

EC-RXA

AMF Relay



Contents

1. Introduction and Application
2. Features and Characteristics
3. Operating Modes
 - 3.1 Auto Mode
 - 3.2 Manual Mode
4. Mains supervision
5. Generator Supervision
6. Design
7. Digital Inputs
8. Parameter Setting
9. Specifications
10. Terminal Details
11. Connection Diagram
12. Dimensional Drawing

1. Introduction and Application:

AMF Relay type EC-RXA has been designed for the control of emergency and stand-by power systems. It integrates the functions of engine start/stop relay, engine and alternator supervision and annunciator. The relay uses DIP switches for ease of setting parameters.

The engine start/stop element allows the automatic starting of the engine when power fails and automatic stopping of the engine when power returns. It also includes delayed supervision of oil pressure switch.

2. Features and Characteristics:

- ❑ Microcontroller technology
- ❑ Wide range of auxiliary supply: 7V to 35V
- ❑ Withstands a dip to zero volts of auxiliary supply for 0.1 second
- ❑ Flush mounting
- ❑ 3-phases mains supervision

- ❑ Supervision of generator voltage
- ❑ Parameter setting using DIP switches
- ❑ Two modes: Auto and Manual
- ❑ Wide array of timer circuits for start delay, stop delay, re-cooling time, mains restoration etc.
- ❑ Eight lamps for annunciation
- ❑ Eight digital inputs
- ❑ Six solid state outputs

3. Operating Modes:

EC-RXA offers two operating modes:
Auto and Manual.

3.1 Auto Mode:

This is the default mode, i.e., relay enters this mode whenever auxiliary supply is switched on.

In this mode it continuously supervises mains voltages against user settable minimum and maximum limits. If any phase voltage goes beyond this safe band, a timer is started. This timer is the 'Start Delay Timer'. If mains voltage stays beyond the band continuously for the set period, then EC-RXA issues a start command to initiate cranking. Cranking stops if either the generator develops a predefined voltage or if cranking period (1 second) ends.

When cranking period ends, EC-RXA starts a 'Wait' timer (3 seconds). This allows engine to pick up sufficient speed on its own to generate required voltage. If the voltage is not built up then another cranking attempt is made. Three such attempts are made. If generator does not build requisite voltage then 'Start Fail' lamp starts glowing. If generator develops requisite voltage then EC-RXA opens the mains CB and closes generator CB. It means that the load is shifted from unhealthy mains to healthy generator.

If generator/ engine become unhealthy, i.e. if voltage or engine speed becomes abnormal, then engine is stopped even if mains is unhealthy. In such a case load is transferred to mains.

If mains return healthy and stay healthy for a period determined by 'Mains Restoration Time' then generator is first run on no load for a time determined by 'Re-cooling Time' by transferring load to mains and thereafter engine is stopped. This gives the engine sufficient time of forced cooling. Engine can be stopped with / without re-cooling by external inputs by choosing appropriate input. An Emergency Stop input stops the engine without carrying out forced cooling phase.

3.2 Manual Mode:

EC-RXA enters manual mode when a digital input marked manual is activated. It reverts to auto mode when this input is de-activated. In this mode engine can be started/stopped. Supervision is suspended. All digital inputs are active.

Activating manual start input starts fuel as well as cranking. While this input is active, if generator builds sustainable voltage, then cranking stops. Fuel continues. If manual start input is removed before engine fires, then cranking stops but fuel continues for 3 seconds hoping that the engine may pickup. Activating Manual Stop stops fuel.

4. Mains Supervision:

Three phase voltages are continuously monitored. EC-RXA permits the user to define under-voltage and over-voltage levels. If measured voltage of any phase is found beyond the safe band, an action is initiated as discussed above.

5. Generator Supervision:

Only one phase voltage of generator is monitored. The upper and lower limits of safe voltage as applied to mains also apply to the generator. When the voltage of monitored generator phase goes beyond prescribed safe limits, EC-RXA initiates action as described under 'Auto Mode'.

6. Design:

It is a compact single board design based on a 16-bit fast micro-controller. This all SMD component board provides a sleek solution to the AMF panel user. The board is protected from the front by a robust glass filled polycarbonate panel that also serves as an annunciator with two push buttons, one for RESET and the other for EMERGENCY STOP.

Three phases of mains and one phase of alternator feed in to a measuring circuit using a fast 12-bit analog-to-digital converter built in the micro-controller. The design permits the user to deploy any relay having a DC coil rated for up to 24VDC. The coil can draw a current of up to 1.2A continuously. A self protecting MOSFET transistor switches the external relay.

All digital inputs are potential free. This implies that voltages **MUST NOT BE APPLIED** to these terminals under any circumstances. The connection diagram is shown in Fig. 6.1.

7. Digital Inputs:

There are 8 digital inputs.

One input, namely MANUAL is used for selecting manual mode of operation.

Two inputs, namely START and STOP are used only in manual mode. Their function is to start and stop the engine respectively. When stop is activated it stops the engine without entering recooling mode.

Remaining 5 inputs are usable in Auto as well as manual mode. These inputs also activate a hooter which resets automatically after 1 minute or when RESET button is pressed.

These inputs are:

1. EMERGENCY STOP
2. HIGH COOLANT TEMPERATURE
3. LOW FUEL
4. LOW LUBE OIL PRESSURE
5. SPARE

EMERGENCY STOP input skips recooling phase and stops the engine immediately. Low Fuel and High Coolant Temperature stop the engine through recooling phase.

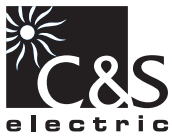
LOW LUBE OIL PRESSURE input is a delayed supervision input. It does not take any action until generator has been running at normal speed after starting. Thereafter it is always functional. It stops the engine through recooling phase

Engine stopping is always preceded by tripping of generator circuit breaker.

8. Parameter Setting:

Parameter setting is through DIP switches mounted on the backside of the board.

- Settings prevalent at the instant of power up are effective.
- If settings are changed subsequent to power up then RESET switch must be pressed for settings to become effective



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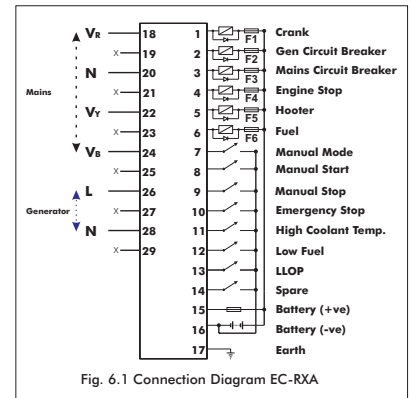
Table 1: Parameter Settings.

Switch	Parameter	Value
1	2	
OFF	OFF	160vac
OFF	ON	180vac
ON	OFF	195vac
ON	ON	210vac
3	4	
OFF	OFF	240vac
OFF	ON	255vac
ON	OFF	270vac
ON	ON	290vac
5	6	
OFF	OFF	Immediate
OFF	ON	5 Sec
ON	OFF	600 Sec
ON	ON	3600 Sec
7	8	
OFF	OFF	3 Sec
OFF	ON	30 Sec
ON	OFF	60 Sec
ON	ON	180 Sec
9	10	
OFF	OFF	1 Minutes
OFF	ON	2 Minutes
ON	OFF	5 Minutes
ON	ON	10 Minutes
11		
OFF		60 Hz
ON		OFF
12		
OFF		1Ph* enable
ON		3Ph Sensing

9. Specifications:

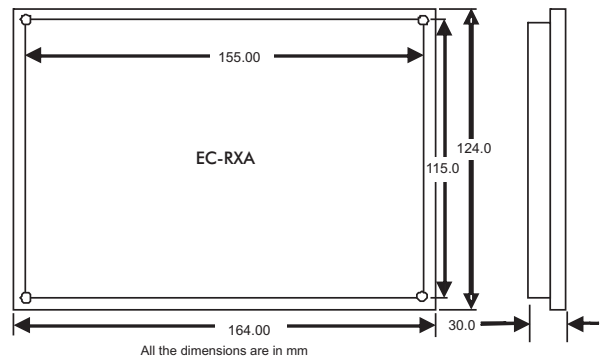
Parameter	Value/Range/Comment
Aux. Supply	7V-35V; 30 mA sustains a voltage dip down to 0V for 100 ms.
Measuring Range	Phase Voltage : 50 VAC - 280 VAC Mains: 3 Phase, 4 Wire system Alternator: Use any one phase for Measurement.
Output	Solid State - MOSFET
Output Rating	1.2A DC@24V DC
Cranking Period	1 Seconds
Crank Wait Period	3 Seconds
Dimensions in mm	164x124x30
Cut out Dimension in mm	145x106
Operating Temperature	-30°C to +70°C
Weight	Appx. 250 gms

11. Connection Diagram:



NOTE: Components shown Connected to terminals are outside EC-RXA.

12. Dimensional Drawing:



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