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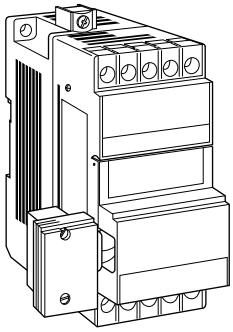


Each analog input module, with a resolution of 11 bits + sign, can process 4 inputs of:
- ± 10V for TSX AEG 4110,
- 4/20 mA for TSX AEG 4111.

This manual describes the software implementation required for these modules when using PL7-2 programming language.
For hardware installation instructions, refer to section 2 of the TSX 17 Micro-PLC Installation Manual (TSX D11 000E).

These modules communicate with the user program via discrete Input bits and IW/OW register words.

1.1-2 Software Code

This code must be declared when PLC I/Os are configured. The code to enter is 27 for TSX AEG 4110/4111 modules.
This module cannot be configured in the fast task.

1.1-3 Configuration

This can be used to set the module's operating mode:
- number of inputs sampled (1 to 4),
- range shift for 4/20 mA modules.

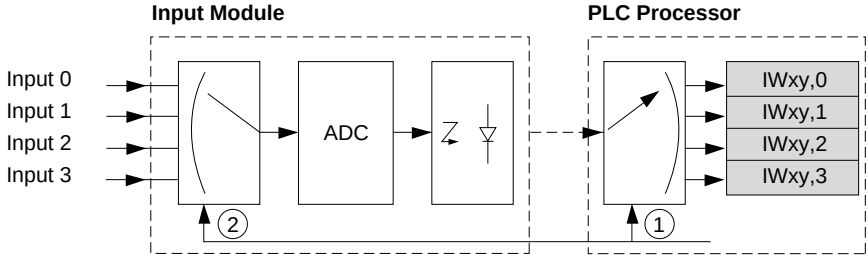
The selection is made by assigning register word OWx,7.

1.1-4 Using the Measurements in Programs

The digital measurement values, that are the image of the analog values of the 4 inputs, are stored in the 4 register words IWx,0 to IWx,3.
A measurement value is accessed by the user's program simply by reading its register word.

1.1-5 Measurement Acquisition Principles

An analog input module comprises only one Analog/Digital Converter circuit (ADC), that has a conversion time of 80ms per input. The 4 inputs are sequentially scanned and converted.



During the acquisition phase, when the PLC master task is acquiring the input values, after converting each input i, the PLC processor will:

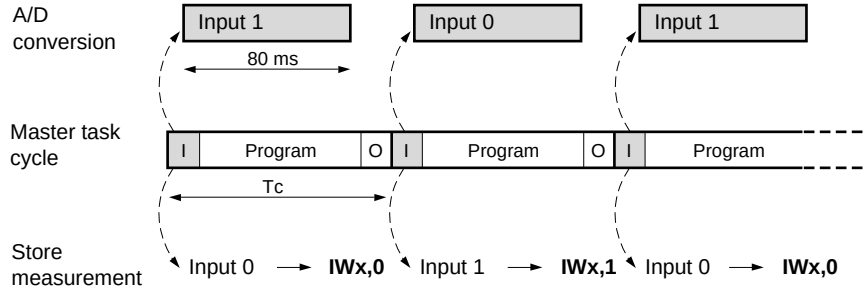
(1) store the new measurement value in register word IWx,1,

(2) multiplex the analog value to input i + 1 (modulo 4) and start its analog/digital conversion.

1.1-6 Measurement Refresh Cycle

1st. Case: master task cycle time ≥ 80 ms.

Example with scanning of 2 inputs:



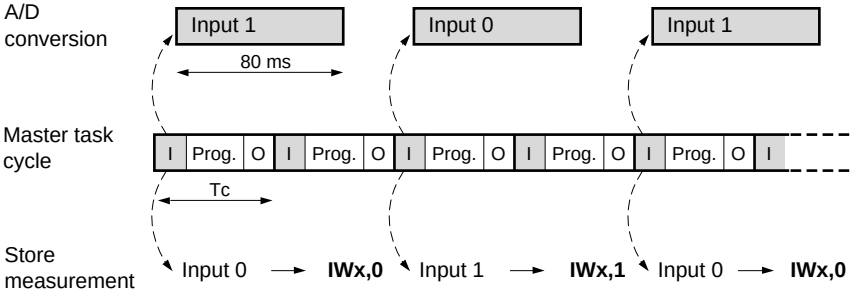
The refresh time of an input equals:

$$T = n \times Tc$$

With n = number of inputs scanned,
Tc = master task cycle time.

2nd. Case: master task cycle time < 80 ms.

Example with scanning of 2 inputs:



The refresh time of an input equals:

$$T = n \times Tc \left[1 + \text{integer of } (80/Tc) \right]$$

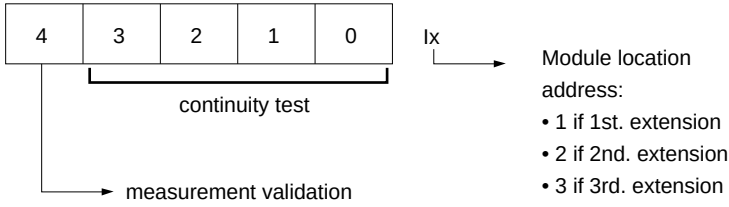
with n = number of inputs scanned,
Tc = master task cycle time.

Example : *With 3 scanned inputs and Tc = 35 ms,*
80/35 = 2.28, Integer of (80/35) = 2,
T = 3 x 35 x [1+2] = 315 ms.

1.2 Bits and Words Accessible by Program

The following bits and words ensure the interface between the user program and the analog input module:
- discrete input bits,
- fault bits,
- I/O register words.

1.2-1 Discrete Input Bits



Ix,0 to Ix,3 Continuity Test (inputs 0 to 3)
These bits are only significant when a 4/20 mA module is used (TSX AEG 4111), configured for shifted range processing (refer to the output register word).

In this case, if the current level on an input drops below 0.5 mA, a continuity failure is detected and the bit corresponding to this input: Ix,0 to Ix,3 (inputs 0 to 3) is set to 1.

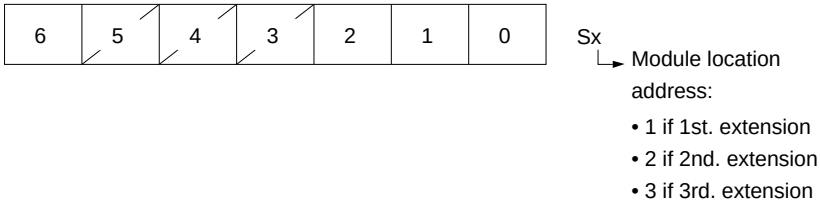
In all other cases, these bits are always set to zero.

Ix,4 Measurement Validation
This bit is accessible in read by program and is set to 1 by the processor as soon as n + 1 measurements (n is the number of sampled inputs) have been performed. It is set to 0 on:
- initialization (INIT),
- cold or hot restart,
- no measurement being made for more than 1 second.

After a cold restart, input values IWx,1 are at 0 and the module runs on the default configuration (OWx,7 = 0, all 4 channels scanned without range shifting).

1.2-2 Fault Bits

These bits can be accessed in read and are set to 1 in the event of an exchange fault on the bus or a failure in the analog part of the module.



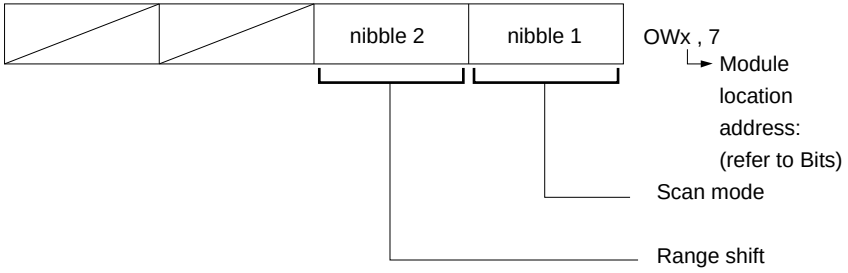
Sx,0 (the notation Sx can be used):
or Sx = 1 : Combines all faults and indicates any variation between configuration code declared in the I/O configuration and the actual module code (27).
Sx,1 = 1 : power supply fault,
Sx,2 = 1 : module fault,
Sx,6 = 1 : module exchange fault.

These bits will set SY10 to 0 (I/O fault).

1.2-3 Output Register Word (Configuration)

Register word OWx,7 is accessible by program in write and can be used to configure the module, i.e. to select:
• the scan mode,
• the register shift.

After a cold restart the module runs on the default configuration: 4 channels scanned without range shifting.



Nibble 1: Scan mode
This allows the program to define the number of inputs scanned. Making this selection optimizes the input refresh period.

• 0 (0000) : all inputs (0, 1, 2, 3) are scanned alternately,
• 1 (0001) : input 0 is scanned continually,
• 2 (0010) : inputs 0 and 1 are scanned alternately,
• 3 (0011) : inputs 0, 1 and 2 are scanned alternately,
• 4 (0100) : inputs 0, 1, 2 and 3 are scanned alternately, (identical to mode 0).
Mode 0 is the default configuration mode.

Note : The scanning mode can be changed during program execution by modifying the value of word OWx,7.

Nibble 2: Range Shift
When a 4/20 mA input module is used, the 0 value corresponds to a 0 mA current level. Shifting the range makes the 0 value correspond to a current level of 4 mA. Range shift is equal to a 250 point shift without changing the resolution. In addition, selecting range shift activates the continuity test.
• 0 (0000) : no range shift (default setting),
• 1 (0001) : 250 point shift.

Example : *0W2,7 = H' 0013'*
Module located in slot 2, scanning 3 inputs with range shift selected.

1.2-4 Input Register Word (Measurement)

Input register words IWx,0 to IWx,3 respectively comprise the results of the measurements received on inputs 0 to 3, coded in twos complement over 16 bits.

Ch. 0 measurement	IWx,0	x = Module location address
Ch. 1 measurement	IWx,1	
Ch. 2 measurement	IWx,2	
Ch. 3 measurement	IWx,3	

Note : The PLC operating system will automatically convert values received from the module in 12-bit format (11-bits + sign) to 16-bit format for direct processing by the user program.

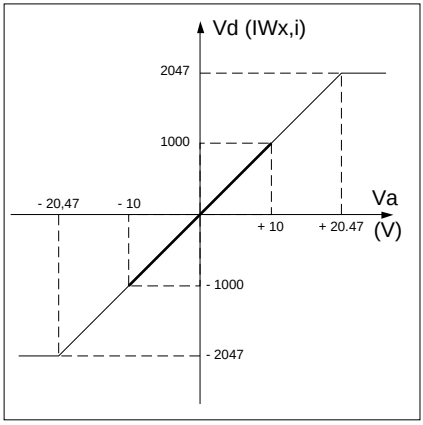
Input range

Module	Rated range	True range
TSX AEG 4110	- 10/+ 10 V	- 20.47/+ 20.47 V
TSX AEG 4111	4/20 mA	- 32.768/+ 32.752 mA

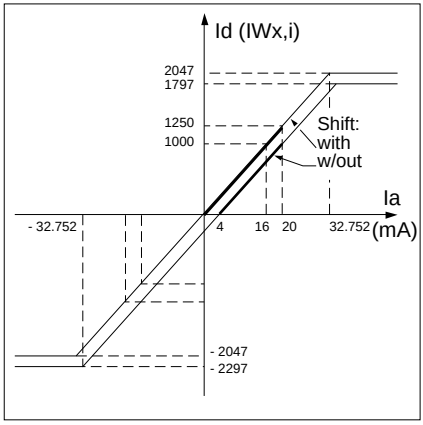
Analog Digital Correspondence

The digital resolution over the maximum range is 11 bits + 1 sign bit, enabling encoding over ± 2047 points across the full module performance range (true range).

TSX AEG 4110: - 10/+ 10 V



TSX AEG 4111: 4/20 mA



Characteristic values

IWx,i	TSX AEG 4110	TSX AEG 4111	4/20mA
Decimal	**- 10/+ 10 V**	**No Shift**	**With Shift**
2047	20.47	32.752	-
1797	17.97	28.752	32.752
1000	10.00	16.000	20.000
1	0.01	0.016	4.016
0	0.00	0.000	4.000
- 250	- 2.50	- 4.000	0.000
- 1000	- 10.00	- 16.000	- 12.000
- 2047	- 20.47	- 32.752	- 28.752
- 2297	-	-	- 32.752
LSB value (*)	10 mV	16 µA	16 µA
Conversion formula	Vn = Va x 100	In = Ia/0.016	In = (Ia-4)/0.016

Vn and In = digital values stored in the register words,
Va and Ia = analog input values expressed in V and mA respectively.

(*) LSB = minimum increment.

1.3 User Program Example

Application

Acquisition of measurements from two pressure sensors operating in 4/20 mA range with sensor failure detection.

Hardware

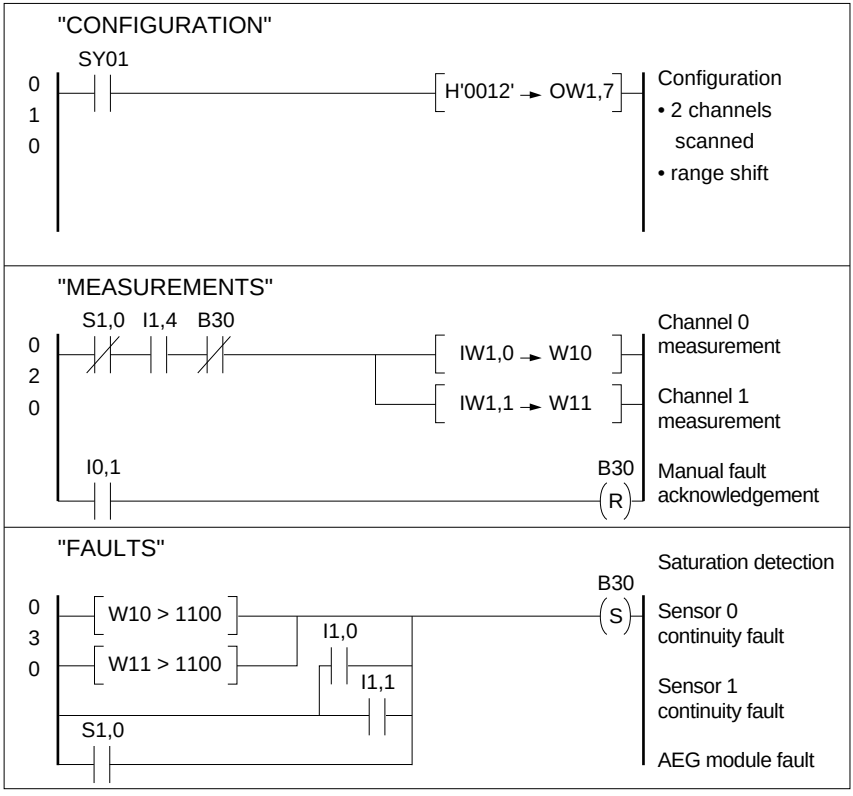
- TSX 17-20 PLC with PL7-2 software cartridge,
- TSX AEG 4111 analog module installed as the first extension.

Program

In addition to acquiring the measurements and transferring them into the two internal words W10 and W11, the program runs a fault detection and acknowledgement system.

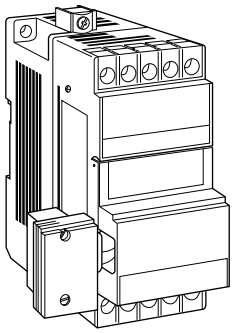
B30 = fault detection comprising detection of measurement saturation, continuity test and module faults,

B30 is reset to 0 by the user via discrete I/O input I0,1.



2.1 Operation

2.1-1 Presentation



Each analog output module, can process 2 outputs of:
- ± 10V for TSX ASG 2000 (11 bits + sign),
- 4/20 mA for TSX ASG 2001 (11 bits).

This manual describes the software implementation required for these modules when using PL7-2 programming language.
For hardware installation instructions, refer to the TSX 17 Micro-PLC Installation Manual (TSX D11 000E).

These modules communicate with the user program via OW register words.

2.1-2 Software Code

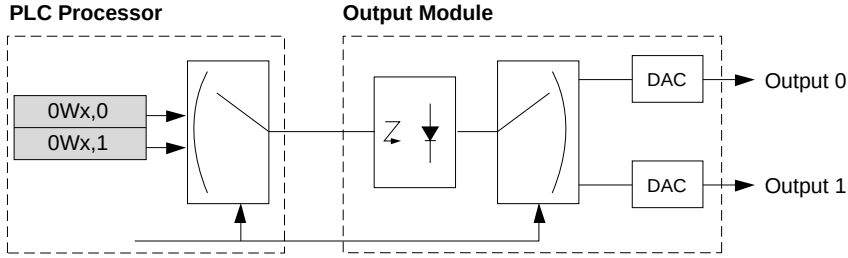
This code must be declared when PLC I/Os are configured. The code to enter is 21 for TSX ASG 2000/2001 modules.
This module cannot be configured in the fast task.

2.1-3 Writing the Outputs

The analog values of the 2 outputs from the module are respectively the image of the digital values stored in the 2 OW register words.
An output is written by the user program simply by transferring the digital value into the assigned register word.

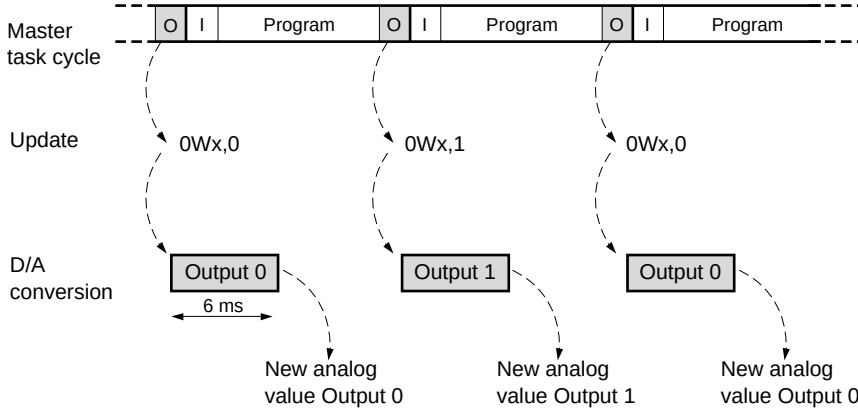
2.1-4 Measurement Restore Principles

An analog output module comprises two Digital/Analog Converter circuits (DAC). Transfer of digital values to the module is performed via multiplexing controlled by the PLC processor.



2.1-5 Measurement Refresh Cycle

The values of the two channels are refreshed alternately. The refresh rate of each channel is therefore equal to twice the cycle time of the master task (total conversion and new value establishment time is less than 6 ms).

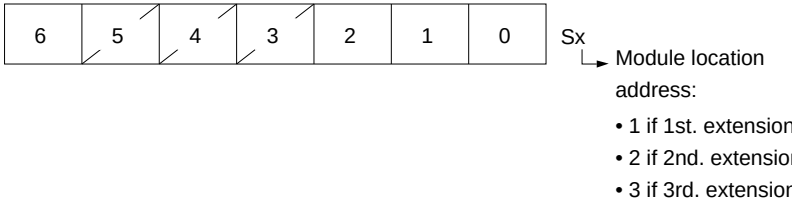


2.2 Bits and Words Accessible by Program

The following bits and words ensure the interface between the user program and the analog input module:
- Fault bits,
- Register words.

2.2-1 Fault Bits

These bits can be accessed in read and are set to 1 in the event of an exchange fault on the bus or a failure in the analog part of the module.



Sx,0
(or Sx) = 1 : Combines all faults and indicates any variation between the configuration code declared in the I/O configuration and the actual module code (21).
Sx,1 = 1 : power supply fault,
Sx,2 = 1 : module fault,
Sx,3 = 1 : module exchange fault.

These bits will set SY10 to 0 (I/O fault).

2.2-2 Output Register Words (Write Outputs)

Output register words OWx,0 and OWx,1 are accessible by program in write and can respectively be used to configure the analog output value for channels 0 and 1.

Output Channel 0	OWx,0	x = Module location address (identical to bit)
Output Channel 1	OWx,1	

Note : The PLC operating system will automatically convert digital values sent to the module in 16-bit (OW register word format) to 12-bit format (11-bits + sign) for direct processing by the module.

Output range

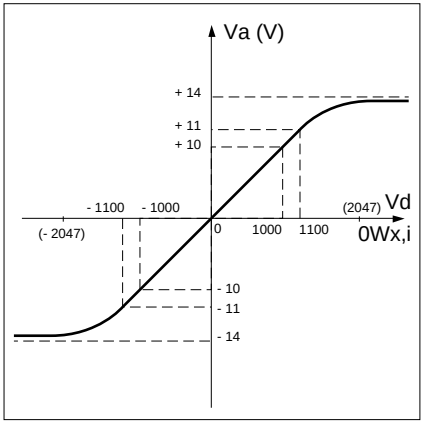
Module	Rated range	Extended range (*)
TSX ASG 2000	- 10/+ 10 V	- 11/+ 11 V
TSX ASG 2001	4/20 mA	0/24 mA

(*) linear response is guaranteed over the entire extended range.

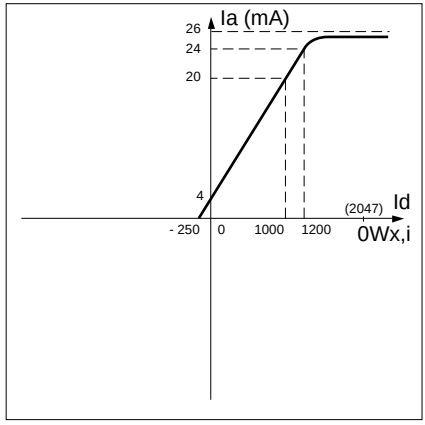
Digital Analog Correspondence

The digital resolution of the Digital/Analog converter (11 bits + 1 sign bit) enables encoding of a value for conversion between -2047 and + 2047. If the value is outside of this range, it will automatically be limited by the PLC's operating system.

TSX ASG 2000



TSX ASG 2001



Characteristic Values

OWx,i Decimal	TSX ASG 2000 -10/+10 V	TSX ASG 2001 4/20 mA
2047	Saturation	Saturation
1200	Saturation	24.000
1100	11.00	21.600
1000	10.00	20.000
1	0.01	4.016
0	0.00	4.000
- 250	- 2.50	0
- 1000	- 10.00	0 (limited)
- 1100	- 11.00	0 (limited)
- 2047	Saturation	0 (limited)
LSB value (*)	10 mV	16 µA
Conversion formula	Va = Vn/100	In = 0.016 x Id+4

Vd and Id = Digital values provided by the user program (content of words OWx,i),
Va and Ia = Voltage and current supplied by the module, expressed in V and mA respectively.

(*) minimum increment.

2.2-3 Analog Output Safety

When the PLC is in Run, setting system bit SY9 to 1 forces the analog output values to 0V for TSX ASG 2000 modules and to 4 mA for TSX ASG 2001 modules.
Stopping the PLC will:

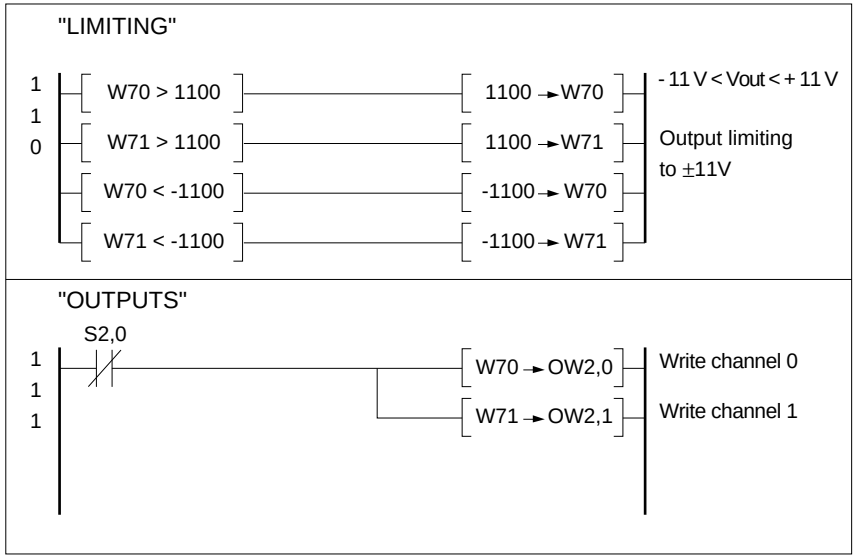
- Set the analog output values to 0V for TSX ASG 2000 modules and to 4 mA for TSX ASG 2001 modules, if bit SY8 is first set to 1 (default value),
- Hold the outputs at their last value, if bit SY8 is first set to 0.

2.3 User Program Example

Application
The two outputs from the module control 2 variable speed drives operating on ± 10 V.

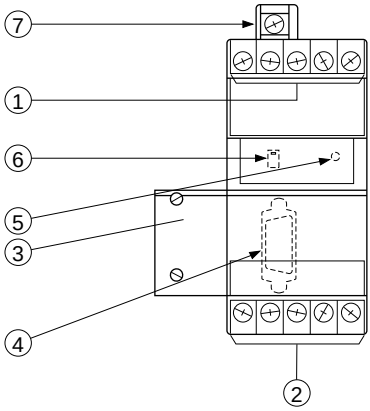
Hardware
- TSX 17-20 PLC with PL7-2 software cartridge,
- TSX ASG 2000 analog module installed as the second extension.

Program
Digital values that are the result of a calculation are stored in words W70 and W71. Before transfer to the module for conversion, the values are checked and limited to ± 11 V.



3.1 Hardware Presentation

3.1.1 TSX AEG 4110 - TSX AEG 4111 Analog Input Modules



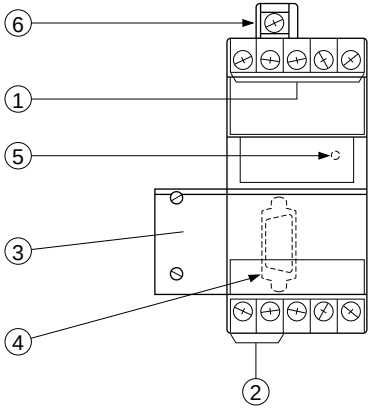
These modules comprise:
- 4 inputs ① and ②

Modules	Inputs ① and ②	
	± 10 V	4/20 mA
TSX AEG 4110	4	-
TSX AEG 4111	-	4

- An I/O fault indicator LED ⑤,
- A 9-pin connector and its cable ③, used to connect to the bus connector of the previous module (I/O extension bus input),
- A 9-pin connector ④, for connecting the bus connector of the next module (I/O extension bus output),
- A switch ⑥ that selects 60 Hz line frequency rejection (the ex-factory setting of this switch is OFF: for 50 Hz supplies),
- A ground terminal ⑦.

Maximum number of modules: 3 in a PL7-2 language configuration.

3.1-2 TSX ASG 2000 - TSX ASG 2001 Analog Output Modules



These modules comprise:
- 2 outputs ①,

Modules	Outputs ①	
	± 10 V	4/20 mA
TSX ASG 2000	2	-
TSX ASG 2001	-	2

- 2 terminals ② for connecting the 24 VDC supply to the module,
- An I/O fault indicator LED ⑤,
- A 9-pin connector and its cable ③, used to connect to the bus connector of the previous module (I/O extension bus input),
- A 9-pin connector ④, for connecting the bus connector of the next module (I/O extension bus output),
- A ground terminal ⑥.

Maximum number of modules: 3 in a PL7-2 language configuration.

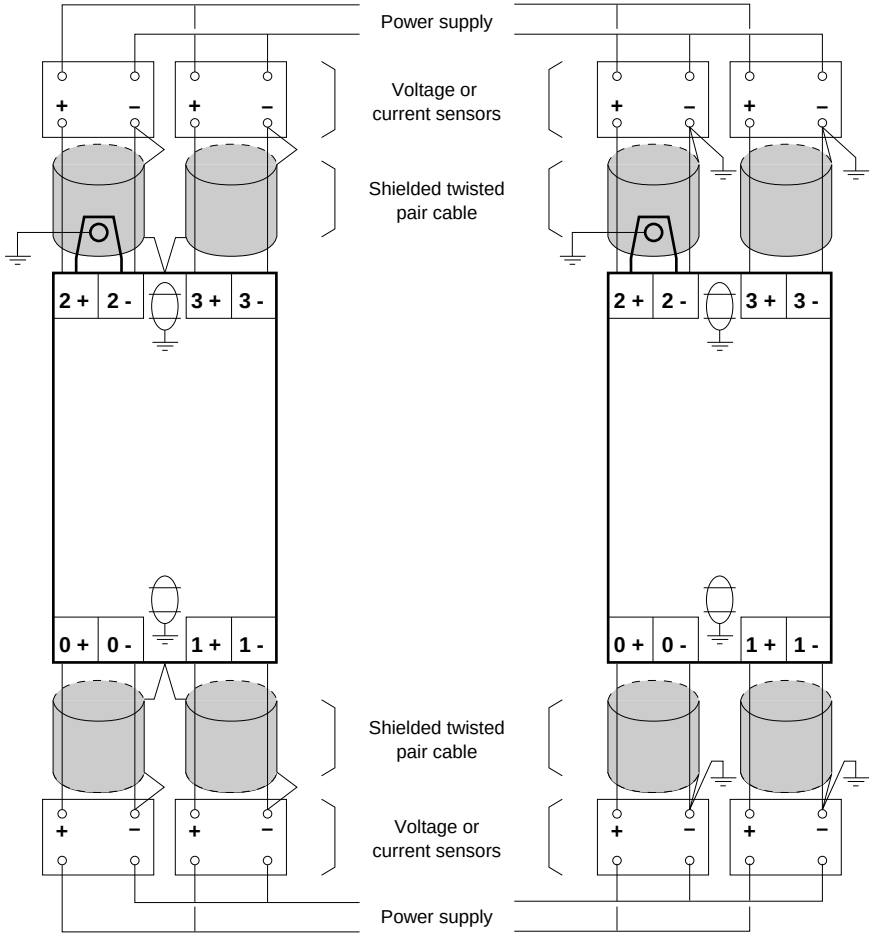
3.2 Connection

3.2-1 Analog Input Modules

TSX AEG 4110 4-inputs ± 10 V,
TSX AEG 4111 4-inputs 4/20 mA
Sensor connections (voltage or current) 4-wire connections:

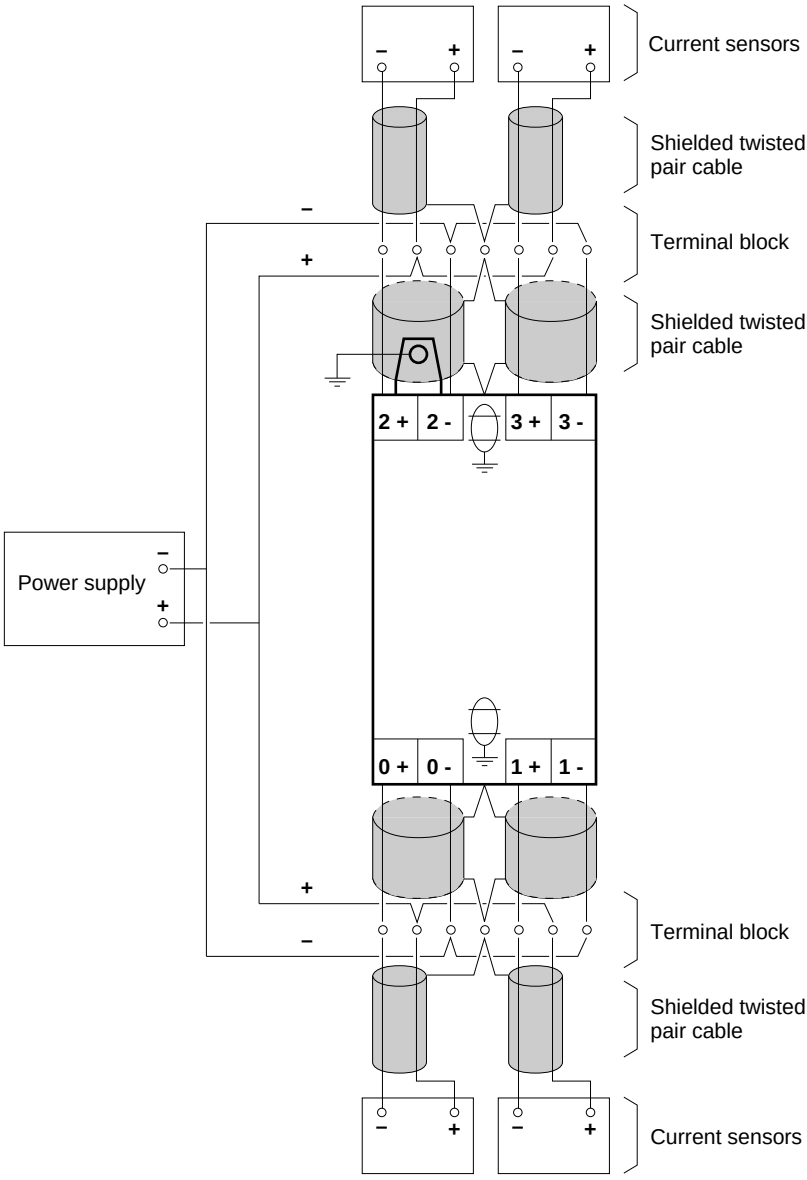
- Floating.
  (no reference to ground, electrical isolation of the sensor output is required).

- Referenced to ground.
  As the 4 channels of the module are not isolated from each other, the common mode voltage between them must not exceed 1 V in normal operation and 15 V during peaks.



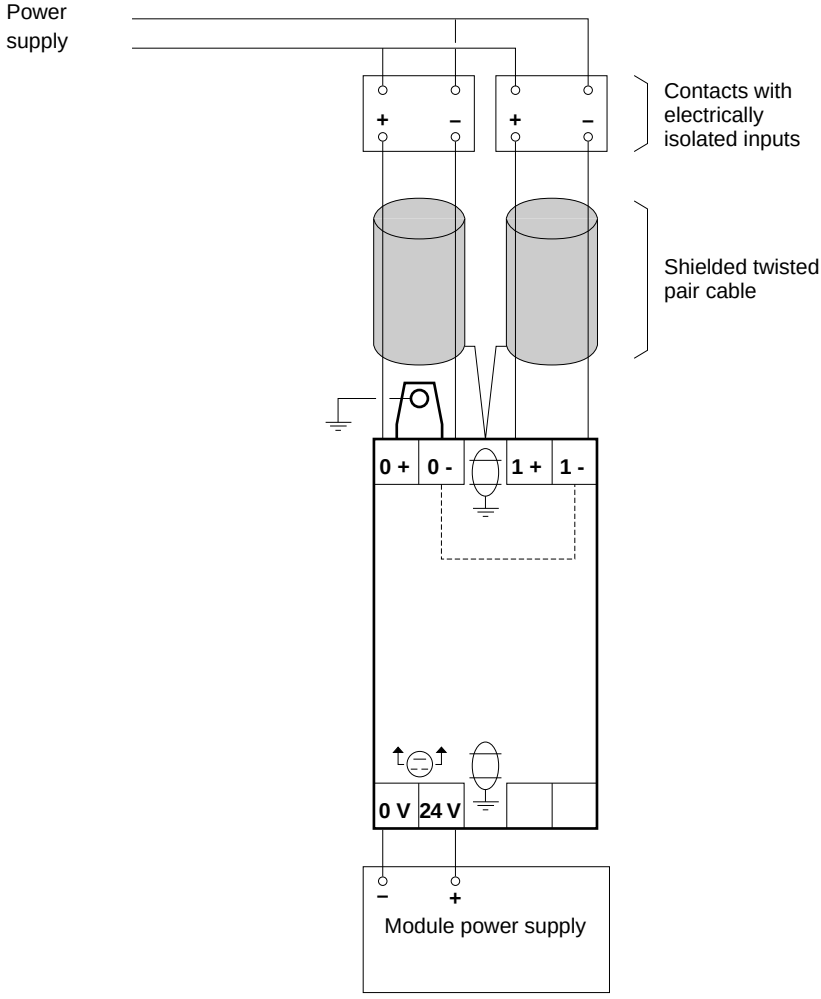
TSX AEG 4111: 4 4/20 mA Inputs

2-wire connection with (current range) sensors.



3.2-2 Analog Output Modules

TSX ASG 2000: 2 ±10 V Outputs
TSX ASG 2001: 2 4/20 mA Outputs



3.3 Characteristics

3.3-1 Analog Inputs

Module		TSX AEG 4110	TSX AEG 4111
High level measurement input	Rated input signal value	± 10 V	4 mA/20 mA
	Extreme input signal values	± 20 V	-32 mA +32 mA
	Resolution over the rated range	10 bits + sign	10 bits
	Resolution over the extreme range	11 bits + sign	11 bits + sign
	Number of channels	4	4
	Number of channels measured	selected by software configuration (1, 2, 3, 4)	
	Input impedance	≥ 50 KΩ	≤ 100 Ω
	Max. allowed input voltage	60 V	30 V
	Common points between inputs	no	no
	Type	differential	differential
	Max. common mode between channels	± 1 V	± 1 V
Conversion	Conversion method	double ramp	double ramp
	Channel acquisition time (1) over the rated range	80 ms	80 ms
	LSB value	10 mV	16 µA
	Max. error at 25 deg. C (2)	± 0.3% of FSR	± 0.2% of FSR
	Max. error (0 to 55 deg. C) (2)	± 0.6% of FSR	± 0.5% of FSR
	Temperature drift	± 0.01% / deg. C	± 0.01% / deg. C
	Serial mode rejection rate (50/60 Hz)	40 dB min.	40 dB min.
	Common mode rejection rate	80 dB	80 dB
Isolation	Between channels	no	no
	Between channels and ground	≥ 1000 MΩ at 500 VDC	
Connections	Cable	Shielded twisted pair, 200 meters max. length	

(1) excluding the PLC cycle time

(2) FSR = Full Scale Range

3.3-2 Analog Outputs

Module		TSX ASG 2000	TSX ASG 2001
High level measurement input	Rated output signal value	± 10 V	4 mA/20 mA
	Extreme input signal values	± 12 V	0 mA/24 mA
	Resolution over the rated range	10 bits + sign	10 bits
	Number of channels	2	2
	Load impedance	≥ 1 KΩ	≤ 300 Ω
	Common points between inputs	yes	yes
Conversion	Max. value establishment time (1)	5 ms	5 ms
	LSB value	10 mV	16 µA
	Max. error at 25 deg. C (2)	± 0.5% of FSR	± 0.5% of FSR
	Max. error (0 to 55 deg. C) (2)	± 1% of FSR	± 1% of FSR
Power supply	Rated voltage	24 VDC	24 VDC
	Max. voltage including ripple	19 to 30 VDC	19 to 30 VDC
	Current (3)	120 mA	120 mA
Protection	Against shorting	yes	yes
Isolation	Between channels	no	no
	Between channels and ground	10 MΩ at 500 VDC	10 MΩ to 500 VDC
Connections	Cable	Shielded twisted pair, 200 meters max. length	

(1) excluding PLC cycle time

(2) FSR = Full Scale Range

(3) each 24 VDC supply provided by a PLC or a 110/240 VAC extension rack can supply only one analog output module.

4.1 Presentation

4.1-1 Features

The TSX DTF 400 analog timer module can be installed in place of extension blocks or other extension modules. It comprises four analog timer functions with a trigger delay. The delay that applies to each channel can be adjusted via the standard internal potentiometer or via an optional external potentiometer. Each channel is activated by the user program, that is informed by each channel when the timer times out by a discrete I/O bit being set to 1.

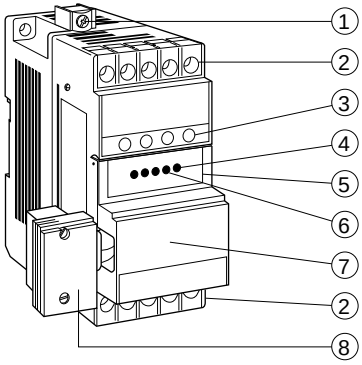
Maximum number of inputs:
- 2 in a PL7-1 configuration,
- 3 in a PL7-2 configuration.

Timer range (per channel)

Potentiometer	Range 1	Range 2	Range 3	Range 4
Internal	0.1 to 1 sec.	0.15 to 1.5 sec.	1 to 10 sec.	10 to 100 sec.
External (1 M Ohm)	0.1 to 6 sec.	0.15 to 9 sec.	1 to 60 sec.	10 to 600 sec.

Selecting the Range
- Channels 0 and 1: The selection is made via the four switches located behind the module display cover,
- Channels 2 and 3: The selection is made by program.

4.1-2 Hardware Presentation



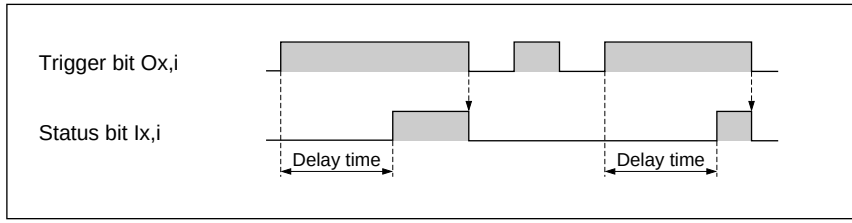
① Ground terminal,
② Terminal used to connect the external potentiometers, or the jumpers if the internal potentiometers are used,
③ 4 internal potentiometers,
④ 1 fault indicator LED,
⑤ Front cover permitting access to the range selection switches,
⑥ 4 status LEDs:
blinking: timer running,
lit: time-out,
⑦ 1 bus connector for connecting the next extension module,
⑧ 1 cable and connector for connecting the extension module to the bus.

Note: Each module is supplied with a set of four jumpers in a plastic bag for connecting to the corresponding terminals, if the internal potentiometers are used to set the duration of the time-out.

4.2 Operation

4.2-1 Operation of a Channel

Each module channel has a "trigger delay function". The timer is triggered when discrete I/O bit Ox,i of the corresponding channel goes to 1. When the timer times out, the corresponding status bit Ix,i goes to 1. When bit Ox,i goes to 0, it resets the timer function.



Reaction to a PLC stoppage: This reaction depends on the state of SY8.
SY8 = 1: timers are reset,
SY8 = 0: timers time-out normally.

4.2-2 Timer Activation and Status

- **Activation:** When discrete I/O bits Ox,i are set to 1,
- **Status read:** By reading discrete I/O bits Ix,i,

1 = time-out

Channel	0	1	2	3
Activation bits	Ox,0	Ox,1	Ox,2	Ox,3
Status bits	Ix,0	Ix,1	Ix,2	Ix,3

O : output variable,
I : input variable,
x : module number in the configuration (1 to 3),
i : channel number in the module (0 to 3).

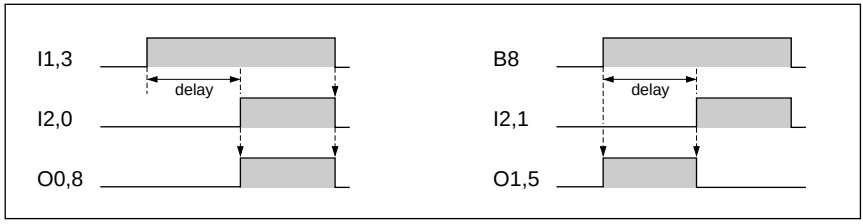
4.2-3 Programming Example

In this example, activation of output O0,8 is delayed and activation of output O1,5 is limited.

• Hardware configuration
- a TSX 17 basic PLC at address 0,
- a TSX DMF 342A extension block at address 1,
- a TSX DTF 400 extension module at address 2,

• Timer activation
- by input I1,3 for channel 0,
- by internal bit B8 for channel 1.

• Timing diagram



• PL7-1 Program

```
S0800      L I1,3
S0801      = O2,0
S0802      L B8
S0803      = O2,1
S0804      L I2,0
S0805      = O0,8
S0806      L B8
S0807      AN I2,1
S0808      = O1,5
```

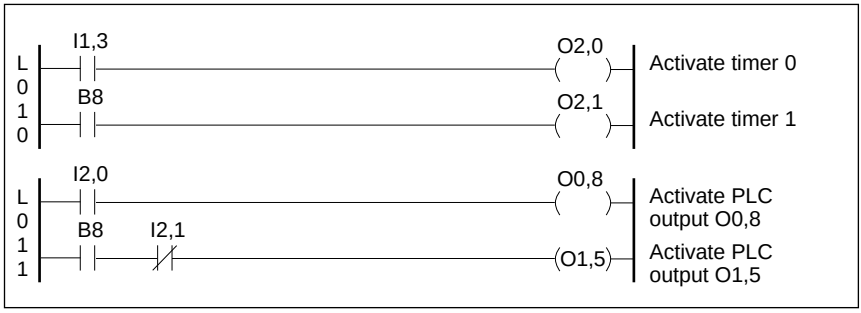
Activate timer 0

Activate timer 1

Activate PLC output O0,8

Activate PLC output O1,5

• PL7-2 Program



4.3 Setting the Module into Service

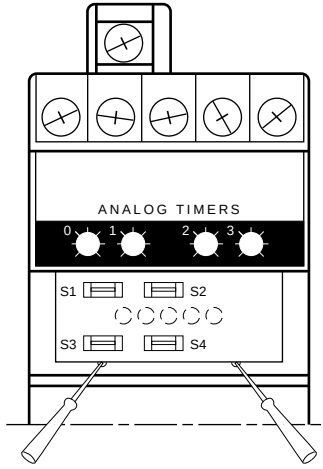
The setting into service of the hardware with a TSX 17 Micro-PLC (installation, association rules, dimensions) is described in Section 2 of the TSX 17 Micro-PLC Installation Manual (TSX D11 000E).

4.3-1 Software Code

This code must be declared when PLC I/Os are configured. The code to enter is 14 for the TSX DTF 400 module.

4.3-2 Selecting the Timer Range

- **For channels 0 and 1:** Selected by the four switches S1, S2, S3 and S4 located behind the transparent cover.



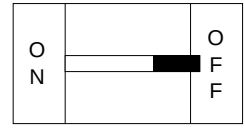
Procedure:

① Use the flat blade of a screwdriver to remove the transparent cover from the module,

② Set the switches to ON or OFF as appropriate, for the selected range (refer to the table on the next page),

③ Replace the cover in its initial position.

Identification of the ON/OFF positions on the range selection switches.



- **For channels 2 and 3:** by programming, setting the Ox,j bits according to the table on the next page.

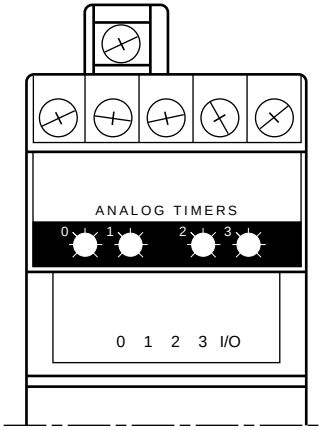
Range	Channel 0		Channel 1		Channel 2		Channel 3		Times with internal potentiometer	Times with external (1 MΩ)* potentiometer
	S1	S3	S2	S4	Ox,4	Ox,5	Ox,6	Ox,7		
1	OFF	ON	OFF	ON	1	0	1	0	0.1 - 1 sec.	0.1 - 6 sec.
2	OFF	OFF	OFF	OFF	1	1	1	1	0.15 - 1.5 sec.	0.15 - 9 sec.
3	ON	ON	ON	ON	0	0	0	0	1 - 10 sec.	1 - 60 sec.
4	ON	OFF	ON	OFF	0	1	0	1	10 - 100 sec.	10 - 600 sec.

(*) Minimum time with an internal potentiometer set to 0,
Maximum time with an internal potentiometer set to its maximum value.

4.3-3 Adjusting the Timer Settings

The user has two different options.

- **Adjustment by internal potentiometer**



In this case, the user must fit the jumpers supplied with the module to the corresponding terminals in the connector block.
The adjustment is made from the module's internal potentiometers that are accessed from the module front panel. The potentiometers are identified in the following manner:

0 for channel 0,
1 for channel 1,
2 for channel 2,
3 for channel 3.

Note: The internal potentiometers have a limited service life. The fitting of external potentiometers is recommended, regardless of the time range required, if the application will require frequent adjustment of the potentiometers.

- **Adjustment by external potentiometer**

If the adjustment is made by an external potentiometer connected to the corresponding connection terminals, the internal potentiometers can be used to improve the accuracy of the adjustment as the two potentiometers are connected in series (refer to the connection diagram in sub-section 4.3-4).

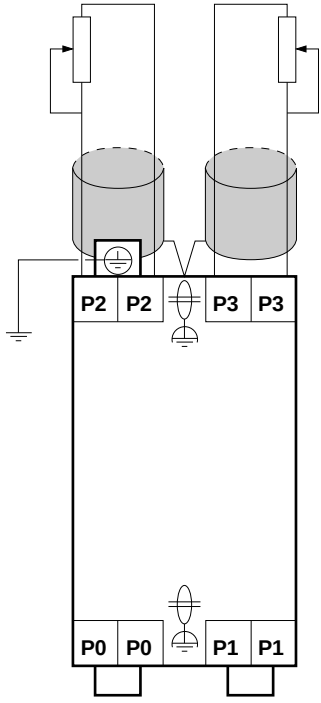
Selecting the potentiometer

The equations used to calculate the value of the external potentiometer take into account the required delay time.

Range 1 P = 150 x T - (10 + P1)
Range 2 P = 96 x T - (10 + P1)
Range 3 P = 15 x T - (10 + P1)
Range 4 P = 1.5 x T - (10 + P1)

P = External potentiometer value in KΩ,
T = Delay time in seconds,
P1 = Internal potentiometer delay time in KΩ with P1 in a range between 0 and 220 KΩ,
The voltage rating of the external potentiometer must be at least 0.5 W.

4.3-4 Connections



Terminal identification

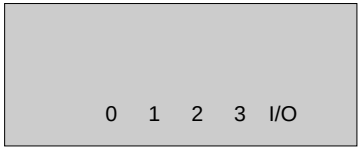
P0 - P0 : channel 0
P1 - P1 : channel 1
P2 - P2 : channel 2
P3 - P3 : channel 3.

In this wiring example, timers 0 and 1 are adjusted by internal potentiometers. The terminals of the corresponding channels must be connected together using a jumper supplied with the module. Timers 2 and 3 are adjusted by external potentiometers. The potentiometers are connected to the module using a shielded cable, with the shield connected to ground and of a total length of not more than 5 meters.

Note: The external potentiometers are user supplied components (not supplied by Telemecanique).

4.4 Setting into Service - Maintenance

4.4-1 Display



The module is fitted with five LEDs that indicate:
- the state of each timer channel (LEDs 0, 1, 2 and 3),
- a module failure (I/O LED).

Timer channel state display

Channel	LED	Timer state		
		Deactivated	Activated	Timed-out
0	0	○	⊗	●
1	1	○	⊗	●
2	2	○	⊗	●
3	3	○	⊗	●

○ LED extinguished ⊗ LED blinking ● LED lit

Module failure display

I/O
- ● module or exchange failure
- ○ normal operation

4.4-2 Troubleshooting

Troubleshooting is performed by reading bit Sx,0

x = module number in the configuration,
Sx,0 = 1 Exchange fault between the basic PLC and the module,
Sx,0 = 0 Normal operation.

4.5 Characteristics

TSX DTF 400		Minimum values	Maximum values
Delay time set by internal potentiometer	Range 1	0.1 second	1 second
	Range 2	0.15 seconds	1.5 seconds
	Range 3	1 second	10 seconds
	Range 4	10 seconds	100 seconds
Delay time set by 1 MΩ external potentiometer (1)	Range 1	0.1 second	6 seconds
	Range 2	0.15 seconds	9 seconds
	Range 3	1 second	60 seconds
	Range 4	10 seconds	600 seconds
Internal potentiometer		0 Ω	220 KΩ
External potentiometer (2)	Value	0 Ω	1 MΩ
	Power	0.5 W	
	Connection Cable		5 Meters (shielded)
Temperature drift (with internal potentiometers)			3%
Operating temperature		0 deg. C	55 deg. C

(1) Minimum values with the internal potentiometer set to 0,
Maximum values with the internal potentiometer set to 220 KΩ.
(2) With linear variation,

This module operated in all of the usual TSX Series 7 PLC environmental conditions.