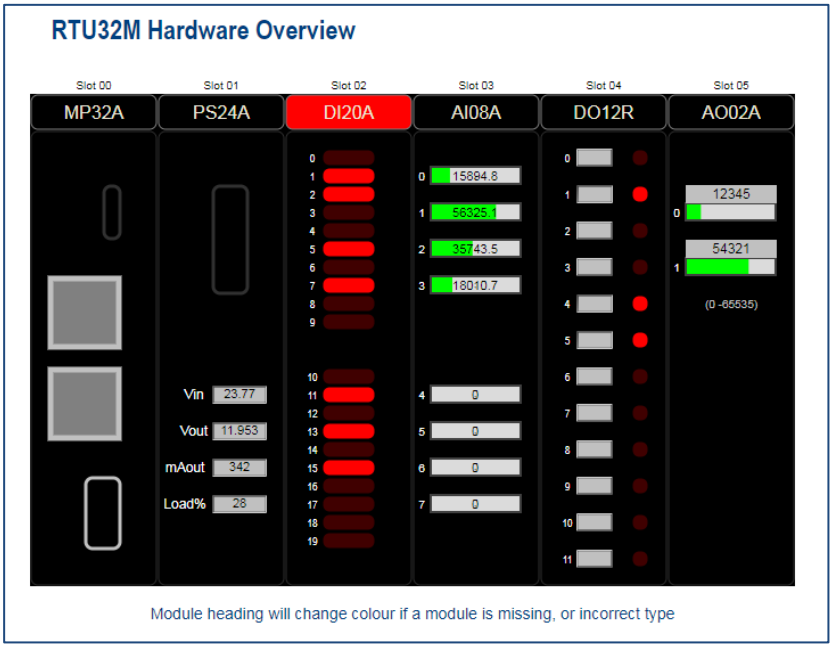
RTU32M Series – Example 1

RTU32M Application - Creating a Smart 'I/O Box'

Application Note

March 2019

RTU32M – modular hardware



The 'No Cost HMI' – HTML page published by WorkSuite for viewing in a web browser (Smart Phone, Tablet, PC etc)

Introduction

Brodersen have been manufacturing products for use in remote monitoring and control solutions for almost 50 years. Our customer base is global and our products are used in a diverse range of Applications that include energy management systems, water and waste water SCADA, infrastructure monitoring, building automation and airport management systems.

This Application note provides an overview of how I/O points, logic, communications parameters and graphics are setup in the RTU32M. Local/HMI access can also be provided to user data via a web browser using HTML pages published from WorkSuite. Follow the steps described to create your own application, or use the link at the end of the document to download the project for review/modification.

RTU32M Overview

The RTU32M modular hardware provides a flexible architecture for creation of RTU solutions. Start with a CPU and power supply, then add I/O modules or system modules to create you desired solution. The I/O can be together in a single block, or distributed in a 'segmented' arrangement of I/O blocks. All RTU32M modules provide access to their status, firmware and hardware revision information and serial number. I/O modules include data values, data quality and timestamps of when the last change occurred (1ms resolution).

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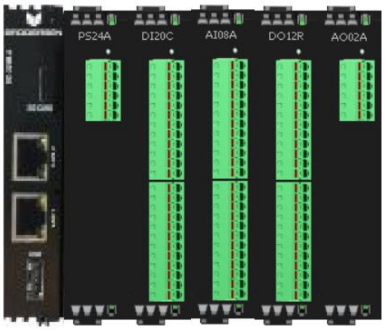
RTU32M Setup and Creation of an Application

The hardware components

In this example, the selection of RTU32M modules used includes;

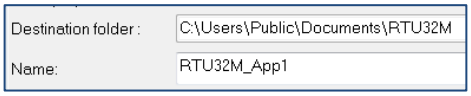
Slot	Module	Description
0	MP32A	CPU (2x LAN, 1x USB, 200-900MHz)
1	PS24A	Power Supply (10-30V DC)
2	DI20C	20ch Digital In (incl. 2x 5kHz counters)
3	AI08A	8ch Analog In
4	DO12R	12ch Relay Out
5	AO02A	2ch Analog Out

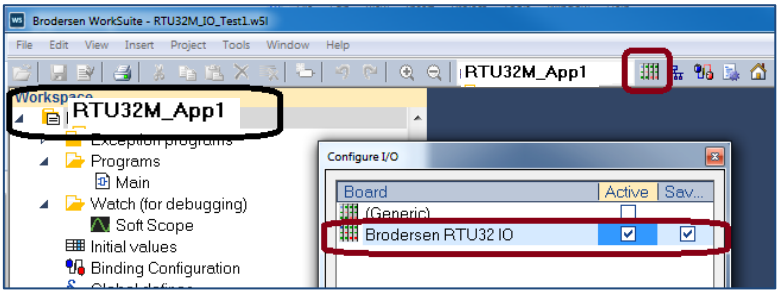


Creating an Application and module list in WorkSuite

Brodersen RTU32M Applications require WorkSuite version ≥ 3.9.2. The link below downloads v3.9.2.1218.
Brodersen WorkSuite 3.9.2.1218 (~450MB).

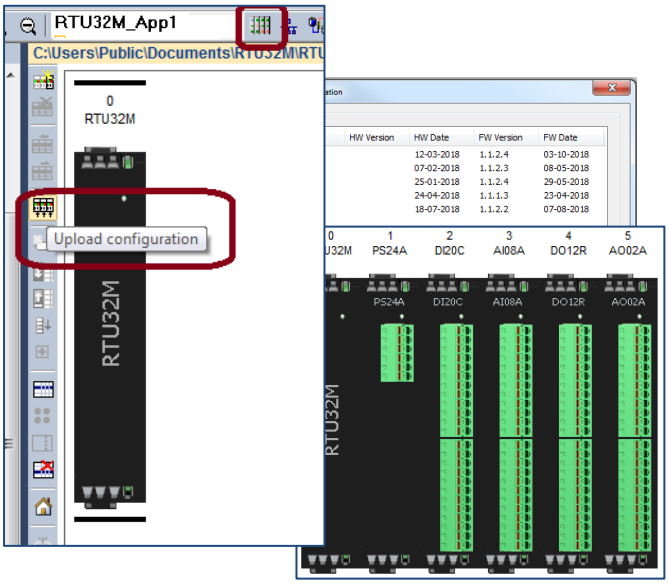
In this example an Application named 'RTU32M_App1' was created using 'File>Add New Project', using the RTU32M default LAN 1 IP setting of 192.168.0.1:502.



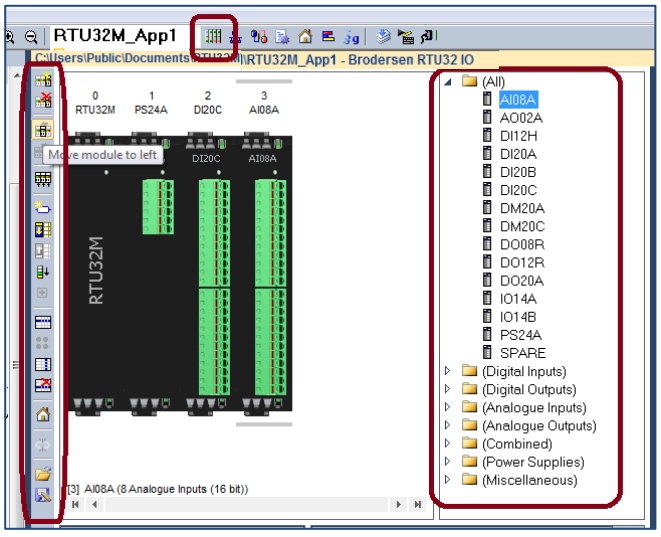


To access the RTU32M I/O Setup, the I/O Configuration Editor must be set to use Brodersen RTU32I/O. Use the I/O icon to access the I/O Editor.

WorkSuite allows creation of the RTU I/O module list by querying the RTU for its list of modules, or if the RTU is not present, the list can be created by adding/moving/deleting modules using 'drag and drop' from the menu.



Auto Module List – uploaded from RTU



Manual Module List – using 'drag and drop'

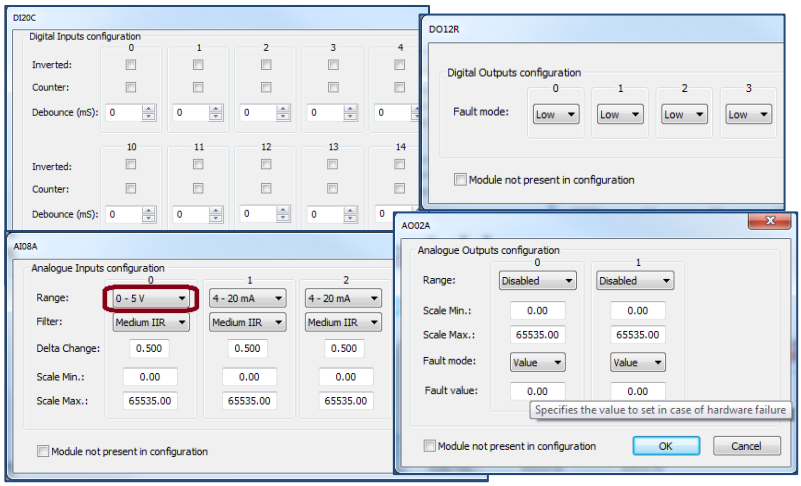
Setup I/O, Create Variables, App. Download

Click on a module to change its setup

Each I/O module has its own configuration page with various setup parameters.

DI Parameters	DO Parameters
Invert	Fault Mode
Count	
Debounce	

AI Parameters	AO Parameters
Range/Mode	Range/Mode
Filter	Scale Min/Max
Sig. Change	Fault Mode
Scale Min/Max	Fault Value



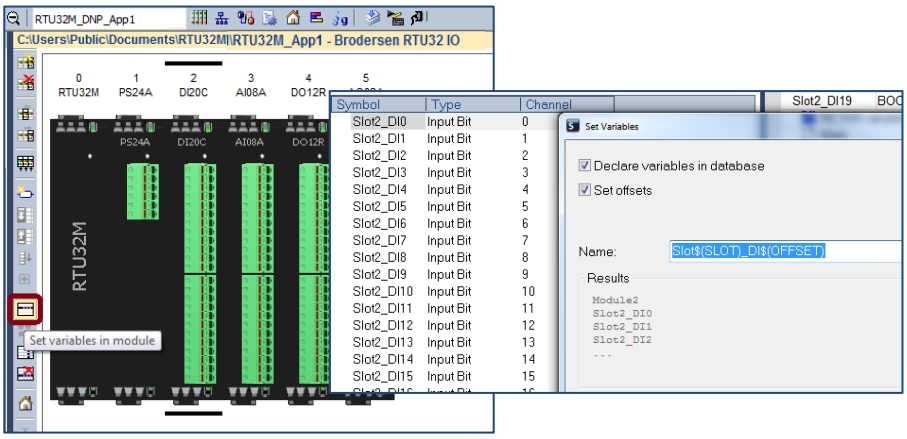
The 'Module not present' allows future module slots and reuse of similar setups (ie. not 'exactly' the same I/O).

Use the tag wizard to create variables

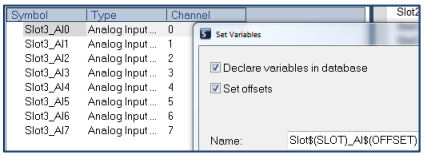
After creating a list of modules, variables are created for each I/O point using the 'Set Variables' icon.

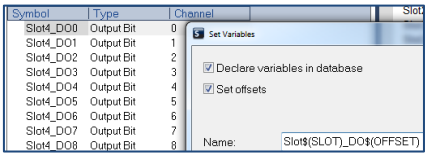
Select/highlight each I/O module in turn, then select the Set Variables icon using syntax to identify each module and channel.

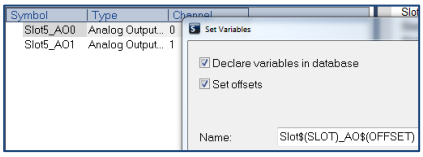
Starting with the DI20C in slot 2 Eg. Slot$(SLOT)_DI$(OFFSET).



Then replace 'DI' with AI, DO and AO for modules 3-5, as shown below.





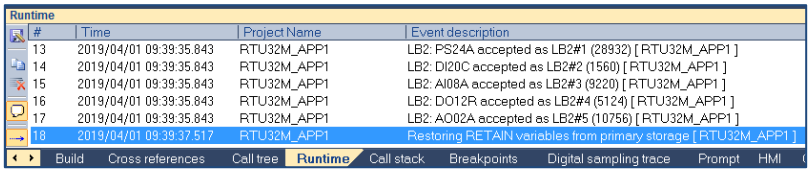


Download the initial 'I/O Box' Application

At this point the basic I/O box Application is ready to deploy/test. Select compile to first check the variables are all OK.

If any errors exist, the compiler warnings will describe what needs to be corrected. If the project compiles OK, then go online to download the RTU Application.

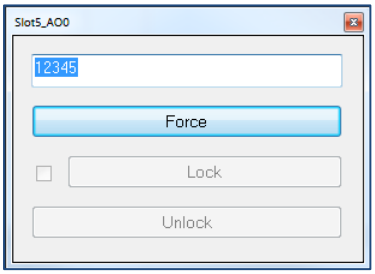
The Runtime TAB at the bottom of the WorkSuite display will show if the RTU32M modules have been correctly detected.



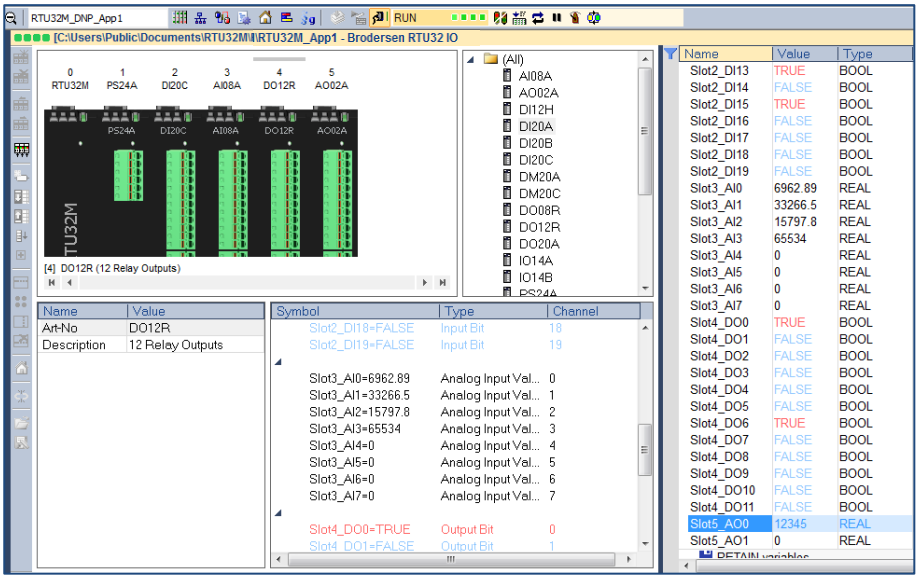
Test the Application, add Module Status Info.

View I/O values from the module editor and/or variables list

The status/values of the I/O variables can be viewed online in both the I/O Editor window and the Variables List as shown here.



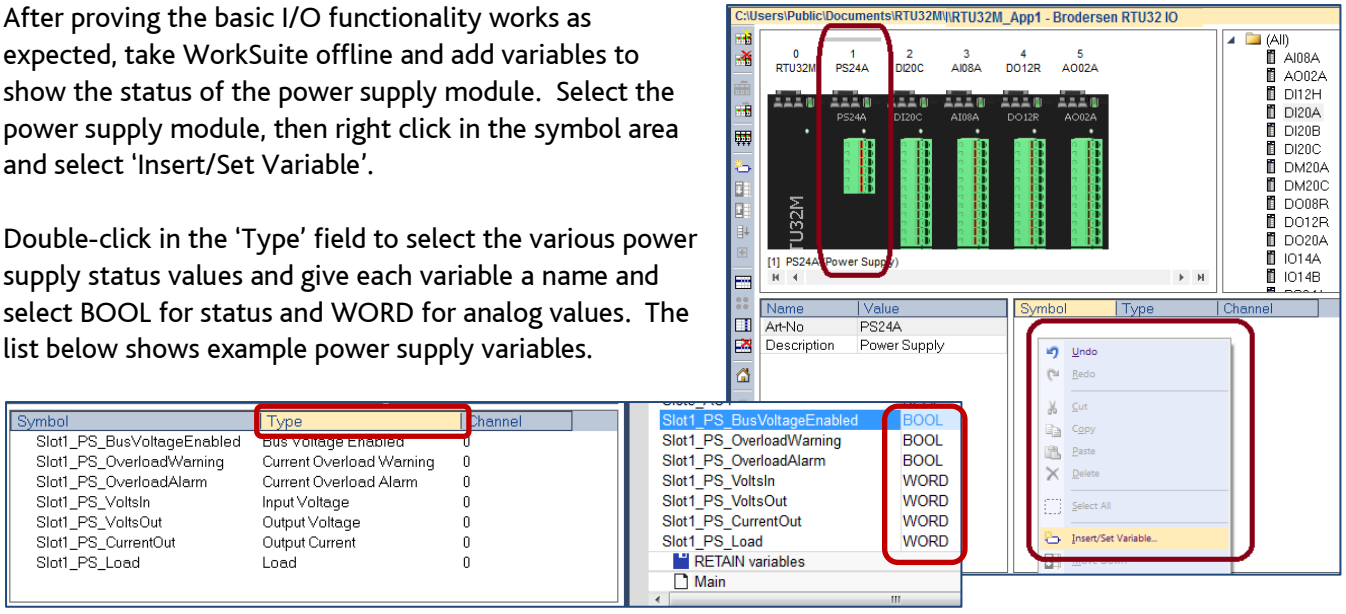
Double click on one of the Output variables to change its state/value.



Additional variables for power supply status

After proving the basic I/O functionality works as expected, take WorkSuite offline and add variables to show the status of the power supply module. Select the power supply module, then right click in the symbol area and select 'Insert/Set Variable'.

Double-click in the 'Type' field to select the various power supply status values and give each variable a name and select BOOL for status and WORD for analog values. The list below shows example power supply variables.



Monitoring I/O Module Status and Version Information

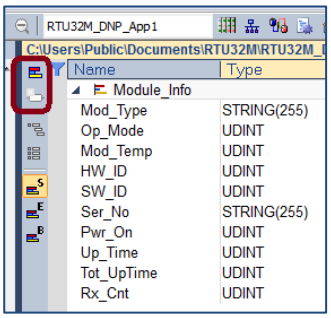
The RTU32M I/O modules allow access to their status and version information. Data includes;

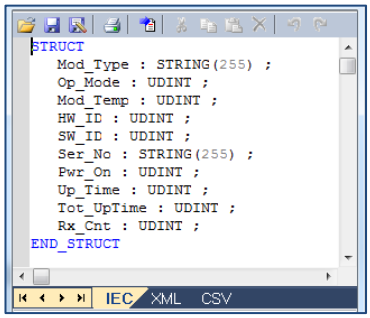
Module Type	Serial Number – High Bytes
Operating Mode	Serial Number – Low Bytes
Heartbeat Count	Internal Temperature
Message Count	Power On Counter
Hardware Revision	Watchdog Counter
Firmware Revision	Up Time Since Restart
Supply Voltage	Total Uptime Hours

Accessing and Storing I/O Module Status Info.

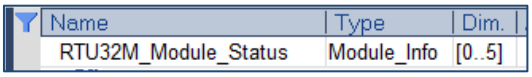
Creating a Structured Tag Array

A 'structured tag' is the easiest way to view and store the I/O module status information. To create a structured tag, right click in the variables list and select 'Structures', or select 'Types>Structures' from the main program tree. The example structure here is named 'Module_Info' and includes various unsigned integer and string variables.

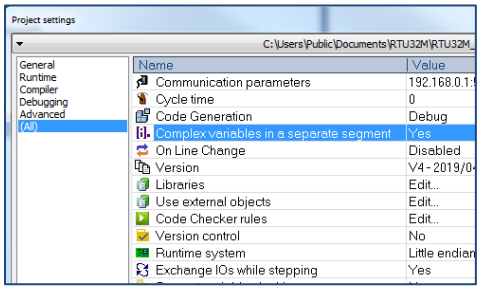




Create a variable named 'RTU32M_Module_Status', with a type of Module_Info. Create an array by giving the tag a dimension of 6.

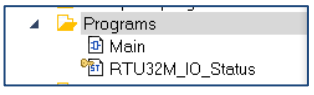


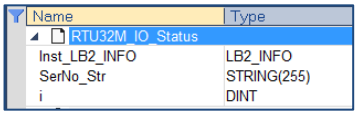
To use structured tags and arrays the WorkSuite project settings must be set to include 'Complex Variables in a Separate Segment'. While making this change, also include 'Allocate status flags for variables with embedded symbols' and 'Embed symbols of all variables' (status flags are required to support manipulating of DNP point status bits and embedding of symbols allows referencing of variables by their tag name in HTML pages).

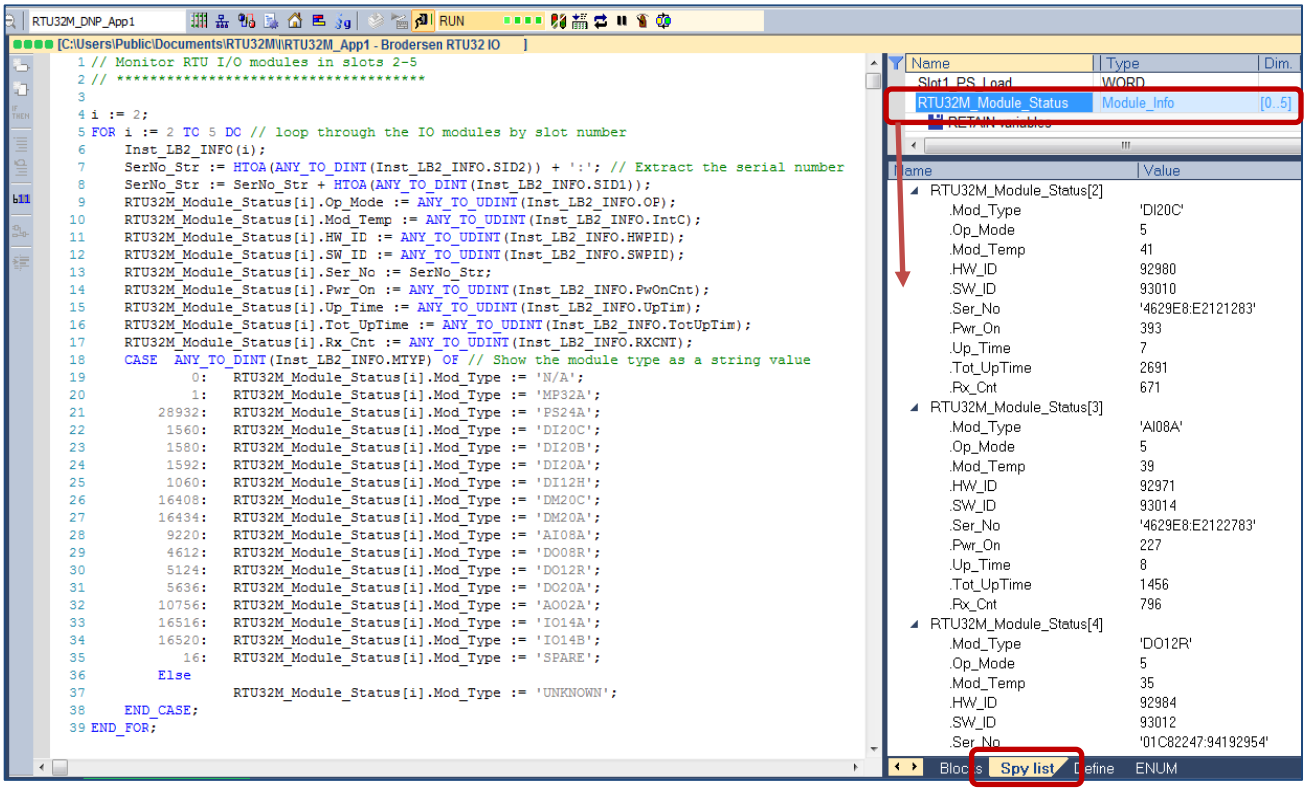


ST program to Access Module Info.

Right click the Programs folder and select 'Insert New Program' and create a ST program named 'RTU32M_IO_Status'. Open the program and right click in the variables area and create three local variables as shown here. Create code as shown below, compile and download the application. Check the logic reads the IO module information and updates the array.







Create HMI Graphics to Monitor the RTU32M

Enhance the ST program logic for use in the graphics page

Create four new REAL variables to store scaled values for the power supply and four new BOOL variables to indicate module fault status. Create code as shown here to scale the power supply values and monitor the module operating mode.

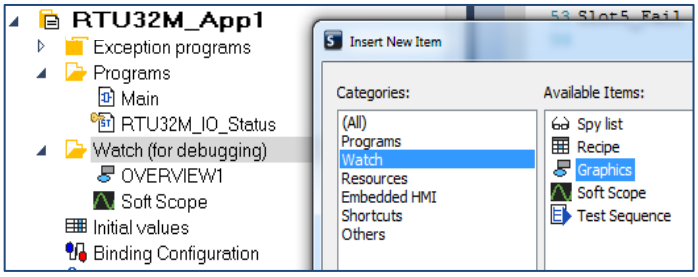
```
// Map and scale Power Supply Info as REALS for HMI
Slot1_Supply_V := ( ANY_TO_REAL ( Slot1_PS_VoltsIn ) / 100.0 );
Slot1_Output_V := ( ANY_TO_REAL ( Slot1_PS_VoltsOut ) / 1000.0 );
Slot1_Output_mA := ANY_TO_REAL ( Slot1_PS_CurrentOut );
Slot1_Load_Percent := ANY_TO_REAL ( Slot1_PS_Load );


// Determine Module Operating Status for HMI
Slot2_Fail := ( RTU32M_Module_Status[2].Op_Mode <>5 );
Slot3_Fail := ( RTU32M_Module_Status[3].Op_Mode <>5 );
Slot4_Fail := ( RTU32M_Module_Status[4].Op_Mode <>5 );
Slot5_Fail := ( RTU32M_Module_Status[5].Op_Mode <>5 );
```

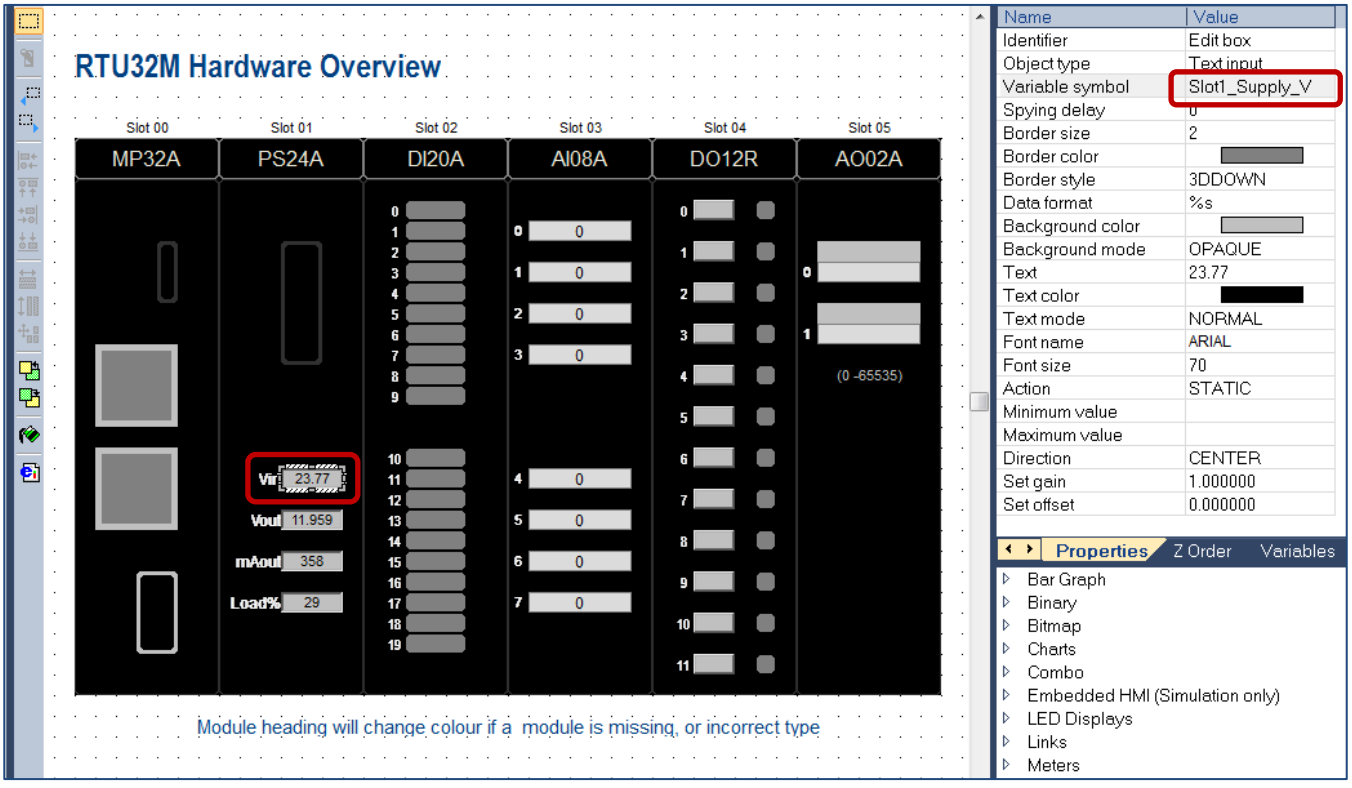
Slot1_Supply_V	23.77	REAL
Slot1_Output_V	11.959	REAL
Slot1_Output_mA	340	REAL
Slot1_Load_Percent	27	REAL
Slot2_Fail	FALSE	BOOL
Slot3_Fail	FALSE	BOOL
Slot4_Fail	FALSE	BOOL
Slot5_Fail	FALSE	BOOL
RETAIN variables		

Create a RTU32M Hardware Overview graphic page

Right click on the Watch folder and select 'Insert New Item', then select Watch and Graphics. Name the new page 'Overview1'.

Use the graphics editor tools to add shapes and links to variables to create a Hardware Overview as shown below.



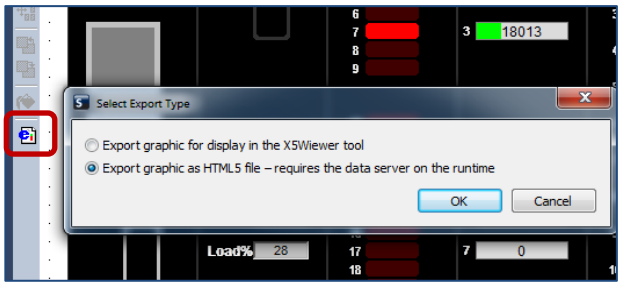


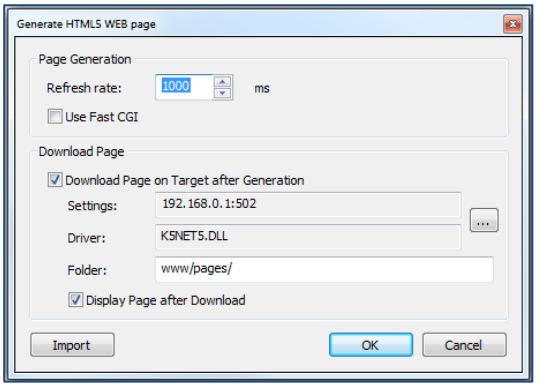
Go online with the RTU to check the control actions operate correctly and that the values displayed are correct.

Published Graphics - Remote Monitoring

Export the graphics file for use with X5 Viewer or as HTML

Graphics pages created in WorkSuite can be exported for use in the X5 Viewer Tool, or as HTML files for use by web browsers.

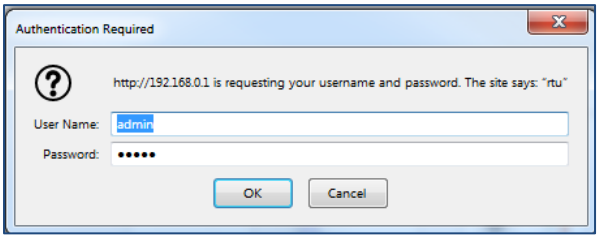


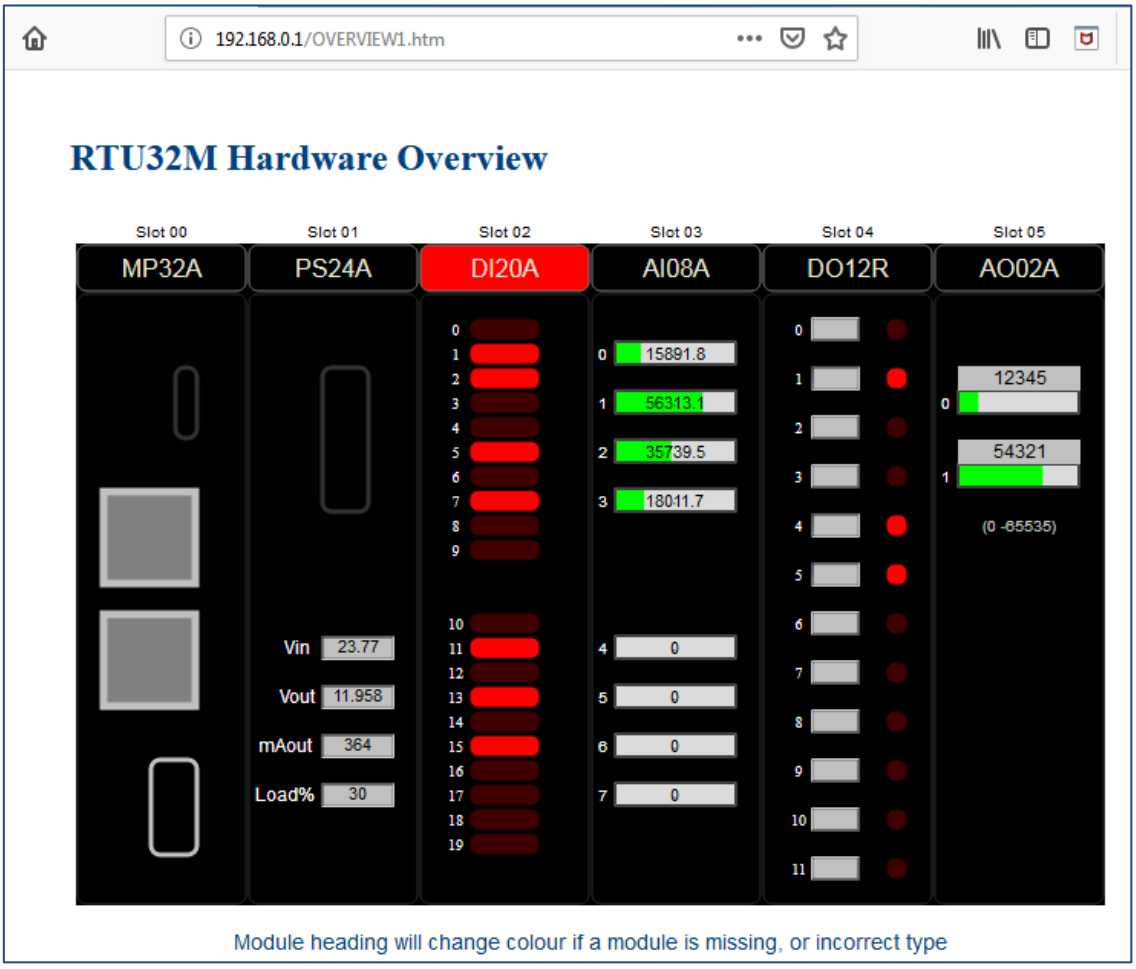


Connect to the RTU – enter the User Name and Password

You are now able to connect to the RTU using you Smart Phone, Tablet or PC.

In the example below the module in Slot 2 was removed to show that the monitoring program created earlier is correctly indicating a module status error.





Download the example RTU32M project

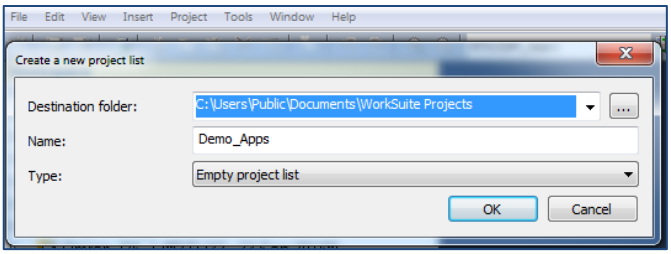
Download the example project file from the Brodersen FTP server using the link below.

http://download.brodersen.com/PETER_KING/RTU32M_App1.zip (~67kB)

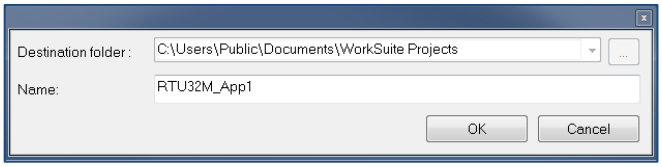
To load the demo project in to WorkSuite, first ensure you have a suitable WorkSuite version (≥ 3.9.2.1160)

The link below downloads WorkSuite version 3.9.2.1218.
Brodersen WorkSuite 3.9.2.1218 (~450MB).

The demo project can be loaded in to an existing Project List, or a new Project List can be created as shown below. Select File>New Project List. Select an appropriate destination folder and give the project list a name eg. 'Demo_Apps'.



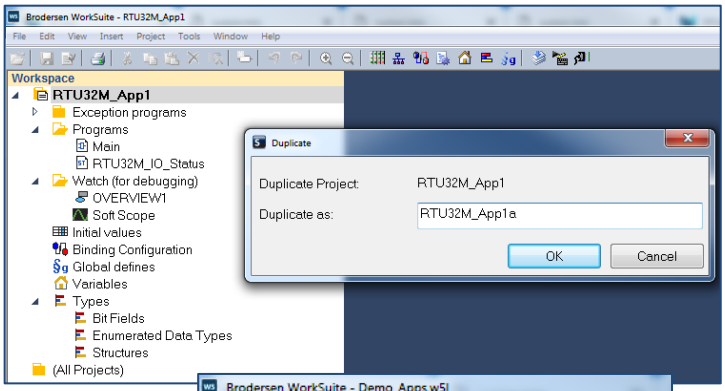
Then select File>Add Existing Project>From zip. Browse to the downloaded zip file and select it. You may be prompted to add items from the projects User Library – ignore this.



Once the file is loaded you can 'charge ahead' and start playing with the code and try it in your RTU (assuming you have the same I/O module layout).

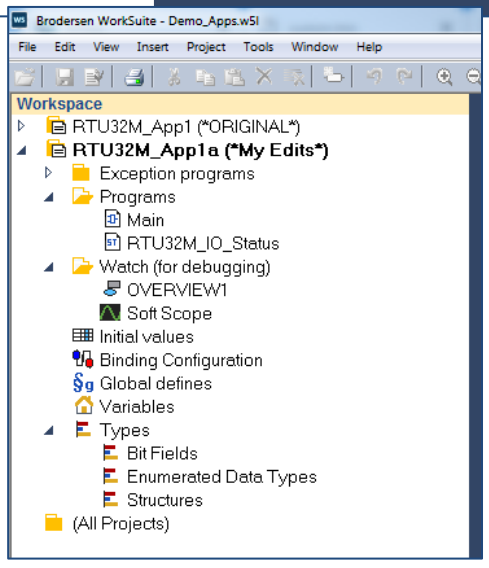
If you have a different module layout you will need to edit the application.

It is recommended that you first duplicate the project, so that you have an original copy to refer back to, if you have difficulty making edits.



You can also edit the Project descriptions to make referencing similar projects easy...

Note: The demo project assumes the default RTU IP address of 192.168.0.1 is used.



Additional product information is available from our website, or from the authorised distributor in your region.

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