



150 Series Drawout Motor (MVD) and Feeder (FVD) Protection Relays



Withdrawable case structure featuring self shorting CT contacts on removal.

Intelligent Protection and Control

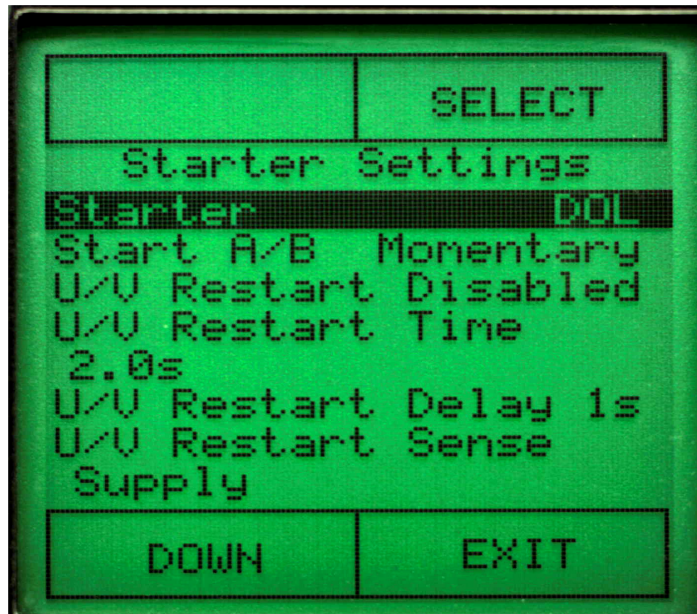
Field programmable front panel, including LEDs and display.

Support for Ethernet, IEC 61850, MODBUS TCP/IP, Serial, MODBUS RTU, P&B Network Gold and PROFIBUS DP.



Simple and Easy to use menu interface

Comprehensive Protection for MV and LV systems



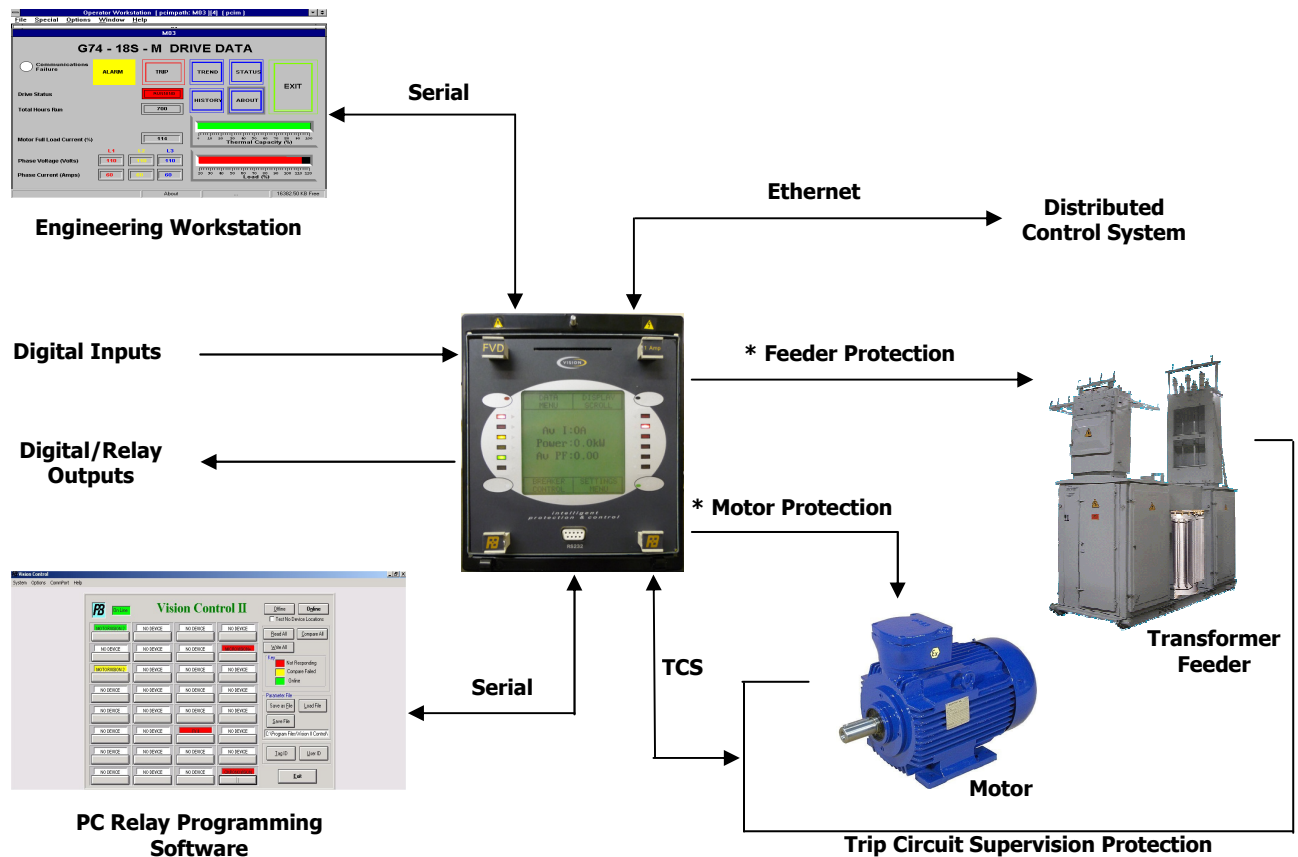
Designed for high temperature industrial environments

75 years experience of providing world class protection products



Functional Overview

The MVD and FVD protection relays provide many functions, these include multiple communication options, a range of I/O configurations including programmable external inputs, trip circuit supervision protection, programmable outputs and configurable LEDs making the 150 Series relays a complete solution for MV and LV applications.



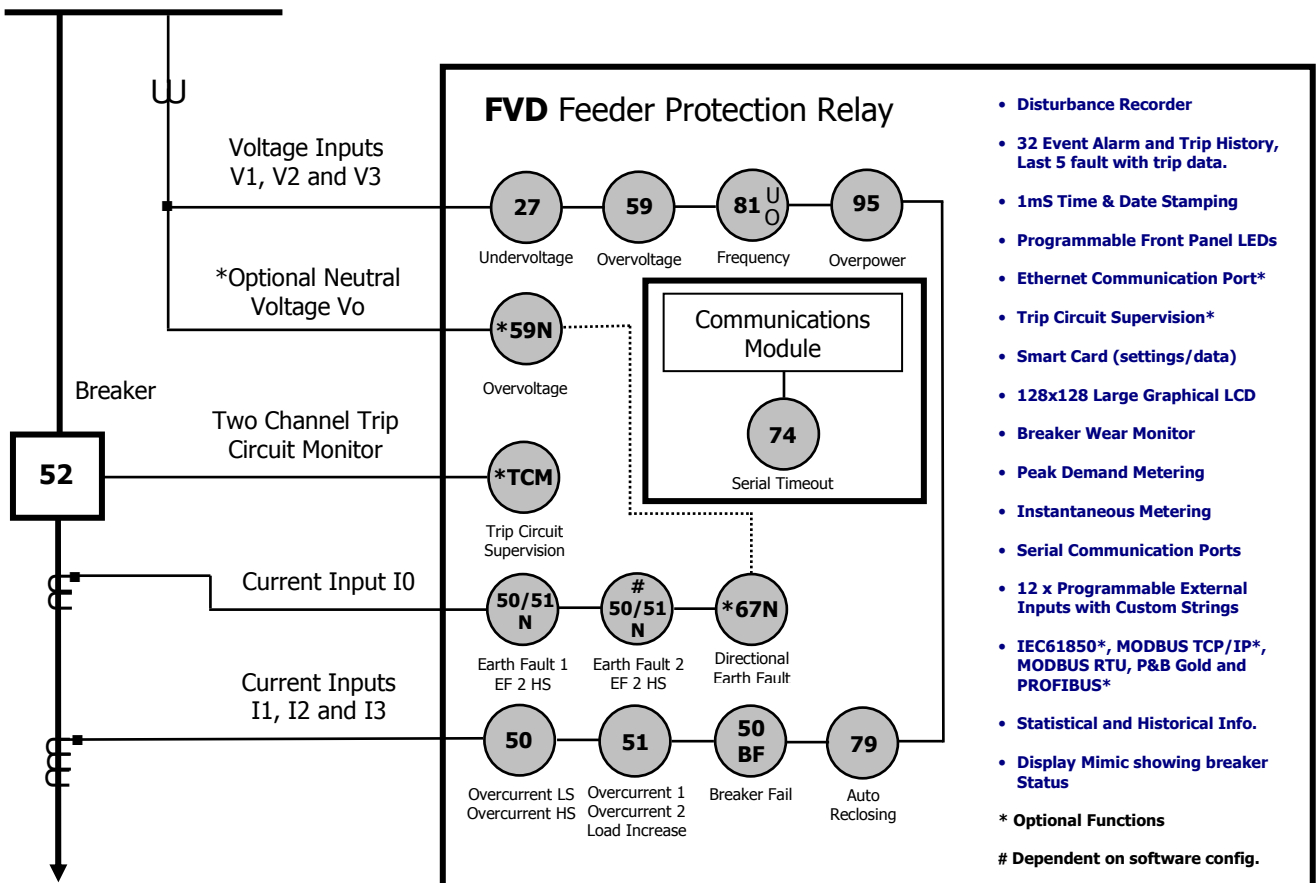
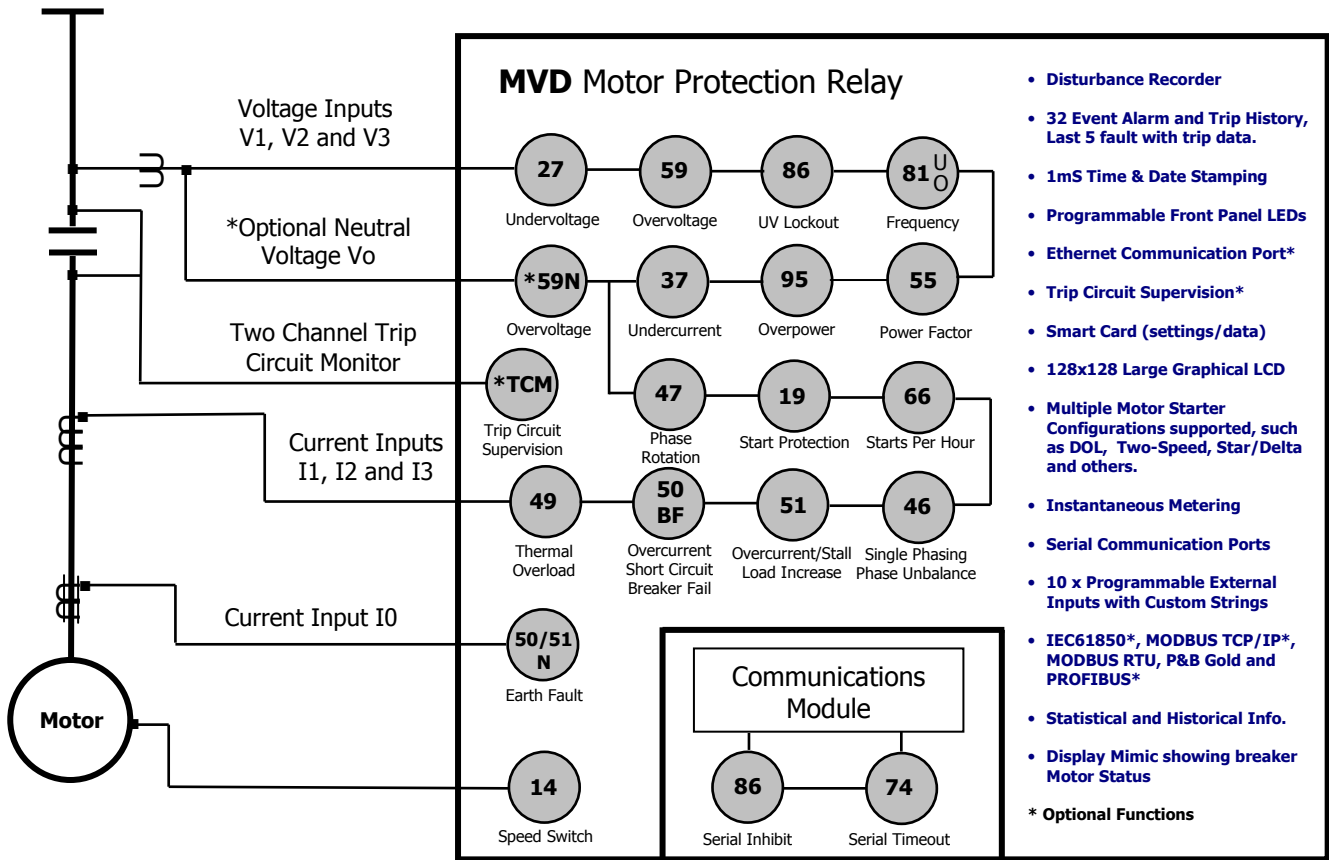
(* Dependent on relay type chosen)

Hardware Overview

- Operating temperature range -20°C to +85°C
- Auxiliary power supply voltage range 80 – 265Vac/dc or 24 - 48Vdc
- 1A or 5A ac current inputs I1, I2, I3 and I0
- 500Vac maximum ac voltage inputs V1, V2, V3 and V0
- Twelve programmable digital inputs
- Upto three programmable relay outputs with changeover contacts
- Upto seven programmable LED status indicators
- Two channel trip circuit supervision protection
- RS232 programming port
- Serial RS485 or Ethernet communication
- 128 x 128 graphic liquid crystal display
- Time Synchronisation – Serial and NTP
- Optional conformally coated circuit boards



Protection Overview





Feature Overview

Large 128 x 128 graphic liquid crystal display.

Provides clear concise information, multiple messages can be viewed along with detailed fault/troubling shooting data, such as disturbance recording data and motor start curve

Programmable front panel LEDs to indicate user defined relay status



Smartcard interface port, allowing external Settings/Data storage

Easy to use four button menu interface

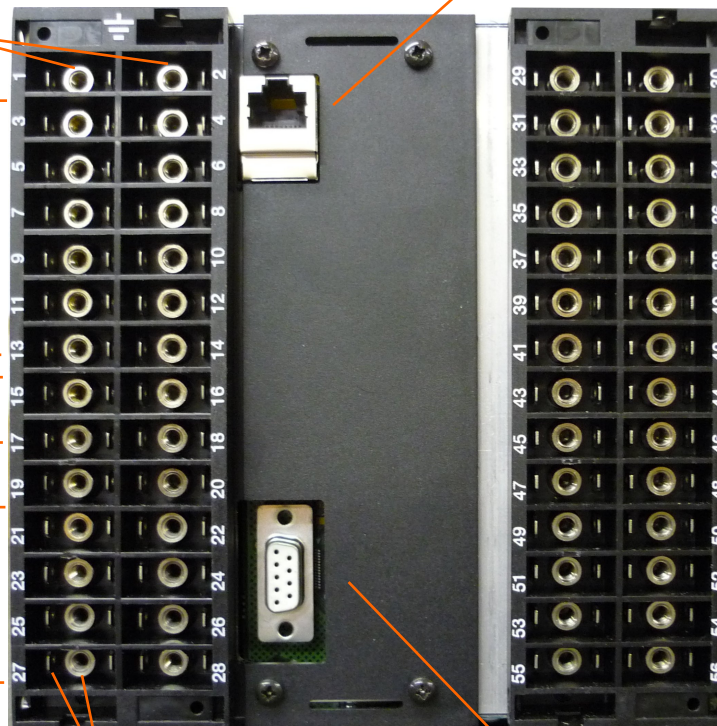
RS232 port allowing simple programming and data extraction from the relay via a PC.

Power supply options
80 – 265Vac/dc
and 24 - 48Vdc

Four programmable output relays with changeover contacts

High speed RS485 serial communication port

CT inputs, 3 phase + Earth fault. CT inputs have self shorting contacts, which engage when relay is removed from the case.



Optional Ethernet communication port, MODBUS TCP/IP or IEC 61850

Programmable digital inputs, with editable custom string options

Optional two channel Trip Circuit Supervision (TCS) monitor

VT inputs, 3 phase + optional neutral voltage input

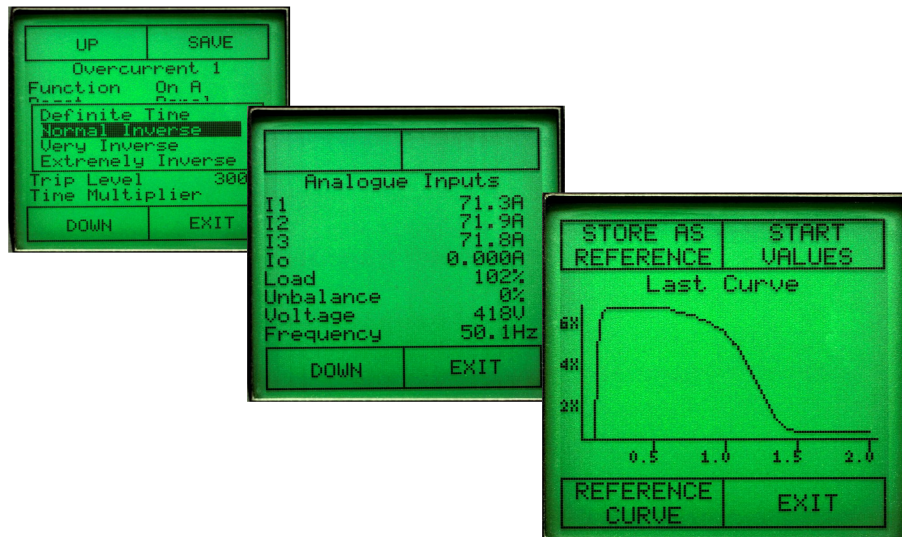
Optional IEC 61850 programming/upgrade port interface

All connectors are equipped for both screw and crimp terminals



User Interface and Programming

The LCD menu is driven by four push buttons, this allows access to measured and recorded data as well as providing a programming interface for the relay settings. The large display allows the menu to be structured in an intuitive way to allow ease of use and clear understanding of the presented information.

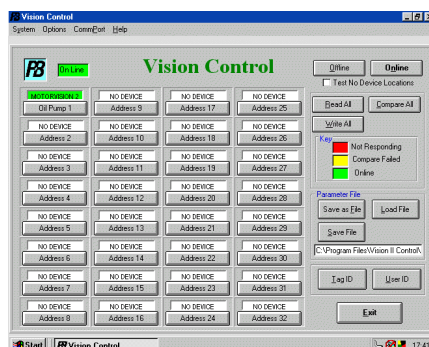


The 150 Series Drawout relays provide three ways to quickly and easily configure the protection and systems settings required to put the relay into service. One method is via the large liquid crystal display using the simple and intuitive menu structure, the second method is via a personal computer and the P&B dedicated Vision Control software and the third method is via a portable smartcard.

Vision Control Software

The Vision Control software is a Windows based PC program offering a graphical user interface allowing full access to the P&B Vision relays, key features are shown below.

- Designed to allow online/offline programming of all P&B Vision Relays
- One parameter file can store data for upto 32 devices as per a typical RS485 network
- Single drives or complete networks are supported, there is no limit on the number of Parameter files, which can be used/saved.
- Metering and Historic data is readily available for download/viewing
- Disturbance Recording data extraction (COMTRADE format)
- Support for relay firmware updates
- Support for Smartcard programming





Fault Reporting and Troubleshooting

The 150 Series relay comes equipped with an extensive range of features designed to help and determine the order and cause of events, to aid and assist in troubleshooting and root-cause analysis. All events and waveforms captured are time and date stamped with a resolution of 1mS.

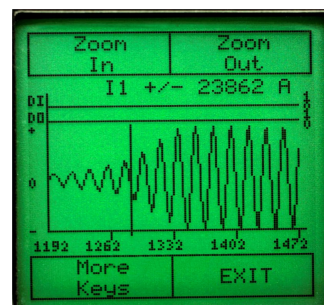
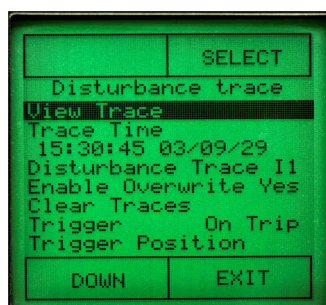
Disturbance Recorder Overview

Disturbance and fault recording is a very effective tool for the operating and design personnel to analyse the performance of the power system and related equipment during and after a major disturbance.

P&B's Disturbance and Fault Recorder System acquires the conditions in an electrical system that lead to (pre-fault), persist during (fault) and follow the fault (post-fault) for subsequent analysis. The analysis provides a detailed insight, with time resolution in milliseconds, into the behaviour of the electrical system.

Each relay can be equipped with its own onboard disturbance recording facility. This can provide up to 8 seconds of waveform capture and can be multi triggered and weighted pre and post fault. Each current and voltage phase is individually recorded along with one programmable digital input and one programmable digital output. Uniquely, due to the powerful graphical display, waveform traces can also be viewed directly at the relay with zoom and scroll functions without the need for any external equipment. Alternatively the waveform data maybe extracted from the relay using the front RS232 port in a 'COMTRADE' format for analysis by any compatible software.

For motor protection the disturbance recorder can be set to trigger on a motor start, this allows a complete capture of the motor start event providing a graphical capture of the actual waveforms allowing the user to easily troubleshoot any problems with motor starting.



Fault Event Overview

This allows upto 32 trip and 32 alarm events to be recorded all with time and date stamping, with a resolution of 1mS. The last 5 events, both for trip and alarm come complete with all the pre-trip data, this includes all current and voltage values, power, power factor and any other relevant data associated with the trip or alarm.

The event recorder memory capacity can be increased through the use of an external smartcard. Through the use of the smartcard sequence event records can be recorded. This allows the tracking of control inputs, control outputs, command inputs, trip/alarm events and auxiliary power dips/losses. The time and date of each event are available in the report.



Specifications

Auxiliary Power Supply & Low Voltage Power Supply	
AC Nominal	Range 80 – 265V AC / DC Range 24V AC / 24-48V DC (Low Voltage Power Supply Optional Extra)
Maximum Power Consumption	10VA Nominal

Operating Temperature Range	
150 Series Protection Relay	-20 °C to +85 °C
IEC 61850 Communication Card	-40 °C to +85 °C

Phase Current Measurement	
Method	True RMS, Sample time <1ms
Range	0.1 to 25x Phase CT Primary Amps
Full Scale	25 x Phase CT Primary Amps Setting
Display Accuracy	± 3% at Phase CT Primary amps
Pick Up Accuracy	± 3% of setting

Earth Phase Current Measurement	
Method	True RMS, Sample time <1ms
Range	0.01 to 2.5x E/F CT Primary Amps (MVD) 0.10 to 25x E/F CT Primary Amps (FVD)
Full Scale	2.5 x E/F CT Primary Amps Setting (MVD) 25 x E/F CT Primary Amps Setting (FVD)
Display Accuracy	± 3% of Reading Over Range
Pick Up Accuracy	± 3% of setting
CT Burden	0.1VA

Voltage Reference Measurement	
Suitable for connection preferably via isolating transformers (VT) or direct connection to max phase to phase system voltage not exceeding the rated voltage.	
Method	True RMS, Sample time <1ms
Rated Insulation Voltage	1000V
Range	100 – 500V AC up to 22kV with external VT
Display Accuracy	± 3%
Power Accuracy	± 5% of Nominal
VT Burden	0.01 VA

Overload Alarm and Trip Curves	
Fault Time Accuracy	± 50mS up to 10 seconds ± 2% of trip time over 10 seconds
Threshold Current Level	Overload Setting ± 2%

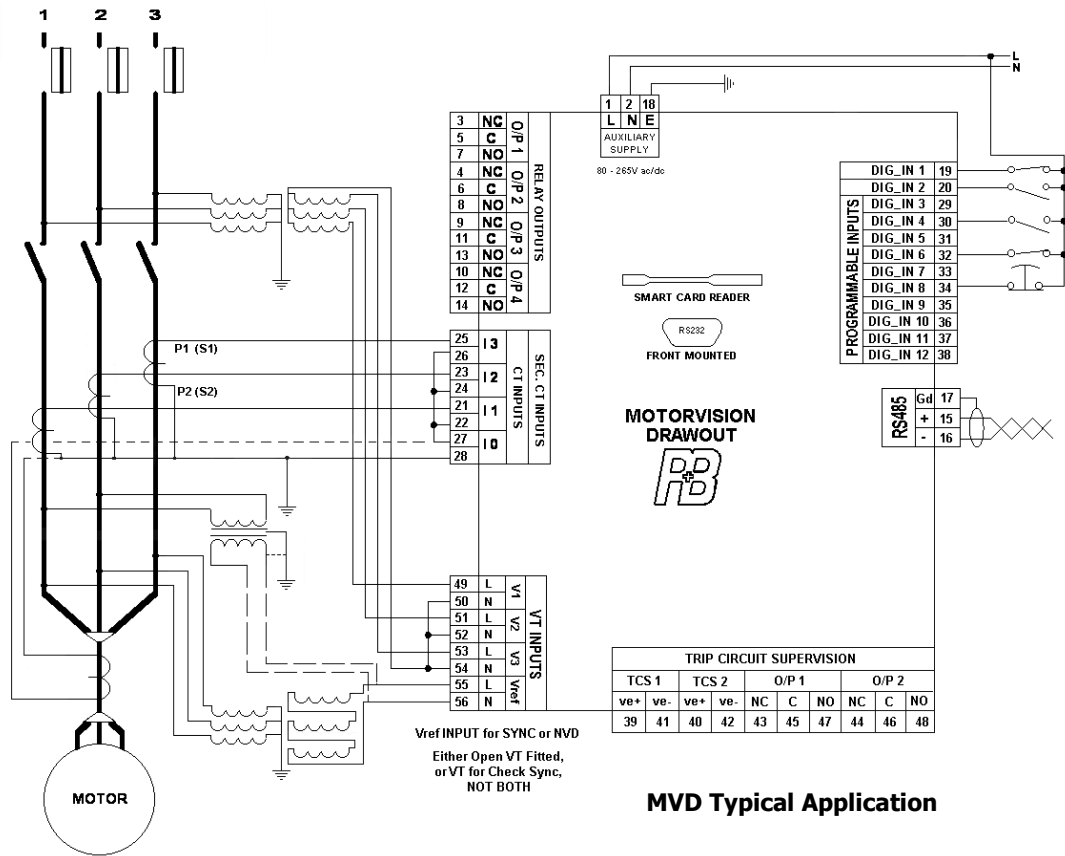
Current Unbalance Alarm and Trip	
Method	Unbalance = $100 \times (I_{max} - I_{min}) / I_r$ % Where I_{max} = max. of 3 phase currents I_{min} = min. of 3 phase currents I_r = Larger of I_{max} or Motor FLC
Alarm Threshold Unbalance Level	50% of Unbalance current ± 2%
Alarm Fixed Time Delay Accuracy	1.0 ± 0.1 seconds
Trip Threshold Unbalance Level	Unbalance Current Setting ± 2%
Trip Time Accuracy	± 0.1 second up to 10 seconds ± 0.1 second +/- 2% above 10 sec.

Time Delays	
Accuracy	± 0.5 seconds or ± 2% of time
Exceptions	
Earth Fault Trip	+150mS,-0.0@ 1.1 x setting +60mS,-0.0@ 2 x setting +40mS,-0.0@ 5 x setting
Total Run Time	Accuracy ± 2%
Auto Restart delay on Restart Time	± 0.2 seconds (additional 2 second initialisation time delay if aux. supply lost)

Output Relays	
Rated Load (at various supply voltages)	10A @ 250 AC 10A @ 30V DC 0.6A @ 110V DC 0.1A @ 220V DC
Continuous Thermal Load	10A
Max Making Current (max. 4s at duty cycle 10%)	35A
Bounce time N/O contact / N/C contact	0.6 / 17 ms
Contact Protection	385V DC, 47 J MOV across both normally closed and normally open contacts

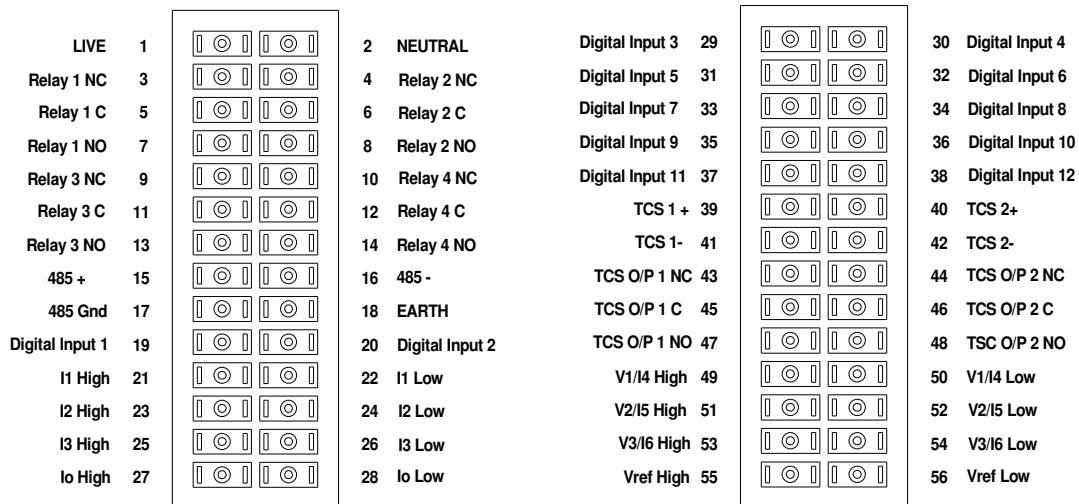


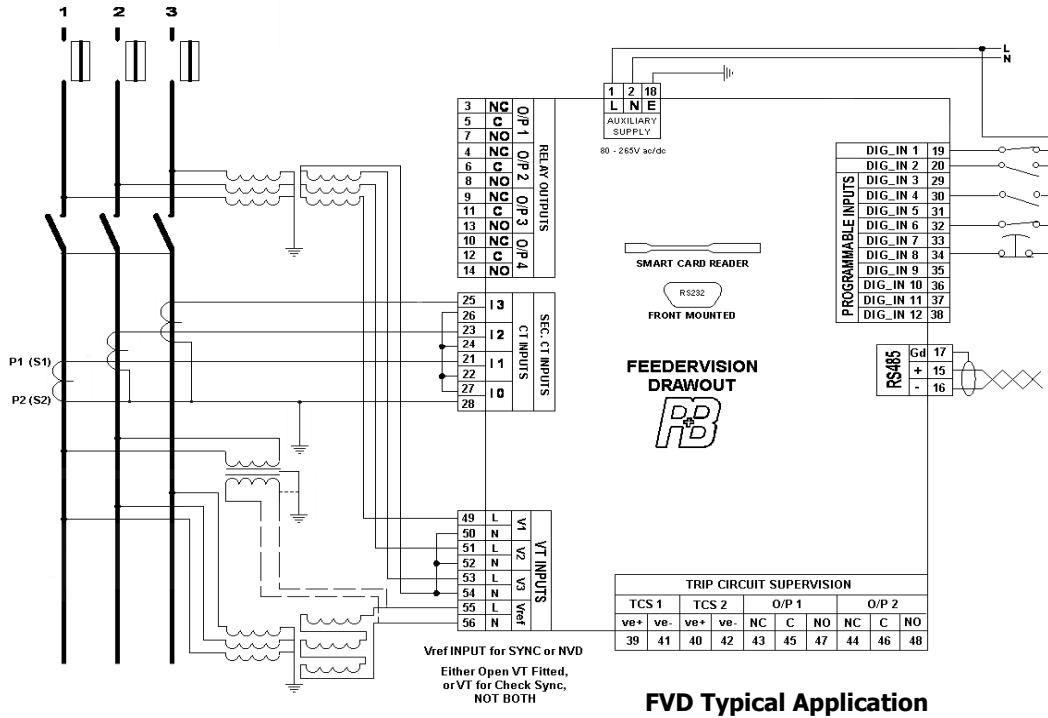
Application Overview



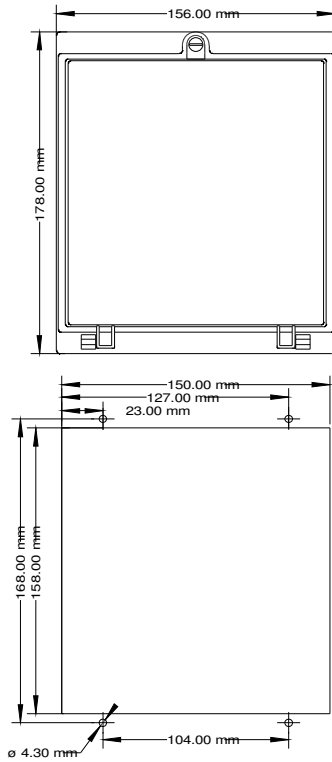
MVD Typical Application

150 Series Terminal Connections





FVD Typical Application



Enclosure Cut Out Dimensions

Designers and Manufacturers of
Motor and Feeder Integrated
Protection Control & Monitoring
Systems

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