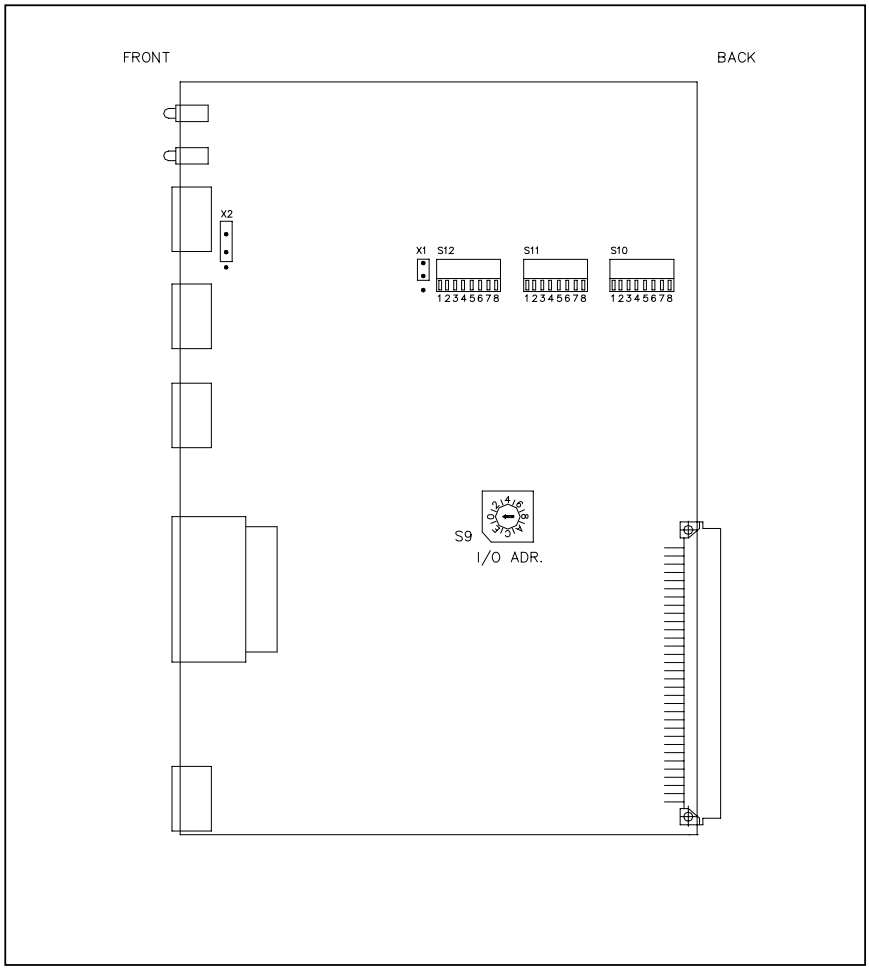
Replacement instruction - CURRENT RELAY MODULE (diff), CRM-1

Placement of I/O addr./ jumpers CRM-1 DELOMATIC



Default settings for CRM-1 diff

General:

The default settings concerns the values for delay time, current level and range. The delay time is the time to wait before sending the breaker out signal when the current level is exceeded. The range is the secondary side of the current transformer ratio, meaning that using a current transformer with the ratio 100/5 will give a range of 5. Using a current transformer with the ratio 100/1 will give a range of 1. The range can only be set to 1 or 5. During DELOMATIC operation the range is set by setting the CT ratio for the CRM-1 diff on the control panel.

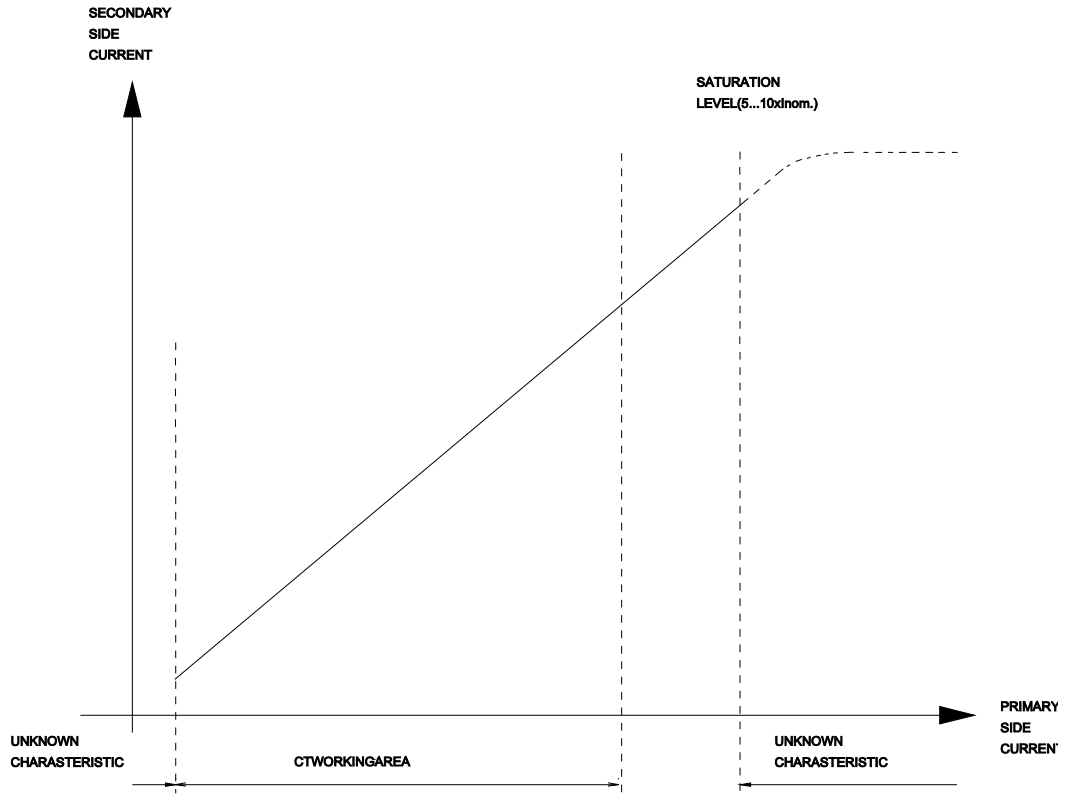
The settings by the DIP switches are used if the DELOMATIC is not able to operate the module (rack failure, supply failure, PSM-1 module failure or similar), and when the supply to the CRM-1 diff module is intact. Then the CRM-1 diff module will use the settings set by the DIP switches to protect the generator. The DIP switches are used for setting values when used in as a standalone module.

After changing the DIP switch settings, the board must be powered up for the changes to take any effect.

Current level and delay time:
There are placed three (3) eight (8) pins DIP switches on the board. The three DIP switches are named S10, S11 and S12. S12 is setting the delay time of breaker out signal.
S10 and pin 1 to 4 of S11 are used to set the current limit for the breaker out signal.

Pin no. 8 of S11 is used to set the range to 1 or 5 A.
See drawing for placement of DIP switches on the board.

IMPORTANT:
In order to achieve selectivity between differential protection and short-circuit protection (prevention of faulty differential current trip), it is recommended to set the time delay of the CRM-1 diff longer than the delay of the short-circuit protection device. The length of the time difference is, however dependent on the total delay of the CRM-1 diff, as some classification societies sets



limits to the accepted delay. A total delay of max. 500 ms will normally be accepted.

Where high speed de-excitation is demanded, the short circuit protection must **not** be connected to shutdown of the AVR.

If high speed de-excitation is demanded, the CRM-1 diff can be used to shutdown the AVR.

Current transformers:

Because of saturation of current transformers, it is recommended to choose the transformer size concerning that the current at all times lies within the working area of the transformers and well away from the saturation level, even in short-circuit situations (see figure below).

Further more the current transformers should be selected with the same nominal VA, current ratio, class and type of protection or measuring.

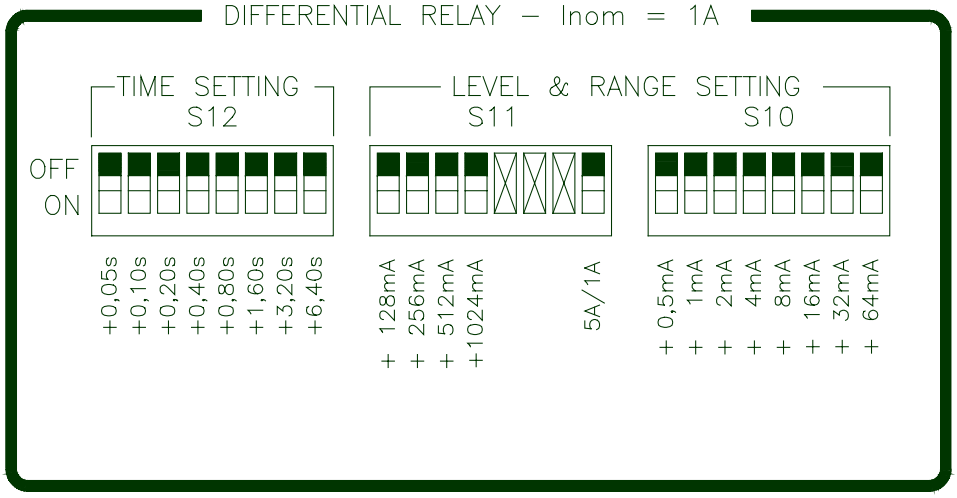
Current level and delay time:

There are placed three (3) eight (8) pins DIP switches on the board. The three DIP switches are named S10, S11 and S12. S12 is setting the delay time of breaker out signal.
S10 and pin 1 to 4 of S11 are used to set the current limit for the breaker out signal.
Pin no. 8 of S11 is used to set the range to 1 or 5 A.
See drawing for placement of DIP switches on the board.

All setting are done as a binary number. For the time setting it is possible to set the value 255 with the 8 pins. To get the time the binary number set by the pins on DIP switch S12 must be multiplied with 50 ms. For the level setting it is possible to set the value 4096 with the 12 pins. To get the level the binary number set by the pins on DIP switch S10 and S11 must be multiplied with 5 mA and again multiplied with the range.

Going from a current value and time delay to get the binary number is done like this. The time (in ms) must be divided with 50 and the result in a binary number to code on S12.

The current level must be divided with the primary side value for the CT ratio and then multiplied with the secondary side value to get the current, that is actually running through the CRM-1 module. Then it (given in A) must be divided with 5 mA (divided with 5 and multiplied with 1000) and then divided with the range. This value is then to be programmed as a binary value on S10 (8 bit) and S11 (4 bit).



Time setting:

S12:	LSB	1	50 ms
		2	100 ms
		3	200 ms
		4	400 ms
		5	800 ms
		6	1600 ms
		7	3200 ms
	MSB	8	6400 ms

Current level and range:			range = 1	range = 5
S10:	LSB	1	0,5 mA	2,5 mA
		2	1 mA	5 mA
		3	2 mA	10 mA
		4	4 mA	20 mA
		5	8 mA	40 mA
		6	16 mA	80 mA
		7	32 mA	160 mA
		8	64 mA	320 mA

S11:	LSB	1	128 mA	640 mA
		2	256 mA	1280 mA
		3	512 mA	2560 mA
	MSB	4	1024 mA	5120 mA
		5	Not used	Not used
		6	Not used	Not used
		7	Not used	Not used
		8	OFF	ON

When a pin is pressed up against the top (with the text "OPEN") it is set OFF and when it is pressed down it is ON.
After changing the DIP switch settings the board must be powered up for the changes to be taken into effect.
The calculations for correct settings are illustrated through two examples:

Example one:

CT-ratio for CRM-1 diff is 100/1
The differential current limit is 20 A delayed in 2,5 sec.

Time setting: 2,5 sec / 50 ms = 2500 / 50 = 50_{DEC} = 0011 0010_{BIN}

Range setting: OFF

Current setting: 20A / 100 * 1 / 5 mA / 1 = 40_{DEC} = 0000 0010 1000_{BIN}

Dip Switches: S12: 2, 5, 6 = ON (All other OFF)
S10: 5, 8 = ON (All other OFF)
S11: 1 = ON (All other OFF]

Example two:

CT-ratio for CRM-1 diff is 200/5
The differential current limit is 40 A delayed in 0,15 sec.

Time setting: 0,15 sec / 50 ms = 150 / 50 = 3_{DEC} = 0000 0011_{BIN}

Range setting: ON

Current setting: 40A / 200 * 5 / 5 mA / 5 = 40_{DEC} = 0000 0010 1000_{BIN}

Dip Switches: S12: 1, 2 = ON (All other OFF)
S10: 5, 8 = ON (All other OFF)
S11: 1 = ON (All other OFF)