Multi-Master Display For Motor Management Relay

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Abstract—Motor Management and Control Device is a flexible and modular motor management system for motors with constant speeds in low-voltage applications. It optimizes the link between the control system and the motor feeder, increases plant availability and allows significant savings to be made during installation, commissioning, operation and maintenance. It is installed in the low-voltage switchgear system and links the higher-level automation system and the motor feeder intelligently. In order to view information about different motors and allow switching between them we use multiple master display for more efficient motor management. It uses ISO3082 which is connected to the display using input and output connectors. This circuitry can help us in employing it in the switching of multiple motor relays.

Keywords—*ISO3082, Input and Output connectors, LCD display.*

I. INTRODUCTION

Motor Management relay is a multifunctional microprocessor-based protective relay for the protection of any size motor at all voltage levels. It also saves automation system and ensures it's functionality and protects it even if the control system is damaged. The relay protection and monitoring parameters are specified and can be viewed on the display or the operator panel connected along with the expansion modules and CT VT. It helps in monitoring trip coil, breaker wear primary and secondary (accumulated interrupted current), oscillography (6000 cycles total), fault data logs (up to 20 events), sequence of events report (up to 300 events), trending (load profile over time), motor History, records the last 5 motor start profiles, motor Start Trending, CT supervision, VT supervision, clock (1 ms time stamping). An event displayed on the operator panel is classified as a change of state as detected by the relay. These include relay pickups, dropouts, trips, contact closure, alarms, setting changes and self-diagnostic failures. The events are stored in a FIFO in chronological order. Each trip record will be date and time stamped to a 1 ms resolution. The trip log record will include information on the type of fault, protection elements that operated, fault location and currents and voltages at the time of the fault. Motor protection relay provides oscillography-recording capabilities. The relay will record all measured signals along with the binary signals of pickup, trip, logic and contact closures. The waveform capture manually through the display or via communications. Front panel user interface has a 128 x 64 pixel LCD display with background illumination for wide angle viewing in all light conditions. 7 programmable LEDs provide quick and easy visual display of power on, mode of operation, alarm and trip indication. Soft keys are provided for operation mode selection, scrolling through data and settings. In addition, the relay settings and test functions are password protected. The relay records the following information: the date the interval began, the total number of starts in the interval, the averages of the following quantities, motor Start Time, start % Rotor Thermal Capacity Used, maximum Start Current. All these parameters and essential readings for different i.e multiple motors can be switched between just be using this proposed circuit which is the multiple master display.

II. PROPOSED SYSTEM

The usual motor relay's operator panel with display shows information such as trip coil monitor, breaker wear primary and secondary, oscillography, fault data logs, sequence of events report, trending(load profile over time), motor history, records the last 5 motor start profiles, motor start trending, CT supervision, VT supervision, clock (1 ms time stamping). For industrial purposes it's always better if the display shows parameters of all the possible motor relays connected to it. Hence multi master display will give a better solution for viewing these parameters independently for the various relays connected to it.

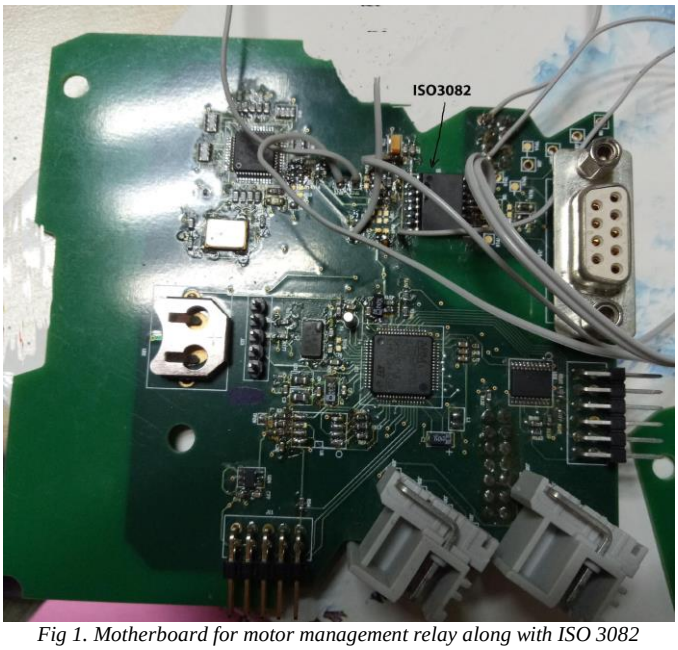

Fig 1. Motherboard for motor management relay along with ISO 3082

III. SPECIFICATION OF COMPONENTS

The motor protection relay cumulatively consists of four blocks with a functionality of it's own. The 4 units are as follows: The Main Unit, Current Module Unit, OLED Display and the Expansion Module Unit.

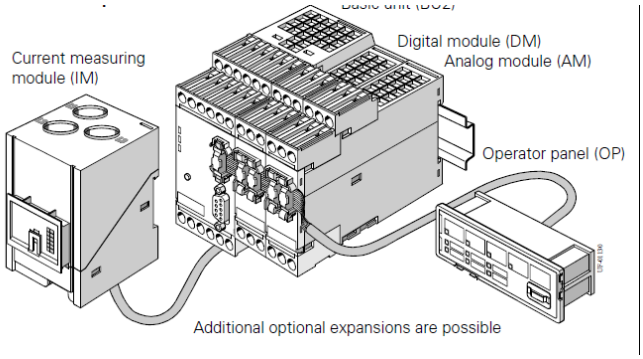

Fig 2. Motor Management Relay Structure

THE MAIN UNIT- This is self-contained and fully functional unit housing the main processor, input/output board, current & voltage board and a communication board in a single module enclosure. The main unit is also equipped with Bi/Tri colour LED for status indication. There is also reset push button available for local trip reset.

CURRENT MODULE UNIT- It comes in two sizes and is suitable for use from 0.375kW. The CM is a pass-through type and hence there is no need of physical termination of power wire and CT shorting while removing the motor protection relay.

OLED DISPLAY UNIT- The OLED display unit is a detachable optional unit provided with motor management relay for display of all metering, protection and fault data. The display unit can be additionally used to configure the installed relay. The OLED display unit is provided with mini-USB port on it's front facia to enable local configuration through laptop using the relay suite parameterization software supplied with the relay.

EXPANSION UNIT- The digital input/output capability of relay can be increased from 6DI/2DO unit and 8DI unit. The requisite connecting cable for the connection of the expansion unit to it's main unit is supplied along with the expansion unit.

This proposed system which we are discussing in this paper can be stacked upon the expansion module so that it can switch between motors. This module consists of the following components MAU202 MINMAX, ISO3082, OPD and input and output connectors.

MAU202 MINMAX- DC-to-DC converters convert one DC voltage level to another, which may be higher or lower, by storing the input energy temporarily and then releasing that energy to the output at a different voltage. The storage may be in either magnetic field storage components (inductors, transformers) or electric field storage components (capacitors). This conversion method can increase or decrease voltage. Switching conversion is more power efficient (often 75% to 98%) than linear voltage regulation, which dissipates unwanted power as heat. Fast semiconductor device rise and fall times are required for efficiency; however, these fast transitions combine with layout parasitic effects to make circuit design challenging. The higher efficiency of a switched-mode converter reduces the heat sinking needed, and increases battery endurance of portable equipment. The MAU202 MINMAX has input and output terminals. The input terminals will be connected to a voltage supply of 5V and the MAU202 would give an output of a voltage level which is a little lesser then the input voltage. MAU202 MINMAX to power up the system. Also two isolator ICs with input and output connectors and an LCD display screen to view the characteristics of the motor protection relay connected to it.

ISO3082- It is an isolated half duplex differential line transceivers for TIA/EIA 485/422 applications. These devices are ideal for long transmission lines because the ground loop is broken to allow for a much larger common-mode voltage range. The symmetrical isolation barrier of the device is tested to provide 2500 VRMS of isolation for 60 s per UL 1577 between the bus-line transceiver and the logic-level interface.

They have active-high driver enables and active-low receiver enables to control the data flow. They are available in two speed grades suitable for data transmission up to 200 kbps and 20 Mbps. When the driver enable pin, DE, is logic high, the differential outputs Y and Z follow the logic states at data input D. A logic high at D causes Y to turn high and Z to turn low. In this case the differential output voltage defined as VOD = V(Y) – V(Z) is positive. When D is low, the output states reverse, Z turns high, Y becomes low, and VOD is negative. When DE is low, both outputs turn high-impedance. In this condition the logic state at D is irrelevant. The DE pin has an internal pull down resistor to ground, thus when left open the driver is disabled (high impedance) by default. The D pin has an internal pull up resistor to VCC, thus, when left open while the driver is enabled, output Y turns high and Z turns low. When the receiver enable pin, RE, is logic low, the receiver is enabled. When the differential input voltage defined as VID = V(A) – V(B) is positive and higher than the positive input threshold, VIT+, the receiver output, R, turns high. When VID is negative and less than the negative and lower than the negative input threshold, VIT–, the receiver output, R, turns low. If VID is between VIT+ and VIT– the output is indeterminate. When RE is logic high or left open, the receiver output is high-impedance and the magnitude and polarity of VID are irrelevant. Internal biasing of the receiver inputs causes the output to go failsafe-high when the transceiver is disconnected from the bus (open-circuit), the bus lines are shorted (short-circuit), or the bus is not actively driven (idle bus).

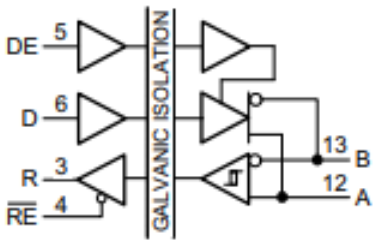

Fig 4. ISO 3082

OPERATOR PANEL (DISPLAY)- The standard operator panel (OP), an optional operator panel with display (OPD) is also available for SIMOCODE pro V. This operator panel can additionally display current measured values, operating data, diagnostics data or status information of the motor feeder on the cabinet. It also contains all the status LEDs that are present on the basic unit and facilitates access to the system interface from outside the cabinet. The motor can be controlled via the buttons on the operator panel. Current measured values, status information, fault messages or the device-internal error log are simultaneously shown on the display.

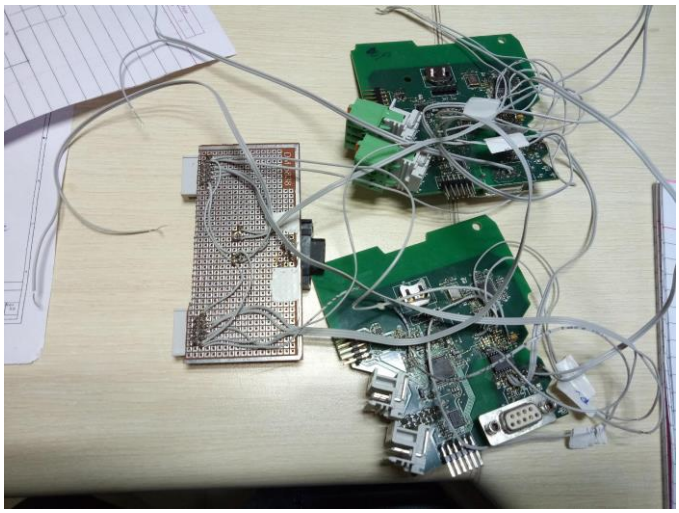

Fig 3. Complete Circuitry Design

IV. SYSTEM DESIGN

MAU202 MINMAX has input and output terminals. At the input we apply 5V from a DC battery source and at the input a voltage of more or less same than 5V should be obtained i.e. the voltage at the output should be comparable to that of the input. The board consists of two connectors named as Input and Output connectors which will consists of the Vcc, Rx, Tx, DE and Gnd pins. The ouput taken out from the MAU202 is connected to the input and ouput connector. The negative terminal of the MAU202 is connected to the Gnd of both the input as well as output connector. While the positive terminal is connected to the Vcc of the input and output connectors.

For the input side an ISO3082(1) is assigned specially to get an isolation between two power domains. The pin 8 of this IC is connected to the ground of the input connector. Vcc is internally connected on the board to an isolated 5V supply. Rx, Tx and DE pins of the connector coming from UART are connected to the pins 3rd, 6th and 5th pins of the ISO3082(1) respectively. The A and B i.e pin 12th and 13th is connected to the ISO3082(2) IC at the output side which is interfaced with the display.

For the output side an ISO3082(2) is also connected to get an isolation of power right before the display. The pin 8 is also connected to the ground of the input connector. Vcc is internally connected on the board to an isolated 5V supply. Rx, Tx and DE of the connector are connected to the pins 3rd, 6th and 5th pins of the ISO3082(2) respectively. The A and B i.e pin 12th and 13th is connected to the ISO3082(1) IC at the input side. The Rx, Tx and DE from output connector are connected to the Rx, Tx and DE of the display to view the switching.

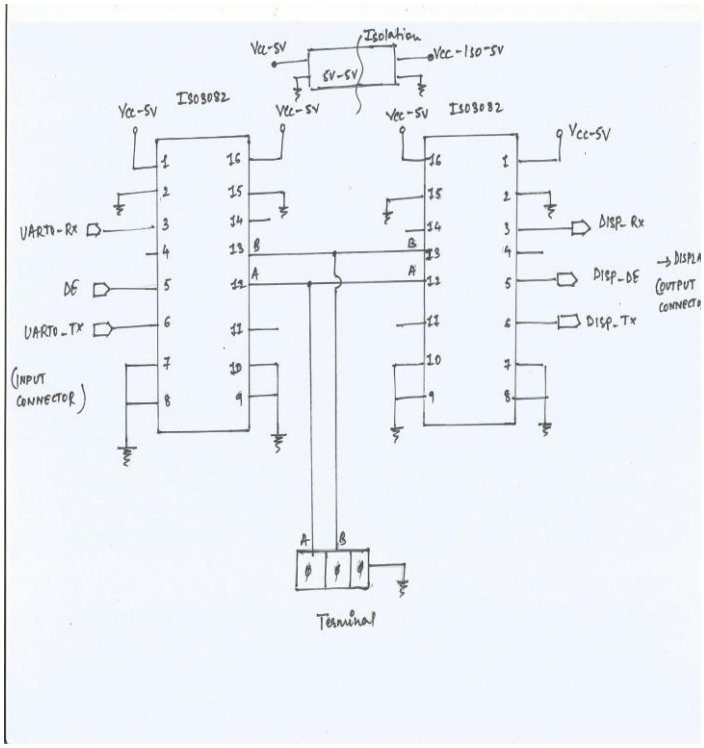

Fig 5. Circuit Diagram

V. CONCLUSION

Thus we can infer that by using this set up and designed circuitry we can enable the user to use the display with multiple masters and showcase various parameters and characteristics of multiple motors connected to it. This makes the relay management more industry friendly and provides additional services to the user.

VI. FUTURE SCOPE

This project can further be enhanced by expanding this circuitry for interfacing more than 2 motors and displaying characteristics for the same.

REFERENCES

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