



P&B ENGINEERING



INTELLIGENT PROTECTION & CONTROL

INTEGRATED COMMUNICATIONS, INSTRUMENTATION, PROTECTION & CONTROL
RELAYS FOR MOTORS, FEEDERS, TRANSFORMERS & GENERATORS



P&B Engineering
Belle Vue Works • Boundary Street • Manchester • M12 5NG

+44 (0) 161 230 6363

+44 (0) 161 230 6464

www.pbeng.co.uk

mail@pbeng.co.uk



Since the first introduction of our Supervision relays which were designed to meet the requirements of intelligent protection and control, we have continued to develop the range following a philosophy of continuous improvement.

To mark our 75th year as an independent UK designer and manufacturer of electrical equipment, we have created a new suite of drawout protection relays to complement our existing non-withdrawable relays. They have been designed for use with larger low voltage circuits and all levels of medium voltage switchgear.

Building upon our established core relay technology from our extensive onshore / offshore oil & gas and petrochemical experience, we now offer a fully comprehensive range of relays which ensure that the electrical system is more reliable, better protected, easier to maintain and safer to operate.

This full Vision range embodies our ethos of providing flexible, cost effective and intelligent solutions to the electrical market sectors.

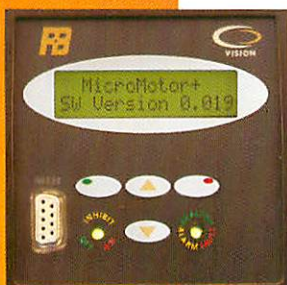
The strength of the range is inherent within its design and manufacture. P&B's first steps towards protection relay design were in 1944 and we have been at the forefront of the design and manufacturing technologies of protective relays for well over 60 years, in both utility and industrial applications. The Vision range is the proud result of that accumulated knowledge and expertise.

This comprehensive family of protection & control relays can satisfy the complete demands of even the most complex power system requirements.

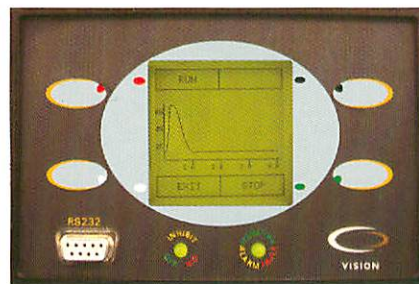
From the specifier to the end user, we can offer a single consistent protection & control solution which is compatible to both low and medium voltage switchgear.

With protocol options including Modbus RTU, Network Gold, IEC 61850, DNP3 and Profibus, P&B can provide a protection solution for all market sectors from Utilities, Power Stations to Oil, Gas, Petrochemical, Water, Cement and Steel plants.

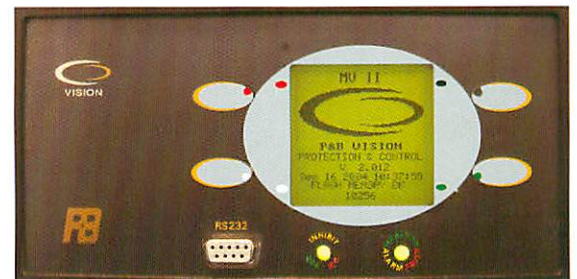
The entire Vision range shares a common modular hardware and software platform, which we have developed over many years with appreciated contributions from system designers, OEM's and end users.



96 x 96mm
SMALL DIN CASE



144 x 96mm
MEDIUM DIN CASE



192 x 96mm
LARGE DIN CASE

Comprehensive range of relays for Motor, Feeder, Transformer & Generator Protection applications

Cost effective intelligent relaying for both low and medium voltage use

Designed, developed and manufactured in the United Kingdom

Flexible digital inputs & relay outputs for a wide range of applications

Intuitive user friendly interface easy to navigate and interrogate

Single to Multifunction programmable protection settings

Integration of all relays to the same communications networks

Cohesive family of relays for large protection scheme design

High IP rating for both non drawout and withdrawable relays

Drawout cases provide self shorting CT contacts upon withdrawal

Structurally robust design with high immunity to transients and EMC

Tolerant to installation and operation in demanding environments

Single & easy to use PC based parameter programming environment

Third party UKAS certification of Vision non-drawout and drawout series



103 X 177mm
100 SERIES CASE



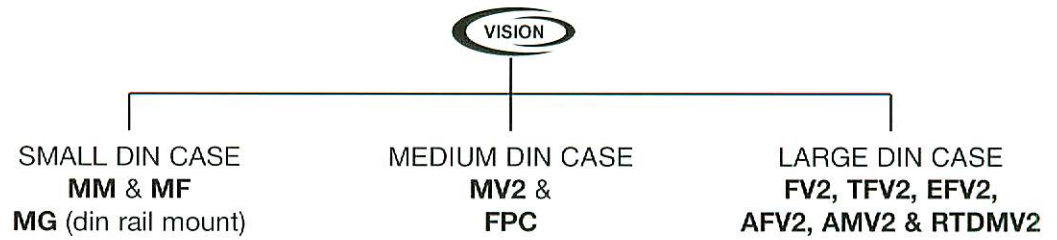
155 X 177mm
150 SERIES CASE



210 X 177mm
200 SERIES CASE

VISION NON-DRAWOUT

Vision Non-drawout is a modular approach to protective relaying, all relays are predominantly used for LV applications but can also be applied to MV circuits. Designed to offer a complete suite of high-specification intelligent protection and control relays for Motor, Feeder & multiple incomer distribution feeders.



MicroGold - MG

Our Introductory, DIN RAIL mounting, low cost, communicating, motor protection & control relay for small DOL drives where electromechanical overload elements would have been ordinarily used.

Pass through CTs are internally fitted and the earth fault can be achieved with an internal 51N function or via a core balance CT for more sensitive earth leakage detection.

Can be fitted with a remote 2 line display, remains competitive whilst adding a VT and RTD input.

MicroVision Plus (MVP) - MM & MF - with two line LCD display

Designed for the requirements of high density, multi tier MCC & PCC projects.

The separate CT module allows direct connection of MM (MicroMotor) to motors with FLCs up to 20Amps. MF (MicroFeeder) uses conventional 1A or 5A Sec CT inputs.

Motorvision - MV2, AMV2, RTDMV2, MVD & AMVD - with fully graphical display

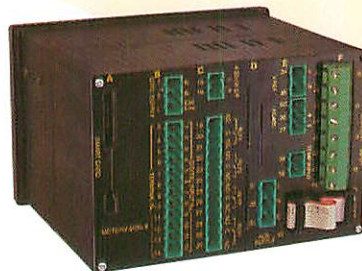
For comprehensive protection & control of all LV and MV electrically or mechanically held DOL, 2 speed, reversing drives & star/delta starters. Optional 2 input TCS and multiple RTD inputs.

Feedervision - FPC, FV2, TFV2, EFV2 & FVD - with fully graphical display

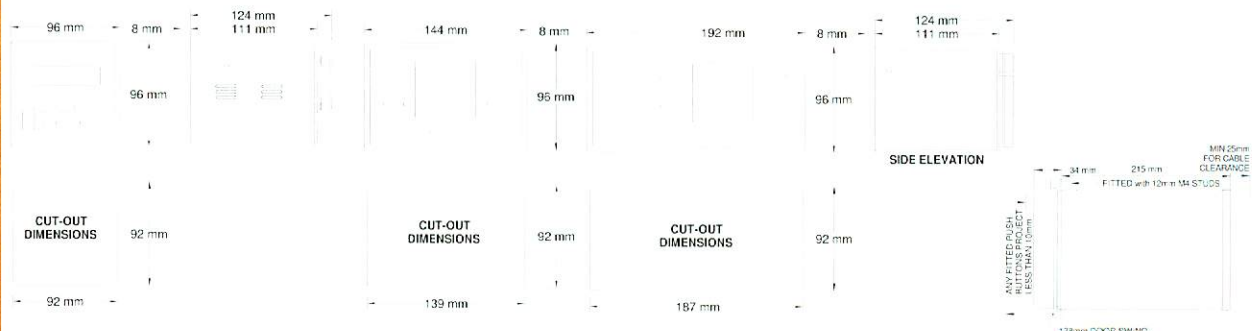
For multi staged IEC or IEE co-ordinated overcurrent protection & control of distribution voltage VCB, fused contactors and transformer feeders. Optional TCS and extra digital inputs and outputs.

Advanced Feedervision - AFV2 & AFVD - with fully graphical display

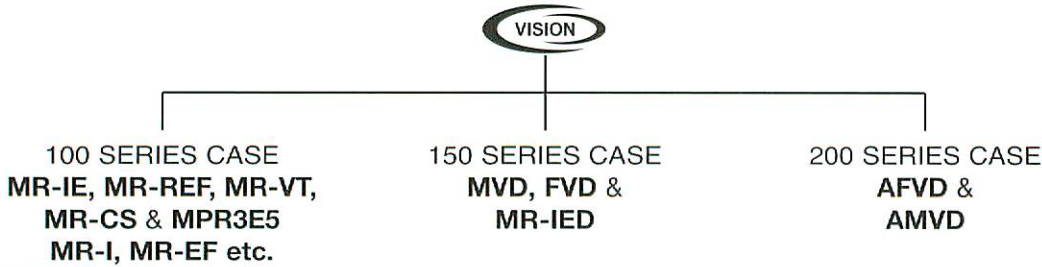
A comprehensive scheme employing 4x AFV2s or 3x AFVDs to achieve all necessary overcurrent, earth fault, check synchronism and voltage protection with hardwired interlocking for full automatic change-over control and momentary paralleling of multi incomer and bus section systems.



Cases are moulded from Glass filled nylon providing anti-flame and non-drip characteristics to UL-94. Perspex covers can be provided to increase the front plate rating to IP54. Terminations are made using plug in blocks to allow easy installation and removal providing excellent socket retention on large cable weights. Suitable for accepting upto 1.5mm² crimped copper cable. CT connections are screw terminals to avoid accidental open circuiting of CT secondary coils.



Withdrawable relays are a robust & simple construction used predominantly for MV applications but can also be applied to higher end LV drives. Designed to offer a complete suite of intelligent protection and control as our non-drawout series but also includes more basic protection-only relays for utility and distribution applications.



MR-IE

IEC or IEEE overcurrent and earth fault protection of MV equipment.

MR-REF

Fast acting restricted earth fault relay for transformer or equipment zoning protection.

MR-VT

2 stage over voltage and 2 stage under voltage protection relay for MV equipment.

MR-CS

Single phase or 3 phase check synchronism protection relay.

MPR3E5

Multifunction motor protection relay for large LV or MV drives where starter control is not required.

MR-IED

Differential relay for motor generator or transformer protection.

MVD & AMVD - Motorvision

For comprehensive protection & control of all LV and MV electrically or mechanically held DOL, 2 speed, reversing drives & star/delta starters. Optional 2 input TCS and multiple RTD inputs.

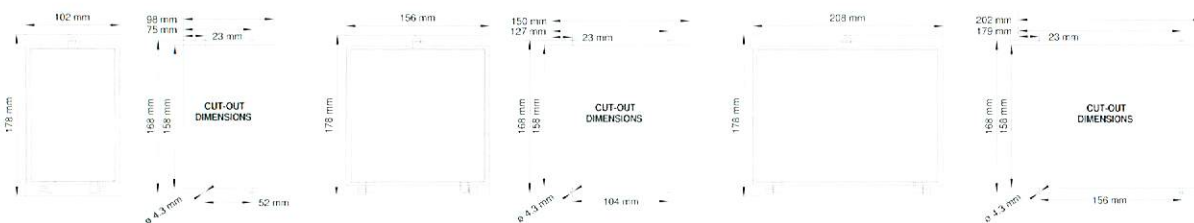
EFVD & FVD - Federvision

For multi staged IEC or IEEE co-ordinated overcurrent protection & control of distribution voltage VCB, fused contactors and transformer feeders. Optional TCS.

AFVD - Advanced Federvision

A comprehensive scheme employing 3x AFVDs to achieve all necessary overcurrent, earth fault, check synchronism and voltage protection with hardwired interlocking for full automatic change-over control and momentary paralleling of multi incomer and bus section systems.

Cases are manufactured from a single sheet of hot dipped galvanised steel coated with Plastisol PVC. The withdrawable chassis is cut from Aluzinc Chromate both materials provide excellent heat and anti-corrosion properties. The hinged polycarbonate covers provide protection to IP54. Terminations are made using L shaped ring crimps with M4 screws and 2x push on 4.88mm blade crimps. The case is permanently wired within the panel yet the relay module can be completely withdrawn with automatic self shorting of CT contacts. All relays in the Vision Drawout Series are fitted with 2 line or fully graphical LCD displays.



PERIPHERAL EQUIPMENT

Smart Card

All Vision relays can be fitted with a smart card read/writer for parameter or statistical storage. The smart card option not only shortens mean time to repair but serves as a useful commissioning aid with its ability to clone and copy settings from one device to another.

- Copy & clone settings without any external equipment
- Fast programming & easy setting transfer

Hall Effect Sensor

Developed as a low cost space saving alternative to conventional iron core CT's, the HES is capable of 3 phase measurement upto 10x of rated value. The HES is designed for LV motors with full load currents (FLC) between 10 to 150Amps and is compatible with the MV2 and FPC.

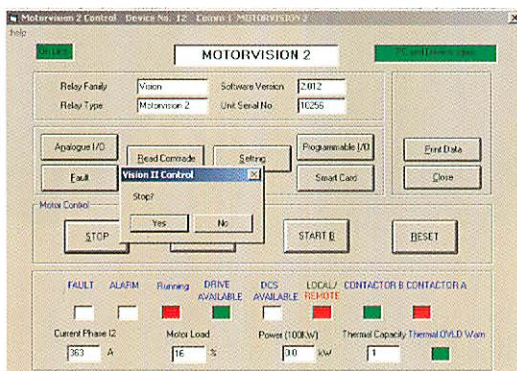
VISION CONTROL

- Single programming tool for all relay types
- Send & read individual parameters or all settings at once
- Send start & stop commands, view digital & analogue values

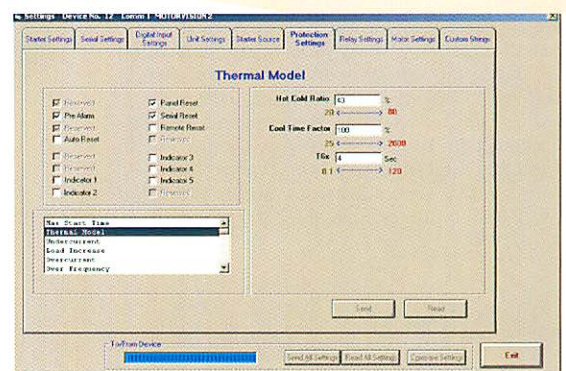
Developed as a software mimic of the Xcell, Vision Control is a user friendly windows based configuration tool for the entire range of Vision relays.

All the parameter settings within the relay can be set remotely through either the RS485 or RS232 serial ports. Settings can be both read from, or written to, simplifying and speeding up the programming and configuration of any relay. Dynamic data, historical data and digital logic status can be monitored and Vision Control can also send start, stop and reset control commands.

Capable of connecting and communicating to 32 devices simultaneously, Vision Control provides a secure parameter storage environment for all settings and any number of relays. It can be used online (with a relay or relays connected) or offline for the programming of saved settings at a later date.

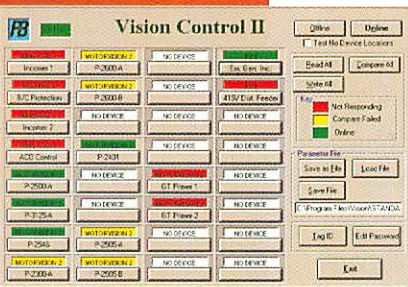


Motorvision screen showing device information and status



Configuring Thermal Model protection settings

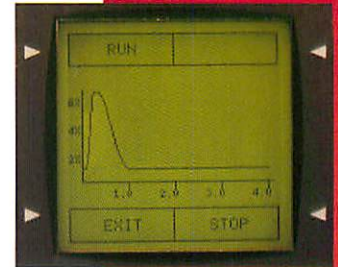
Vision control main page showing online devices



Fundamental to the Vision range is the use of intuitive and clear LCD interfaces. The 2 Line display is used for physically small and protection-only relays, with large, powerful, fully graphical displays employed by the protection & control relays.

A sensible menu structure with the ability of displaying multiple data and parameter points simultaneously. As a further example of the graphical capability, during motor starting the inrush curve is traced real time and is then automatically stored to allow for comparison to a previously saved start curve.

- Clear & intuitive display and menu structure
- Access & program all parameters, view measured & recorded data
- Automatic backlight power saver & programmable screen saver



Real-time start curve capture



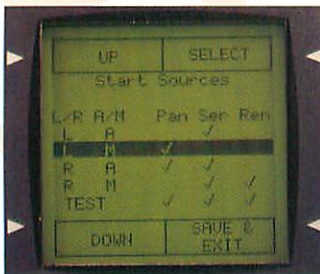
Selecting the Starter Type from a drop-down list.



Selecting Digital Inputs. If a digital input has already been set it is struck off the drop-down list. EG Start A



Selecting Actions for a protective function.



Setting permissive start sources.



Display Scroll showing drive status information.



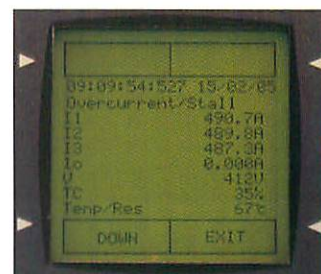
Viewing the analogue measurements in a single page.



Timing out to trip on an Overcurrent condition

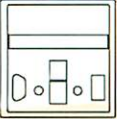

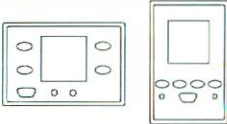
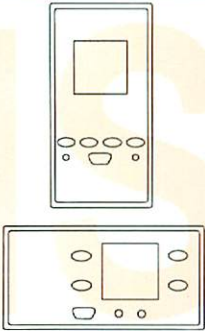
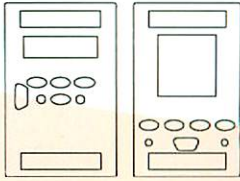
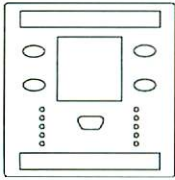
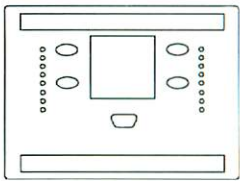


Active Faults page. A&T denotes Alarm and Trip as set earlier.



Viewing last fault data with time and date stamping to 1ms.

SELECTION TABLE

	ID	FUNCTION	ANSI No's	CASE
MicroGold	MG	Intelligent Motor Protection & Control	(27 50n 51n 59) 37 50 51 69 74 86	
MicroMotor	MM	Intelligent Motor Protection & Control	9 19 27 34 37 46 47 48 49 50 50n 51 51n 59 66 69 74 86	
MicroFeeder	MF	Intelligent Feeder Protection & Control	27 50 50n 51 51n 59 69 74 86	
Motorvision	MV2	Intelligent Motor Protection & Control	9 19 27 34 37 46 47 48 49 50 50n 51 51n 55 59 66 69 74 81 86	
Feeder Protection & Control	FPC	Intelligent Feeder Protection & Control	27 50 50n 51 51n 59 69 74 86	
Advanced Motorvision	AMV2	Intelligent Motor Protection & Control with TCS	9 19 27 34 37 46 47 48 49 50 50n 51 51n 55 59 66 69 74 81 86	
MultiChannel RTD Motorvision	AMV2	Intelligent Motor Protection & Control with Multiple RTD Channels	9 19 27 34 37 46 47 48 49 50 50n 51 51n 55 59 66 69 74 81 86	
FeederVision	FV2	Intelligent Feeder Protection & Control	27 50 50n 51 51n 59 69 74 81 86	
Extended FeederVision	EFV2	Intelligent Feeder Protection & Control with Extra I/O & Check Sync	25 27 50 50n 51 51n 59 69 74 81 86	
Advanced FeederVision	AFV2	Intelligent Feeder Protection & Control for Auto Transfer Systems	25 27 34 50 50n 51 51n 59 69 74 79 81 86	
MR-IE	MR-IE	Overcurrent & Earth Fault	50 51 50n 51n 50BF	
MR-REF	MR-REF	Restricted EF	64R	
MR-VT	MR-VT	Under/Over Volts	27 59	
MR-CS	MR-CS	Check Sync	25	
MPR3E5	MPR3E5	Motor Protection	37 46 47 49 50 50n 50BF 51 51n 66 74	
Motorvision Drawout	MVD	Intelligent Motor Protection & Control	9 19 27 34 37 46 47 48 49 50 50n 50BF 51 51n 55 59 66 69 74 81 86	
FeederVision Drawout	FVD	Intelligent Feeder Protection & Control	25 27 50 50n 50BF 51 51n 59 (67N) 69 74 81 86	
MR-IED	MR-IED	Differential Protection	50 50n 51 51n 74 86 87	
Advanced FeederVision Drawout	AFVD	Intelligent Feeder Protection & Control for ATS	25 27 34 50 50n 51 51n 59 69 74 79 81 86	
Advanced Motorvision Drawout	AMVD	Intelligent Motor Protection & Control	9 19 27 34 37 46 47 48 49 50 50n 51 51n 55 59 66 69 74 81 86	
Extended FeederVision Drawout	EFVD	Intelligent Feeder Protection & Control with Extra I/O & Check Sync	25 27 50 50n 51 51n 59 69 74 81 86	

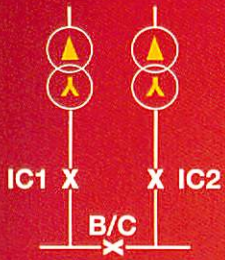
● Standard
● or () Option

144 & 192mm Vertical display and graphical display for 100 Series by special request

MEASUREMENTS	INPUTS				O/P/UTS		COMMUNICATIONS					PORTS		OPTIONS			
	CT's	CT inputs	VT inputs	Digital I/P's	Relay O/P's	Prog LED's	P&B	Modbus	Profibus	DNP3	IEC61850	RS485	RS232	RTD	4-20mA	TCS	Smart Card
3Ph I, UB%, ML%, TC, Hrs (lo, V, Hz, kW, PF)	Pass through	3	(1)	5	3		•	•	•			•	•	•			
3Ph I, UB%, ML%, TC, Hrs, V, Hz, kW, PF	1, 2, 5 or 15A	4	1	5	3		•	•	•			•	•	1			•
3Ph I, lo, Hrs, V, Hz, kW, PF	1 or 5A	4	1	5	3		•	•	•			•	•				•
3Ph I, lo, UB%, ML%, TC, Hrs, V, Hz, kW, PF	1, 2, 5A or HES	4	1	12	4		•	•	•		•	•	•	1	•		•
3Ph I, lo, Hrs, V, Hz, kW, PF	1, 2, 5A or HES	4	1	12	4		•	•	•		•	•	•		•	•	
3Ph I, lo, UB%, ML%, TC, Hrs, V, Hz, kW, PF	1 or 5A	4	1 (3)	12	6		•	•	•		•	•	•	1	•	•	•
3Ph I, lo, UB%, ML%, TC, Hrs, V, Hz, kW, PF RTDs	1 or 5A	4	1 (3)	12	4		•	•	•		•	•	•	6 or 12	•		•
3Ph I, lo, Hrs, 3Ph, V, Hz, kW, PF, kVA, kVAR's	1 or 5A	4	3	12	8 (10)		•	•	•		•	•	•		•	•	•
3Ph I, lo, Hrs, 3Ph, V, Hz, kW, PF, kVA, kVAR's Phase Angle	1 or 5A	4	4	24	10		•	•	•		•	•	•		•	•	•
3Ph I, lo, Hrs, 3Ph, V, Hz, kW, PF, kVA, kVAR's Phase Angle	1 or 5A	4	4	24	10		•	•	•		•	•	•		•	•	•
3Ph I, lo, Accumulated I	1 or 5A	4	n/a	2	4		•	•	•		•	•	•				•
lo	1 or 5A	1	n/a	2	4		•	•	•		•	•	•				•
3Ph V	n/a	n/a	4	2	4		•	•	•		•	•	•				•
V, Phase Angle	n/a	n/a	4	2	4		•	•	•		•	•	•				•
3Ph I, UB%, ML%, TC, Hrs	1 or 5A	4	n/a	2	4		•	•	•		•	•	•				•
3Ph I, lo, UB%, ML%, TC, Hrs, V, Hz, kW, PF	1 or 5A	4	4	12	4 (6)		•	•	•		•	•	•				•
3Ph I, lo, Hrs, 3Ph V, Hz, kW, PF, kVA, kVAR's	1 or 5A	4	4	12	4 (6)		•	•	•		•	•	•				•
6 Ph I, %UB	1 and/or 5A	8	n/a	12	4		•	•	•		•	•	•				•
3Ph I, lo, Hrs, 3Ph, V, Hz, kW, PF, kVA, kVAR's Phase Angle	1 or 5A	4	4	24	10		•	•	•		•	•	•		•	•	•
3Ph I, lo, UB%, ML%, TC, Hrs, V, Hz, kW, PF RTD's	1 or 5A	4	4	12	4 (6)		•	•	•		•	•	•	9	•	•	•
3Ph I, lo, Hrs, 3Ph, V, Hz, kW, PF, kVA, kVAR's Phase Angle	1 or 5A	4	4	24	10		•	•	•		•	•	•		•	•	•

Disturbance Recording is available as an option on all Vision products.

AUTOMATIC CHANGE OVER SCHEME



Larsen and Toubro (L&T) LV PCC Switchboard

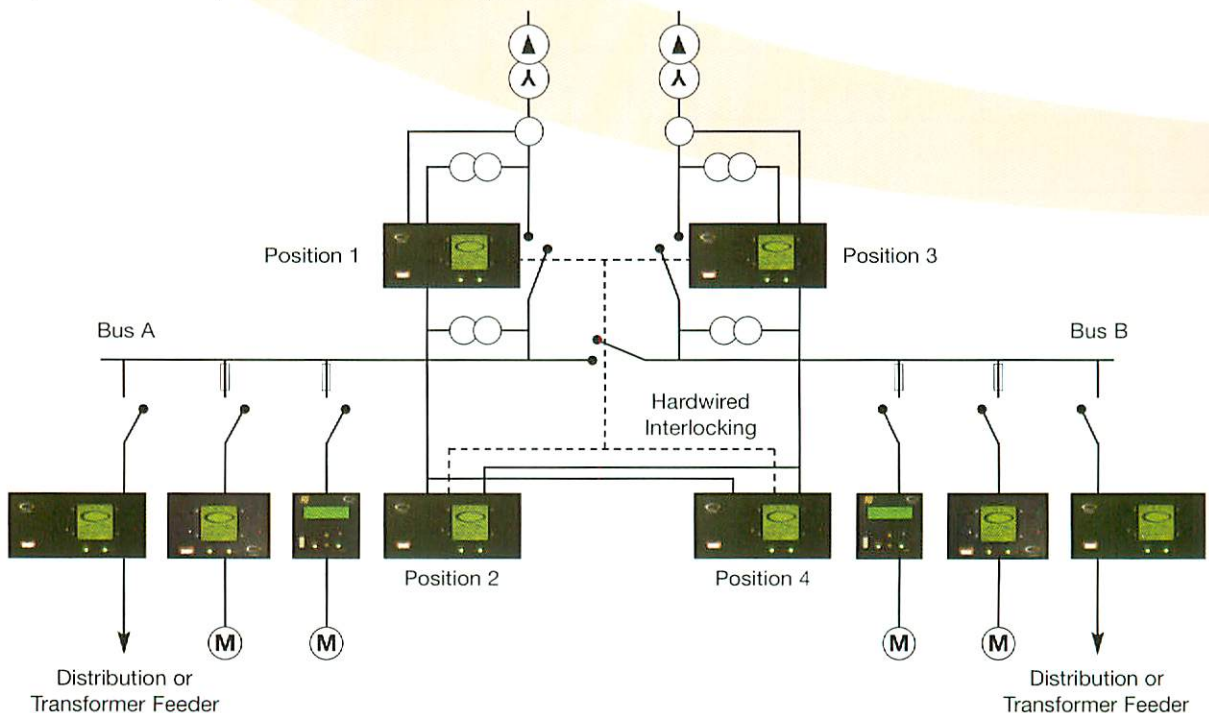
The Advanced Feedervision Automatic Change-Over System was designed to provide all the necessary protection, control, metering and control logic for LV & MV Auto Transfer Schemes.

The AFV relay provides permissive and restrictive transfer routines including momentary paralleling for supply restoration or service on all two incomer and bus section based distribution systems.

The AFV ACO system has been widely implemented and is fully compliant with the specific requirements of Exxon / Esso, Shell, Reliance and IOCL Selective Automatic Transfer requirements.

The Advanced Feedervisions can replace all conventional devices used to achieve the selective nature of transfer including all of the protection based decisions, permissive interlocking and involved control logic necessary to provide functional control to an Auto Transfer System.

AFV's ACO scheme used along with Motorvision, Feedervision, Microvision and the Xcell provides a complete intelligent switchgear solution.



Position 1:
Incomer 1 (I/C1)
Protection & Control

Position 2:
Bus Coupler
(B/C) Protection

Position 3:
Incomer 2 (I/C2)
Protection & Control

Position 4:
ACO Controller

DATA CONCENTRATION

- **Data gathering device for all measured, calculated and statistical relay values**
- **Information, protocol and control gateway for large numbers of relays**
- **Single or multi point entry for upstream systems to communicate with relays**
- **Intelligent fully dual redundant and fault tolerant communicating system**
- **Scalable, expandable without programming, reliable and easy to use**

The Xcell Data concentrator behaves as a data gathering device in order to update an internal database of all available information from each relay that is connected to it.

This means that a host system can interface directly to the Xcell and access up to date and accurate relay information available at a single source. Fundamentally this increases the speed and reliability of communications between the relays and the host system by removing the slowness of individual information requests to each and every relay.

The Xcell system can also perform protocol conversion to ensure that relays and the host system can communicate effectively. The Xcell can be used as a single or dual redundant system meaning that communication will not be interrupted in the event of equipment failure or even by a physical cable break within the network.



INNOVATING PROTECTION

As an equipment designer, product development is an important aspect of our customer commitment. We continually strive to implement effective and sometimes novel approaches to ongoing and future protection problems. Our internal development work is supported by a host of external resources which include referencing experts, professional and academic bodies, system integrators and most importantly end users.

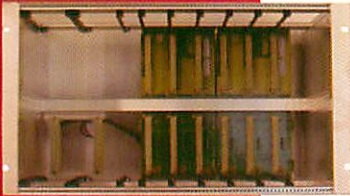
VTm

Our patented VTm formula provides an alternative to pilot wire protection offering effective overcurrent protection of closed ring systems without elaborate interconnection or breaker control via communication.

VTm is a typical IDMT overcurrent function with additional discrimination determined by the voltage drop at the fault which means devices closest to the fault will operate more quickly. This simplifies normal overcurrent grading and allows isolation of the faulted section only thereby improving utility CML and CI figures.

Series Arc

Our patented Series Arc application is a method of providing low level short circuit current protection on long cable runs or as a means of detecting intermittent or loose connections in the source to supply cable run. This often overlooked cause of electrical system failure can be eliminated with early detection using Series Arc and can be used overground or underground to supplement intrinsically safe installations.



A maximum of six Xcell processors can be mounted in a single 19" 6U rack with single or dual redundant wide ranging power supplies.

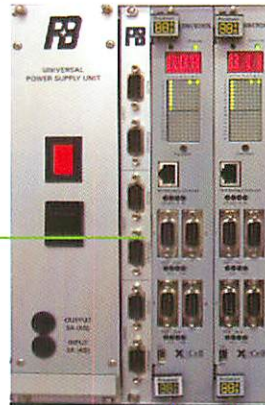
With a maximum of 32 devices per single Xcell loop each of up to 1.5km, a total of 192 devices can communicate via a single DCS link.

The Xcell system provides a Modbus RTU gateway for our P&B protocol, which was developed to remove some of the speed issues encountered with the modbus command structure. Typically, a command request and confirmation can be processed in under 500ms using this system.

DCS Distributed Control System

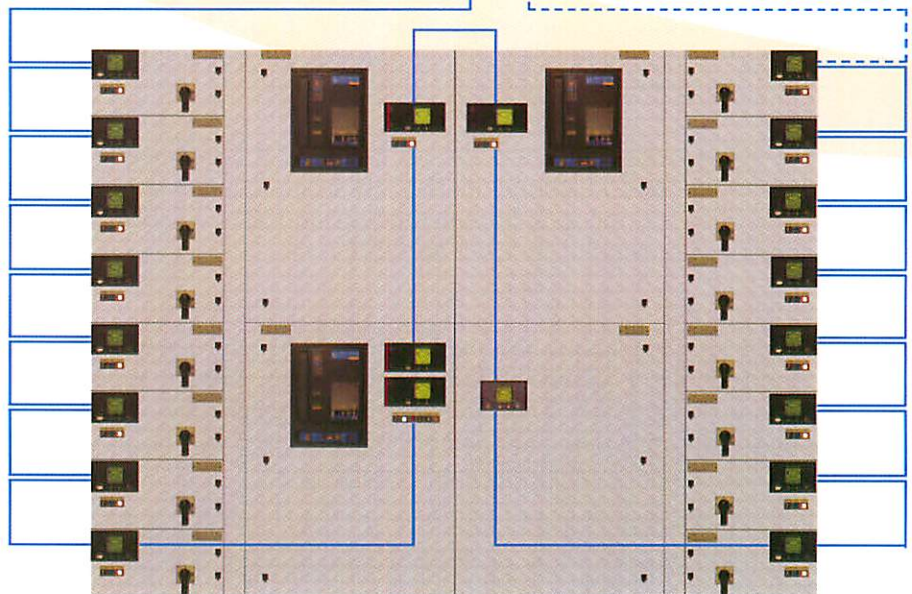


Duty and standby redundant RS232 / RS422 or RS485 Modbus RTU serial links.



If distributed Xcells are needed, the integrated high-speed field bus connection can be extended allowing dual redundant communication between racks.

Single or dual redundant twisted pair RS485 data highway.



Vision Series Protocol options include:

- Network Gold (P&B)
- Modbus RTU
- Profibus
- TCP IP Open Modbus

- DNP3*
- IEC 61850*

*Restricted Application

A major advantage of the Xcell is that no configuration is required apart from the setting of the Modbus node (address) number, the LED matrix simplifies commissioning by indicating online units and further relays can be added to the network at a later date which will be auto-sensed by the Xcell.

EWS Engineering Work Station

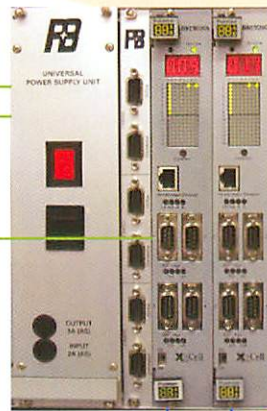


Modbus commands supported by the Xcell:
2, 3, 4, 5, 6, 8, 15 & 16

Modbus commands supported directly by the relay:
2, 3, 4, 5, 6, & 8

Event Stamping:

The entire Vision family allows historical viewing of time and date stamped events:
32 trips
32 alarms and last start/stop or trip/close commands.



KEY BENEFITS:

- COMMON COMMUNICATION SYSTEM FOR MOTOR, FEEDER & GENERATOR PROTECTION & CONTROL.
- DISTRIBUTED DATA REDUNDANCY.
- INTELLIGENT DUAL REDUNDANCY.
- NO CUSTOM SOFTWARE CONFIGURATION.
- EACH SECTION CAN BE INDIVIDUALLY COMMISSIONED.
- ALLOWS FOR CHOICE OF SWITCHBOARD MANUFACTURER AT DIFFERENT VOLTAGE LEVELS.
- OPTIONAL DIGITAL & ANALOGUE I/O MODULES
- CHRONOVISION 1ms TIME SYNCHRONISATION TO GPS SIGNAL

The Xcell system can interface with all major SCADA and DCS packages including:
Honeywell,
Foxboro,
Allen Bradley,
ABB,
Rosemont,
Yokogawa etc.

SERIAL COMMUNICATIONS

All Vision relays include, as standard, a 3 pin rear RS485 serial port to allow connection to data networks, programming, interrogation and control.

In most instances the relay behaves as a slave device to the host system, for all protocols the baud rate, parity and protocol are either self defined or selectable within the serial settings of the device.

P&B's Network Gold protocol is used to connect via twisted pair cable to the Xcell Data Concentrator and also for connection to the Vision Control software.

The RS232 front port can be used for Vision Control or other temporary data connections without disturbing the rear port or where rear access is not normally possible.

When Profibus is specified the 3 pin connection is replaced and the interface is via a 9-way D-type connector. For different physical interface requirements the rear port can be changed to a RJ type connection.

Relay Protocols:

- **P&B Network Gold**
- **Modbus RTU**
- **Modbus ASCII**
- **Profibus DP**
- **DNP3**
- **IEC61850**

The serial address of the relay is important and once defined applies to both front and rear ports. For networked systems this address 1 to 32, (up to 64 or 125 - protocol dependant) correctly identifies the relay to the host system.

In recent years, communication protocols have played a much larger aspect when defining the specification of equipment requirements. The Vision range provides the flexibility to switchgear and system integrators in order to successfully meet and fulfil such project requirements.

As we develop and implement new features and functions we make available, through our website, updated firmware for downloading into the relay.

Relays can be updated using a programming tool within Vision Control using the RS485 or RS232 serial ports.



DISTURBANCE RECORDING

- **Capture upto 8 seconds of current and voltage disturbances**
- **View, scroll and zoom onscreen without any external equipment**
- **Extract traces in Comtrade format for further waveform analysis**

The optional disturbance recording feature of the Vision series has the ability to record all measured analogue channels and the logic status of one output relay and one digital input, with a maximum of eight seconds recording time at a sampling rate of 1ms.

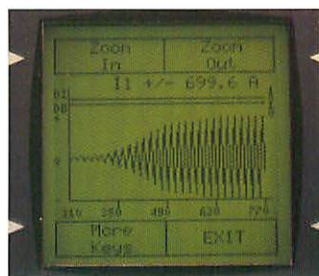
The recording period can be weighted pre and post fault condition with the ability to select from one of four triggering events.

The relay's powerful graphical LCD can display recorded traces on screen without the need for any external equipment. On screen oscillograph viewing has a zoom and scroll feature.

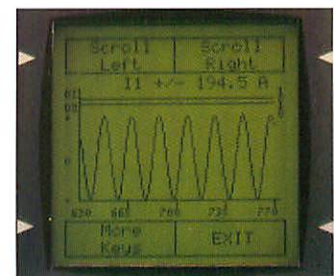
The front mounted RS232 port allows the captured traces to be extracted in standard Comtrade format for further analysis.



Selecting trace to view



Viewing phase current I1



Magnified view of I1

RETROFIT & REPLACEMENT

P&B acknowledges its long history and compatibility with older products and this has become a major influence in the design of the Vision range.

The organisation of the pin out for the 100 series, for example, was chosen as a pin for pin compatible replacement to the LED style MPR3E5.

Where direct compatibility is not possible we have developed retrofit solutions using the MV2 as the replacement protection relay. This ensures we can continue to provide future customer support, help modernise and extend the working life of existing switchgear whilst the user can inherit further benefits such as plant telemetry and control integration.

- **Retrofit is a credible effective cost way to replace older equipment**
- **Minimal disruption to integrate Retrofits**
- **All designs eliminate the need for rewiring or any panel rework**

We welcome suggestions for bespoke retrofit design where the use of the MV2 or MVD would be advantageous.

When replacing MPC2000 relays the MV2 is fitted to an adaptor plate to allow installation using the existing panel cut-out. To avoid lengthy rewiring we can also include a converter module to interface between the existing cable harness and MV2 pin out.

The MV2 can be mounted horizontally or vertically within a chassis which is pre-wired to similar terminals as per the existing unit.

The MV2 is mounted vertically when replacing PBSJ relays and is fitted within a chassis intended to be a drop-in replacement presenting like terminals so the panel wiring, CT's and aperture remain completely unchanged.



MPC2000+



MPC2000



PBSJ3E5N11
& PBSJ140

SUMMARY

The Vision range is the result and accumulation of 75 years of experience designing and manufacturing electrical equipment for both Utility and Industrial applications.

P&B Engineering will continue to invest in; product development, improvements in quality and in our ability to support, assist and to listen to our customers. This promise has seen us specified time and again by Clients, Consultants and Manufacturers.

Our relays have been used around the world in some of the harshest and demanding of environments. We manufacture using only approved material and the highest specification components available.

- **The Vision range has been rigorously tested to IEC & ANSI/IEEE standards.**
- **P&B Engineering maintains a quality management system to ISO 9001:2000.**
- **We offer UL approved products to UL Number E242003.**



SAMPLE CLIENT LIST

END USERS:

Adco / Adnoc
Air Products
Associated British Ports
BOC
BP
BPCL
Conoco Phillips
Daewoo
Dow Corning
E-on
Enoc
Esso
Exxon Mobil
Ford
Great Man Made River
Glaxo Smith Kline
Hess
HJ Enthoven
Huntsman Tioxide
Ineos
Indian Oil Company Ltd
Intergen
Jaguar

END USERS:

Kenya Pipeline
Korean National Hydro
La Farge
Maersk
National Grid
Natref
Petro Dept Oman
Petrofac
Petronas
Reliance
Rohm & Haas
Rolls Royce
Royal Vopak
RWE npower
Scottish Power
Shell
Smurfit Townsend Hook
TATA Steel
Texaco Chevron
Thai Lube Oil
Thames Water
Titan Chemical
Total Fina Elf

MANUFACTURERS:

ABB
Al Hassan
Alstom / Areva
AT Group
Baldwin & Francis
Blackburn Starling
Crompton Controls
Eaton Cutler Hammer
Ebomac
FKI
HC Controls
Hyundai
Igranic Controls
Larsen & Toubro
LSIS
Moeller
Powell
Schneider
Siemens
STS Field & Grant
Tamco
VA Tech
Wartsila

CONSULTANTS:

Amec
Atkins
Bechtel
CB&I John Brown
Costain Oil & Gas
Doosan Babcock
Dong Ah
ENI Saipem
Fluor Daniel
Foster Wheeler
GS E&C
Halliburton
Jacobs
JGC
Kellogg Brown & Root
Mott Macdonald
NEL Power
Samsung
Shamprogetti
Stone & Webster
Technip
Technimont
Wood Group



P&B Power Engineering

Market leaders in MV Circuit Breaker Retrofit with 30+ fully type tested designs up to 4000A covering manufacturers including English Electric, Ferguson Palin, Metropolitan Vickers, GEC, Brush, South Wales Switchgear, Reyrolle and Whipp and Bourne.

The recently introduced Zeus 12kV (50kA 3Secs, 125kA or 150kA Peak, 4kA Continuous) vacuum breaker is born from our extensive retrofit experience. The fully interlocked and metal clad design incorporates integral earthing via the CB for both cables and the busbars.

P&B Weir Electrical

Designers and Manufacturers of portable earthing clamps and detection equipment. Used on overhead lines and in sub stations at both Transmission and Distribution level voltages during maintenance or erection.

Specialist earthing equipment is available for various types of rail network with the Track Circuit Operating Devices and interlocked, tamper-proof short circuiting straps.

Manufacturer of Buchholz relays for oil filled transformers and electromechanical overload relays.

P&B Technical Services

Technical Services Division provide independent advice and electrical system study services to a host of clients and consultants for all Civil, Industrial, Power Station and Utility applications.

Grading and protection co-ordination studies, load flow studies, short circuit fault level, HSE protection Audits and system stability studies with phasor and transient based system analysis.

Electrical Systems Protection courses for engineers and technicians are run in numerous locations throughout the year.

P&B Engineering

Designers and manufacturers of electrical protection relays for over 60 years, having pioneered and supplied to countless utility and industrial locations worldwide.

Leaders in the field of intelligent, communicating, protection and control switchgear solutions that are required for high specification LV / MV onshore & offshore, oil & gas and petrochemical projects.

Complete product life cycle design, development and manufacturing is carried out entirely in house.