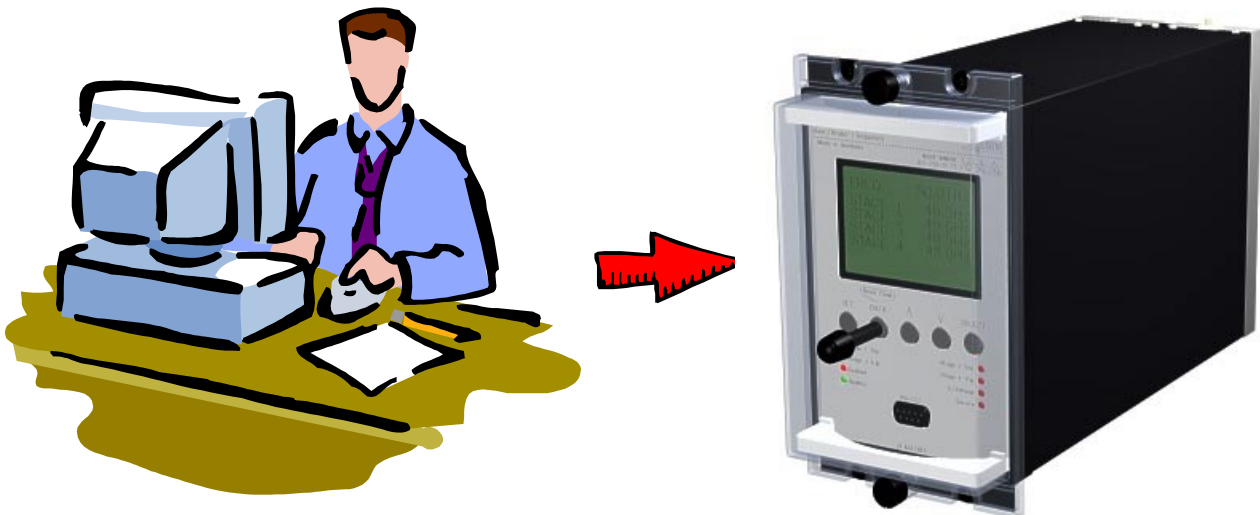


SOFTWARE FUNCTION & VERIFICATION

2V165 B UMX

TRANSFORMER PARALLEL CONTROL RELAY



Issue	Date	Summary of changes
A	18/11/2002	Initial issue.
B	04/12/2002	UMX software updated.
C	12/12/2002	UMX software updated.

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1.0 OVERVIEW

The 2V165 Series relays are designed to monitor & control the tap changers of up to four (4) transformers connected on a common bus & operating in the master slave control configuration.

Master follower parallel control schemes traditionally use auxiliary switches on the tap changers to determine out of step errors. While this is a reliable & proven technique there are two significant drawbacks:

1. Wiring complexity between the tap changer auxiliary switches
2. Requirement for matched tap changers

The first issue is overcome by replacing each tap changer auxiliary switch with a TPI transducer (2V200), which sends a frequency signal proportional to the tap position. This requires only two wires for each tap changer & is simply wired back to the 2V165. The second issue is overcome with a user specified tap position logic table in the 2V165 to allow non-matched tap changers to operate together.

The tap position of each transformer is monitored as well as the raise / lower commands initiated by the selected master voltage regulating relay. The 2V165 responds by sending the appropriate raise / lower commands to each tap changer in accordance with the tap position logic table.

If any tap changer moves outside the limits established in the tap position logic table, an out of step alarm contact will pick up & all further tap change commands inhibited.

Any or all of the transformers may be taken off the parallel scheme & operated independently. This is signaled to the 2V165 via status inputs, which inhibit any tap change commands or alarm outputs relating to that transformer.

A status input is provided to automatically step all tap changers to a programmed position within the tap position logic table.

RMS 2V165 Relays have many in built features to simplify the interface with OLTC's to provide a reliable, effective & simple to operate voltage control system. An RS232 programming port is provided for ease of establishing relay settings using a PC & μ MATRIXwin.

3.0 DESCRIPTION – UMX2V165B.UMX

3.1 Standard Features

The 2V165 provides a range of standard features as described in the RMS Technical Bulletin which may be downloaded from:

<http://www.rmspl.com.au/handbook/2v165.pdf>

TAP RAISE / LOWER INITIATE INPUTS

Two (2) separate status inputs are provided to detect tap raise & tap lower initiate signals from the master voltage regulating relay. These are used to allow the 2V165 to check that tap position changes only occur in synchronization with tap raise / lower commands. An input control signal of 1s minimum duration is required.

TAP RAISE / LOWER INITIATE OUTPUTS

When a tap raise or lower input is detected the 2V165 sends specific tap change output commands to each transformer so that the positions in the pre-defined tap position logic table are observed. A continuous contact output is provided which is reset when the corresponding tap position indicator changes position.

OUT OF STEP ALARM

When a tap raise or lower command is output, an out of step alarm timer is initiated. If all tap changers have not moved to the specified tap within the user specified time delay (1-30s in 1s steps), the alarm contact will close & a message identifying the problem tap changer displayed.

TAP CHANGE FEEDBACK OUTPUT CONTACT

The contact is closed when a Tap Raise / Lower command is received from the 2V164 AVR & is reset when all transformers have successfully moved to the next position in the tap position logic table. The contact is wired back to the 2V164 Tap Change Feedback status input to pause the interval timer until all transformers have completed the tap change sequence.

PARALLEL / INDEPENDENT CONTROL STATUS INPUTS

A status input is provided for each transformer to signal if the transformer is operating as part of the parallel group. ('In Group') Tap raise & lower commands will be inhibited for transformers not 'In Group' & its tap position cannot initiate an out of step alarm.

NO TRANSFORMERS 'IN GROUP' OUTPUT CONTACT

When there are no transformers 'In Group', via the IN GROUP status inputs, the N/O contact is closed. This function is useful to automatically inhibit the local AVR to avoid tap change fail & voltage level alarms.

AUTO HOME

When a transformer is returned to 'In Group', it will automatically home to the 'Reference Tap Position' to match the other transformers 'In Group'. A user specified time delay (10-300s in 5s steps), is provided to allow for the tap changer to reach the specified target position during which period the Out of Step alarm is inhibited.

GO TO SPECIFIED TAP

A status input is provided which may be initiated to drive all 'In Group' transformer tap changes to a user specified reference tap position. An initiate pulse of 1s minimum is required.

OPERATIONAL INDICATORS

LEDs indicate the following conditions.

- § Transformer 1 In Group
- § Transformer 2 In Group
- § Transformer 3 In Group
- § Transformer 4 In Group
- § Tap change in progress
- § Out of step alarm
- § Healthy
- § Service

DATA DISPLAY

During normal operation the front panel LCD provides the following information:

- § The tap position of each transformer
- § Transformer out of step status

TPI ANALOGUE OUTPUT (Optional on some hardware)

A single tap position indicator analogue output signal is provided for interface to an RTU. The analogue output is linked to the reference tap position (= transformer 1 tap position if matched tap changers are used).

Output: 4 to 20mA or 0 to 10mA

Compliance voltage: 7.5V

Accuracy: +/-0.5%

Analogue output:

- Tap 1 4mA
- Tap 30 20mA
- Tap N $(N * 16/29) + (4-16/29)$ mA

3.2 Special Features of this Software UMX Version

TPI INPUTS

Four TPI inputs are provided to accept a 1 to 5K HZ frequency coded signals from the RMS manufactured 2V200 TPI transducers. The 2V165 is programmed with the number of taps & direction for each transformer.

This UMX utilises the following table.

	Transformer #3	Transformer #1	Transformer #2	Transformer #4
Lowest Volts	1	1	1	17
	2	2	2	16
	3	3	3	15
	4	4	4	14
Normal Volts	5	5	5	13
	6	6	6	12
	7	7	7	11
	8	8	8	10
	9	9	9	9
	10	10	10	8
	11	11	11	7
	12	12	12	6
	13	13	13	5
	14	14	14	4
	15	15	15	3
	16	16	16	2
Highest Volts	17	17	17	1

4.0 USER INTERFACE

Refer to the μ MATRIX Users Guide for detailed instructions on the operation of the user interface.

To download a PDF version of the guide:

www.rmspl.com.au/digital/uMATRIXInfo.pdf

To download further μ MATRIX software & documentation:

www.rmspl.com.au/uMATRIX.htm

5.0 Loading software, Calibration & Test

This section requires at least the following:
A PC with Windows 98 or later and at least one COM port.
UMatrixWin software.
The correct serial cable.
The ability to interrogate the relay via the front panel buttons.
A general understanding of how UMX and UMP files work with the relay.

Settable parameters will be overwritten by loading a new UMX file. They can however, be saved to a UMP file and then returned to the relay later. To learn how to do this, refer to the uMatrix Userguide.

5.1 Loading the UMX

Before loading the UMX2V165B software, ensure that it is compatible with your hardware. Download the compatibility list from the RMS website at:

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

Now ensure that the bios version in the relay matches the table in section 2.0 of this document. (If the bios version is different, you may not be able to load this UMX. Contact RMS for support.)

Load the UMX via the front panel COM port using the 'uMatrixWin' software. Now ensure that the UMX version matches the table in section 2.0.

To interrogate for versions, press 'SET' and 'DATA' buttons simultaneously, then select 'Version Page'. Alternatively, use uMatrixWin – Options – Utilities.

Check versions

The relay is now ready to calibrate. *Note: calibration is a factory function. If you are simply changing or re-loading a UMX, re-calibration is not necessary. The relay is deemed to be fully operational.*

5.2 Calibration using 'WinCal'

Test equipment required:
As 5.0 plus
A Calibrated 2V200 unit.

- a) With the 2V200 and PC connected to the relay, start Wincal, select uMatrix – Connect.
- b) Select uMatrix – Calibrate and follow the prompts. When completed, verify the following parameters.

5.3 Tap Position Indicator Verification

Check that each Transformer Tap Position displays the correct value by emulating positions at 1, 5 and 17. (As per section 3.2)

VERIFY

5.4 Analogue Output Verification

Does not exist in all hardware

- a) With the TPI of Transformer No.1 set to position 1 there should be 4.7 +/-0.1mA between terminals 53 and 55 and with the TPI set to 30 there should be 20.0 +/-0.1mA.

VERIFY

If the relay settings in the above are correct, the relay is deemed to be fully operational.

TESTED BY : _____ DATE : _____

6.0 CONNECTION DIAGRAM

