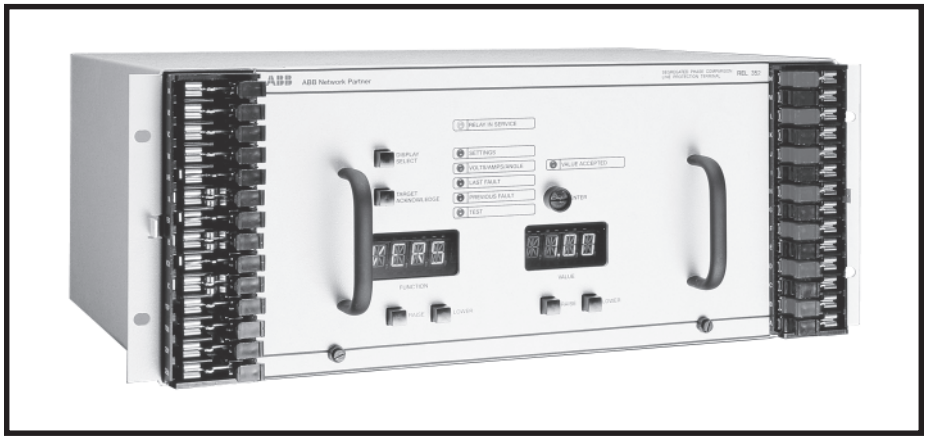
Effective: February 2001
New Information
Mailed to: E, D, C/40-100C, 41-400B

Multi-Zoned Distance
Device Number: 87L

REL 352 Phase Comparison Line Protection System



BASIC SYSTEM

Standard Features

Numerical Processing (Fully Digital)

Multiple Microprocessor Design

Phase Comparison Protection Algorithm

Current Change (DI) Detectors and Selectable Voltage Change (DV) Detectors

Four High Set Overcurrent Units for Direct Trip

Fault Locator Function

Self Checking Function

Sampling Techniques:

- 7 Incoming Analog Waveforms
- 12 Samples per Cycle

High Speed Operation

Loss of Potential Supervision

Loss of Current Monitoring

Close Into Fault Detection

1 or 5 ampere Current Transformer Operation

50 or 60 Hz Operation

Contact Outputs for:

- Breaker Trip
- General Start
- Breaker Failure Initiate
- Reclose Initiate, Reclose Block
- System Failure Alarm
- Channel Alarm
- Trip Alarm

RS232C Communications Port

Communication Channel Delay Measurement

Digital Fault Recording

Local Man-Machine Interface

19 Inch Rack Mounting; 4-Rack Units High

Optional Features

FT-14 Test Switches

Distance Backup Function

Power Swing Block or Trip

Dual Power Supplies

Extended Contact Output (6 Trip, 6 BFI, 2 RB)

RS232C Communications Port with IRIG Input Port

APPLICATION

The REL 352 relay is a numerical (fully digital) phase comparison transmission line protection system, with optional distance back-up protection.

The REL 352 is a dual-microprocessor based, composite sequence filter, phase comparison protection system. The REL 352 operates on the principles inherited from previous successful phase comparison relaying systems; but, adapted and improved using numerical techniques.

The REL 352 is a communication channel dependent system optimized for operating with power line carrier equipment. Either ON-OFF or FSK (frequency shift) power line carrier equipment can be used to interface with the REL 352.

The REL 352 is a high speed relaying system suitable for application to any voltage level. Its principle of operation makes it ideal for short lines and tapped lines with a power transformer, where traditional distance protection fails.

An optional distance-type relaying system can be included to provide back-up for a loss of communication channel. This back-up system is similar to a zone 2 and zone 3 distance units and logic for a distance non-pilot relaying system.

The REL 352 has the capability of communication channel propagation delay measurement, which is very important for the correct operation of the relaying system. Once this delay has been measured, it will be entered as a system setting.

CONSTRUCTION

The REL 352 relay assembly consists of an outer-chassis and an inner-chassis which slides into the outer-chassis. All of the relay circuitry, with the exception of the input isolation transformers and first-line surge protection, are mounted on the inner chassis, to which the front panel is attached. The outer chassis has a backplate, which is a receptacle for all external connections. Two optional FT-14 switches are mounted in the two peripheral areas of the outer chassis.

REL 352 SPECIFICATIONS

TECHNICAL

Principle of Operation

Phase Comparison, Single-Comparer and Dual Comparer using Low Speed Power Line Carrier (ON-OFF and FSK), Audio Tone and Microwave

INPUT RATINGS

Nominal ac Voltage

(VLN) at 60 Hz	69.3 V rms
Nominal ac Current (In)	1 or 5 A rms
Rated Frequency	50 or 60 Hz

Maximum Permissible ac Voltage

Continuous	160 V rms (limited by maximum input to A/D converter)
10 Second	240 V rms (limited by input transformer flux density)

Maximum Permissible ac Current

Continuous	15 A rms (limited by thermal characteristics)
1 Second Operational	160 A rms-5A nominal 32 Arms-1A nominal (limited by maxmum input to the A/D converter)
Thermal	500 A

dc Battery Voltages

Nominal	Input Range
60/48 V dc	38 - 70 V dc
110/125 V dc	88 - 150 V dc
220/250 V dc	176 - 280 V dc

dc Burdens

Battery	15 W normal
	40 W tripping

ac Burdens

Volts per Phase	0.02 VA at 70 V ac
Current per Phase	0.45 VA at 5 A

EXTERNAL CONNECTIONS

Terminal blocks located on the rear of the chassis suitable for #14 square tongue lugs. Wiring to FT-14 switches suitable for #12 wire lugs.

CONTACT DATA

Trip Contacts - make and carry 30 A for 1 second, 10 A continuous capability, break 50 watts resistive or 25 watts with L/R =.045 seconds

Non-Trip Contacts - 1 A dc make and continuous, break 25 watts resistive or 10 watts with L/R = 0.045 from 38 to 280 V dc

Contacts also meet IEC-255-6A, IEC-255-12, IEC-255-16, BS142-1982

COMMUNICATION EQUIPMENT INTERFACE

Inputs

Optoisolated (7500 V peak) jumper configurable for 20 V, 48 V, 125 V external dc Power Supply Operation

"On" State Current:

20 V	15 mA
48 V	6 mA
125 V	6 mA

Interfaces to Power Line Carrier (ON-OFF and FSK) Audio Tone and Microwave

Mark 1
Space 1
Channel Failure 1
Mark 2
Space 2
Channel Failure 2

} 3-Terminal Application

Output

Optoisolated (7500 V peak) Power Transistor Output (Rated 400 V) supporting external dc power supply operation in the range of 20 - 150 V dc

Interfaces to

Carrier on/off (for ON-OFF PLC) or Carrier mark / space (for FSK PLC) control

OPTIONAL COMPUTER NETWORK INTERFACE

RS232C/PONI - with IRIG input port for single point computer communications

INCOM/PONI - for local network communications using INCOM network

CHASSIS DIMENSIONS AND WEIGHT

Height 7" (177.8 mm) 4 Rack Units (See Figure 1)

Width 19" (482.6 mm)

Depth 14" (356 mm) including terminal blocks

Weight 38 lb. (17.5 kg)

ENVIRONMENTAL DATA

Ambient Temperature Range

For Operation	-20ºC to +60ºC
For Storage	-40ºC to +80ºC

Insulation Test Voltage 2.8 kV, dc, 1 minute (3.2 kV dc, 1 sec) ANSI, C37.90 IEC-255-5

Open contacts 1400 Vdc continuous

Impulse Voltage Withstand 5 kV Peak, 1.2/50 microseconds, 0.5 Joule, (IEC-225-5)

Surge Withstand Voltage 3 kV, 1 MHz (ANSI C37.90.1, IEC-255-22-1)

Fast Transient Voltage 4 kV, 10/100 ns Withstand (ANSI C37.90.1, IEC 255-22-4)

EMI Field Strength Withstand 25 MHz-1GHz, 10V/m Withstand (ANSI C37.90.2)

Electrostatic Discharge Tests (IEC 255-22-2, IEC, 801-Y) 8/12 kV test voltage

Emission Tests (EN 55022, Class A)

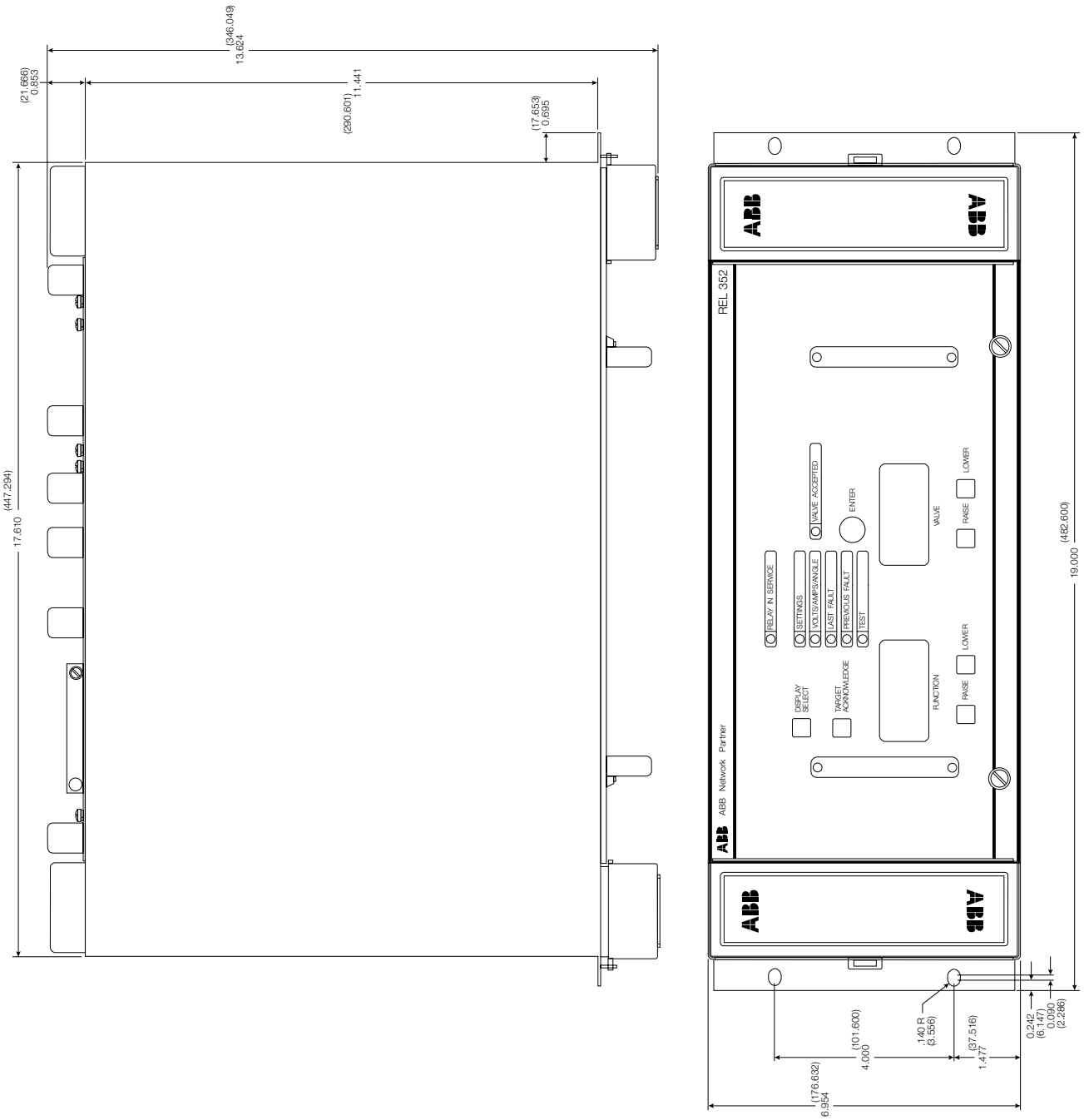


Figure 1. REL 352 Outline Drawing

REL 352 RELAY SYSTEM

CATALOG NUMBERING SCHEME

Catalog Digit #	1	2	3	4	5	6	7	8	9	10
Typical REL 352 Catalog #	M	P	2	B	2	N	B	N	R	G

TRIP / BFI / RI / RB / CONTACTS **(DIGIT #3)**

[6] = 6 Trip, 6 BFI, 4 RI, 2 RB Contacts
[2] = 2 Trip, 2 BFI, 4 RI, 2 RB Contacts

CURRENT INPUT **(DIGIT #4)**

[A] = 1 AMP CT
[B] = 5 AMP CT
[C] = MOCT Inputs (Not Available - Future Release)

BATTERY SUPPLY VOLTAGE **(DIGIT #5)**

[1] = 48/60 V dc Single Supply
[2] = 110/125 V dc Single Supply
[3] = 220/250 V dc Single Supply
[4] = 48/60 V dc Dual Supplies
[5] = 110/125 V dc Dual Supplies
[6] = 220/250 V dc Dual Supplies

DISTANCE BACKUP RELAYING **(DIGIT #6)**

[P] = Backup Distance Protection
[N] = No Backup Protection

PILOT SYSTEM COMMUNICATION CHANNEL INTERFACE **(DIGIT #7)**

[B] = Binary I/O Interface to PLC (AM & FM), Audio Tone, Anolog Microwave (Optoisolated 24, 48, 125 V dc External Power Supply)

TEST SWITCHES **(DIGIT #8)**

[F] = FT-14 Switches
[N] = No FT-14 Switches

REMOTE COMMUNICATION DEVICE **(DIGIT #9)**

[R] = RS232C PONI
[C] = INCOM PONI
[B] = RS232C W/IRIG Port

ADDITIONAL FEATURES **(DIGIT #10)**

[G] = Oscillographic Data Storage

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