



652-8-2000/2001/3000/3001 Multi-Function Multi-Range Timer

INSTALLATION
INSTRUCTIONS
MAY 2010
652-0-0000

DESCRIPTION

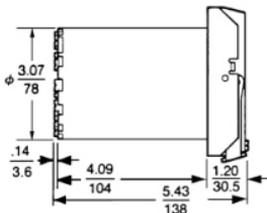
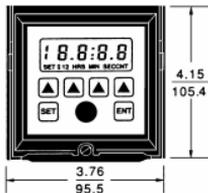
The Model 652 is a microprocessor based, 4 1/2 digit LCD display timer that can provide an indication of either the time remaining or elapsed. There are 5 selectable timing ranges covering values from one millisecond to 199 hours 59 minutes. The unit allows selection of an operating mode from 14 different sequences and has both an instantaneous relay and a programmable relay output.

The timing range and output sequence are programmed with an internal DIP switch assembly. The time value is entered using the keypad on the front face. The programmed values are retained in memory by a lithium battery and are secured in memory by a keypad lockout command. The keypad can also be used to perform secondary functions such as reset, immediate time out, time inhibit, changing the direction of the display, displaying the number of cycles run and clearing the cycle counter.

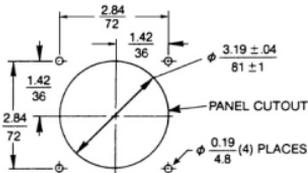


The Model 652 is housed in a standard 15-terminal plug-in round case (one of which is not used). Two models are available for operation on either 120 VAC or 240 VAC. With its sealed faceplate and membrane keypad, the Model 652 is designed to operate in harsh industrial environments. But with its extensive time capability, it is also well suited for sophisticated laboratory use.

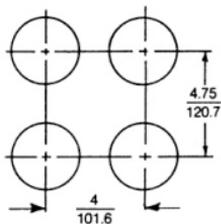
DIMENSIONS



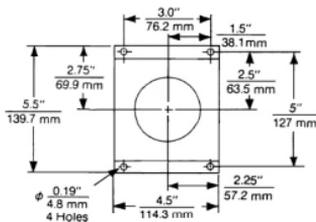
MOUNTING DIMENSIONS



MINIMUM DIMENSIONS MULTIPLE MOUNTINGS



OPTIONAL 600-3-3950 SURFACE MOUNTING BRACKET



SETTING TIME BASE AND OPERATING MODE

The first step to set-up the Model 652 for operation is to determine time base setting and operating mode you require. Both of these items are accomplished by setting DIP switches located on the backside of the unit.



Fig. 1

TIME BASE SETTING

Switches 1, 2 and 3 are used to select the time base.

SW1	SW2	SW3	TIMING RANGE
OFF	OFF	OFF	0.001 - 19.999 Sec.
OFF	OFF	ON	0.01 - 199.99 Sec.
OFF	ON	OFF	0.1 - 1999.9 Sec.
OFF	ON	ON	1 Sec. - 199 Min., 59 Sec.
ON	OFF	OFF	1 Min. - 199 Hrs., 59 Sec.

OPERATING MODE SETTING

To determine the operating mode you require, refer to pages 5 and 6 and select the operating mode, including the control input and relay output sequences.

OPERATING MODE	SW 4	SW 5	SW 6	SW 7	CONTROL INPUT
1	OFF	OFF	OFF	OFF	Normal Start
2	OFF	OFF	OFF	ON	Normal Start
3	OFF	OFF	ON	OFF	Reverse Start
4	OFF	OFF	ON	ON	Reverse Start
5	OFF	ON	OFF	OFF	Momentary Start
6	OFF	ON	OFF	ON	Accumulator
7	OFF	ON	ON	OFF	Normal Start
8	OFF	ON	ON	ON	Normal Start
9	ON	OFF	OFF	OFF	Reverse Start
10	ON	OFF	OFF	ON	Reverse Start
11	ON	OFF	ON	OFF	Normal Start Pulse
12	ON	OFF	ON	ON	Normal Start Pulse
13	ON	ON	OFF	OFF	Reverse Start Pulse
14	ON	ON	OFF	ON	Reverse Start Pulse

PROGRAMMING

The second step to set-up the Model 652 is to program the set point(s) time and cycle counter. Whenever the 652 is in an unprogrammed condition, the display will show four dashes. This will occur when the unit is powered up for the first time, when the battery is replaced, or when any of the DIP switches are changed.

Note: Changing any of the DIP switches will erase all programmed values. It is important that all DIP switches be set to the correct position before programming begins.

Depending upon the operating mode, the 652 will accept from one to three programmed values and will sequence through them in the following order: Set point 1, Set point 2, Cycle Count. Any parameter not applicable to the selected operating mode will not be displayed.

To enter, display, or change any of the programmed values, press the SET key to begin program mode. While in program mode, the ENT key may be used to step through the parameters. After the last parameter has been displayed, the ENT key will exit program mode.

Upon entering program mode, the value of set point 1 is displayed along with the "SET" annunciator. If the operating mode calls for more than one set point, "SET 1" will be illuminated. Set point 2 is displayed with the "SET 2" annunciators and cycle count is displayed "SET CNT".

In program mode, a displayed value may be changed with the four increment keys before pressing "ENT". The three rightmost increment keys increment the 3 rightmost digits on the display (they rollover from 9 to 0 with no carry to the next digit).



For Illustration Purposes Only.

Fig. 2

The leftmost increment key is used to set the leftmost 1 and 1/2 digits on the display (they increment to 19 before returning to 0). Depressing an increment key for longer than one second causes continuous incrementing until released. With a time base of min:sec or Hr:min, the digit to the right of the colon rolls over from 5 to 0.

Should the user wish to erase changes that have been made to the displayed number, pressing the "SET" key again will return the value store in memory to the display.

With the desired number on the display, the "ENT" key may be used to store it in memory and sequence to the next value.

Program mode may be entered while timing is in progress without affecting the current operations. As new parameters are entered, they are held in temporary memory locations until the last one is entered. Then, upon exit from program mode, the new values will be used at the beginning of the next cycle (or possibly half cycle in the case of repeat-cycle operation).

Because the key has a special "wake up" feature, set points may be viewed or changed without AC power applied to the unit. To conserve the battery, the display will blink and return to "sleep" mode when no key has been pressed for 15 seconds. When this happens, the unit leaves program mode and discards changes not entered ("ENT"). Therefore, when making changes on battery power, do not hesitate too long between key strokes.

Generally, a set point of 0 is invalid and will not be accepted ("ENT" key will not function). The only time that a set point of 0 will be accepted is to define continuous repeat operation (0 may be entered for "SET CNT").

KEYPAD SECONDARY FUNCTIONS

When not in program mode, the four increment keys perform the secondary functions, which are indicated on the keypad above and below the keys in Fig. 2.

RESET OF CURRENT OPERATION

Pressing the two leftmost increment keys simultaneously initiates a reset of the current timing/counting operation. To guard against an accidental reset, the user is prompted with "rst?" on the display and is then required to press the "ENT" key to actually perform the reset. The command may be cancelled by pressing any key other than "ENT", or by not pressing any key for 15 seconds. For repeat-cycle operation, the reset command takes the unit back to the beginning current phase (set point 1 or set point 2). The keypad reset command will have no effect on a unit that is either reset or timed out. Changing a set point and following it with a keypad reset allows the new set point to become effective immediately.

KEYPAD TIME/COUNT OUT

The two center increment keys may be pressed simultaneously to initiate a forced time out of the current timing operation. To guard against an accidental time out, the user is prompted with "to?" and is then required to press the "ENT" key to actually end the current cycle (or half cycle in the case of repeat cycle mode). The command may be cancelled by pressing any key for 15 seconds. For the repeat-pulse modes, where two times may be running at the same time, the keypad time out will affect only what is currently being displayed. That is, if an output pulse is in progress, the pulse will be terminated without affecting the cycle time. If any output pulse is not in progress, the cycle will be ended. The keypad time-out command will have no effect on a unit that is reset or timed out.

KEYPAD INHIBIT

The two rightmost keys may be pressed simultaneously to inhibit the current timing/counting cycle. To guard against accidentally inhibiting the operation, the user is prompted with "inh?" on the display and is then required to press the "ENT" key to actually inhibit the operation.

The command may be cancelled by pressing any key other than "ENT", or by not pressing any key for 15 seconds. While timing is inhibited from the front panel, the unit alternates the normal display with the word "inhP". Keypad inhibit may be entered for a unit that is not running when instructed to start via the control input. The keypad inhibit may be turned off by pressing the same two keys that were used to invoke it. In this case the user will be prompted with "run?" on the display and will be required to press the "ENT" key to resume operation.

DISPLAY UP/DOWN SELECTION

The factory set default operation of the display is to count down from the set point to 0 (show time remaining). For the cycle counter, the default counts up from 0 (shows accumulated cycle count). The up or down arrow will be illuminated to indicate the display direction. The defaults may be overridden any time the unit is not in program mode by pressing the leftmost increment key. No confirmation is required for this command since only the display is affected. The display direction may be set for three individual functions: Timer 1 (used when running set point 1); Timer 2 (used when running set point 2); and the Cycle Counter. The up/down selection will affect whichever one of these is currently being displayed. When the time base switches are set for hr:min, the arrow on the display flashes to indicate that the unit is operating.

DISPLAY TIME

Pressing the 2nd key (labeled "TIME" in Fig. 2) causes the display to show the current time value setting. Confirmation is not required since only the display is affected. This key may be used to return the time value to the display after displaying the cycle counter. When displaying a repeat-cycle or repeat-pulse time value, the "1" and "2" annunciators identify which portion of the cycle is being displayed.

DISPLAY CYCLE COUNTER

The cycle counter can be used to either count the number of timing cycles (available in any mode of operation) or as a preset cycle control in operation modes 7 through 14. Pressing the 3rd increment key (labeled "CYCLES" in Fig. 2) causes the display to show the current cycle count. Confirmation is not required since only the display is affected.

CLEAR CYCLE COUNTER

The cycle counter may be reset from the keypad by pressing the rightmost increment key. To guard against accidentally clearing the cycle count, the user is prompted with "Clr?". The command may be cancelled by pressing any key other than ENT, or by not pressing any key for 15 seconds after which the command is automatically cancelled.

CONTINUOUS CYCLE COUNTER

For any of the single-cycle modes, or for a continuously running repeat mode, the cycle counter functions as follows:

- It keeps a running total of timing cycles (including cycles cut short with the keypad timeout).
- Can only be displayed, it has no control ability.
- Can only be reset with the keypad.
- Displays cycle counts up to 2,999,999.
- Can only be displayed as accumulated cycle count.

In all cases, the cycle count is indicated on the display by alternating the numerical count with "CYCL CNT".

PRESET CYCLE COUNTER

For any controlled-cycle repeat-mode operation (3rd set point nonzero), the internal cycle counter is used to terminate operation when the programmed cycle count has been satisfied. In this case the cycle counter has the following properties:

- Counts the timing cycles within the current controlled series (including cycles cut short with the keypad time-out).
- Has control ability (stops operation when the cycle count is satisfied).
- Can be reset be either control input or keypad.
- Displays cycle counts up to 19,999.
- Can be displayed as accumulated cycle count or cycle count remaining.

When not operating in the cycle control mode, the cycle counter can exceed the 19,999 limit on the display. Display operation is normal until the count reaches 20,000 at which time the display alternates between three high order digits (shown with an H) and three low order digits (shown with an L). At a count of 1,000,000 the "1" annunciator is added and at 2,000,000 the "2" annunciator is used. The cycle counter stops and flashes the word "End" when the maximum value of 2,999,999 is reached.

KEYPAD LOCK-OUT

Although not indicated on the front panel, the 652 has a keypad lockout function which may be turned on by pressing the leftmost and rightmost increment keys simultaneously. In program mode, the keypad lock-out prevents any programmed values from being changed, but allows them to be viewed. When not in program mode, the following functions are inhibited:

Keypad reset	Keypad time-out
Keypad inhibit	Keypad clearing of the cycle counter

The keypad lock-out may be turned off by pressing the same two keys that were used to turn it on. Turning the keypad lock-out on or off may only be done when the unit is not in program mode. Also, the keypad lock-out may not be turned on if the unit had not been programmed (four dashes on the display).

A key pad lock-out feature may be invoked by pressing the leftmost and rightmost increment keys simultaneously when not in program mode. This allows the parameters to be viewed but not changed. To indicate that the keypad is locked while a programmed value is being viewed, the display alternates the numerical value with the word "LOC." The keypad lock-out may be turned off by pressing the same two keys when not in program mode.

DISPLAY FIRMWARE IDENTIFICATION

Another function which is not identified on the front panel is the ability to display the part number and version of the internal firmware. This information may be of importance when contacting ATC Application Engineering for assistance. Pressing the three rightmost increment keys simultaneously when not in program mode will begin the scrolling of the information across the display. The scrolling may be terminated by pressing another key function of by waiting one minute for it to stop automatically.

DIAGNOSTICS

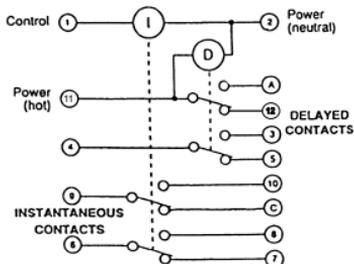
When the 652 is powered up after all power having been removed (no AC power and no battery), or whenever a DIP switch is changed, the unit runs through a diagnostic check of its internal registers and memory. While this testing is in progress, all segments of the LCD display are illuminated for 3.5 seconds allowing the operator to visually check the display.

If the diagnostic tests are all good, the display changes to four dashes, indicating the unprogrammed state. If the diagnostic check fails, all operation is inhibited and an error number flashes on the display.

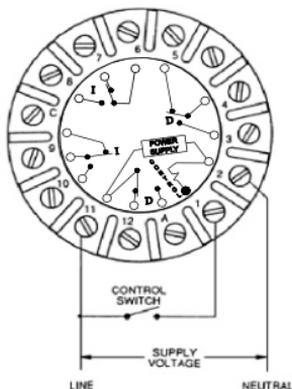
Other diagnostic checks are performed continuously while the 652 is operating. These checks include testing the validity of the programmed data in memory, and monitoring an internal watchdog timing function. If a fault is detected, the 652 turns off both relays and flashes an error number.

An error condition can be cleared by pressing any key on the front panel. When this is done, the unit is reinitialized (erasing all program data) just as if a DIP switch was changed. If the error continues, the unit must be returned to the ATC for repairs. When contacting ATC, please report the error number that was displayed.

INTERNAL SCHEMATIC



WIRING CONNECTIONS



Note: It is important that the metal bracket on the front of the case be connected to earth ground. Mounting the 652 in a grounded metal panel is satisfactory.

SPECIFICATIONS

Timing Ranges

0.001 sec. to 19.999 sec.
0.01 sec. to 199.99 sec.
0.1 sec. to 1999.9 sec.
1 sec. to 199 min., 59 sec.
1 min. to 199 hrs., 59 min.

Repeat Accuracy

±0.005 sec.

Display

Type: 4 1/2 Digit LCD
Digit Size: 7/16" High

Reset Time

2000/2001 - 25 mS
3000/3001 - 8mS

Initiate Time

2000/2001 - 25 mS
3000/3001 - 8 mS

Memory

2000/2001 - EEPROM
3000/3001 - Lithium Battery

Operating Power

120 or 240 VAC, +10%,
-20%, 50/60 Hz

Power and Control Input

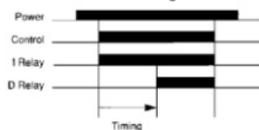
Voltage: 120 or 240 VAC
Range: -20% to +10% of Nominal
Frequency: 50/60 Hz
Power Consumption: 5.2 VA

Output

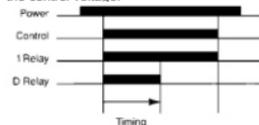
Type: Relay
Instantaneous: 2 N.O.,
2 N.C. Contacts
Programmable: 2 N.O.,
2 N.C. Contacts
Rating: 7 A Resistive Max.
240 Volts Max., 600 VA Max.

SINGLE CYCLE MODES:**MODE 1: ON-DELAY**

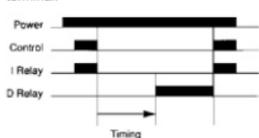
The supply voltage is supplied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state and timing begins. Upon completion of timing, the delayed contacts change state. Reset takes place upon removal of the control voltage.

**MODE 2: INTERVAL**

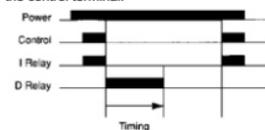
The supply voltage is applied at all times. When voltage is applied to the control terminal, both the instantaneous and delayed contacts change state and timing begins. Upon completion of timing, the delayed contacts return to their original state. Reset takes place upon removal of the control voltage.

**MODE 3: REVERSE START, DELAY**

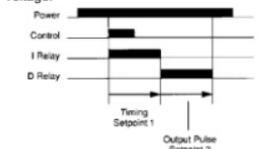
The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When the voltage is removed from the control terminal, the instantaneous relay returns to its rest state and timing begins. Upon completion of timing, the delayed contacts change state. Reset takes place when voltage is once again applied to the control terminal.

**MODE 4: REVERSE START, INTERVAL**

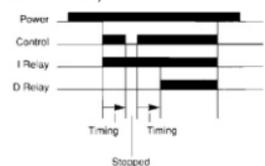
The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When the voltage is removed from the control terminal, the instantaneous relay returns to its rest state, the delayed contacts become energized and timing begins. Upon completion of timing, the delayed contacts return back to their original state. Reset takes place when voltage is once again applied to the control terminal.

**MODE 5: MOMENTARY START**

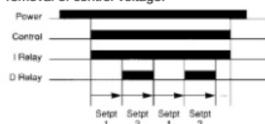
The supply voltage is applied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state and timing begins. The control voltage can now be removed. Upon completion of timing, the instantaneous contacts change back to their original state and the delayed contacts change state for a programmable amount of time. The timing interval is controlled by set point 1 and the output pulse width is controlled by set point 2 (with a time base of .01 sec). If the control is still on at the end of timing, both the instantaneous and delayed contacts remain in their transferred state until reset by removal of the control voltage.

**MODE 6: ACCUMULATOR**

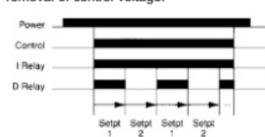
The supply voltage is applied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state and timing begins. If the control voltage is removed while timing, the current state is held. Reapplying control voltage causes timing to continue from the point of interruption. Upon completion of timing, the delayed contacts change state. Reset takes place upon removal of the control voltage. A keypad time-out while the unit is topped will cause a pulse output which is controlled by set point 2 (with a time base of .01 sec).

**REPEAT CYCLE MODES:****MODE 7: REPEAT CYCLE, OFF FIRST**

The supply voltage is applied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state and timing begins using set point 1. When the time has satisfied set point 1, the delayed contacts change state and timing continues using set point 2. When timing has reached set point 2, the delayed contacts return to their original state and operation begins over again with set point 1. The third set point (SET CNT) controls the number of cycles (continuous operation if set point 3 is programmed for 0). Reset takes place upon removal of control voltage.

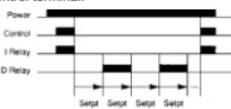
**MODE 8: REPEAT CYCLE, ON FIRST**

The supply voltage is applied at all times. When voltage is applied to the control terminal, both the instantaneous and delayed contacts change state and timing begins using set point 1. When the time has satisfied set point 1, the delayed contacts return to their original state and timing continues using set point 2. When timing has reached set point 2, the delayed contacts are once again energized and operations begins over with set point 1. The third set point (SET CNT) controls the number of cycles (continuous operation if set point 3 is programmed for 0). Reset takes place upon removal of control voltage.



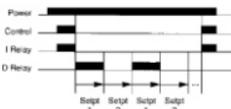
MODE 9: REPEAT CYCLE, REVERSE START, OFF START

The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When voltage is removed from the control terminal, the instantaneous relay returns to its rest state and timing begins using set point 1. When the time has satisfied set point 1, the delayed contacts change state and timing continues using set point 2. When timing has reached set point 2, the delayed contacts return to their original state and operation begins over again with set point 1. The third set point (SET CNT) controls the number of cycles (continuous if programmed for 0). Reset takes place when voltage is once again applied to the control terminal.



MODE 10: REPEAT CYCLE, REVERSE START, ON FIRST

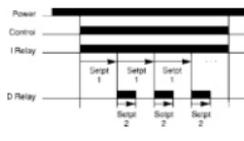
The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When voltage is removed from the control terminal, the instantaneous relay returns to its rest state, the delayed contacts change state and timing continues using set point 2. When set point 2 has been satisfied, the delayed contacts are once again energized and operation begins over with set point 1. The third set point (SET CNT) controls the number of cycles (continuous if 0). Reset takes place when voltage is once again applied to the control terminal.



REPEAT PULSE MODES

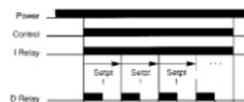
MODE 11: REPEAT PULSE

The supply voltage is applied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state and timing begins using set point 1. When the time has satisfied set point 1, the delayed contacts are energized for a period of time which is controlled by set point 2. At the same time that the output pulse begins, a new cycle time (set point 1) begins. During an output pulse, the display shows the pulse. The third set point (SET CNT) controls the number of cycles (continuous operation if set point 3 is programmed for 0). Reset takes place upon removal of control voltage.



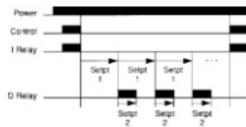
MODE 12: REPEAT, PULSE, 1ST PULSE IMMEDIATE

The supply voltage is applied at all times. When voltage is applied to the control terminal, the instantaneous contacts change state, timing begins using set point 1 and the delayed contacts are energized for a period of time which is controlled by set point 2. When the time has satisfied set point 1, another output pulse begins and the cycle time (set point 1) restarts. During an output pulse, the display shows the pulse. The third set point (SET CNT) controls the number of cycles (continuous operation if set point 3 is programmed for 0). Reset takes place upon removal of control voltage.



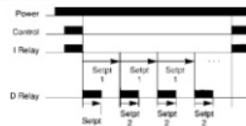
MODE 13: REPEAT PULSE, REVERSE START

The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When the voltage is removed from the control terminal, the instantaneous relay returns to its rest state and timing begins using set point 1. When the time has satisfied set point 1, the delayed contacts are energized for a period of time which is controlled by set point 2. At the same time that the output pulse begins, a new cycle time (set point 1) begins. During an output pulse, the display shows the pulse. The third set point (SET CNT) controls the number of cycles (continuous operation if 0). Reset takes place when voltage is once again applied to the control terminal.



MODE 14: REPEAT PULSE, 1ST PULSE IMMEDIATE, REVERSE START

The supply voltage is applied at all times. Applying voltage to the control terminal holds the unit in reset with the instantaneous relay energized. When voltage is removed from the control terminal, the instantaneous relay return to its rest state, timing begins using set point 1, and the delayed contacts are energized for a period of time which is controlled by set point 2. When the time has satisfied set point 1, another output pulse begins and the cycle time (set point 1) restarts. During an output pulse, the display shows the pulse. The third set point (SET CNT) controls the number of cycles (continuous if 0). Reset takes place when voltage is once again applied to the control terminal.



ORDERING INFORMATION

Part Number	Description
652-8-2000	Timer 120 VAC, EEPROM
652-8-2001	Timer 240 VAC, EEPROM
652-8-3000	Timer 120 VAC, Battery
652-8-3001	Timer 240 VAC, Battery
651-3-0128	Gasket 1/8" Thick (Included with Timer)
651-3-0129	Gasket 1/4" Thick (Included with Timer)
652-3-0130	Battery (Included with Timer)



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