# INSTRUCTION MANUAL

THE BENSHAW PROMISE 2 Year Warranty

## SurProtex™ Digital Protection Relay

Thank you for purchasing the Benshaw Inc. SPD Series Digital Protection Relay. Benshaw products are designed and manufactured for the toughest industrial applications and are backed by a two year limited warranty. To ensure the performance from your product, please review this manual before product installation and use.

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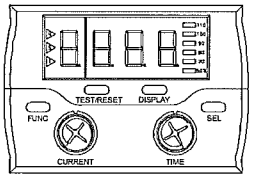
*Standards:IEC60947, UL508, VDE0660 EN60947, BS5424, KSC4504



Pub#:890012-02-01

## Introduction:

The Benshaw SurProtex™ Digital Protection Relay combines advanced motor protection with a digital display for ease of setting and display of line current and motor parameters.




## Features:

- Wide Current Range: .5-60A (without CTs)
- 4 Segment door mountable LED Display
- Easy View thermal content bar graph
- 3 phase current display
- Programmable O/L Class: 1-60
- Phase reversal protection
- Phase loss protection
- Under current protection
- Alarm output
- Trip output (Form C)
- Stalled motor detection
- Locked rotor detection
- Optional Ground fault protection Personnel (.1~2.5A)



## Installation:

SPD relays may be panel or DIN rail mounted. The SPD relay may be placed directly in line on loads that have a continuous current equal to or less than the SPD device rating. For loads which are greater than the device rating, current transformers must be used to reduce the current through the SPD relay to below the device rating. Refer to wiring diagrams for proper terminal connections.

Load power connections may be made to the SPD relay by either using the screw terminals provided, or by running load power wire through the bottom "tunnels" of the SPD relay.

## Tunnel Access:

1. **Carefully** remove **1** of the 2 finger guards which cover the screw terminals by pusing up on the front edge of the guard.
2. Remove all 3 exposed terminal screws.
3. Gently pull the bus cover assembly apart.
4. Extract the bus bars from the opposite side of the relay.
5. Run each phase of the load power wire through the corresponding "tunnel".



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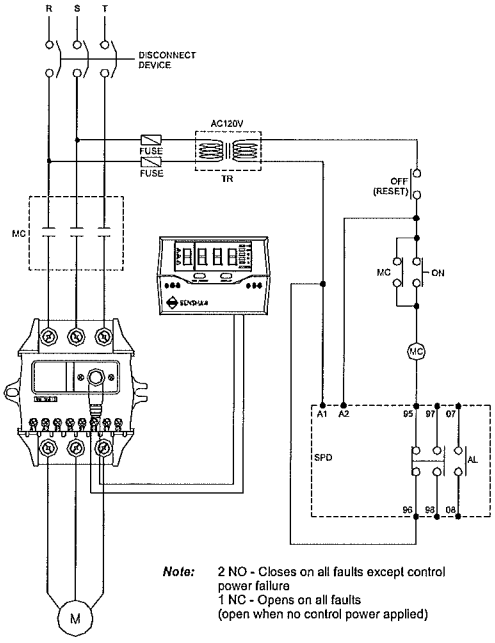
## Trip Indication:

| Protection Function | Display | Item Description |
|---|---|---|
| Thermal O/L | O-L | Load has exceeded thermal capacity |
| Under-Current | Und | Load drew less than undercurrent % for 3 seconds |
| Reverse Phase | rP | Line power phasing reversed |
| Phase Failure | PF | One or more power phases has been lost for 3 seconds |
| Phase Unbalan. | PU | Current has been unbalanced by 50% for 5 seconds |
| Stalled Motor | StL | Load drew more than 180% of FLA for 5 sec. after start |
| Locked Rotor | Loc | Load drew locked rotor current for .5 seconds |
| Ground Fault | GF | *Ground fault current detected in set time |
| Alarm Trip | Bar Graph 60-110% | Load is approaching thermal limit |
| *Ground fault detection is only available when ordered as an option | | |



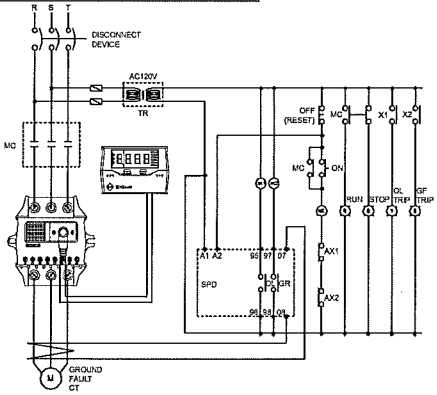
## Wiring Diagram (standard):




*Note:* 2 NO - Closes on all faults except control power failure
1 NC - Opens on all faults
(open when no control power applied)



## Wiring Diagram (standard):




## Parameter Descriptions:

**Current Dial:**
**Description:** This dial sets the Full Load Amps (FLA) for the SPD. This dial should be set at (Motor FLA x Motor Service factor)/CT ratio. This value is used for all of the SPD's current based functions.
**Values:** 0.5-6.3 Amps in 0.1 Amp steps for SPD-06XX-X, 5.0-63 Amps in 1 Amp steps for SPD-60XX-X
**Default:** The default value is 0.5 for SPD-06XX-X, and 5.0 for SPD-60XX-X

**Sto:**
**Description:** This must be selected to save changes to parameter, otherwise changes will be aborted when TEST mode is exited.

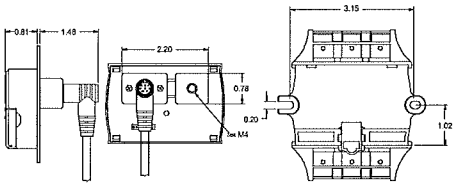
## Display Mounting:

The display unit may be mounted on top of the SPD relay, or mounted on the exterior of a control panel with the optional panel mounting kits (SPD-M1~4). The panel mounting kit is available with 3 lengths of connecting cable.

SPD-M1 = 1 meter cable
SPD-M2 = 2 Meter cable
SPD-M4 = 4 meter cable

## Relay Mounting:

The SPD relay may be DIN rail or screw panel mounted. Refer to dimensions below for mounting information.




Display Unit Relay Unit



## Programming:

Programming of menu items can only occur with the relay in the trip mode (except Motor FLA and O/L class). Refer to chart on page 6.

① Open access cover of SPD relay
② Press TEST/TRIP button
③ Rotate the CURRENT dial to set motor FLA
④ Rotate the TIME dial to set O/L class
⑤ Press FUNC button to access menu items
⑥ Press SEL to view/adjust menu items
⑦ Repeat steps ④ & ⑤ for each menu item
⑧ Press SEL when STO menu item appears to store the new values

## Viewing:

Viewing of menu parameters and line currents may occur at any time while control power is applied.

① Press DISPLAY button to switch between display items.

Ø1 current☛Ø2 current☛Ø3 current☛motor FLA☛O/L Class☛Delay (if enabled)

② Repeatedly Press the FUNC button until the desired menu item appears
③ Press the SEL button to view item value



## Menu Parameters:

| Menu Item | SEL Key | Item Description |
|---|---|---|
| 1. CHA | Inv/dEF | Inverse time only/ Start Delay function |
| 2. dEF | 00-30 | Start Delay Time (sec) |
| 3. r.P | oFF/on | Reverse phase detection |
| 4. Und | oFF/ 30-70 | Undercurrent detection (% of set current) |
| 5. ALt | oFF /50- 110 | Alarm trip (%) |
| 5. 9-F | oFF /.0 1- 110 | Ground fault delay (sec) (when ordered as option) |
| 6. StL | oFF/ on | Stalled motor detection |
| 7. Loc | oFF/200-900 | Locked rotor detection (% of set current) |
| 8. Ct | 1- 20 | CT ratio. Must be set at 10 for SPD-60 units |
| 9. P- F | oFF/on | Phase failure detection |
| Sto | Sto | Stores new values |
| Time Dial | 00- 63 | Overload Class Trip time at 600% FLA |
| Current Dial | 5- 63<br>5- 63 | FLA, SPD-6 Series<br>FLA, SPD-60 Series |

Notes:
- Time and current may be set at any time
- Menu parameters may only be set in test mode
- CT ratio must be left at 10 on SPD-60 series
- Ground fault current is set with dip switches as per table on relay (100-2500 mA)



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## Parameter Descriptions:

**1. CHA:**
**Description:** This parameter selects either Inverse Time or Start Delay operation of the SPD relay. Inverse Time mode is a standard I^2T overload with the class set by the TIME dial. Start Delay mode is the same with a time delay after a start during which the SPD ignores current flow. This allows the use of a light overload while running after starting a very heavy load.
**Values:** Inv (Inverse Time) or dEF (Start Delay)
**Default:** The default value is Inv (Inverse Time)

**2. dEF:**
**Description:** This parameter sets the length of time the SPD will ignore current flow after a start is given if parameter 1 is set to dEF. If parameter 1 is set to Inv, this parameter is not accessible.
**Values:** 00-30 seconds in 2 second steps
**Default:** The default value is 00 seconds

**3. r.P:**
**Description:** This parameter activates Reverse Phase detection. When it is activated the SPD must see ABC rotation to allow a start. When deactivated, the SPD is insensitive to phase rotation.
**Values:** Off/On
**Default:** The default value is Off

**4. Und:**
**Description:** This parameter sets the Undercurrent protection for the SPD. If the load current falls below this level for 3 seconds, the SPD will trip.
**Values:** Off/30-70 (% of Current Dial setting) in 10% steps
**Default:** The default value is Off



## Parameter Descriptions:

**5. Alt/g-F:**
**Description:** This parameter varies with the model of SPD you order.

SPD-XXS-X is equipped with a N/O alarm contact on terminals 07-08 and has the Alt parameter. This sets the point at which the alarm contact closes as % of the motor's thermal capacity.

SPD-XXSZ-X is equipped with zero sequence ground fault protection with a CT input on terminals 07-08 and has the g-F parameter. This sets the length of time that the ground fault current determined by the dip switches behind the display must be detected before the SPD will trip.
**Values:** SPD-XXS-X: Off/60-110 (% of thermal capacity) in 10% steps
SPD-XXSZ-X: Off/0.05, 0.1-1.0 seconds in 0.1 second steps
**Default:** The default value in both cases is Off

**6. StL:**
**Description:** This parameter activates the Stalled Motor detection. When activated and the load draws 180% of the Current Dial setting for 5 seconds after a start, the SPD will trip.
**Values:** Off/On
**Default:** The default value for this parameter is Off

**7. Loc:**
**Description:** This parameter sets up the Locked Rotor protection for the SPD. If the load draws this percentage of the Current Dial setting for 0.5 seconds, the SPD will trip.
**Values:** Off/200-900 (% of Current Dial setting) in 100% steps
**Default:** The default value for this parameter is Off



## Parameter Descriptions:

**8. Ct:**
**Description:** This parameter tells the SPD the ratio of the current transformer connected to it, with the secondary normalized to 1A. The SPD-60XX-X must have this parameter set at 10.
**Values:** 1, 5-120 in steps of 5
**Default:** The default value is 1 for SPD-06XX-X and 10 for SPD-60XX-X

**9. P-F:**
**Description:** This parameter activates the Phase Failure detection for the SPD. If current is lost in one or two phases for more than 3 seconds the SPD will trip.
**Values:** Off/On
**Default:** The default value for this parameter is On

**Time Dial:**
**Description:** This dial sets the overload class of the SPD. The SPD uses an I^2T curve that, at 600%, will trip in the time set by this dial.
**Values:** 0-63 in steps of 1
**Default:** The default value is 0

**Terminals:**
**Description:** A1-A2: 120 VAC 60 Hz control power
95-96: N/C Trip contact
(Opens at 100% thermal capacity)
97-98: N/O Trip contact
(Closes at 100% thermal capacity)
07-08: SPD-XXS-X:N/O Alarm contact
(Changes state at Alt% setting)
SPD-XXSZ-X: Zero sequence CT input