

# SIMATIC

## S7-200 Tips

Group	Topic
1	Emulating an External Potentiometer

### Overview

This example shows how, with a connected timer, one may emulate an external potentiometer (POT) similar to the integrated analog potentiometers of the S7-200 PLCs. When using the onboard POTs, the settings have to be made directly on the PLC. However, when emulating an external POT, settings can be made from other locations like from the outside of a control cabinet.

The principle is based on the following: the CPU transmits a signal to the timer; after a time that can be set (here between 0.5 and 10 seconds), the timer transmits a return signal. The CPU measures this signal which corresponds to a time entry. Depending on requirements, this time entry can be used to respond correspondingly faster or slower. In this example, the value of the POT is displayed using a TD200 for illustrative purposes.

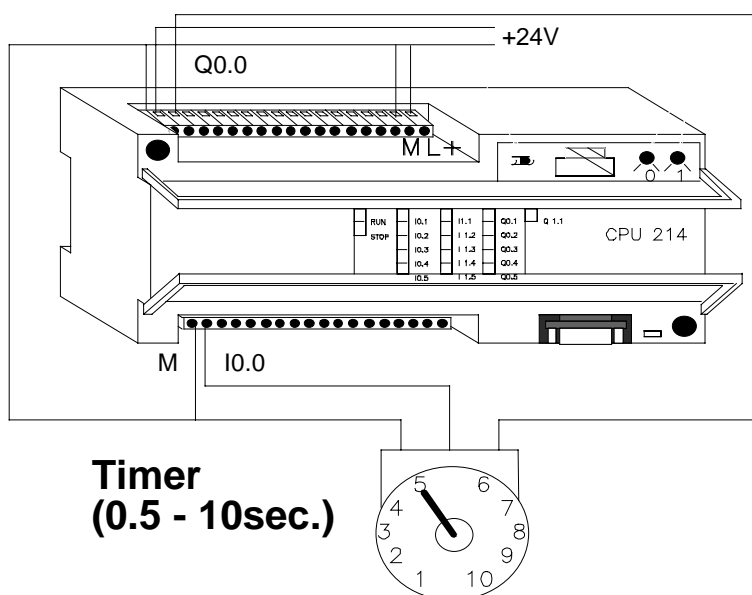
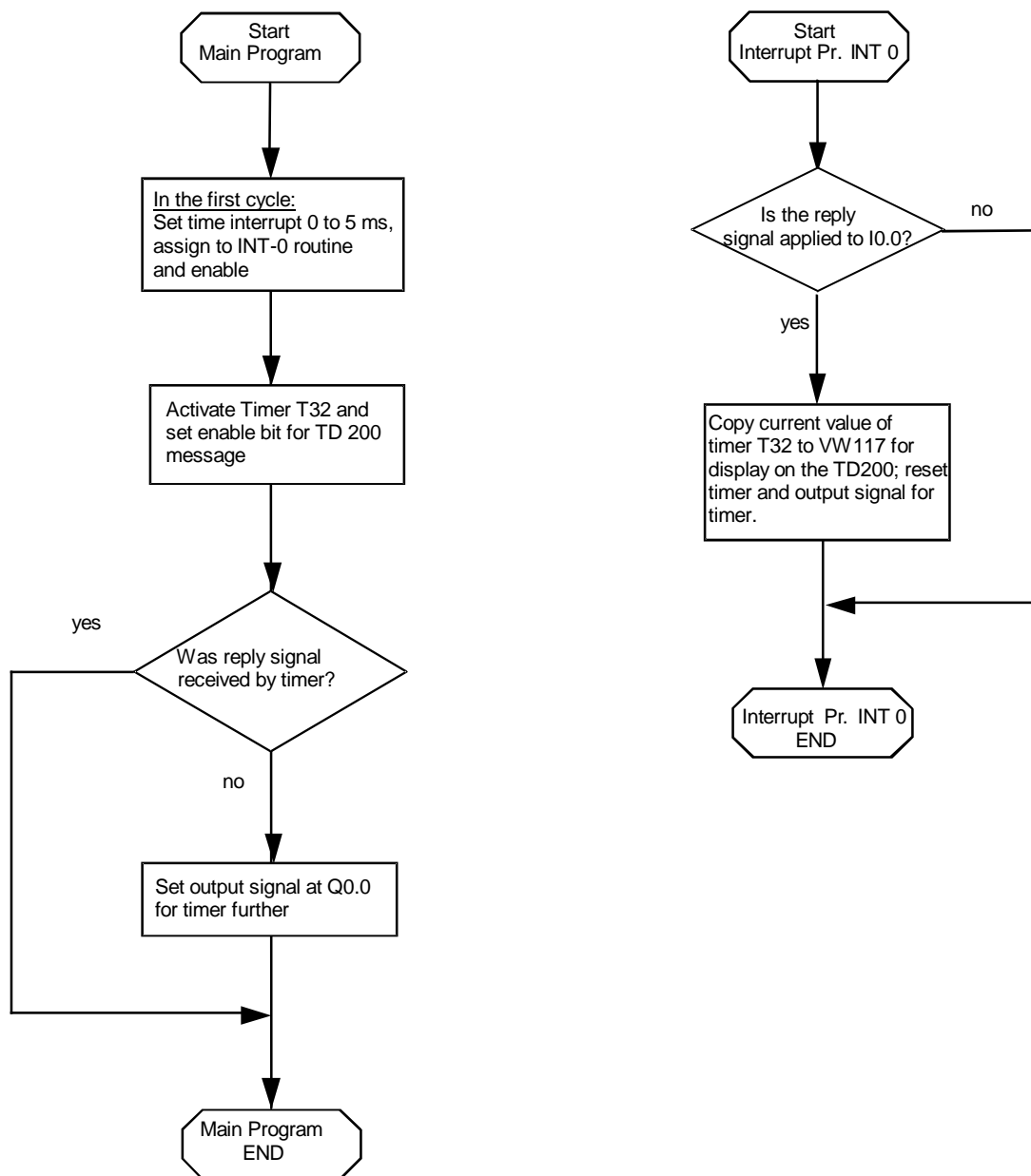


Figure 43.1 Connection of the Timer to the S7-200 PLC

## Hardware Components

1	SIMATIC CPU S7-212 or S7-214
1	TD200 (optional)
1	Siemens Timer
	Part No.: 7PU8040-1AB30
	Type: 0.5 to 10sec. / 24V DC
	Price: \$102.00

## Program Structure



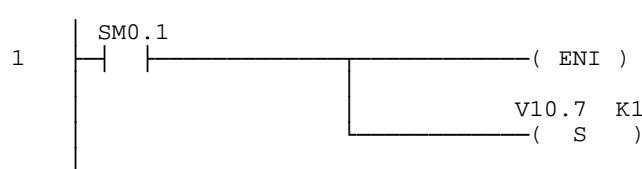
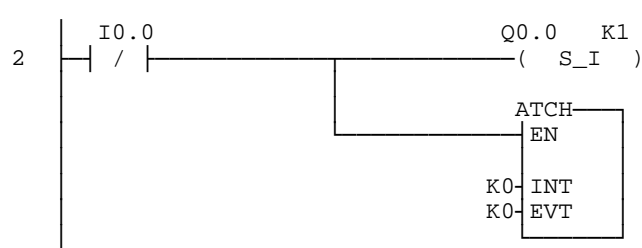
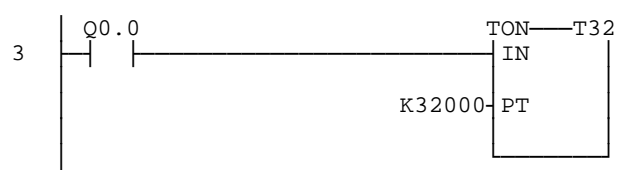
## Program Description

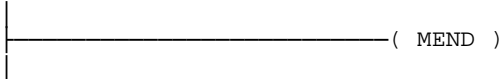
This program example consists of the main program and an interrupt routine. The main program initializes the time interrupt 0 in the first cycle by setting it to 5ms, then assigning it to the interrupt routine INT 0 and enabling it. Also, the main program activates Timer T32 (a 1ms timer), and assigns it the task of measuring the time interval between the signal to the timer and the reply signal. Moreover, the enable bit, V10.7, is set for the first message of the text display TD200 which displays the timer value. As long as there is no reply signal by the timer at input I0.0, the output signal is set for the timer at Q0.0 and thus maintained.

Every 5ms (the smallest possible time interval), time interrupt 0 checks to see if the timer has responded. With 0.05%, the maximum inaccuracy of 5ms which occurs (as against the maximum settable value of 10s at the timer) is negligible. If this is the case, the measured time value is transferred to the variable word VW117 so that it will be displayed on the TD200. To restart time measurement, the output signal for the timer is reset at Q0.0. The timer will reset its reply signal, and the whole process will start again.

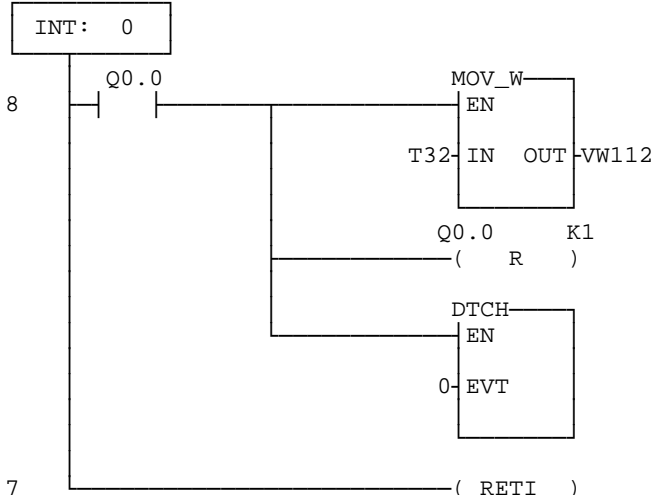
This structure requires that the updating duration of the POT value corresponds to the set time value. This program uses a TD200 for displaying the POT value. Data block DB1 is needed for initializing the TD200.

## Main Program

LAD (S7-MicroDOS)	STL (IEC)
	<pre>LD    SM0.1    // in the first cycle ENI                    // enable interrupt(s) =     V10.7     // and enable Message 1                     // forTD200</pre>
	<pre>LDN   I0.0     // if no signal                     // by timer SI     Q0.0, 1  // set output signal ATCH  0, 0     //attach the interrupt</pre>
	<pre>LD     Q0.0     // if output signal TON    T32, 32000 // turn on timer 32</pre>

4		<b>MEND</b>	// End Main Program
---	---	-------------	---------------------

### Interrupt Programs

		<b>INT 0</b>	// Time Interrupt 0
8		<b>LD Q0.0</b>	// If timer signal is // pending
		<b>MOVW T32, VW112</b>	// Copy time value to // TD200 text variable // VW112
		<b>R Q0.0, 1</b>	// reset output signal // for timer // for complete restart
		<b>DTCH 0</b>	// detach interrupt 0
7		<b>RETI</b>	// End Time Interrupt

### Data Block DB1:

// Definition of the parameter block for the TD200

V0 'TD' // ID for TD200  
 VB2 16#10 // Set the language to English, update as quickly as possible.  
 VB3 16#00 // Set the display for 20 characters.  
 VB4 1 // Set the number of messages to "1".  
 VB5 0 // Set the flag address to M0.0 to M0.7  
 VW6 100 // Set the address of the start message to VB100.  
 VW8 12 // Set the address of the bit for message enable to VB12.

// Define the message for the TD200

// Message 1

V100 'POT Value: ' // Text of message - 20 characters  
 VB115 16#10 // MSB of the format word (making processing possible)  
 VB116 16#33 // LSB of the format word (unsigned word value)

## Conversion Notes

To Convert from IEC STL to S7-Micro/DOS STL:

- Add a 'K' before all non-Hex numerical constants (i.e. 4     K4)
- Replace '16#' with 'KH' for all Hex constants (i.e. 16#FF     KHFF)
- Commas denote field divisions. Use arrow or TAB keys to toggle between fields.
- To convert an S7-Micro/DOS STL program to LAD form, every network must begin with the word 'NETWORK' and a number. Each network in this Application Tip program is designated by a number on the ladder diagram. Use the INSNW command under the EDIT menu to enter a new network. The MEND, RET, RETI, LBL, SBR, and INT commands each receive their own networks.
- Line-Comments denoted by '/' are not possible with S7-Micro/DOS, but Network-Comments are possible.

The data block shown was created in Micro/Win; in Micro/DOS use the V-memory editor to enter a data block (Refer to the Micro/DOS users' guide). Note that in Micro/Win:

- 16#.. denotes a hexadecimal value
- 'text' represents a string value

## General Notes

The SIMATIC S7-200 Application Tips are provided to give users of the S7-200 some indication as to how, from the view of programming technique, certain tasks can be solved with this controller. These instructions do not purport to cover all details or variations in equipment, nor do they provide for every possible contingency. Use of the S7-200 Application Tips is free.

Siemens reserves the right to make changes in specifications shown herein or make improvements at any time without notice or obligation. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Should a conflict arise between the general information contained in this publication, the contents of drawings or supplementary material, or both, the latter shall take precedence.

Siemens is not liable, for whatever legal reason, for damages or personal injury resulting from the use of the application tips.

All rights reserved. Any form of duplication or distribution, including excerpts, is only permitted with express authorization by SIEMENS.