



NewCode Modbus Communication User Manual

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(NE_NC-MK1-Modbus_MAN_01_20_D-00.docx)

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| Revision History | | |
|-------------------------|-----------------|--|
| Date | Revision | Description |
| 13 Jan 2014 | 1A-01 | -Draft submitted for review. -Draft released to CD. |
| 16 Jan 2014 | 1B-01 | -Corrected logic maps. -Added change of RTC global. |
| 26 May 2017 | 1C-00 | -Reflect holding register changes made in the device code (copy the Input registers to Holding Registers at address 1000). |
| 02 June 2017 | 1C-01 | -Added Logic Flags C (PLC Inputs) to Holding Registers at address 1052, but swapped the bytes around. |
| 8 Sept 2020 | 1D-00 | -Added new voltage selections available on NewCode-MK2 revision 05C and greater. |

1. ABSTRACT

The NC-MK1-Modbus (NewCode Modbus) acts as a translator between the Modbus SCADA and the NewCode. It is advisable to read the NewCode user manual, as some of the topics will require knowledge on the NewCode. It is also advisable to have knowledge on Modbus. Modbus specification document can be found on the web from <http://www.modbus.org/>.

The communication protocol between the NC-MK1-Modbus and SCADA is Modbus-RTU. Communication protocol between the NC-MK1-Modbus and the NewCode is a NewElec proprietary protocol. Enabling the PLC to communicate with the NewCode via Modbus.

2. SPECIFICATIONS

2.1 Technical Specifications of NC-MK1-Modbus

| | | |
|-------------------|---|--|
| General Data | Mounting Positions | <ul style="list-style-type: none"> ● Mounted inside of NewCode. |
| | Allowed Ambient Temperature | <ul style="list-style-type: none"> ● Operation : 0 °C to +60 °C |
| | Humidity | <ul style="list-style-type: none"> ● < 87% |
| NC-MK1-Modbus | Power Supply | <ul style="list-style-type: none"> ● +5Vdc |
| | Consumption | <ul style="list-style-type: none"> ● 20 mA |
| | Communication Mediums | <ul style="list-style-type: none"> ● Modbus ● I2C |
| Modbus | Protocol | <ul style="list-style-type: none"> ● Modbus-RTU |
| | Baud Rate | <ul style="list-style-type: none"> ● 2400 bit/s ● 4800 bit/s ● 9600 bit/s ● 19200 bit/s ● 38400 bit/s ● 57600 bit/s |
| | Cable Length @ Baud Rate | <ul style="list-style-type: none"> ● 1200 m @ 2400 bit/s to 38400 bit/s ● 1000 m @57.6Kbit/s |
| | Termination Resistor (Termination resistors must be connected at the beginning and end of bus) | <ul style="list-style-type: none"> ● 150 Ohm (0.5W). |
| Indication Lights | Type | <ul style="list-style-type: none"> ● Light Emitting Diode (LED) |
| | LED Indications | <ul style="list-style-type: none"> ● SCADA Communication <ul style="list-style-type: none"> ◦ Red = No communication. ◦ Green = Receiving. ● Address Of Module <ul style="list-style-type: none"> ◦ Green Flash = 1 ◦ Red Flash = 10 ◦ Orange Flash = 100 ◦ Red Solid = I2C Error ◦ Orange Solid = Modbus Error |

2.2 Functions supported

Following Modbus functions are supported:

| Function | | Function Name |
|----------|-----|--|
| Hex | Dec | |
| 0x01 | 01 | Read Coils. (See Chapter 2.2.1) |
| 0x02 | 02 | Read Discrete Inputs. (See Chapter 2.2.2) |
| 0x03 | 03 | Read Holding Registers. (See Chapter 2.2.3) (Address 0x4000) |
| 0x04 | 04 | Read Input Registers. (See Chapter 2.2.4) (Address 0x3000) |
| 0x06 | 06 | Write Single Register. (See Chapter 2.2.3) (Address 0x4000) |
| 0x10 | 16 | Write Multiple Registers. (See Chapter 2.2.3) (Address 0x4000) |
| 0x11 | 17 | Report Slave ID. |

2.2.1 Read Coils

Following values can be read from the coil register:

| Address | Bit Position | Name | Read Only |
|---------|--------------|-------------------------|-----------|
| 0 | 0 | Relay 1 Status | Yes |
| | 1 | Relay 2 Status | Yes |
| | 2 | Relay 3 Status | Yes |
| | 3 | Relay 4 Status | Yes |
| | 4 | External Relay 5 Status | Yes |
| | 5 | External Relay 6 Status | Yes |
| | 6 | External Relay 7 Status | Yes |
| | 7 | External Relay 8 Status | Yes |

2.2.2 Read Discrete Input Register

Following values can be read from the discrete input register:

| Input Position | Name | Read Only |
|----------------|---------------|-----------|
| 0 | Field Input 1 | Yes |
| 1 | Field Input 2 | Yes |
| 2 | Field Input 3 | Yes |
| 3 | Field Input 4 | Yes |
| 4 | Field Input 5 | Yes |

| | | |
|---------|-------------------------|-----|
| 5 | Field Input 6 | Yes |
| 6 | Field Input 7 | Yes |
| 7 | Reserved | Yes |
| 8 | External Field Input 8 | Yes |
| 9 | External Field Input 9 | Yes |
| 10 | External Field Input 10 | Yes |
| 11 | External Field Input 11 | Yes |
| 12 | External Field Input 12 | Yes |
| 13 | External Field Input 13 | Yes |
| 14 | External Field Input 14 | Yes |
| 15 | External Field Input 15 | Yes |
| 16 ~ 23 | Analogue 1 Input | Yes |
| 24 ~ 31 | Analogue 2 Input | Yes |

2.2.3 Read Holding Registers

Following values can be read from the holding register:

| Addr | Bit Position | Name | Read Only |
|------|--------------|--|-----------|
| 0 | 0 ~ 15 | PLC Inputs (Bits from SCADA to NC Relay) | No |
| 1 | 0 ~ 7 | Analogue Out Channel 1 (SCADA to NC Relay) | No |
| | 8 ~ 15 | Analogue Out Channel 2 (SCADA to NC Relay) | No |
| 2 | 0 ~ 15 | Setting Password. | No |
| 3 | 0 ~ 7 | Maximum Load 1 (4 ~ 100 %) | No * |
| | 8 ~ 15 | Maximum Load 0 (4 ~ 100 %) | No * |
| 4 | 0 ~ 7 | Thermal Class Curve 1 (3 ~ 40 Sec) | No * |
| | 8 ~ 15 | Thermal Class Curve 0 (3 ~ 40 Sec) | No * |
| 5 | 0 ~ 15 | CT Primary Ratio (1 ~ 1000) | No * |
| 6 | 0 ~ 7 | Modal Setting 0 = NC1 1 = NC 5 2 = NC 25 3 = NC 50 4 = NC 100 5 = NC 300 | No * |
| | 8 ~ 15 | CT Secondary Ratio (1 ~ 9) | No * |
| 7 | 0 ~ 7 | Voltage Symmetry Trip Level. (60 ~ 100 %) | No * |

| Addr | Bit Position | Name | Read Only |
|------|--------------|--|--------------|
| | 8 ~ 15 | Line Voltage Selection 0 = 110 V 1 = 380 V 2 = 400 V 3 = 525 V 4 = 550 V 5 = 680 V 6 = 950 V 7 = 1100 V 8 = 3k3 V / 110 V 9 = 6k6 V / 110 V 10 = 11kV / 110 V 11 = 120 V. 12 = 127 V. 13 = 190 V 14 = 208 V 15 = 220 V 16 = 230 V 17 = 240 V 18 = 277 V 19 = 347 V 20 = 415 V 21 = 440 V 22 = 460 V 23 = 480 V 24 = 600 V 25 = 1050 V 26 = 2200 V | No * (*1) |
| 8 | 0 ~ 7 | Voltage Low Trip Level (0 ~ 15 %) | No * |
| | 8 ~ 15 | Voltage High Trip Level (0 ~ 15 %) | No * |
| 9 | 0 ~ 7 | Unbalance Trip Time (1 ~ 10 Sec) | No * |
| | 8 ~ 15 | Unbalance Trip Level (0 ~ 50 %) | No * |
| 10 | 0 ~ 7 | Minimum Load Startup Delay Time (0 ~ 200 Sec) | No * |
| | 8 ~ 15 | Minimum Load Trip Time (1 ~ 10 Sec) | No * |
| 11 | 0 ~ 7 | Minimum Load Current Trip Level (10 ~ 100 %) | No * |
| | 8 ~ 15 | Minimum Load Reset Time 0 = Manual 1 = 10 Seconds 2 = 5 Minutes 3 = 10 Minutes 4 = 20 Minutes 5 = 30 Minutes 6 = 45 Minutes 7 = 1 Hour 8 = 3 Hours 9 = 6 Hours | No * |

| Addr | Bit Position | Name | Read Only |
|------|--|---|-----------|
| 12 | 0 ~ 7 | Earth Leakage Trip Type 0 = Instantaneous Time 1 = Inverse Definite Minimum Time | No * |
| | 8 ~ 15 | Minimum Load Power Factor Trip Level (10 ~ 100 %) | No * |
| 13 | 0 ~ 15 | Earth Leakage Trip Level (30 ~ 999 mA) | No * |
| 14 | 0 ~ 15 | Earth Leakage Trip Time (100 ~ 1000 ms, 50ms increment) | No * |
| 15 | 0 ~ 15 | Running Stall Trip Level (110 ~ 300 %) | No * |
| 16 | 0 ~ 15 | Running Stall Trip Time (100 ~ 2000 ms) | No * |
| 17 | 0 ~ 7 | Thermal Capacity Reset Level (0 ~ 99 %) | No * |
| | 8 ~ 15 | Running Stall Hold-Off Time (0 ~ 200 Sec) | No * |
| 18 | 0 ~ 7 | Number Of Consecutive Starts (1 ~ 3) | No * |
| | 8 ~ 15 | Starts Per Hour (1 ~ 60) | No * |
| 19 | 0 | Control Byte B = Single Phase Enabled | No * |
| | 1 | Control Byte B = Running Stall Enabled | No * |
| | 2 | Control Byte B = Minimum Load Trip Type 0 = Load Trip Level 1 = Power Factor Trip Level | No * |
| | 3 | Control Byte B = Earth Leakage Enabled | No * |
| | 4 | Control Byte B = Vacuum Fail Enabled | No * |
| | 5 | Control Byte B = Isolation Lockout Enabled | No * |
| | 6 | Control Byte B = Frequency Trip Enabled | No * |
| | 7 | Control Byte B = Thermal Auto Calculate Reset Enabled | No * |
| | 8 | Control Byte A = Minimum Load Enabled | No * |
| | 9 | Control Byte A = Under Voltage Enabled | No * |
| | 10 | Control Byte A = Over Voltage Enabled | No * |
| | 11 | Control Byte A = Voltage Symmetry Enabled | No * |
| | 12 | Control Byte A = Fail Safe Selected | No * |
| | 13 | Control Byte A = Unbalance Enabled | No * |
| | 14 | Control Byte A = Phase Rotation Enabled | No * |
| 15 | Control Byte A = Short Circuit Enabled | No * | |
| 20 | 0 | Control Byte D = RTD 1 Enabled | No * |
| | 1 | Control Byte D = RTD 2 Enabled | No * |
| | 2 | Control Byte D = RTD 3 Enabled | No * |
| | 3 | Control Byte D = RTD 4 Enabled | No * |
| | 4 | Control Byte D = Analogue In 1 Enabled | No * |
| | 5 | Control Byte D = Analogue In 2 Enabled | No * |
| | 6 | Control Byte D = Analogue Out 1 Enabled | No * |
| | 7 | Control Byte D = Analogue Out 2 Enabled | No * |
| | 8 | Control Byte C = Starts Per Hour Enabled | No * |
| | 9 | Control Byte C = Voltage Phase Rotation RWB | No * |
| | 10 | Control Byte C = Vectorial Stall Enabled | No * |
| | 11 | Control Byte C = Auto Thermal Reset Enabled | No * |
| | 12 | Control Byte C = Relay 1 Not Main Trip | No * |
| | 13 | Control Byte C = External I/O Module Connected | No * |
| | 14 | Control Byte C = FLED Connected | No * |
| 15 | Control Byte C = Reserved | No * | |

| Addr | Bit Position | Name | Read Only |
|------|--------------|--|-----------|
| 21 | 0 ~ 1 | RTD Type 1 0 = PT 100 1 = PT 1000 2 = PTC 3 = NTC | |
| | 2 ~ 3 | RTD Type 2 0 = PT 100 1 = PT 1000 2 = PTC 3 = NTC | No * |
| | 4 ~ 5 | RTD Type 3 0 = PT 100 1 = PT 1000 2 = PTC 3 = NTC | No * |
| | 6 ~ 7 | RTD Type 4 0 = PT 100 1 = PT 1000 2 = PTC 3 = NTC | No * |
| | 8 ~ 15 | Starter Type 0 = Protection Relay 1 = Direct On line 2 = Reversal Direct On Line 3 = Star – Delta 4 = Reversal Star – Delta 5 = Dahlander 6 = Reversal Dahlander 7 = Pole Changing 8 = Reversal Pole Changing 9 = Soft Starter 10 = Reversal Soft Starter 11 = Oil Circuit Breaker Direct Online | No * |
| 22 | 0 ~ 15 | Field Input 1 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 23 | 0 ~ 15 | Field Input 2 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 24 | 0 ~ 15 | Field Input 3 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 25 | 0 ~ 15 | Field Input 4 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 26 | 0 ~ 15 | Field Input 5 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 27 | 0 ~ 15 | Field Input 6 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 28 | 0 ~ 15 | Field Input 7 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 29 | 0 ~ 15 | Field Input 8 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 30 | 0 ~ 15 | Field Input 9 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 31 | 0 ~ 15 | Field Input 10 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 32 | 0 ~ 15 | Field Input 11 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 33 | 0 ~ 15 | Field Input 12 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 34 | 0 ~ 15 | Field Input 13 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 35 | 0 ~ 15 | Field Input 14 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |
| 36 | 0 ~ 15 | Field Input 15 Delay (0 ~ 2000 ms, 50 ms incremental) | No * |

| Addr | Bit Position | Name | Read Only |
|------|--------------|----------------------------------|-----------|
| 37 | 0 ~ 7 | RTD 1 High Alarm Level | No * |
| | 8 ~ 15 | RTD 1 High Trip Level | No * |
| 38 | 0 ~ 7 | RTD 1 Lo Alarm Level | No * |
| | 8 ~ 15 | RTD 1 Lo Trip Level | No * |
| 39 | 0 ~ 7 | RTD 2 High Alarm Level | No * |
| | 8 ~ 15 | RTD 2 High Trip Level | No * |
| 40 | 0 ~ 7 | RTD 2 Lo Alarm Level | No * |
| | 8 ~ 15 | RTD 2 Lo Trip Level | No * |
| 41 | 0 ~ 7 | RTD 3 High Alarm Level | No * |
| | 8 ~ 15 | RTD 3 High Trip Level | No * |
| 42 | 0 ~ 7 | RTD 3 Lo Alarm Level | No * |
| | 8 ~ 15 | RTD 3 Lo Trip Level | No * |
| 43 | 0 ~ 7 | RTD 4 High Alarm Level | No * |
| | 8 ~ 15 | RTD 4 High Trip Level | No * |
| 44 | 0 ~ 7 | RTD 4 Lo Alarm Level | No * |
| | 8 ~ 15 | RTD 4 Lo Trip Level | No * |
| 45 | 0 ~ 7 | Analogue In 1 High Trip Level | No * |
| | 8 ~ 15 | Analogue In 1 High Alarm Level | No * |
| 46 | 0 ~ 7 | Analogue In 1 Lo Trip Level | No * |
| | 8 ~ 15 | Analogue In 1 Lo Alarm Level | No * |
| 47 | 0 ~ 7 | Analogue In 2 High Trip Level | No * |
| | 8 ~ 15 | Analogue In 2 High Alarm Level | No * |
| 48 | 0 ~ 7 | Analogue In 2 Lo Trip Level | No * |
| | 8 ~ 15 | Analogue In 2 Lo Alarm Level | No * |
| 49 | 0 ~ 7 | Analogue Out 1 High Trip Level | No * |
| | 8 ~ 15 | Analogue Out 1 High Alarm Level | No * |
| 50 | 0 ~ 7 | Analogue Out 1 Lo Trip Level | No * |
| | 8 ~ 15 | Analogue Out 1 Lo Alarm Level | No * |
| 51 | 0 ~ 7 | Analogue Out 2 High Trip Level | No * |
| | 8 ~ 15 | Analogue Out 2 High Alarm Level | No * |
| 52 | 0 ~ 7 | Analogue Out 2 Lo Trip Level | No * |
| | 8 ~ 15 | Analogue Out 2 Lo Alarm Level | No * |
| 53 | 0 ~ 7 | Logic Function 1 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 1 Mask | No * |
| 54 | 0 ~ 7 | Logic Function 1 Input C Pointer | No * |
| | 8 ~ 15 | Logic Function 1 Input B Pointer | No * |
| 55 | 0 ~ 7 | Logic Function 2 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 2 Mask | No * |
| 56 | 0 ~ 7 | Logic Function 2 Input C Pointer | No * |
| | 8 ~ 15 | Logic Function 2 Input B Pointer | No * |
| 57 | 0 ~ 7 | Logic Function 3 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 3 Mask | No * |
| 58 | 0 ~ 7 | Logic Function 3 Input C Pointer | No * |
| | 8 ~ 15 | Logic Function 3 Input B Pointer | No * |
| 59 | 0 ~ 7 | Logic Function 4 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 4 Mask | No * |
| 60 | 0 ~ 7 | Logic Function 4 Input C Pointer | No * |

| Addr | Bit Position | Name | Read Only |
|------|--------------|---|-----------|
| | 8 ~ 15 | Logic Function 4 Input B Pointer | No * |
| 61 | 0 ~ 7 | Logic Function 5 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 5 Mask | No * |
| 62 | 0 ~ 7 | Logic Function 5 Input C Pointer | No * |
| | 8 ~ 15 | Logic Function 5 Input B Pointer | No * |
| 63 | 0 ~ 7 | Logic Function 6 Input A Pointer | No * |
| | 8 ~ 15 | Logic Function 6 Mask | No * |
| 64 | 0 ~ 7 | Logic Function 6 Input C Pointer | No * |
| | 8 ~ 15 | Logic Function 6 Input B Pointer | No * |
| 65 | 0 ~ 15 | Timer A timeout (1 ~ 3000 Sec) | No * |
| 66 | 0 ~ 7 | Timer A Reset Input Pointer | No * |
| | 8 ~ 15 | Timer A Start Input Pointer | No * |
| 67 | 0 ~ 15 | Timer B timeout (1 ~ 3000 Sec) | No * |
| 68 | 0 ~ 7 | Timer B Reset Input Pointer | No * |
| | 8 ~ 15 | Timer B Start Input Pointer | No * |
| 69 | 0 ~ 7 | Counter A Count Up Input Pointer | No * |
| | 8 ~ 15 | Counter A Count Limit | No * |
| 70 | 0 ~ 7 | Counter A Reset Input Pointer | No * |
| | 8 ~ 15 | Counter A Count Down Input Pointer | No * |
| 71 | 0 ~ 7 | Counter B Count Up Input Pointer | No * |
| | 8 ~ 15 | Counter B Count Limit | No * |
| 72 | 0 ~ 7 | Counter B Reset Input Pointer | No * |
| | 8 ~ 15 | Counter B Count Down Input Pointer | No * |
| 73 | 0 ~ 7 | Pulse Generator Input Pointer | No * |
| | 8 ~ 15 | Status Reporter Input Pointer | No * |
| 74 | 0 ~ 7 | Latch A Reset Input Pointer | No * |
| | 8 ~ 15 | Latch A Set Input Pointer | No * |
| 75 | 0 ~ 7 | Latch B Reset Input Pointer | No * |
| | 8 ~ 15 | Latch B Set Input Pointer | No * |
| 76 | 0 ~ 7 | Pulse Generator Duty Cycle (1 ~ 99 %) | No * |
| | 8 ~ 15 | Pulse Generator Period (1 ~ 240 min) | No * |
| 77 | 0 ~ 7 | RTC Start Time Minutes | No * |
| | 8 ~ 15 | RTC Start Time Hours | No * |
| 78 | 0 ~ 7 | RTC Stop Time Minutes | No * |
| | 8 ~ 15 | RTC Stop Time Hours | No * |
| 79 | 0 ~ 7 | Relay 2 Input Pointer | No * |
| | 8 ~ 15 | Relay 1 Input Pointer | No * |
| 80 | 0 ~ 7 | Relay 4 Input Pointer | No * |
| | 8 ~ 15 | Relay 3 Input Pointer | No * |
| 81 | 0 ~ 7 | External Relay 6 Input Pointer | No * |
| | 8 ~ 15 | External Relay 5 Input Pointer | No * |
| 82 | 0 ~ 7 | External Relay 8 Input Pointer | No * |
| | 8 ~ 15 | External Relay 7 Input Pointer | No * |
| 83 | 0 ~ 7 | Thermal Capacity Warning Level | No * |
| | 8 ~ 15 | External Reset Input Pointer | No * |
| 84 | 0 ~ 7 | Starter Input Select msb Input Pointer | No * |
| | 8 ~ 15 | Starter Input Select lsb Input Pointer | No * |

| Addr | Bit Position | Name | Read Only |
|------|--------------|---|-----------|
| 85 | 0 ~ 7 | Starter Local - Start Slow Forward Input Pointer | No * |
| | 8 ~ 15 | Starter Local - Start Fast Forward Input Pointer | No * |
| 86 | 0 ~ 7 | Starter Local - Start Slow Reversal Input Pointer | No * |
| | 8 ~ 15 | Starter Local - Start Fast Reversal Input Pointer | No * |
| 87 | 0 ~ 7 | Starter Local - Start Stop Input Pointer | No * |
| | 8 ~ 15 | Starter Local - Start Interlock Input Pointer | No * |
| 88 | 0 ~ 7 | Starter Remote - Start Slow Forward Input Pointer | No * |
| | 8 ~ 15 | Starter Remote - Start Fast Forward Input Pointer | No * |
| 89 | 0 ~ 7 | Starter Remote - Start Slow Reversal Input Pointer | No * |
| | 8 ~ 15 | Starter Remote - Start Fast Reversal Input Pointer | No * |
| 90 | 0 ~ 7 | Starter Remote - Start Stop Input Pointer | No * |
| | 8 ~ 15 | Starter Remote - Start Interlock Input Pointer | No * |
| 91 | 0 ~ 7 | Starter Auto - Start Slow Forward Input Pointer | No * |
| | 8 ~ 15 | Starter Auto - Start Fast Forward Input Pointer | No * |
| 92 | 0 ~ 7 | Starter Auto - Start Slow Reversal Input Pointer | No * |
| | 8 ~ 15 | Starter Auto - Start Fast Reversal Input Pointer | No * |
| 93 | 0 ~ 7 | Starter Auto - Start Stop Input Pointer | No * |
| | 8 ~ 15 | Starter Auto - Start Interlock Input Pointer | No * |
| 94 | 0 ~ 7 | Execution Timer (0 ~ 10 Sec) | No * |
| | 8 ~ 15 | Feedback Input Pointer | No * |
| 95 | 0 ~ 15 | Pre Start Warning Timer (0 ~ 999 Sec) | No * |
| 96 | 0 ~ 15 | Feedback Timer (0 ~ 2000 ms, 50 ms Incremental) | No * |
| 97 | 0 ~ 15 | Backspin Timer (0 ~ 999 Sec) | No * |
| 98 | 0 ~ 15 | DC Break Timer (0 ~ 2000ms, 50 ms Incremental) | No * |
| 99 | 0 ~ 15 | Restart Timer (0 ~ 600 Sec) | No * |
| 100 | 0 ~ 15 | Star Max Timer (1 ~ 50 Sec) | No * |
| 101 | 0 ~ 15 | Transition Timer (0 ~ 2000ms, 50 ms Incremental) | No * |
| 102 | 0 ~ 15 | Unauthorized Current Timer (0 ~ 2000ms, 50 ms Incremental) | No * |
| 103 | 0 ~ 7 | RTC Month | No * |
| | 8 ~ 15 | RTC Year | No * |
| 104 | 0 ~ 7 | Reserved | No * |
| | 8 ~ 15 | RTC Day | No * |
| 105 | 0 ~ 7 | RTC Minutes | No * |
| | 8 ~ 15 | RTC Hours | No * |

* Password needs to be unlocked with writing 0x5AA5 hexadecimal to register 2.

| Addr | Bit Position | Name | Read Only |
|------|--------------|----------------------------|-----------|
| 1000 | 0 ~ 7 | Heart Beat | Yes |
| | 8 ~ 15 | Thermal Capacity Remaining | Yes |
| 1001 | 0 ~ 15 | Load Red Phase | Yes |
| 1002 | 0 ~ 15 | Load White Phase | Yes |
| 1003 | 0 ~ 15 | Load Blue Phase | Yes |
| 1004 | 0 ~ 15 | Phase Voltage Red Phase | Yes |
| 1005 | 0 ~ 15 | Phase Voltage White Phase | Yes |
| 1006 | 0 ~ 15 | Phase Voltage Blue Phase | Yes |
| 1007 | 0 ~ 15 | Load Sum | Yes |

| Addr | Bit Position | Name | Read Only |
|---------|--------------------------|------------------------------------|-----------|
| 1008 | 0 ~ 15 | Line Voltage | Yes |
| 1009 | 0 ~ 15 | Earth Leakage Level | Yes |
| 1010 | 0 ~ 7 | Voltage Symmetry Level | Yes |
| | 8 ~ 15 | Current Unbalance Level | Yes |
| 1011 | 0 ~ 7 | Frequency Level | Yes |
| | 8 ~ 15 | Power Factor Level | Yes |
| 1012 | 0 ~ 15 | Insulation Level | Yes |
| 1013 | 0 ~ 7 | Thermal Curve Selected | Yes |
| | 8 ~ 15 | Maximum Load Current Selected | Yes |
| 1014 | 0 ~ 7 | RTD 2 Level | Yes |
| | 8 ~ 15 | RTD 1 Level | Yes |
| 1015 | 0 ~ 7 | RTD 4 Level | Yes |
| | 8 ~ 15 | RTD 3 Level | Yes |
| 1016 | 0 ~ 7 | Analogue Channel 2 In | Yes |
| | 8 ~ 15 | Analogue Channel 1 In | Yes |
| 1017 | 0 ~ 7 | Analogue Channel 2 Out | Yes |
| | 8 ~ 15 | Analogue Channel 1 Out | Yes |
| 1018 | 0 | Alarm Flags A – Voltage Present | Yes |
| | 1 | Alarm Flags A – Over Voltage | Yes |
| | 2 | Alarm Flags A – Under Voltage | Yes |
| | 3 | Alarm Flags A – Voltage Symmetry | Yes |
| | 4 | Alarm Flags A – Insulation Lockout | Yes |
| | 5 | Alarm Flags A – Low Frequency | Yes |
| | 6 | Alarm Flags A – High Frequency | Yes |
| | 7 | Alarm Flags A – Earth Fault | Yes |
| | 8 | Alarm Flags A – In Service | Yes |
| | 9 | Alarm Flags A – Earth Leakage | Yes |
| | 10 | Alarm Flags A – Over Current | Yes |
| | 11 | Alarm Flags A – Running Stall | Yes |
| | 12 | Alarm Flags A – Unbalance | Yes |
| | 13 | Alarm Flags A – Single Phase | Yes |
| | 14 | Alarm Flags A – Minimum Load | Yes |
| | 15 | Alarm Flags A – Short Circuit | Yes |
| 1019 | 0 | Alarm Flags B – RTD 1 Hi | Yes |
| | 1 | Alarm Flags B – RTD 1 Lo | Yes |
| | 2 | Alarm Flags B – RTD 2 Hi | Yes |
| | 3 | Alarm Flags B – RTD 2 Lo | Yes |
| | 4 | Alarm Flags B – RTD 3 Hi | Yes |
| | 5 | Alarm Flags B – RTD 3 Lo | Yes |
| | 6 | Alarm Flags B – RTD 4 Hi | Yes |
| | 7 | Alarm Flags B – RTD 4 Lo | Yes |
| | 8 | Alarm Flags B – Vectorial Stall | Yes |
| | 9 | Alarm Flags B – Frozen Contact | Yes |
| 10 ~ 15 | Alarm Flags B – Reserved | Yes | |
| 1020 | 0 ~ 7 | Alarm Flags C – Reserved | Yes |
| | 8 | Alarm Flags C – Analogue In 1 Hi | Yes |
| | 9 | Alarm Flags C – Analogue In 1 Lo | Yes |

| Addr | Bit Position | Name | Read Only |
|------|--------------|-------------------------------------|-----------|
| | 10 | Alarm Flags C – Analogue In 2 Hi | Yes |
| | 11 | Alarm Flags C – Analogue In 2 Lo | Yes |
| | 12 | Alarm Flags C – Analogue Out 1 Hi | Yes |
| | 13 | Alarm Flags C – Analogue Out 1 Lo | Yes |
| | 14 | Alarm Flags C – Analogue Out 2 Hi | Yes |
| | 15 | Alarm Flags C – Analogue Out 2 Lo | Yes |
| 1021 | 0 ~ 15 | Reserved | Yes |
| 1022 | 0 | Trip Flags A – Over Voltage | Yes |
| | 1 | Trip Flags A – Under Voltage | Yes |
| | 2 | Trip Flags A – Voltage Symmetry | Yes |
| | 3 | Trip Flags A – Insulation Lockout | Yes |
| | 4 | Trip Flags A – Low Frequency | Yes |
| | 5 | Trip Flags A – High Frequency | Yes |
| | 6 | Trip Flags A – Earth Fault | Yes |
| | 7 | Trip Flags A – Starts Per Hour | Yes |
| | 8 | Trip Flags A – Over Current | Yes |
| | 9 | Trip Flags A – Running Stall | Yes |
| | 10 | Trip Flags A – Unbalance | Yes |
| | 11 | Trip Flags A – Single Phase | Yes |
| | 12 | Trip Flags A – Minimum Load | Yes |
| | 13 | Trip Flags A – Short Circuit | Yes |
| | 14 | Trip Flags A – Phase Rotation | Yes |
| | 15 | Trip Flags A – Earth Leakage | Yes |
| 1023 | 0 | Trip Flags B – RTD 1 Hi | Yes |
| | 1 | Trip Flags B – RTD 1 Lo | Yes |
| | 2 | Trip Flags B – RTD 2 Hi | Yes |
| | 3 | Trip Flags B – RTD 2 Lo | Yes |
| | 4 | Trip Flags B – RTD 3 Hi | Yes |
| | 5 | Trip Flags B – RTD 3 Lo | Yes |
| | 6 | Trip Flags B – RTD 4 Hi | Yes |
| | 7 | Trip Flags B – RTD 4 Lo | Yes |
| | 8 | Trip Flags B – System Failure | Yes |
| | 9 | Trip Flags B – Vectorial Stall | Yes |
| | 10 | Trip Flags B – Frozen Contact | Yes |
| | 11 | Trip Flags B – Execution Fault | Yes |
| | 12 | Trip Flags B – Feedback Fault | Yes |
| | 13 | Trip Flags B – Unauthorized Current | Yes |
| | 14 ~ 15 | Trip Flags B – Reserved | Yes |
| 1024 | 0 ~ 7 | Reserved | Yes |
| | 8 | Trip Flags C – Analogue In 1 Hi | Yes |
| | 9 | Trip Flags C – Analogue In 1 Lo | Yes |
| | 10 | Trip Flags C – Analogue In 2 Hi | Yes |
| | 11 | Trip Flags C – Analogue In 2 Lo | Yes |
| | 12 | Trip Flags C – Analogue Out 1 Hi | Yes |
| | 13 | Trip Flags C – Analogue Out 1 Lo | Yes |
| | 14 | Trip Flags C – Analogue Out 2 Hi | Yes |
| | 15 | Trip Flags C – Analogue Out 2 Lo | Yes |

| Addr | Bit Position | Name | Read Only |
|------|----------------------------------|--|-----------|
| 1025 | 0 ~ 15 | Reserved | Yes |
| 1026 | 0 | Warning Flags A – Analogue In 1 Hi | Yes |
| | 1 | Warning Flags A – Analogue In 1 Lo | Yes |
| | 2 | Warning Flags A – Analogue In 2 Hi | Yes |
| | 3 | Warning Flags A – Analogue In 2 Lo | Yes |
| | 4 | Warning Flags A – Analogue Out 1 Hi | Yes |
| | 5 | Warning Flags A – Analogue Out 1 Lo | Yes |
| | 6 | Warning Flags A – Analogue Out 2 Hi | Yes |
| | 7 | Warning Flags A – Analogue Out 2 Lo | Yes |
| | 8 | Warning Flags A – RTD 1 Hi | Yes |
| | 9 | Warning Flags A – RTD 1 Lo | Yes |
| | 10 | Warning Flags A – RTD 2 Hi | Yes |
| | 11 | Warning Flags A – RTD 2 Lo | Yes |
| | 12 | Warning Flags A – RTD 3 Hi | Yes |
| | 13 | Warning Flags A – RTD 3 Lo | Yes |
| | 14 | Warning Flags A – RTD 4 Hi | Yes |
| 15 | Warning Flags A – RTD 4 Lo | Yes | |
| 1027 | 0 ~ 15 | Reserved | Yes |
| 1028 | 0 | Logic Flags A – Timer A Output | Yes |
| | 1 | Logic Flags A – Timer B Output | Yes |
| | 2 | Logic Flags A – Real Time Clock Output | Yes |
| | 3 | Logic Flags A – Relay 1 Output | Yes |
| | 4 | Logic Flags A – Relay 2 Output | Yes |
| | 5 | Logic Flags A – Relay 3 Output | Yes |
| | 6 | Logic Flags A – Relay 4 Output | Yes |
| | 7 | Logic Flags A – Counter A Output | Yes |
| | 8 | Logic Flags A – Logic Function 1 Output | Yes |
| | 9 | Logic Flags A – Logic Function 2 Output | Yes |
| | 10 | Logic Flags A – Logic Function 3 Output | Yes |
| | 11 | Logic Flags A – Logic Function 4 Output | Yes |
| | 12 | Logic Flags A – Logic Function 5 Output | Yes |
| | 13 | Logic Flags A – Logic Function 6 Output | Yes |
| | 14 | Logic Flags A – Simulation Active | Yes |
| 15 | Logic Flags A – Counter B Output | Yes | |
| 1029 | 0 | Logic Flags B – Starter Output 1 | Yes |
| | 1 | Logic Flags B – Starter Output 2 | Yes |
| | 2 | Logic Flags B – Starter Output 3 | Yes |
| | 3 | Logic Flags B – Starter Output 4 | Yes |
| | 4 | Logic Flags B – Starter Output 5 | Yes |
| | 5 | Logic Flags B – Reserved | Yes |
| | 6 | Logic Flags B – Local Selection Bit lsb. | Yes |
| | 7 | Logic Flags B – Local Selection Bit msb | Yes |
| | 8 | Logic Flags B – Field Input 1 | Yes |
| | 9 | Logic Flags B – Field Input 2 | Yes |
| | 10 | Logic Flags B – Field Input 3 | Yes |
| | 11 | Logic Flags B – Field Input 4 | Yes |
| | 12 | Logic Flags B – Field Input 5 | Yes |

| Addr | Bit Position | Name | Read Only |
|------|---|--|-----------|
| | 13 | Logic Flags B – Field Input 6 | Yes |
| | 14 | Logic Flags B – Field Input 7 | Yes |
| | 15 | Logic Flags B – Reserved | Yes |
| 1030 | 0 | Logic Flags C – PLC Input (Control) Bit 8 | Yes |
| | 1 | Logic Flags C – PLC Input (Control) Bit 9 | Yes |
| | 2 | Logic Flags C – PLC Input (Control) Bit 10 | Yes |
| | 3 | Logic Flags C – PLC Input (Control) Bit 11 | Yes |
| | 4 | Logic Flags C – PLC Input (Control) Bit 12 | Yes |
| | 5 | Logic Flags C – PLC Input (Control) Bit 13 | Yes |
| | 6 | Logic Flags C – PLC Input (Control) Bit 14 | Yes |
| | 7 | Logic Flags C – PLC Input (Control) Bit 15 | Yes |
| | 8 | Logic Flags C – PLC Input (Control) Bit 0 | Yes |
| | 9 | Logic Flags C – PLC Input (Control) Bit 1 | Yes |
| | 10 | Logic Flags C – PLC Input (Control) Bit 2 | Yes |
| | 11 | Logic Flags C – PLC Input (Control) Bit 3 | Yes |
| | 12 | Logic Flags C – PLC Input (Control) Bit 4 | Yes |
| | 13 | Logic Flags C – PLC Input (Control) Bit 5 | Yes |
| | 14 | Logic Flags C – PLC Input (Control) Bit 6 | Yes |
| 15 | Logic Flags C – PLC Input (Control) Bit 7 | Yes | |
| 1031 | 0 | Logic Flags D – Pre Start Warning Signal | Yes |
| | 1 | Logic Flags D – DC Break Active | Yes |
| | 2 | Logic Flags D – Transition Active | Yes |
| | 3 | Logic Flags D – Backspin Active | Yes |
| | 4 | Logic Flags D – Reserved | Yes |
| | 5 | Logic Flags D – Latch Output B | Yes |
| | 6 | Logic Flags D – Reserved | Yes |
| | 7 | Logic Flags D – TC Warning Level | Yes |
| | 8 | Logic Flags D – Timer A Pulse Output | Yes |
| | 9 | Logic Flags D – Timer B Pulse Output | Yes |
| | 10 | Logic Flags D – Status Reporter Output | Yes |
| | 11 | Logic Flags D – Latch Output A | Yes |
| | 12 | Logic Flags D – Relay 5 | Yes |
| | 13 | Logic Flags D – Relay 6 | Yes |
| | 14 | Logic Flags D – Relay 7 | Yes |
| 15 | Logic Flags D – Relay 8 | Yes | |
| 1032 | 0 ~ 7 | Reserved | Yes |
| | 8 | Logic Flags E – Field Input 8 | Yes |
| | 9 | Logic Flags E – Field Input 9 | Yes |
| | 10 | Logic Flags E – Field Input 10 | Yes |
| | 11 | Logic Flags E – Field Input 11 | Yes |
| | 12 | Logic Flags E – Field Input 12 | Yes |
| | 13 | Logic Flags E – Field Input 13 | Yes |
| | 14 | Logic Flags E – Field Input 14 | Yes |
| 15 | Logic Flags E – Field Input 15 | Yes | |
| 1033 | 0 ~ 15 | Reserved | Yes |
| 1034 | 0 ~ 7 | Counter B | Yes |
| | 8 ~ 15 | Counter A | Yes |

| Addr | Bit Position | Name | Read Only |
|------|--------------|--|-----------|
| 1035 | 0 ~ 15 | Reserved | Yes |
| 1036 | 0 ~ 15 | Start Up Counter | Yes |
| 1037 | 0 ~ 15 | Trip Counter | Yes |
| 1038 | 0 ~ 15 | Motor Running Hour Counter | Yes |
| 1039 | 0 ~ 15 | Load Running Hour Counter | Yes |
| 1040 | 0 ~ 15 | Relay On Hour Counter | Yes |
| 1041 | 0 ~ 15 | Active Power Used | Yes |
| 1042 | 0 ~ 15 | Reactive Power Used | Yes |
| 1043 | 0 ~ 7 | Start Up Date – Month | Yes |
| | 8 ~ 15 | Start Up Date – Year | Yes |
| 1044 | 0 ~ 7 | Reserved | Yes |
| | 8 ~ 15 | Start Up Date – Day | Yes |
| 1045 | 0 ~ 7 | Start Up Date – Minutes | Yes |
| | 8 ~ 15 | Start Up Date – Hours | Yes |
| 1046 | 0 ~ 7 | Real Time Clock – Month | Yes |
| | 8 ~ 15 | Real Time Clock – Year | Yes |
| 1047 | 0 ~ 7 | Reserved | Yes |
| | 8 ~ 15 | Real Time Clock – Day | Yes |
| 1048 | 0 ~ 7 | Real Time Clock – Minutes | Yes |
| | 8 ~ 15 | Real Time Clock – Hours | Yes |
| 1049 | 0 ~ 7 | Modbus Address | Yes |
| | 8 ~ 15 | Reserved | Yes |
| 1050 | 0 ~ 15 | CT Primary Ratio (1 ~ 1000) | Yes |
| 1051 | 0 ~ 7 | Modal Setting 0 = NC1 1 = NC 5 2 = NC 25 3 = NC 50 4 = NC 100 5 = NC 300 | Yes |
| | 8 ~ 15 | CT Secondary Ratio (1 ~ 9) | Yes |
| 1052 | 0 | Logic Flags C – PLC Input (Control) Bit 0 | Yes |
| | 1 | Logic Flags C – PLC Input (Control) Bit 1 | Yes |
| | 2 | Logic Flags C – PLC Input (Control) Bit 2 | Yes |
| | 3 | Logic Flags C – PLC Input (Control) Bit 3 | Yes |
| | 4 | Logic Flags C – PLC Input (Control) Bit 4 | Yes |
| | 5 | Logic Flags C – PLC Input (Control) Bit 5 | Yes |
| | 6 | Logic Flags C – PLC Input (Control) Bit 6 | Yes |
| | 7 | Logic Flags C – PLC Input (Control) Bit 7 | Yes |
| | 8 | Logic Flags C – PLC Input (Control) Bit 8 | Yes |
| | 9 | Logic Flags C – PLC Input (Control) Bit 9 | Yes |
| | 10 | Logic Flags C – PLC Input (Control) Bit 10 | Yes |
| | 11 | Logic Flags C – PLC Input (Control) Bit 11 | Yes |
| | 12 | Logic Flags C – PLC Input (Control) Bit 12 | Yes |
| | 13 | Logic Flags C – PLC Input (Control) Bit 13 | Yes |
| | 14 | Logic Flags C – PLC Input (Control) Bit 14 | Yes |
| | 15 | Logic Flags C – PLC Input (Control) Bit 15 | Yes |

*1 = Voltage selection 11 to 26 is only available on NewCode-MK2 revision 05C and greater.

2.2.4 Read Input Registers

Following values can be read from the input register:

| Addr | Bit Position | Name | Read Only |
|------|------------------------------|------------------------------------|-----------|
| 0 | 0 ~ 7 | Heart Beat | Yes |
| | 8 ~ 15 | Thermal Capacity Remaining | Yes |
| 1 | 0 ~ 15 | Load Red Phase | Yes |
| 2 | 0 ~ 15 | Load White Phase | Yes |
| 3 | 0 ~ 15 | Load Blue Phase | Yes |
| 4 | 0 ~ 15 | Phase Voltage Red Phase | Yes |
| 5 | 0 ~ 15 | Phase Voltage White Phase | Yes |
| 6 | 0 ~ 15 | Phase Voltage Blue Phase | Yes |
| 7 | 0 ~ 15 | Load Sum | Yes |
| 8 | 0 ~ 15 | Line Voltage | Yes |
| 9 | 0 ~ 15 | Earth Leakage Level | Yes |
| 10 | 0 ~ 7 | Voltage Symmetry Level | Yes |
| | 8 ~ 15 | Current Unbalance Level | Yes |
| 11 | 0 ~ 7 | Frequency Level | Yes |
| | 8 ~ 15 | Power Factor Level | Yes |
| 12 | 0 ~ 15 | Insulation Level | Yes |
| 13 | 0 ~ 7 | Thermal Curve Selected | Yes |
| | 8 ~ 15 | Maximum Load Current Selected | Yes |
| 14 | 0 ~ 7 | RTD 2 Level | Yes |
| | 8 ~ 15 | RTD 1 Level | Yes |
| 15 | 0 ~ 7 | RTD 4 Level | Yes |
| | 8 ~ 15 | RTD 3 Level | Yes |
| 16 | 0 ~ 7 | Analogue Channel 2 In | Yes |
| | 8 ~ 15 | Analogue Channel 1 In | Yes |
| 17 | 0 ~ 7 | Analogue Channel 2 Out | Yes |
| | 8 ~ 15 | Analogue Channel 1 Out | Yes |
| 18 | 0 | Alarm Flags A – Voltage Present | Yes |
| | 1 | Alarm Flags A – Over Voltage | Yes |
| | 2 | Alarm Flags A – Under Voltage | Yes |
| | 3 | Alarm Flags A – Voltage Symmetry | Yes |
| | 4 | Alarm Flags A – Insulation Lockout | Yes |
| | 5 | Alarm Flags A – Low Frequency | Yes |
| | 6 | Alarm Flags A – High Frequency | Yes |
| | 7 | Alarm Flags A – Earth Fault | Yes |
| | 8 | Alarm Flags A – In Service | Yes |
| | 9 | Alarm Flags A – Earth Leakage | Yes |
| | 10 | Alarm Flags A – Over Current | Yes |
| | 11 | Alarm Flags A – Running Stall | Yes |
| | 12 | Alarm Flags A – Unbalance | Yes |
| | 13 | Alarm Flags A – Single Phase | Yes |
| 14 | Alarm Flags A – Minimum Load | Yes | |

| Addr | Bit Position | Name | Read Only |
|------|------------------------------|-----------------------------------|-----------|
| | 15 | Alarm Flags A – Short Circuit | Yes |
| 19 | 0 | Alarm Flags B – RTD 1 Hi | Yes |
| | 1 | Alarm Flags B – RTD 1 Lo | Yes |
| | 2 | Alarm Flags B – RTD 2 Hi | Yes |
| | 3 | Alarm Flags B – RTD 2 Lo | Yes |
| | 4 | Alarm Flags B – RTD 3 Hi | Yes |
| | 5 | Alarm Flags B – RTD 3 Lo | Yes |
| | 6 | Alarm Flags B – RTD 4 Hi | Yes |
| | 7 | Alarm Flags B – RTD 4 Lo | Yes |
| | 8 | Alarm Flags B – Vectorial Stall | Yes |
| | 9 | Alarm Flags B – Frozen Contact | Yes |
| | 10 ~ 15 | Alarm Flags B – Reserved | Yes |
| 20 | 0 ~ 7 | Alarm Flags C – Reserved | Yes |
| | 8 | Alarm Flags C – Analogue In 1 Hi | Yes |
| | 9 | Alarm Flags C – Analogue In 1 Lo | Yes |
| | 10 | Alarm Flags C – Analogue In 2 Hi | Yes |
| | 11 | Alarm Flags C – Analogue In 2 Lo | Yes |
| | 12 | Alarm Flags C – Analogue Out 1 Hi | Yes |
| | 13 | Alarm Flags C – Analogue Out 1 Lo | Yes |
| | 14 | Alarm Flags C – Analogue Out 2 Hi | Yes |
| | 15 | Alarm Flags C – Analogue Out 2 Lo | Yes |
| 21 | 0 ~ 15 | Reserved | Yes |
| 22 | 0 | Trip Flags A – Over Voltage | Yes |
| | 1 | Trip Flags A – Under Voltage | Yes |
| | 2 | Trip Flags A – Voltage Symmetry | Yes |
| | 3 | Trip Flags A – Insulation Lockout | Yes |
| | 4 | Trip Flags A – Low Frequency | Yes |
| | 5 | Trip Flags A – High Frequency | Yes |
| | 6 | Trip Flags A – Earth Fault | Yes |
| | 7 | Trip Flags A – Starts Per Hour | Yes |
| | 8 | Trip Flags A – Over Current | Yes |
| | 9 | Trip Flags A – Running Stall | Yes |
| | 10 | Trip Flags A – Unbalance | Yes |
| | 11 | Trip Flags A – Single Phase | Yes |
| | 12 | Trip Flags A – Minimum Load | Yes |
| | 13 | Trip Flags A – Short Circuit | Yes |
| | 14 | Trip Flags A – Phase Rotation | Yes |
| 15 | Trip Flags A – Earth Leakage | Yes | |
| 23 | 0 | Trip Flags B – RTD 1 Hi | Yes |
| | 1 | Trip Flags B – RTD 1 Lo | Yes |
| | 2 | Trip Flags B – RTD 2 Hi | Yes |
| | 3 | Trip Flags B – RTD 2 Lo | Yes |
| | 4 | Trip Flags B – RTD 3 Hi | Yes |
| | 5 | Trip Flags B – RTD 3 Lo | Yes |
| | 6 | Trip Flags B – RTD 4 Hi | Yes |
| | 7 | Trip Flags B – RTD 4 Lo | Yes |
| | 8 | Trip Flags B – System Failure | Yes |

| Addr | Bit Position | Name | Read Only |
|------|----------------------------|---|-----------|
| | 9 | Trip Flags B – Vectorial Stall | Yes |
| | 10 | Trip Flags B – Frozen Contact | Yes |
| | 11 | Trip Flags B – Execution Fault | Yes |
| | 12 | Trip Flags B – Feedback Fault | Yes |
| | 13 | Trip Flags B – Unauthorized Current | Yes |
| | 14 ~ 15 | Trip Flags B – Reserved | Yes |
| 24 | 0 ~ 7 | Reserved | Yes |
| | 8 | Trip Flags C – Analogue In 1 Hi | Yes |
| | 9 | Trip Flags C – Analogue In 1 Lo | Yes |
| | 10 | Trip Flags C – Analogue In 2 Hi | Yes |
| | 11 | Trip Flags C – Analogue In 2 Lo | Yes |
| | 12 | Trip Flags C – Analogue Out 1 Hi | Yes |
| | 13 | Trip Flags C – Analogue Out 1 Lo | Yes |
| | 14 | Trip Flags C – Analogue Out 2 Hi | Yes |
| 25 | 0 ~ 15 | Reserved | Yes |
| 26 | 0 | Warning Flags A – Analogue In 1 Hi | Yes |
| | 1 | Warning Flags A – Analogue In 1 Lo | Yes |
| | 2 | Warning Flags A – Analogue In 2 Hi | Yes |
| | 3 | Warning Flags A – Analogue In 2 Lo | Yes |
| | 4 | Warning Flags A – Analogue Out 1 Hi | Yes |
| | 5 | Warning Flags A – Analogue Out 1 Lo | Yes |
| | 6 | Warning Flags A – Analogue Out 2 Hi | Yes |
| | 7 | Warning Flags A – Analogue Out 2 Lo | Yes |
| | 8 | Warning Flags A – RTD 1 Hi | Yes |
| | 9 | Warning Flags A – RTD 1 Lo | Yes |
| | 10 | Warning Flags A – RTD 2 Hi | Yes |
| | 11 | Warning Flags A – RTD 2 Lo | Yes |
| | 12 | Warning Flags A – RTD 3 Hi | Yes |
| | 13 | Warning Flags A – RTD 3 Lo | Yes |
| | 14 | Warning Flags A – RTD 4 Hi | Yes |
| 15 | Warning Flags A – RTD 4 Lo | Yes | |
| 27 | 0 ~ 15 | Reserved | Yes |
| 28 | 0 | Logic Flags A – Timer A Output | Yes |
| | 1 | Logic Flags A – Timer B Output | Yes |
| | 2 | Logic Flags A – Real Time Clock Output | Yes |
| | 3 | Logic Flags A – Relay 1 Output | Yes |
| | 4 | Logic Flags A – Relay 2 Output | Yes |
| | 5 | Logic Flags A – Relay 3 Output | Yes |
| | 6 | Logic Flags A – Relay 4 Output | Yes |
| | 7 | Logic Flags A – Counter A Output | Yes |
| | 8 | Logic Flags A – Logic Function 1 Output | Yes |
| | 9 | Logic Flags A – Logic Function 2 Output | Yes |
| | 10 | Logic Flags A – Logic Function 3 Output | Yes |
| | 11 | Logic Flags A – Logic Function 4 Output | Yes |
| | 12 | Logic Flags A – Logic Function 5 Output | Yes |
| | 13 | Logic Flags A – Logic Function 6 Output | Yes |

| Addr | Bit Position | Name | Read Only |
|------|--------------------------|--|-----------|
| | 14 | Logic Flags A – Simulation Active | Yes |
| | 15 | Logic Flags A – Counter B Output | Yes |
| 29 | 0 | Logic Flags B – Starter Output 1 | Yes |
| | 1 | Logic Flags B – Starter Output 2 | Yes |
| | 2 | Logic Flags B – Starter Output 3 | Yes |
| | 3 | Logic Flags B – Starter Output 4 | Yes |
| | 4 | Logic Flags B – Starter Output 5 | Yes |
| | 5 | Logic Flags B – Reserved | Yes |
| | 6 | Logic Flags B – Local Selection Bit lsb. | Yes |
| | 7 | Logic Flags B – Local Selection Bit msb | Yes |
| | 8 | Logic Flags B – Field Input 1 | Yes |
| | 9 | Logic Flags B – Field Input 2 | Yes |
| | 10 | Logic Flags B – Field Input 3 | Yes |
| | 11 | Logic Flags B – Field Input 4 | Yes |
| | 12 | Logic Flags B – Field Input 5 | Yes |
| | 13 | Logic Flags B – Field Input 6 | Yes |
| | 14 | Logic Flags B – Field Input 7 | Yes |
| 15 | Logic Flags B – Reserved | Yes | |
| 30 | 0 | Logic Flags C – PLC Input Bit 8 | Yes |
| | 1 | Logic Flags C – PLC Input Bit 9 | Yes |
| | 2 | Logic Flags C – PLC Input Bit 10 | Yes |
| | 3 | Logic Flags C – PLC Input Bit 11 | Yes |
| | 4 | Logic Flags C – PLC Input Bit 12 | Yes |
| | 5 | Logic Flags C – PLC Input Bit 13 | Yes |
| | 6 | Logic Flags C – PLC Input Bit 14 | Yes |
| | 7 | Logic Flags C – PLC Input Bit 15 | Yes |
| | 8 | Logic Flags C – PLC Input Bit 0 | Yes |
| | 9 | Logic Flags C – PLC Input Bit 1 | Yes |
| | 10 | Logic Flags C – PLC Input Bit 2 | Yes |
| | 11 | Logic Flags C – PLC Input Bit 3 | Yes |
| | 12 | Logic Flags C – PLC Input Bit 4 | Yes |
| | 13 | Logic Flags C – PLC Input Bit 5 | Yes |
| | 14 | Logic Flags C – PLC Input Bit 6 | Yes |
| | 15 | Logic Flags C – PLC Input Bit 7 | Yes |
| 31 | 0 | Logic Flags D – Pre Start Warning Signal | Yes |
| | 1 | Logic Flags D – DC Break Active | Yes |
| | 2 | Logic Flags D – Transition Active | Yes |
| | 3 | Logic Flags D – Backspin Active | Yes |
| | 4 | Logic Flags D – Reserved | Yes |
| | 5 | Logic Flags D – Latch Output B | Yes |
| | 6 | Logic Flags D – Reserved | Yes |
| | 7 | Logic Flags D – TC Warning Level | Yes |
| | 8 | Logic Flags D – Timer A Pulse Output | Yes |
| | 9 | Logic Flags D – Timer B Pulse Output | Yes |
| | 10 | Logic Flags D – Status Reporter Output | Yes |
| | 11 | Logic Flags D – Latch Output A | Yes |
| | 12 | Logic Flags D – Relay 5 | Yes |

| Addr | Bit Position | Name | Read Only |
|------|--------------|--------------------------------|-----------|
| | 13 | Logic Flags D – Relay 6 | Yes |
| | 14 | Logic Flags D – Relay 7 | Yes |
| | 15 | Logic Flags D – Relay 8 | Yes |
| 32 | 0 ~ 7 | Reserved | Yes |
| | 8 | Logic Flags E – Field Input 8 | Yes |
| | 9 | Logic Flags E – Field Input 9 | Yes |
| | 10 | Logic Flags E – Field Input 10 | Yes |
| | 11 | Logic Flags E – Field Input 11 | Yes |
| | 12 | Logic Flags E – Field Input 12 | Yes |
| | 13 | Logic Flags E – Field Input 13 | Yes |
| | 14 | Logic Flags E – Field Input 14 | Yes |
| | 15 | Logic Flags E – Field Input 15 | Yes |
| 33 | 0 ~ 15 | Reserved | Yes |
| 34 | 0 ~ 7 | Counter B | Yes |
| | 8 ~ 15 | Counter A | Yes |
| 35 | 0 ~ 15 | Reserved | Yes |
| 36 | 0 ~ 15 | Start Up Counter | Yes |
| 37 | 0 ~ 15 | Trip Counter | Yes |
| 38 | 0 ~ 15 | Motor Running Hour Counter | Yes |
| 39 | 0 ~ 15 | Load Running Hour Counter | Yes |
| 40 | 0 ~ 15 | Relay On Hour Counter | Yes |
| 41 | 0 ~ 15 | Active Power Used | Yes |
| 42 | 0 ~ 15 | Reactive Power Used | Yes |
| 43 | 0 ~ 7 | Start Up Date – Month | Yes |
| | 8 ~ 15 | Start Up Date – Year | Yes |
| 44 | 0 ~ 7 | Reserved | Yes |
| | 8 ~ 15 | Start Up Date – Day | Yes |
| 45 | 0 ~ 7 | Start Up Date – Minutes | Yes |
| | 8 ~ 15 | Start Up Date – Hours | Yes |
| 46 | 0 ~ 7 | Real Time Clock – Month | Yes |
| | 8 ~ 15 | Real Time Clock – Year | Yes |
| 47 | 0 ~ 7 | Reserved | Yes |
| | 8 ~ 15 | Real Time Clock – Day | Yes |
| 48 | 0 ~ 7 | Real Time Clock – Minutes | Yes |
| | 8 ~ 15 | Real Time Clock – Hours | Yes |

2.2.5 Listen mode only

Writing to address 0 will allow the NewCode Modbus unit to listen to the message but not to reply to the message. This allows the Modbus master to write to the same register across all the Modbus slaves.

2.3 Flag Descriptions

2.3.1 Function Flag Table 1

It is signals that can be routed to the inputs of the logic functions, timers, counters, status reporter, latch, starter control and relays.

| Value | Name |
|-------|------------------------------|
| 0 | Constant Zero |
| 1 | Constant One |
| 2 | In Service Flag |
| 3 | Voltage Present Flag |
| 4 | Over Current Alarm Flag |
| 5 | Short Circuit Alarm Flag |
| 6 | Running Stall Alarm Flag |
| 7 | Unbalance Alarm Flag |
| 8 | Single Phase Alarm Flag |
| 9 | Earth Fault Alarm Flag |
| 10 | Earth Leakage Alarm Flag |
| 11 | Minimum Load Alarm Flag |
| 12 | Over Voltage Alarm Flag |
| 13 | Under Voltage Alarm Flag |
| 14 | Voltage Symmetric Alarm Flag |
| 15 | High Frequency Alarm Flag |
| 16 | Low Frequency Alarm Flag |
| 17 | Isolation Lockout Alarm Flag |
| 18 | Frozen Contact Alarm Flag |
| 19 | Over Current Trip Flag |
| 20 | Short Circuit Trip Flag |
| 21 | Running Stall Trip Flag |
| 22 | Unbalance Trip Flag |
| 23 | Single Phase Trip Flag |
| 24 | Earth Fault Trip Flag |
| 25 | Earth Leakage Trip Flag |
| 26 | Minimum Load Trip Flag |
| 27 | Over Voltage Trip Flag |
| 28 | Under Voltage Trip Flag |
| 29 | Voltage Symmetric Trip Flag |
| 30 | High Frequency Trip Flag |

| Value | Name |
|-------|------------------------------------|
| 31 | Low Frequency Trip Flag |
| 32 | Insulation Lockout Trip Flag |
| 33 | Phase Rotation Trip Flag |
| 34 | Starts Per Hour Trip Flag |
| 35 | Frozen Contact Trip Flag |
| 36 | Trip Flag |
| 37 | Timer A Output |
| 38 | Inverted Timer A Output |
| 39 | Timer A Pulsed Output |
| 40 | Inverted Timer A Pulsed Output |
| 41 | Timer B Output |
| 42 | Inverted Timer B Output |
| 43 | Timer B Pulsed Output |
| 44 | Inverted Timer B Pulsed Output |
| 45 | RTC Output |
| 46 | Inverted RTC Output |
| 47 | Counter A Output |
| 48 | Inverted Counter A Output |
| 49 | Counter B Output |
| 50 | Inverted Counter B Output |
| 51 | Logical Function 1 Output |
| 52 | Inverted Logical Function 1 Output |
| 53 | Logical Function 2 Output |
| 54 | Inverted Logical Function 2 Output |
| 55 | Logical Function 3 Output |
| 56 | Inverted Logical Function 3 Output |
| 57 | Logical Function 4 Output |
| 58 | Inverted Logical Function 4 Output |
| 59 | Logical Function 5 Output |
| 60 | Inverted Logical Function 5 Output |
| 61 | Logical Function 6 Output |
| 62 | Inverted Logical Function 6 Output |
| 63 | Field Input 1 |
| 64 | Field Input 2 |
| 65 | Field Input 3 |
| 66 | Field Input 4 |
| 67 | Field Input 5 |

| Value | Name |
|--------------|--------------------------------|
| 68 | Field Input 6 |
| 69 | Field Input 7 |
| 70 | Field Input 8 |
| 71 | Field Input 9 |
| 72 | Field Input 10 |
| 73 | Field Input 11 |
| 74 | Field Input 12 |
| 75 | Field Input 13 |
| 76 | Field Input 14 |
| 77 | Field Input 15 |
| 78 | PLC Input Bit 1 |
| 79 | PLC Input Bit 2 |
| 80 | PLC Input Bit 3 |
| 81 | PLC Input Bit 4 |
| 82 | PLC Input Bit 5 |
| 83 | PLC Input Bit 6 |
| 84 | PLC Input Bit 7 |
| 85 | PLC Input Bit 8 |
| 86 | PLC Input Bit 9 |
| 87 | PLC Input Bit 10 |
| 88 | PLC Input Bit 11 |
| 89 | PLC Input Bit 12 |
| 90 | PLC Input Bit 13 |
| 91 | PLC Input Bit 14 |
| 92 | PLC Input Bit 15 |
| 93 | PLC Input Bit 16 |
| 94 | Restart Flag |
| 95 | Status Reporter Output |
| 96 | Latch A Output |
| 97 | Latch B Output |
| 98 | Pulse Generator Output |
| 99 | TC Warning Alarm |
| 100 | Execution Trip flag |
| 101 | Feedback trip flag |
| 102 | Unauthorized current trip flag |
| 103 | System failure trip flag |
| 104 | RTD 1 high warning flag |

| Value | Name |
|-------|----------------------------------|
| 105 | RTD 1 high alarm flag |
| 106 | RTD 1 high trip flag |
| 107 | RTD 1 low warning flag |
| 108 | RTD 1 low alarm flag |
| 109 | RTD 1 low trip flag |
| 110 | RTD 2 high warning flag |
| 111 | RTD 2 high alarm flag |
| 112 | RTD 2 high trip flag |
| 113 | RTD 2 low warning flag |
| 114 | RTD 2 low alarm flag |
| 115 | RTD 2 low trip flag |
| 116 | RTD 3 high warning flag |
| 117 | RTD 3 high alarm flag |
| 118 | RTD 3 high trip flag |
| 119 | RTD 3 low warning flag |
| 120 | RTD 3 low alarm flag |
| 121 | RTD 3 low trip flag |
| 122 | RTD 4 high warning flag |
| 123 | RTD 4 high alarm flag |
| 124 | RTD 4 high trip flag |
| 125 | RTD 4 low warning flag |
| 126 | RTD 4 low alarm flag |
| 127 | RTD 4 low trip flag |
| 128 | Analogue In 1 high warning flag |
| 129 | Analogue In 1 high alarm flag |
| 130 | Analogue In 1 high trip flag |
| 131 | Analogue In 1 low warning flag |
| 132 | Analogue In 1 low alarm flag |
| 133 | Analogue In 1 low trip flag |
| 134 | Analogue In 2 high warning flag |
| 135 | Analogue In 2 high alarm flag |
| 136 | Analogue In 2 high trip flag |
| 137 | Analogue In 2 low warning flag |
| 138 | Analogue In 2 low alarm flag |
| 139 | Analogue In 2 low trip flag |
| 140 | Analogue Out 1 high warning flag |
| 141 | Analogue Out 1 high alarm flag |

| Value | Name |
|-------|----------------------------------|
| 142 | Analogue Out 1 high trip flag |
| 143 | Analogue Out 1 low warning flag |
| 144 | Analogue Out 1 low alarm flag |
| 145 | Analogue Out 1 low trip flag |
| 146 | Analogue Out 2 high warning flag |
| 147 | Analogue Out 2 high alarm flag |
| 148 | Analogue Out 2 high trip flag |
| 149 | Analogue Out 2 low warning flag |
| 150 | Analogue Out 2 low alarm flag |
| 151 | Analogue Out 2 low trip flag |
| 180 | Starter Output 1 |
| 181 | Starter Output 2 |
| 182 | Starter Output 3 |
| 183 | Starter Output 4 |
| 184 | Starter Output 5 |
| 185 | Pre Warning Flag |
| 186 | DC Break Flag |
| 187 | Transition Flag |
| 188 | Back Spin Flag |

2.3.2 Function Flag Table 2

It is signals that can be routed to the inputs of the local and remote selection.

| Value | Name |
|-------|---------------|
| 0 | Constant Zero |
| 1 | Constant One |
| 2 | Field Input 1 |
| 3 | Field Input 2 |
| 4 | Field Input 3 |
| 5 | Field Input 4 |
| 6 | Field Input 5 |
| 7 | Field Input 6 |
| 8 | Field Input 7 |
| 9 | Field Input 8 |
| 10 | Field Input 9 |

| Value | Name |
|-------|------------------|
| 11 | Field Input 10 |
| 12 | Field Input 11 |
| 13 | Field Input 12 |
| 14 | Field Input 13 |
| 15 | Field Input 14 |
| 16 | Field Input 15 |
| 17 | PLC Input Bit 1 |
| 18 | PLC Input Bit 2 |
| 19 | PLC Input Bit 3 |
| 20 | PLC Input Bit 4 |
| 21 | PLC Input Bit 5 |
| 22 | PLC Input Bit 6 |
| 23 | PLC Input Bit 7 |
| 24 | PLC Input Bit 8 |
| 25 | PLC Input Bit 9 |
| 26 | PLC Input Bit 10 |
| 27 | PLC Input Bit 11 |
| 28 | PLC Input Bit 12 |
| 29 | PLC Input Bit 13 |
| 30 | PLC Input Bit 14 |
| 31 | PLC Input Bit 15 |
| 32 | PLC Input Bit 16 |

2.3.3 Function Flag Table 3

It is signals that can be routed to the inputs of the starter logic starts, stops and interlock.

| Value | Name |
|-------|--------------------------------|
| 0 | Constant Zero |
| 1 | Constant One |
| 2 | In Service Flag |
| 3 | Timer A Output |
| 4 | Inverted Timer A Output |
| 5 | Timer A Pulsed Output |
| 6 | Inverted Timer A Pulsed Output |
| 7 | Timer B Output |

| Value | Name |
|--------------|------------------------------------|
| 8 | Inverted Timer B Output |
| 9 | Timer B Pulsed Output |
| 10 | Inverted Timer B Pulsed Output |
| 11 | RTC Output |
| 12 | Inverted RTC Output |
| 13 | Counter A Output |
| 14 | Inverted Counter A Output |
| 15 | Counter B Output |
| 16 | Inverted Counter B Output |
| 17 | Logical Function 1 Output |
| 18 | Inverted Logical Function 1 Output |
| 19 | Logical Function 2 Output |
| 20 | Inverted Logical Function 2 Output |
| 21 | Logical Function 3 Output |
| 22 | Inverted Logical Function 3 Output |
| 23 | Logical Function 4 Output |
| 24 | Inverted Logical Function 4 Output |
| 25 | Logical Function 5 Output |
| 26 | Inverted Logical Function 5 Output |
| 27 | Logical Function 6 Output |
| 28 | Inverted Logical Function 6 Output |
| 29 | Field Input 1 |
| 30 | Field Input 2 |
| 31 | Field Input 3 |
| 32 | Field Input 4 |
| 33 | Field Input 5 |
| 34 | Field Input 6 |
| 35 | Field Input 7 |
| 36 | Field Input 8 |
| 37 | Field Input 9 |
| 38 | Field Input 10 |
| 39 | Field Input 11 |
| 40 | Field Input 12 |
| 41 | Field Input 13 |
| 42 | Field Input 14 |
| 43 | Field Input 15 |
| 44 | PLC Input Bit 1 |

| Value | Name |
|-------|------------------|
| 45 | PLC Input Bit 2 |
| 46 | PLC Input Bit 3 |
| 47 | PLC Input Bit 4 |
| 48 | PLC Input Bit 5 |
| 49 | PLC Input Bit 6 |
| 50 | PLC Input Bit 7 |
| 51 | PLC Input Bit 8 |
| 52 | PLC Input Bit 9 |
| 53 | PLC Input Bit 10 |
| 54 | PLC Input Bit 11 |
| 55 | PLC Input Bit 12 |
| 56 | PLC Input Bit 13 |
| 57 | PLC Input Bit 14 |
| 58 | PLC Input Bit 15 |
| 59 | PLC Input Bit 16 |

3. DEFINITIONS AND TERMINOLOGY

| | |
|------------------------|---|
| EEPROM | Electrical Erasable Programmable Read Only Memory (non volatile) |
| Flash memory | Similar to EEPROM (only block write - non volatile) |
| GSD | Generic station description file. |
| In service | When the current rise above 10% of full load current it is assumed that the motor is running. |
| Intrinsic safe | It is a protection technique for safe operation of electronic equipment in explosive atmospheres. The concept was developed for safe operation of process control instrumentation in hazardous areas. The theory behind intrinsic safety is to ensure that the available electrical and thermal energy in the system is always low enough that ignition of the hazardous atmosphere cannot occur. |
| LED | Light emitting diode (It is used as visual indicators) |
| Motor protection relay | It is an intelligent (computerized) unit monitoring an electric motor's current and voltage supply. In case of overloading, phase lost etc. the power supply of the motor will be interrupted by the protection relay to prevent damage to the motor. |
| PLC | Programmable Logic Controller. |

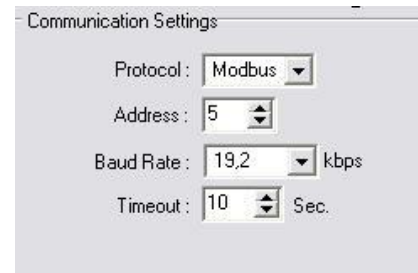
4. OPERATING INSTRUCTIONS

4.1 Getting Started

4.1.1 Setting Up The NC-MK1-Modbus

Following must be done via the NewCode front-end:

- Connect the NewCode front-end to the relay.
- Select the communication device as modbus.
- Set the address of the relay.
- Select the correct baudrate.
- Select the time out period to reset PLC inputs.
 - 0 seconds will lock the PLC bits after a communication failure.
 - 1 to 255 seconds will change the PLC bits back to zeros.
- Transmit settings to relay.



4.2 Monitoring Diagnostic On Front-End

The front-end will show the following diagnostics under the “**Statistics**” tab:

1. Modbus module present.
2. Cyclic Time – Time intervals that a valid message is received.
3. Longest Cycle Time – Longest Rx interval.
4. Listen Mode – Is listen mode active.
5. Message Counter – Amount of messages received.
6. CRC counter – Amount of messages with a CRC problem.
7. Revision – Firmware revision of the Modbus module.

4.3 DB 9 Connection

On the DB9 pins Pin 2 must be connected to A and Pin 9 to B.

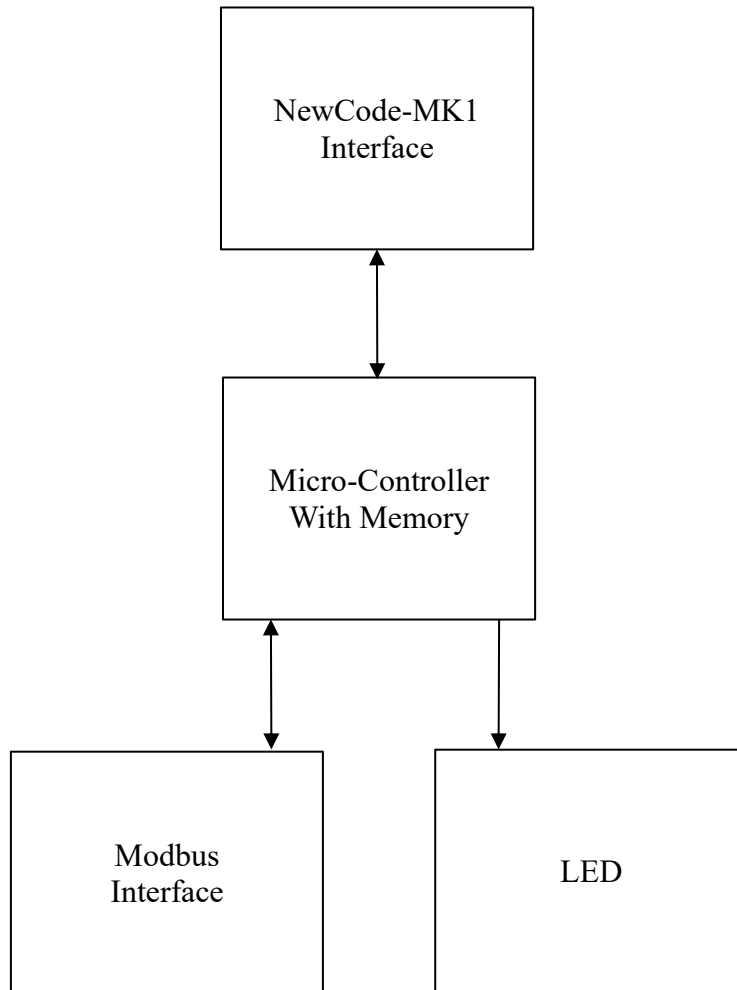
4.4 Synchronizing The RTC

Following steps can be taken to synchronize the RTC of the modbus slave units:

- Through out the process write to address 0 to talk to all the slaves.
- Unlock the holding registers by writing 0x5AA5 to holding register address 2.
- Then write the new RTC time to holding register address 103 to 105.

5. DIAGRAMS

5.1 Block Diagram of NC-MK1-Modbus



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