269 FREOUENTLY ASKED OUESTIONS

1 Can I use an 86 lockout on the 269?

Yes, but If an external 86 lockout device is used and connected to the 269, ensure that the 269 is reset prior to attempting to reset the lockout switch. If the 269 is still tripped, it will immediately retrip the lockout switch. Also, if the lockout switch is held reset, the high current draw of the lockout switch coil may cause damage to itself and/or the 269 output relay circuitry.

2 What RS485 baud rates are available and how can I change the baud rate of the 269Plus?

The following baud rates are available on the 269Plus:
300bps, 1200,bps, and 2400bps (default). To change the default baud rate, please contact our Technical Call Centre.

3 How can I change the baud rate of 269/269Plus to communicate with MPM or MTM?

Communication with Meter module (MTM or MPM) is pre-set to a baud rate of 1200BPS

4 What communication protocol does 269 support?

The 269 Plus Motor Protection relays communicate with other computerized equipment such as programmable controllers, personal computers or plant master computers with the Modicon Standard Data Communication Network (MODBUS RTU).

This document describes the subset of protocol as supported by the 269 Plus Motor Protection relays.

MODES OF OPERATION

- GE Multilin 269 Plus relays always act as MODBUS slaves, meaning they never initiate a dialogue but listen and respond to the bus master computer.

- Only the Remote Terminal Unit (RTU) format of the MODBUS protocol is adopted for the 269 Plus. The format is described later and features binary data format rather than ASCII character communications.

- As the physical layer of the protocol, two-wire (4-wire is also available as a modification for a moderate cost) Multi-drop RS485 standard is supported. This standard uses twisted pair cable. Up to 32, 269 Plus relays on up to 4000 ft of cable can be supported.

- Optionally, Serial Communication Interface (SCI) boxes can be purchased to support RS232 standard for the connection of a group of relays on an RS485 bus to RS232 which is supported by PCs and some PLCs.

- Since the operation of 269 Plus relays are register based, a master computer can monitor and control the operation of the relays by reading or writing to the relay registers. Therefore, the Register Read and Write f functions of the MODBUS are supported only.

- 269 Plus relays provide flexibility towards master computer corrective actions upon communication errors and timeouts. This is left to the discretion of the master programmer.

- The protocol, as supported by 269 Plus relays, features the following:

- Protocol - RS485, maximum baud rate - 2400BPS

5 What are the merits of a residual ground fault connection versus a core balance connection?

The use of a zero sequence (core balance) CT to detect ground current is recommended over the G/F residual connection. This is especially true at motor starting. During across-the-line starting of large motors, care must be taken to prevent the high inrush current from operating the ground element of the 269. This is especially true when using the residual connection of 2 or 3 CTs. Twisted (and shielded when using core balance 50:0.025A CT) cables minimize noise pickup and are recommended for use with a zero sequence connection. In a residual connection the unequal saturation of the current transformers, size and location of motor, size of the power system, resistance in the power system from the source to the motor, type of iron used in the motor core & saturation density, and residual flux levels may all contribute, among other things, to the production of a false residual current in the secondary or relay circuit. The common practice in medium and high voltage systems is to use low resistance grounding. By using the doughnut CT scheme, such systems offer the advantages of speed and reliability without much concern for starting current, fault contribution by the motor, or false residual current.
When a zero sequence CT is used, a voltage is generated in the secondary winding only when zero sequence current is flowing in the primary leads. Since virtually all motors have their neutrals ungrounded, no zero sequence current can flow in the motor leads unless there is a ground fault on the motor side.

6 Can I apply an external voltage to the digital switch inputs on the 269?

No. The 269/269Plus is designed for Dry Contacts Only to its digital switch inputs (Spare, Differential, Access, Ext Reset, Emergency Restart, Speed)

Warning: Applying an external voltage may cause damage to the internal circuitry.

7 What Firmware Revision of 269 communicates with MTM?

MTMs using firmware revision E1.8 or higher will communicate with all 269/269Plus relays.
MTMs using firmware revision below E1.8 are compatible with 269/269Plus relays using firmware revision B4.0 to 5.2.2.

The 269 will display and issue Meter Failure (Incompatible Revisions) alarm message when incompatible firmware revisions are used while attempting to communicate with an MTM.

8 What should I consider when installing a 269/269Plus?

Please ensure that the chassis ground terminal 42 of the relay is connected directly to the dedicated cubicle ground bus of the system to prevent transients from damaging the 269/269Plus resulting from changes in ground potential.

Although the 269Plus circuitry is internally shielded, to minimize unwanted noise pickup and interference, ensure that any high voltage/current carrying conductors or sources of strong electromagnetic fields are directed away from the 269/269Plus or any of its input/output external wiring such as control power, Phase & GF CTs, RTDs, digital inputs, output relays, etc.

MOD 239 Remote Faceplate:

Ensure that the faceplate ribbon cable is properly grounded to the same ground as terminal 42 on the 269/269Plus.

9 Can I set 269 to monitor power and energy and set protection for voltage elements?

No, MPM or MTM must be used.

The 269 Plus communicates the following information to the meter modules MPM: 1) 269/meter Protocol Revision; 2) Reset MWH; 3) CT Primary; 4) VT Ratio; 5) Analog Output Scale Factor; and 6) Checksum.

The meter, in turn, sends back the following information to the 269 Plus:
1) Echo Protocol Revision

2) Vab, Vbc, Vca or Van, Vbn, Vcn (depending on whether the VTs are connected for phase to phase or phase to neutral voltage measurement)

3) Average Voltage
4) kW
5) kvar
6) Frequency
7) Voltage Phase Reversal Status
8) VT Wiring Configuration (phase to phase or phase to neutral)
9) kW sign
10) kvar sign
11) Meter Revision
12) Power Factor
13) Power Factor sign indication (Lead or Lag)
14) MWh
15) Checksum

This exchange of information takes place once every 0.5 second.

MPM Analog Output

The Analog Out Scale Factor setpoint is entered in the 269 Plus setpoints, page 7, to set the Full Scale value for the MPM analog outputs (KWATTS and KVARS). The value entered here is the multiplier that is multiplied by 100 KW to determine the meter's analog output Full Scale for KWATTS, or by 30 KVAR to determine the meter's analog output Full Scale for KVAR. 4 mA represents 0 KWATTS and 0 KVARS and 20 mA represents full scale. Average RMS current is produced in analog form where 4-20 mA is equivalent to 0 A to 2×CT rating for the MPM and 0 A to 1.5xCT for the MPM. Power factor is produced in analog form where 4/12/20 mA represents 0.01 lag/1/0.01 lead power factor value respectively.

10 The 269 seems to have tripped the motor. The 269 then blocks any additional starts for a period of time. After some time elapses, the 269 resets automatically. This may happen several times before it s reported, although more often than not, it happens on commissioning.

Every time the 269 is interrogated, it displays the cause of last trip with the same pre-trip data. The motor, and starter wiring are checked and all appear to be in good condition.

What is causing the 269 to trip the motor? And why is it detecting a fault (eg. ground fault) every time this happens?

The 269 may not be tripping the motor. In addition to trips, the TRIP relay may be activated by any one of four inhibit lockouts. These are: starts/hour, time between starts, start inhibit, and backspin timer. If any of these inhibit lockouts are assigned to the TRIP relay and if the feature is enabled, then it may be the most probable cause for the above scenario.

This is most commonly observed and experienced on synchronous motors or unloaded motors. On these motors, current may fall to very low levels as compared to full load Amps. If the current falls below 5% of the CT primary, the 269 will immediately recognize this as a stop condition. All inhibit lockout timers are checked at this time. If an inhibi is active and its timer has not expired to zero when this condition is detected, the 269 will activate the assigned relay.

This explains many of the mysteries listed above such as: the associated lockout with every APPARENT TRIP, the same cause of last trip message, the same pre-trip data and finally, the automatic resetting of the relay.

Remember that the 269 is designed to default its display to the cause of the trip message. So, when you go looking for the cause of the trip in the pre-trip data page of Actual Values (p.5) you will probably stumble upon the Cause of Last Trip message. This message, as are all the following pre-trip data, may have been there from the last time the motor tripped or may have been caused when the relay was tested.

Finally, had the relay truly tripped the motor, it would never have reset automatically. An automatic reset is only possible if the external reset terminals are permanently shorted together, otherwise a manual or serial reset must b performed before the 269 clears the trip. The only features that may be assigned to the TRIP relay and can reset automatically are the inhibit lockouts.

11 So, what can I do to remedy this situation?

Whenever this happens, the ideal solution is to wire in a set of 52b contacts from the breaker or auxiliary contacts from the contactor (open contacts when contactor is energized/closed) into the 269s spare input terminals #44 & 45 Then, the 269 must be programmed in setpoints p.5 to read the spare input terminals as 52b contacts.

SPARE INPUT TO READ 52b? YES

This is a must if the motor is a synchronous motor. If, on the other hand, this happens on an unloaded induction motor, it may be possible to turn the inhibit lockout setpoint(s) in question to OFF for the duration of the test. Once up and running under normal loading conditions, the setpoint(s) may be programmed again.

12 Can I test my output relays?

Yes, testing of the output Relays is possible by following the procedure below:

Using the front faceplate keypad, navigate to:
PAGE 6: SETPOINT VALUES MULTILIN SERVICE CODES

Line down to:
EXERCISE RELAY: NO

Value up to:
EXERCISE RELAY: TRIP

Press Store:

The Trip output relay will become energized. To de-energize, value to No and Store.
Each output relay can be excerised in this manner or all may be excerised simultaneously by storing All. The energized ouptut relay is designed to automatically de-energize after a 4 minute period.

Note: The output relays cannot be forced while the motor is running.

13 I m testing an Overload Curve trip time and finding that it is taking longer than the published times?

Ensure that the desired Curve number under test is stored in the relay.

When testing one of the 269s 8 Standard Overload Curves, or a programmed Custom Curve, be sure that the Thermal Capacity Used is at 0% before injecting current. This can be checked by using the front faceplate keypad and navigating to:
PAGE 3: ACTUAL VALUES MOTOR CAPACITY DATA

Line down to:
THERMAL CAPACITY USED = 0 PERCENT

When the Thermal Capacity Used reaches 100%, an Overload Trip issued by the relay based on the time to trip of the selected overload curve. The Overload curve will come into effect when the motor phase current exceeds the overload pickup level x FLC setpoint. This setpoint should be set according to the service factor of the motor.

Note that if RTD or Unbalance biasing to Thermal Memory are enabled, the time to trip may be shorter than the published times. These setpoints should be defeated when testing.

If using a single-phase current source to inject current to the series connected phase CTs, do not apply current that is more than 3 x CT i.e. 15amps to 5 Amp tap. If more than 3 x CT is required for testing, a balanced 3 phase current source must be used for accurate trip times.

Finally, apply the Overload Current is constant and steady manner. Do not ramp up the injected current.

14 My Overload Lockout Time won t count down to zero minutes and I cannot reset my Overload Trip?

If this is occurring after an Overload Trip has been issued by the 269Plus it possible that the RTD Input to Thermal Memory feature has been enabled. The RTD Input to Thermal Memory feature is available on the 269Plus.

RTD Input to Thermal Memory Input Feature:

When the amount of Thermal Capacity Used reaches 100% and the motor load increases above the Overload pickup level, an Overload Trip is issued by the 269Plus relay thereby taking the motor off-line. An Overload Lockou time is then calculated based on 85% of the entered Stopped Cool Time, in the default case 25 minutes, (85% of 30 mins). 25 minutes is the time it takes for Thermal Capacity Used to decrease from 100% to 15% to allow a successful reset of the Overload trip.

However, if RTD Input to Thermal Memory is not defeated, Thermal Capacity Used will decrease from 100% to a certain percentage based on the programmed RTD curve and the temperature of the hottest stator RTD temperature. Depending on the programmed curve and the temperature of the hottest Stator RTD, Thermal Capacity Used may decrease and remain at a certain level. If the level of Thermal Capacity Used remains over 15%, a reset condition is not possible, and the lockout time will not expire to zero minutes. When programming the RTD curve, the hottest stator RTD temperature must decrease below 15% Thermal Capacity Used in order for the lockout time to expire to zero minutes. By shorting the Emergency Restart terminals, Thermal Capacity Used will momentarily decrease to zero until the hottest stator RTD is sensed again. At this point, Thermal Capacity Used jumps back up due RTD Biasing.

This explains why the 269Plus Overload Lockout time will not entirely count down to zero after an Overload trip.

15 Can I use 269 in single-phase system?

NO. There are two types of configuration.

3 Phase CT configuration:
One CT for each of the three motor phases are required to input a current into the relay proportional to the motor phase current. The phase sequence must be as shown in Figure 2.4 and Figure 2.7. The CTs used can have either a 1 amp. or 5 amp. secondary and should be chosen so that the motor full load current is between 75 and 95 percent of the rated CT primary amps. The CT ratio should thus be of the form n:1 or n:5 where n is between 20 and 1500. The ratio of the CT used must be programmed into the 269 Plus (see section 3.7).

2 Phase CT configuration:
Each of the two CTs acts as a current source. The current that comes out of the CT on phase 'A' flows into the interposing CT on the relay marked 'A'. From there, the current sums with the current that is flowing from the CT on phase 'C' which has just passed through the interposing CT on the relay marked 'C'. This 'summed' current flows through the interposing CT marked 'B' and from there, the current splits up to return to its respective source (CT). Polarity is very important since the value of phase 'B' must be the negative equivalent of 'A' + 'C' in order for the sum of all the vectors to equate to zero.

16 How does the PF Protection Delay work?

If PF Protection Delay setpoint is set to OFF, then the PF lag/lead alarm & trip delay times function as programmed.

eg. if PF Lead Alarm = 5 secs an alarm will activate in 5 secs after the PF Lead level threshold has been exceeded.

Example if the PF Protection Delay is programmed to 15 secs:
After a successful start, (a start does not have exceed the O/L pickup level, just greater than 5% of CT Primary. If the starting current does exceed the O/L Pickup level, then it must drop back down below the pickup level for a successful start) the PF being measured must come within the programmed Lag/Lead level range and remain within that range for the programmed time delay entered. Once the PF has remained within the Lag/Lead range for that time or greater, then the PF Trip/Alarm features become active.

If the PF doesn't come or remain within the programmed Lag/Lead range for the time entered, then the PF Trip/Alarm features are do not become enabled and PF protection is defeated.

eg. PF Protection Delay = 30 secs

PF Lead Trip = 0.90 Trip Time Delay = 5 secs

PF Lag Trip = 0.90 Trip Time Delay = 5 secs

The motor is started. Once current exceeds 5% CT and does not exceed the O/L pickup level, the 269 displays a "Run" condition which is a successful start. If the starting current exceeds the O/L pickup level, the 269 displays a "Motor Starting" condition. When the starting current drops below this level, a "Run" condition is displayed. At this moment, a successful start is registered.

Now, the PF being measured must come within the PF range of 0.90 Lead to 0.90 Lag and remain within this range for a minimum of 30 secs. Once the PF remains within this range for at least 30secs, then the PF Lead and Lag Trips and respective time delays become enabled and will function based on their time delays. Until this happens after a successful start, the PF Lag/Lead Trips will remain disabled.

17 How does the Single Shot Restart Feature work?

When enabled, the Single-Shot Restart Feature allows the motor to be restarted immediately after an Overload trip has occurred. This feature only works with an Overload Trip, and no other types of trips are supported.

To allow a Single-Shot restart after an Overload trip, the Thermal Capacity Used is reduced from 100% (Overload condition) to 12%, a value below 15%, upon resetting the relay. This allows a successful reset of the Overload trip, thereby enabling a restart of the motor. At times, it may be necessary to press the reset key twice, once to reduce Thermal Capacity to 12% and a second time to actually reset the relay.

If a second Overload trip occurs within 20 minutes of the initial Overload reset, an inhibit Overload Lockout time will be issued which is not resetable and must be allowed to expire to zero minutes in order to be reset. If a second Overload trip occurs after 20 minutes of the initial Overload reset, the Single-Shot Restart feature is re-enabled and the Overload trip may be reset.

18 What terminals should I use to connect stator RTDs?

The 269 Plus relay has 6 sets of 4 terminals available for the connection of RTDs to monitor the temperature of the stator windings. If fewer than 6 RTDs are to be used they must be connected to the lowest numbered RTD connections on the rear of the relay. The stator RTD setpoints are found in SETPOINTS mode, page 2. The "# OF STATOR RTDS USED" setpoint should be chosen to represent the number of RTDs actually connected to the motor stator windings. Thus if 3 RTDs are connected to the stator, the "# OF STATOR RTDS USED" setpoint should be set to 3, and the 3 RTDs must be connected to the terminals for RTD1, RTD2, and RTD3 (terminals #1-12).

There are individual trip, alarm, and high alarm setpoints for each stator, and trip and alarm setpoints for other (eg. bearing) RTDs. For stator RTDs a TRIP relay activation will occur when at least two stator RTDs go over their corresponding setpoints. This is the case when the "Stator RTD Voting" scheme is in effect. Other RTDs are not affected by the voting feature. Trip relay activation for other RTDs will occur when anyone of the RTD temperatures goes over its setpoint value. This is also the case for stator RTDs if voting is defeated. Stator RTD Alarms and High Alarms, and other RTD Alarms are also issued based on individual RTD setpoints. The maximum stator RTD temperature at anytime will be used for relay thermal calculation.

19 What should be considered when wiring RTD leads to the 269/269Plus?

When determining RTD lead length, some important factors should be considered.

- Distance between the 269/269Plus relay and the motor RTDs.
- Wire gauge that will be used. The 269/269Plus relay can accommodate a maximum gauge of 16AWG.
- Ambient temperature
- Wire gauge resistance per foot at this ambient temperature.

Correct operation will occur providing all three wires are of the same length and the total resistance of each lead is not greater than 25% of the RTD 0°C resistance. This can be accomplished considering the above points and by using identical lengths of the same type of wire.
Note: If 10 ohm copper RTD's are used, special care should be taken to keep the lead resistance as low as possible.

20 Why is my 269/269Plus Relay making a "ticking" sound when power up?

This ticking sound is perfectly normal during operation for the relay while power up. Simply, the relay is multiplexing through a series of mini relays used for RTD temperature sampling. When forcing RTDs, the continuous ticking sound will stop since only one RTD mini relay is selected.

21 What are the effects of the Thermal Capacity Reduction setpoint?

If the motor is running at or less than full load, thermal memory will discharge at a programmed rate to a certain value based on the FLC Thermal Capacity Reduction setpoint.

For example, a value of 46% may be chosen for this setpoint. If the current being drawn by the motor drops below full load current to 80% and remains constant, then the thermal memory will empty to 80% of the FLC Thermal Capacity Reduction setpoint, namely, 36.8% (0.8 x 46). In this way the thermal memory will discharge to an amoun related to the present motor current in order to represent the actual temperature of the motor closely.

Likewise if the motor is running at exactly 100% FLC, the Thermal Capacity Used will settle to a value based on the entered setpoint x 1, in this example 46%.

Example if Motor is running between 1.00 x FLC and the O/L pickup level:

If the motor is running between 1.00 x FLC and the O/L pickup level, one of two thermal model algorithms can be observed.

If the Thermal Capacity Used is less than the phase current (as a multiple of FLC) x the FLC Thermal Capacity Reduction setpoint, the Thermal Capacity Used will rise to that value.

Example: FLC = 100amps, O/L pickup = 1.10, FLC Thermal Capacity Reductions = 30%, Motor is running at 108amps steady
Thermal Capacity Used = FLC TC Reduction x (Iavg/Iflc)
= 30 x 1.08 = 32.4 (33%)

If the Thermal Capacity Used is below 33% at the time of this condition, it will rise to this value at a rate of 6% per minute and remain at this value until the phase current exceeds the O/L pickup level or drops below 1.01 x FLC

If the Thermal Capacity is greater than 33%, it will neither increase nor decrease and remain at its present value until the phase current exceeds the O/L pickup level or drops below 1.01 x FLC.

With the motor is running at 1.00 x FLC, thermal capacity used would settle to 30%. If O/L Curve 1 was selected, and the O/L pickup level = 1.10 and the motor running current increased instantaneously to 2 x FLC setpoint (200amps) the time to trip would normally be 29 seconds if thermal capacity was initially at zero and the current applied at a stable rate (no ramping).

However, since Thermal Capacity Used was already at 30%, the time to reach 100% will be 30% faster. When Thermal Capacity Used reaches 100%, the relay will issue an Overload Trip, assuming RTD and U/B biasing is defeated. Therefore, instead of 29seconds, the time to trip will be 29 x 1.30 = 20.3seconds (20secs).

22 Why is the 269/269Plus not updating any statistical or learned values?

The 269/269Plus will not update any statistical or learned values when it placed into Test Mode. To check if this setpoint has been enabled, navigate to:
PAGE 6: SETPOINTS VALUES MULTILIN SERVICE CODES

Line down to:
PLACE 269 PLUS IN TEST MODE? YES

Value up to No and Store. The relay will now begin updating statistical/ learned values.