Series NRX Circuit Breaker
Wiring Diagrams

Instructions Apply To:

Series NRX, Type NF Frame
ANSI, UL1066, UL489 / IEC, IZMX16, IZM91

Series NRX, Type RF Frame
IEC, IZMX40

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General Wiring Notes

1. Each contact block on the Secondary Terminal Block consists of two contacts (Figure A). A possible 27 terminal blocks will provide 54 contact points for the type NF frame. A possible 46 terminal blocks will provide 92 contact points for the type RF frame.

Figure A. Secondary Terminal Blocks

2. Drawout circuit breakers use Style 66B2508G01 contact blocks that mount onto a metal DIN rail.

3. Fixed mounted circuit breakers use Style 66B2510G01 contact blocks that mount onto an insulated support frame. The customer tension connectors are at a 45° angle.

4. Customer wiring is done using a tension clamp termination on each contact.

5. Contact blocks are individually mounted and hence contact positions may be empty depending on accessories and options ordered.

6. For drawout configurations, a cross connector can be used to tie adjacent contacts together. It is Weidmuller Style ZQV4 (300V rated only).

7. The tension clamp terminals will support solid or flexible conductors, #12/4mm² through #24/2.5mm² AWG wire and are UL/CSA rated for 600V, 10A.

8. The recommended wire strip length is 10 mm (.394").

9. The tension clamp terminals also support finely stranded conductors with wire-end ferrules and plastic collars DIN 46228/4, rated connection.

10. The two-point black plugs house two female crimp contacts (Weidmuller crimp Style 73477FCB01), with the odd assigned numbers having the coded rib feature on the black plug (Figure B). Note that the connector plug must be oriented as shown in Figure B before making the connection.

11. For secondary contacts, odd numbers should be treated as positive voltage for any accessory. This will not apply for AC ratings.

12. Reference tools for secondary contacts: Crimp tool connector – 1003300000; crimp contact wire release front black housing – 1964560000; release of black housing from secondary structure – 1964550000.

13. Reference tool for removing leads from secondary contact connector plug – 65A2818H01 Extraction Tool (Figure C).

Table 1. Customer Wiring Details

<table>
<thead>
<tr>
<th>Type of connection</th>
<th>Tension clamp connection</th>
</tr>
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<tbody>
<tr>
<td>Blade size</td>
<td>0.6 x 3.5 mm</td>
</tr>
<tr>
<td>Clamping range, rated connection, max.</td>
<td>4 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, solid, min</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, flexible, max.</td>
<td>4 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, flexible plus plastic collar DIN 46228/1, rated connection, min.</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Cross-section for connected conductor, finely stranded with wire-end ferrules and plastic collars DIN 46228/4, rated connection, min.</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Conductor connection cross-section AWG, min.</td>
<td>AWG 30</td>
</tr>
<tr>
<td>Stripping length</td>
<td>10 mm</td>
</tr>
<tr>
<td>Connection direction</td>
<td>top</td>
</tr>
<tr>
<td>Clamping range, rated connection, min.</td>
<td>0.05 mm²</td>
</tr>
<tr>
<td>Gauge to IEC 60947-1</td>
<td>A3</td>
</tr>
<tr>
<td>Conductor cross-section, solid, max.</td>
<td>4 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, flexible, min.</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, flexible plus plastic collar DIN 46228/1, rated connection, max.</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>Conductor cross-section, flexible AHE plus plastic collar DIN 46228/4, rated connection, max.</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>Conductor connection cross-section AWG, max.</td>
<td>AWG 12</td>
</tr>
</tbody>
</table>

Figure B. Weidmuller Plug and Crimp Contact

Figure C. Extraction Tool in Use
Figure 1. Zone Interlock Wiring

**Notes**

1. Twisted together AWG #14 to #20 copper wire. Route Zone interlock wiring separate from power conductors. DO NOT GROUND any Zone interlock wiring.

2. The maximum distance between two farthest breakers on different zones (from the ZO downstream to the ZI upstream terminals) is 250 feet (75m).

3. A maximum of 20 breakers may be contained in parallel in one zone.

4. Provide a self interlocking jumper (on Zone 3), if coordination is desired with other downstream breakers not providing the zone interlock feature.
Figure 2. Digitrip Alarm Wiring

Notes

1. For the Digitrip 520M product, Alarm 1 (ALM1) is for Remote Circuit Breaker Problem Alarm on CAT # N5MLSIG or for Maintenance Mode Active on CAT # N5MRLSIA. Contact rating 1A @ 120 VAC and 1A @ 24VDC.

   For the Digitrip 1150 product, Alarm 1 (ALM1) is a programmable contact that can be assigned for a variety of trip or alarm conditions. Contact rating 1A @ 120 VAC and 1A @ 24VDC.

2. For the Digitrip 520M product, Alarm 2 (ALM2) is for Hi Load Alarm Function on CAT # N5MLSI or # N5MRLSI, or for use with Ground Alarm CAT # N5MRLSIG. Contact rating 1A @ 240 VAC and 1A @ 24VDC.

   For the Digitrip 1150 product, Alarm 2 (ALM2) is a programmable contact that can be assigned for a variety of trip or alarm conditions. Contact rating 1A @ 120 VAC and 1A @ 24VDC.

3. If a Communication Module is used, see Figures 7, 8 or 9 for different wiring. A Communication Module will require 24VDC power which in turn provides isolated power to the Digitrip in the circuit breaker. If a Communication Module is not used, and if auxiliary voltage is desired for Alarms or display purposes, the trip unit should be fed from a separate galvanically isolated 24 volt dc supply.
Figure 3. Ground Fault Residual 3-Phase 4-Wire

Notes

1. Sensor NFNCTKIT (IZMX-CT16-N) is customer wired to sense Neutral currents. This is required for 3-phase, 4-wire Residual Ground Fault (applicable for Trip Units having G protection).

2. | Series NRX Frame | Required Sensor (IZMX Type Coding) |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>NF</td>
<td>NFNCTKIT (IZMX-CT16-N)</td>
</tr>
<tr>
<td>RF</td>
<td>RFNCTKIT (IZMX-CT40-N)</td>
</tr>
<tr>
<td>NF or RF</td>
<td>NFGFSKIT (IZMX-EFS)</td>
</tr>
</tbody>
</table>
Figure 4. Source Ground Fault Sensing

Notes

1. Sensor NFGFSKIT (IZMX-EFS) is used to sense and detect Ground Fault Currents.

2. Apply jumper for this mode of sensing for trip units having Ground or Ground Alarm Functionality.
Notes

1. Sensor NFGFSKIT (IZMX-EFS) is used to sense and detect Ground Fault Currents of 3-wire or 4-wire.

2. Apply jumper for this mode of sensing for trip units having Ground or Ground Alarm Functionality.
Notes

1. The Digitrip 520M Cat # N5MRLSI(G) can locally be placed in Maintenance Mode via a two position switch located on the Trip Unit. The Digitrip 1150 Cat # N11RLSI(G) can be locally programmed to place the Digitrip in Maintenance Mode. The function can be armed via a remote switch as shown. In addition, the function can be activated via Communications Modules. A blue LED on the Digitrip verifies the Digitrip is in Maintenance Mode.

2. The recommended selector switch for this low voltage application is Eaton part number 10250T133-2E which includes a contact block rated for logic level and corrosive use.

3. The maximum length of this wiring to remote Arm Switch (or alternate relay contact) is 3 meters (9.78 feet). Use # 20 AWG wire or larger.

4. A remote Stack Light Annunciator Panel or other remote indication device can be connected to verify that Digitrip is in Maintenance Mode.

5. Relay in Digitrip makes when in Maintenance Mode. Contact is rated 1A @ 120VAC.

6. The Digitrip can also be placed remotely in its Maintenance Mode via a General Purpose Relay (ice cube type with logic level contacts), activated by a remote control switch. A recommended type is IDEC Relay RY22. Choose voltage as desired.

7. If Communication Module is used, see Figures 7 or 8 for different wiring. The Communication Module will require 24VDC power and will provide isolated power to the Digitrip in the circuit breaker. If a Communication Module is not used, the Digitrip that requires auxiliary voltage for Alarms should be fed from a galvanically isolated 24 volt dc supply.
Figure 7. INCOM Communications Module (ICAM)

Notes

1. The Series NRX Communication Module is a separate device that snaps into the Din Rail starting at locations 19 through 26. (Removal of the four contact blocks is required.)

2. The Communications Module voltage requirement is 24VDC ±10% and should be sourced from a high quality supply (6 watts is the burden of the CAM).

3. INCOM communication cable is a two conductor with shield type wire in “daisy chain” configuration. The recommended cable (Belden “Blue Hose” # 9643 or equivalent) has a twisted-pair of wires (# 20 AWG stranded 7 x 28 conductors with PVC insulation) having an aluminum/mylar foil shield with drain wire. The Maximum system capacity is 10,000 feet of communications cable and 1000 devices on the INCOM network. Make sure that the twisted-pair wire is recommended for INCOM network use. Use shielded twisted-pair wire to connect each slave to the INCOM network, daisy-chain style. The polarity of the twisted-pair is not important. Ground the shield at the host computer (device).

4. Set the jumper on the module to enable or disable the communications control as desired.

5. When the Communications Module is employed and Source Ground or Zero Sequence Ground Sensing method is required, the Ground Fault function is enabled by this jumper.

6. Connectors are UL/CSA rated 300V, VDE rated 250V. The recommended connector is Weidmuller # BL 3.5/90/5 BK, oriented for 90° lead exit, however other lead orientations are possible. Wire guage # 18 AWG/0.82mm2.

7. The final device in the daisy-chain configuration must have a 100 ohm termination resistor installed across terminals #1 and #2 on TB2.
Notes

1. The Series NRX Communication Module is a separate device that snaps into the Din Rail starting at locations 19 through 26. (Removal of the four contact blocks is required.)

2. The Communications Module voltage requirement is 24VDC ±10% and should be sourced from a high quality supply (6 watts is the burden of the CAM).

3. Modbus communication cable is a three conductor with shield type wire in “daisy chain” configuration. The recommended cable has a twisted-pair of wires (#24 AWG stranded 7 x 32 conductors with PVC insulation) having an aluminum/mylar foil shield with drain wire. The Maximum system capacity is 4,000 feet of communications cable and 32 unit loads on the Modbus RTU network. Make sure that the twisted-pair wire is recommended for Modbus RTU network use. Use shielded twisted-pair wire to connect each slave to the Modbus RTU network, daisy-chain style. The polarity of the twisted-pair is not important. Ground the shield at the host computer (device).

4. Set the jumper on the module to enable or disable the communications control as desired.

5. When the Communications Module is employed and Source Ground or Zero Sequence Ground Sensing method is required, the Ground Fault function is enabled by this jumper.

6. Connectors are UL/CSA rated 300V, VDE rated 250V. The recommended connector is Weidmuller # BL 3.5/90/5 BK, oriented for 90° lead exit, however other lead orientations are possible. Wire gauge #18 AWG/0.82mm2.

7. The final device in the daisy-chain configuration must have a 121 ohm termination resistor installed across terminals #1 and #2 on TB2.
Notes

1. The Series NRX Communication Module is a separate device that snaps into Din Rail starting at location 19 through 26. (Removal of the four contact blocks is required.)
2. Communication Module voltage requirement is 24 VDC ± 10% and should be sourced from reliable service (6 watts is the burden of the CAM).
3. Profibus DP communication cable uses a five conductor flexible cable with shield type wire in “daisy chain” configuration. The maximum cable length depends on Baud rate and can link up to 32 unit loads on the network. See Profibus guide line Order number 2.142.
   Ground the shield at host computer (device).
4. Set jumper on the module to enable or disable communications control as desired.
5. When the Communications Module is employed and Source Ground or Zero Sequence Ground Sensing method is required, this Ground Fault function is enabled by this jumper.
6. Connector TB1 is UL/CSA rated 300V, VDE rated 250V. Recommended: Weidmuller (BL 3.5/90/5 BK) Orientation: 90° lead exit, but other lead orientations are possible. Wire gauge: #18 AWG / 0.82mm².
7. The final device on each end of the network in the daisy chain configuration must have termination resistors installed as shown on TB2.
**Figure 10. Communications Control (SR and ST Wiring)**

**Notes**

1. Spring Release and Shunt Trip wiring as shown for optional communication close or open capability.
2. Choose Spring Release coil voltage rating as desired if communications is required.
3. Choose Shunt Trip rating to be the same as Spring Release rating if communication is required.
5. Close duration is two seconds on communication activation.
6. Communication control jumper must be in the enable position for communications opening or closing.
7. Spring Release terminals are 35 & 36 for NF Frame only. For RF Frame breakers, the terminals are 49 & 50.
Figure 11. Undervoltage Release

Notes
1. Treated as the positive voltage for DC ratings.
Figure 12. Circuit Breaker Control - Type NF Frame

Legend:

MOT – Motor Operator for Charging Closing Spring
ST – Shunt Trip
SR – Spring Release

Description of Operation

1. Motor is energized and runs, charges closing spring, and is cut off by switch.
2. When spring is charged, SC closes and Green indicating light will light (if applicable).
3. Closing CS-C contact energizes Spring Release Coil and closes circuit breaker. Spring Release internal electronics pulse the SR coil and then provides a high impedance circuit. This provides anti-pumping.
4. When the spring discharges its energy, the motor switch will re-energize the charging motor until the spring is charged again.
5. To detect presence of voltage (Health Light), use Omron Red indicator LED Port # C22-LR-120 for 120VAC application. For 230VAC application, use C22-LR-230. For 24VDC application, use C22-LR-24. Remove White (22mm diameter pilot light) Light Diffuser from assembly to give better indication of voltage present. Activate Pushbutton to trip circuit breaker. See Eaton for other voltages.
6. For secondary contacts, odd numbers should be treated as positive for any accessory. This will not apply to AC ratings.
7. The secondary contacts for drawout circuit breakers have been so arranged to allow for jumper stab connectors to tie common voltage together wherever possible. (For example: Terminals 36 to 38 could employ this jumper stab).
8. Reference Figure 15 for internal circuit breaker wiring.
Figure 13. Circuit Breaker Control - Type RF Frame

Legend:
MOT – Motor Operator for Charging Closing Spring
ST – Shunt Trip
SR – Spring Release

Description of Operation

1. Motor is energized and runs, charges closing spring, and is cut off by switch.
2. When spring is charged, SC closes and Green indicating light will light (if applicable).
3. Closing CS-C contact energizes Spring Release Coil and closes circuit breaker. Spring Release internal electronics pulse the SR coil and then provides a high impedance circuit. This provides anti-pumping.
4. When the spring discharges its energy, the motor switch will re-energize the charging motor until the spring is charged again.
5. To detect presence of voltage (Health Light), use Omron Red indicator LED Port # C22-LR-120 for 120VAC application. For 230VAC application, use C22-LR-230. For 24VDC application, use C22-R-24. Remove White (22mm diameter pilot light) Light Diffuser from assembly to give better indication of voltage present. Activate Pushbutton to trip circuit breaker. See Eaton for other voltages.
6. For secondary contacts, odd numbers should be treated as positive for any accessory. This will not apply to AC ratings.
7. The secondary contacts for drawout circuit breakers have been so arranged to allow for jumper stab connectors to tie common voltage together wherever possible. (For example: Terminals 50 to 52 could employ this jumper stab).
8. Reference Figure 16 for internal circuit breaker wiring.
Figure 14. Series NRX NF Mounted Breaker (with external PT Module)

Series NRX NF Mounted Breakers – 3 pole – 3 wire
Series NRX RF Mounted Breakers without internal PT module

Series NRX NF Mounted Breakers – 3 pole or 4 pole – 4 wire
Figure 15. Series NRX-NF Frame Breaker Master Connection Diagram Drawing Number 6D32389 (continued next page)
Figure 15 Notes for previous page Number 6D32389 - NF Frame

Note:

1. All contacts shown with circuit breaker open and discharged and control power de-energized. The OTS are shown in reset position.
2. All trip unit wires are #22 AWG—0.34 mm²—300V.
3. All accessory wires are #18 AWG—0.82 mm²—600V.
4. 54 contacts maximum.
5. PT module inputs for Digitrip 1150 only.
6. Connectors K15 and K16 are not always present.
7. On three-pole circuit breakers only, connector K4—1.2 wires only are wired out to secondary contacts.
8. Odd number contacts have guide rib on black housing.
9. Zone interlock wiring shown dotted—optional jumper is standard.
10. Latch check switch can be wired either externally (option) or internally (option) to a spring release accessory. Wiring LCS internally ensures the one-shot pulse provided by the SR circuitry is made active only after the mechanism spring is charged and the latch is in its proper state.
11. For accessories having a DC rating, the odd numbers will be treated as positive voltage.
12. Reserved for spring charge SC input contact.
13. For Digitrip 520M ALM2 is an alarm used for GF (Ground fault style trip unit). ALM1 is used for diagnostic alarm or maintenance mode active. For Digitrip 1150, these contracts can be programmed as desired.
Figure 16. Typical breaker master connection diagram - RF
Figure 17. Typical breaker master connection diagram (Cont.) - RF.
Figure 16 and 17. Notes for two previous pages Number 6D32424 - RF Frame

1. All contacts shown with circuit breaker open and discharged and control power de-energized. The OTS are shown in reset position.
2. All trip unit wires are #22 AWG—0.34 mm²—300V.
3. All accessory wires are #18 AWG—0.82 mm²—600V.
4. 92 contacts maximum.
5. Contacts 47 and 48 are not used on this breaker. If an internal PT Module is not provided, an external PT Module may be connected at terminals 14, 30, 31, and 32.
6. Connectors K15 and K16 are not always present.
7. On three-pole circuit breakers only, connector K4—1.2 wires only are wired out to secondary contacts.
8. Odd number contacts have guide rib on black housing.
9. Zone interlock wiring shown dotted—optional jumper is standard.
10. Latch check switch can be wired either externally (option) or internally (option) to a spring release accessory. Wiring LCS internally ensures the one-shot pulse provided by the SR circuitry is made active only after the mechanism spring is charged and the latch is in its proper state.
11. For accessories having a DC rating, the odd numbers will be treated as positive voltage.
12. Reserved for spring charge SC input contact.
13. For Digitrip 520M ALM2 is used for GF (ground fault style trip unit) or high load alarm (non-ground fault style trip unit). ALM1 is used for diagnostic alarm or maintenance mode active. For Digitrip 1150, these contacts can be programmed as desired.