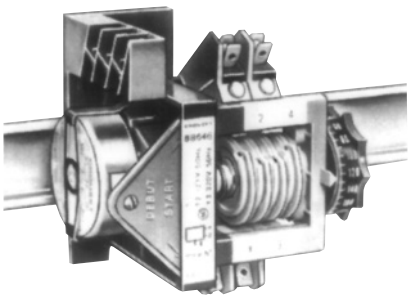
88 646 SERIES
CAM TIMERS

UL listed CSA recognized



88 646 SERIES is specifically adapted for applications requiring 2 to 4 circuits. The switches are mounted on both sides of frame to give minimum overall length. Precision SPDT switches rated at 6 Amps, 1/3 H.P., 125/250V AC. are standard. Switches are individually removable. Adjustable cams are simple and quick setting. Adjustable cam key comes as standard.

STANDARD CAMS FOR SINGLE ON/OFF OPERATION PER CYCLE:

Cams are adjusted by using red plastic key supplied. Each cam consists of two sections, one red half and one grey half. The grey section is normally adjusted for “START” and the red section for “STOP.” Each cam has a notch which will match the tab on the adjusting key. With the key positioned so the “START” side is facing the knob, the grey cam section can be adjusted by inserting the tab of the key into the notch in the cam while turning the knob. Reversing the key so the “STOP” side faces the knob, the red cam can be adjusted.

STEP 1. Insert Cam Adjusting Key into No. 1 cam (grey section) having the word “START” on tool facing adjusted knob and turn knob until the degree reading matches the first transfer point on your time chart for that cam.

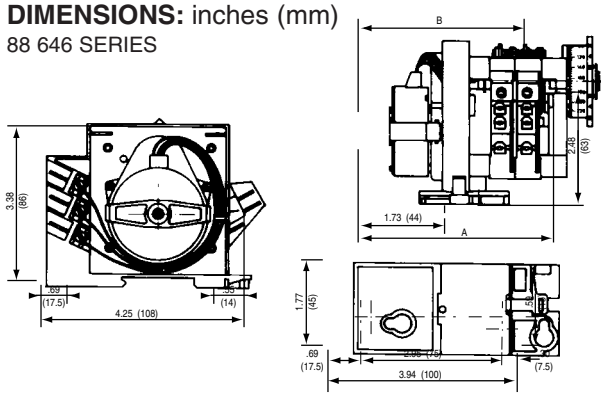
STEP 2. Insert Cam Adjusting Key into No. 1 (red section) having the word “STOP” on tool now facing cam adjusting knob and turn knob until the degree reading matches the next transfer point on your time chart for that same cam. This completes setting of No. 1 cam.

STEP 3. Repeat steps 1 and 2 for each additional circuit of your cam timer.

NOTE: All switches have single pole, double throw circuitry. On each circuit where the load should be energized for less than 180° of cam shaft rotation, use the NO switch terminal.

DIMENSIONS: inches (mm)

88 646 SERIES



Type	Cams	Circuits inch (mm)	A inch (mm)	B oz (g)	Weight
88 646 0	2	2	3.74 (95)	3.15 (80)	8.18 (250)
88 646 2	4	4	4.25 (108)	3.66 (93)	10.58 (300)

88 646 series mounted by clipping onto an INTERNATIONAL DIN-RAIL, or by two screws fastened by built in ears.

SPECIFICATIONS:

GENERAL

Voltage . . . . . 220 VAC, 115 VAC, 24 VAC, (+10 -15%) 50-60 Hz

Input Power

88 646 (Crouzet motor 82 344) . . . . . 2.6 W

Operating Temperature . . . . . -5°C +60°C (23°F +140°F)

Storage Temperature . . . . . -40°C +80°C (-40°F +178°F)

Duty Cycle 100%

Circuitry . . . . . SPDT

Output Switches (Crouzet 83 160 080) 6 A, 1/3 H.P., 125/250

Wiring Connections

Gear Motors . . . . . 1/4″ spade terminal block

Gear Motors . . . . . 1/4″ spade terminal block

Direction . . . . . CW direction is standard

CAMS

Minimum Notch or Pulse (Electrical) . . . . . 12° (1/20 of cycle)

Rise Electrical . . . . . 12° (1/20 of cycle)

Maximum Cam Speed . . . . . 30 RPM

Setting Accuracy . . . . . 1°

Repeat Accuracy

Adjustable and Programmable Cams . . . . . ±1° (±.25% of cycle time)

Cut Cams . . . . . ±0.5% (± .125% of cycle time)

Cam Construction

Adjustable . . . . . split type - made of delrin

OPTIONAL:

P: Programmable Cams: For multiple on/off operations per cycle see page 3-42 for details.

C: Cut Cams: For multiple or non-tamperable operations per cycle, consult factory with time charts for cams.

P  **C** 

ORDERING INFORMATION:

SERIES . **NO. OF CAMS** . **TYPE OF CAM** . **SPEED/CYCLE TIME** S=s - M=min. - H=Hr . **ELECTRICAL**

SERIES
88 646

NO. OF CAMS
002 = 2 cam
204 = 4 cam

TYPE OF CAM
S=Standard cam
P=Programmable cam
C=Cut cam

SPEED/CYCLE TIME
Select one of these:

2S	6S	15S	60S	4M	30M	4H
3S	10S	20S	2M	10M	1H	12H
4S	12S	30S	3M	15M	2H	24H

ELECTRICAL

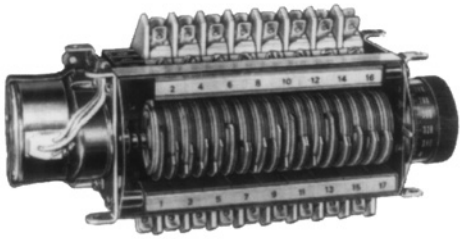
AS =115 VAC - 60hz	**ES** =220 VAC - 50hz
AH =220 VAC - 60hz	**EL** =24 VAC - 50hz
AL = 24 VAC - 60hz	**CS** =110 VAC - 50hz

EXAMPLE: 88646002.S.6S.AS ie: 88 646 cam timer with 2 standard cams, 6 second cycle time, and 115 VAC - 60hz

Products and specifications subject to change without notice.
Consult factory for application assistance.

88 645 SERIES
CAM TIMERS

UL listed CSA recognized



88 645 Series is specifically adapted for applications requiring 1 to 22 circuits. The switches are mounted on both sides of frame to give minimum overall length. Precision SPDT switches rated at 6 Amps, 1/3 H.P., 125/250 V AC are standard. Switches are individually removable. Adjustable cams, simple and quick setting. Adjustable cam key comes as standard.

STANDARD CAMS FOR SINGLE ON/OFF OPERATION PER CYCLE:

Cams are adjusted by using red plastic key supplied. Each cam consists of two sections, one red half and one grey half. The grey section is normally adjusted for “start” and the red sections for “stop.” Each cam has a notch which will match the tab on the red adjusting key. With the key positioned so the “start” side is facing the knob, the grey cam section can be adjusted by inserting the tab of the key into the notch in the cam while turning the knob. Reversing the key so the “stop” side faces the knob, the red cam can be adjusted.

STEP 1. Insert Cam Adjusting Key into No. 1 cam (grey section) having the word “start” on tool facing adjusted knob and turn knob until the degree reading matches the first transfer point on your time chart for that cam.

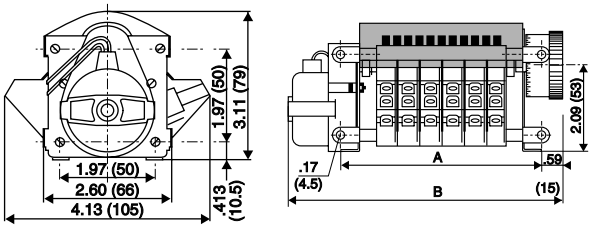
STEP 2. Insert Cam Adjusting Key into No. 1 (red section) having the word “stop” on tool now facing cam adjusted knob and turn knob until the degree reading matches the next transfer point on your time chart for that same cam. This complete setting of No.1 cam.

STEP 3. Repeat steps 1 and 2 for each additional circuit of your cam timer.

note: All switches have single pole, double throw circuitry. On each circuit where the load should be energized for less than 180° of cam shaft rotation, use the NC switch terminal. On each circuit where the load should be energized for more that 180° of cam shaft rotation, use the NO switch terminal.

DIMENSIONS: inches (mm)

88 645 SERIES



Type	Cams	Circuits Avail.	A inch (mm)	B oz (g)	Weight
88 645 0	7	1 to 7	3.23 (82)	5.12 (130)	19.40 (550)
88 645 2	12	8 to 12	4.57 (116)	6.46 (164)	26.45 (750)
88 645 4	17	13 to 17	5.83 (148)	7.72 (196)	31.75 (900)
88 645 6	22	18 to 22	7.09 (180)	8.98 (228)	35.27 (1000)

SPECIFICATIONS:

GENERAL
Voltage . . . . . 220 VAC, 115 VAC, 24 VAC (+10-15%), 50-60 Hz
Input Power
88 645 (Crouzet motor 82 334) . . . . 2.3 W
Operating Temperature . . . . . -5°C to +60°C (23°F to +140°F)
Storage Temperature . . . . . -40°C to +80°C (-40°F to +178°F)
Duty Cycle 100%
Circuitry . . . . . SPDT
Output Switches (Crouzet 83 160 080) 6 A, 1/3 H.P., 125/250
Wiring Connections
Gear Motor . . . . . 1/4˝ spade terminal block
Switches . . . . . 1/4˝ spade terminals
Direction . . . . . CW direction is standard
CAMS
Minimum Notch or Pulse
(Electrical) . . . . . 12° (1/20 of a cycle)
Rise
(Electrical) . . . . . 12° (1/20 of a cycle)
Maximum Cam Speed . . . . . 30 RPM
Setting Accuracy . . . . . 1°
Repeat Accuracy
Adjustable and Programmable
Cam . . . . . +1° (±.25% of cycle time)
Cut Cams . . . . . ±.5% (±.125% of cycle time)
Cam Construction
Adjustable . . . . . split type - made of delrin

OPTIONAL:

P: Programmable Cams: For multiple on/off operations per cycle see page 3-42 for details.
C: Cut Cams: For multiple or non-tamperable operations per cycle, consult factory with time charts for cams.

P  **C** 

ORDERING INFORMATION:

SERIES . NO. OF CAMS . TYPE OF CAM . SPEED/CYCLE TIME . ELECTRICAL

SERIES
88 645

NO. OF CAMS
007 = 7 cam
212 = 12 cam
417 = 17 cam
622 = 22 cam

TYPE OF CAM
S= Standard cam
P= Programmable cam
C= Cut cam

SPEED/CYCLE TIME
Select one of these

2S	**6S**	**15S**	**60S**	**4M**	**30M**	**4H**
3S	**10S**	**20S**	**2M**	**10M**	**1H**	**12H**
4S	**12S**	**30S**	**3M**	**15M**	**2H**	**24H**

ELECTRICAL

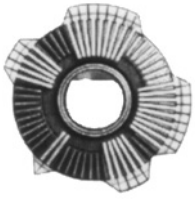
AS = 115 VAC - 60 Hz	**ES** = 220 VAC - 50 Hz
AH = 220 VAC - 60 Hz	**EL** = 24 VAC - 50 Hz
AL = 24 VAC - 60 Hz	**CS** = 110 VAC - 50 Hz

EXAMPLE: 88645002.P.10S.AS ie: 88 645 cam timer with 2 programmable cams, 10 second speed/cycle time, and 115 VAC - 60hz.

Products and specifications subject to change without notice.
Consult factory for application assistance.

A cam timer is a simple timing device comprised of a frame which holds a series of cams on a shaft. The shaft is driven by a motor with a gear train that is set to rotate 360˚ over a certain time period. During this time period the cams actuate snap-acting SPDT (Single Pole Double Throw) switches. The switches can be wired to be either NC (normally Closed) or NO (Normally Open) so that when the individual cam actuates the individual switch, its output changes from Open to Closed. This change will happen once and go back to the rest position once in 360˚ with the standard cam. Maximum differential per standard cam is 180˚.
If multiple tripping of the switch is required, the cam must be changed to either a programmable cam or a custom cut-cam (in large quantities). With the programmable cam, Programmable Cam Pins must also be used and plugged-in at the required 6˚ intervals to create the desired effect.

Standard cam



Programmable cam with pins

Custom cut-cam

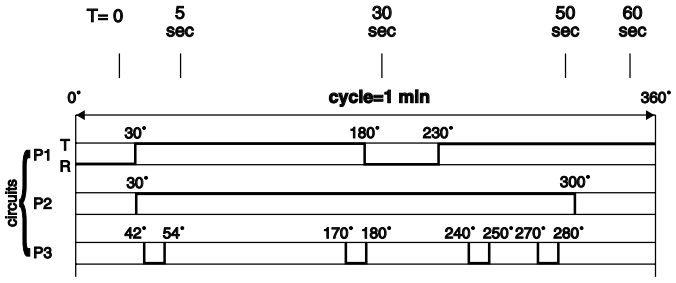
4

NOTE: Replacement red cam adjustment tool for 88 645 and 88 646 with standard cams: Part Number 79 221 702

NOTE: Programmable cams can be combined with standard cams for the most economical results of a required pattern by the user. See opposite page for more detail.

EXAMPLE:

PROGRAMMING A CAM TIMER:
It is best to create a time chart as shown. Use “T” as the trip-point and “R” as rest for each cam (P1, P2, P3, etc.) and draw throw/off pattern for each movement of the switch. This will make the final adjustment very easy.



STANDARD CYCLE TIMES:

TIME	MOTOR SPEED
2 sec	30 RPM
3 sec	20 RPM
4 sec	15 RPM
6 sec	10 RPM
10 sec	6 RPM
12 sec	5 RPM
15 sec	4 RPM
20 sec	3 RPM
30 sec	2 RPM
60 sec	1 RPM

TIME	MOTOR SPEED
1 min	1 RPM
2 min	1/2 RPM
3 min	1/3 RPM
4 min	1/4 RPM
10 min	1/10 RPM
12 min	1/12 RPM
15 min	1/15 RPM
24 min	1/24 RPM
30 min	1/30 RPM

PROGRAMMABLE CAMS (for 88 645 & 88 646) INSTALLATION & INFORMATION

Disconnect timer from power sources (motor and switches) before installing programmable cams.

DESCRIPTION:

CROUZET programmable cams should be used whenever multiple actuations are required from the same cam during one timing cycle. Any number of adjustable cams can be replaced with programmable cams.

INSTALLATION:

It is suggested that the programmable cams be installed in timer before the programming pins are installed on the cam. To install cam(s), refer to instructions for your particular model.

MODEL 88 645 SERIES:

1. Remove snap ring and slide knob from cam shaft.
2. Remove the two screws from gray end bracket and slide from cam shaft. Note correct position before removing for reassembly.
3. Loosen two screws on clutch assembly (opposite knob end) and slide shaft assembly free.

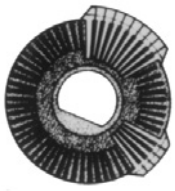
NOTE: *On some models it may be necessary to run motor to allow access to screws. Position screws for easy access.*

4. The adjustable cam(s) can now be removed by sliding them toward knob end of cam shaft.
5. Replace the adjustable cam(s) with programmable cam(s) making sure the total number of adjustable and programmable cams is equal to original number of cams.

NOTE: *When replacing adjustable cams, be sure red cam half is facing knob end of cam shaft.*

6. There should not be any space between the cams and the first cam should be against the shoulder on cam shaft.
7. Replace gray end bracket on cam shaft noting it is facing same direction as when removed.
8. Replace knob and snap ring on shaft making sure snap ring is square to and against knob. Shaft should rotate freely in bracket; if not, move snap ring away from knob slightly.
9. Replace entire assembly into cam timer with clutch assembly on motor shaft and aligning holes in end bracket with mounting holes. Replace the two end bracket screws and tighten. Tighten clutch assembly screws.

79 222 640 **Programmable Cam (1 piece)**
79 222 641 **Programmable Cam Pins (1 bag)**
1 bag = 30 pieces total
10-Rise/Fall pins
20 intermediate pins



MODEL 88 645

1. Remove snap on protective cover.
2. Loosen hex nut in center of knob and slide cover knob from shaft.
3. Remove the four screws securing the end bracket to timer frame and remove end bracket.
4. Loosen two screws on clutch assembly (end opposet knob) and slide cam shaft assembly free.

NOTE: *On some timers it may be necessary to run motor to position screws for easy access.*

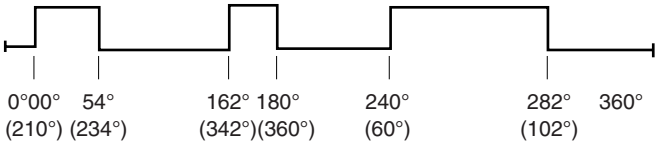
5. Remove snap ring (knob end).
6. The adjustable cams can now be removed by sliding them toward the knob end of the cam shaft.
7. Replace the adjustable cam (s) with programmable cam(s) making sure total number of adjustable and programmable cams is equal to the original number of cams.

NOTE: *When replacing adjustable cam, make sure red cam half is facing knob end of cam shaft.*

8. There should not be any space between the cams and the first cam should be against the shoulder on cam shaft.
9. Replace snap ring on cam shaft making sure it is square and against the last cam.
10. Replace cam shaft assembly in timer so clutch assembly is on motor shaft.
11. Replace end bracket and secure with four screws.
12. Tighten screws on clutch assembly.
13. Replace knob and tighten hex nut.

PROGRAMMING CAMS

Each slot on the programmable cam is 6° apart. Any operation requires a minimum of one “rise” and one “fall” program pin; therefore, the minimum pulse that can be obtained in 12° or 1/30 of the cycle time. (Cycle time being time for one complete revolution of timer.) It is suggested a timing chart be made for each cam to make programming easier. The chart should be from 0° to 360°. Indicate on the chart each “on” and “off” point. Since the programmable cam has slots ever 6°, the “on” and “off” degree points must be divisible by 6.



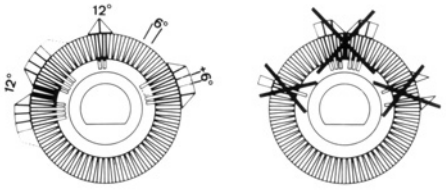
The following sample program illustrates a circuit with three pulses per cycle.

When pins are insert on programmable cam, they are inserted from top of timer which will put the pins 180° from the actual switching point. To compensate for this, you simply add 180° to each of your actuation points.

IMPORTANT: *A “rise” and “fall” pin must always be used at the beginning and end of actuation. Therefore, the minimum pulse will be 12° or 1/30 of total time cycle. For ever intermediate pin used, the time of the pulse will be increased by 6 or 1/60 of time cycle.*

In example shown, first pulse will require 1 rise, 1 fall, 2 flat top pins.
NOTE: *Rise and fall pins are the same pins, the direction in which they are inserted determines whether it is a “rise” or “fall.”*

When programmable cams are complete, the adjustable cams may be adjusted in standard manner.



Products and specifications subject to change without notice.
Consult factory for application assistance.