

Multifunction Voltage/Frequency Relay

UFD14 and UFD34 Frequency/Load Shedding Relays

The UFD14 and UFD34 Frequency/Load Shedding relays are members of Cooper Power Systems' Edison® Series of microprocessor based protective relays. These relays offers the following functions:

- Four over/under definite time frequency elements (81O/U).
- Two definite time Hz/second rate of frequency change elements which can be logically ANDed to any or all of the 81 elements.
- One undervoltage (27) supervisory element
- Three blocking inputs to control the frequency
- 12 additional output contacts may be added.
- The UFD14 accepts a single phase voltage input, and the UFD34 accepts a three phase voltage input.

Also present are those features common to all 'M' Series relays:

- Simple five button man machine interface (MMI) allows access to all functions, settings, and stored data without the need for a computer.
- Bright electroluminescent display easily visible even in brightly lit environments.
- Draw-out design permits relay testing without disturbing connections to case.
- Modbus communication protocol and RS485 terminal on rear.
- Modular design allows the draw-out module to be fitted to a variety of space saving cabinet styles.
- Three programmable form c (SPDT) output contacts and one Form A/B contact.
- Pick-up (start-time) elements.



Figure 1 - Front View of the UFD14 Load Shed Relay

- Programmable reset characteristics.
- Dedicated power supply/relay fail output contacts.
- Event records.
- Cumulative trip counters.
- Auto-ranging power supplies.

APPLICATIONS

The UFD14 and UFD34 are ideally suited for use on utility systems that employ load shedding schemes to match load to available generation during system events.

The ability to logically AND the frequency and d/dt elements allows for very flexible control strategies to be implemented.

The UFD14 and UFD34 may also be used in industrial or co-gen environments where the need to shed internal plant load, or to break ties to the supply utility, is required in order to protect local generation or critical processes.

TARGETS

Eight bright LED targets are provided as follows:

- One red LED for each frequency element.
- One red LED for the Hz/second elements.
- One red LED for the undervoltage (27) supervision element.

For all of the above, the LEDs flash when the element is picked up, and constantly illuminate upon trip. In addition, one yellow LED is provided which illuminates when any of the blocking inputs are active. A second yellow LED flashes when the relay is in programming mode, and illuminates constantly upon relay or power supply failure.

FUNCTIONAL SPECIFICATIONS

Nominal Frequency Setting Range	50 or 60Hz
Programmable Φ-Φ primary voltage ..	0.10 - 1.00 kV in 0.01kV steps
.....	1.1 - 9.9 kV in 0.1 kV steps
.....	1 - 655 kV in 1 kV steps
Programmable secondary voltage	100-125V in 1V steps
Integration time for the Frequency and df/dt elements	
.....	3 – 10 cycles in 1 cycle steps
Frequency Elements (81)	
Quantity	4
Characteristic	Selectable between Under (81<),
.....	Over (81>), Under/Over (81<>),
.....	or Disable
Δ Frequency setting ¹ (change)...	0.05 - 9.99 Hz in 0.01 Hz steps
Delay ² without df/dt control	0.05-99.9 sec. in 0.01 sec. steps
Time Delay ² with df/dt control ...	0.05-99.9 sec. in 0.01 sec. steps
Hz/second Elements	
Quantity	2
Characteristic	Rate of rise, rate of decrease, or
.....	absolute rate of variation
Hz/second setting	0.1 - 9.9 Hz/sec in 0.1 Hz/sec steps
Voltage Supervision Element (27)	
Quantity	1
Characteristic	Supervisory
Voltage setting	30 - 90% of system voltage in 1%
.....	steps

df/dt CONTROL

The four frequency elements may each be associated with one of the two df/dt elements. When set in this fashion, the frequency element begins its own dedicated timer as soon as it picks up. If the controlling df/dt element also picks up, the time delay associated with the df/dt element also begins. The first timer to expire then operates the output contact.

For example, a frequency element may be set to pick up at 59.9 Hz, and a time delay of 60 seconds is started. After a 2 seconds, the controlling df/dt element picks up, indicating the rate of frequency decay is very fast, and it's timer, set to 5 seconds, starts. After five seconds the df/dt timer expires, closing the contact. Alternately, if the df/dt element did not pick up until 58 seconds in to the 81 element timer, then the output contact would close after 2 more seconds when the 60 second timer on the 81 element expired.

BLOCKING INPUTS

Three blocking inputs are provided. One each dedicated toward blocking all frequency pickup functions, all time delayed frequency functions, and all df/dt controlled elements.

EXPANSION CONTACT MODULE

The UDF14 and UFD34 may be equipped with one or two REX8 output relay expansion modules providing up to 12 additional output contacts.

¹ The setting is made based upon the change from the programmed system base frequency. Whether a positive, negative, or absolute value change is acted upon is dependent upon the over, under, or over/under setting selected.

² Total time delay is the set time delay plus the integration time.

RESET CHARACTERISTICS

Each of the four programmable output relays may be programmed to reset in one of three manners.

- Instantaneously upon the input or calculated quantities dropping below the pickup value.
- Automatically, but with a time delay adjustable between 0.01 and 99.99 seconds in 0.01 second steps.
- Manual reset (by front panel or computer command) only.

MEASUREMENTS

System frequency and phase-to-phase voltage are available for display on the relay and are accessible by software.

LAST TRIP RECORD

The following parameters are stored in non-volatile memory, providing details of the last trip event:

- Which element was the cause of the last trip.
- Frequency, phase-to-phase voltage, and Hz/sec rates of change as measured by both Hz/sec elements.

DIAGNOSTICS

Complete memory and circuit diagnostics are run upon powering the relay.

During normal operation the relay suspends operation every 15 minutes for 10 msec and runs a comprehensive set of diagnostics that includes memory checksum, test of the A/D converters by injection of an internally generated reference voltage, and a check of the ALU.

The relay provides two manual test routines which may be run at any time. The first routine performs the same 15 minute test an in addition checks the target LEDs and the control circuitry to the output relays without operating the output relays. The second test is identical but also operates the output relays.

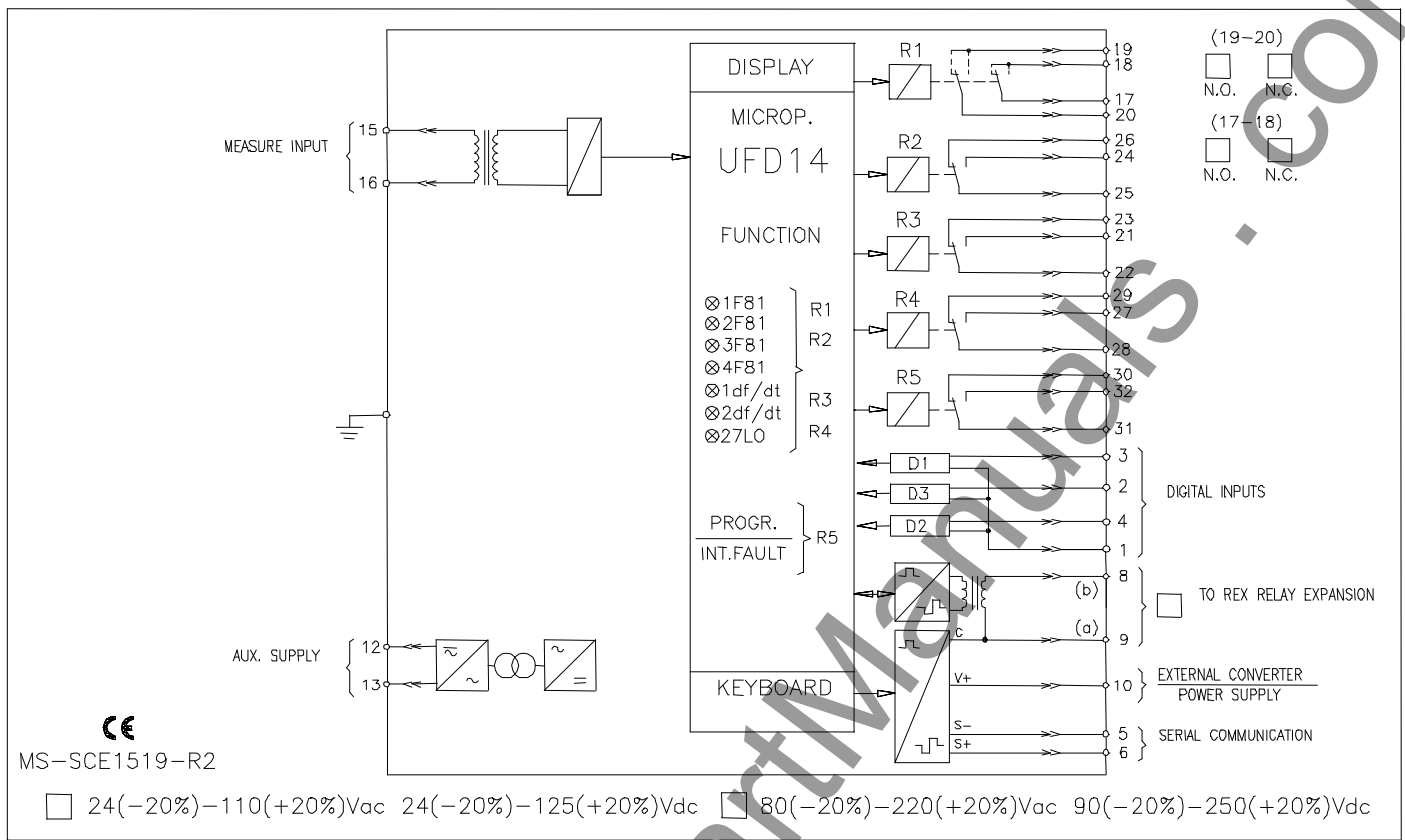


FIGURE 2: Wiring Diagram of the UFD14 Single Phase Relay

UFD14 and UFD34 Frequency Load Shedding Relays

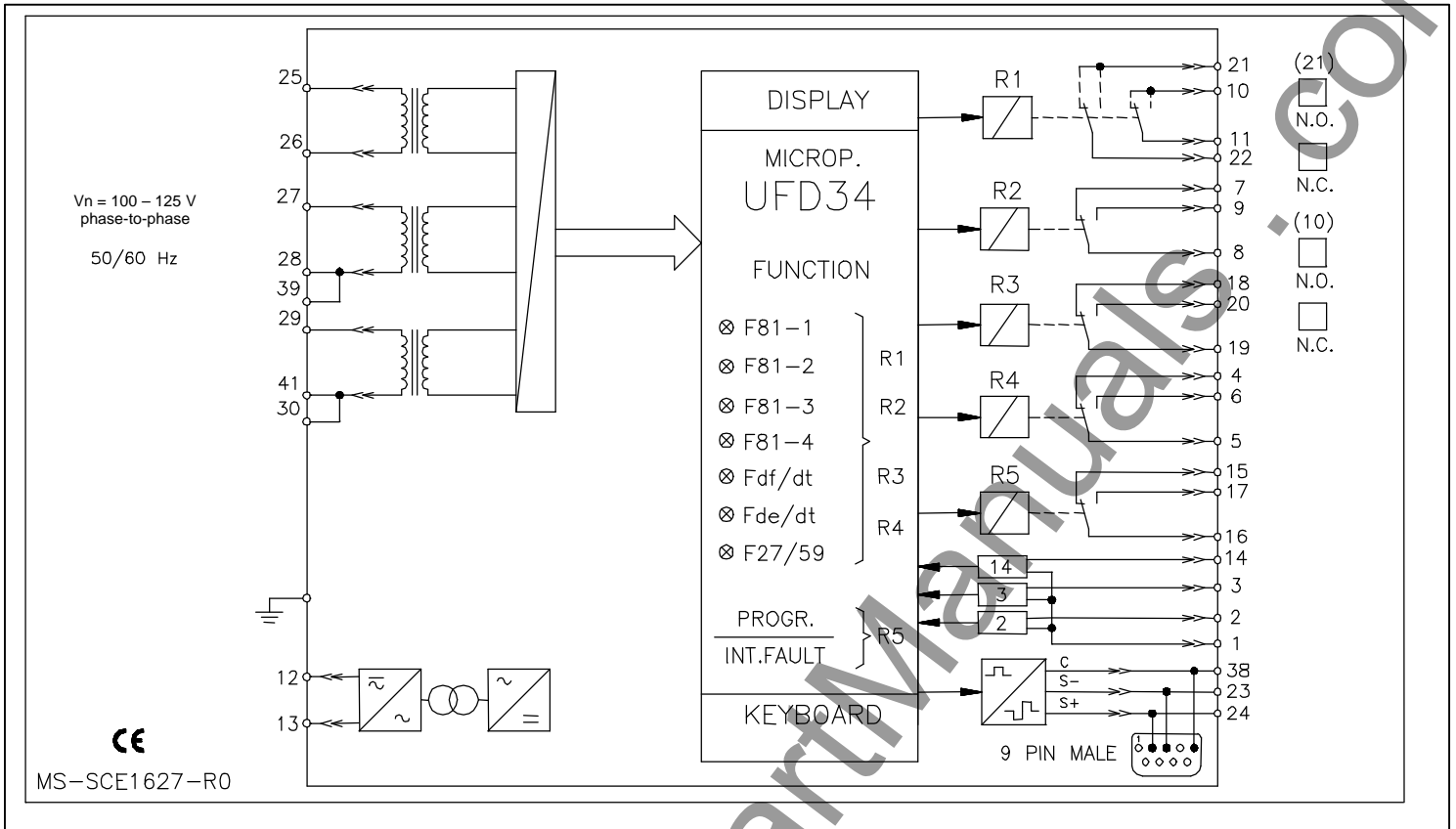


FIGURE 3: Wiring Diagram for the UFD34 Three Phase Relay

ORDERING INFORMATION

Construct the catalog number from the following table:

Base Relay Model	Power Supply ¹		Case Style ²	
	Code	Description	Code	Description
PRUFD14	L	24-110V AC/DC	D	Draw-out relay only, no cabinet supplied
PRUFD34	H	90-220V AC/DC	S	Single case
			T	Double case
			N	19" rack mount
			C2	Denotes mounting position in either a double case or 19" rack along with other relays ordered at the same time.
			C3	
			C4	

If ordering two or more relays to be fit in a common case, the first relay ordered should indicate the case style desired. This relay will be located in the leftmost bay of the case. Subsequent relays should use the C2, C3, or C4 suffixes to denote their position in the case using the leftmost bay as a "C1" reference.

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³ The power supplies are user replaceable and interchangeable. See catalog section 150-99.

⁴ The relay itself may be drawn out of any of the listed cases and plugged into any of the other case styles. The catalog number specified during ordering denotes the type of cabinet in which the relay will be shipped.