

# CIRCUIT BREAKERS

Pacer stocks circuit protection devices designed with the characteristics necessary to protect the special conditions unique to marine electrical systems.

**LONG DELAYS:** Necessary to prevent nuisance tripping during ignition. See charts for percentage of rated current vs. trip time.

**SERIES TRIP:** Breakers where the sensing coil and contacts are in series with the load being protected.

**TRIP FREE:** The circuit will open even if forcibly held on, preventing an operator from damaging a circuit by holding the handle in the on position

**MOUNTING:** Pacer stocks breakers that can be panel mounted or surface mounted depending on the location conditions.

Refer to the technical characteristics of each breaker for the proper specifications necessary for your application.

## HOW MAGNETIC CIRCUIT BREAKERS FUNCTION

All magnetic circuit breakers are composed of an electromagnetic coil and an armature device which will open a set of contacts, thus protecting the circuit if the current exceeds a predetermined amount. The cause for the armature opening is the amount of current in the electromagnetic coil. Inside the coil is a non-magnetic delay tube, housing a spring biased, movable magnetic core. As the current is increased, the magnetic field strengthens, drawing the movable magnetic core up to the pole piece. (Fig. 1)

When an overload occurs the magnetic core moves fully into the coil. The maximum electromagnetic force is attained causing the armature to be attracted to the pole piece, unlatching a trip mechanism and opening the contacts (Fig. 2)

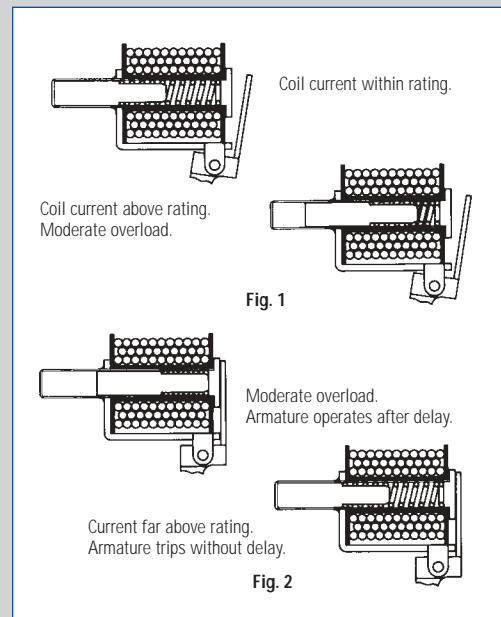
The time delay for opening the circuit is the time it takes for the magnetic core to get to the fully "in" position. The speed at which the core moves can be controlled by filling the delay tube with a viscous fluid. A heavy viscosity fluid causes a long delay. Marine applications require long delays in breakers because of surges during motor start ups.

## FUNCTIONS OF A CIRCUIT BREAKERS

- Close or open a circuit manually
- Carry rated current continuously despite extremes of temperature
- Withstand mechanical shock and vibration
- Withstand non-hazardous transient voltage or current
- Opens the circuit automatically whenever an overcurrent occurs

## ADVANTAGES OF MAGNETIC CIRCUIT BREAKERS

- Provides manual switching, opens automatically under overload conditions, carries full rated current
- Highly versatile, ideal for coordination with other forms of protection
- Operates as a function of current only
- When appropriate, can provide pulse tolerant design to protect against nuisance tripping, or high amplitude transients, while still providing for maximum equipment protection
- A better choice over the thermal breakers due to temperature extremes on boats



# MAGNETIC CIRCUIT BREAKERS

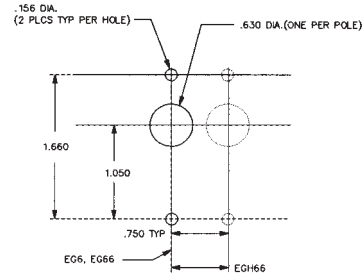
## "A" FRAME



Magnetic circuit breakers are a low cost answer to power switching and reliable circuit protection. Temperature will not effect the operation of magnetic circuit breakers, as is the case with thermal breakers or fuses. The opening of the circuit is accomplished by the amount of current passing through an electromagnetic coil. As the current exceeds the amount specified by the breaker the circuit will open. (See chart, "Percentage overload vs. trip time.") "A" frame breakers are designed to have long trip delays to avoid nuisance tripping. Pacer stocks this style in amperages ranging from 5 to 50 amp. All breakers are DC-50/60Hz and are available in white, black and red handles.

### FEATURES:

- Series Trip
- "Trip Free"
- Magnetic Operation, operates as a function of current only
- Panel mounted
- Power Switching
- Round Cutout .500 diameter



### PERCENTAGE OVERLOAD VS. TRIP TIME IN SECONDS AT +25(C (VERTICAL MOUNT)

DELAY	100%	135%	150%	200%	400%	600%	800%	1000%
DC/60Hz LONG DELAY	NO TRIP	7-130	3-60	1.3-20	.085-3	.02-2	.015-.8	.01-.26

### "A" FRAME INTERRUPTING CAPACITY, AMPS

(REFER TO TABLE 5 - TECHNICAL DATA FOR ABYC CIRCUIT BREAKER MIN. AMPERE INTERRUPTING CAPACITY)

MAX. RATING	VOLTAGE		CURRENT RATING FULL LOAD AMPS	INTERRUPTING CAPACITY UL/CSA WITHOUT BACKUP FUSE
	FREQUENCY	PHASE		
65	DC		31 - 50	3000
80	DC		0.02 - 30	3000
125/250	50/60Hz	1Ø	0.02 - 30	3000
125/250	50/60Hz	1Ø	31 - 50	2000

### TECHNICAL SPECIFICATION AND TEST RESULTS

**Series Trip** - Long Delay

**Inrush Pulse Tolerance:** 10 times rated current

**Operating Temperature:** -40°C to 85°C

**Shock:** Withstands 100g or more without tripping while carrying full rated current per MIL-Std-202, Method 213, Cond. 1.

**Vibration:** Withstands 10g without tripping while carrying full rated current per MIL-Std-202, Method 204, Cond. A.

**Endurance:** Withstands 10,000 operations at rated voltage and current or withstands 50 operations of 600% AC or 1000% DC rated current at rated voltage and current, in accordance with UL 1077.

**Moisture Resistance:** Meets requirements of MIL-C-55629, tested in accordance with MIL-STD-202, Method 106.

**Salt Spray:** Meets requirements of MIL-C-55629, tested in accordance with MIL-STD-202, Method 101.

**Trip Free:** Trips open on overload, cannot be forcibly held on.

RATED AMPS	SINGLE POLE	DOUBLE POLE	
		SINGLE THROW	DOUBLE THROW
5	EG6-1-5		
10	EG6-1-10	EG66-1-10	EGH66-1-10
15	EG6-1-15	EG66-1-15	EGH66-1-15
20	EG6-1-20	EG66-1-20	EGH66-1-20
25	EG6-1-25	EG66-1-25	EGH66-1-25
30	EG6-1-30	EG66-1-30	EGH66-1-30
40	EG6-1-40		
50	EG6-1-50		

COLOR ABBREVIATION
WH = WHITE
BK = BLACK
RD = RED (Available in Single Pole)

### ORDERING INFORMATION:

Combine the part number and the color abbreviation. All breakers are available by the piece.

# MAGNETIC CIRCUIT BREAKERS

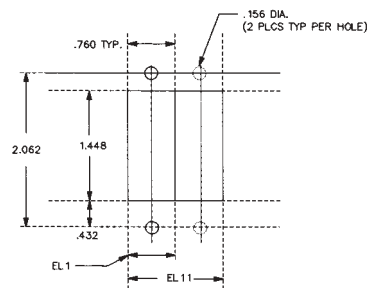
## "C" FRAME



Designed for use in the industrial, military and marine applications. "C" frame breakers are suitable for use in any situation where precision operation is required. Magnetic circuit breakers are a low cost answer to power switching and reliable circuit protection. Temperature will not effect the operation of magnetic circuit breakers, as is the case with thermal breakers or fuses. Available in DC-50/60Hz through 50 Amps and DC above 50 amps. Stocked in white and black handles.

### FEATURES:

- Series Trip
- "Trip Free"
- Magnetic Operation, operates as a function of current only
- Panel mounted
- Rectangular Panel Cutout: .500 width, 1.000 height
- Power Switching



### PERCENTAGE OVERLOAD VS. TRIP TIME IN SECONDS AT +25°C (VERTICAL MOUNT)

DELAY	100%	135%	150%	200%	400%	600%	800%	1000%
DC/60Hz LONG DELAY	NO TRIP	6.5-115	3-65	1.2-20	.08-3	.018-2.5	.015-.8	.009-.25

### "C" FRAME INTERRUPTING CAPACITY, AMPS

(REFER TO TABLE 5 - TECHNICAL DATA FOR ABYC CIRCUIT BREAKER MIN. AMPERE INTERRUPTING CAPACITY)

MAX. RATING	VOLTAGE		CURRENT RATING FULL LOAD AMPS	INTERRUPTING CAPACITY UL/CSA WITHOUT BACKUP FUSE
	FREQUENCY	PHASE		
65	DC		71 - 100	5000
80	DC		0.02 - 70	7500
125/250	50/60Hz	1Ø	0.02 - 50	3000

### TECHNICAL SPECIFICATION AND TEST RESULTS

**Series Trip** - Long Delay

**Inrush Pulse Tolerance:** 12 times rated current

**Operating Temperature:** -40°C to 85°C

**Shock:** Withstands 100g or more without tripping while carrying full rated current per MIL-Std-202, Method 213.

**Vibration:** Withstands 10g without tripping while carrying full rated current per MIL-Std-202, Method 204.

**Endurance:** Per UL 1077 (6000 operations at rated load plus 4000 operations with no load). Tested at a maximum rate of 6 times per minute.

**Moisture Resistance:** Designed to meet the requirements of MIL-C-55629, when tested in accordance with MIL-STD-202, Method 106.

**Salt Spray:** Designed to meet the requirements of MIL-C-55629, when tested in accordance with MIL-STD-202, Method 101.

**Trip Free:** Will trip open even when forcibly held on or restrained.

**Meets:** UL recognized, CSA Certified

RATED AMPS	SINGLE POLE	DOUBLE POLE DOUBLE THROW
15	EL1-1-15	
20	EL1-1-20	EL11-1-20
25	EL1-1-25	EL11-1-25
30	EL1-1-30	EL11-1-30
40	EL1-1-40	EL11-1-40
50	EL1-1-50	EL11-1-50
60	EL1-1-60	EL11-1-60
70	EL1-1-70	EL11-1-70
80	EL1-1-80	EL11-1-80
90	EL1-1-90	EL11-1-90
100	EL1-1-100	EL11-1-100

### COLOR ABBREVIATION

WH = WHITE  
BK = BLACK

### ORDERING INFORMATION:

Combine the part number and the color abbreviation. All breakers are available by the piece.



## BREAKER TOGGLE GUARD

Protects critical function circuits from being accidentally switched off at the breaker. Fits all "A" frame breakers. Mounts on the surface of the panel with 2, 6-32 x 3/8" mounting screws (included).

P/N: EG6-GUARD

### ORDERING INFORMATION:

Available by the piece.

## AC LOCKOUT SLIDES

AC Lockout slides allow only one AC circuit breaker to be activated at a time. Both styles use the circuit breaker mounting screw holes, no special panel modifications required.

P/N: EG-SLIDE

Fits all double pole "A" frame circuit breakers found on page 57.

P/N: EL-SLIDE

Fits all double pole "C" frame circuit breakers found on page 58.

### ORDERING INFORMATION:

Available by the piece.

## ADAPTER PLATES

"A" frame to "C" frame adapter plates fit exactly over our EG6 breakers, converting its face design to a EL1 rectangular type. With this adapter, a EG6 breaker can easily be used in a pre-cut EL1 slot.

P/N: EG-EL

### ORDERING INFORMATION:

Available by the piece.

## BREAKER BOOTS AND COVERS

Pacer stocks a variety of breaker boots and covers to protect and increase the life span of our circuit protection devices. All boots and covers protect panel mounted toggle type and push button type breakers. Constructed from silicone rubber with nickel-plated brass nuts. Temperature range -160°F to 500°F. Resist salt, water, acids, weather, dust, sunlight, and ozone.

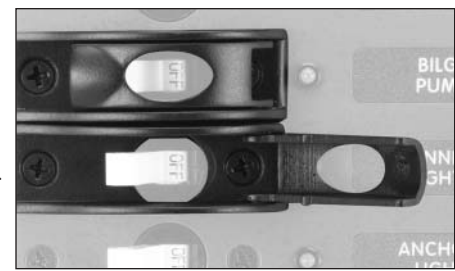
SCREW ON BREAKER BOOTS, FOR PUSH BUTTON TYPE BREAKERS

PART NUMBER	COLOR	HEIGHT	THREAD	FOR USE WITH
ES-PBCAP	CLEAR	9/16"	3/8"	ETS658 SERIES
ES-PBLCAP	CLEAR	15/16"	3/8"	ETS45 SERIES
ES-PB41CAP	CLEAR	Variable	15/32"	ETS41 SERIES
ES-PBCVR	CLEAR	9/16"	3/8"	ETS658 SERIES
ES-PBCVR-BK	BLACK	9/16"	3/8"	ETS658 SERIES

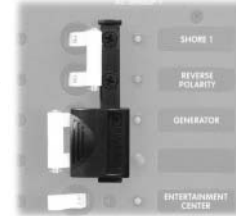


BOOTS FOR TOGGLE TYPE BREAKERS

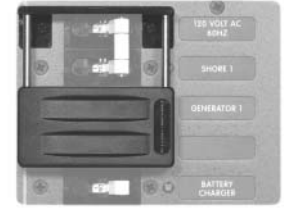
PART NUMBER	COLOR	MOUNT METHOD	MARKED	FOR USE WITH
EG-SGLBOOT	CLEAR	Behind Panel	ON	"A" Frame Sgl. EG6
EG-DBLBOOT	CLEAR	Behind Panel	ON	"A" Frame Dbl. EG66 & EGH66
EL-SGLBOOT	CLEAR	Front Panel	ON/OFF	"C" Frame Sgl. EL1
EL-DBLBOOT	CLEAR	Front Panel	ON/OFF	"C" Frame Dbl. EL11



EG6-GUARD



EG-SLIDE



EL-SLIDE



EG-EL

### ORDERING INFORMATION:

Available by the boot.

## BREAKER BUS BARS

Tinned copper breaker bus bars are designed to tie together the load side of "A" frame and "C" frame breakers. Available in 1ft. and 3ft. lengths.

PART NUMBER	THICKNESS	LENGTH
EBB-BRKR1	1/8"	1 FT.
EBB-BRKR3	1/8"	3 FT.

### ORDERING INFORMATION:

Available by the piece.

## BREAKER MOUNTING SCREWS

Black painted, general purpose, Phillips round head screws 6-32 x 3/8".

P/N: EGF-6-32-375

### ORDERING INFORMATION:

Available in 50 piece bags.

**PACER MARINE - SARASOTA**  
CORPORATE HEADQUARTERS  
NATIONAL AND OEM SALES  
1-800-424-9549 • FAX: 941-379-9015



**PACER MARINE - FT. LAUDERDALE**  
EAST COAST SALES AND  
AFTER MARKET SALES  
1-800-634-5031 • FAX: 954-763-8062



## PANEL MOUNT THERMAL BREAKERS

SERIES 658: Economical, series trip, thermal breakers.  
White and black actuators.

SERIES 45: Cost effective, series trip, thermal breakers with ON/OFF switching.

SERIES 41: Series trip, thermal breakers with ON/OFF switching. Corrosion, humidity and fungus resistant housing. Ampere ratings to 70 AMPS.

SERIES	658	45	41 (<30 AMPS)	41 (30A through 70A)
DESCRIPTION	Series trip	Series trip. Push ON, push OFF switching, B & W reset button for trip indication	Series trip. Push-pull ON-OFF switching	Series trip. Push-pull ON-OFF switching
CURRENT RATINGS	5 through 30 AMPS	5 through 30 AMPS	15 through 25 AMPS	30 through 70 AMPS
MAXIMUM VOLTAGE RATINGS	250V AC or 28V DC	250V AC or 28V DC	115V AC or 28V DC	115V AC or 28V DC
MAXIMUM INTERRUPTING	2000A UL tested according to standard 1077	10 times rated current of circuit breaker, normal use. UL rated up to 2000A	10 times rated current for current ratings 1-5A, 1000A for current ratings 8-25A	2000A at 28V DC
LIFE	2000 cycles at rated current	6000 cycles (UL 1077) 10,000 mechanical	4000 cycles at 200% rated current	2000 cycles at rated current
TERMINALS	.250 quick connect	.250 quick connect 30A have screw terminals	Screw terminals	Screw terminals
APPROVALS	UL 1077 up to 25A CSA up to 25A VDE	UL 1077 up to 16A CSA up to 15A VDE	will meet MIL-E-5272C	will meet MIL-E-5272C
DESIGN NOTES	N/A	N/A	Melamine housing. Corrosion, humidity, and fungus resistant	Melamine housing. Corrosion, humidity, and fungus resistant

### TRIPPING TIMES IN SECONDS AT 70F (21C)

100%	NO TRIP	NO TRIP	NO TRIP	NO TRIP
200%	1.5 - 8	10 - 40	10 - 65	12 - 80
300%	1 - 5	3 - 18	3 - 20	3 - 25
400%		2 - 9	1.5 - 12	1.2 - 12
500%		1 - 6	1 - 8	1 - 7
600%		.6 - 5	.6 - 6	.5 - 5
1000%		.2 - 2.5	.2 - 3.5	.1 - 2

RATED AMPS	P/N	P/N	P/N	P/N
5	ETS658-5	ETS45-5	N/A	
10	ETS658-10	ETS45-10	N/A	
15	ETS658-15	ETS45-15	ETS41-15	
20	ETS658-20	ETS45-20	ETS41-20	
25	ETS658-25	ETS45-25	ETS41-25	
30	ETS658-30	ETS45-30		ETS41-30
40				ETS41-40
50				ETS41-50
60	(For clear caps use P/N) (ES-PBCAP, ES-PBCVR, or ES-PBCVR-BK) Previous Pg.	(For clear caps use P/N) (ES-PBLCAP) Previous Pg.	(For clear caps use P/N) (ES-PB41CAP) Previous Pg.	ETS41-60
70				ETS41-70

### ORDERING INFORMATION:

Available in 50 piece bags.

\*FOR SERIES 658 BREAKERS ADD WH=WHITE OR BK=BLACK TO THE END OF THE P/N.

EX: ETS658-10WH - SERIES 658 w/WHITE ACTUATOR