

## APPENDIX A - INSTRUCTIONAL REFERENCES

A list of instructional references is provided in Table A.1 to identify instructional documents that could be of assistance.

Table A.1 Instructional References (continued on next page)

DOCUMENT DESCRIPTION	DOCUMENT NUMBER
<b>Circuit Breakers</b>	
Series C̄ L-Frame Frame Book	IL 29-120L
Series C̄ N-Frame Frame Book	IL 29-120N
Series C̄ R-Frame Frame Book	IL 29-120R
Series C̄ R-Frame Supplement	IL 29C713
SPB Systems Pow-R Breaker Supplement	IL 29849
DSII/DSLII Breaker Supplement	IL 8700C39
<b>Digitrip OPTIM Trip Unit System</b>	
OPTIM Trip Unit System Overview	IB 29C890
OPTIM Trip Units	IB 29C891
OPTIMizer Hand Held Programmer	IB 29C892
Breaker Interface Module	IB 29C893
<b>Digitrip RMS Trip Units</b>	
Digitrip RMS 810	IL 29-888
Digitrip RMS 910	IL 29-889
<b>Digitrip OPTIM Wiring Diagrams</b>	
Series C̄ L-Frame Wiring	IL 29C894
Series C̄ N-Frame Wiring	IL 29C894
Series C̄ R-Frame Wiring	IL 29C714
SPB Systems Pow-R Wiring	IL 15545
DSII/DSLII Wiring	IL 1A33600
<b>Energy Monitoring Devices</b>	
IQ Energy Sentinel	
Series C̄ F-Frame	IL 17537
Series C̄ J-Frame	IL 17538
Series C̄ K-Frame	IL 17539
Universal IQ Energy Sentinel	
Internal	IL 17540
External	IL 17541
<b>Communication Devices</b>	
Communications Module (PONI)	
INCOM PONI	IL 17547
RS-232 PONI	IL 17202
Modem PONI	IL 17203
Buffered PONI	IL 17361
CONI	IL 17436
IMPACC Wiring Spec.	IL 17513

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<b>Accessories</b>	
Potential Transformer Module (L and N-Frame) Ground Fault Indicator	29C126 1259C14G01
<b>Digitrip OPTIM Time-Current Curves</b>	
<p>Series <math>\bar{C}</math> L-Frame Curves</p> <ul style="list-style-type: none"> <li>I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>600A Instantaneous &amp; Override Phase</li> <li>400A Instantaneous &amp; Override Phase</li> <li>250A Instantaneous &amp; Override Phase</li> <li>125A Instantaneous &amp; Override Phase</li> <li>Ground Fault Protection</li> </ul> <p>Series <math>\bar{C}</math> N-Frame Curves</p> <ul style="list-style-type: none"> <li>I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>Instantaneous &amp; Override Phase</li> <li>Ground Fault Protection</li> </ul> <p>Series <math>\bar{C}</math> R-Frame Curves</p> <ul style="list-style-type: none"> <li>1600/2000A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>1600/2000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600/2000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>2500A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>2500A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>2500A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600A Instantaneous &amp; Override Phase</li> <li>2000A Instantaneous &amp; Override Phase</li> <li>2500A Instantaneous &amp; Override Phase</li> <li>1600A Ground Fault Protection</li> <li>2000A Ground Fault Protection</li> <li>2500A Ground Fault Protection</li> </ul> <p>SPB Systems Pow-R Curves</p> <ul style="list-style-type: none"> <li>400-1200A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>400-1200A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>400-1200A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600-3000A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>1600-3000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600-3000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>4000-5000A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>4000-5000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>4000-5000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>400-1200A Instantaneous &amp; Override Phase</li> <li>1600-3000A Instantaneous &amp; Override Phase</li> <li>4000-5000A Instantaneous &amp; Override Phase</li> <li>Ground Fault Protection</li> </ul> <p>DSII/DSLII Curves</p> <ul style="list-style-type: none"> <li>400-1200A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>400-1200A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>400-1200A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600-5000A I<sup>2</sup>t Long &amp; Short Delay Phase</li> <li>1600-5000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase</li> <li>1600-5000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase</li> <li>400-1200A Instantaneous &amp; Override Phase</li> <li>1600-5000A Instantaneous &amp; Override Phase</li> <li>Ground Fault Protection</li> </ul>	<ul style="list-style-type: none"> <li>SC-6323-96</li> <li>SC-6324-96</li> <li>SC-6325-96</li> <li>SC-6326-96</li> <li>SC-6327-96</li> <li>SC-6328-96</li> <li>SC-6329-96</li> <li>SC-6330-96</li> <li>SC-6331-96</li> <li>SC-6332-96</li> <li>SC-6333-96</li> <li>SC-6334-96</li> <li>SC-6335-96</li> <li>SC-6336-96</li> <li>SC-6337-96</li> <li>SC-6338-96</li> <li>SC-6339-96</li> <li>SC-6340-96</li> <li>SC-6341-96</li> <li>SC-6342-96</li> <li>SC-6343-96</li> <li>SC-6344-96</li> <li>SC-6345-96</li> <li>SC-6346-96</li> <li>SC-6347-96</li> <li>SC-6348-96</li> <li>SC-6349-96</li> <li>SC-6350-96</li> <li>SC-6351-96</li> <li>SC-6352-96</li> <li>SC-6353-96</li> <li>SC-6354-96</li> <li>SC-6355-96</li> <li>SC-6356-96</li> <li>SC-6357-96</li> <li>SC-6358-96</li> <li>SC-6359-96</li> <li>SC-6360-96</li> <li>SC-6275-95</li> <li>SC-6276-95</li> <li>SC-6277-95</li> <li>SC-6278-95</li> <li>SC-6279-95</li> <li>SC-6280-95</li> <li>SC-6281-96</li> <li>SC-6282-96</li> <li>SC-6283-96</li> </ul>

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Series C̄ R-Frame Supplement	IL 29C713
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DSII/DSLII Breaker Supplement	IL 8700C39
<b>Digitrip OPTIM Trip Unit System</b>	
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Series C̄ N-Frame Wiring	IL 29C894
Series C̄ R-Frame Wiring	IL 29C714
SPB Systems Pow-R Wiring	IL 15545
DSII/DSLII Wiring	IL 1A33600
<b>Energy Monitoring Devices</b>	
IQ Energy Sentinel	
Series C̄ F-Frame	IL 17537
Series C̄ J-Frame	IL 17538
Series C̄ K-Frame	IL 17539
Universal IQ Energy Sentinel	
Internal	IL 17540
External	IL 17541
<b>Communication Devices</b>	
Communications Module (PONI)	
INCOM PONI	IL 17547
RS-232 PONI	IL 17202
Modem PONI	IL 17203
Buffered PONI	IL 17361
CONI	IL 17436
IMPACC Wiring Spec.	IL 17513

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<p><b>Series C L-Frame Curves</b>                      I<sup>2</sup>t Long &amp; Short Delay Phase                      I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      600A Instantaneous &amp; Override Phase                      400A Instantaneous &amp; Override Phase                      250A Instantaneous &amp; Override Phase                      125A Instantaneous &amp; Override Phase                      Ground Fault Protection</p> <p><b>Series C N-Frame Curves</b>                      I<sup>2</sup>t Long &amp; Short Delay Phase                      I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      Instantaneous &amp; Override Phase                      Ground Fault Protection</p> <p><b>Series C R-Frame Curves</b>                      1600/2000A I<sup>2</sup>t Long &amp; Short Delay Phase                      1600/2000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      1600/2000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      2500A I<sup>2</sup>t Long &amp; Short Delay Phase                      2500A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      2500A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      1600A Instantaneous &amp; Override Phase                      2000A Instantaneous &amp; Override Phase                      2500A Instantaneous &amp; Override Phase                      1600A Ground Fault Protection                      2000A Ground Fault Protection                      2500A Ground Fault Protection</p> <p><b>SPB Systems Pow-R Curves</b>                      400-1200A I<sup>2</sup>t Long &amp; Short Delay Phase                      400-1200A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      400-1200A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      1600-3000A I<sup>2</sup>t Long &amp; Short Delay Phase                      1600-3000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      1600-3000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      4000-5000A I<sup>2</sup>t Long &amp; Short Delay Phase                      4000-5000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      4000-5000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      400-1200A Instantaneous &amp; Override Phase                      1600-3000A Instantaneous &amp; Override Phase                      4000-5000A Instantaneous &amp; Override Phase                      Ground Fault Protection</p> <p><b>DSII/DSLII Curves</b>                      400-1200A I<sup>2</sup>t Long &amp; Short Delay Phase                      400-1200A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      400-1200A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      1600-5000A I<sup>2</sup>t Long &amp; Short Delay Phase                      1600-5000A I<sup>2</sup>t Long &amp; Flat Short Delay Phase                      1600-5000A I<sup>4</sup>t Long &amp; Flat Short Delay Phase                      400-1200A Instantaneous &amp; Override Phase                      1600-5000A Instantaneous &amp; Override Phase                      Ground Fault Protection</p>	<p>SC-6323-96                      SC-6324-96                      SC-6325-96                      SC-6326-96                      SC-6327-96                      SC-6328-96                      SC-6329-96                      SC-6330-96</p> <p>SC-6331-96                      SC-6332-96                      SC-6333-96                      SC-6334-96                      SC-6335-96</p> <p>SC-6336-96                      SC-6337-96                      SC-6338-96                      SC-6339-96                      SC-6340-96                      SC-6341-96                      SC-6342-96                      SC-6343-96                      SC-6344-96                      SC-6345-96                      SC-6346-96                      SC-6347-96</p> <p>SC-6348-96                      SC-6349-96                      SC-6350-96                      SC-6351-96                      SC-6352-96                      SC-6353-96                      SC-6354-96                      SC-6355-96                      SC-6356-96                      SC-6357-96                      SC-6358-96                      SC-6359-96                      SC-6360-96</p> <p>SC-6275-95                      SC-6276-95                      SC-6277-95                      SC-6278-95                      SC-6279-95                      SC-6280-95                      SC-6281-96                      SC-6282-96                      SC-6283-96</p>

## APPENDIX B - CHECKING ZONE SELECTIVE INTERLOCKING

**Notice:** See wiring diagrams for specifications on wire size, number of permissible breakers and other details. See Table A.1 for a list of wiring diagrams.

**Step 1:** To test the short delay interlocks, follow steps 2 thru 4.

**Step 2:** With no current flowing in any of the breakers in the system and with no auxiliary power applied, temporarily connect the short delay output to the short delay input on each breaker (both upstream and downstream) in the system one by one. The designations of the breaker terminals which should be connected are:

NEP/LEP Trip Units	REP Trip Units	
SOUT TO SIN	RD and SPB D9 to D10	DSII Z2 to Z3

Temporarily set the short delay time to .2 seconds or greater and a flat response. Set the instantaneous trip to maximum. If the breaker has a Digitrip 750 or 1050 trip unit, an OPTIMizer or BIM must be used to change settings. If the breaker has a Digitrip 510, 610, 810 or 910 trip unit, the settings can be changed by the switches on the trip unit. Then run a short delay test with a simulated current 20% above the short delay pick up. If the breaker has a Digitrip 750 or 1050 trip unit, the test must be run using an OPTIMizer or BIM. The trip time should be a bit less than the short delay time setting. If the time is less than .1 seconds, there is a problem with the breaker. After the test on each breaker is complete, return all connections and settings to their original condition.

**Step 3:** Next, and still with no current flowing in any of the breakers in the system and with no auxiliary power applied, temporarily connect 5 to 6 volts dc from a battery or other convenient source in parallel with the short delay interlock output on one downstream breaker. The designations for the breaker terminals to which this voltage is to be applied are:

	NEP/LEP Trip Units	REP Trip Units (RD and SPB) (DSII)	
+ side of voltage	SOUT	D9	Z2
- side of voltage	COM	C1	Z1

**Step 4:** Next on the upstream breaker that is fed from this downstream breaker temporarily set the short delay time to .2 seconds or greater and a flat response. Set the instantaneous trip to maximum. If the upstream breaker has a Digitrip 750 or 1050 trip unit, an OPTIMizer or BIM must be used to change settings. If the upstream breaker has a Digitrip 510, 610, 810 or 910 trip unit, the settings can be changed by the switches on the trip unit.

Then run a short delay test on the upstream breaker with a simulated current 20% above the short delay pick up. If the upstream breaker has a Digitrip 750 or 1050 trip unit, the test must be run using an OPTIMizer or BIM. If the zone selective system is working properly, the trip time will be a bit less than the short delay time setting on the upstream breaker. If the time is less than .1 seconds, a wiring error is indicated. Then disconnect the voltage at the downstream breaker and repeat the test on the upstream breaker. Now the trip time should be less than .1 second. Note these tests must be run with the temporary voltage applied at each downstream breaker. Furthermore, if there is more than one upstream breaker fed from downstream breakers, each upstream breaker must be tested with each downstream breaker. After all tests are complete, return all settings to their original condition.

**Step 5:** To test the ground fault interlocks on breakers with NEP or LEP trip units, repeat steps 2 thru 4 except substitute GOUT for SOUT and GIN for SIN. To test the ground fault interlocks on RD or SPB breakers with REP trip units, repeat steps 2 thru 4 except substitute C4 for D10 and C5 for D9. To test the ground fault interlocks on DSII breakers with REP trip units, repeat steps 2 thru 4 except substitute Z4 for Z2 and Z5 for Z3.

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