MicroComm
INSTALLATION INSTRUCTIONS

RT10 Right Track Discrete Input/Output Modules

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Section 1 Hardware Installation

1.1 Intent & Scope

This document describes the installation procedure for the RT10 Discrete Input/Output Modules when used with a DXL or DXI system. An RT10 Controller and up to three RT10 Expanders are designed to be mounted on a standard DIN rail. Screw terminal connectors are used to connect the discrete input or discrete output wiring to the RT10 Controller or Expander units. The RT10 units communicate with the DXI/DXL system via an Ethernet connection. Instructions on the software configuration are included in Section 2.

1.2 Description

The RightTrack RT10 Controller and RT10 Expander are designed to facilitate the monitoring of discrete inputs and the control of discrete outputs, communicating with a host system via an Ethernet network. The modules are both economical and compact, and mount easily to a standard DIN rail.

The RT10 Controller provides 18 open drain outputs and 18 discrete inputs that can be software configured for either supervised or non-supervised operation. With terminating resistors installed, supervised inputs can detect both open circuit and short circuit faults, and can monitor the status of either one or two switches (allowing up to 36 switches to be monitored).

The RT10 controller also includes an Ethernet port, a 200 MHz ARM9 processor (that runs the Linux operating system), provides power supply circuitry that can power up to three RT10 Expanders and an IP Address Reset Pushbutton

RT10 Expanders are simply “daisy-chained” (one after the other) to an RT10 Controller, with each expander providing an additional 24 outputs and 24 inputs. A total of 90 discrete outputs and 90 discrete inputs (supporting up to 180 switches) can therefore be managed by an RT10 system installation.

The Controller is powered via an external 24Vdc supply and has a power switch and status LED indications.

1.2.1 Mounting the RT10 Controller and Expander

The RT10 modules are designed to snap onto a standard DIN top hat metal rail EN 5002 - 35 x 7.5. A cross section of the rail is shown below.

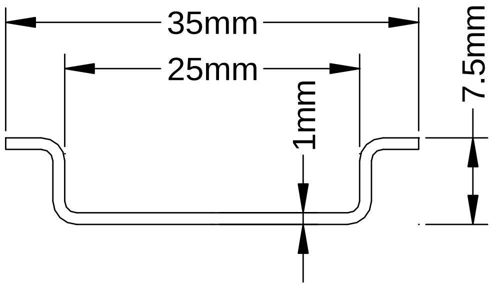


Figure 1 Cross section of DIN rail used with RT10 Modules

1.2.2 Discrete Switch Inputs

Each RT10 Controller/Expander can facilitate 18/24 supervised or non-supervised inputs. With terminating resistors, each supervised input can monitor one or two discrete contacts. Supervised inputs detect open and short circuit faults in the field wiring. The wiring for supervised switch contacts is shown below.

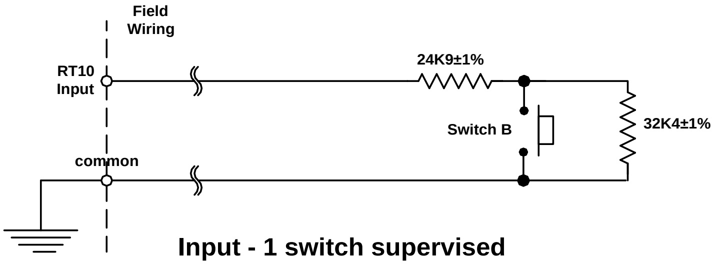


Figure 2 Resistor terminations for a single Supervised Switches

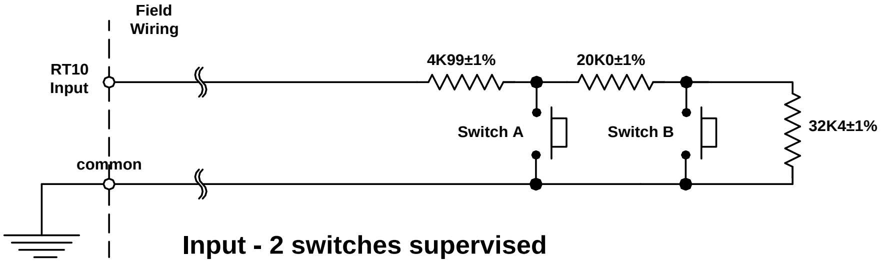


Figure 3 Resistor terminations for two Supervised Switches

With two supervised switches the input to the RT10 modules can be in one of five states. The voltage at the RT10 input terminal determines the states. The actual voltage measured will be slightly different than those given in the table due to component tolerances and the resistance of the wiring to the switch.

Input State	Wiring	Switch B	Switch A	Voltage
Open Fault	Open Circuit	NA	NA	10
Idle	Normal	Not Pushed	Not Pushed	8.5
Switch B Pressed	Normal	Pushed	Not Pushed	7.1
Switch A Pressed	Normal	NA	Pushed	3.3
Short Fault	Short Circuit	NA	NA	0

Table 1 Terminal Voltages for Supervised 2 Switch Input

With one supervised switch the voltages at the input terminals can be in one of 4 states.

Input State	Wiring	Switch B	Voltage
Open Fault	Open Circuit	NA	10
Idle	Normal	Not Pushed	8.5
Switch B Pressed	Normal	Pushed	7.1
Short Fault	Short Circuit	NA	0

Table 2 Terminal Voltages for Supervised 1 Switch Input

1.2.3 Discrete Outputs

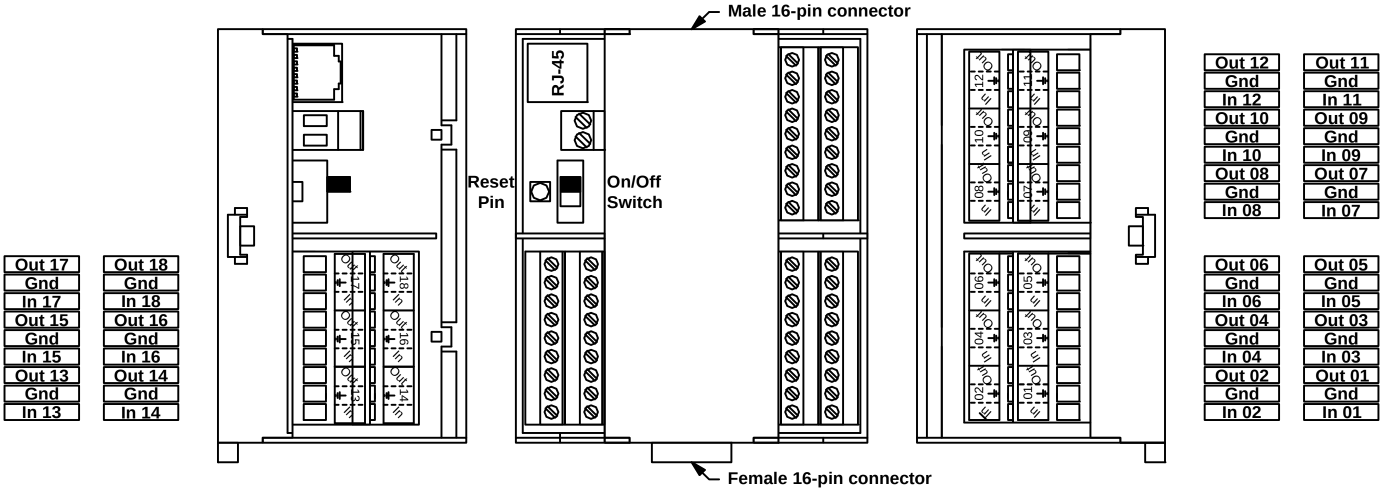
The discrete output of the RT10 modules is an open drain FET that can withstand up to 30Vdc and when on can sink up to 250 mA of current. The voltage drop across the output when sinking 250 mA of current is less than 0.5 volts.

1.2.4 DIO Port Numbers

The DIO Controller has 18 discrete inputs and 18 discrete outputs, with each input and output configured as a three terminal port, while an Expander has 24 discrete inputs and 24 discrete output configured as 24 three terminal ports.

1.2.4.1 DIO Screw Terminal Assignments for RT10 Controller

The RT10 Controller has 18 DIO ports, viewing the RT10 from the top and showing the side views the screw connector labels are shown in the following diagram.

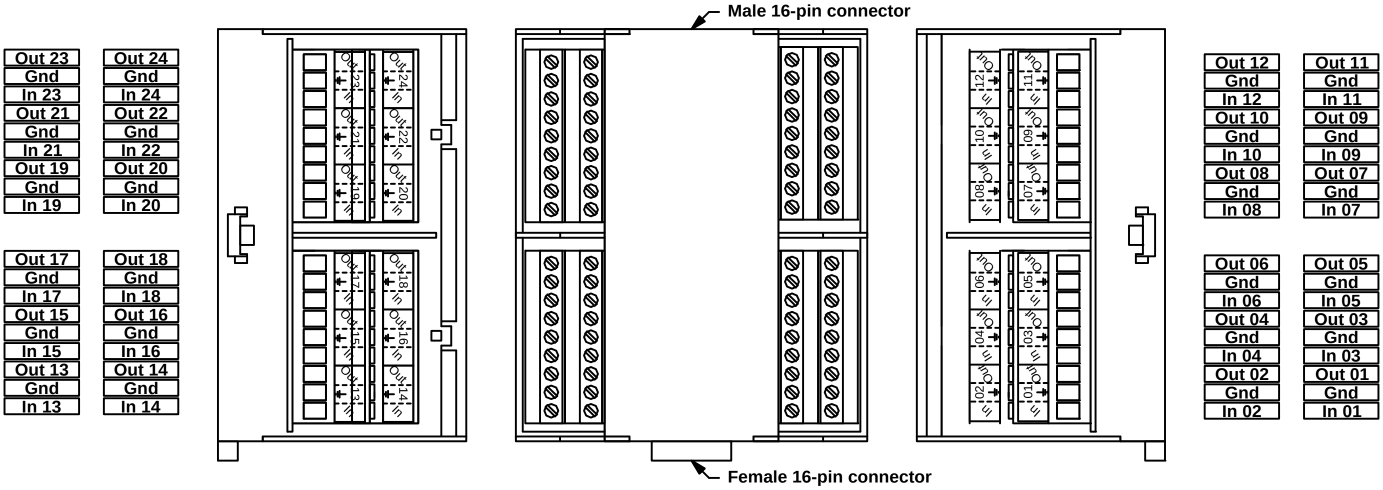


Controller Module

Figure 4 RT10 Controller Module Showing Input Output Screw Connections

1.2.4.2 IO Screw Terminal Assignments for RT10 Expander

The RT10 Expander has 24 DIO ports, viewing the RT10 Expander from the top and showing the side views the screw connector connections are shown in the following diagram.



Expander Module

Figure 5 RT10 Expander Module Showing Input Output Screw Connections

1.2.4.3 DIO Expander Daisy Chained to a DIO Controller

To add an RT10 Expander to a RT10 Controller the DIO Expander male connector plugs into the female connector on the RT10 Controller. If a second Expander is required then it plugs into the first Expander.

When a DIO Expander is plugged into a DIO Controller the system treats the screw terminal ports as contiguous numbered ports from 1-42, i.e. all the ports in the Expander unit are offset by 18 from the actual label numbers. Similarly if a second Expander unit is added its port numbers will be interpreted as contiguous numbers from 43-66 and the system would interpret the port numbers of a third Expander as having port numbers from 67-90.

Section 2 Software Configuration

2.1 Introduction

The RightTrack RT10 communicates using an embedded website and Modbus/TCP over an Ethernet network providing general-purpose digital inputs and digital outputs. All inputs are capable of being connected to one or two switches. Each output is an open drain sink driver output.

2.2 Technical Specifications

Ethernet Port Specifications

Quantity	One
Type	Auto-MDX
Speed	10/100
Default IP Address	192.168.0.2 (Subnet 255.255.255.0)

2.3 General Operation

2.3.1 RT10 Controller

The RT10 controller is the primary RT10 module that provides:

- Power supply
- Power Switch with power LED
- Status LED indicators (Status indicates module is booted, Activity winks during I/O scans)
- IP Address Reset Pushbutton
- Ethernet connectivity (Embedded website, Modbus TCP)
- 18 I/O channels.

Only one controller can be used in a RT10 system although it supports up to 3 additional Expander modules each providing 24 I/O channels for a total of up to 90 channels.

2.3.2 Resetting to the Standard IP Address

To reset to the standard IP address of 192.168.0.2 first power down the unit using the RT10 power switch.
Next, power the unit on again while holding down the small IP Address Reset Pushbutton just in front of the power switch.
Note you must hold this button down until the red activity LED just to the right lights up (about 2 minutes).
Using a Web browser go to the following URL: http://192.168.0.2 and verify that the RT10 Login screen comes up. If it doesn't try again ensuring you hold down the switch long enough.

2.3.3 RT10 Expanders

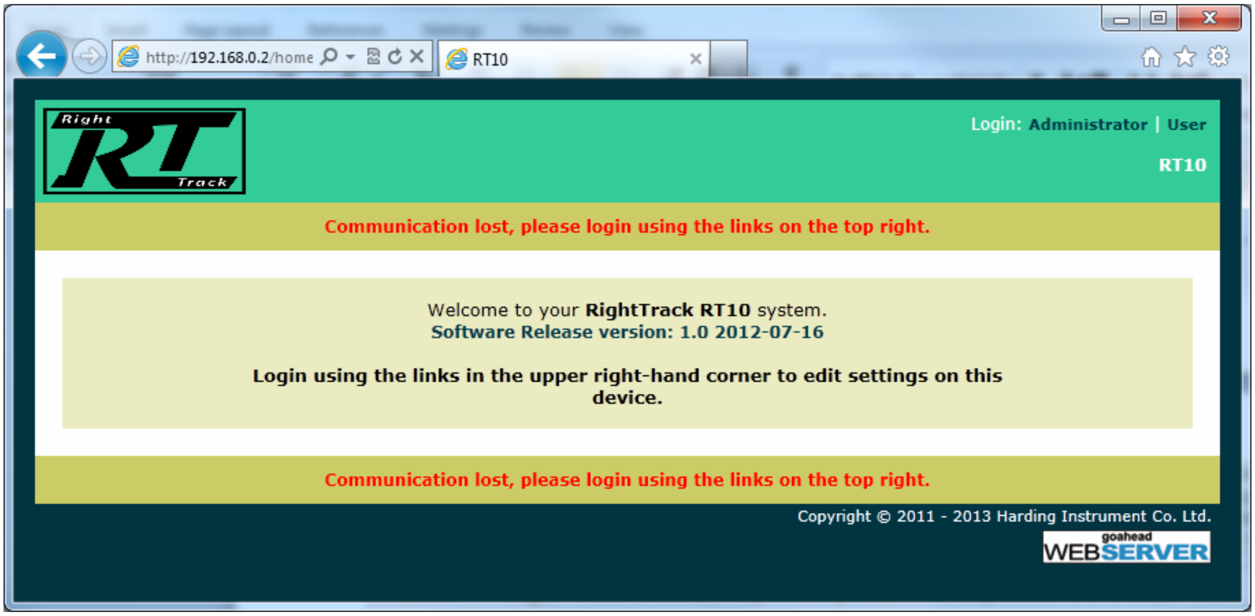
Up to 3 RT10 expanders may be added to a RT10 system. Each RT10 provides an additional 24 I/O channels.

2.4 Web Configuration Interface

To access the RT10 embedded web site use a web browser to go to the following URL:
http://192.168.0.2 *(assuming the default IP is in use, if not use the assigned address)*
This will bring you to the home page. To further configure the RT10 you must login.
If you have any issues first verify your PC is properly connected to the RT10 and has a unique IP address in the same subnet as the RT10. Also verify any firewalls or web security settings allow local connections.
Below is a quick overview of each of the pages.

2.4.1 Login Page

To login on the RT10 homepage click on the "Administrator" link on the top right and enter **admin** for the password.



Communication lost, please login using the links on the top right.

Welcome to your **RightTrack RT10** system.
Software Release version: 1.0 2012-07-16

Login using the links in the upper right-hand corner to edit settings on this device.

Communication lost, please login using the links on the top right.

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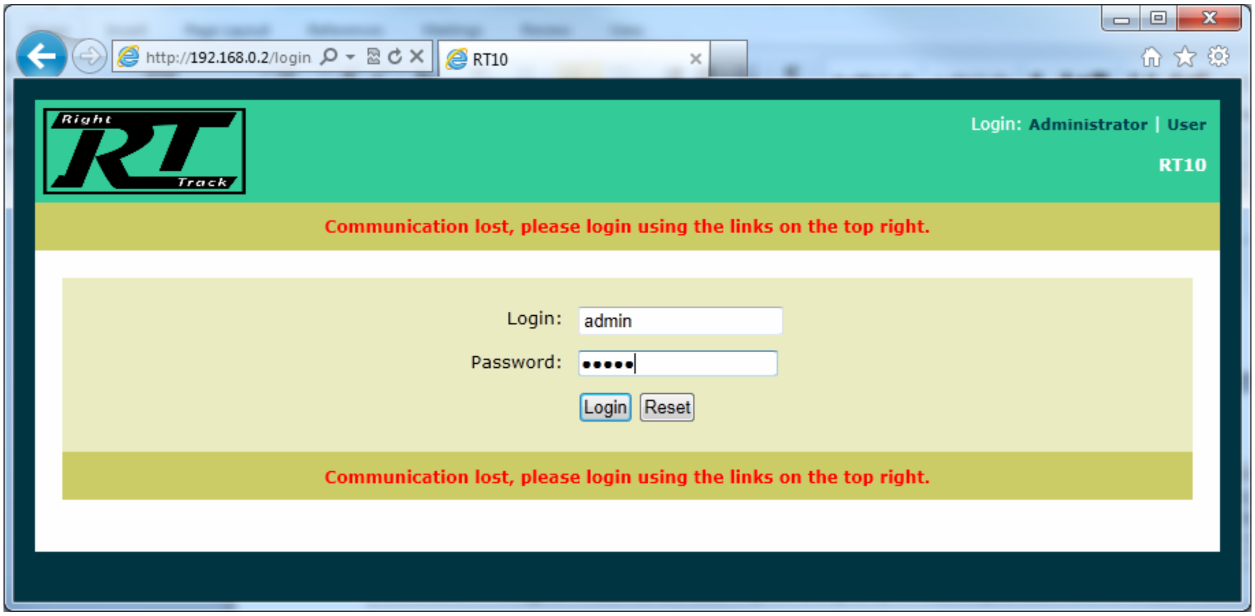
Figure 6 Initial Page



Communication lost, please login using the links on the top right.

Login: admin
Password: •••••

Communication lost, please login using the links on the top right.

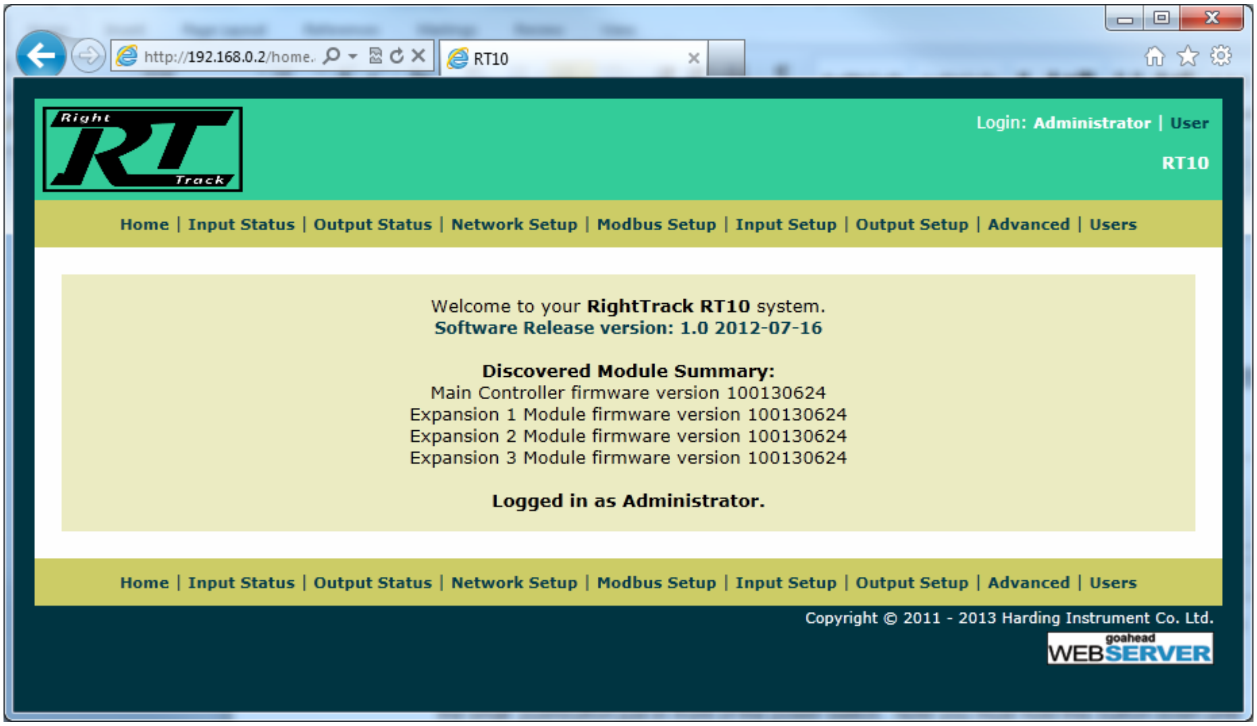
Figure 7 Login Page

Note the User login (password **user**) is also available but cannot be used to configure the RT10, only monitor it. - Several menus will not appear.

2.4.2 Home Page

After login the home page will be displayed, which provides access to a full set of configuration menus. These menus names are displayed along the top and bottom headers, along with version information on all attached modules.

The screen below shows three attached expansion modules.


http://192.168.0.2/home.
RT10
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users

Welcome to your **RightTrack RT10** system.
Software Release version: 1.0 2012-07-16

Discovered Module Summary:
Main Controller firmware version 100130624
Expansion 1 Module firmware version 100130624
Expansion 2 Module firmware version 100130624
Expansion 3 Module firmware version 100130624

Logged in as Administrator.

Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
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goahead WEBSERVER

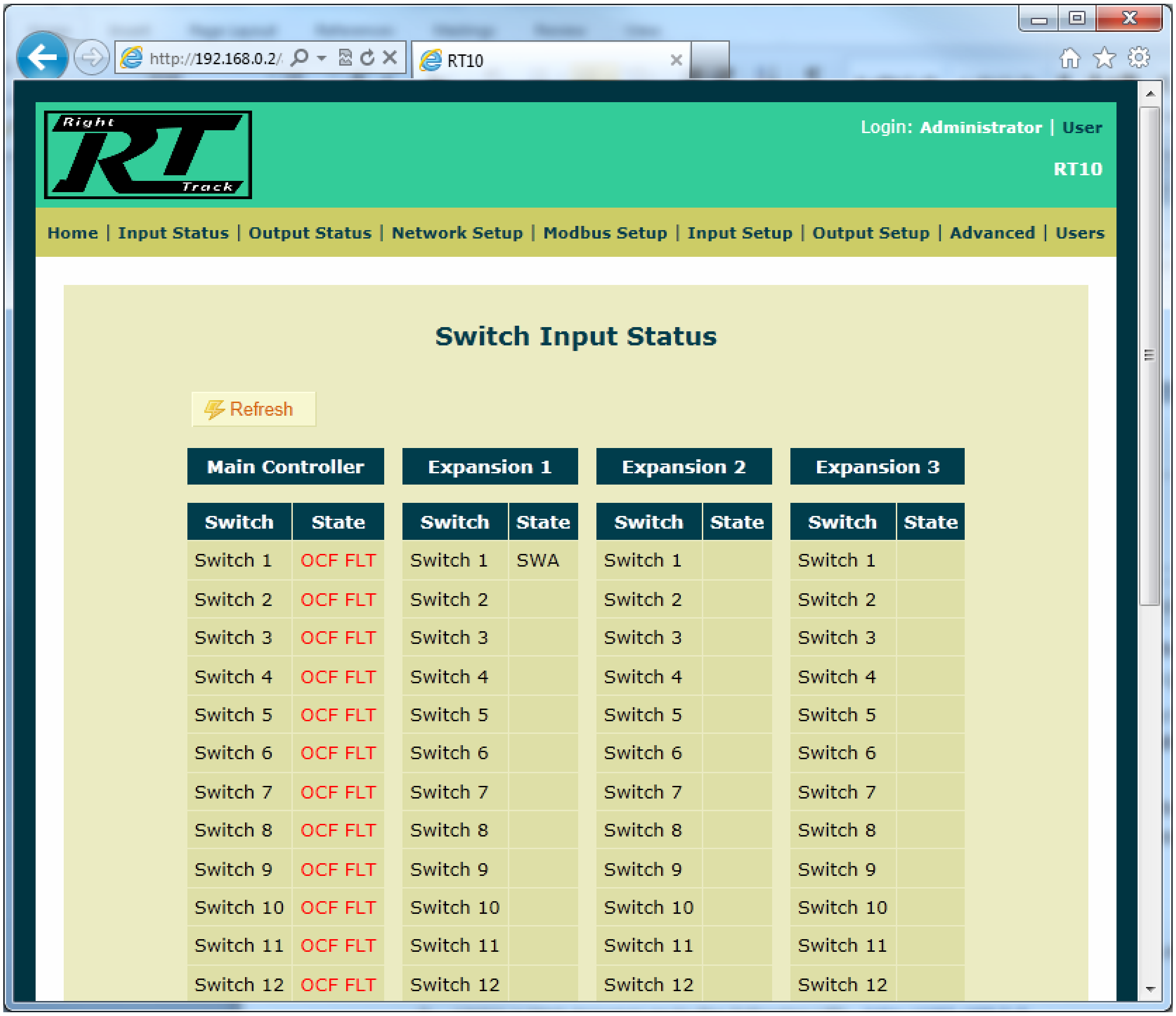
Figure 8 Home Page

2.4.3 Input Status Page

The Input Status Page shows the current state of all input channels for each module in a columnar format. The various states shown include:

SWA – Switch A is active
SWB – Switch B is active
OCF – Open Circuit fault
SCF – Short Circuit fault
FLT – Fault (set on any fault)

The home page auto-refreshes every 10 seconds or if the user clicks the Refresh button.


http://192.168.0.2/
RT10
Right
RT
Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Refresh

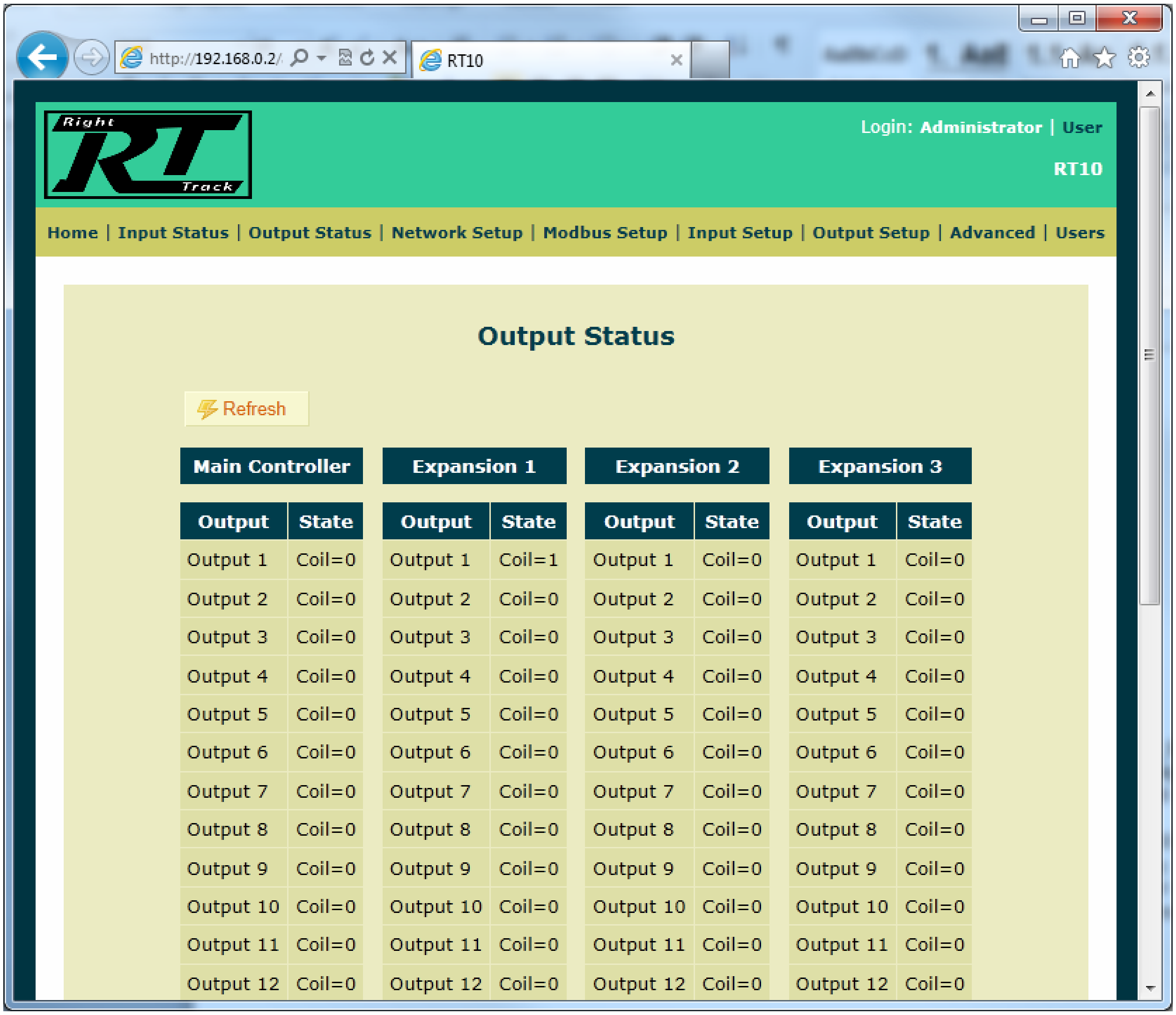
Switch Input Status

Main Controller		Expansion 1		Expansion 2		Expansion 3	
Switch	**State**	**Switch**	**State**	**Switch**	**State**	**Switch**	**State**
Switch 1	OCF FLT	Switch 1	SWA	Switch 1		Switch 1	
Switch 2	OCF FLT	Switch 2		Switch 2		Switch 2	
Switch 3	OCF FLT	Switch 3		Switch 3		Switch 3	
Switch 4	OCF FLT	Switch 4		Switch 4		Switch 4	
Switch 5	OCF FLT	Switch 5		Switch 5		Switch 5	
Switch 6	OCF FLT	Switch 6		Switch 6		Switch 6	
Switch 7	OCF FLT	Switch 7		Switch 7		Switch 7	
Switch 8	OCF FLT	Switch 8		Switch 8		Switch 8	
Switch 9	OCF FLT	Switch 9		Switch 9		Switch 9	
Switch 10	OCF FLT	Switch 10		Switch 10		Switch 10	
Switch 11	OCF FLT	Switch 11		Switch 11		Switch 11	
Switch 12	OCF FLT	Switch 12		Switch 12		Switch 12	

Figure 9 RT10 Controller and Expander Input Status Page

2.4.4 Output Status Page

The Output Status Page shows the current state of all output channels for each module in a columnar format. The states simply show the current "Coil" setting of 0 or 1. Note that the meaning of this setting can be affected by the individual outputs configuration.


http://192.168.0.2/
RT10
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Refresh

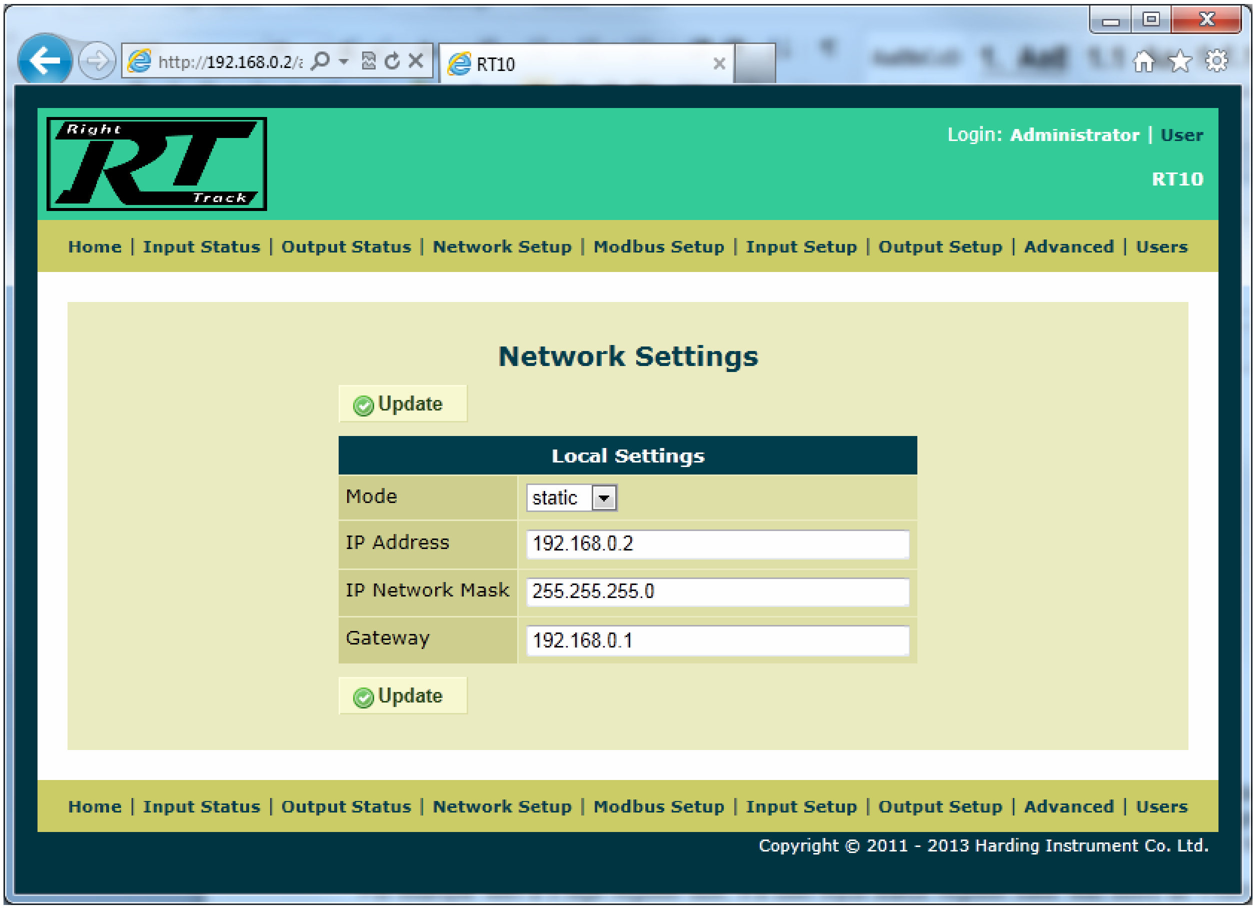
Output Status

Main Controller		Expansion 1		Expansion 2		Expansion 3	
Output	State	Output	State	Output	State	Output	State
Output 1	Coil=0	Output 1	Coil=1	Output 1	Coil=0	Output 1	Coil=0
Output 2	Coil=0	Output 2	Coil=0	Output 2	Coil=0	Output 2	Coil=0
Output 3	Coil=0	Output 3	Coil=0	Output 3	Coil=0	Output 3	Coil=0
Output 4	Coil=0	Output 4	Coil=0	Output 4	Coil=0	Output 4	Coil=0
Output 5	Coil=0	Output 5	Coil=0	Output 5	Coil=0	Output 5	Coil=0
Output 6	Coil=0	Output 6	Coil=0	Output 6	Coil=0	Output 6	Coil=0
Output 7	Coil=0	Output 7	Coil=0	Output 7	Coil=0	Output 7	Coil=0
Output 8	Coil=0	Output 8	Coil=0	Output 8	Coil=0	Output 8	Coil=0
Output 9	Coil=0	Output 9	Coil=0	Output 9	Coil=0	Output 9	Coil=0
Output 10	Coil=0	Output 10	Coil=0	Output 10	Coil=0	Output 10	Coil=0
Output 11	Coil=0	Output 11	Coil=0	Output 11	Coil=0	Output 11	Coil=0
Output 12	Coil=0	Output 12	Coil=0	Output 12	Coil=0	Output 12	Coil=0

Figure 10 RT10 Controller and Expander Output Status Page

2.4.5 Network Setting Page

The network setup page is used to configure the RT10 controller's IP address settings. Note that any changes in this screen will require an RT10 reboot and you will need to login to the new address.


http://192.168.0.2/
RT10
Right RT Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Update

Network Settings

Local Settings	
Mode	static
IP Address	192.168.0.2
IP Network Mask	255.255.255.0
Gateway	192.168.0.1

Update
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
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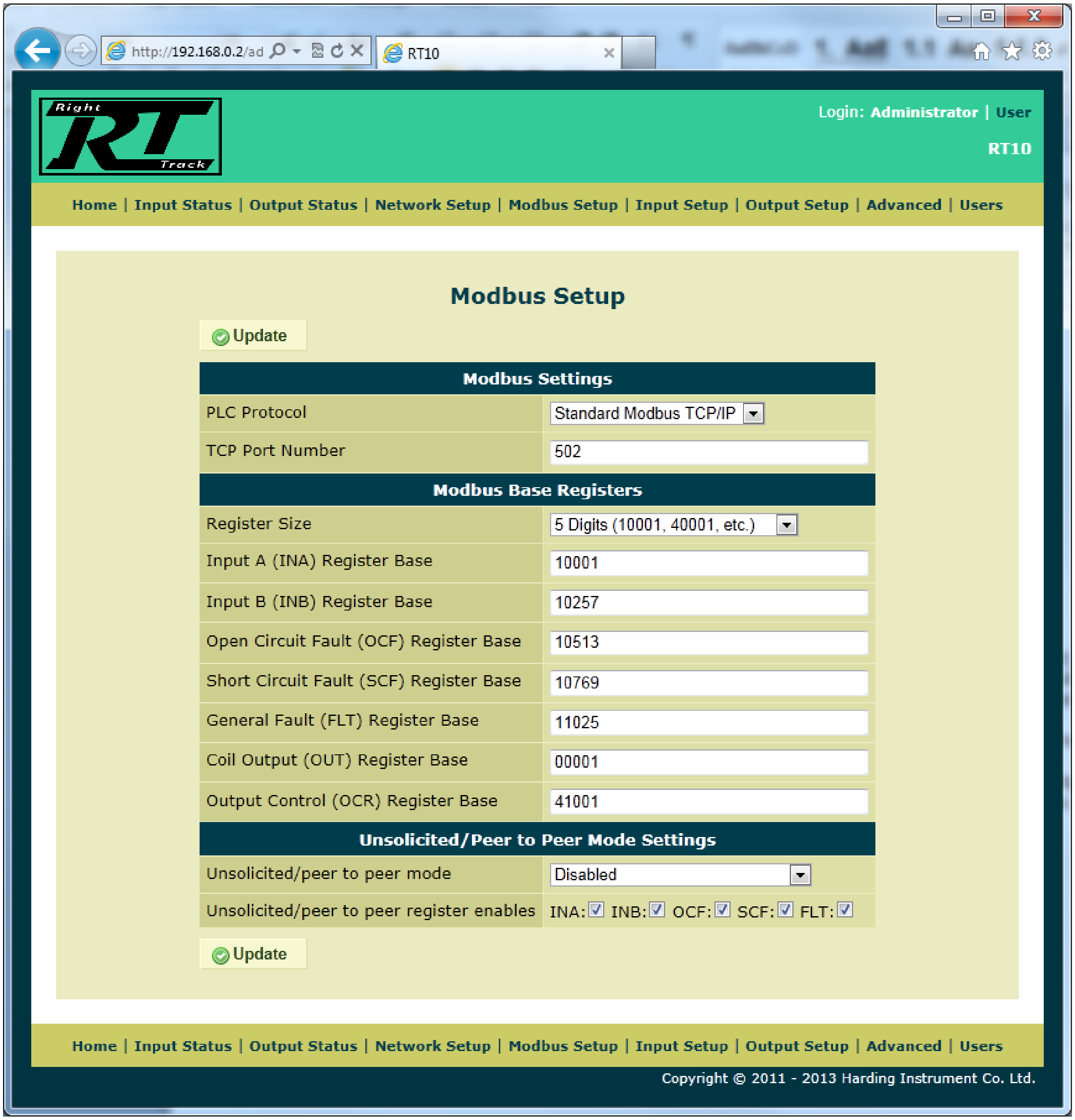
Figure 11 Network Setup Page

2.4.6 Modbus Setup Page

The Modbus setup page is used to configure the RT10 controller's Modbus TCP settings. Settings include protocol type and port, base registers, and register types.


http://192.168.0.2/ad
RT10
Right
RT
Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Update
Update
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
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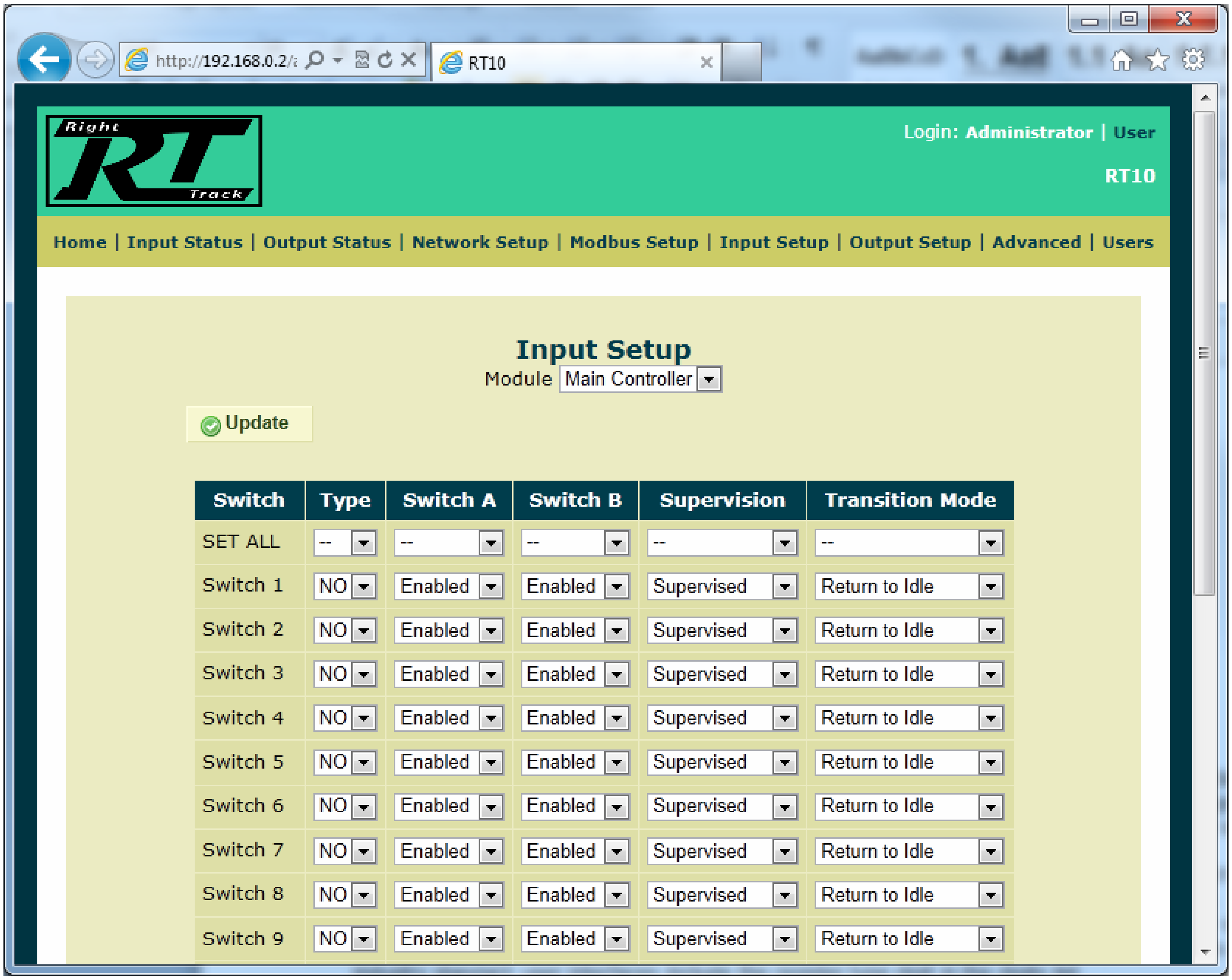
Modbus Setup

Modbus Settings	
PLC Protocol	Standard Modbus TCP/IP
TCP Port Number	502
Modbus Base Registers	
Register Size	5 Digits (10001, 40001, etc.)
Input A (INA) Register Base	10001
Input B (INB) Register Base	10257
Open Circuit Fault (OCF) Register Base	10513
Short Circuit Fault (SCF) Register Base	10769
General Fault (FLT) Register Base	11025
Coil Output (OUT) Register Base	00001
Output Control (OCR) Register Base	41001
Unsolicited/Peer to Peer Mode Settings	
Unsolicited/peer to peer mode	Disabled
Unsolicited/peer to peer register enables	INA: ☑ INB: ☑ OCF: ☑ SCF: ☑ FLT: ☑

Figure 12 Modbus Setup Page

2.4.7 Input Setup Page

The Input Setup Page is used to configure each RT10 module's inputs individually using the module pull-down at the top of the page. Settings include switch type, supervision, and transition modes.


http://192.168.0.2/
RT10
Right
Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Update

Input Setup

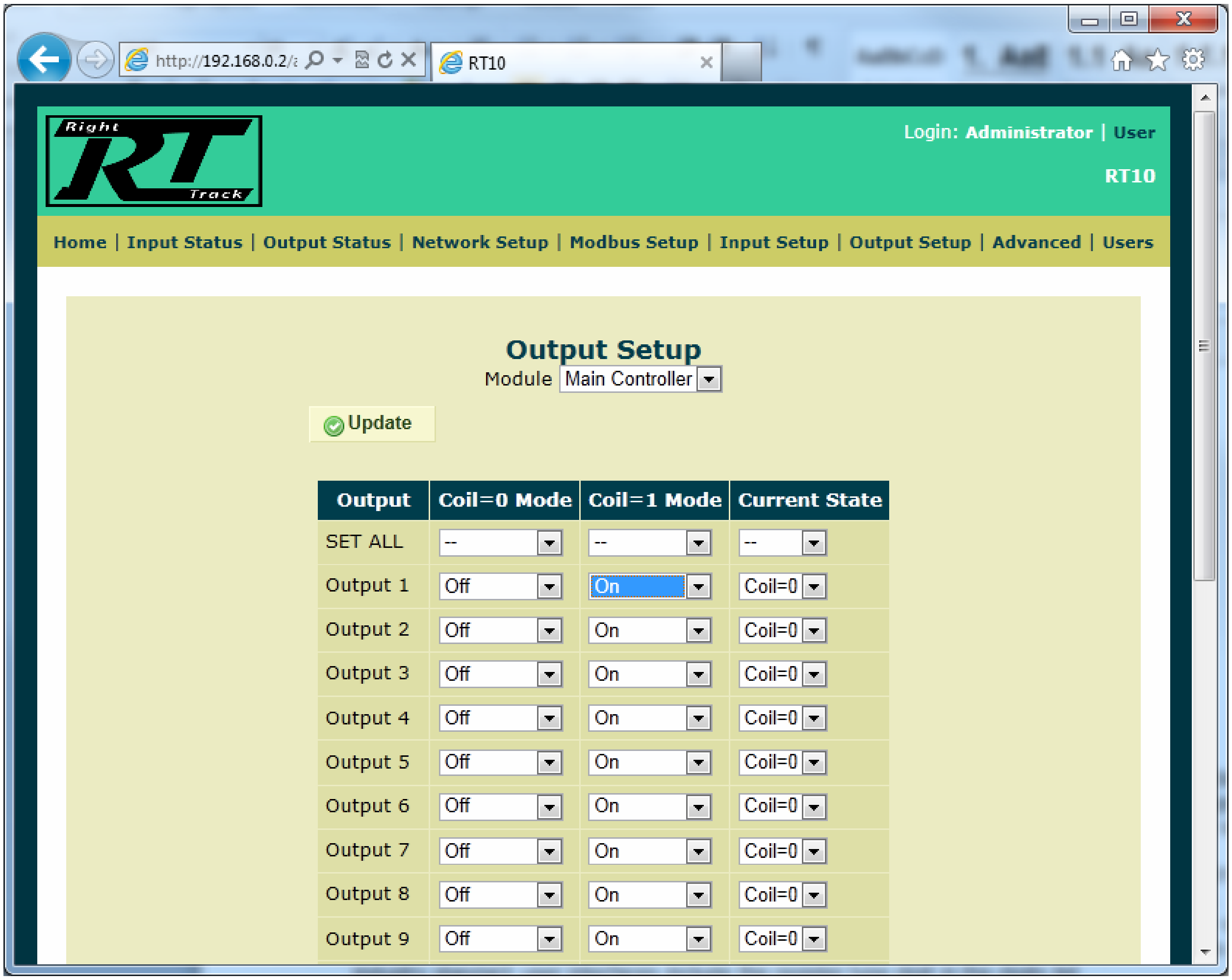
Module Main Controller

Switch	Type	Switch A	Switch B	Supervision	Transition Mode
SET ALL	--	--	--	--	--
Switch 1	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 2	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 3	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 4	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 5	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 6	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 7	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 8	NO	Enabled	Enabled	Supervised	Return to Idle
Switch 9	NO	Enabled	Enabled	Supervised	Return to Idle

Figure 13 Input Setup Page

2.4.8 Output Setup Page

The Output setup page is used to configure each RT10 module's outputs individually using the module pull-down at the top of the page. Settings include coil 0/1 setup (off, on, wink, blink, flash, fast flash) and current state.


http://192.168.0.2/
RT10
Right Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Update

Output Setup

Module: Main Controller

Output	Coil=0 Mode	Coil=1 Mode	Current State
SET ALL	--	--	--
Output 1	Off	On	Coil=0
Output 2	Off	On	Coil=0
Output 3	Off	On	Coil=0
Output 4	Off	On	Coil=0
Output 5	Off	On	Coil=0
Output 6	Off	On	Coil=0
Output 7	Off	On	Coil=0
Output 8	Off	On	Coil=0
Output 9	Off	On	Coil=0

Figure 14 Output Setup Page

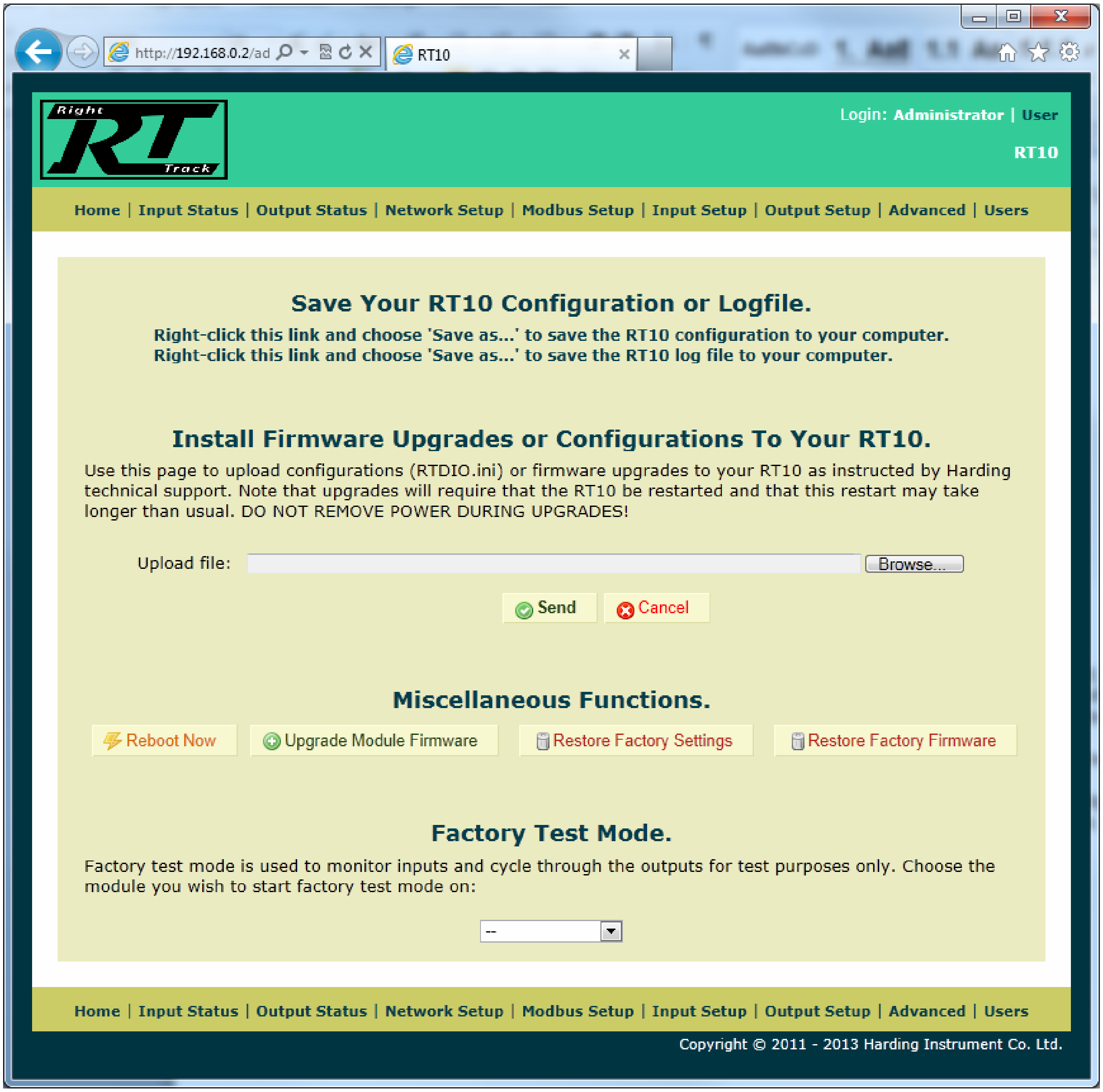
2.4.9 Users Page

The Users page allows you to change default passwords used to access the website.
It is not recommended you change the passwords but if you do make sure you remember your changes.

2.4.10 Advanced Page

The Advanced page allows access to low-level logs, configuration save and restore, upgrading, and other miscellaneous functions such as:

- Reboot – Restarts the RT10
- Upgrade module firmware - used to upgrade all attached modules, see following sections for details.
- Restore Factory Settings – Restores configuration to factory defaults
- Restore Factory Firmware – Restores firmware and configuration to factory defaults


http://192.168.0.2/ad
RT10
Right
RT
Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Browse...
Send
Cancel
Reboot Now
Upgrade Module Firmware
Restore Factory Settings
Restore Factory Firmware
--
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users

Save Your RT10 Configuration or Logfile.

Right-click this link and choose 'Save as...' to save the RT10 configuration to your computer.
Right-click this link and choose 'Save as...' to save the RT10 log file to your computer.

Install Firmware Upgrades or Configurations To Your RT10.

Use this page to upload configurations (RTDIO.ini) or firmware upgrades to your RT10 as instructed by Harding technical support. Note that upgrades will require that the RT10 be restarted and that this restart may take longer than usual. DO NOT REMOVE POWER DURING UPGRADES!

Upload file:

Miscellaneous Functions.

Factory Test Mode.

Factory test mode is used to monitor inputs and cycle through the outputs for test purposes only. Choose the module you wish to start factory test mode on:

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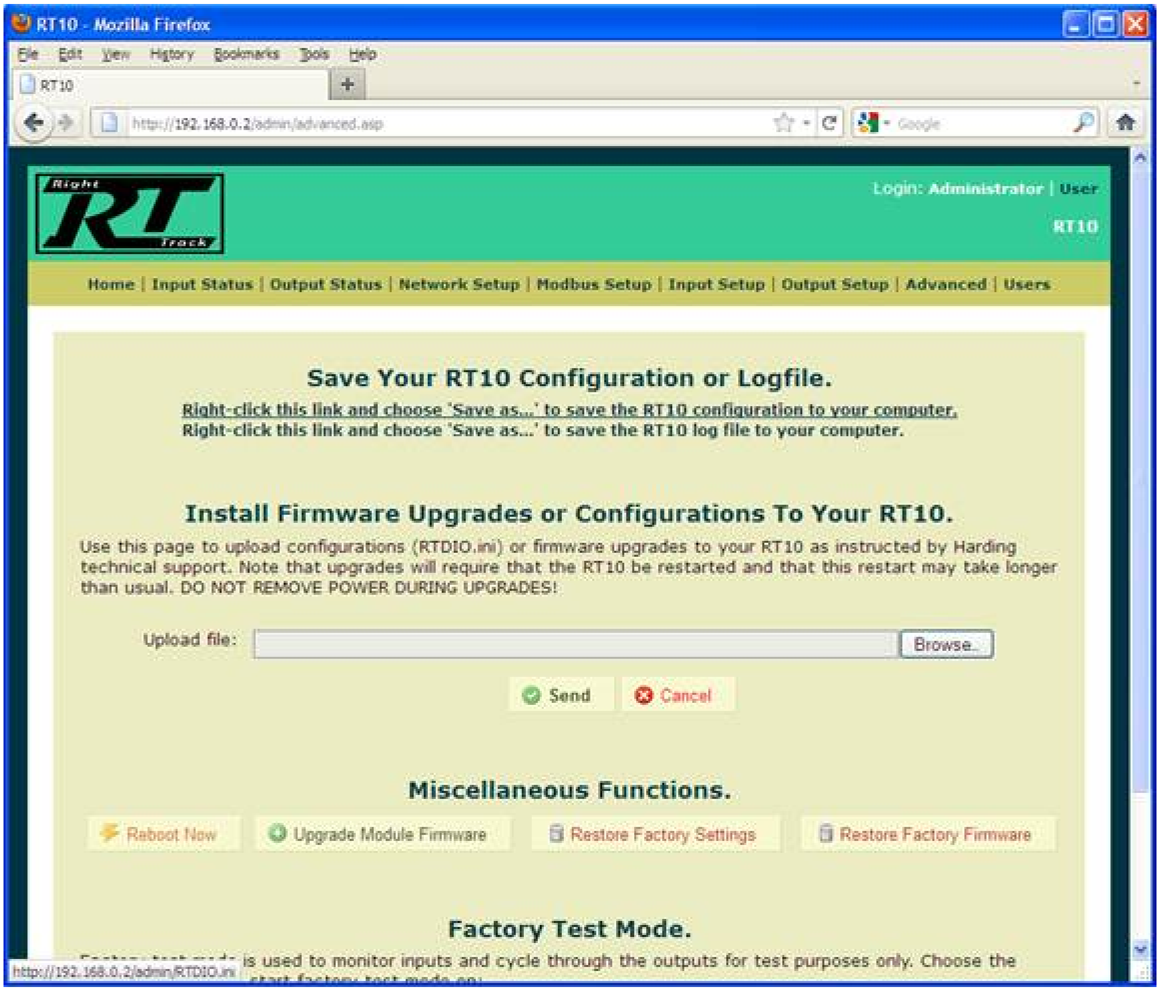
Figure 15 Advanced Page

2.5 Upgrading RT10 Firmware

The RT10 firmware consists of two parts – the main website/modbus firmware (controller only) and the individual module firmware (controllers & expanders). Usually both are upgraded at the same time.

2.5.1 Upgrading the RT10 Controller

To upgrade an RT10, do the following:
Connect your RT10 controller to be upgraded (including any expansion modules, up to 3) to a PC on a local network and power everything on.
On your PC, go to the Harding FTP site and download the required upgrade file “OB6900110-XX.tar.gz” (XX may vary) located in the RT10 subdirectory to a known location (or obtain the upgrade file via other means).
On your PC browser, go to the RT10 website and login.
On the website Advanced page, save your RT10 configuration INI file by right clicking on the “save the RT10 configuration to your computer” link and saving the file in a known location. Note the upgrade should preserve your settings but we back it up just in case.


RT10 - Mozilla Firefox
File Edit View History Bookmarks Tools Help
RT10
http://192.168.0.2/admin/advanced.asp
Google
Right RT Track
Login: Administrator | User
RT10
Home | Input Status | Output Status | Network Setup | Modbus Setup | Input Setup | Output Setup | Advanced | Users
Browse...
Send
Cancel
Reboot Now
Upgrade Module Firmware
Restore Factory Settings
Restore Factory Firmware
http://192.168.0.2/admin/RTDIO.ini

Save Your RT10 Configuration or Logfile.

Right-click this link and choose 'Save as...' to save the RT10 configuration to your computer.
Right-click this link and choose 'Save as...' to save the RT10 log file to your computer.

Install Firmware Upgrades or Configurations To Your RT10.

Use this page to upload configurations (RTDIO.ini) or firmware upgrades to your RT10 as instructed by Harding technical support. Note that upgrades will require that the RT10 be restarted and that this restart may take longer than usual. DO NOT REMOVE POWER DURING UPGRADES!

Upload file:

Miscellaneous Functions.

Factory Test Mode.

is used to monitor inputs and cycle through the outputs for test purposes only. Choose the

Figure 16 Advanced Page Saving Configuration

Again on the Advanced page, in the “Install Firmware Upgrades…” section click on the Browser button to upload a file. Navigate and chose the “OB6900110-XX.tar.gz” upgrade file you downloaded in step 2 above.

1. Wait a minute or two for the upload to complete. When the reboot page appears click Reboot.
2. Wait approximately 5 minutes for the upgrade to complete. Each attached module will also be upgraded. DO NOT REMOVE POWER DURING THIS PROCESS.

3. Once the upgrade completes the RT10 should boot up normally and each module's status LED should begin winking.
4. On your PC browser, go to the RT10 website and login to the home screen to verify the version and the module versions show the expected version numbers.
5. If the module does not communicate verify the controllers status LED is ON all the time and that each modules activity LED is ON but winking. If not wait a bit longer or call support. If the LED's look normal try communicating with the default 192.168.0.2 IP address instead, the unit may have reverted.

Note that this process will automatically update all attached expansion modules. If you need to upgrade an expansion module later on follow the procedure below.

2.5.2 Upgrading a RT10 Expansion Module

To upgrade an RT10 expansion module simply use an already upgraded RT10 controller with the older expansion modules attached and do the following:

1. Connect your RT10 to be upgraded (including all expansion modules to be upgraded, up to 3) to a PC on a local network and power everything on.
2. On your PC browser, go to the RT10 website and login.
3. On the website Advanced page (as shown above), in the "Miscellaneous Functions" section click on the "Upgrade Module Firmware" button. OK the confirmation dialog and allow the unit to reboot.
4. Once the upgrade completes the RT10 should boot up normally and each module's status LED should begin winking.
5. On your PC browser, go to the RT10 website and login and verify all module versions are updated.

2.6 Digital I/O Operation

2.6.1 Switch Updates

Normally, the RightTrack RT10 assumes NO (Normally Open) switches; unless otherwise specified, all information below assumes a NO switch.

2.6.2 Unsupervised Inputs

Unsupervised inputs are always reported as switch A. Any inputs configured as switch B in unsupervised mode will never be reported (will poll as 0 state).
Unsupervised inputs can be configured as NO (Normally Open) or NC (Normally Closed) switches.
Unsupervised inputs will not report faults hence the fault, open circuit fault, and short circuit fault status will be 0 if the related switch is unsupervised.

2.6.3 Supervised Inputs

Supervised inputs can have up to 2 switches defined per input. Supervised inputs can also report an open or short circuit fault. The RT10 hardware can detect the following conditions: no switches pressed, switch A pressed, switch B pressed, short circuit fault, or open circuit fault. When switch A is pressed the hardware is not able to detect the state of switch B (i.e. when switch A is pressed, the state of switch B is unknown). As well it cannot determine the position of the switches when an open or short circuit fault occurs.

2.6.4 Switch States

In normal (non-faulted) operation, the hardware is only able to detect 3 states: no switches pressed, switch A pressed, or switch B pressed. Because of this, there are some limitations.

1. When switch A and B are pressed at the same time, the hardware cannot uniquely identify this condition. There are two software modes that will determine what happens in this case.
   In the Return-To-Idle (RTI) mode, the first switch detected from an idle (or faulted) state will be reported, either A or B. No other switch will be reported until the switch returns to an idle (or faulted) state.
   In the Switch Transition (ST) mode, all switch transitions will be reported. If switch B is pressed and held down, then switch A is pressed, the RT10 will report a switch B press, then a switch A press (while the general RTI mode would not have reported the switch A press). In this mode, whenever switch A is pressed, switch B will also be reported as pressed. For details of these two modes, see below.

2. Supervised inputs defined as NC (Normally Closed) can only have switch A defined. Because the RT10 cannot detect switch A and B pressed simultaneously, the NC idle position (both switches pressed) cannot be uniquely detected, thus switch B can never report that it is in an idle state. Hence, only switch A can be defined for NC inputs (any inputs defined as switch B in NC mode will never be reported by the RT10). In NC mode, any switch in the switch B threshold will report as idle (which is the same as if switch A was pressed – in other words, in NC mode, both switch A and switch B act as switch A).

3. All switches configured for an input should be the same type – i.e. a NC switch A and NO switch B should not be configured to use the same input channel. This is for the same reason as #2 above. Hence a supervised input can have 1 or 2 NO switches (A only, B only, or A and B), or 1 NC switch (A only). This only really applies to user programming as there is a configuration register per input, not per switch.

2.6.5 Switch Faults

Switches with faults are in an unknown switch state. The RT10 will handle all faulted switch inputs as if both of the switches were in the idle (off) state.
If a switch was being pressed when a fault is detected, the RT10 will set the switch state to “switch released” and the appropriate fault state to “fault on” for that switch. When the fault is corrected while a switch was held down, a “switch pressed” and a “fault off” action will be reported. Because these values are in separate Modbus registers, the order these messages are received in is not guaranteed. Hence, any software that communicates with the RT10 cannot make assumptions on switch state based on the last fault report or vice versa i.e. don’t

ignore switch press indications if the last fault state was faulted, as a fault correction indication could be immediately following).

2.6.6 Default Return-To-Idle (RTI) Mode

The RT10 reports all configured presses and/or releases that it detects. Switches can be configured as either NO or NC. Switches can be configured to report events on the following transitions:

Momentary (reports switch on #2) (not implemented)
Latched (reports switch on #1 and #2)

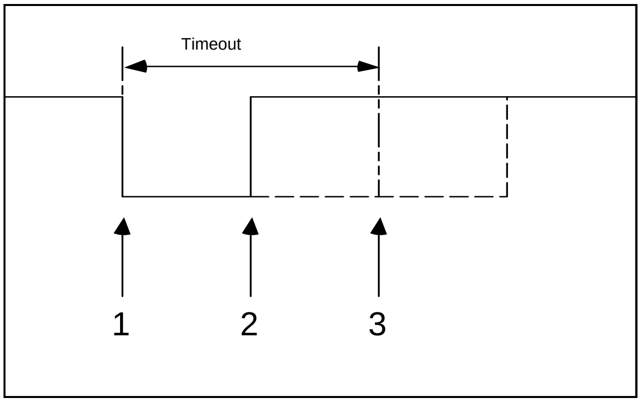


Figure 17 RT10 Switch Operations

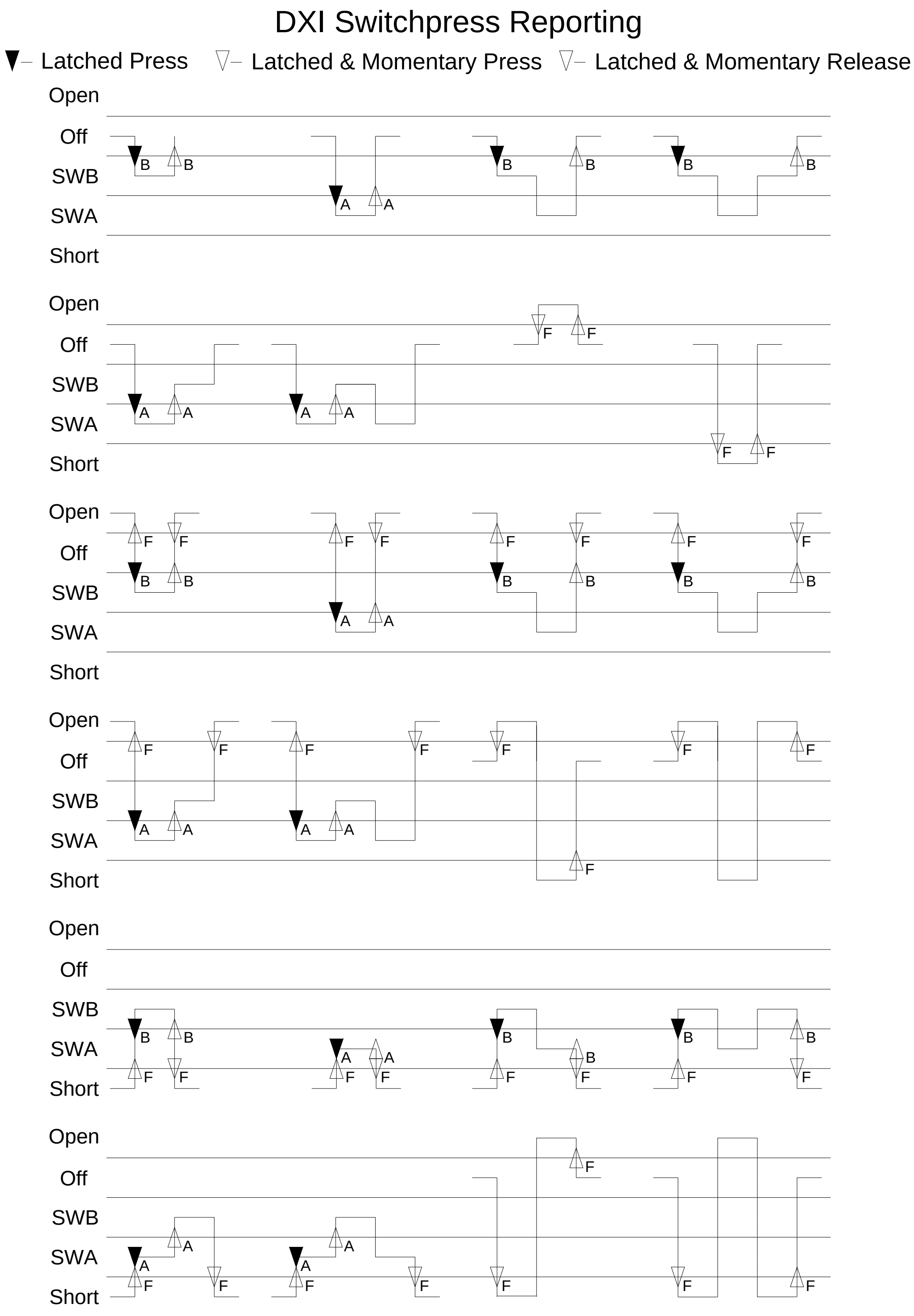

DXI Switchpress Reporting
▼– Latched Press
▽– Latched & Momentary Press
▽– Latched & Momentary Release
Open
Off
SWB
SWA
Short
A
B
F

Figure 18 Return-To-Idle (RTI) Switch reporting

2.6.7 Switch Transition Mode

This feature provides the ability to detect SWA after SWB is pressed and SWB when SWA is pressed and is enabled using by setting the transition mode bits for the inputs to 1.

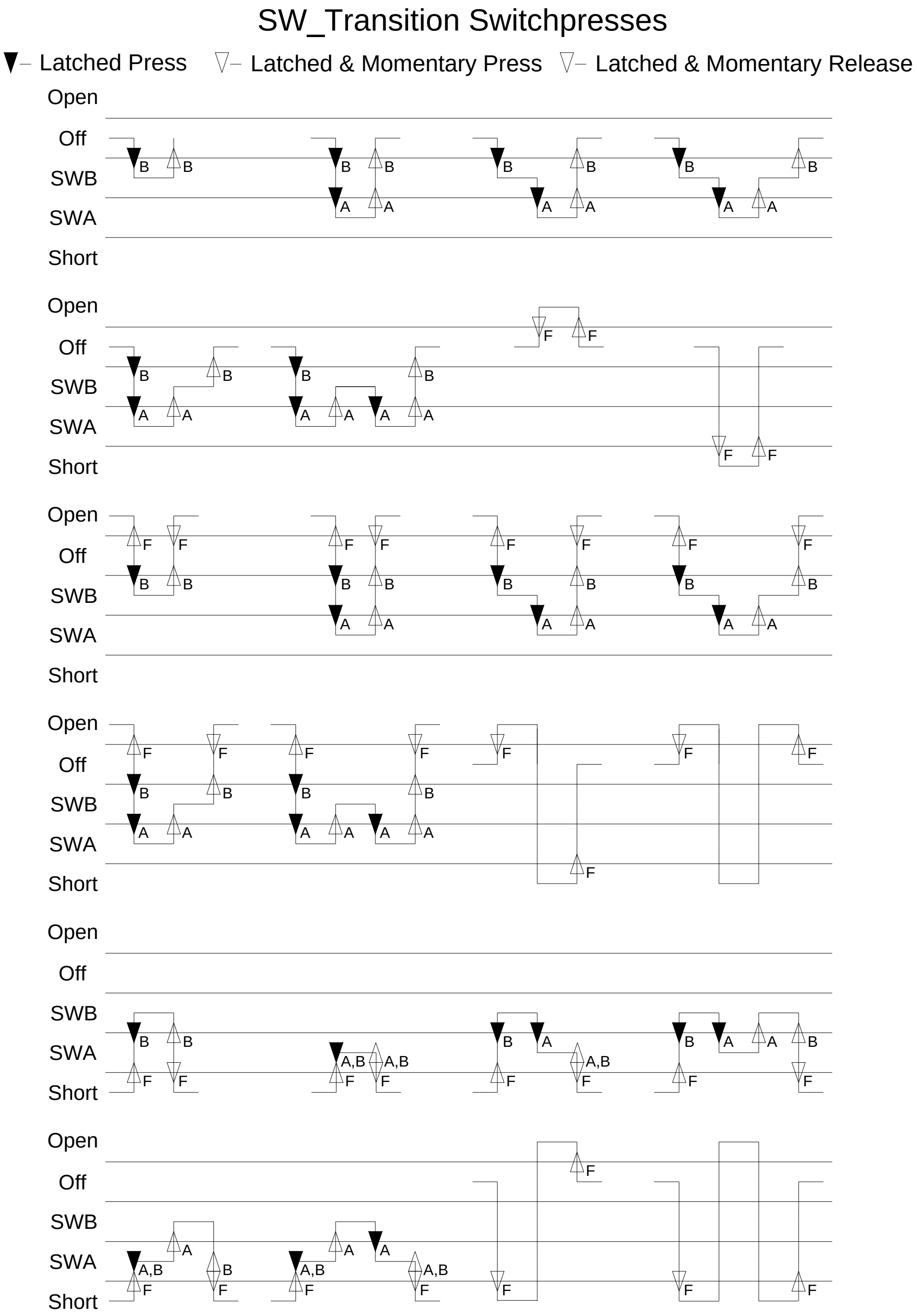

SW_Transition Switchpresses
▼– Latched Press
▽– Latched & Momentary Press
▽– Latched & Momentary Release
Open
Off
SWB
SWA
Short
A
B
F
A,B

Figure 19 Switch Transition (ST) switch reporting

2.7 Modbus Operation

2.7.1 Polled vs. Peer-to-Peer Mode

In polled mode, the RT10 will act as a server only and will only respond to at least the following commands and return the appropriate responses including register/coil/input status values.

In peer-to-peer mode, the RT10 will respond to the polled commands and return the appropriate responses including register/coil/input status values just like in polled mode. In addition, it will push unsolicited messages for any change of state in the input status bit values.

2.7.2 Supported Modbus Commands in Polled and Peer-to-peer Mode

Function	Description	Return value to PLC/Driver
01	Read Coil Status	Status of outputs
02	Read Input Status	Status of input switches/faults
03	Read Holding Registers	Holding register contents
05	Force Single Coil	Set status of a single output
06	Preset Single Register	Set holding register value for a single holding register
15	Force Multiple Coils	Set status of multiple outputs
16	Preset Multiple Registers	Set holding register values of multiple holding registers

Note that highest numbered coil/input status bit in a byte is the most significant bit of the byte. Within a word, byte order for Modbus is big-endian (MSB first). The first word sent contains the lowest numbered coil/input status bits, and the last word sent contains the highest numbered coil/input status bits. Remaining bits not used are zero-filled.

2.7.3 Supported Modbus Unsolicited Peer-to-Peer Commands

In peer to peer mode, the RT10 will scan the switches and check for changes in state.
If and only if changes in state are detected, the RT10 will push changes in input status registers to the controlling PLC or host driver.
The interval, at which the RT10 will scan the switches, and if changed push them to the PLC, should be at least every 100 ms, preferably faster.
The range of switch inputs is determined by a configuration register/web user interface check box (see UNSOL_MODE register). This currently only applies to the Modbus peer-to-peer mode, and not the Cimplicity peer-to-peer mode (which only updates one point per message so only changed switch inputs will be sent no matter what the value of this configuration item is set to).

- All switches: push all switch bits of that type when a state changes
- Intelligent mode (Changed switches): determine lowest switch and highest switch that changed, then the block write command will push the range of switches from lowest to highest only.

Since there are 5 different ranges of switch inputs (INA, INB, OCF, SCF, FLT) there may be 5 block write commands initiated per scan interval.
For Modbus, there are two different methods that unsolicited messages could be sent. They could be sent as a direct PLC-to-PLC message using a normal Modbus command, or to a Cimplicity/HMI driver using the equivalent of a Cimplicity MSTR block.
Unsolicited messages will be sent to the IP address(es) of PLCs that have last polled or wrote commands to the Modbus registers. Thus the server or PLC need to only poll or set registers once to start unsolicited mode transfers.

2.7.4 PLC-To-PLC Message Modbus Command

Switch inputs on the RT10 will be pushed to the PLC as coils on the PLC, with the RT10 operating as a Modbus client to connect to the destination PLC, send the switches as a Force Multiple Coil command (with coil number as switch number), then await the complete response from the destination PLC. After a timeout it can then close the connection if no new switch updates are available.

Function	Description	Sent value to PLC/Driver
15	Force Multiple Coils	Push status of multiple switch inputs

Note that if peer-to-peer mode is active, the PLC should still be able to poll the switch inputs, as well as receive the pushed switches on their PLC. Hence there may be two ways to get the switch updates.

- Polled: read switch input bits 0-65535 from RT10 (Modbus address 10001-19999 or 100001-165535)
- Peer-to-peer: PLC has coil bits 0-65535 pushed to it from RT10 (Modbus address 00001-09999 or 000001 to 065535)

The same offset from base register (INA_BASE, INB_BASE, OCF_BASE, SCF_BASE, FLT_BASE) will be used in either case (for example, with INA_BASE set to the default, switch 1 may be read by polling switch input 10001/100001, or peer-to-peer at coil 00001/000001).

2.7.5 Cimplicity/HMI driver MSTR block Command

Cimplicity/HMI normally requires the PLC to use a MSTR block command to send unsolicited messages as a block of registers using Preset Multiple Registers to the Cimplicity TCP/IP communications enabler, then await the complete response from the destination. After a timeout it can then close the connection if no new switch updates are available.
This is a Modbus Preset Multiple Registers command with an additional 5 register header at the front of the block for the Cimplicity TCP/IP communications enabler to determine which internal point to set.

Function	Description	Sent value to PLC/Driver
16	Preset Multiple Registers	Set holding register values of multiple holding registers

The contents of the Data Block starting at Modbus register 0 (register 400001/40001) are as follows

Register	Function	Value
0	Network address of sending PLC (RT10)	0
1	Zero	0
2	Zero	0
3	Address of the point to be updated	Switch input base+switch input number (10001 if first switch input is the start)
4	Number of bytes of point data being sent	Number of bytes of switch data being sent below (always 2)
5	Point data	Switch data 0x0000 for switch off, 0x0001 for switch on

Note that if peer-to-peer mode is active, the server should still be able to poll the switch inputs, as well as receive the pushed switches on their server. Hence there may be two ways to get the switch updates.

- Polled: read switch input bits 0-65535 from RT10 (Modbus address 10001-19999)
- Peer-to-peer: server has switch input bits 0-9999 pushed to it from RT10 (Modbus address 10001-19999)

The same offset from base register (INA_BASE, INB_BASE, OCF_BASE, SCF_BASE, FLT_BASE) will be used in either case (for example, with INA_BASE set to the default, switch 1 may be read by polling switch input 10001, or peer-to-peer at switch input 10001).

2.7.6 Modbus Register Size

The RT10 allows the user to choose their Modbus register size allowing either 5 or 6 digit addressing.

Allowable choices: 5 or 6, default 5.

	Register Type	Start Reg
Register Size (digits): 5	Coil	00001
	Input Status	10001
	Holding Register	40001

	Register Type	Start Reg
Register Size (digits): 6	Coil	000001
	Input Status	100001
	Holding Register	400001

This affects the user interface for the base addresses above (INA_BASE, INB_BASE, OCF_BASE, SCF_BASE, FLT_BASE, OUT_BASE) and the value sent in the Cimplicity unsolicited message MSTR

block header. User interface will enter values in the range above. Internal register value will subtract the starting register as above.
For example with a 5 digit register size, if a user input status register base was listed as 11001, the internal bit number of the first status register is 11001-10001 or Modbus bit 1000 in the array.

2.7.7 Modbus Registers

The tables below are summaries of the register maps for holding registers, coils, and discrete inputs. More details are included in the sections following.
Register mapping below assumes maximum input and output capacity is 256 inputs and 256 outputs

For any values with bit-wise bit maps, note that highest numbered coil/input status bit in a word is the most significant bit of the message. Within a word, byte order for Modbus is big-endian (MSB first). The first word (lowest address) contains the lowest numbered coil/input status bits, and the last word (highest address) contains the highest numbered coil/input status bits. Remaining bits not used are zero-filled.
Holding registers 0-999 (40001-40999 or 400001-40999) are reserved for fixed setup registers only. External setup should only be allowed to set holding register base addresses 999 up (41000+ or 401000+).
Note that all unused registers listed below should contain 0 when read, and all defaults for future settings for these registers must be 0. For example, a PLC changing only values 0-6 and 16-95 may write this as a block of 96 registers starting at register 0, with default zero values for registers 7-15.

Start Address	End Address	Start 4X Addr	End 4X Addr	Function	Saved?	Changes take effect...
0	0	40001	40001	INA_BASE	After Save	Immediately
1	1	40002	40002	INB_BASE	After Save	Immediately
2	2	40003	40003	OCF_BASE	After Save	Immediately
3	3	40004	40004	SCF_BASE	After Save	Immediately
4	4	40005	40005	FLT_BASE	After Save	Immediately
5	5	40006	40006	OUT_BASE	After Save	Immediately
6	6	40007	40007	OCR_BASE	After Save	Immediately
7	15	40008	40016	Unused		
16	31	40017	40032	INA_EN	After Save	After Save
32	47	40033	40048	INB_EN	After Save	After Save
48	63	40049	40064	SUP_EN	After Save	After Save
64	79	40065	40080	SW_TYPE	After Save	After Save
80	95	40081	40096	TRN _MODE	After Save	After Save
96	127	40097	40128	Unused		
128	128	40129	40129	PLC_PROTOCOL	After Save	After save&restart
129	129	40130	40130	IP_PORT	After Save	After save&restart
130	130	40131	40131	UNSOL_MODE	After Save	After save&restart
131	131	40132	40132	UNSOL_REGS	After Save	After save&restart
132	252	40133	40253	Unused		
253	253	40254	40254	SAVE	No	Immediately
254	254	40255	40255	RESYNC	No	Immediately
255	255	40256	40256	RESET	No	Immediately
256	256	40257	40257	NUM_INP	Read-only	Read only
257	257	40258	40258	NUM_COL	Read-only	Read only
258	512	40259	40512	Unused		
512	512	40513	40513	DEV_ID	Read-only	Read only
513	513	40514	40514	DEV_SN1	Read-only	Read only
514	514	40515	40515	DEV_SN2	Read-only	Read only
515	515	40516	40516	DEV_VER	Read-only	Read only
516	516	40517	40517	DEV_VER_YEAR	Read-only	Read only
517	517	40518	40518	DEV_VER_MON	Read-only	Read only

518	518	40519	40519	DEV_VER_DAY	Read-only	Read only
*		*				
OCR_BASE (default 1000*)	OCR_BASE +255 (default 1255)	41001 (default)	41256 (default)	OCR (changeable through configuration)	No	Immediately

*Note: register 999 (4X Addr 401000) is the first register that the user can change the OCR base address to but is not the default to be consistent in numbering with coils and discrete inputs

Table 3 Holding Register Memory Map

Start Address	End Address	Start 0X Addr	End 0X Addr	Function
OUT_BASE (default 0)	OUT_BASE+255 (default 255)	00001	00256	OUT

*Note: These are default addresses, changeable through configuration

Table 4 Coil Bit Memory Map

Start Address	End Address	Start 1X Addr	End 1X Addr	Function
INA_BASE (default 0)	INA_BASE+255 (default 255)	10001	10256	INA
INB_BASE (default 256)	INB_BASE+255 (default 511)	10257	10512	INB
OCF_BASE (default 512)	OCF_BASE+255 (default 767)	10513	10768	OCF
SCF_BASE (default 768)	SCF_BASE+255 (default 1023)	10769	11024	SCF
FLT_BASE (default 1024)	FLT_BASE+255 (default 1279)	11025	11280	FLT

*Note: These are default addresses, changeable through configuration

Table 5 Discrete Input Bit Memory Map

Notes:

Modbus Register Size (digits)
This should be a pull down choice and should have a table beside it showing examples.
Allowable choices: 5 or 6, default 5.

	Register Type	Start Reg
Register Size (digits): 5	Coil	00001
	Input Status	10001
	Holding Register	40001

	Register Type	Start Reg
Register Size (digits): 6	Coil	000001
	Input Status	100001
	Holding Register	400001

This affects the user interface for the base addresses above (INA_BASE, INB_BASE, OCF_BASE, SCF_BASE, FLT_BASE, OUT_BASE) and the value sent in the Cimplicity unsolicited message MSTR block header. User interface will enter values in the range above. Internal register value will subtract the starting register as above. For example with a 5 digit register size, if a user input status register base was listed as 11001, the internal bit number of the first status register is 11001-10001 or Modbus bit 1000 in the array.
Note: This is not the same format as DXL host properties; DXL host properties is the number of digits after the first register type identifier. That format is not what industry standard user interfaces use, the industry standard user interfaces include the register type digit in the digits list.
5 digits industry standard = 4 digits DXL (example: 40001 is holding register[0])
6 digits industry standard = 5 digits DXL (example: 400001 is holding register[0])

2.7.8 Read Only Setup Holding Registers

Setup holding registers are all at fixed Modbus addresses and can be queried by the host device to determine RT10 capabilities on start-up.

DEV_ID[0..x]

Device identification
Register address: Holding registers 512..998
Structure with device identification including

- **Device ID to identify feature set of this device**
- **Serial Number**
- **Operating firmware version(s)**

NUM_INP

Number of Discrete inputs
Register address: Holding register 256
16 bit value
Default: Auto-detect based on number of inputs on all enumerated modules
PLC or DXL program can determine size of system based on this value
Also used in sanity checking routines to determine valid register ranges particularly if host is using less than the full number of input registers and wants switch A and/or B and/or faults to be consecutive in input space.

NUM_COL

Number of coil outputs
Register address: Holding register 257
16 bit value
Default: Auto-detect based on number of outputs on all enumerated modules
PLC or DXL program can determine size of system based on this value
Also used to determine valid register ranges particularly if host is using less than the full number of output coils.

2.7.9 RT10 Setup Write/Read Holding Registers

Setup holding registers are all at fixed Modbus addresses. These are in non-volatile memory and will use the last saved settings on start-up even after a power-down/power-up.
Note that any changes to Write/Read Holding Registers will not trigger any changes until the SAVE register is toggled. Changes can therefore be made in any order, then SAVE toggled to effect the changes in the system. This will also save the settings to be the defaults on next reboot.

INA_BASE

Switch A Discrete Input base address
Register address: Holding register 0
16 bit value
Starting discrete input number of first discrete input register for Switch A.
Default 0

INB_BASE

Switch B Discrete Input base address
Register address: Holding register 1
16 bit value
Starting discrete input number of first discrete input register for Switch B.
Default 256

OCF_BASE

Open Circuit Fault Discrete Input base address
Register address: Holding register 2
16 bit value

Starting discrete input number of first discrete input register for open circuit fault.
Default 512

SCF_BASE

Short Circuit Fault Discrete Input base address
Register address: Holding register 3
16 bit value
Starting discrete input number of first discrete input register for short circuit fault
Default 768

FLT_BASE

Fault Discrete Input base address
Register address: Holding register 4
16 bit value
Starting discrete input number of first discrete input register for supervision fault
Default 1024

OUT_BASE

Coil Output base address
Register address: Holding register 5
16 bit value
Starting coil number of first output coil
Default 0

OCR_BASE

Output control register base address
Register address: Holding register 6
16 bit value
Starting holding register for first output coil output control register
Default 1000 (Modbus holding register 401001)

INA_EN[0..15]

Input Switch A enabled
Register address: Holding register 16..31
16 words of 16 bit bitmaps
Switch enable for switch A inputs (0=disabled, 1=enabled)
Polls/Unsolicited broadcasts of switches will filter out disabled switches (switch state is ANDed with INA_EN)
Default all 0x0000 (all switches disabled). This default can be changed from the web page for configuration-less use.
Enabling a switch will calculate its status and additionally, while in unsolicited mode will transmit the current switch status (once SAVE is toggled).
Disabling a switch will clear the switch state to off, and additionally while in unsolicited mode will transmit the new switch status (once SAVE is toggled).

INB_EN[0..15]

Input Switch B enabled
Register address: Holding register 32..47
16 words of 16 bit bitmaps
Switch enable for switch B inputs (0=disabled, 1=enabled)
Polls/Unsolicited broadcasts of switches will filter out disabled switches (switch state is ANDed with INB_EN)
Default all 0x0000 (all switches disabled). This default can be changed from the web page for configuration-less use.
Enabling a switch will calculate its status and additionally, while in unsolicited mode will transmit the current switch status (once SAVE is toggled).
Disabling a switch will clear the switch state to off, and additionally while in unsolicited mode will transmit the new switch status (once SAVE is toggled).

SUP_EN[0..15]

Supervision enabled
Register address: Holding register 48..63
16 words of 16 bit bitmaps
Supervision enabled for inputs (0=disabled, 1=enabled)
Supervision must be enabled to see input switch B, open circuit faults, or short circuit faults.
Default all 0x0000 (all switch supervision disabled)

SW_TYPE[0..15]

Switch type
Register address: Holding register 64…79
16 words of 16 bit bitmaps
Normally Open/Normally Closed mode for switches (0=NO, 1=NC)
Default all 0x0000 (all switches normally open)

TRN_MODE[0..15]

Transition mode
Register address: Holding register 80..95
16 words of 16 bit bitmaps
Determines if return to idle is required to change switch states in supervision mode
(0=RTI, return to idle required, or 1=switch transition, switch states will change without idle)
Default 0x0000 (all switches RTI mode). This default can be changed from the web page for configuration-less use.
Normally closed switches are not supported in transition mode (transition mode will automatically set switch to normally open) since transition mode sends switch A and B states, while switch B is not used in NC mode (see notes).

2.7.10 Modbus Setup Write/Read Holding Registers

Setup holding registers are all at fixed Modbus addresses. These are in non-volatile memory and will use the last saved settings on start-up even after a power-down/power-up.
Note that any changes to Write/Read Holding Registers will not trigger any changes until the SAVE register is toggled. Changes can therefore be made in any order, then SAVE toggled to effect the changes in the system. This will also save the settings to be the defaults on next reboot.
Also note that some Modbus related settings may require a reset to take effect as noted below.

PLC_PROTOCOL

PLC protocol,
Register address: Holding register 128
Bit 0..3: Protocol
    0000=Modbus TCP/IP Polled or Peer-to-Peer
    0001=Cimplicity MSTR Block Modbus TCP/IP (changes unsolicited message format)
    0010=Omron FINS UDP/IP (future use)
    0011=Omron FINS TCP/IP (future use)
Bit 4..15: Reserved (must be 0)
Changing this setting will require a reset to take effect if changing from a Modbus to Omron protocol or vice-versa.
Default 0x0000 (Modbus TCP/IP)

IP_PORT

IP port number to receive PLC messages from.
Register address: Holding register 129
Changing this setting will require a reset to take effect.
Default 502 (Modbus default port)
If/when Omron interface is implemented defaults should change if mode is changed from web interface
Web interface changing mode to Omron should change this setting to 9600
Web interface changing mode to Modbus should change this setting to 502

UNSOL_MODE

Register update method used to determine whether unsolicited messages are sent.
Register address: Holding register 130
Bit 0: unsolicited mode enable, 0=unsolicited mode disabled, 1=unsolicited mode enabled
Bit 1: all switches mode enable, 0=intelligent update mode, 1=all switches update mode
Allowable values:
    0=Unsolicited mode disabled
    1=Unsolicited mode enabled, intelligent update mode
    3=Unsolicited mode enabled, all switches update mode

For the intelligent update mode, the RT10 determines the lowest switch and highest switch that changed, then the block write command will push the range of switches from lowest to highest only. All switches mode sends the entire register block when any switch changes. Updates are sent to all connected hosts using IP_PORT. The RT10 will automatically connect back to a host once the host first connects with a poll or write, and continues to send unsolicited updates until the host goes offline.
Default 0 (unsolicited mode disabled)
This currently only applies to the Modbus peer-to-peer mode, and not the Cimplicity peer-to-peer mode (which only updates one point per message so only changed switch inputs will be sent no matter what the value of this configuration item is set to).

UNSOL_REGS

Types of registers permitted to be sent as unsolicited updates. This allows the host PLC or driver to inform the RT10 which registers are not required to be sent as unsolicited messages (for example, if only faulted state is required without needing to know if it is open or short circuited, OCF and SCF may be disabled).
Register address: Holding register 131
Bit 0: transmit unsolicited messages for change in INA, 0=transmit,1=do not transmit
Bit 1: transmit unsolicited messages for change in INB, 0=transmit,1=do not transmit
Bit 2: transmit unsolicited messages for change in OCF, 0=transmit,1=do not transmit
Bit 3: transmit unsolicited messages for change in SCF, 0=transmit,1=do not transmit
Bit 4: transmit unsolicited messages for change in FLT, 0=transmit,1=do not transmit
Bit 5..15 reserved (must be 0)
Default 0 (transmit unsolicited messages for all changes)

2.7.11 Command Write/Read Holding Registers

All of the following registers are not saved in non-volatile memory and will always default to 0 on start-up.

RESET

Register address: Holding address 255

Changing the RESET register from value 1 to value 0 will hard reset the RT10.
(hence the PLC or external device will have to write 1, then 0 to reset)
This will reset the operating system and RT10 software.
Note that PLC programming may at a regular interval write the last value written to this register, hence the change to 1 then 0 to trigger this, otherwise on first trigger of reset an endless string of resets will result.

Changing the RESET register from value 2 to value 0 will soft reset the RT10.
(hence the PLC or external device will have to write 2, then 0 to reset)
This will reset the RT10 software only for a faster reset.
Note that PLC programming may at a regular interval write the last value written to this register, hence the change to 2 then 0 to trigger this, otherwise on first trigger of reset an endless string of resets will result.

Default on start-up: 0

RESYNC

Register address: Holding address 254

Changing the RESYNC register from value 1 to value 0 will trigger the RT10 to send unsolicited messages indicating the state of all enabled switches, including INA, INB, OCF, SCF, FLT.
(hence the PLC or external device will have to write 1, then 0 to resync)
Note that PLC programming may at a regular interval write the last value written to this register, hence the change to 1 then 0 to trigger this, otherwise on first trigger of resync an endless string of resynchs will result.
This register is only used when the PLC mode is unsolicited peer to peer.
Default on start-up: 0

SAVE

Register address: Holding address 253
Changing the SAVE register from value 1 to value 0 will cause all current settings to be saved to the settings file and the RT10 modules.
(hence the PLC or external device will have to write 1, then 0 to save)
Note that PLC programming may at a regular interval write the last value written to this register, hence the change to 1 then 0 to trigger this, otherwise on first trigger of save an endless string of saves will result.
Default on start-up: 0

2.7.12 RT10 Output Write/Read Holding Registers

OCR[0..255]

Output Control register, 1 per output
Register address: Holding register OCR_BASE..OCR_BASE+255
Output 1 starts at output control register base address

These registers affect the output blink pattern for coil on and coil off
Normally the output will be solid on when the coil is on, and solid off when the coil is off, but this behaviour can be changed to blink when on, or be normally closed status, etc. by setting different values for these registers.

Bit 0..7: Blink state when the corresponding coil bit for this output is set to 0
Bit 8..15: Blink state when the corresponding coil bit for this output is set to 1

Bit values:

Value	Blink Pattern
0x00	Off
0x01	On
0x02	Wink (1/8 sec off, 7/8 sec on)
0x03	Blink (1/8 sec on, 7/8 sec off)
0x04	Flash (4/8 sec off, 4/8 sec on)
0x05	Fast flash (1/8 sec off, 1/8 sec on)

Default value is 0x0100 for normally open (Off when coil is 0, on when coil is 1)
Other examples:
Normally closed: 0x0001 (on when coil is 0, off when coil is 1)
Blink when coil is 1, full off when coil is 0: 0x0300

Note that these registers can be used in place of coil registers to set absolute output status.
In this case, all coils can be left at 0 state. Then, to turn on an output set the corresponding OCR register to the On state (0x0001), or to turn off an output set the corresponding OCR register to the Off state (0x0000), all while leaving the coils at 0 state.
Note that changes made by Modbus to these registers are NOT saved over a reboot. Changes made with the web interface are saved and used as start-up defaults.

2.7.13 Read Only Input Status

INA[0..255]

Switch A Discrete Input bits, 1 bit per input
Register address: Discrete input INA_BASE...INA_BASE+255

Internally stored as 16 words of 16 bit bitmaps
Input 1 starts at switch A base address
In NO mode, 0=switch open, 1=switch closed
In NC mode, 0=switch closed, 1=switch open

INB[0..255]

Switch B Discrete Input bits, 1 bit per input
Register address: Discrete input INB_BASE...INB_BASE+255
Internally stored as 16 words of 16 bit bitmaps
Input 1 starts at switch B base address
In NO mode, 0=switch open, 1=switch closed
In NC mode, always reads 0

OCF[0..255]

Open Circuit Fault bits, 1 bit per input
Register address: Discrete input OCF_BASE...OCF_BASE+255
Internally stored as 16 words of 16 bit bitmaps
Input 1 starts at Open Circuit Fault base address
0=no open circuit fault, 1=open circuit fault

SCF[0..255]

Short Circuit Fault bits, 1 bit per input
Register address: Discrete input SCF_BASE...SCF_BASE+255
Internally stored as 16 words of 16 bit bitmaps
Input 1 starts at Short Circuit Fault base address
0=no short circuit fault, 1=short circuit fault

FLT[0..255]

Open/Short Circuit Fault bits, 1 bit per input
Register address: Discrete input FLT_BASE...FLT_BASE+255
Internally stored as 16 words of 16 bit bitmaps
Input 1 starts at Fault base address
0=no fault, 1=fault
This is (OCF OR SCF)

2.7.14 Write/Read Output Coils

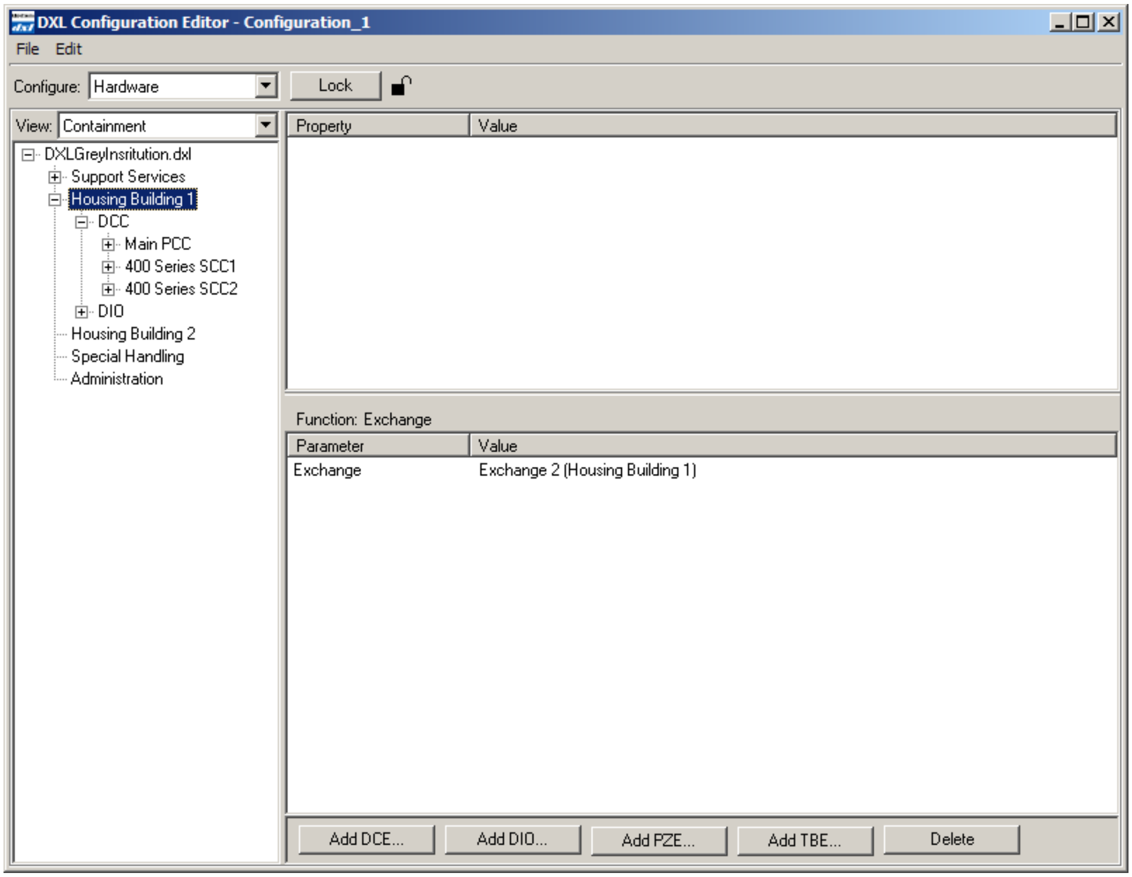
OUT[0..255]

Open/Short Circuit Fault bits, 1 bit per input
Register address: Output coil OUT_BASE...OUT_BASE+255
Internally stored as 16 words of 16 bit bitmaps
Output 1 starts at Coil output base
0 = output off state (defined in associated OCR register)
1 = output on state (defined in associated OCR register)

Section 3 Configurating the RT10

3.1 Adding an RT10 to the Configuration

A DCC has 4 status inputs and 4 status outputs. If a system requires more status inputs or outputs Discrete Input/Output (DIOs) modules can be added to the system. The Configuration Screen for an exchange as shown allows you to add DIOs to the configuration.



Configure: Hardware

View: Containment

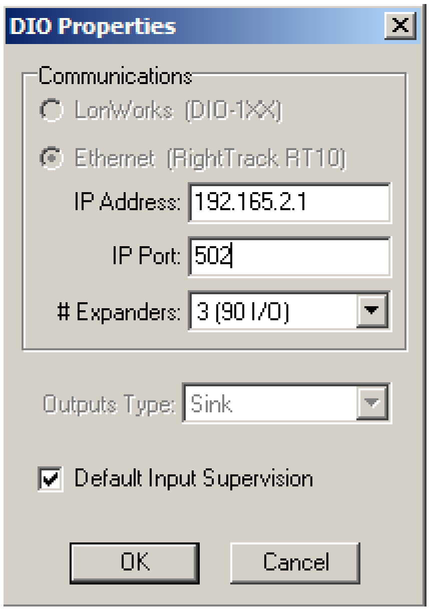
- DXLGreyInsritution.dxl
  - Support Services
  - Housing Building 1
    - DCC
      - Main PCC
      - 400 Series SCC1
      - 400 Series SCC2
    - DIO
  - Housing Building 2
  - Special Handling
  - Administration

Property	Value

Function: Exchange

Parameter	Value
Exchange	Exchange 2 (Housing Building 1)

If the DCC in the exchange uses VOIP PCI Card then the RT10 DIO is the type of DIO that can be added to the exchange. (Other types of DIOs require a Lonworks PCI Card.) Clicking on the **Add DIO...** button the following pop up window allows you to specify the **IP Address:** and the **IP Port:** of the RT10. Note that the **Output Type:** for an RT10 is always a “Sink” type output.



○ LonWorks (DIO-1XX)

● Ethernet (RightTrack RT10)

IP Address: 192.165.2.1

IP Port: 502

Expanders: 3 (90 I/O)

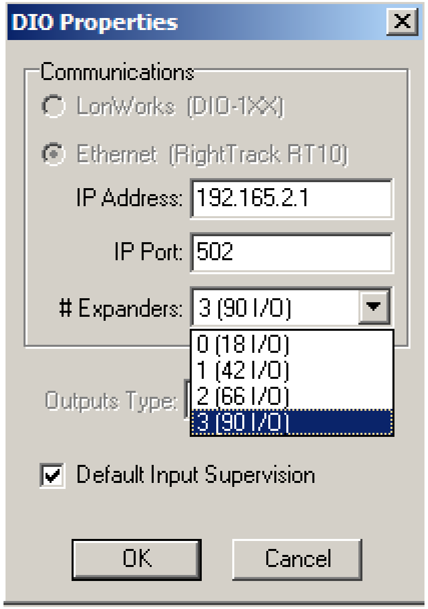
Outputs Type: Sink

☑ Default Input Supervision

The drop down **# Expander:** entry allows you to specify how many expander modules are used (up to a maximum of 3) with the RT10.

Selecting the DIO in the **Configuration Editor** a **Modify...** button is available to allow *some* changes to a DIO that has been added.

Note that the RT10 switch inputs are normally used with a resistor network that provides input line supervision for either one or two switches. If no line supervision is provided (unchecking the **Default Input Supervision** entry) only one switch can be used for each input. The expanded switch inputs for the will show Switch 1 and Switch 2 entries but only Switch 1 can be used.



DIO Properties

Communications

○ LonWorks (DIO-1XX)

● Ethernet (RightTrack RT10)

IP Address: 192.165.2.1

IP Port: 502

Expanders: 3 (90 I/O)

☑ Default Input Supervision