

AutoCap™ Adaptive Capacitor Controller And Recorder



POWERFLEX® SERIES

The Fisher Pierce Series 4400 AutoCap Adaptive Capacitor Controller takes the complexity out of switched capacitor bank control.

Plug in the factory-programmed AutoCap controller* and it adapts itself to the installation. No more hassles with sensor wiring or setpoint calculations. The Series 4400 can be installed without ever opening the enclosure!

The Adaptive VAR™ control mode automatically measures the size of the bank, and establishes VAR set points for maximum energy loss reduction.

The PhaseFind™ function of the controller locates current signal source, and compensates for phase rotation and reversed wiring.

The Voltage Guard™ measures the voltage change caused by capacitor switching and applies this value to the present line voltage. If Voltage Guard predicts that bank switching will cause the line to exceed preset voltage limits, switching is inhibited, preventing both out of range line voltage conditions and capacitor bank cycling.

The controller automatically corrects for installation errors such as sensing voltage and current from different phases, reversed current signal wiring, reversed Trip/Close wiring, and calibration errors. The AutoCap can adjust to abnormal operating conditions including reverse

power flow, bank hunting, low switching voltage, capacitor can failure (neutral current lockout), and excessive bank switching.

The Series 4400 AutoCap is a programmable one-to-four season controller. It can operate on the basis of VAR, voltage, current, temperature, time and combinations of these inputs. Programming is accomplished using SmartSet™ application software, Windows-based and menu driven for ease of use. In addition, AutoCap includes complete load data/event recording and report creation supported in SmartSet™.

Features

- Adaptive VAR control.
- Voltage Guard (adaptive voltage restraint).
- PhaseFind.
- Reverse power functions.
- True rms voltage and current sensing.
- Total harmonic distortion recording.
- Reverse Trip/Close wiring detection.
- Anti-hunt function.
- Undervoltage inhibit feature.
- Plug-to-plug compatible with existing controllers.
- Windows-based SmartSet application software.
- Graphs and reports directly from SmartSet.
- Compact package.

Options

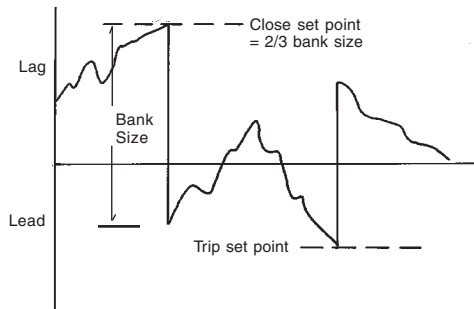
- Expanded load data and event recording.
- PanelSet™ allows programming of controller without a laptop.

*Patent Pending

Exclusive AutoCap™ Advantages

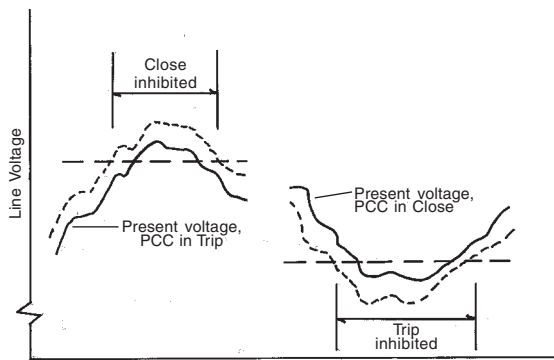
The Series 4400 AutoCap controller includes many new and innovative functions which eliminate the traditional struggle associated with setting optimum VAR setpoints (Fig. 1 – Adaptive VAR); finding the voltage change caused by bank switching (Fig. 2 – Adaptive Voltage Guard); and field wiring (Fig. 3 – PhaseFind).

• **Reverse power functions** calculate proper VAR setpoints to compensate for altered VAR measurement during this condition. Four other control mode options are also available for use during reverse power conditions. An LED on the controller panel indicates reverse power condition.



Adaptive VAR (Fig. 1)

Identifies size of the capacitor bank and sets the VAR switching points for maximum loss reduction.

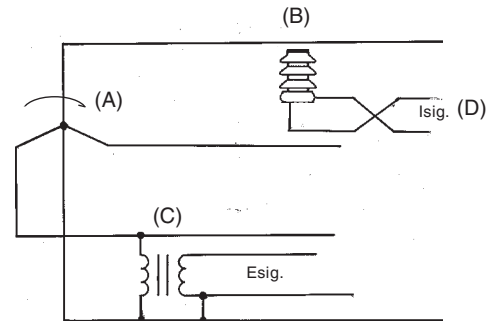


Additional AutoCap Features

The AutoCap controller builds on more than 30 years of Fisher Pierce experience in the design, manufacture, and application of electronic capacitor controls.

- Standard meter socket mounting, pole or wall mounting available.
- Single phase line current signal input: Line post sensor or CT input for VAR and current control and data recording.
- Capacitor bank neutral current signal input: Fisher Pierce split lamination sensor (AT929) or CT neutral current input.
- Neutral current lockout lamp; reset by manual button or command through RS-232.

- **Reverse Trip/Close detection** automatically senses reverse wiring of the Close and Trip drive circuits to the capacitor switch; inhibits all switching, except manual, and indicates error by flashing LED on front panel.
- **Anti-hunt function** automatically compensates for rapid bank tripping due to cycling loads or interaction from other switched banks on the feeder.
- **Undervoltage inhibit** feature protects the capacitor bank switch from damage caused by low voltage.



PhaseFind (Fig. 3)

Compensates for phase rotation (A), finds current signal phase (B) with respect to voltage phase (C), and compensates for reversed wiring (D).

Adaptive Voltage Guard (Fig. 2)

Identifies voltage change from bank switching; inhibits Close operation if Voltage Guard plus present line voltage exceeds high voltage limit. Reverse conditions inhibit Trip.

- Shielded ambient temperature sensor.
- 9 Pin, RS-232 communications port.
- Optical communication port available.
- 365/366 day time clock includes next century.
- Programmable momentary output relays.
- Nonvolatile memory.
- Independent watchdog timer.
- Electromechanical operations counter available.
- Internal LCD read-only display available.
- Operational status LED's.
- Manual Close/Trip operation and Auto/Manual switches.

SmartSet Application Software

The Series 4400 AutoCap controller is programmed using Windows-based SmartSet software created by Fisher Pierce for greater programming ease.

Using SmartSet software, the AutoCap is a multi-function microprocessor based controller which can be programmed for up to four seasons. Each season can have its own primary and override functions as listed in the Control Modes table below. The PCC is programmed via a standard RS-232 or optional optical communications port using any Windows-based PC.

Control Modes

Basic Functions	Override Functions	Voltage Bias	Reverse Power
<ul style="list-style-type: none"> Adaptive VAR VAR Voltage Current Time High Temp Low Temp 	<ul style="list-style-type: none"> Voltage Time High Temp Low Temp 	<ul style="list-style-type: none"> Time High Temp Low Temp 	<ul style="list-style-type: none"> Ignore Voltage VAR Trip and Inhibit Close and Inhibit

The following additional functions are also provided:

- **Real-time monitoring** of data readings and controller status through local RS-232 or optical port.
- **Traditional holiday calendar** – 10 year predefined, can be user edited.
- **Individual and block holidays** – 10 year user programmable.
- **Daylight Saving Time calendar** – 10 year pre-defined, can be edited.
- **Daily close count limit** - User programmable.
- **Switching time delays/inhibits** – For automatic and manual modes with LED indication on controller panel.
- **Neutral current lockout** – Trips bank and prevents further capacitor operation, and flashes external lamp in the event of a capacitor can failure. Reset by external button or RS-232 command.

View Setup Screen – allows user to review controller setup and site configuration summary.

Season Configuration Screen – fully prompted for easy controller programming.

Extensive Data Recording

The Series 4400 AutoCap PCC provides a full spectrum of user defined load data and controller operations recording capability. Three-phase load data are derived from single phase measurements and assume balanced load. All recorded data are easily uploaded via RS-232 or optional optical port. Memory of 32K standard; expanded 128K is available.

Data Recording Parameters

Load Data Recording

(1 min. to 4 hour averaging period)

Date/Time Stamp
Voltage (Sec. or Line)
Current (Sec. or Line)
kVA (3 ϕ)
kVA (3 ϕ)
kW (3 ϕ)
Power Factor
Total Harmonics
Temperature
Trip/Close Status

Daily Summary Recording

Date Stamp
Time of Max/Min Value
Daily Max/Min Voltage
Daily Max/Min Current
Daily Max/Min (3 ϕ) kVA
Daily Max/Min Temp
Daily Close Operations
Daily Close Hours
Close Ops Running Total

Operations Recording

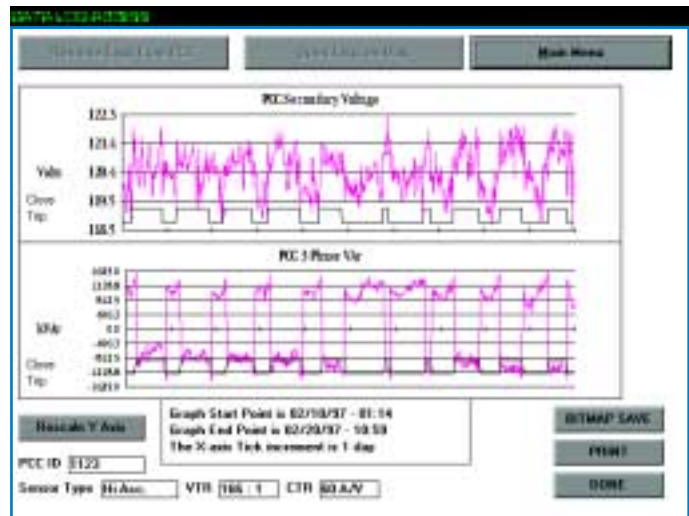
Date/Time
Basic Operations
Override Operations
Manual Operations
Power up/Power down
Voltage Before/Delta
kVA Before and After
kW Before and After
Reverse Power

Report Generation Capability

The SmartSet™ report generation feature provides spreadsheet format and visual presentation of recorded data as well as many editing features. This capability is integrated into SmartSet – no additional software is required. The ability to graph all load study data, specify time period, and superimpose Close/Trip operations is included.

Load Data Reports

- Spread sheet format
- Graphing of all load data
- Edit graph time period
- Scale of graph
- Title of graph
- Trip/Close status
- Report printing



Typical Load Data Graph

Specifications:

SERIES 4400 AUTOCAP™ CONTROLLER

Voltage Range:

PCC Power and True RMS Sensing	95 – 140 V, 60 Hz
	190 – 280 V, 60 Hz
	95 – 125 V, 50 Hz
	190 – 250 V, 50 Hz

Sensing Accuracy:

±0.5% of reading over temperature.

Voltage Control and Override:

95-140V / 190-280V secondary in 0.1V increments.

Voltage Bias:

0-20V / 0-40V in 0.1V increments.

Voltage Transformer Ratio (VTR):

1:1 to 1000:1 in 0.1:1 increments.

Current:

- Sensors:**—Fisher Pierce series 1301 line post sensor (60 A/V) ... 4-800A true rms.
—Lindsey line post sensor (100 A/V) ... 4-800A true rms.
—CT secondary ... 0.1 – 20A true rms.

Accuracy: ± 1.0% Reading, ± 0.2% Range, ± sensor error.

Angle Accuracy: ... ± 1 deg., ± sensor error.

Current Control - Range/Resolution:

Line post sensor ... 4-800A in 0.1A increments.

Current Transformer ... 0.1-20A secondary in 0.01A increments.

Current Transformer Ratio (CTR):

5:5 to 2000:5 in 1:5 increments.

VAr Control - Range/Resolution:

Adaptive VAr: Limited only by secondary voltage range x current sensing range.

3ø kVAr: Range ± 1 to ± 99,999 kVAr in 1 kVAr increments.

Time Control - Range/Resolution:

Two Close and two Trip settings for each day of the week in 24:00 hour clock, in 1 minute increments.

Temperature Control - Range/Resolution:

Sensor located on bottom of enclosure with radiation shield.

Range: -40° to +122°F (-40° to +50°C) outside air ambient.

Accuracy: ± 2°F / 1°C

Temperature Control, Override, and Bias:

- Close on High temperature.
- Close on Low temperature.
- Range ... -40° to +122° F (-40° to +50° C) outside air ambient in 1°F (1°C) increments.

Serial Communications Port: DB9 female connector

Optical Communications Port: Type 2

Operating Humidity Range: 0-95% non-condensing.

Surge Withstand: ANSI C62.41-1987

Electrostatic Discharge Test: 15kV applied to all accessible parts, IEC 801-2.

Output Relay Rating: 10A continuous. 50A, 50% PF, 6 cycles make only.

Relay Type: Momentary (two relays).

Contact closure period: 1-1000 sec. in 1 sec. increments.

Fuse Rating: 10A FNM Slo-Blo® load fuse.

2A controller fuse.

Enclosures:

Six Stab Lexan: 8.5h x 6.5w x 4.0d in. Includes optical port and electromechanical operations counter options.

Aluminum: 11.5 x 7.0w x 4.0d in. Includes optical port and electromechanical counter options.

Computer Requirements:

SmartSet setup software requires Windows 3.1 or better.

SERIES 1301 LINE POST SENSOR.

Calibration Accuracy at 120A: ± 1%

Linearity Error: 3-1200A, ± 1%

Angle Error: 3-600A, ± 0.5°

Temperature Error: ± 0.02%/°C

7th Harmonic Response: 82%

See Fisher Pierce Series 1301 bulletin FP054 for complete specifications.

Ordering Information

Model	44	1	1	N	-	C	T	S	-	SK	7	1	A
Section	1	2	3	4	-	5	6	7	-	8	9	10	11

Example

Section 1 Basic Model Number
44 Autocap programmable capacitor controller in compact enclosure

Section 2 Line Current Input (Current sensing device ordered separately).
1 Fisher Pierce 1301 line post sensor (60A/V) or Lindsey sensor (100A/V)
2 CT (5A secondary)
0 None

Section 3 Neutral Current Sensor
1 Fisher Pierce AT929 sensor with 6 foot lead (supplied)
2 CT (not supplied)
3 VT (not supplied)
0 None

Section 4 Optical Communication Port
F Supplied
N None

Section 5 Counter/Display
C Electro-mechanical counter only
D 2-line display only (read only)
E Electro-mechanical counter and 2-line display (read only)
P Panel Set "Programmable 2 Line Display"
K Panel Set with Mechanical Counter "Programmable 2 Line Display"
N None

Section 6 Temperature Sensor
T Supplied
N None

Section 7 Memory
S Standard 32K
E Expanded 128K

Section 8 External Wiring and Mounting Configuration (See Below)

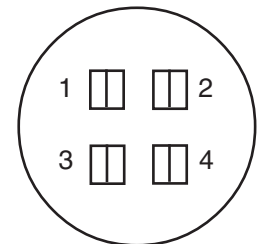
Section 9 Enclosure Type
7 Lexan (Meter socket mounting only)
8 Aluminum

Section 10 Voltage/Frequency
1 120 Vac, 60Hz
2 240 Vac, 60 Hz
3 120 Vac, 50 Hz
4 220 Vac, 50 Hz

Section 11 Factory Code

Section 8 Four Jaw Meter Socket Mounting and Wiring

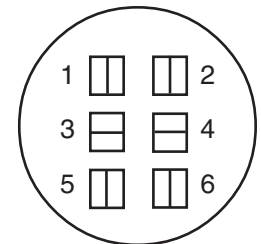
Section 8	1	2	3	4	5	6	External GND Lug	Enclosure	Current Inputs
FJ	L	N/GND	TR	CL	-	-	NO	LEXAN	NONE
GJ	L	N/COM	TR	CL	-	-	YES	LEXAN/ALUM	NONE



Section 8 Six Jaw Meter Socket Mounting and Wiring

Section 8	1	2	3	4	5	6	External GND Lug	Enclosure	Current Inputs
SJ	CSL	N/GND	L	TR	CSH	CL	NO	LEXAN	LINE ONLY
TJ	CSL	N	L	TR	CSH	CL	YES	LEXAN/ALUM	LINE ONLY
SM	L	N/GND	CSL	CSH	TR	CL	NO	LEXAN	LINE ONLY
TM	L	N	CSL	CSH	TR	CL	YES	LEXAN/ALUM	LINE ONLY
SL	L	N/GND	NSL	NSH	TR	CL	NO	LEXAN	NEUTRAL ONLY
TL	L	N	NSL	NSH	TR	CL	YES	LEXAN/ALUM	NEUTRAL ONLY
SK	L	N/GND/COM	NSH	CSH	TR	CL	NO	LEXAN	LINE+NEUT
TK	L	N/COM	NSH	CSH	TR	CL	YES	LEXAN/ALUM	LINE+NEUT

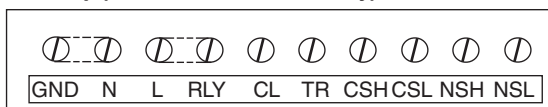
View looking into socket



Section 8 Bracket Mounting with Terminal Strip

Section 8		External GND Lug	Enclosure	Current Inputs
BJ: POLE WJ: WALL	WIRE TO TERMINAL STRIP AS SHOWN BELOW	YES	ALUM	NONE, LINE, NEUTRAL OR LINE+NEUTRAL

Terminal Strip (Aluminum Enclosure Only)



GND= System ground N= Neutral L= Line
RLY= Output relay armatures CL= Close TR= Trip
CSH = Line current signal High CSL = Line current signal Low
NSH= Neutral current signal High NSL= Neutral current signal Low

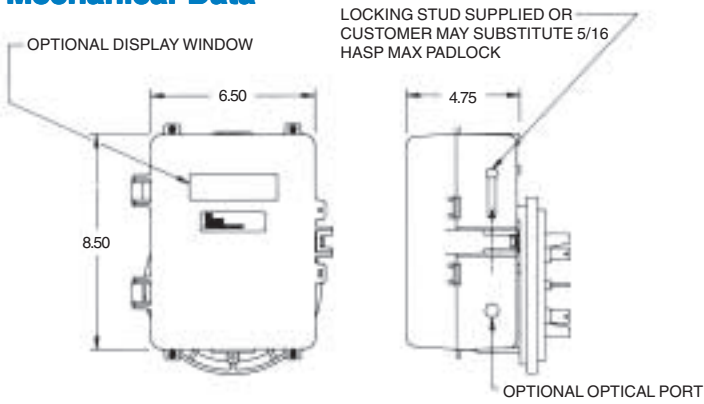
- Broken lines between terminals indicate removable jumper

Socket for CT shorting switch available for SJ and TJ wiring

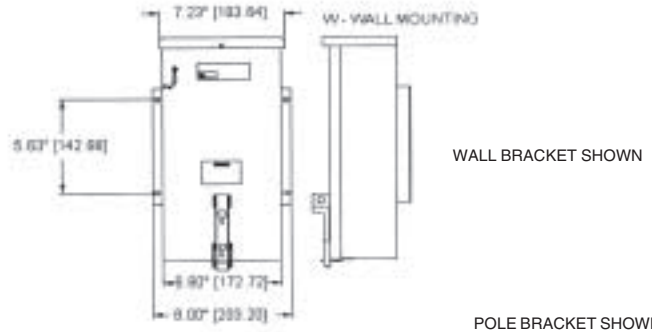
Refer to Fisher Pierce product bulletin IC172-1293-4M-F for 2100 Series Meter Socket ordering information.

Series 4400 AutoCap Adaptive Capacitor Controller

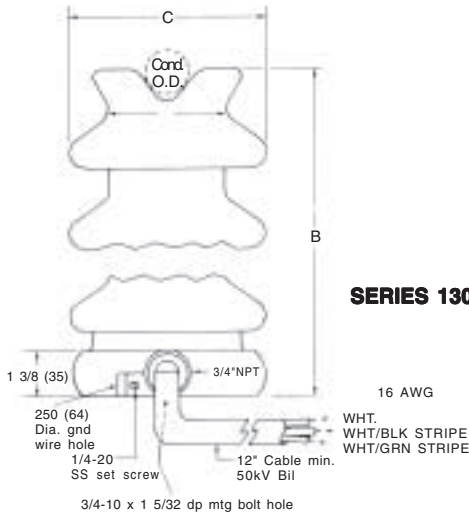
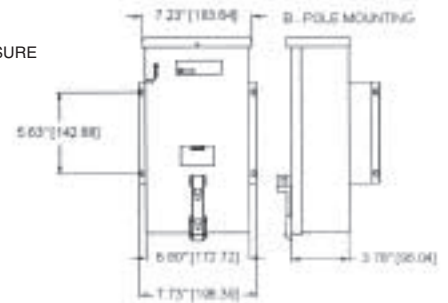
Mechanical Data



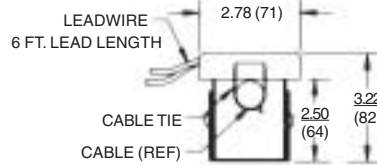
LEXAN ENCLOSURE (6 STAB METER PLUG SHOWN)



ALUMINUM ENCLOSURE



SERIES 1301 LINE POST SENSOR



AT929-41-6 Current Sensor

LINE POST SENSOR DIMENSIONS

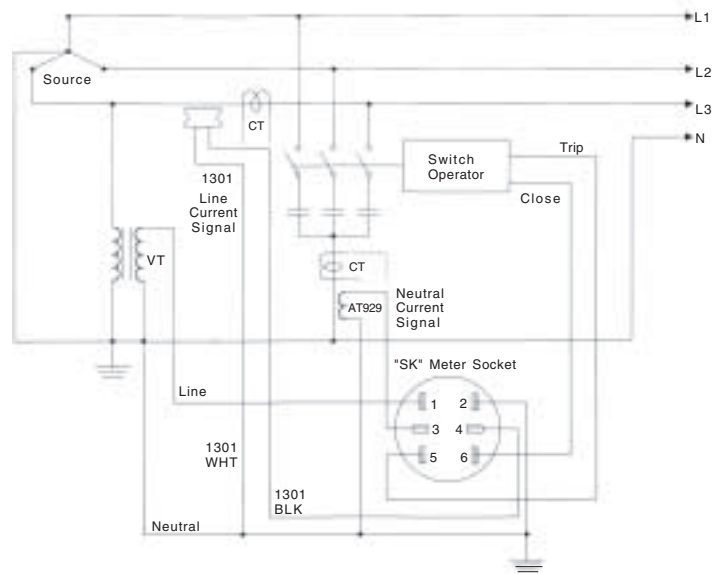
MODEL	A	B	C	Max.Cond.Dia.
1301-11A & 17A (15KV)	3.3(84)	9.3(236)	5.6(142)	1.5(38)
1301-41A & 47A (25KV)	5.0(127)	12.5(317)	7.0(178)	2.0(38)
1301-21A & 27A (35KV)	5.0(127)	14.5(368)	7.0(178)	2.0(51)

Installation and Preferred Sensor Location

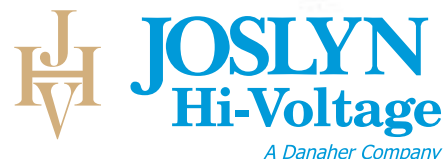
Notes:

1. 4W - grounded WYE circuit shown.
2. Refer to ordering information for wiring of other socket codes or terminal strip.
3. Refer to instruction manual for complete installation information.

Specifications are subject to change.



90 Libbey Parkway, Weymouth, MA 02189 U.S.A.
 Tel: (781) 340-0700 • Fax: (781) 340-0728
<http://www.fisherpierce.com>



4000 East 116th St., Cleveland, Ohio 44105-4398 USA
 Tel: (216) 271-6600 • Fax: (216) 341-3615
www.joslynhivoltage.com