Multilin 750/760

Feeder protection system

The 750/760 Feeder Protection System is a digital relay intended for the management and primary protection and control of distribution feeders. This easy to use relay provides comprehensive protection functions for feeders and back up protection for bus, transformers and transmission lines in a draw out construction and at a reduced product life cycle cost.

Key Benefits

- Easy to use Feeder Protection System supported by industry leading suite of software tools
- Accurate built-in metering functions - Eliminates auxiliary metering devices and reduces cost
- Improve uptime of auxiliary equipment - I/O monitoring
- Reduce troubleshooting time and maintenance costs - IRIG-B time synchronization, event reports, waveform capture, data logger
- Minimize replacement time - Draw-out construction
- Simplify testing - Built in simulation features
- Cost effective access to information. Supports industry protocols such as DNP & Modbus. Includes an optional 10MB Ethernet port for system integration
- Complete asset monitoring - Analog I/O, Full metering including demand & energy
- Leading edge technology - Flash memory for product field upgrade
- Extended life - Optional conformal coating for chemically corrosive and humid environments
- Globally accepted ensuring adherence to international codes and standards

Applications

- Primary protection and control for distribution feeders on solidly grounded, high impedance grounded or resonant (Peterson Coil) grounded systems
- Bus blocking/Interlocking schemes
- High-speed fault detection for arc flash mitigation
- Throw over schemes (bus transfer scheme applications)
- Load shedding schemes based on voltage and frequency elements
- Back-up protection for transmission lines, feeders and transformers
- Distributed Generation (DG) interconnect protection

Protection and Control

- Directional, instantaneous phase & ground overcurrent protection
- Directional sensitive ground and Restricted Earth Fault protection
- Reverse power protection
- Synchro Check - V, f, Hz, & dead-source
- Automatic bus transfer or manual control
- 4 shot recloser (760 only)

Communications

- Networking interfaces - 10Mbps Ethernet, RS232, RS485 and RS422 ports
- Ethernet port, 10Mbps
- Multiple protocols - ModBus™ RTU, TCP/IP, DNP 3.0 Level 2

Monitoring & Metering

- Metering - current, voltage, sequence components, power, energy, voltage
- Breaker operation & trip failure
- Total breaker arcing current
- Ambient temperature /analog transducer input
- Oscillography & Data Logger - 10 records up to 32 power cycles
- Simulation mode and playback capability

EnerVista Software

- State of the art software for configuration and commissioning Multilin products
- Document and software archiving toolset to ensure reference material and device utilities are up-to-date
- EnerVista™ Integrator providing easy integration of data in the 750/760 into new or existing monitoring and control systems
Protection and Control

The 750/760 Feeder Protection System is a digital relay intended for the management and primary protection and control of distribution feeders. This easy to use relay provides comprehensive protection functions for feeders and back up protection for bus, transformers and transmission lines at a reduced product life cycle cost.

Time & Instantaneous Overcurrent

The 750/760 has two phase TOC elements with level detectors for each phase. The 750/760 also has two overcurrent elements most commonly used for primary and back up protection. Each TOC element has the following programmable characteristics:

- Pickup current level for trip, alarm, or control
- Choice of 15 curve shapes (including FlexCurves) and curve multipliers
- Instantaneous or linear reset time characteristic
- Voltage restraint

Ground overcurrent protection

Solidly grounded and low impedance grounded distribution systems requiring fast clearing of ground faults to limit equipment damage. This 750/760 allows directional elements to be used to supervise the ground overcurrent protection.
elements. This means the 750/760 can be used to provide sensitive tripping for faults in one direction. Typical applications for directional overcurrent include:

- Isolation of the faulted feeder in ring bus or parallel feeder arrangements.
- Prevention of back-feeding utility source fault from industrial plant generators.
- Sensitive hi-speed ground protection of transformers.

Sensitive ground and Restricted Earth Fault (REF) protection.

Sensitive ground and RGF protection features provide sensitive detection of ground faults. Sensitive ground fault protection includes:

- Instantaneous (50N) & Tim (51N) - 2 levels.
- Directional supervision allows to discriminate between forward and reverse faults.
- Dual polarization (current & voltage) provides max security and reliability.

750/760 employed to provide transformer back up protection (grounded wye windings and autotransformers) using the RGF feature.

Voltage Protection

Overvoltage/Undervoltage protection features can cause a trip or generate an alarm when the voltage exceeds a specified voltage setting for a specified time. Voltage protection includes a negative sequence voltage element to detect abnormal system unbalance conditions, and a neutral displacement voltage element using the calculated zero sequence voltage (3V0) to detect ground faults.

Frequency Protection

750/760 provides functionality to improve network (grid) stability using voltage or frequency based techniques. Also allows to provide back up protection and trip breakers directly when protecting generators and other frequency sensitive power equipment.

- 2 Under-frequency elements (81U).
- 2 Over-frequency elements (81O).
- Frequency decay: 4 df/dt elements (59/81).
- 2 Undervoltage elements.

Reverse power detection

750/760 relay allows to trip or alarm when power flows against the intended direction. In systems having in-plant generation parallel to the utility supply, detection of power flow toward the utility is necessary. For such applications, 750/760 eliminates requirement for separate device to detect power flow direction and reduces overall cost. This feature can also be used to detect motoring power into the generator.
Synchronism Check
Breaker closing can be supervised by $\Delta V$, $\Delta f$ and $\Delta Hz$ setpoints. Dead-source alternatives are provided.

Cold Load Pickup Control
This function allows automatic or manual blocking or raising of trip settings for a period after the breaker is closed. Built-in scheme available to perform main-tie-main transfer using a set of three relays, two on incoming and one on a normally open bus tie breaker. This scheme uses “open before close” sequence for safe operation.

Manual Close Control
After the breaker is closed manually, the relay can block any IOC element or raise the pickup value of any TOC element, each for a programmable time delay, after which normal operation is restored.

Bus Transfer Scheme
A set of three relays, two on incoming and one on a normally open bus tie breaker can perform transfer on loss-of-source.

Recloser (760 Only)
Autoreclosing can be initiated externally or from an overcurrent protection. Up to four reclose operations are possible, each with a programmable dead time. For each reclose shot, the relay can be programmed to block any IOC element, and to adjust the curve characteristics of any TOC element. The number of shots can be reduced by high currents.

Equipment Management
The following comprehensive features in the relay allows to manage the primary breaker:
- Trip counter to keep track of number of operations
- Per-phase breaker contact wear calculations for maintenance
- Breaker failure detection
- Trip coil monitoring

Monitoring and Metering
The 750/760 features advanced monitoring and metering functions which include:

Fault Locator
The relay uses captured data to calculate the type, distance to and the impedance of the fault. Records of the last 10 faults are stored.

Breaker Conditions
The relay calculates the per-phase wear on the breaker contacts to establish a threshold. When the breaker maintenance threshold is exceeded the relay can trigger an alarm. An alarm is also generated if the relay detects that the supervisory trickle current is not present. A failure to respond to an open or close signal in a programmed time can be used to generate an alarm.

VT Failure
The VT failure feature monitors each phase of input voltage, generating an alarm and sending the programmed output signals when a failure is detected.

Power Factor
Two independent elements monitor power factor, each with programmable pickup, dropout and time delay.

Analog Input
Any external quantity may be monitored via an auxiliary current input. Two analog input level monitoring elements and two rate-of-change elements are available. When the measured quantity exceeds the pickup level, the relay can trigger an alarm or signal an output.

Event Recording
The relay captures and stores the last 256 events, recording the time, date, cause, and system parameters. Events may be recorded selectively by category, so that only events of interest are recorded.

Oscillography
A block of configurable volatile memory can be used for recording samples of the AC input voltages and current, and the status of logic inputs and output relays. This memory can be configured between the ranges of two to 16 blocks with 16 to 256 power frequency cycles of data respectively. The amount of pre-event data recorded is set by the user. Trace memory recording can be triggered by operation of selected features or logic inputs.

Trip Counter
The number of breaker trip operations is recorded, and can be displayed for statistical purposes (useful for units without operation counters).
Inputs and Outputs
The 750/760 features user-configurable inputs and outputs:

Outputs
The 750/760 has eight electromechanical relay outputs:
- Two are factory programmed for breaker control
- Five can be configured to operate as either fail-safe or non-fail-safe, and either latching, self-resetting, or pulsed; these relays can be programmed to be operated by any feature
- One of the relays is factory programmed as a fail-safe internal failure alarm relay

The 750/760 has one high-speed SCR solid state output.

The 750/760 has eight electromechanical relay outputs. One of the relays is factory programmed as a fail-safe internal failure alarm relay. Any of 60 predefined functions, including remote tripping, resetting, feature blocking, and more.

Access Security
The 750/760 can be protected against unauthorized setpoint changes. A key switch may be installed on the rear terminals to allow setpoint changes from the front panel. An optional passcode restricts setpoint changes from both the front panel and ports.

EnerVista Software
The EnerVista™ Suite is an industry-leading set of software programs that simplifies every aspect of using the 750/760 relay. The EnerVista™ suite provides all the tools to monitor the status of your protected asset, maintain the relay, and integrate information measured by the 750 into DCS or SCADA monitoring systems. Convenient COMTRADE and Sequence of Events viewers are an integral part of the 750 Setup software included with every 750 relay, to carry out postmortem event analysis to ensure proper protection system operation.

EnerVista Launchpad
EnerVista™ Launchpad is a powerful software package that provides users with all of the setup and support tools needed for configuring and maintaining MultiLin products. The setup software within Launchpad allows configuring devices in real-time by using serial, Ethernet, or modem connections, or offline by creating setting files to be sent to devices at a later time.

Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed. Documents made available include:
- Manuals
- Application Notes
- Guideform Specifications
- Brochures
- Wiring Diagrams
- FAQ's
- Service Bulletins

The relay has 14 contact and 20 serial inputs which can be programmed to perform any of 60 predefined functions, including remote tripping, resetting, feature blocking, and more.

Logic Inputs
A configurable memory block can record eight channels of any measured or calculated parameter. In continuous mode, this feature can be programmed to capture from 136 seconds of data per cycle to 48 weeks of data per hour.

Data Logging
A configurable memory block can record eight channels of any measured or calculated parameter. In continuous mode, this feature can be programmed to capture from 136 seconds of data per cycle to 48 weeks of data per hour.

Simulation
The relay provides a powerful simulation feature for testing the functionality of the relay in response to programmed conditions. System parameters are entered as setpoints. Pre-fault, fault, and post-fault conditions can be simulated to exercise relay features.

Level detectors block diagram.

Setpoints block diagram.
Viewpoint Monitoring

Viewpoint Monitoring is a simple-to-use and full-featured monitoring and data recording software package for small systems. Viewpoint Monitoring provides a complete HMI package with the following functionality:

- Plug-&-Play Device Monitoring
- System Single-Line Monitoring & Control
- Annunciator Alarm Screens
- Trending Reports
- Automatic Event Retrieval
- Automatic Waveform Retrieval

Retrofit Existing Multilin SR 750 Devices in Minutes

Traditionally, retrofitting or upgrading an existing relay has been a challenging and time consuming task often requiring re-engineering, panel modifications, and re-wiring. The Multilin 8 Series Retrofit Kit provides a quick, 3-step solution to upgrade previously installed Multilin SR 750/760 protection relays, reducing upgrade costs.

With the new 8 Series Retrofit Kit, users are able to install a new 850 Feeder Management System without modifying existing panel or switchgear cutouts, re-wiring, or need for drawing changes and re-engineering time and cost.

With this three-step process, operators are able to upgrade existing SR relays in as fast as 21 minutes, simplifying maintenance procedures and reducing system downtime.

1. **Update Settings File**
   - EnerVista 8 Series Setup Software provides automated setting file conversion with graphical report to quickly and easily verify settings and identify any specific settings that may need attention.

2. **Replace Relay**
   - Simply remove the 4 existing terminal blocks and then remove the SR chassis from the panel. No need to disconnect any of the field wiring.

3. **Plug & Play Reconnection**
   - Insert the new 8 Series Retrofit chassis into the switchgear and simply plug-in the old terminal blocks - there is need to make any cut-out modifications or push and pull cables.

The 8 Series Retrofit Kit comes factory assembled and tested as a complete unit with the 8 Series protection device and includes replacement hardware (terminal blocks and screws) if the existing hardware is significantly aged or damaged.

Explore in Detail

visit us online to explore the SR to 8 Series retrofit kit in detail using our interactive app. www.GEGridSolutions.com/8SeriesRetrofitKit

Multilin 8 Series Retrofit
**Technical Specifications**

**PROTECTION**

**PHASE/NEUTRAL/GROUND/NEGATIVE SEQUENCE TIME OVERCURRENT PROTECTION**
- **Pickup level:** 0.05 to 20.00 in steps of 0.01 x CT
- **Dropout level:** 97 to 98% of pickup
- **Curve shape:** ANSI extremely very/very/moderately

**REAL POWER**
- **Level accuracy:** ±3% of trip time error
- **Timing accuracy:** ±10 ms

**SENSITIVE GROUND TIME OVERCURRENT PROTECTION**
- **Pickup level:** 97 to 98% of pickup
- **Dropout level:** 97 to 98% of pickup
- **Curve shape:** ANSI extremely very/very/very

**NEUTRAL DISPLACEMENT**
- **Target accuracy:** ±0.00 to 1.25 in steps of 0.01 x VT

**NEUTRAL POWER**
- **Target accuracy:** ±0.01 Hz

**NEUTRAL CURRENT**
- **Target accuracy:** ±0.00 to 100.00 in steps of 0.01

**REVERSE POWER**
- **Target accuracy:** ±0.03 to 1.00 in steps of 0.1

**ZERO SEQUENCE CURRENT**
- **Target accuracy:** ±2% of full scale

**SYMMETRICAL COMPONENTS**
- **Target accuracy:** ±2% of full scale

**SHORT CIRCUIT CURRENT**
- **Target accuracy:** ±2% of full scale

**MONITORING**

**PHASE/NEUTRAL CURRENT**
- **pickup level:** 0.05 to 20.00 x CT in steps of 0.01
- **Dropout level:** 97 to 98% of pickup
- **Time delay:** 0.0 to 6000.0 s in steps of 1

**POWER FACTOR**
- **pickup level:** >30% of nominal in all phases

**ANALOG IN RATE**
- **pickup level:** >30% of nominal in phase A

**OVERFREQUENCY**
- **pickup level:** 20.01 to 65.00 Hz in steps of 0.01

**TIP / CLOSE COIL MONITORS**
- **pulse output:** Pulse output at 1 second on time and one second off time after the programmed interval.

**LAST TRIP DATA**
- **Records cause of most recent trip:** 4 RMS currents, and 3 RMS voltages with a 1 ms time stamp.

**WAVEFORM CAPTURE**
- **Data channels:** 4 currents, 3 voltages, 14 logic input states and 8 output relays

**DATA LOGGER**
- **Data channels:** 8 channels, same parameters as for analog outputs available
### Technical Specifications (Cont’d)

#### INPUTS

**PHASE CURRENT INPUT**
- **Source CT:** 1 to 500 A primary / 1 or 5 A secondary
- **Relay input:** 1 A or 5 A (specified when ordering)
- **Burden:** Less than 0.2 VA at 1 or 5 A
- **Conversion range:** 0 to 20 x CT (fundamental frequency only)
- **Accuracy:** ±2.5% of 2 x CT: ±0.5% of 2 x CT
- **Overload withstand:** 1 second @ 80 times rated current
- **Calculated neutral current errors:** 3 x phase inputs

**GROUND CURRENT INPUT**
- **Source CT:** 1 to 500 A primary / 1 or 5 A secondary
- **Relay input:** 1 A or 5 A (specified when ordering)
- **Burden:** Less than 0.2 VA at 1 or 5 A
- **Conversion range:** 0.1 to 20 x CT (fundamental frequency only)
- **Accuracy:** ±2 x CT: ±0.6% of 2 x CT
- **Overload withstand:** 1 second @ 80 times rated current

**SENSITIVE GROUND CURRENT INPUT**
- **Source CT:** 1 to 500 A primary / 1 or 5 A secondary
- **Relay input:** 1 A or 5 A (specified when ordering)
- **Burden:** Less than 0.2 VA at 1 or 5 A
- **Conversion range:** 0.1 to 20 x CT (fundamental frequency only)
- **Accuracy:** ±2 x CT: ±0.6% of 2 x CT
- **Overload withstand:** 1 second @ 80 times rated current

**BUS AND LINE VOLTAGE INPUTS**
- **Source VT:** 0.2 to 600 kV / 50 to 240 V
- **Source VT ratio:** 50 to 1000 VA in steps of 0.1
- **Relay input:** 50 V to 240 V phase-neutral
- **Burden:** Less than 0.025 VA at 120 V or >576 k
- **Max continuous:** 273 V phase-neutral (full scale) CT
- **Accuracy:** ±0.205% of full scale (10 to 130 V ±0.8% of full scale (130 to 273 V)
- **Accuracy (10° - 40° C):** ±0.205% of full scale
- **DROOP:** 0.00 to 1.25 x VT in steps of 0.01

**LOGIC INPUTS**
- **Inputs:** 14 contact and / or virtual, 6 virtual (functions assigned to logic inputs)
- **Dry contacts:** 1000 maximum ON resistance (32 VDC @ 2 mA provided by relay)
- **Wet contacts:** 30 to 300 VDC @ 2 mA (external DC voltage only)

**ANALOG INPUT**
- **Current input:** 0 – 1 mA, 0 – 5 mA, 0 – 10 mA, 0 – 20 mA, 0 – 40 mA, or 0 – 20 mA (programmable)
- **Input impedance:** 175 ± 5%
- **Conversion range:** 0 to 20 mA
- **Accuracy:** ±1% of full scale

**TRIP AND CLOSE COIL MONITORING INPUTS**
- **Acceptable voltage range:** 20 to 250 VDC
- **Triticle current:** 2 mA to 5 mA

**IRIG-B INPUT**
- **Amplitude-modulated:** 2.5 to 6 Vp (3.1 signal ratio)
- **DC shift:** 150 mV

#### OUTPUTS

**TYPE OUTPUTS**
- **Type:** Form C
- **Contact material:** Silver alloy
- **Max. contact rating:** 15 A @ 250 VDC for 500 ms
- **Response time:** ±1 ms
- **Isolation:** Fully isolated

**SOLID STATE TRIP**
- **Total delay:** 0.01 ms per output
- **Output relays:** 1 TRIP, 2 AUXILIARY, 3 TRIP
- **Response time:** 0.01 ms
- **Isolation:** 600 V
- **Contact material:** Silver alloy

**COMMUNICATIONS**
- **Serial Ports:** 300 – 19,200 baud, programmable parity, ModBus® RTU or DNP 3.0 protocol
- **Ethernet Port:** 10BaseT, RJ45 Connector, ModBus® RTU over TCP/IP

#### POWER SUPPLY

**CONTROL POWER**
- **Options:** LO/HI (specified when ordering)
- **Input range:** DC = 20 to 60 V
- **AC = 50 to 60 V @ 48 – 62 Hz
- **Input range:** AC = 80 to 300 V
- **AC = 70 to 265 V @ 48 – 62 Hz
- **Power:** 25 VA nominal, 35 VA maximum
- **Voltage loss hold-up time:** 30 ms

**ENVIRONMENTAL**
- **Operating temperature range:** -40°C to +60°C
- **Ambient storage temperature:** -40°C to +85°C
- **Humidity:** Operating up to 95% (non condensing) @ 55°C

**APPROVALS TESTS**
- **UL508 / UL C22.2 No 14 / EN60255-5
- **ISO CE**

**PRODUCTION TESTS**
- **Thermal cycling:** Operational test at ambient, reducing to -40°C and then increasing to 60°C
- **Dielectric strength:** On CT inputs, VT inputs, control power inputs, switch inputs, coil supervision outputs, and relay outputs 12 kVac for 1 minute to safety ground.

**TYPE TESTS**
- **Dielectric voltage withstand:** EN60255-5
- **Impulse voltage withstand:** EN60255-5
- **Insulation resistance:** EN60255-5
- **Damped Oscillatory:** IEC 61000-4-2 / IEC 60255-22-2
- **Discharge:** IEC 61000-4-2 / IEC 60255-22-2
- **Fast Transient:** EN61000-4-4 / IEC 60255-22-4
- **Disturbance:** EN61000-4-4 / IEC 60255-22-4
- **Surge Immunity:** EN61000-4-5 / IEC 60255-22-5
- **Conducted RF:** EN61000-4-6 / IEC 60255-22-6
- **Immunity:** CISPR11 / CISPR22 / IEC 60255-25
- **Impedance:** EN60255-21-1
- **Shock & Bump:** EN60255-21-2
- **Sisetic:** EN60255-21-3
- **Power magnetic immunity:** EN60100-4-8
- **Pulse Magnetic immunity:** EN61000-4-9
- **Voltage Dip & interruption:** EN61000-4-4
- **Immunization:** EN60529
- **Environmental (Dry heat):** EN60068-1-2
- **Cold:** EN60068-2-2
- **Relative Humidity:** EN60068-2-30
- **Cyclic EFT:** IEC / ANSI C37.90.1
- **Damped Oscillatory RTIF:** IEC / ANSI C37.90.2
- **RF Immunity:** IEEE/ANSI C37.90.3
- **ESD:** IEEE/ANSI C37.90.3
- **Safety:** UL508 / UL C22.2-14 / UL1053

Please refer to Multilin 750/760 Feeder Protection System Instruction Manual for complete technical specifications.
### Ordering

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<thead>
<tr>
<th>750/760</th>
<th>* * * * * * Description</th>
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<tbody>
<tr>
<td><strong>Phase Current Inputs</strong></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>1 A phase current inputs</td>
</tr>
<tr>
<td>P5</td>
<td>5 A phase current inputs</td>
</tr>
<tr>
<td><strong>Ground Current Inputs</strong></td>
<td></td>
</tr>
<tr>
<td>G1</td>
<td>1 A zero sequence current inputs</td>
</tr>
<tr>
<td>G5</td>
<td>5 A zero sequence current inputs</td>
</tr>
<tr>
<td><strong>Sensitive Ground Current Inputs</strong></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>1 A sensitive ground current input</td>
</tr>
<tr>
<td>S5</td>
<td>5 A sensitive ground current input</td>
</tr>
<tr>
<td><strong>Power Supply Options</strong></td>
<td></td>
</tr>
<tr>
<td>LO</td>
<td>20 – 60 VDC, 20 – 48 VAC @ 48 – 62 Hz</td>
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<tr>
<td>HI</td>
<td>88 – 300 VDC, 70 – 265 VAC @ 48 – 62 Hz</td>
</tr>
<tr>
<td><strong>Analog Outputs</strong></td>
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<tr>
<td>A1</td>
<td>Eight 0 – 1 mA analog outputs</td>
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<tr>
<td>A5</td>
<td>Eight 0 – 5 mA analog outputs</td>
</tr>
<tr>
<td>A10</td>
<td>Eight 0 – 10 mA analog outputs</td>
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<tr>
<td>A20</td>
<td>Eight 4 – 20 mA analog outputs</td>
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<tr>
<td><strong>Breaker Status LED</strong></td>
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<tr>
<td>R</td>
<td>Red breaker closed LED</td>
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<tr>
<td>G</td>
<td>Green breaker closed LED</td>
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<tr>
<td><strong>Enhancements</strong></td>
<td></td>
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<tr>
<td>E</td>
<td>Enhanced display, larger LCD, improved keypad</td>
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<tr>
<td>T</td>
<td>Enhanced display with Ethernet 10BaseT option</td>
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<tr>
<td><strong>Environmental Protection</strong></td>
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<tr>
<td>H</td>
<td>Harsh Chemical Environment Option</td>
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