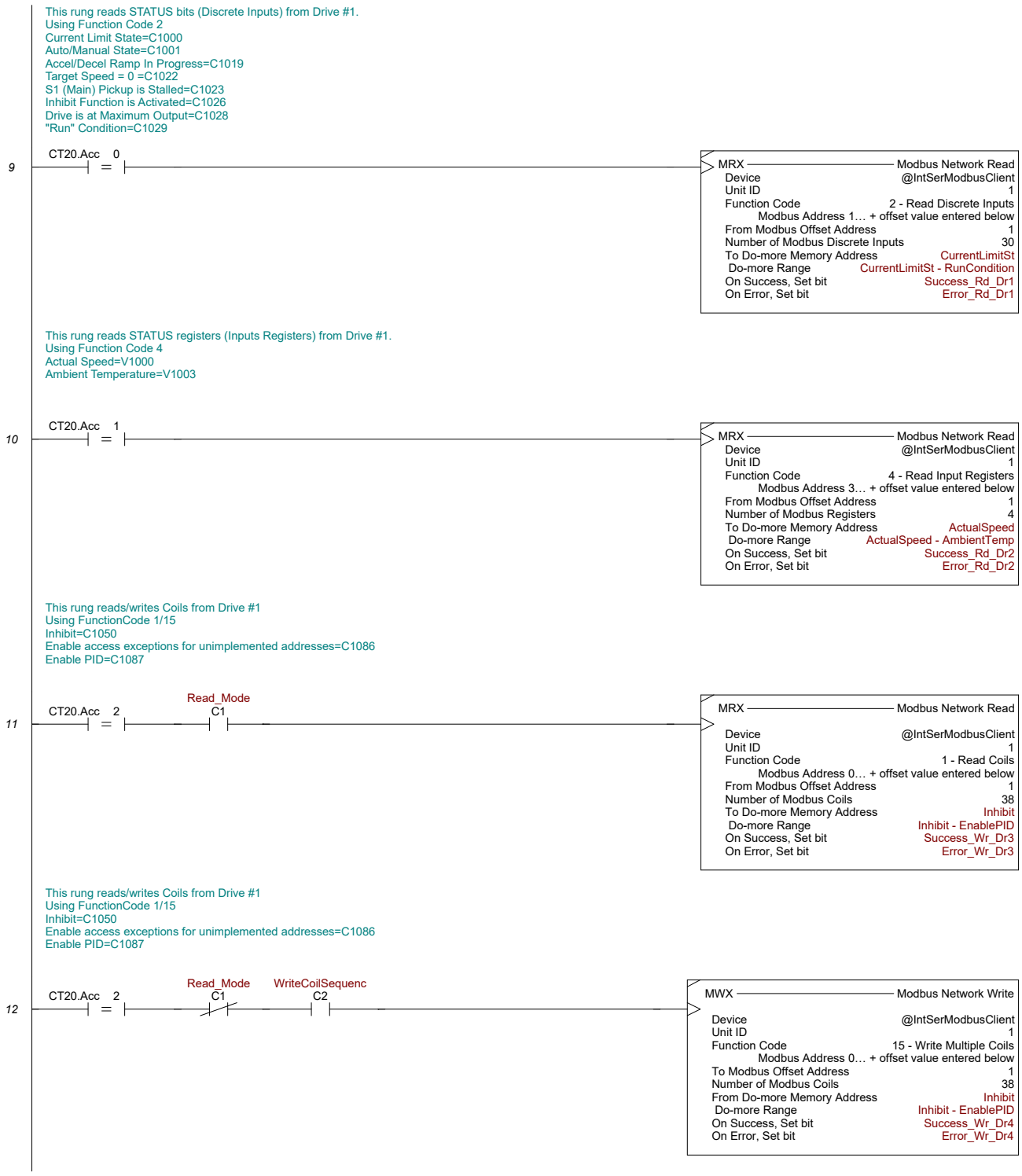
This rung is an Error counter, which records the comm attempts. This is the first step in setup/troubleshooting. If number is increasing there is an error in the program/setup/cabling

This timer generates the "heart beat" that increments the counter in rung 8. The heart beat in this example increments the counter every tenth of a second.

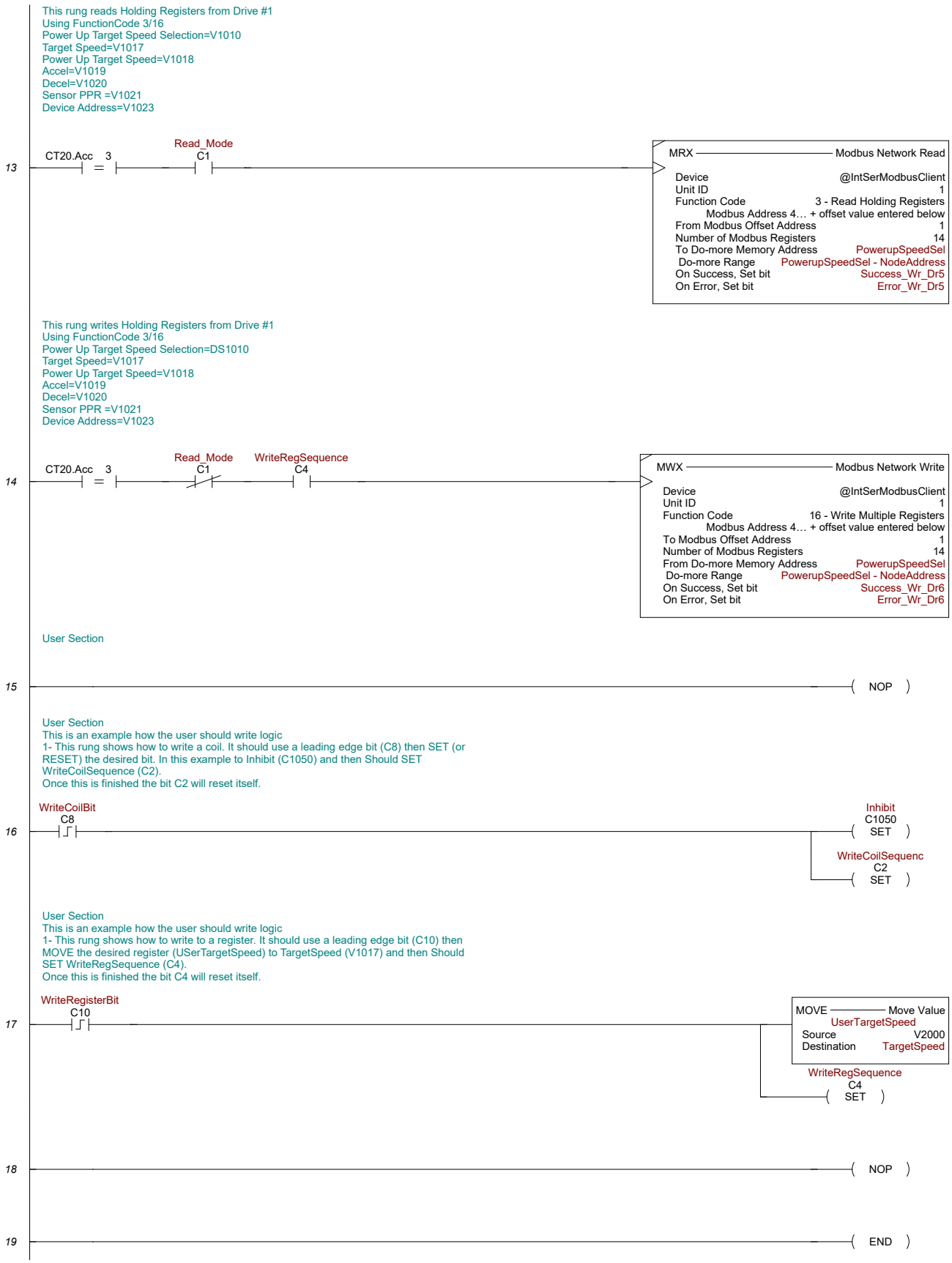


Counter CT20 controls the order in which message instructions in the subsequent rungs are enabled. Incremented by the heart beat timer T20, counter CT20 will increment count from 0 to 4. The counter accumulated value is used to enable one message and then another at one tenth second intervals.




This rung reads STATUS bits (Discrete Inputs) from Drive #1.
Using Function Code 2
Current Limit State=C1000
Auto/Manual State=C1001
Accel/Decel Ramp In Progress=C1019
Target Speed = 0 =C1022
S1 (Main) Pickup is Stalled=C1023
Inhibit Function is Activated=C1026
Drive is at Maximum Output=C1028
"Run" Condition=C1029
9
CT20.Acc 0
=
MRX Modbus Network Read
Device @IntSerModbusClient
Unit ID 1
Function Code 2 - Read Discrete Inputs
Modbus Address 1... + offset value entered below
From Modbus Offset Address 1
Number of Modbus Discrete Inputs 30
To Do-more Memory Address CurrentLimitSt
Do-more Range CurrentLimitSt - RunCondition
On Success, Set bit Success_Rd_Dr1
On Error, Set bit Error_Rd_Dr1
This rung reads STATUS registers (Inputs Registers) from Drive #1.
Using Function Code 4
Actual Speed=V1000
Ambient Temperature=V1003
10
CT20.Acc 1
=
MRX Modbus Network Read
Device @IntSerModbusClient
Unit ID 1
Function Code 4 - Read Input Registers
Modbus Address 3... + offset value entered below
From Modbus Offset Address 1
Number of Modbus Registers 4
To Do-more Memory Address ActualSpeed
Do-more Range ActualSpeed - AmbientTemp
On Success, Set bit Success_Rd_Dr2
On Error, Set bit Error_Rd_Dr2
This rung reads/writes Coils from Drive #1
Using FunctionCode 1/15
Inhibit=C1050
Enable access exceptions for unimplemented addresses=C1086
Enable PID=C1087
11
CT20.Acc 2
=
Read_Mode
C1
MRX Modbus Network Read
Device @IntSerModbusClient
Unit ID 1
Function Code 1 - Read Coils
Modbus Address 0... + offset value entered below
From Modbus Offset Address 1
Number of Modbus Coils 38
To Do-more Memory Address Inhibit
Do-more Range Inhibit - EnablePID
On Success, Set bit Success_Wr_Dr3
On Error, Set bit Error_Wr_Dr3
This rung reads/writes Coils from Drive #1
Using FunctionCode 1/15
Inhibit=C1050
Enable access exceptions for unimplemented addresses=C1086
Enable PID=C1087
12
CT20.Acc 2
=
Read_Mode
C1
WriteCoilSequenc
C2
MWX Modbus Network Write
Device @IntSerModbusClient
Unit ID 1
Function Code 15 - Write Multiple Coils
Modbus Address 0... + offset value entered below
To Modbus Offset Address 1
Number of Modbus Coils 38
From Do-more Memory Address Inhibit
Do-more Range Inhibit - EnablePID
On Success, Set bit Success_Wr_Dr4
On Error, Set bit Error_Wr_Dr4

BRX PLC Example Program, continued



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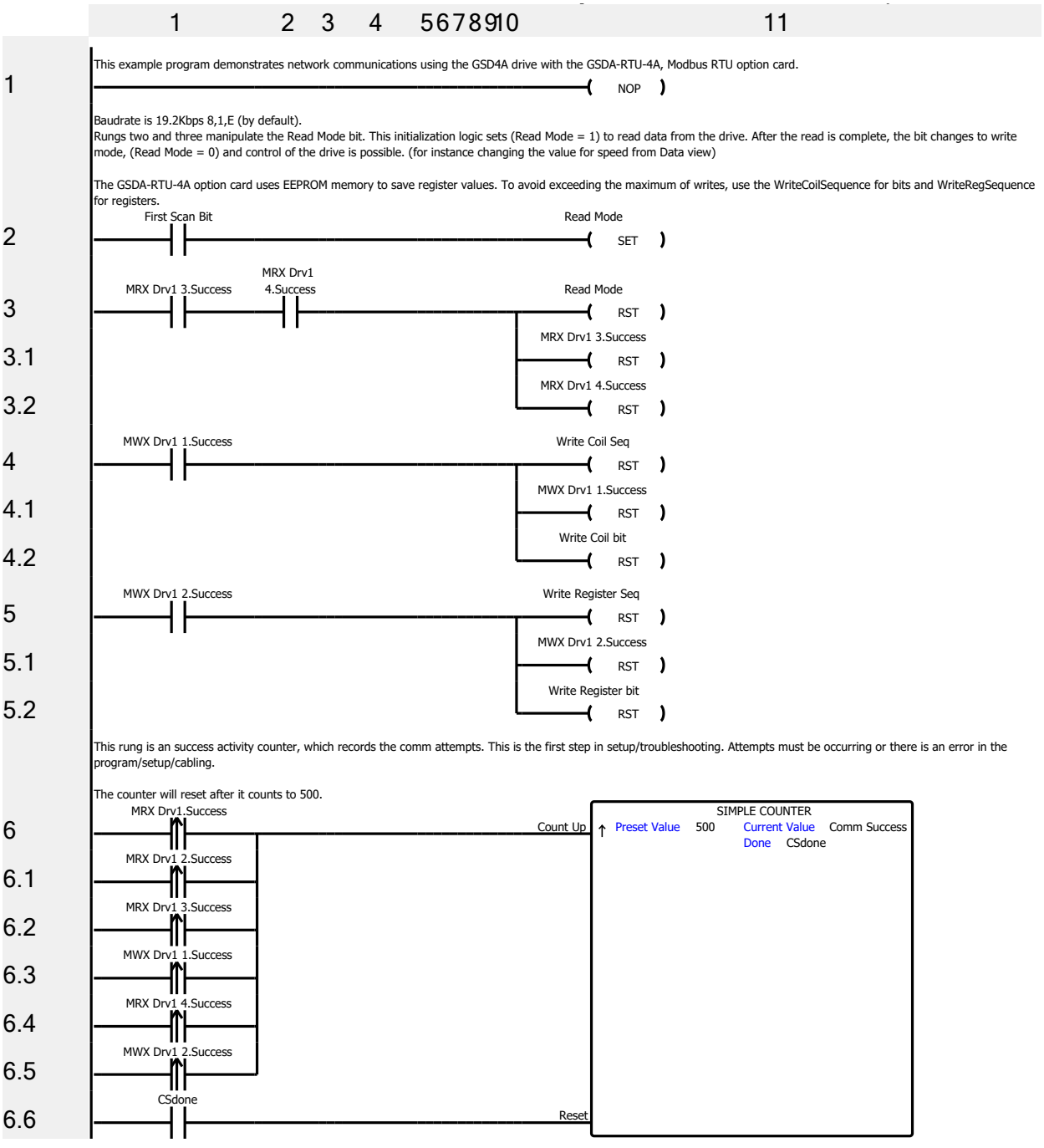
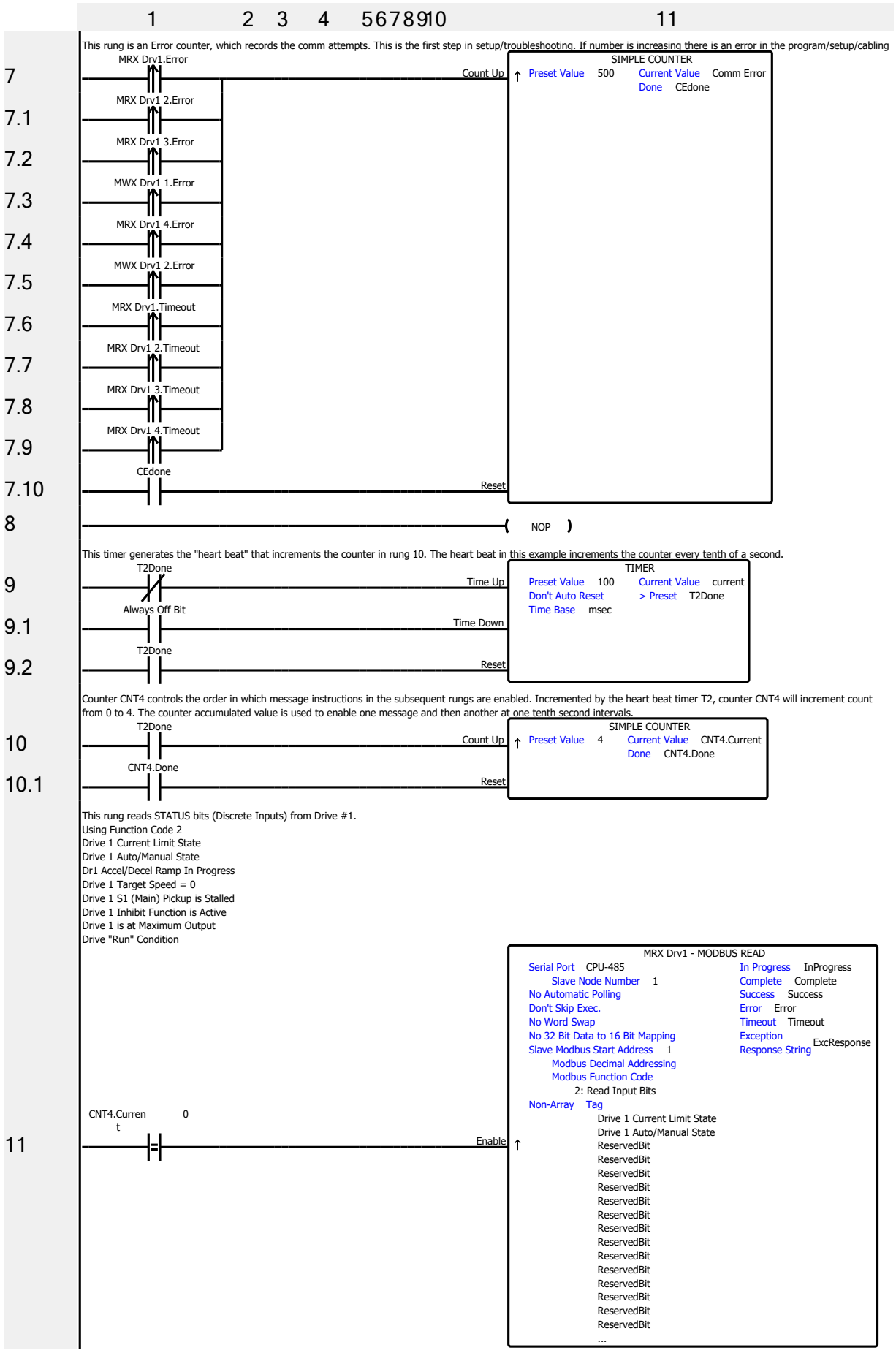
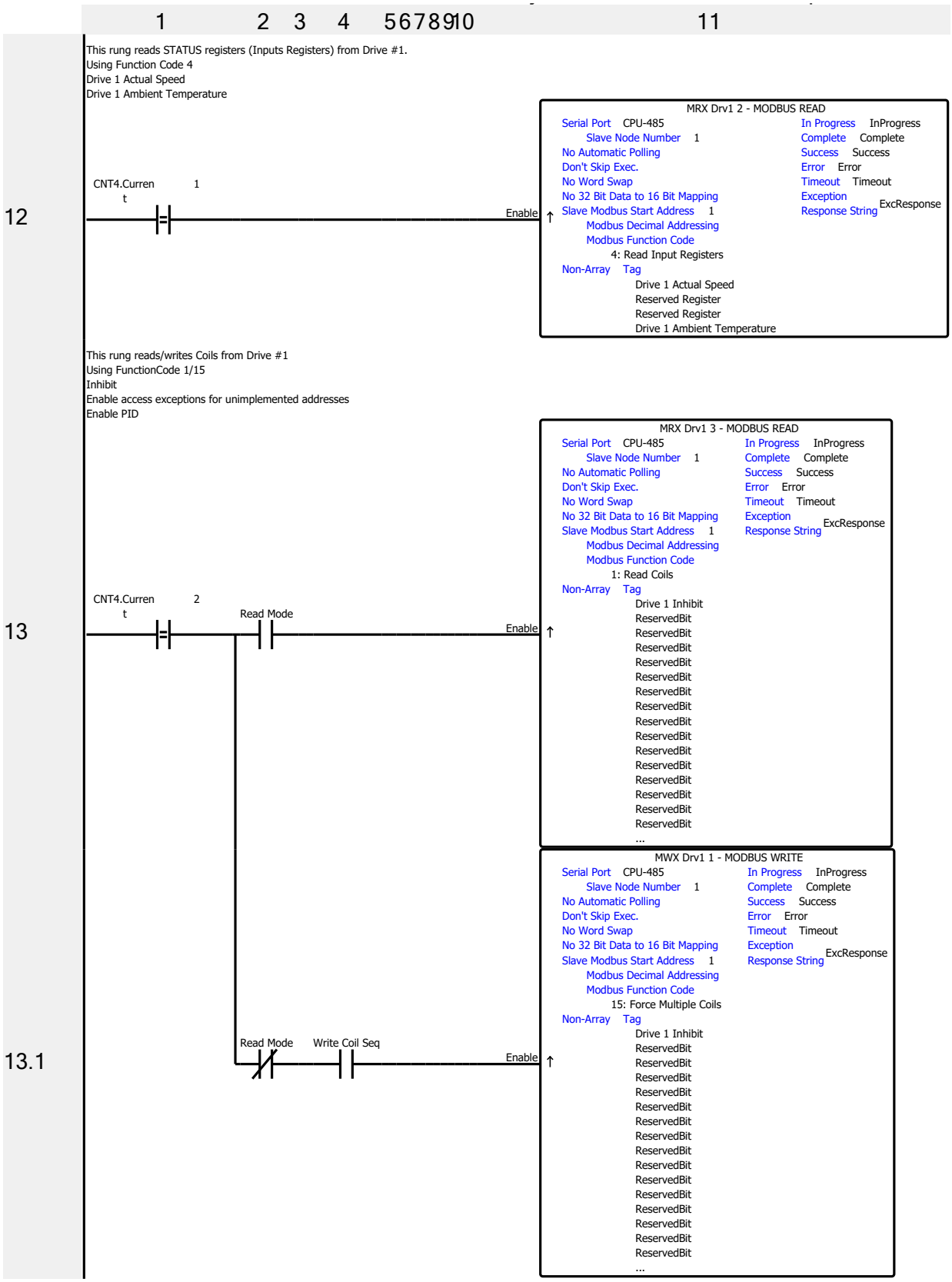
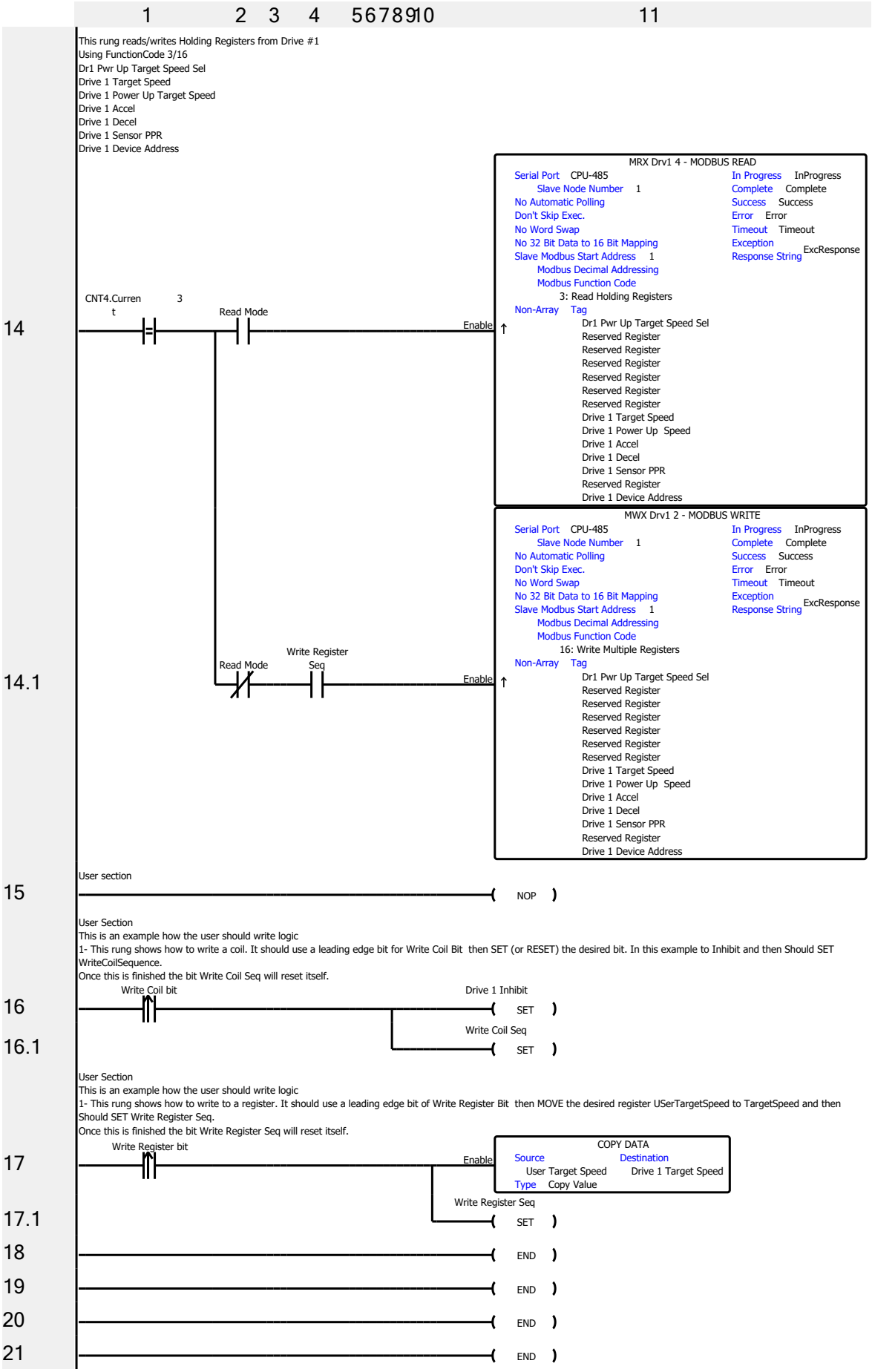


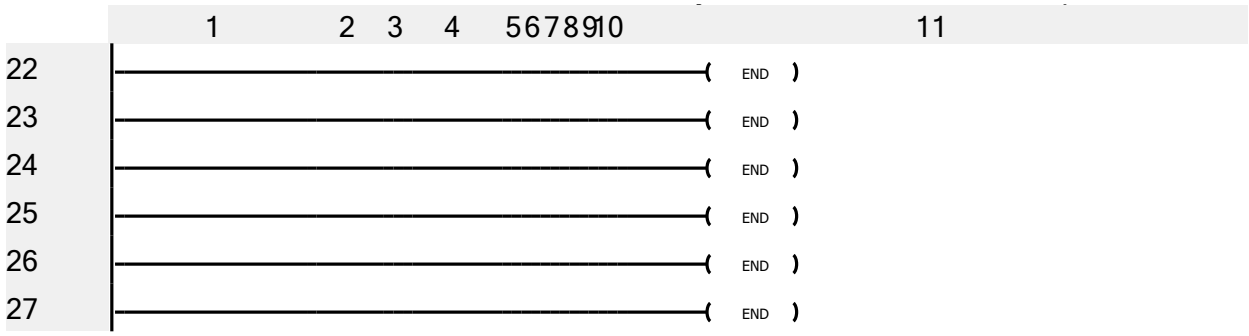
Productivity PLC Example Program, continued




1 2 3 4 5 6 7 8 9 10 11
This rung reads STATUS registers (Inputs Registers) from Drive #1.
Using Function Code 4
Drive 1 Actual Speed
Drive 1 Ambient Temperature
12
CNT4.Current
1
Enable
MRX Drv1 2 - MODBUS READ
Serial Port CPU-485
Slave Node Number 1
No Automatic Polling
Don't Skip Exec.
No Word Swap
No 32 Bit Data to 16 Bit Mapping
Slave Modbus Start Address 1
Modbus Decimal Addressing
Modbus Function Code
4: Read Input Registers
Non-Array Tag
Drive 1 Actual Speed
Reserved Register
Reserved Register
Drive 1 Ambient Temperature
In Progress InProgress
Complete Complete
Success Success
Error Error
Timeout Timeout
Exception
Response String ExcResponse
This rung reads/writes Coils from Drive #1
Using FunctionCode 1/15
Inhibit
Enable access exceptions for unimplemented addresses
Enable PID
13
CNT4.Current
2
Read Mode
Enable
MRX Drv1 3 - MODBUS READ
Serial Port CPU-485
Slave Node Number 1
No Automatic Polling
Don't Skip Exec.
No Word Swap
No 32 Bit Data to 16 Bit Mapping
Slave Modbus Start Address 1
Modbus Decimal Addressing
Modbus Function Code
1: Read Coils
Non-Array Tag
Drive 1 Inhibit
ReservedBit
...
In Progress InProgress
Complete Complete
Success Success
Error Error
Timeout Timeout
Exception
Response String ExcResponse
13.1
Read Mode
Write Coil Seq
Enable
MWX Drv1 1 - MODBUS WRITE
Serial Port CPU-485
Slave Node Number 1
No Automatic Polling
Don't Skip Exec.
No Word Swap
No 32 Bit Data to 16 Bit Mapping
Slave Modbus Start Address 1
Modbus Decimal Addressing
Modbus Function Code
15: Force Multiple Coils
Non-Array Tag
Drive 1 Inhibit
ReservedBit
...
In Progress InProgress
Complete Complete
Success Success
Error Error
Timeout Timeout
Exception
Response String ExcResponse

PRODUCTIVITY PLC EXAMPLE PROGRAM, CONTINUED

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END
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