ICM455

Programmable, Three-Phase Voltage Monitor

Installation, Operation & Application Guide

For more information on our complete range of American-made products – plus wiring diagrams, troubleshooting tips and more, visit us at **www.icmcontrols.com**

Important Safety Information

HIGH VOLTAGE WARNING! – ***Turn off power at the main service panel before installing.***

Specifications

Input
- **Line Voltage:** 190 – 630 VAC
- **Frequency:** 50 – 60 Hz
- **Load Side Monitoring:** Optional
- **Control Voltage:** 18 – 240 VAC

Output
- **Type:** Relay, SPDT
- **Voltage Range:** 240 VAC at 10A max
- **Frequency:** 50 – 60 Hz
- **Remote Monitor Voltage:** 0 – 10 VDC

Control Operating Temperature
- **Operating Temperature:** -40°F to 167°F (-40°C to 75°C)
- **Storage Temperature:** -40°F to 185°F (-40°C to 80°C)

LCD Operating Temperature
- **Operating Temperature:** -4°F to 167°F (-40°C to 75°C)

Mechanical
- **Mounting:** Surface mount using two (2) #8 screws
- **Terminations:** Screw terminals
- **Dimensions:** 5.5”L x 4.5”W x 1.5”H

Parameters

Phase Unbalance Protection
- **Voltage Unbalance:** 2-20%, adjustable

Over/Under Voltage
- **Under Voltage:** 2-25%, adjustable
- **Over Voltage:** 2-25%, adjustable

Phase Loss Protection
- **Phase Loss Condition:** Equals 25% of nominal for any given phase; system will shut down and a fault will be recorded if this should occur.

Delay on Break Timer
- **Control Voltage:** 18-240 VAC
- **Time Delay:** 15 seconds to 10 minutes

Fault Interrogation Delay
- **Time Delay:** 0 – 15 seconds, adjustable
- Provides a delay between fault detection and system shutdown—helps to eliminate nuisance trips and unnecessary shutdowns.

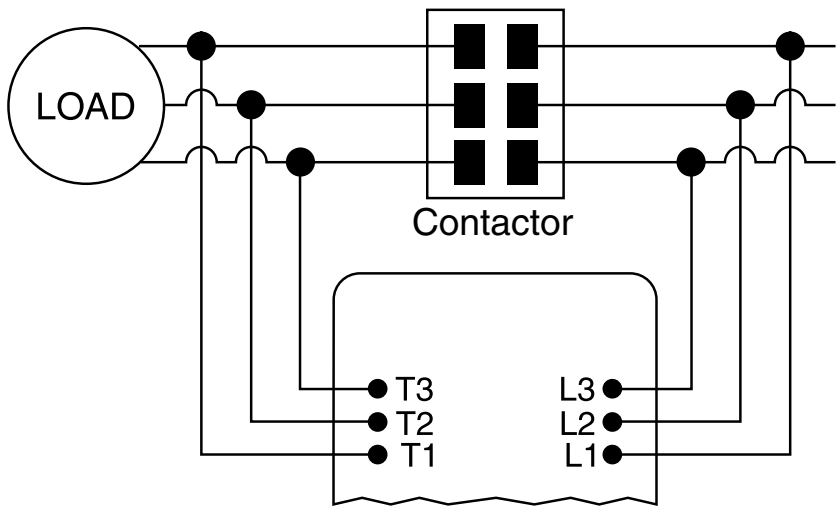
Installation

1. Turn off power at main service panel.
2. Using two (2) #8 screws, mount the **ICM455** in a cool, dry, easily accessible location in the control panel.
3. Connect voltage as shown in “Wiring Diagram”. Leave existing line and load side connections intact on the contactor.
4. Load side monitoring is optional (unit may be used to monitor line side only). Wire the contactor and optional control voltage monitor as shown in “System Diagram”.

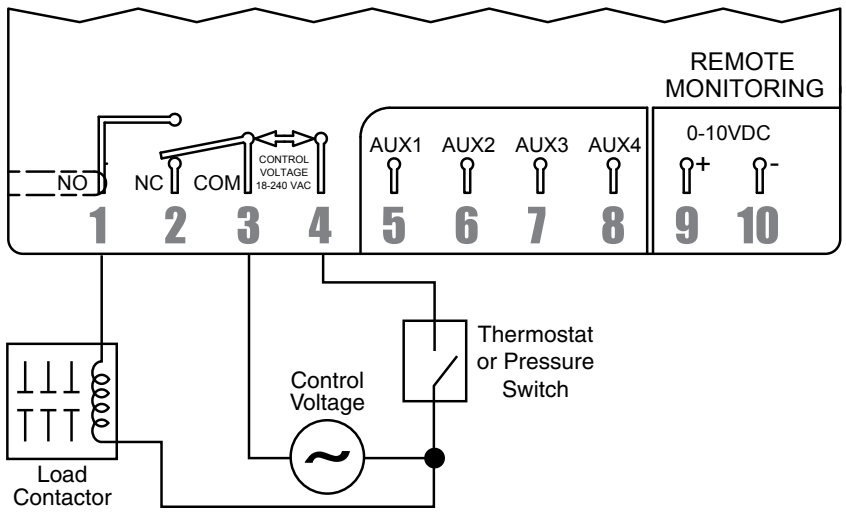
   ⁂ **Note:** *Load/line wire must be rated for 3-phase voltage rating, 20ga minimum.*
5. Upon application of power, the **ICM455** will be on line and will begin to monitor the system.

   ⁂ **Note:** *If voltage is not correct, see “Voltage Read Calibration” in Button Functions section*
   - Terminals 3 and 4 are the control signal input terminals.
   - “Control Mode” is turned ON or OFF in setup.
   - With “Control Mode” set to ON, there must be a voltage present on terminals 3 and 4 for the relay output terminals 1 and 3 to close; this voltage can be supplied from a thermostat, pressure switch, etc.
   - When the voltage on theses terminals is re-applied, the unit will not re-energize until the delay on break (0-10 minutes) time has elapsed.
   - Use of terminals 3 and 4 is optional; they will be ignored if the “Control Mode” is switched to OFF.
   - Terminals 1 and 3 are “dry”, normally open contacts.
   - Terminals 1 and 3 are closed when power is within specifications.
   - Terminals 1 and 3 open when there is a fault condition.
   - Terminals 1 and 3 open when there is a loss of the control signal with “Control Mode” set to ON.
   - Auxiliary terminals will be used in future models.

Wiring Diagram



Typical System Diagram



Setting the Parameters

1. Press the green **SETUP** button to enter the setup mode. Setup LED will light.
2. Use the ⌃ and ⌄ buttons to change user parameters.
3. Scroll through setup by pressing and releasing the **SETUP** button.
4. When the last parameter has been set, the phase average will be displayed and the setup LED will automatically turn off.

Button Functions

⌃ ⌄ Press arrow to scroll through and select parameter settings in Setup Mode.
Voltage Read Calibration:
Hold both down to calibrate line voltage. Fault and setup LEDs will flash. Use the ⌃ and ⌄ buttons to adjust. *Press **SETUP** to exit calibration.*

SETUP Press to enter Setup Mode and select user parameters. Setup LED illuminates when in Setup Mode.

READ Press to return to home screen, which alternates between line voltage and phase average.

FAULT Press to read faults. Hold for 5 seconds to clear faults and reset memory. Fault light will blink when fault has been added to memory.

SETUP + FAULT Press and hold to reset system due to system error – this will not reset the parameters.

To turn backlight on, press any button.

Output Conditions

Output Voltage	Condition
8 VDC	Phase Loss
7 VDC	Phase Reversal
6 VDC	Under Voltage
5 VDC	Over Voltage
4 VDC	Phase Imbalance
2 VDC	Load Energized
0 VDC	No Power to Unit

Parameters

Parameter	Description	Range	Default	Recommended
Line Voltage	Average phase to phase line voltage.	190 – 630 V	208 V	Name Plate Voltage
Delay on Break	Amount of time between the load de-energizing and re-energizing.	0 – 10 minutes	15 seconds	4 minutes**
Delay on Fault	Amount of time before the load de-energizes due to a non-critical fault.*	0 – 15 seconds	15 seconds	7-8 seconds**
% Over/Under Voltage	Maximum/Minimum phase to phase average voltage, respectively.	2 – 25%	20%	12-15%
% Phase Unbalance	Amount of allowable voltage unbalance.	2 – 20%	20%	4-5%**
Reset Mode	AUTO or number of times the load can be re-energized after a load side fault before a manual reset is necessary. ⁂ **Note:** *When monitoring line side only, the reset mode will always be AUTO.*	AUTO or 1 – 10 retries	AUTO retries	AUTO retries
Control Mode	When control mode is set to OFF, the load will energize if no 3-phase fault condition exists. With control mode ON, the load will energize if no fault conditions exist and control voltage is present at terminals 3 and 4.	ON or OFF	ON	Based on wiring
Set Date/Time	Set date and time in order to store faults in real time. When first powered on, or after a long power outage, you will be prompted to set the date and time when **SETUP** is pressed.	ON or OFF	ON	Based on wiring

* Non-critical faults are faults such as High/Low Voltage and Phase Unbalance. Critical faults, such as Phase Loss and Phase Reversal, have a fault interrogation of under 2 seconds and it is not user adjustable.
** For best recommendations, consult manufacturer of equipment.

Fault Conditions

Press and release fault button to scroll through all saved faults.
⁂ **Note:** *For initial setup, press and hold FAULT for 5 seconds to remove any previously stored faults.*

Fault	Problem	Corrective Action
Line Over Voltage	Average phase-phase voltage exceeds the maximum percentage	1. Check system for over-voltage cause. 2. Increase the percent over-voltage setting if necessary. 3. Increase fault line interrogation if necessary.
Line Phase Loss	Not all three of the phases on the line side are present	1. Press and hold the **READ** button on the phase monitor or use an AC voltmeter to carefully measure all three phase-phase line voltages (ex: Line 1 → Line 2, Line 2 → Line 3, Line 3 → Line 1). 2. Repair the missing phase.
Line Phase Reversal	Lines 1, 2, or 3 are not in sequence (not 120° phase shifted)	1. Turn OFF power. 2. Swap any 2 phases on the line side of the IMC455 (example: swap Line 1 and Line 2).* 3. Re-apply power.
Line Phase Unbalance	A voltage unbalance between the three line phases exceeds the unbalanced set point	1. Press the **READ** button to observe the present line voltages. Check system for unbalance cause. 2. Increase fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Line Under Voltage	Average phase-phase voltage in below the minimum percentage	1. Check system for under-voltage cause. 2. Increase the percentage under-voltage setting if necessary. 3. Increase fault time interrogation if necessary.
Load Phase Loss	Not all three of the phases on the load side are present	1. Re-energize the contactor. 2. If the fault reappears after the load energizes: a. Turn all power OFF. b. Check all load side connections. c. Check the contacts of the contactor for damage, debris, or excess carbon.
Load Phase Rev	Loads 1, 2, or 3 are not in sequence (not 120° Phase Shifted)	1. Turn OFF all power. 2. Swap any 2 phases on the load side of the **ICM455** only (example: swap load 1 and 2).* 3. Re-apply power.
Load Phase Unbalance	A voltage unbalance between the three load phases exceeds the unbalance set point	1. Press the **READ** button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Brownout	All three phases lost (0V)	Check system supply voltage for cause of voltage loss

* **ONLY** swap phases during initial setup, not after the **ICM455** has been in operation without errors.

Troubleshooting

Parameter	LCD Readout	LED Status	Corrective Action
Line voltage is not correct	Phase Average	N/A	Use calibration method described in “Button Functions”.
Load will not energize	Phase Average	All LEDs off.	Confirm that the control input (terminals 3 and 4) is properly connected and configured.
Load will not energize	Phase Average	Load LED off, Fault LED blinking	Press **FAULT** once to observe the current fault; correct the condition of the first fault that appears (see Fault Conditions above for a list of corrective actions.
Fault LED blinks repeatedly while load is energized	Phase Average	Fault LED blinking, Load LED on.	Indicates there are faults saved in the memory, press **FAULT** rapidly to scroll through saved faults; to clear the faults, press and hold **FAULT** for more than 5 seconds.
Load will not de-energize when control voltage is OFF	Phase Average	Load LED on, Control LED off	The control mode setting is off; press **SETUP** to get to the control mode. Press ∧ to set control mode on.
Setup LED is on while load is being energized	Anything Other Than Phase Average	Setup LED on, Load LED on	To exit setup mode, press either **READ** or **FAULT**.
Load will not energize	Reset	Fault LED blinking	Unit in lockout; maximum number of retires in manual reset mode has been reached. To reset unit, press **FAULT** and hold for more than 5 seconds.
Load turns on and off repeatedly	Readout is Irrelevant	Fault LED blinking	Fix load side fault. Press **FAULT** to observe condition; the delay on break period may be too short; press **SETUP** to enter the delay on break mode; press ∧ to lengthen the delay.

ONE-YEAR LIMITED WARRANTY

The Seller warrants its products against defects in material or workmanship for a period of one (1) year from the date of manufacture. The liability of the Seller is limited, at its option, to repair, replace or issue a non-case credit for the purchase prices of the goods which are provided to be defective. The warranty and remedies set forth herein do not apply to any goods or parts thereof which have been subjected to misuse including any use or application in violation of the Seller’s instructions, neglect, tampering, improper storage, incorrect installation or servicing not performed by the Seller. In order to permit the Seller to properly administer the warranty, the Buyer shall: 1) Notify the Seller promptly of any claim, submitting date code information or any other pertinent data as requested by the Seller. 2) Permit the Seller to inspect and test the product claimed to be defective. Items claimed to be defective and are determined by Seller to be non-defective are subject to a $30.00 per hour inspection fee. This warranty constitutes the Seller’s sole liability hereunder and is in lieu of any other warranty expressed, implied or statutory. Unless otherwise stated in writing, Seller makes no warranty that the goods depicted or described herein are fit for any particular purpose.

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