

# ACSVR Installation Instructions

The ACSVR is designed to be installed on basic inefficient reciprocating and scroll compressors up to 10 tons. The ACSVR should not be installed on AC systems with pump-down functions or systems with elaborate controls like CRAC units or quad compressor systems. The ACSVR should never be installed on multi-speed or variable speed compressors, for this is the function that the ACSVR is emulating. A heat load must be present in order to properly commission this technology.

\*\*\*Additional supplies you may need for installation: Thermostat wire (6ft 18/2 & 18/5), wire nuts, zip ties, electrical tape\*\*\*

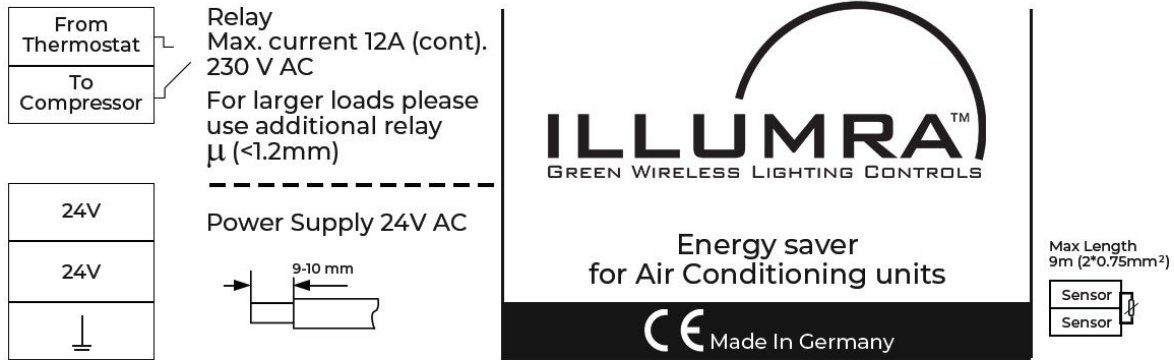
## **ACSVR Installation for Roof Top Unit / Package / Wall Units (Single or Dual Circuits)**

1. Make sure AC unit is in good mechanical condition and operating properly.
2. Locate the control board (circuit board) inside the control panel and mount the ACSVR in close proximity (see Fig. 1). The ACSVR must be protected from the weather and moisture from the plenum. Never install the ACSVR in the return or supply air stream.
3. Connect 24-volt power to the ACSVR using standard thermostat 18 AWG wire.
4. Locate the thermostat wire that controls the primary circuit (aka Y1) from the thermostat to the compressor. Connect the Y1 wire coming from the thermostat to the input side of the ACSVR and connect the output side from the ACSVR to the wire going to the compressor. NOTE: The signal now travels from Thermostat to ACSVR to Compressor. This can be done either before or after the control board in most cases. However, some systems have factory delays at start up or special signals from the control board to the secondary circuit that depends on what the primary circuit is doing.
5. Connect the temperature sensor from the ACSVR directly onto the supply side of the evaporator (see Fig 2, 3 & 5). Place sensor away from any fresh air intake stream that might cause constant temperature fluctuations. On dual compressor units make sure that you install the sensor on the correct evaporator for the compressor which the ACSVR is controlling. Use 18 AWG wire to extend sensor up to a maximum of 30 feet/9 meters.
6. After you have installed the ACSVR watch it go through a couple of cycles before you close up the unit (see Validation Check). For dual compressor systems, make sure that the 2<sup>nd</sup> compressor is running while watching the ACSVR go through its cycles. Confirm that condenser fan for the 2<sup>nd</sup> compressor is running when the ACSVR turns off the primary compressor when in Phase 5/6.

## **ACSVR Installation for Split Systems:**

1. Make sure AC unit is in good mechanical condition and operating properly.
2. Locate the 24-volt power supply and Y1 control signal inside the air handler and mount the ACSVR (ACSVR) in close proximity to the control board/terminal strip. The exterior wall of air handler is a good location (see Fig 4).
3. Connect the 24-volt power to the ACSVR using standard thermostat 18 AWG wire.
4. Connect the Y1 wire coming from the thermostat to the input side of the ACSVR and connect the output side from the ACSVR to the wire going to the compressor. NOTE: The signal now travels from Thermostat to ACSVR to Compressor. This can be done either before or after the control board in most cases.
5. Connect the temperature sensor from the ACSVR directly onto the supply side of the evaporator (see Fig 5). If the supply side of the evaporator is sealed or very difficult to access just securely mount the sensor in the supply air stream as close to the evaporator as possible (Max 5 feet/1.5 meters).
6. ACSVR must go through 2 cycles to ensure everything is working properly (see Validation Checklist).

**Connections:**



**Status & Error Codes:**

Check if the Green ACSVR LED is flashing.

Flash rate indicated status / error code (1 flash = status 1, 2 flashes = 2 etc)

Please note that the ACSVR control cycle always begins with an OFF - Period of the compressor to allow calibration and to prevent short-cycling.

Status Code	Description	
<b>1</b>	<b>Power cut protection (compressor off)</b>	(1 minute)
<b>2</b>	<b>Standby and sensing for cooling (relay closed)</b>	(2 minutes)
<b>3</b>	<b>Efficiency Sensing (compressor on)</b>	(approx. 2.5 - 7 minutes)
<b>4</b>	<b>Dynamic Learning (compressor on)</b>	(3 - 15 minutes)
<b>5</b>	<b>Anti short cycle time (compressor off)</b>	(3 minutes)
<b>6</b>	<b>Temperature sensing (compressor off)</b>	(0 - 6 minutes)
<b>7</b>	<b>Sensor Error: shorted/open/out of range (relay closed)</b>	

**ACSVR Install Figures:**

Figure 1- ACSVR installed inside control panel of RTU.



Figure 2- Zip-tie cut 2 inches long at 45° and attached to sensor.

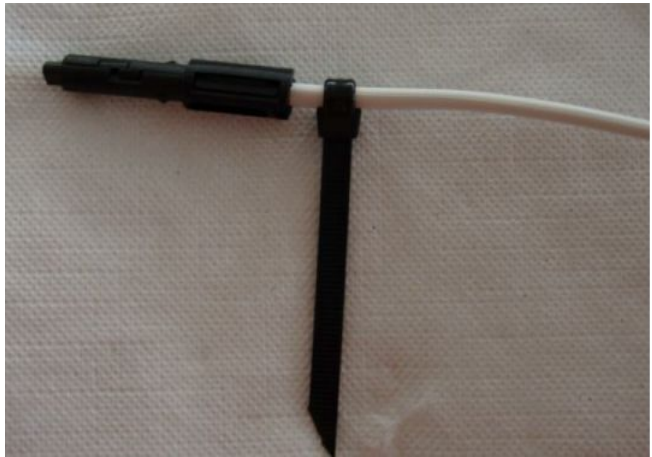


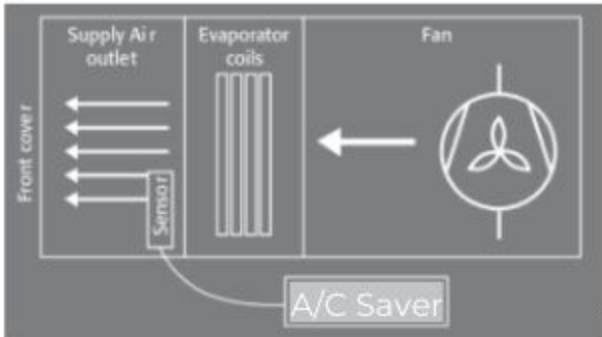
Figure 3- Sensor attached to supply side of evaporator.



Figure 4- ACSVR attached to exterior wall of air handler.



Figure 5- Position sensor in air stream as close to the evaporator as possible (Max 5 feet/1.5 meters)





### **3 Year Limited Warranty ACSVR 24Volt for North American Continent Coverage:**

The manufacturer of this product guarantees to the purchaser that this product is free of defects in material and workmanship for at least 3 years, commencing from the date of purchase.

This unit is warranted only in normal use. It does not cover failures caused by improper installation, abuse, misuse, modification or alteration of electrical circuitry or physical construction and events beyond our control.

The manufacturer shall not be liable for consequential economic damages resulting from breach of this warranty.

Installation has to be conducted according to ACSVR installation instructions by qualified personnel. This warranty does not cover any additional accessories necessary for installation (e.g. additional wiring).

### **Return Policy:**

Warranty units will be replaced at no charge.

Defective units shall be returned prepaid to one of our service centers and will then be replaced.

Returns will not be accepted without a Return Authorization (RA) number. Please contact us through **support@ILLUMRA.com** to receive an RA number and specify your contact name & phone number, shipping directions and the version number on the ACSVR (e.g. V4.1.7). Also attach a copy of your invoice which includes the company name and phone number of the distributor from which you purchased the ACSVR. You will receive shipping instructions within 3 business days.

The manufacturer shall not be responsible for labor costs for removal or reinstallation of the product.

## Technical Data

### 1. Operating data

	<u>Type 1</u>	<u>Type 2</u>	<u>Type 3</u>
Input voltage	230V AC (+/- 10%) 50 / 60 Hz	24V AC (+/- 10%) 50 / 60 Hz	120VAC (+/- 10%) 50 / 60 Hz
Max. current Consumption	15 mA	90 mA	29 mA

Sensor measuring range: min. -10°C, max. 55°C

Max. allowable temp. at sensor: 70°C

### 2. Output (Relay)

Contact function:	NO (Normally Open)
Switching voltage:	24 V AC to 230 V AC
Max. switching current:	12 A continuously / 120 A temporarily (20ms) at 250V switching voltage
Anti-short cycle protection:	3 minutes (1 minute upon power-up)

### 3. Operating conditions

Operating temperature:	min. 0°C, max. 55°C
Relative humidity:	min. 15%, max. 90%
No Condensation	

### 4. Storage and Transport conditions

Storage temperature:	min. -25°C, max. 85°C
Relative humidity:	min. 10%, max. 95%

### 5. Dimensions

Length x Height x Width:	173 x 32 x 42 mm without strain relief 231 x 32 x 42 mm with strain relief
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## Validation Checklist Sample:

Client: .....					ILLUMRA's A/C Saver Validation Checklist	
A/C Unit #: .....						
Date: .....					Record duration A/C Saver spends in each Phase for 2 complete cycles	
A/C Saver #: .....						
HVAC Tech Name: .....						
HVAC Tech Contact #: .....						
Compressor Status	Phase	Duration per Phase		Recommended Duration per Phase	Troubleshooting	
		Cycle 1	Cycle 2		Problem	Potential Cause & Solution
ON	P2			2 Minutes	Staying in P2 more than 2 Minutes	No call from the T-stat so AC will not reach set point during testing. Sensor installed on return side of evaporator. Bad compressor or no refrigerant.
ON	P3			2.5 - 7 Minutes	Never Leaves P3	AC unit is undersized. Evaporator temperature can not stabilize. Fresh Air intake is crossing the A/C Saver's sensor. Low or High on Refrigerant. AC needs tune-up. Check pressures.
ON	P4			3 - 15 Minutes	Takes more than 7 Minutes to leave P3	Sensor is on secondary evaporator of a dual compressor system and the A/C Saver is controlling the primary compressor. AC unit is nearly undersized. See above "Never Leaves P3"
OFF	P5			3 Minutes	Jumps to P2 from P3 or P4	T-stat reached set point: lower t-stat so AC does not reach set point during this testing. Large heat load entered return air stream: A/C Saver may still be in P2 until AC reaches set point.
OFF	P6			0 - 6 Minutes	Compressor does not come ON after returning to P2 from P5 or P6	T-stat reached set point: lower t-stat so AC does not reach set point during this testing. There is a time delay on the control board greater than 3 Minutes: intercept Y1 after control board.
ON	P2			2 Minutes	A/C Saver loses power when system reaches Set Point	A/C Saver is not powered by a constant 24V: take power directly from 24V transformer.
ON	P3			2.5 - 7 Minutes	A/C Saver never goes into P6	A/C Saver will only go into P6 when the 3 Minute compressor cycle in P5 was not long enough for the blower to move all the cold energy stored in the evaporator into the room.
ON	P4			3 - 15 Minutes	During normal operation the compressor only runs for 7 Minutes or	AC unit is extremely oversized and/or swing differential on T-stat is too narrow: if possible, increase swing differential at T-stat to 2 minimum and / or make sure you install the OFF delay ON break Blower Relay.
OFF	P5			3 Minutes	A/C Saver in P7	Problem with the sensor. Not terminated correctly or faulty.
OFF	P6			0 - 6 Minutes		
OFF	P5	YES / NO			For Dual Compressor Systems: Does Condenser Fan remain ON for 2nd Compressor when A/C Saver has 1st Compressor turned OFF?	

The A/C Saver's LED will blink 1 time in P 1, 2 times in P2..... and so on, 7 times in P7. P1 will only be seen after a power failure for 1 minute and P7 will only be seen when there is a problem with the sensor. The A/C Saver will cycle from P2 through P6/P6 when everything is operating correctly. Set the T-stat to a low setting before you start the validation check; you do not want the T-stat reach set point during the Validation Check. When A/C Saver leaves P5/P6 and returns to P2 to start the next cycle the compressor should start within a few seconds otherwise you have a time delay that exceeds 3 minutes that must be removed / bypassed.