# μMATRIX-S User's Guide

relay monitoring systems pty ltd

## Advanced Protection Devices

User Guide

Test Manual

Relay Software

μMATRIXwin

# $\mu$MATRIX-S User's Guide

### About This Manual

The $\mu$MATRIX User Guide is designed as a generic document to describe the common operating parameters for all relays built on this platform. Some specific relay applications are described but for detailed information the individual data sheets and product manuals should be consulted.

## Contact Us

# How this guide is organised
## This guide is divided into four parts:

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# Design Concept

The $\mu$MATRIX platform has been developed to compliment and extend the capabilities of the range of RMS analogue relays. Digital relays promise a number of important benefits such as communications, multiple functionality and self-supervision. In practice however, the result can be a very complex device, which is difficult to set, operate and maintain. The very nature of digital technology also means that product life cycles are shorter necessitating users to regularly review their system design standards and provide a higher level of operator training.

The uMATRIX-S platform is an evolution of the earlier uMATRIX platform. Great care has been taken to maintain compatibility with previous hardware and application software so that users can make a seamless transition from previous relay models based on the uMATRIX to the updated versions based on the uMATRIX-S platform.

## 1.1 Keeping it Simple!

Our objective for the $\mu$MATRIX project was to develop a simple platform, which could be used to replicate all of our popular analogue relay designs. At the same time we wanted to take advantage of the additional features and flexibility promised by digital technology while avoiding the pitfalls described above. In our view the $\mu$MATRIX had to meet the following criteria:

- ► Use a CPU family expected to have a long production life
- ► Standard hardware set for the CPU, operator interface and power supply
- ► Low component count to increase the MTBF
- ► High accuracy A-D converters integrated in the CPU
- ► Internal flash memory to avoid the use of an external EPROM and high speed bus
- ► Automated factory calibration (No trim pots!)
- ► Large graphics display to view status and simplify setting
- ► Separate USB programming port and SCADA communication RS485 port.
- ► One PC program to function with all relay types and versions
- ► Scalable I/O to keep product cost in line with functionality
- ► Ability for customers to load customized software firmware applications (UMX)
- ► Simple technique to develop software for new relay types
- ► Utilize our standard and proven CT and VT input circuitry
- ► Cost effective yet suit modest production runs
- ► Compact design to minimize panel space

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# μMATRIX-S Platform Features

## 1.2 Meeting Special Customer Requirements

An innovative aspect of our design is that the software has been written in two distinct parts:

The first part comprises the low level drivers, which handle the display, buttons, communications, digital and analogue inputs, relay outputs etc. This is similar to the BIOS level in a PC.

The second part is the applications level. This determines the "personality" of the relay. i.e. what the set points are and what the outputs do in response to the inputs. The application level software is designed to be quite simple to develop so that special relay functions can be quickly conceived at minimal cost. The digital section of the hardware is standard and the testing regime is less onerous as the extensive low-level code has not been changed.

Because of this structure, the firmware in each relay is quite stable while at the same time we are able to quickly introduce new product types onto the market.

If a particular feature or function is not mentioned in the product data sheet, this does not mean it is not possible or readily available. We are able to quickly compile new software versions called UMX which you can then be simply loaded into the relay via the front programming port. The advantage of this approach is that you end up with a far simpler and cost effective relay solution which closely meets your needs. This situation is in stark contrast to the alternative of complex devices which far exceed your requirements but come with considerable baggage by way off implementation difficulties and extra cost.

## 1.3 The μMATRIX-S relay platform provides the following features across the range:

- Large graphics display panel with LED back lighting
- Four (4) multi voltage binary status inputs
- Optional additional three (3) multi voltage binary status inputs
- Six (6) output relay C/O contacts
- Optional two (2) additional output relay N/O contacts
- Six front panel mounted LED status indicators
- Seven (7) analogue measuring inputs
- Internal case temperature monitoring sensor
- USB PC programming port
- RS485 SCADA network port (Optically isolated)
- CPU watchdog
- Wide auxiliary supply range with fail alarm contact
- Size 4 draw out case
- Made in Australia

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## 1.4 Summary of changes introduced with the uMATRIX-S relay platform

- Case length reduced by 18mm to suit 4M56-S case;
- LED backlighting to reduce EMC emissions – contrast adjustment no longer required;
- Front panel USB programming port to increase data transfer speed and improve compatibility with notebook PC's;
- Network communications port is now optional to maintain low cost of base model;
- Network communication port maintained the optically isolated RS485 serial port but the RS232 configuration option has been deleted;
- New current and voltage channels to improve measurement stability;
- New status input option covering 18-275V AC and 300V DC range;
- Updated switchmode power supply to reduce EMC emissions and improve transient overload protection;
- Surface mount production technology to allow increased component density for additional functionality now and in the future.


## 1.5 Summary of what has not changed from the previous uMATRIX relay platform

- I/O and basic functionality has been maintained;
- Basic menu structure and operation has been maintained;
- Electrical terminal mapping has not changed allowing existing wiring diagrams to be maintained;
- Compatibility with existing application software back to version 0500 maintained;
- Compatibility with existing uMATRIXwin programming software maintained;
- Modbus RTU network communication protocol maintained Case size 4 has been maintained although the length has been reduced;
- Made in Australia.


By maintaining compatibility with the earlier uMATRIX hardware and application software, users can  make a seamless transition from previous relay models:

| uMATRIX | | uMATRIX-S |
|---------|-----|-----------|
| 2H34 | to | 2H34-S |
| 2V67 | to | 2V67-S |
| 2V164 | to | 2V164-S |

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# User Interface

## 2.1　General Overview

A significant feature of the $\mu$MATRIX platform is the simplicity of setting and operation.

This has been achieved at the front panel through the use of a large screen LCD that allows a large number of characters to be displayed. Deep menu structures and obscure terms and abbreviations have been avoided. Only three top level screens are used; DATA PAGE,  SET PAGE  and DIAGNOSTICS PAGE.   LEDs provide distinctive indication of core functions such as timing of monitored parameters and I/O status.

A front panel mounted RS232 port provides the facility for connection to a PC. A single application program, $\mu$MATRIXwin, has been written to function with all $\mu$MATRIX relay versions. This greatly simplifies operation in the field, as you do not need to maintain multiple software applications and versions.

These innovative features combine to provide an intuitive operating environment needing minimal operator training when compared to more complex relay designs.

```
Phase A -112.10V
Phase B -112.00V
Phase C -111.95V
Stage 1 - IDLE
Stage 2 - IDLE
Stage 3 - IDLE
Stage 4 - IDLE
   ** ENABLED **
```

2V67 DATA page screen – actual size

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## 2.2　Local Panel Operator Interface
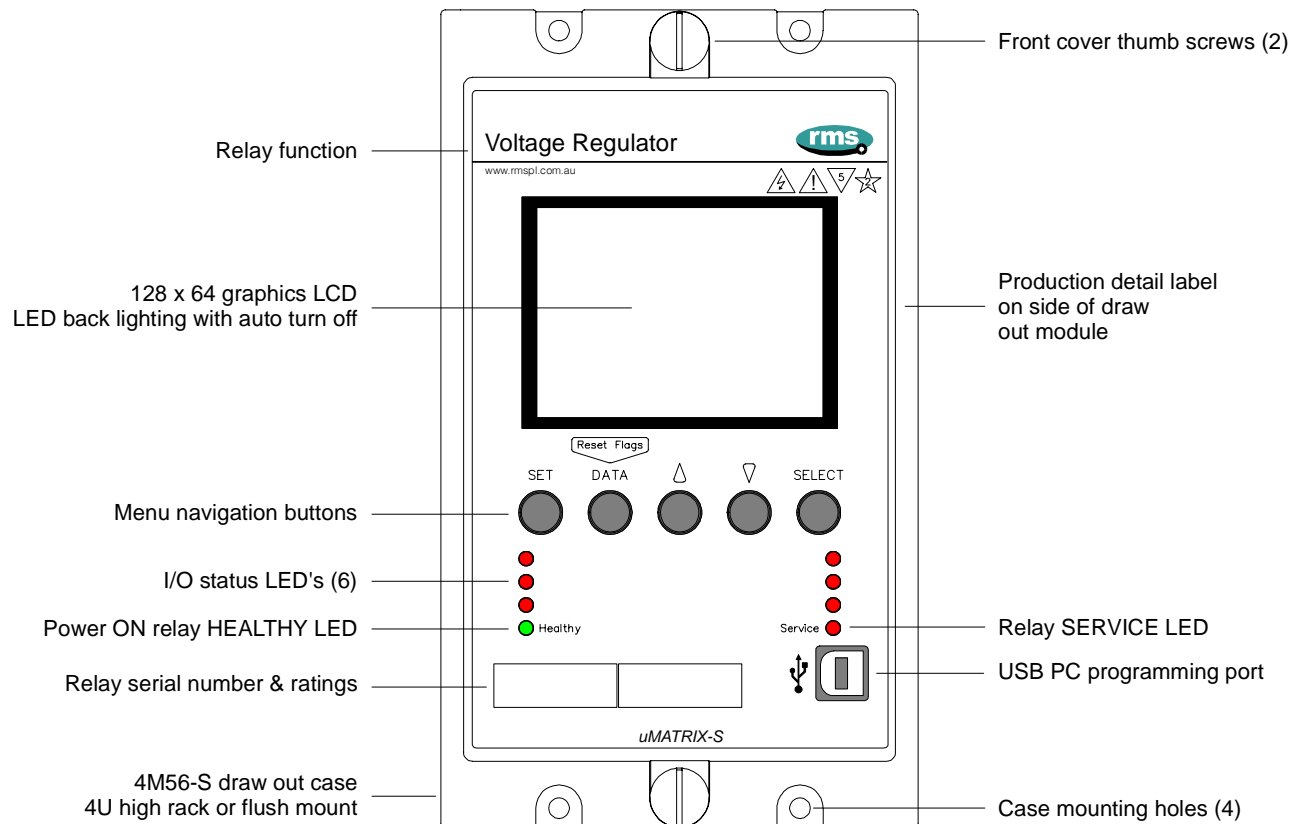


**Display**

A 64 x 128 pixel graphics display is employed. The yellow / green mode STN LCD with built in EL panel back lighting provides high visibility for all lighting conditions.

**Keyboard**

A keypad comprising five (5) push buttons is provided to navigate through the MMI menu system. A reset button is mounted in the relay cover to allow flag resetting.

**Operation Indicators**

Six (6) LED are provided for indicating the status of inputs and outputs pertaining to a particular $\mu$MATRIX model. An additional two (2) LED's are provided to indicate "Healthy" (Green power LED) or "Service" (Red fail alarm).

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## Menu Structure

The following menu flow chart is generic to the $\mu$MATRIX platform.
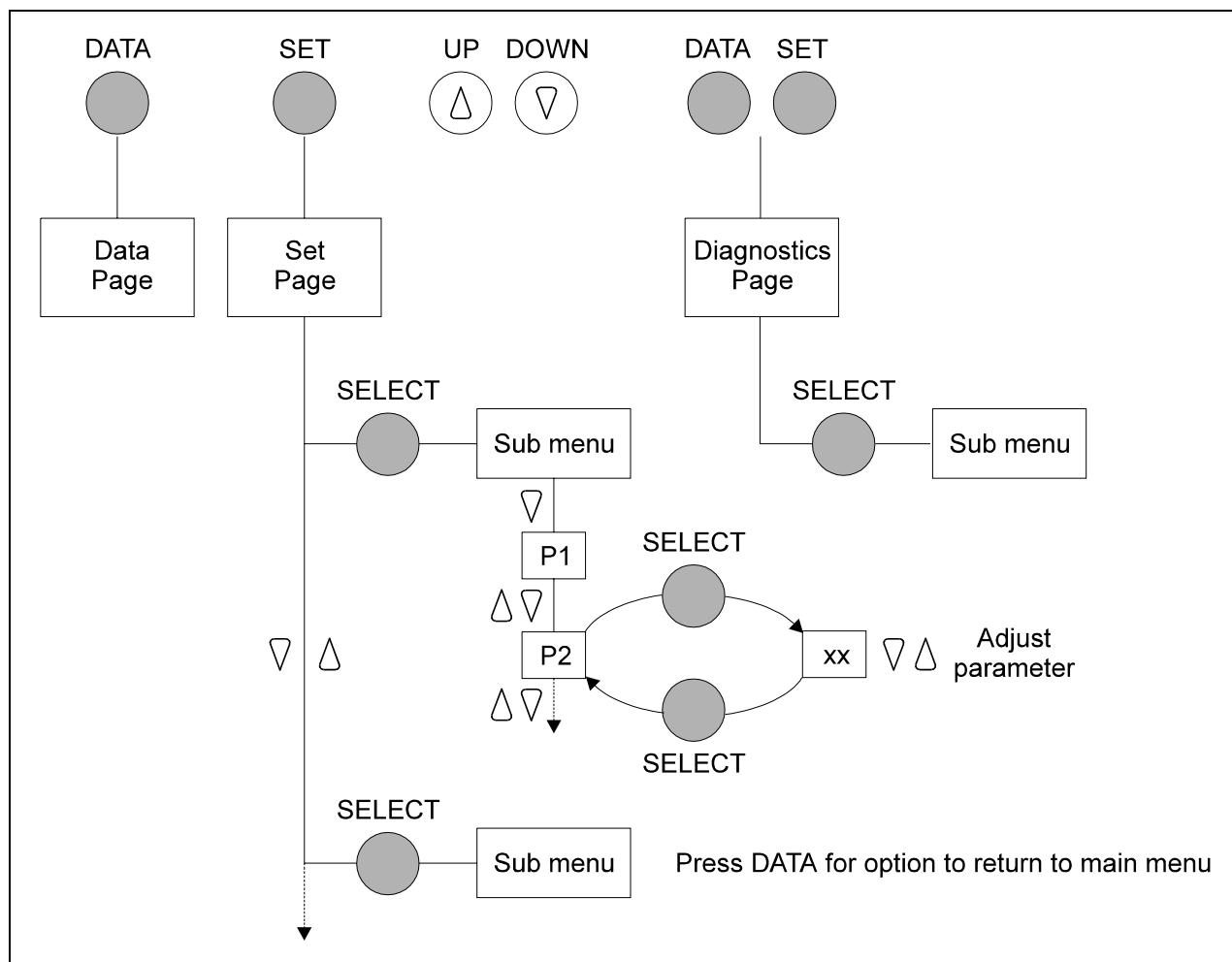


The structure of the menu is clear and straightforward. Operation is intuitive.

The main menu comprises three levels only:

DATA page:      This is the default screen and displays monitored parameters and activity.

Use the "DATA PAGE" button to move to this page from any other menu.

The relay will automatically revert to this page after a time delay.

SET page:      This page is used to access the setting menu specific to the $\mu$MATRIX relay.

Use the "SET PAGE" button to move to this page.

DIAGNOSTICS:  This page is used to review the $\mu$MATRIX relay status access to the versions page.

Access by pressing the "DATA PAGE" and "SET PAGE" buttons together.

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## 2.3    PC User Interface Program  -  μMATRIXwin

The purpose of the μMATRIXwin application is to provide display, configuration and diagnostic facilities required to support the family of μMATRIX digital relays. The prime functions of the application are:

► To display and set the various parameters for a connected μMATRIX      - Set Parameters

► To Display and set the various parameters for a connected CDB      - Set Parameters

► To display the Status of nominated inputs and outputs of μMATRIX      - Display Status

► To export reports of setting parameters & status screen      - Report Printing

      - Setting management

► To configure a μMATRIX for a specific customer application      - Configuration

► To upgrade the operational firmware of the μMATRIX      - Upgrade Firmware

► To provide utility and diagnostic facilities at a technical level      - Diagnostics



A range of μMATRIX modules have been developed based on the specified foundation resources. The characteristics of each model are defined in a Configuration Database (CDB).  The CDB is saved as part of the Parameters File (UMP) with the extension .ump.

The μMATRIXwin application dynamically represents the particular μMATRIX Model by receiving information from either the currently connected μMATRIX relay (via the USB serial port) or by opening a UMP file saved on the PC.

A user can save the characteristics for a particular relay and recall it for configuration of other μMATRIX units. It is not necessary to have a μMATRIX connected to display and modify the characteristics of a UMP that has been loaded from a file.

The user interface is based on standard Windows text and numerical data entry controls organised in groups within standard page controls related to their function.

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PC Programming Port Connection

The application can connect to either a:

►  $\mu$MATRIX connected to theUSB port

►  $\mu$MATRIX CDB that has been saved to a file.

Connection is made between the PC and $\mu$MATRIX relay via a straight through serial cable with D9 male connector at the $\mu$MATRIX end.

FRONT PANEL
USB PROGRAMMING
PORT
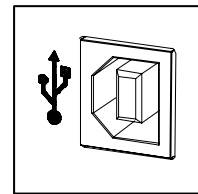


PC Communications Port

When using uMATRIX-S relays with the USB programming port the communications rate the baud rate setting in uMATRIXwin has no effect. The baud rate will automatically operate at the maximum rate determined by the USB port and is ~4x faster than the 19,200 transfer rate on the older uMATRIX platform relays using the RS232 programming port.

The $\mu$MATRIX programming port is used to communicate exclusively with the $\mu$MATRIXwin application so there is no identified need to support baud rates other than the maximum.

The user must be able to select the physical Com port 1 to 10 from the resources available on the PC and a menu option is provided for this purpose.

Use the [Detect USB COM Port] Shortcut to identify the COM Port Windows has assigned.



1.  Click on the [Detect USB COM Port] shortcut in Programs Menu.

2.  Connect the relay to a USB port on your computer using the cable provided

3.  Observe and note the COM Port number that appears when you plug in the relay
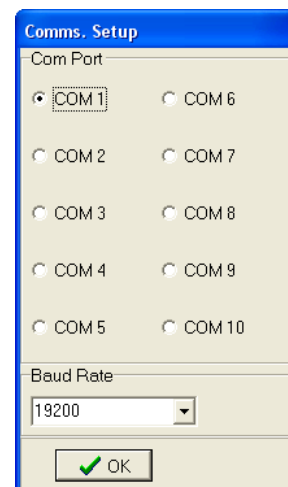
## PC Requirements

The application is designed to operate on 32 Bit Windows NT4, XP, Vista, and Win 7 platforms.

16 Bit Windows 3.x is not supported.

A minimum Pentium 1 500Mhz PC with 256MB RAM and running Windows XP is recommended.

A USB communications port.

## Installation Options

An automatic installation of the $\mu$MATRIXwin program onto your PC is carried out using the uMATRIXwin 5.2-Setup.exe file. This has the advantage of automatically creating a directory structure where all relevant program and help files are saved. Sample UMP and UMX files can also then be used to automatically launch the $\mu$MATRIXwin application.

A clean Uninstall may be carried out from the standard ADD/REMOVE PROGRAMS command.

## *www.rmspl.com.au/umatrix.htm*

## Installation Procedure

Locate the uMATRIXwin 5.2-Setup.exe file using the START, RUN, BROWSE commands,

Open the Setup.exe file by selecting OK and follow the on screen prompts to install the $\mu$MATRIXwin program.

## Uninstall Procedure

Use the START, SETTINGS, CONTROL PANEL, ADD/REMOVE PROGRAMS commands,

Select the $\mu$MATRIXwin program,

Select ADD/REMOVE.

## About Screen

Use the HELP, ABOUT commands to verify the installed version of the $\mu$MATRIXwin program.
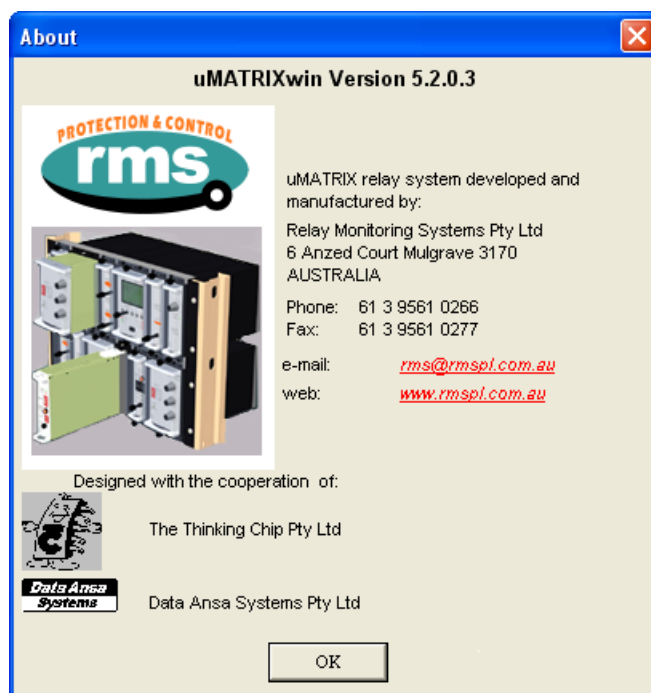
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## 2.4 Password Control

Password Protection and Setting

The μMATRIXwin application incorporates a simple two level security system:

► The first level does not require a password and allows access to all functions except for the Utilities menu.

► The second level is reserved for the Utilities menu and can only be accessed once a connection to a relay has been established and the correct user password entered.

When the μMATRIXwin application is first loaded the user can set a password by accessing the Options, Set Password command. This password may be changed in the Utilities menu or the program uninstalled and then reinstalled.



This system is not intended to stop unauthorised access to, or operation of, μMATRIX relays. Its purpose is to help operators avoid inadvertent errors when writing UMP or UMX files to a relay by requiring them to consciously enter a password before transferring files.

You may simply hit enter if a password has not previously been set up or enter the password if the OK box is greyed out to continue.



If the password has been forgotten simply follow the uninstall procedure and then reinstall μMATRIXwin to return the program to the default "blank" password status.

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## 2.5 µMATRIXwin Screen Layouts

Note the three screen panels depicted below. From left to right:

► µMATRIX Display Page

► µMATRIX Relay (CDB) Page of connected relay (2V164 relay shown)

► µMATRIX File (CDB) Page of file retrieved from PC data base



Note the 16 character configuration name dialog box in the Relay and File panels.

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## 2.5    μMATRIXwin Screen Layouts (Continued)

The display width of each panel can be adjusted to suit a particular PC window and saved using the OPTIONS, DISPLAY WIDTH, SAVE CURRENT command.

This command only applies to the width of the Display Panel i.e. the left panel. The other 2 panels (Relay and File) will resize to share the remaining space.  The range you can save the Display Width to is also limited to between 10% and 50% of the full form.  So if you set it to more than 50% of the form width the next time you restart it will drop back to 50% of the form width with the Relay and File panels taking 25% each of remaining space.

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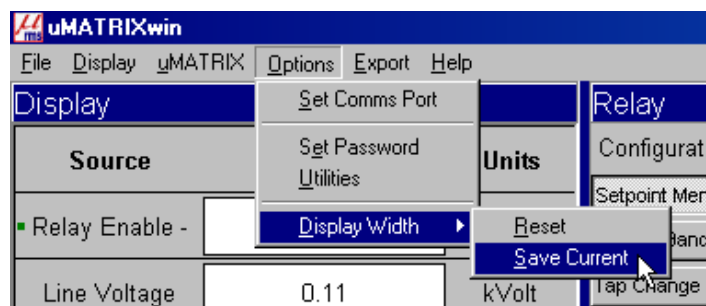
## 2.6    Using Pre-Saved Setting Files  (UMP's)

Default setting files are available for all relay versions on the RMS web site.

Before modifying a setting file for loading into a relay check that the correct UMP file version is used.   Refer section 3.2 on selecting the correct UMP file version to avoid problems in downloading the modified file to the relay.

The screen depicted below shows the save options available when working with $\mu$MATRIXwin when not connected to a relay.
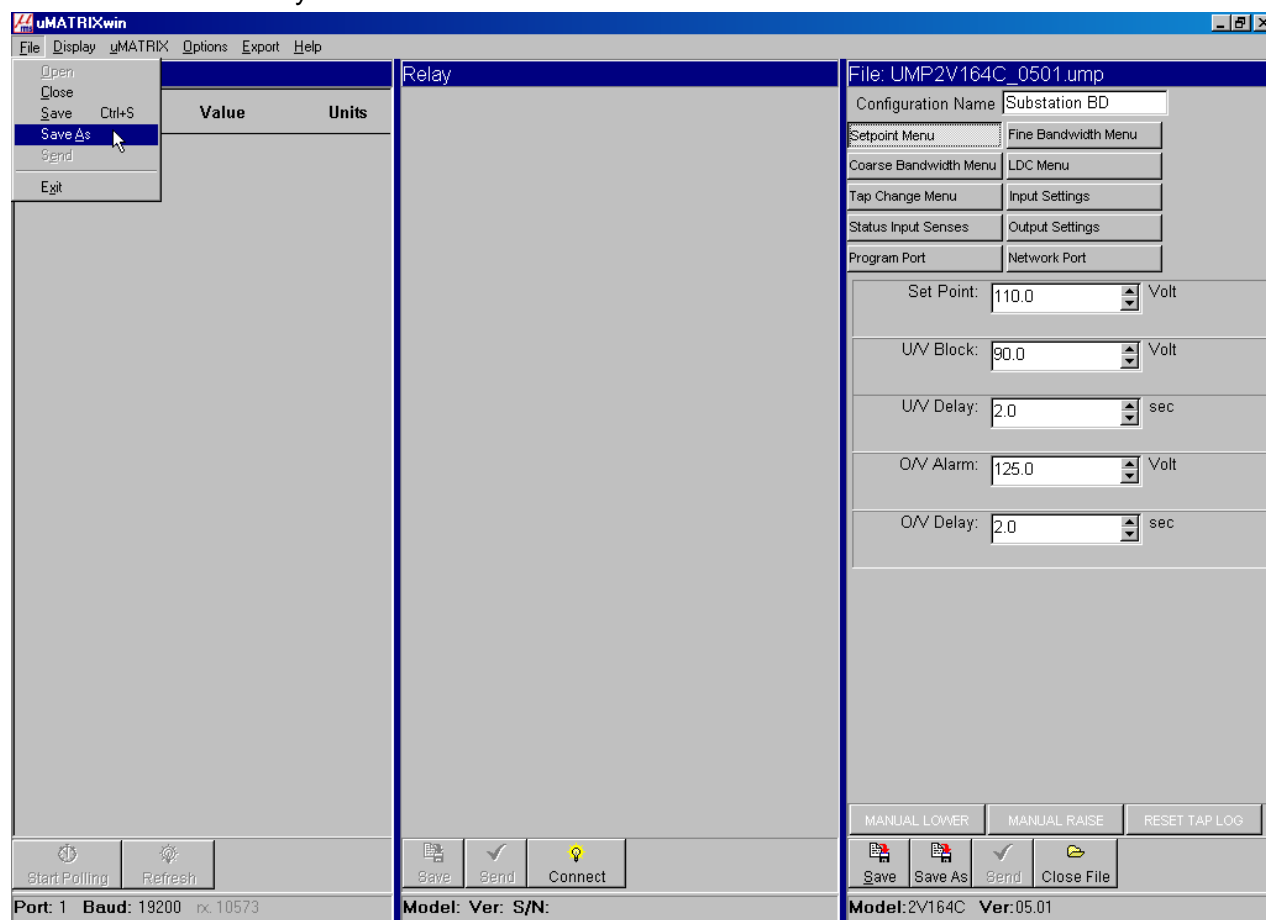
## 2.7 Exporting Feature

The REPORT feature provided in version 5.0 has been replaced with an EXPORT facility in version 5.1. This provides the ability to export comma delimited (.csv) files for importation into programs such Word, Excel and D Base. The exported data can then be manipulated and printed to suit user requirements.

Use the EXPORT command and select DISPLAY, RELAY or FILE data to be exported.
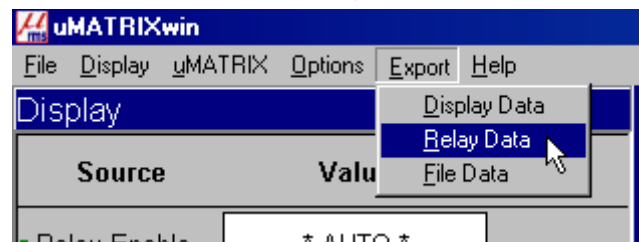


This feature is particularly useful in the control of parameter setting (UMP), files by employing the following release and verification procedure:

► Application Engineer creates setting file to suit specific relay application;

► Application Engineer exports the relay parameters as a comma delimited file and releases the UMP to the filed staff;

► Field staff load the file onto the specified relay;

► Field staff exports a copy of the relay parameters as a comma delimited file and returns a copy to the Application Engineer;

► The Application Engineer does an electronic compare between the original file retained and the daughter file returned;

► Any mismatch can then be investigated.

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## 2.8    Exporting Feature (Continued)

This screen capture shows the format of a UMP setting file exported in a .csv format and opened in Windows Notepad.

Note the tilda ~ character used to identify the end of the file.

```
Substation BD - Notepad
File   Edit   Search   Help

RELAY,15/01/04,13:00,Serial Number,608741/01,Hardware Config,23,BIOS Version,05.01........
MENU,PARAM,VALUE,UNIT
Setpoint Menu                    ,Set Point,110.0,Volt
Setpoint Menu                    ,U/V Block,90.0,Volt
Setpoint Menu                    ,U/V Delay,2.0,sec
Setpoint Menu                    ,O/V Alarm,125.0,Volt
Setpoint Menu                    ,O/V Delay,2.0,sec
Fine Bandwidth Menu              ,Bandwidth,3.0,Volt
Fine Bandwidth Menu              ,Initial Delay,30.0,sec
Fine Bandwidth Menu              ,Delay Mode,Definite,
Fine Bandwidth Menu              ,Interval Delay,15.0,sec
Coarse Bandwidth Menu            ,Bandwidth,10.0,Volt
Coarse Bandwidth Menu            ,Coarse Delay,10.0,sec
Coarse Bandwidth Menu            ,O/C Block,150,%
Coarse Bandwidth Menu            ,O/C Delay,10.0,sec
LDC Menu                         ,LDC Mode,OFF,
LDC Menu                         ,Resistance 1,0.0,Volt
LDC Menu                         ,Reactance 1,0.0,Volt
LDC Menu                         ,Resistance 2,0.0,Volt
LDC Menu                         ,Reactance 2,0.0,Volt
Tap Change Menu                  ,Tap Rate Alarm,100.0,/Hr
Tap Change Menu                  ,Tap Fail Delay,300.0,sec
Tap Change Menu                  ,TPI Type,Digital,
Tap Change Menu                  ,Max Taps,22,
Input Settings                   ,VT Primary,0.11,kVolt
Input Settings                   ,CT Primary,1,Amp
Input Settings                   ,Load Step 1,-5.0,%
Input Settings                   ,Load Step 2,-10.0,%
Status Input Senses              ,Manual Mode  -,Apply V,
Status Input Senses              ,Load Step 1  -,Apply V,
Status Input Senses              ,Load Step 2  -,Apply V,
Status Input Senses              ,T/C Feedback -,Apply V,
Status Input Senses              ,LDC Selection,Apply V,
Status Input Senses              ,Independent Mode,Remove V,
Output Settings                  ,Output 20mA @,130.0,Volt
Output Settings                  ,Output 4mA @,90.0,Volt
Output Settings                  ,Tap Change Pulse,2.0,sec
Program Port                     ,Baud Rate,19200,
Network Port                     ,Baud Rate,19200,
Network Port                     ,Parity,NONE,
Network Port                     ,Data Bits,8,
Network Port                     ,Stop Bits,1,
Network Port                     ,Modbus Address,94,
~
```
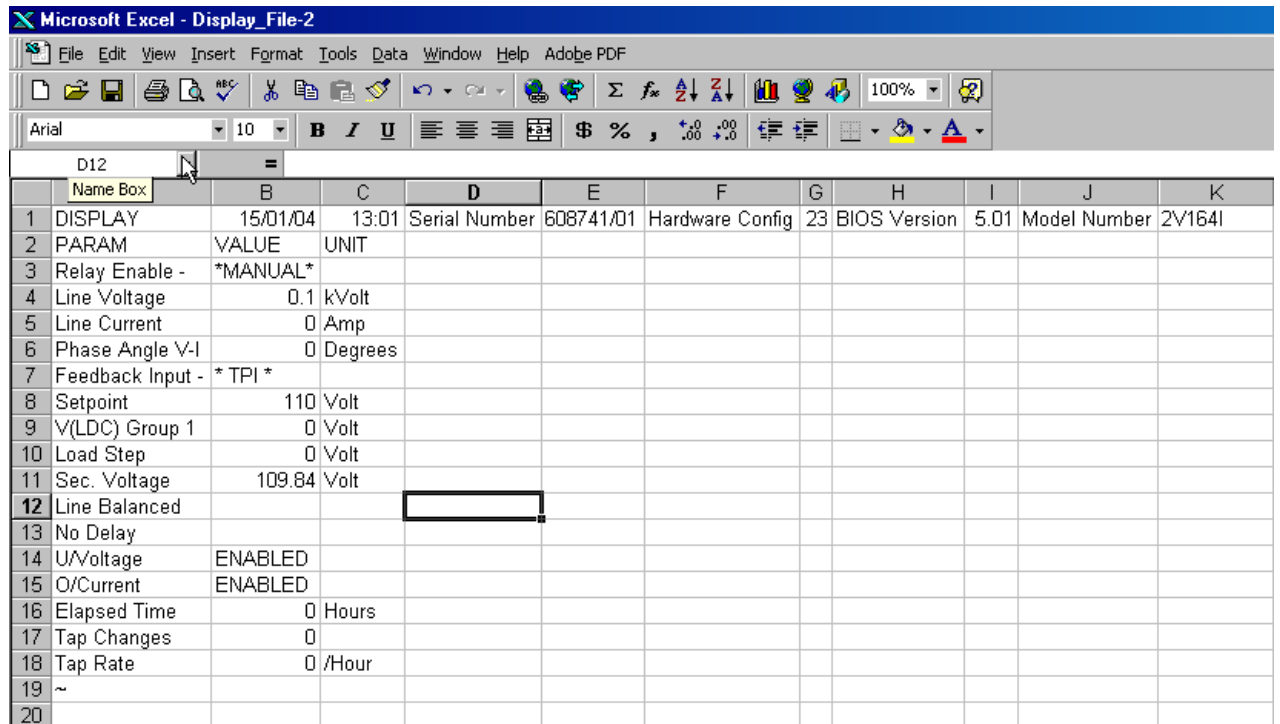
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## 2.8 Exporting Feature (Continued)

This screen capture shows the same .csv format UMP setting file opened in Microsoft Excel.

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## 2.9 Installing a New Software UMX onto a Relay

Before attempting to load a new UMX file ensure that you have:

a) Isolate the relay from critical control or protection circuits,
b) Make sure you have a backup of the current UMX file in case you need to reinstall it,
c) Make sure that the new UMX you are going to install is compatible with the relay hardware version and your specific application. This can be done by consulting your RMS support agent or by checking the μMATRIX compatibility file available from:

### *www.rmspl.com.au/digital/compatibility.pdf*

Installing a new software UMX code is possible when you have connected to the relay using a PC and μMATRIXwin.

Having completed the above checks, access the UTILITIES menu through OPTIONS.
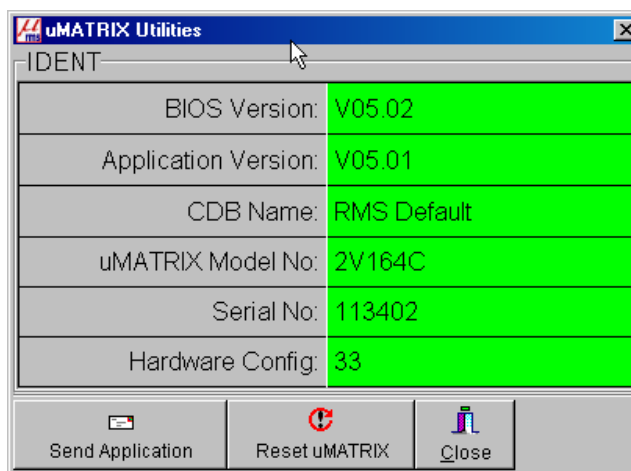


On the UTILITIES screen you are given the facility to SEND APPLICATION. Selecting this brings up the file selection dialog box so that you can locate the UMX file required and commence loading the file to the relay. Loss of connection to the relay during a download will cause the relay to lose the previous application. Re-establish the connection and try again until the down load is completed successfully.

It should be noted that when a new software file (.umx) is loaded into a relay any previously saved parameters files (.ump) are no longer compatible. New parameters files are simply created by printing the old parameters file, opening the default .ump file in μMATRIXwin & updating the fields from the printed version.

Alternatively connect to the μMATRIX relay with the new UMX file so you can view the default setting in the centre window. Now open the old UMP file into the right hand window and update each tabs settings in the centre window. Note that there may be some new tabs available which is why the old setting file cannot be used. Now upload to the relay and save to a new setting file.

The default .ump file is available from the RMS web site or can be created by connecting to the updated relay & saving the relay setting.

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## 2.10 Using Citect with Modbus Protocol on the SCADA Network Port

Refer to: *www.rmspl.com.au/digital/citectmodbus.pdf*

The SCADA network port utilizes Modbus RTU protocol. Modbus register allocation tables are available from our web site for each relay model. A sample Citect screen is also available for demonstration purposes.

## 2.11 Remote Control - SCADA Network Port

Physical Layer

The network port is intended for applications where permanent connection to a master control system is required. An optically isolated RS485 physical layer is provided for this function.

The RS485 connection is intended for applications where multiple $\mu$MATRIX relays are to be connected on a common communications bus.

Connection is made at the rear panel using M4 screw terminals.

The network port may be used for a permanent link to a modem, remote PC, data concentrator or SCADA system. The standard communications protocol is MODBUS RTU.

RS485 Network Terminating Resistor

Where multiple relays are connected in a multi-drop configuration the RS485 comms. bus must have a 120 ohm terminating resistor fitted at each end. If the uMATRX-S relay is at one end of the transmission line a terminating resistor can be added by placing SW100-3 and SW100-4 in the ON position as depicted below.

RS485 Network BIAS Resistors

Where a single relay is connected to the network, or where the relay is a long distance from other devices on the comms. bus, BIAS resistors may need to be fitted to ensure reliable operation. To simplify this configuration, BIAS resistors are fitted to each uMATRIX-S relay and may be selected IN by setting switches SW100-1 and SW100-2 to the ON position as depicted below. This bank of four switches can be accessed by withdrawing the relay module from it's case, turning upside down and looking at the centre PCB near the rear terminal blocks.



**BIAS Resistors**          **120 ohm Terminating Resistor**

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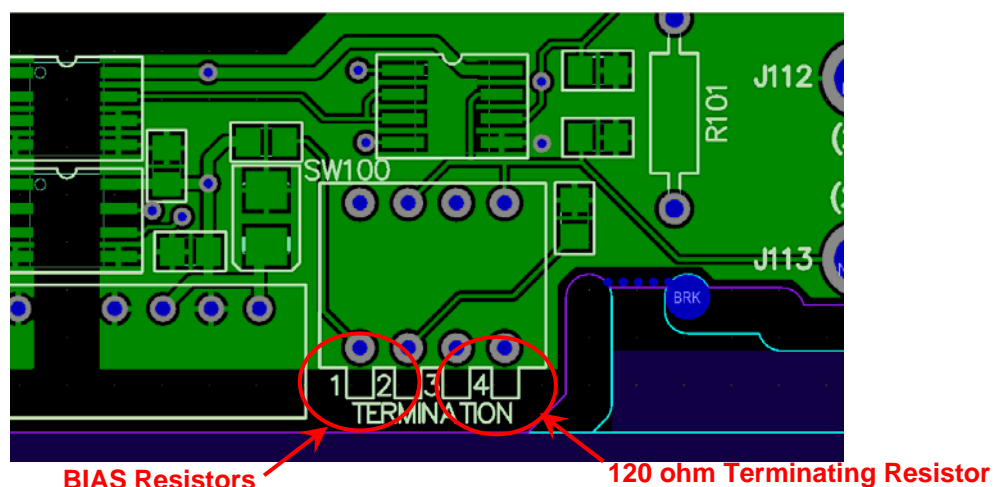
# Specifying the μMATRIX-S Platform

### 3.1    Summary

The Customer Ordering Code is made up of two parts as follows:


2V164-S-BDDAA-C

└─── Software application - UMX code

└─── Hardware order code
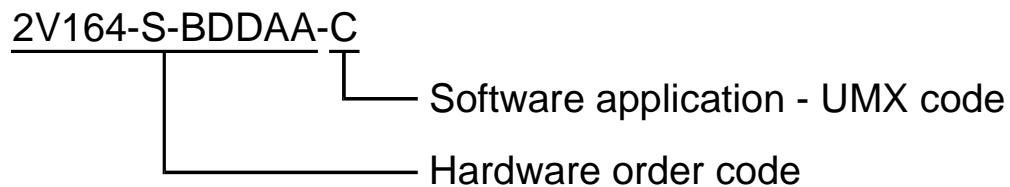

The hardware code is made up of:

2V164-S          General product classification

-BDDAA           Hardware field descriptors


The Application software code is a single alpha character:

-C                    UMX - Application software ordering code

Can be changed in the field using a PC with uMATRIXwin installed via the front panel USB port.

Visit *www.rmspl.com.au/digital* for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice.  uMATRIX-S_info/Iss B/10/05/10 - 22/31

## 3.2 Determining Application Software (UMX Code)

Determining which software UMX is loaded onto a $\mu$MATRIX relay may be done in three ways:

3.2.1 New relays received from the factory have a label located on the side of the draw out module. This label is printed with information specific to the relay and includes the UMX software version that was loaded during factory testing.

3.2.2 Press the DATA and SET page buttons on the relay simultaneously to bring up the DIAGNOSTICS page.

Now press SELECT to view the versions page and you will see:

** VERSION PAGE **

a)   BIOS Version: Vxx.xx   The version of the low level BIOS code loaded by the factory.

b)   S/W Version:   Vxx.xx   The version of the software UMX.

c)   CBD:   RMS Default   The .ump parameters file saved to the relay from $\mu$MATRIXwin.

d)   Model:   xxxxxU   The xxxxx is the relay hardware code. The "U" is the software UMX code.

e)   S/N:   xxxxxx.xx   The production tracking serial number also found on the front label.

f)   H/W Config:   xx   This number is related to the PCB loading and is auto detected.

Note:  This menu structure is a typical example only as the actual menu will vary depending on the relay model and software version.

3.2.3 Connect to the relay through the front panel USB configuration port using $\mu$MATRIXwin and a PC.

Now select OPTIONS and UTILITIES and you will get the same information as above.
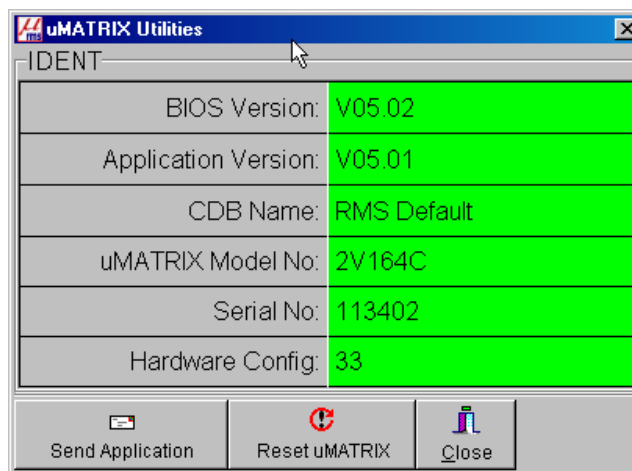
Visit *www.rmspl.com.au/digital*  for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice.  uMATRIX-S_info/Iss B/10/05/10 - 23/31

### 3.3 Determining Application Software Functionality

Now that you have determined the software UMX loaded in the relay you need to obtain the Software Functional Description document that relates to it.

This document is provided with the relay and should have accompanied this document.

If you don't have it or need a different one it may be obtained from our web site by accessing the following page and then selecting the relay type:

The location is: *http://www.rmspl.com.au/umatrix.htm*

Now select the ZIP file which relates to the software and version to match the information on the relay version page.

This ZIP file contains four files as follows:

**.umx** Software application file to load into the compatible relay hardware;

**.ump** Parameters settings file to create setting off line;

**.pdf** Functional description of the software application;

**.pdf** Modbus allocation tables for network communications port.

## 3.4    Specifying Relay Hardware Code

The $\mu$MATRIX hardware platform comprises a purpose built micro controller card with a Mitsubishi 16 bit CPU at its core.

The required ordering code is generated from the specific $\mu$MATRIX-S product data sheet as follows:

e.g. 2V67-S-BDDAA-A

| General Type | Order Code | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **2V67-S** - | | | | | |

**1** **AUXILIARY SUPPLY RANGE**

A    20-70V DC                    B    40-275V AC (300V DC)

**2** **RELAY INITIATE INPUT**

A    24-80V AC/DC                 B    80-150V AC/DC
C    150-275V AC (300V DC)   D    18-275V AC (300V DC)

**3** **REMOTE FLAG RESET INPUT**

A    24-80V AC/DC                 B    80-150V AC/DC
C    150-275V AC (300V DC)   D    18-275V AC (300V DC)

**4** **VOLTAGE INPUTS**

A    3 Pole Version                B    1 Pole Version

**5** **REAR COMMUNICATIONS PORT**

A    Not required                   B    Required – Modbus protocol

**❗ REQUEST DEFAULT APPLICATION SOFTWARE**

A    UMX2V067A                                          3 phase 4 stage under / over voltage
H    UMX2V067H                                          1 phase 4 stage under / over voltage


## 3.5    Mounting Requirements



Size 4M56-S
draw out case
Drawing units: mm

Suits flush panel mounting &
4U high 19 inch rack frame

Front view        Side view        Terminal layout        Panel cut out

Visit *www.rmspl.com.au/digital* for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice.  uMATRIX-S_info/Iss B/10/05/10 - 25/31
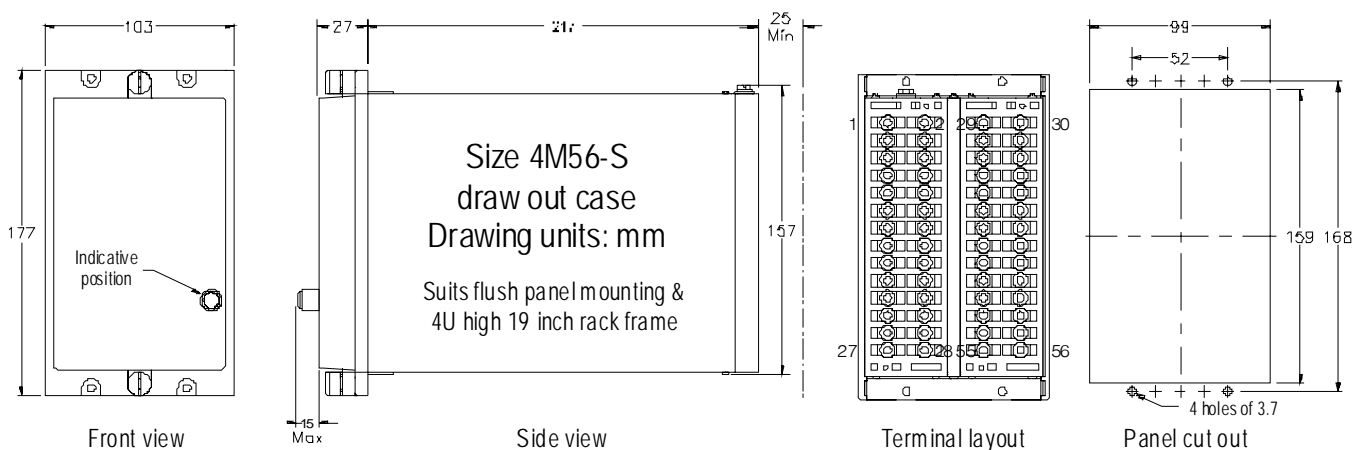
## 3.6 Generic μMATRIX-S Terminal Layout and Connections

Case Earth
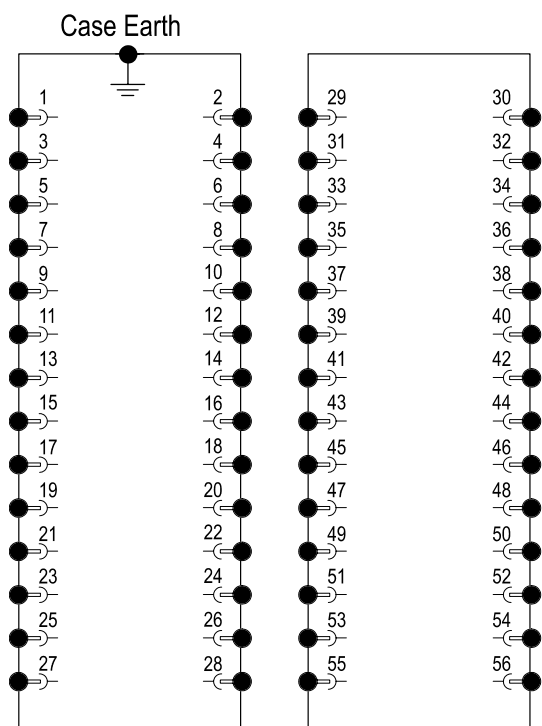


4M56 Case terminations (REAR VIEW)

*Note: The status inputs & some relay outputs are assigned by the software (UMX) loaded on the relay.

Shown here are the standard assignments of the A, B, C UMXs. Other UMX versions may differ. Consult the UMX data sheets for specific I/O assignments.

FRONT PANEL
USB PROGRAMMING
PORT

One USB female to male
2 metre connection cable supplied
with each order of relays

SCADA
COMMUNICATIONS
PORT

RS485
Network port

24 — A
28 — +B
26 — GND

BIAS links
J19  J18

SHIELD

RS485 Shielded twisted
pair cable (Up to 1Km)

120 Ohm

To other μMATRIX relays (Up to 32 units)
Fit external terminating resistor to end of BUS relay only
Fit internal BIAS jumper links for single relay connection only

Vx

Status input group 1
SI1 +5 /−7
SI2 +9 /−

Status input group 2
SI3 +11 /−13
SI4 +15 /−13

Status input group 3
SI5 +16 /−22
SI6 +18 /−22
SI7 +20 /−22

Power supply /
CPU fail alarm
25 / 23 / 27

Output relay 1
19 / 21 / 17

Output relay 7
8 / 10

Output relay 8
12 / 14

Refer to the specific uMATRIX relay model for conection details of the:

- Analogue inputs (7 maximum)
- Additional relay outputs (5 maximum)
- Anologue output (2 maximum)

Generic uMATRIX-S terminal connections  - Relay shown in de-energised condition

Visit *www.rmspl.com.au/digital* for the latest product information.

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## 3.7 Specifying Relay Software Code

Firmware

The firmware code is the low level BIOS used to provide the I/O drivers, MMI and logic toolbox. This is installed by the factory only.

Application Software (UMX)

The software is the application specific code, which determines the look of the MMI and the utilization of the available hardware elements in a particular $\mu$MATRIX relay version.

The CDB determines the function of the relay by setting out how the toolbox items provided in the firmware and the hardware elements are config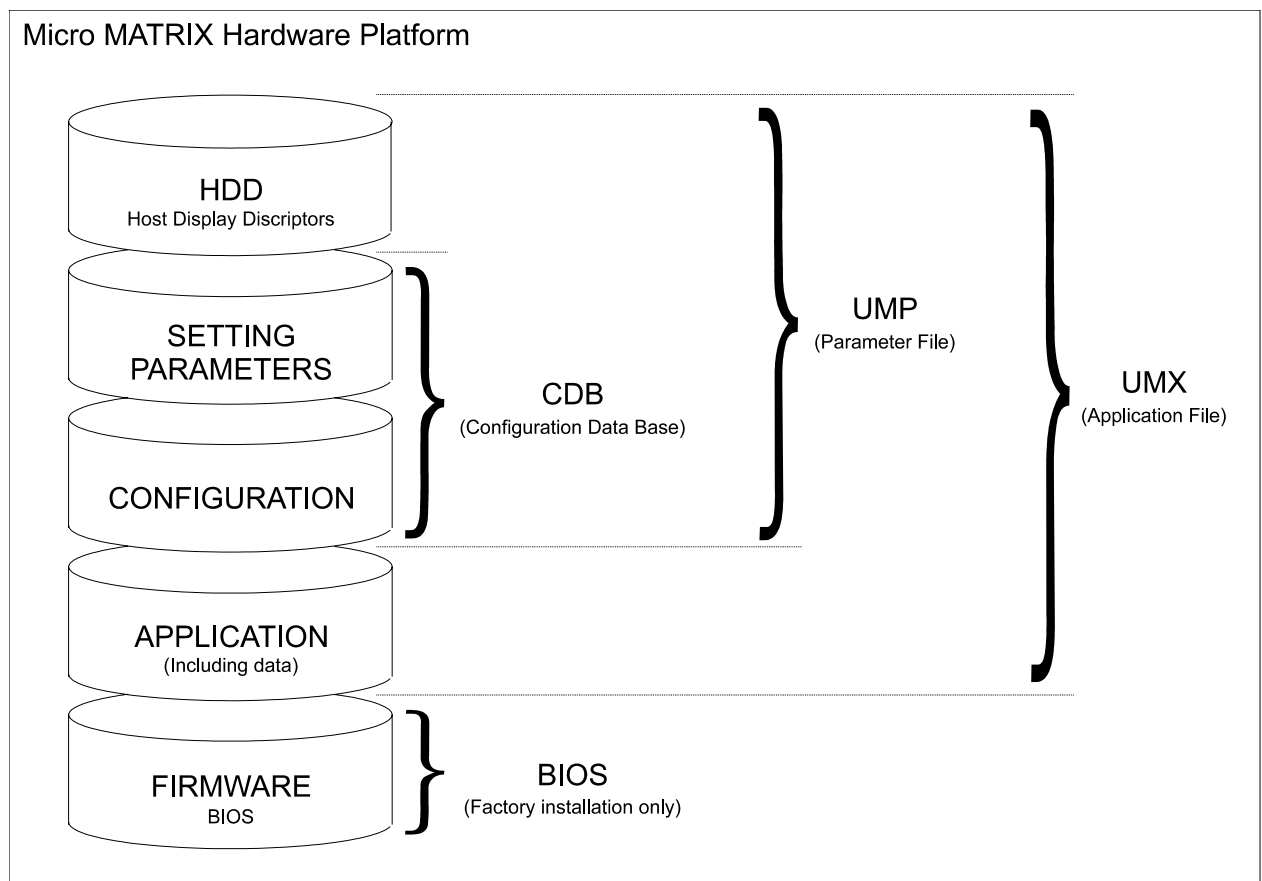ured and linked together. The CDB also comprises the setting parameters, which determines the actual operating points required by the end user.

The Host Display Descriptor file (HDD) provides the information needed by the PC programming application to display and function with the information relating to that specific $\mu$MATRIX relay version.

The relationship between these elements are described in the following diagram:

Micro MATRIX Hardware Platform

HDD
Host Display Discriptors

SETTING PARAMETERS

CONFIGURATION

CDB
(Configuration Data Base)

UMP
(Parameter File)

UMX
(Application File)

APPLICATION
(Including data)

FIRMWARE
BIOS

BIOS
(Factory installation only)

## 3.8 File Names

The following file name protocols are used when saving electronic files:

BIOS $\mu$MATRIX.mot Mitsubishi standard format (Factory programmed)

Software UMX2V067A.umx $\mu$MATRIX Program (UMX includes UMP file)

CDB 2V67K1A.ump $\mu$MATRIX Parameters (UMP includes factory default settings)

## 3.9 Issue Level Protocol

BIOS Firmware issue level Control

Version numbers are assigned in the format 00.00

The first two digits record major version releases while the second two digits record minor revisions.

Application Software (UMX) issue level Control

Issue level numbers are assigned in the format 00.00

The first two digits record major issue releases while the second two digits record minor revisions.

The Application file name and issue level is recorded on the $\mu$MATRIX Diagnostic Page without the file extension.

UMX Ordering Code

A single alpha character is used to describe the software issue starting at A and finishing at Z giving 26 possible Applications for each major product variant (E.g. 2V67).

Setting Parameters Control

The $\mu$MATRIX is designed such that the Setting Parameters may be readily changed at the front panel or via the programming port. It is therefore not possible (or desirable), to control the Setting Parameters after the relay has been shipped. What RMS controls, is the factory default Setting Parameters loaded into the relay during testing and calibration.

Visit *www.rmspl.com.au/digital* for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice. uMATRIX-S_info/Iss B/10/05/10 - 28/31

# Relay Applications

The following sections describe the relay applications so far developed for the $\mu$MATRIX platform. As this is a generic product user guide you need to check the RMS web site for the latest product data sheets and new applications.

## 4.1    2V67    Four stage under / over voltage relay

### *www.rmspl.com.au/2v67-s.htm*

The 2V67 Series relay is a three-pole voltage monitoring relay with four stages of adjustable voltage pick up and drop out points. Each voltage set point can be set for under or overvoltage operation and has an independent time delay driving an output relay. An undervoltage lockout is used to disable the four voltage outputs when the voltage falls below a preset level. A single status input is used to enable the four voltage sensing stages.

Undervoltage Load Shedding

Loss of adequate system voltage can lead to plant and equipment damage if not taken off line or the voltage level restored. The 2V67 relay can be used to provide four stages of load shedding as the voltage progressively falls through the four independent setting stages.

Cogeneration Schemes

At the interface between the utility and the cogenerator, undervoltage relays are installed as minimum protection to provide an operating voltage window for the cogenerator. During faulted conditions when the cogenerator may become overloaded, the 2V67 relay will detect the decline in voltage and remove the cogenerator from the system.

Automatic Transfer

In order to restore service within a given acceptable time period, automatic transfer switching can be applied to initiate throwover from primary power to the alternate power source. The 2V67 relay can initiate switching after a given time delay to avoid transfer switching during temporary low voltage conditions.

Transformer Protection

The 2V67 relay may be used to supplement the tap changer control system and to prevent equipment damage as a result of failure of the tap change undervoltage blocking mechanism or overvoltage run away.

Visit *www.rmspl.com.au/digital* for the latest product information.

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### 4.2    2H34    Four stage under / over frequency relay

## *www.rmspl.com.au/2h34-s.htm*

Under-frequency Load Shedding

Loss of adequate system frequency is an early indicator of impending system voltage collapse. This can lead to plant and equipment damage if not taken off line or the frequency / voltage level restored. The 2H34 relay can be used to provide four stages of load shedding as the frequency progressively falls through the four independent setting stages. Trip on rate of change of frequency is also possible.

The 2H34 Series relay is a frequency-monitoring relay with four stages of adjustable frequency pick up and drop out points. Each frequency set point can be set for under or over frequency operation and has an independent time delay driving an output relay. An undervoltage lockout is used to disable the four frequency outputs when the voltage falls below a preset level. A single status input is used to enable the four frequency sensing stages.

### 4.3    2SY212    Synchronizing check relay

## *www.rmspl.com.au/2sy212-s.htm*

The 2SY212 synchronism check relay is designed to measure the phase angle between the monitored single phase voltages on the line & bus sides of a circuit breaker & verify that this angle is less than setting. If the measured angle has met this criteria for the time period defined by the setting & the voltage magnitudes meet the criteria established by the Live Line/Bus & U/V Line/Bus settings, the output relay will be energised & the breaker permitted to close. Resetting will occur if either the phase angle or voltage magnitude stray outside the pre-set limits or if the sync check enable input is de-energised. Front panel LED's provide visual indication of relay status & sync check function.

Bus or Line U/V, Differential Voltage and Frequency Slip Close block functionality together with flexible synchronism check bypass logic caters for a diverse range of applications.

Visit *www.rmspl.com.au/digital* for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice.  uMATRIX-S_info/Iss B/10/05/10 - 30/31

## 4.4    2V164  Voltage regulating and control relay

### *www.rmspl.com.au/2v164-s.htm*

The 2V164 Series relays are designed for the control of motor driven on-load power transformer tap changers.

The 2V164 Voltage Regulator Relay continuously monitors the transformer output voltage and current and provides "RAISE" and "LOWER" control commands to the on-load tap changer such that the load centre is automatically maintained within acceptable limits.  Small variations in supply frequency will not affect the system performance.

When designing the 2V164, considerable emphasis was placed on producing a relay which would be very simple to install, set up and operate in the field.  The result is a simple yet effective and very dependable voltage regulator relay available at a competitive price. The relay is very easy to set up due to the large screen LCD MMI and PC programming port.

RMS 2V164 Relays have many in built features to simplify the interface with OLTC's to provide a reliable, effective and simple to operate voltage control system.

A tap position indicator input is provided to enable the transformer tap to be displayed on the MMI. The output from the RMS type 2V200 Tap Position Transducer is required for this function to operate. A 4-20mA analogue output is also provided.

Visit *www.rmspl.com.au/digital*  for the latest product information.

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## Australian Content

Unless otherwise stated the product(s) quoted are manufactured by RMS at our production facility in Melbourne Australia. Approximately 60% of our sales volume is derived from equipment manufactured in house with a local content close to 90%. Imported components such as semi-conductors are sourced from local suppliers & preference is given for reasonable stock holding to support our build requirements.

## Quality Assurance

RMS holds NCSI (NATA Certification Services International), registration number 6869 for the certification of a quality assurance system to AS/NZS ISO9001-2008. Quality plans for all products involve 100% inspection and testing carried out before despatch. Further details on specific test plans, quality policy & procedures may be found in section A4 of the RMS product catalogue.

## Product Packaging

Protection relays are supplied in secure individual packing cardboard boxes with moulded styrene inserts suitable for recycling. Each product & packing box is labeled with the product part number, customer name & order details.

## Design References

The products & components produced by RMS are based on many years of field experience since Relays Pty Ltd was formed in 1955. A large population of equipment is in service throughout Australia, New Zealand, South Africa & South East Asia attesting to this fact. Specific product & customer reference sites may be provided on application.

## Product Warranty

All utility grade protection & auxiliary relay products, unless otherwise stated, are warranted for a period of 24 months from shipment for materials & labour on a return to factory basis. Repair of products damaged through poor application or circumstances outside the product ratings will be carried out at the customer's expense.

## Standard Conditions of Sale

Unless otherwise agreed RMS Standard Terms & Conditions (QF 907) shall apply to all sales. These are available on request or from our web site.



# Relay Monitoring Systems Pty Ltd

6 Anzed Court, Mulgrave, Victoria 3170, AUSTRALIA

Tel: +61 3 8544 1200  Fax: +61 3 8544 1201  Email*: rms@rmspl.com.au*  Web: *www.rmspl.com.au*