

Man Machine Interface Design

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Using a Man Machine Interface Application

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# Man-Machine Interface Design

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The user **must follow the chronological order** when performing the various operations required to create a process control man-machine interface application. Failure to follow the chronological order or omitting a required operation will cause errors in the application.

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## 1.1 Program Configuration Methodology

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After installing the PMS2-MMX option, the operator dialog software must be configured. To do this, the following operation must be performed in the order shown :

- ① Run PL7-MMI 37 by double clicking on the corresponding icon,
- ② Select the module that will execute the application: PCM27/37 and Appli\_1 to Appli\_4 (refer to section 1.2),
- ③ Declare the PROCESS CONTROL (REGULATION) option in PL7-MMI 37 (refer to section 1.3),
- ④ Configure the PROCESS CONTROL (REGULATION) option in PL7-MMI 37, to generate the symbol data base that will be transferred to the cartridge (refer to section 1.4),
- ⑤ Quit the Task Manager. The system is now ready for the user to create a man-machine interface PROCESS CONTROL (REGULATION) application.

## 1.2 Selecting the Module to Program

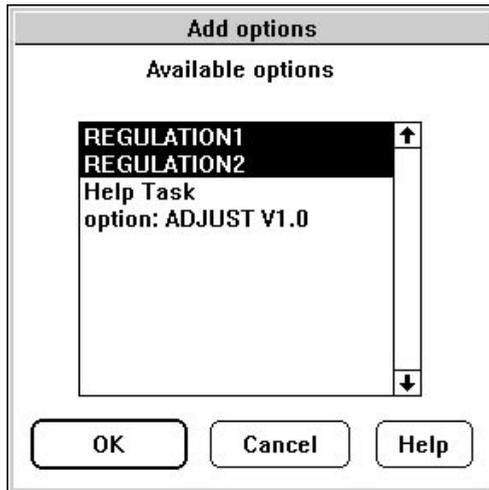
The module is selected from the dialog box shown below. It is displayed automatically when the MMI icon is selected. The dialog box lets the user define module characteristics.

- Select a module to program from the four available : PCM27/37 and Appli\_1 to Appli\_4 (do not select CCX or PC). Each module has its own dedicated MMI OFB. The user must therefore declare in the PL7-3 configuration, as many MMI OFBs as there are modules (e.g. if module Appli\_3 is selected, 3 MMI OFBs must be declared in the PL7-3 configuration),
- Select the language for the keyboard connected to the TSX PCM 37 station. For the Process Control Man-Machine Interface keyboard TPMX KB •, select United States,
- Graphic image resolution: always 640 x 350 pixels,
- Multi-console. Select this box if several terminals are connected together,
- Physical address of the man-machine interface in the PLC. This address is the same as the one declared when the configuration was defined in XTEL-CONF,
- For module versions V1.4 and higher, configure the screen saver to take effect after a specified period of inactivity, using the Delay (in minutes) field.
- Description of the process control man-machine interface application (up to 80 characters in length). The description comments are optional.

### 1.3 Declaring the Process Control (Regulation) Option in PL7-MMI 37

This operation is required to identify the PROCESS CONTROL (REGULATION) function as a task recognized by the PL7-MMI 37 design program. To declare the function:

- Pull down the **Utilities** menu from the action bar in the PL7-MMI 37 primary window and select **Add options**. This will display a list of available options:

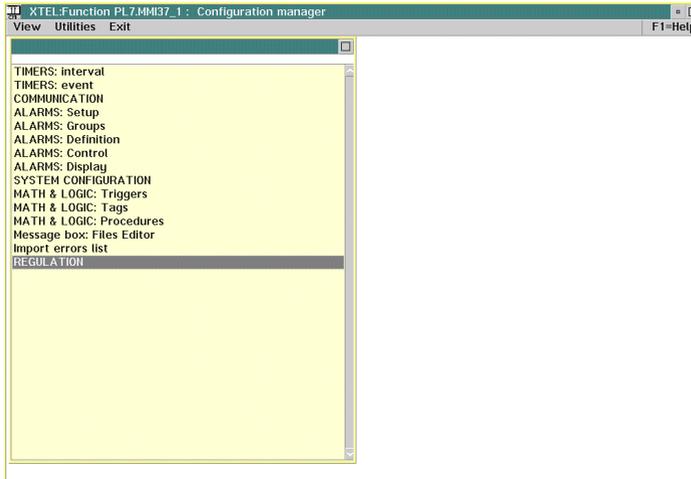


- Select **two lines** REGULATION1 and REGULATION2. Once selected, the two lines are highlighted in reverse video,
- Validate the selection made. This starts installation of the option in PL7-MMI 37 and starts :
  - the transfer to XTEL-SDBASE of the controller OFBs (32 PID, 20 PIDF, 10 PIDMC, 10 PIDAT, 5 MOTOR, 5 HCOOL, 5 PIDFZ, 5 RATIO, 5 RM, 5 PIDFF, 10 ANIN and 10 ANOUT symbols).
  - under GED, import the FAV, FAVi (i = 1 to 9), PFAV, PFAVi (i = 1 to 9), TOUCHES, TOUCHES 1, FAVIN and FAVOUT symbols.A dialog box lets the user follow the progress of these operations,
- When a new dialog box tells the user that installation is complete, press **Enter**.

## 1.4 Configuring the Process Control (Regulation) Task in PL7-MMI 37

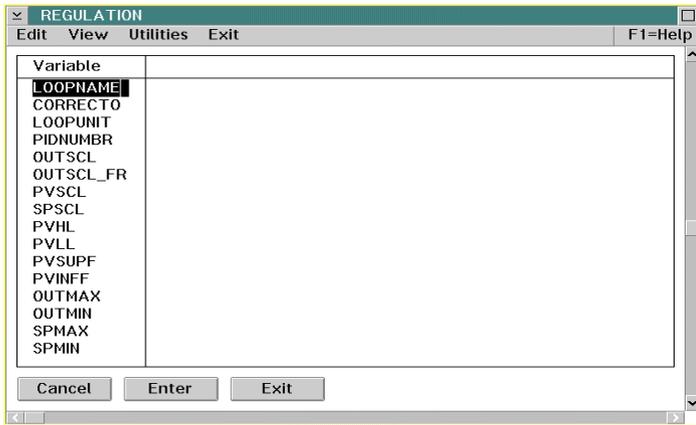
This operation lets the user generate the symbol data base that will be transferred to the man-machine interface module for use by the Process Control (Regulation) function. The following procedure should be followed:

- Pull down the **Create** menu from the action bar of the PL7-MMI 37 primary window and select **Configuration Manager CM**. The following screen is displayed:



- Select **REGULATION** by double clicking on the corresponding line. This displays the Regulation screen.

- Pull down the **Utilities** menu and select **Import**. This displays a dialog box that reminds the user which application directory is selected. This is the directory that Regulation task specific variables will be imported into,
- Validate the action to start importing files and fill-in the list of variables,



## Warning

**Symbols must only be imported once.**

- Use the **Exit**, menu to exit the Regulation function and then the Configuration Manager and return to the PL7-MMI 37 primary window. The user can now create a process control man-machine interface application (refer to section 2).



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## 2.1 Application Creation Methodology

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A process control man-machine interface application comprises a number of animated screens that can be accessed by the operator. The screens listed below are required for all applications and must always be present:

- **MENU:** This screen is required for all applications, as it is the first one displayed. It lets the user access the supervisory control and tuning screens,
- **Supervisory control views:** These screens provide the user with a realtime view of the application and allow the user to act on them:
  - Display process controller front panels,
  - Display alarm banner lines, generated by the Alarms function (optional),
  - Modify process controller parameters,
  - Access to other screens,
- **TREND:** This screen displays trending curves for each selected process controller. It lets the user access process controller parameters for tuning the process control loop. **This screen was designed by Telemecanique and should never be changed,**
- **TUNE:** This screen displays the parameter settings for the selected process controller. Like the TREND screen, **this screen was designed by Telemecanique and should never be changed.**

Creating a process control man-machine interface application comprises creating the MENU screen and (one or more) supervisory control screens. Once this is done, the files must be transferred to the TSX PCM 37 module. This operation requires seven consecutive phases (for further information, refer to the PL7-MMI 37 documentation):

- ① Run PL7-MMI 37, by double clicking on its icon. This displays the Module Selection screen. Select the module that will be used to run the application: PCM27/37 and Appli\_1 to Appli\_4 (refer to section 1.2),
- ② Create screen backgrounds (or static pictures) for the MENU and supervisory control screens (refer to section 2.2),
- ③ Define the animation for the created screen backgrounds (refer to section 2.3),
- ④ Define the Process Control (Regulation) password,
- ⑤ Generate files for transfer to the man-machine interface module (refer to section 2.5),
- ⑥ Transfer the files to the man-machine interface module (refer to section 2.6),
- ⑦ Document the application (optional).

## 2.2 Creating Screen Backgrounds (Static Screens)

### 2.2-1 Introduction

The Graphics Editor GED, accessed via **Graphics Editor GED** in the **Create** menu lets the user draw color screen backgrounds. In addition to the features provided by the editor (refer to Part A, Section 2 of the PL7-MMI 37 documentation), it offers a pre-drawn screen and pre-drawn and pre-animated symbols:

- **SCREEN**: This pre-drawn screen helps create supervisory control views.
- **FAV..FAV9**: These symbols represent the front panels of the controllers, for insertion in the supervisory control views,
- **PFAV..PFAV9**: These symbols represent the "small" version of the front panels of the controllers, for insertion in the synoptic screens,
- **FAVIN, FAVOUT**: These symbols represent the front panels of interfaces with the process, for insertion in the supervisory control views,
- **PFAVIN, PFAVOUT**: These symbols represent a "small" version of the front panels of interfaces with the process, for insertion in the synoptic screens,
- **TOUCHES** and **TOUCHES1**: These symbols represent all the keys required for controlling an application.

The table below shows the symbols to use in integrating the front panels of the various controllers into supervisory control screens:

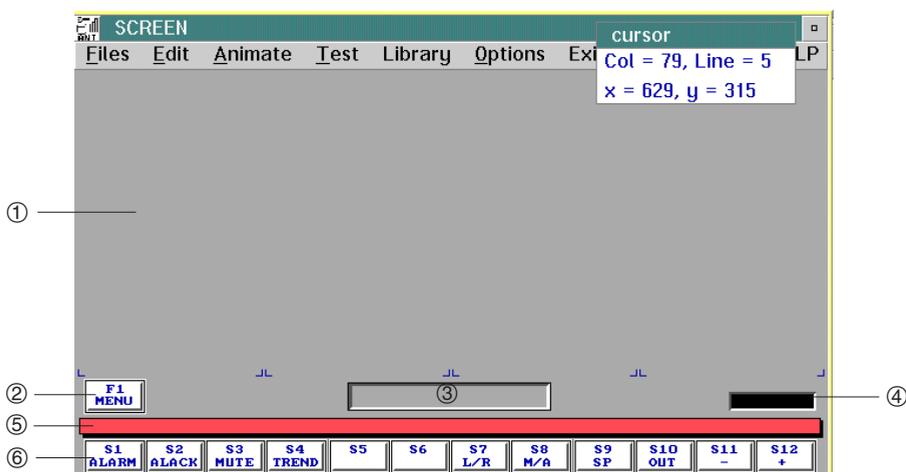
Pre-animated symbols		Controller represented	OFB assigned	Keys to use
Front panel	Small front panel			
FAV	PFAV	PID controller	PID	TOUCHES
FAV1	PFAV1	PID controller with analog output and PWM	PIDF	TOUCHES1
FAV2	PFAV2	PID controller with manual mode control	PIDMC	TOUCHES1
FAV3	PFAV3	Self-tuning PID controller	PIDAT	TOUCHES1
FAV4	PFAV4	PID controller with servo-motor output	MOTOR	TOUCHES1
FAV5	PFAV5	PID controller with hot/cool output	HCOOL	TOUCHES1
FAV6	PFAV6	PID controller with feedforward	PIDFZ	TOUCHES1
FAV7	PFAV7	Ratio controller	RATIO	TOUCHES1
FAV8	PFAV8	Model controller	RM	TOUCHES1
FAV9	PFAV9	Extended PIDF controller	PIDFF	TOUCHES1

**Warning**

None of the symbols (FAV, FAV1, TOUCHES, etc) must be modified.

Due to the multiplexing used, a supervisory control screen can only include front panels of the same type. In addition, it is necessary to use the TOUCHES symbol with FAV front panels and the TOUCHES1 symbol with all other front panels (FAV1 to FAV9).

As the small versions of the front panels and the interfaces with the process are not multiplexed, it is possible to use different PFAV symbols in the same screen and FAVIN and FAVOUT symbols, or a type of FAV with FAVIN and FAVOUT symbols.

**2.2-2 Pre-drawn SCREEN Screen**

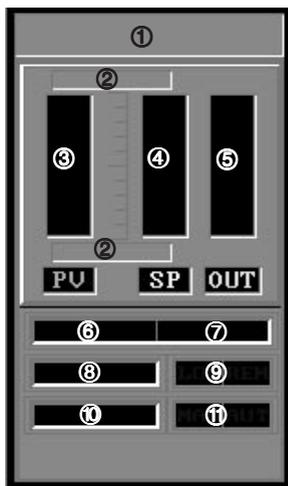
This screen offers as standard the elements which appear in all the supervisory control views (alarm banner, key zone, etc) and displays the coordinates to be able to position the front panels accurately, thus ensuring that the supervisory control views are uniform.

- ① zone for receiving up to 4 controller front panels,
- ② MENU key for returning to the MENU screen,
- ③ zone for displaying the name of the screen,
- ④ data entry zone,
- ⑤ alarm banner,
- ⑥ band of function keys required for controlling an application.

The SCREEN screen is not animated. The function key band, the MENU key, the alarm banner and the data entry zone should all be animated under ANT (see section 2.3).

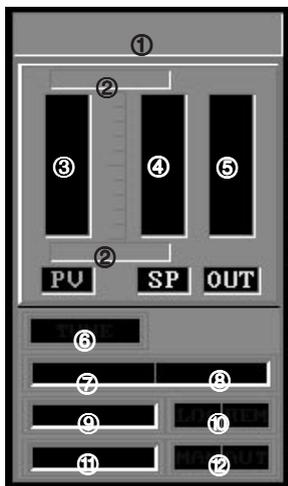
### 2.2-3 Ready-made Symbols

#### PID (FAV), PIDF (FAV1), PIDMC (FAV2), RM (FAV8), or PIDFF (FAV9) controller front panel



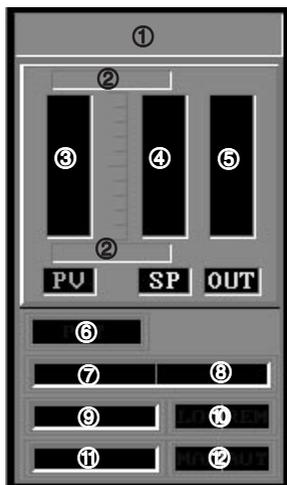
- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as the PV remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Setpoint bargraph. Its color is yellow,
- ⑤ Output level bargraph expressed as a percentage. Its color is violet,
- ⑥ Process Variable expressed in physical units,
- ⑦ Type of physical units,
- ⑧ Setpoint expressed in physical units,
- ⑨ Setpoint status: Internal (LOCAL) or external (REMOTE),
- ⑩ Output value expressed as a percentage or in physical units (PIDFF),
- ⑪ Controller operating mode: MANUAL or AUTOMATIC.

#### PIDAT (FAV3) controller front panel



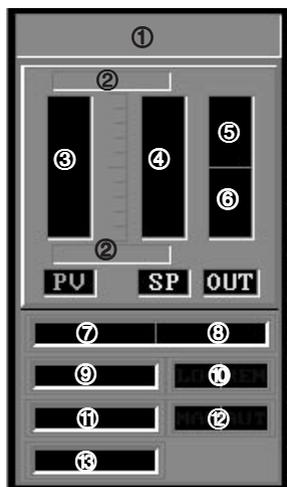
- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as the PV remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Setpoint bargraph. Its color is yellow,
- ⑤ Output level bargraph expressed as a percentage. Its color is violet,
- ⑥ TUNE indicator, lit to show that the controller is self-tuning,
- ⑦ Process Variable expressed in physical units,
- ⑧ Type of physical units,
- ⑨ Setpoint expressed in physical units,
- ⑩ Setpoint status: Internal (LOCAL) or external (REMOTE),
- ⑪ Output value expressed as a percentage,
- ⑫ Controller operating mode: MANUAL or AUTOMATIC.

**MOTOR (FAV4) controller front panel**



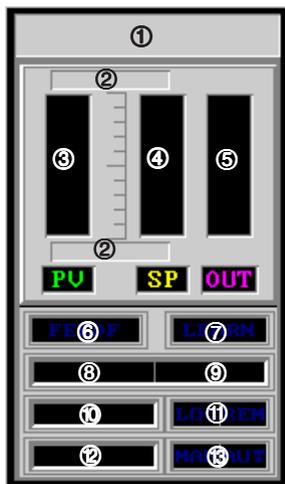
- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Setpoint bargraph. Its color is yellow,
- ⑤ Bargraph showing the output expressed as a percentage. Its color is violet,
- ⑥ POT indicator that lights to show that the controller has taken into account the electric motor position signal,
- ⑦ Process Variable expressed in physical units,
- ⑧ Type of physical units,
- ⑨ Setpoint expressed in physical units,
- ⑩ Setpoint status: Internal (LOCAL) or external (REMOTE),
- ⑪ Output value expressed as a percentage,
- ⑫ Controller operating mode: MANUAL or AUTOMATIC.

**HCOOL (FAV5) controller front panel**



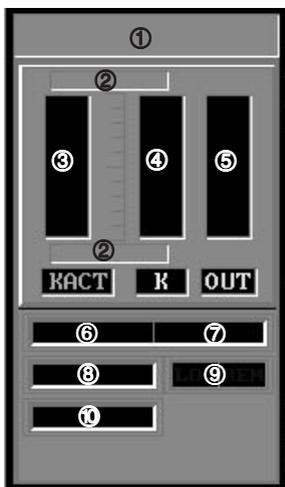
- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Setpoint bargraph. Its color is yellow,
- ⑤ Bargraph showing the "Hot" output level expressed as a percentage. Its color is violet,
- ⑥ "Downwards" bargraph showing the "Cool" output level expressed as a percentage. Its color is blue,
- ⑦ Process Variable expressed in physical units,
- ⑧ Type of physical units,
- ⑨ Setpoint expressed in physical units,
- ⑩ Setpoint status: Internal (LOCAL) or external (REMOTE),
- ⑪ "Hot" output value expressed as a percentage,
- ⑫ Controller operating mode: MANUAL or AUTOMATIC,
- ⑬ "Cool" output value expressed as a percentage.

## PIDFZ (FAV6) controller front panel



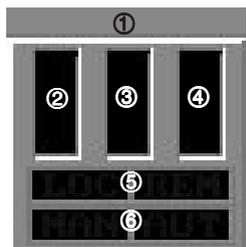
- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Setpoint bargraph. Its color is yellow,
- ⑤ Output level bargraph expressed as a percentage. Its color is violet,
- ⑥ FEEDF indicator which lights to show that the controller is using adaptive feedforward,
- ⑦ LEARN indicator which lights to show that the controller is learning the fuzzy logic rules,
- ⑧ Process Variable expressed in physical units,
- ⑨ Type of physical units,
- ⑩ Setpoint expressed in physical units,
- ⑪ Setpoint status: Internal (LOCAL) or external (REMOTE),
- ⑫ Output value expressed as a percentage,
- ⑬ Controller operating mode: MANUAL or AUTOMATIC.

## RATIO (FAV7) controller front panel



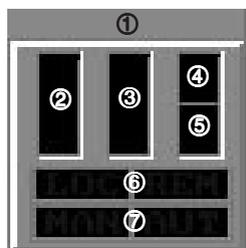
- ① Control loop name,
- ② Ratio coefficient scale range,
- ③ Bargraph showing the true ratio coefficient. Its color is green as long as it remains between the lower and higher coefficient thresholds. It turns red when a threshold value is exceeded,
- ④ Bargraph showing the required ratio coefficient between the controlled value and the controlling value. Its color is yellow,
- ⑤ Bargraph showing the calculated ratio output used as the Remote Setpoint for the downstream controller. Its color is violet,
- ⑥ Value of the true ratio coefficient expressed in physical units,
- ⑦ Type of physical units,
- ⑧ Value of the required ratio coefficient expressed in physical units,
- ⑨ Internal ratio coefficient status: Internal (LOCAL) or external (REMOTE),
- ⑩ Value of the calculated ratio output expressed as a percentage.

### PID (PFAV), PIDF (PFAV1), PIDMC (PFAV2), PIDAT (PFAV3), MOTOR (PFAV4), PIDFZ (PFAV6), RM (PFAV8) or PIDFF (PFAV9) controller small front panel



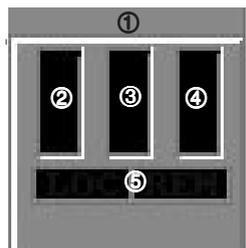
- ① Control loop name,
- ② Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ③ Setpoint bargraph. Its color is yellow,
- ④ Output level bargraph expressed as a percentage. Its color is violet,
- ⑤ Setpoint status: Internal (LOCal) or external (REMote),
- ⑥ Controller operating mode: MANual or AUTomatic.

### HCOOL (PFAV5) controller small front panel



- ① Control loop name,
- ② Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ③ Setpoint bargraph. Its color is yellow,
- ④ Bargraph showing the "Hot" output level. Its color is red,
- ⑤ Bargraph showing the "Cool" output level. Its color is blue,
- ⑥ Setpoint status: LOCAl or REMote,
- ⑦ Controller operating mode: MANual or AUTomatic.

### RATIO (PFAV7) controller small front panel



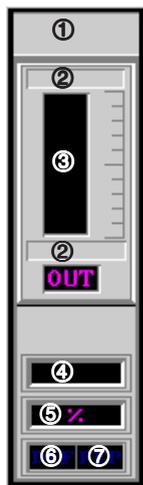
- ① Control loop name,
- ② Bargraph showing the true ratio coefficient. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ③ Bargraph showing the required ratio coefficient between the servo value and the control loop value. Its color is yellow,
- ④ Bargraph showing the calculated ratio output used as the Remote Setpoint for the downstream controller. Its color is violet,
- ⑤ Internal ratio coefficient status: LOCAl or REMote.

### ANIN (FAVIN) interface front panel

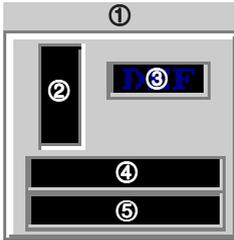


- ① Control loop name,
- ② Process Variable scale range,
- ③ Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ④ Process Variable value in physical units,
- ⑤ Type of physical units,
- ⑥ ERR indicator which lights if there is a process variable fault.

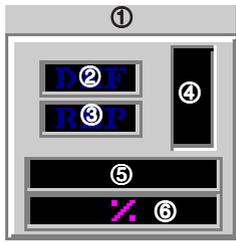
### ANOUT (FAVOUT) interface front panel



- ① Control loop name,
- ② Process Variable scale range,
- ③ Output level bargraph expressed as a percentage. Its color is violet,
- ④ Output value expressed as a percentage,
- ⑤ % symbol which shows that the output is expressed as a percentage,
- ⑥ ERR indicator which lights if there is a module or channel fault,
- ⑦ REP indicator which lights if the OFB is in fallback position.

**ANIN (PFAVIN) interface small front panel**

- ① Control loop name,
- ② Process Variable bargraph. Its color is green as long as it remains between the lower and higher thresholds. It turns red when a threshold value is exceeded,
- ③ ERR indicator which lights if there is a process variable fault
- ④ Process Variable value in physical units,
- ⑤ Type of physical units.

**ANOUT (PFAVOUT) interface small front panel**

- ① Control loop name,
- ② ERR indicator which lights if there is a module or channel fault,
- ⑦ REP indicator which lights if the OFB is in fallback position,
- ③ Output level bargraph expressed as a percentage. Its color is violet,
- ④ Output value expressed as a percentage,
- ⑤ % symbol which shows that the output is expressed as a percentage.

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**Function keys required for application control: TOUCHES or TOUCHES1**

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
S1 ALARM	S2 ALACK	S3 MUTE	S4 TREND	S5	S6	S7 L/R	S8 M/A	S9 SP	S10 OUT	S11 -	S12 +

- ① **S1 ALARM** : Calls the Alarms task,
- ② **S2 ALACK** : Remote error acknowledgment,
- ③ **S3 MUTE** : Warning buzzer control linked to alarms,
- ④ **S4 TREND** : Calls the tuning view,
- ⑤ **S5** : Not used,
- ⑥ **S6** : Not used,
- ⑦ **S7 L/R** : Selects the Setpoint or Ratio coefficient field for the currently selected controller and modifies its value : LOC or REM,
- ⑧ **S8 M/A** : Selects the Operating Mode field for the currently selected controller and modifies its value : MAN or AUT,
- ⑨ **S9 SP** : Selects the Setpoint field for the currently selected controller,
- ⑩ **S10 OUT** : Selects the Output field for the currently selected controller,
- ⑪ **S11 -** : Decrements the value of the selected field (Setpoint or Output),
- ⑫ **S12 +** : Increments the value of the selected field (Setpoint or Output).

**Note**

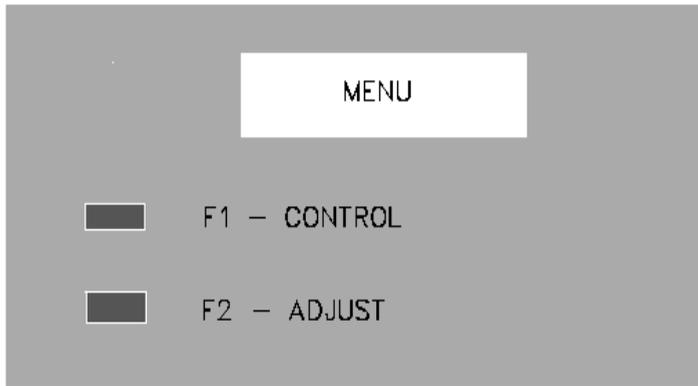
There is no symbol associated with the MS OFB.

### 2.2-4 Creating the Menu Screen

This screen is required in all applications. If the MENU screen is not present, the following message is displayed :



It should provide access to the supervisory control screens and the tuning screens. The graphic design of this screen and its wording are left to the application designer to define, within the limits of the features supported by the Graphics Editor GED. The procedure described below is an example showing how a Menu screen can look:



*The section numbers in brackets refer to Part A of the PL7-MMI 37 documentation describing the Graphics Editor GED.*

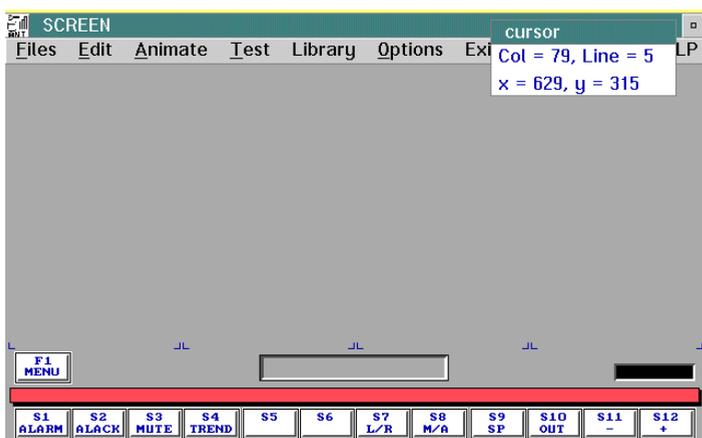
- ① Define the screen background color. To do this:
  - Select the background color (section 2.22),
  - Replace the background color with the selected color (section 2.4).
- ② Draw the graphic objects: Two command buttons, the title window, etc. (sections 2.7 and 2.17).
- ③ Define the color of the graphic objects drawn (section 2.11).
- ④ Define and place the text (section 2.9).
- ⑤ Save the Menu screen (section 2.6).

## 2.2-5 Creating the Supervisory Control Screens

This type of screen must always be created as it is absolutely necessary. It is only possible to tune process control loops where an FAV symbol has been drawn, animated and multiplexed. These screens use predefined symbols previously described and graphic objects created by the designer.

The **predefined symbols** in the symbols library (FAV, PFAV and TOUCHES) **must never be modified** (except for the modifications described in sections 2.3-5 and 2.3-6). The drawings used for other graphic objects and the positioning on-screen of all objects (including symbols) is up to the application designer.

To simplify the task of the designer and ensure the consistency of the supervisory control screens, the following pre-drawn screen is displayed (SCREEN). This offers as standard the elements which appear in all the supervisory control views (alarm banner, key zone, etc) and displays the addresses to be able to position the front panels accurately.



In each case, a supervisory control screen must comprise the following elements:

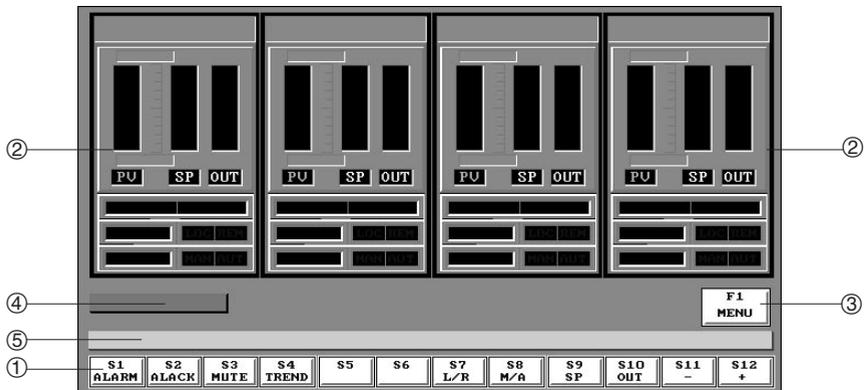
- ① The TOUCHES symbol that displays the commands required for controlling PID controllers (using FAV) or the TOUCHES1 symbol that displays the commands required for controlling other controllers (FAV1 to FAV7),
- ② One or more FAV symbols of the same type that display the status of the control loops. It is only possible to display a maximum of four front panels per screen when using FAV, FAV1 to FAV4 and FAV6 to FAV9 symbols and only three when using the FAV5 symbol (although it is possible to enter 4 of them). If the number of loops to display exceeds the maximum allowed, it is necessary to create more than one supervisory control screen. **Attention: a single supervisory control screen can only contain one type of symbol: FAV or FAV1 or FAV2, etc.**

The configuration of the PROCESS CONTROL (REGULATION) task in PL7-MMI 37 restricts the number of controller front panels that can be used in the supervisory control screens to 32 FAV (PID), 20 FAV1 (PIDF), 10 FAV2 (PIDMC), 10 FAV3 (PIDAT), 5 FAV4 (MOTOR), 5 FAV5 (HCOOL), 5 FAV6 (PIDFZ), 5 FAV7 (RATIO), 5 FAV8 (RM) and 5 FAV9 (PIDFF).

The number of interface front panels is limited to 10 FAVIN (ANIN) and 10 FAVOUT (ANOUT).

It is possible to exceed this number by symbolizing the required elements in SDBASE (see section 2.7-2).

- ③ A key that returns the user to the MENU screen (or to the previous screen),
- ④ A field required for multiplexing the various process controller front panels. In operation, this screen is used for local entry of Setpoint and Process Variable parameters,
- ⑤ An optional field, for displaying a copy of the Alarm task banner line. **So that all alarm information can be displayed in normal operation, this field should cover the entire width of the screen.**



---

The section numbers in brackets refer to Part A of the PL7-MMI 37 documentation describing the Graphics Editor GED.

The various operations for creating a supervisory control screen are as follows. They can be simplified by the use of the pre-drawn SCREEN screen.

- ① Define the screen background color. To do this:
  - Select the background color (section 2.22),
  - Replace the background color with the selected color (section 2.4),
- ② Retrieve the TOUCHES or TOUCHES1 symbol (section 2.10),
- ③ Retrieve the selected FAV symbol (section 2.10). Repeat this operation as many times as there are front panels to draw.

**Attention:**

**The activation of symbols in operation will take place in the order in which they were created.**

**If the ERASE or SYMBOL (COPY, REPLACE, OVERLAY, etc.) functions are used to modify the location of the symbols, the Animation Editor must be used to delete all references to symbols that no longer exist graphically. To perform this operation, use the Cancel action in the Library menu in the Animation Editor ANT.**

- ④ Draw the other graphic objects: One command button, the multiplexing field and the alarm banner line (sections 2.7 and 2.17),
- ⑤ Define the color of the graphic objects drawn in step ④ (section 2.11),
- ⑥ Define and place the text (section 2.9) for the graphic objects drawn in step ④ (section 2.9),
- ⑦ Save the screen, e.g. OVEN\_4 (section 2.6)

**Using the SCREEN screen**

Having edited the SCREEN file, perform operations ③ and ⑦.

---

### 2.2-6 Exiting the Graphic Editor

This operation uses the EXIT icon (see section 2.4).

**Attention**

**This operation does not automatically save the generated screens.**

---

## 2.3 Defining Animations

---

### 2.3-1 Introduction

The Animation Editor ANT, is accessed by selecting **Animation Editor ANT** in the **Create** menu. It lets the user define animation on a static screen that has been drawn previously under GED. Since animation is attached to a static screen, the first action is to open the corresponding file. To do this pull down the **File** menu in the Animation Editor ANT and select the **Open** action. Doing this displays a dialog box that lists all of the files to animate. Select the file to open, e.g. OVEN\_4 or MENU and confirm the selection made.

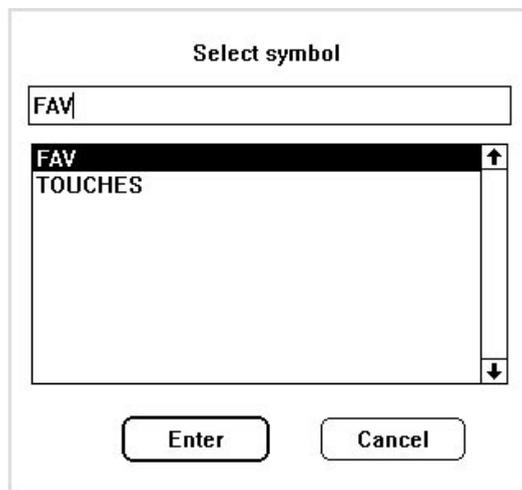
---

### 2.3-2 Animating a Symbol

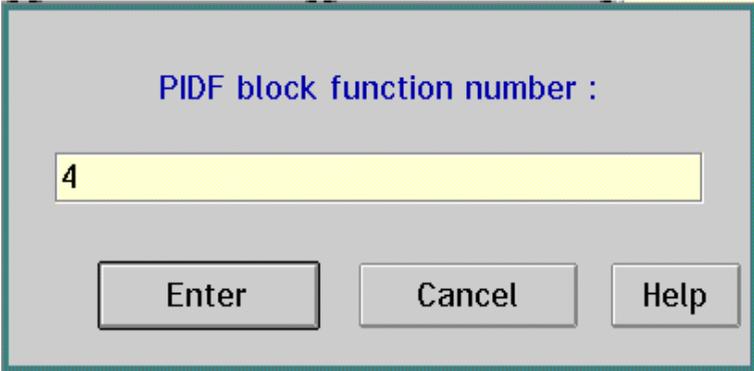
The FAV, PFAV or TOUCHES symbols are part of a library of symbols, **but they are not part of the current screen**. To include them, follow the procedure below:

#### FAV or PFAV symbols

- ① Pull down the **Library** menu and select **Use**. The next dialog box which lists the symbols available for the currently displayed screen will be displayed:



- ② Select the symbol to animate: e.g. FAV, then confirm the selection. A message is displayed to remind the user of the functions of the mouse buttons:
  - The right mouse button selects the next symbol when there are a number of symbols of the same type in the screen (e.g. more than one FAV symbol),
  - The left mouse button lets the user define the animation to use for the selected symbol.Click on the OK button to delete the dialog box. The first symbol of the selected type is framed with a dotted line.
- ③ Move the dotted line until it surrounds the symbol to animate by clicking on the right mouse button.
- ④ Start the definition of the animations required for the selected symbol by clicking on the left mouse button. A dialog box is displayed. For example :



PIDF block function number :

4

Enter Cancel Help

- ⑤ Define the number of the OFB that will be assigned to the selected front panel. Confirm the entry made. Once this is done, the user can define the animation required for the symbol. The maximum number of symbols available as standard are 32 FAV, 20 FAV1, 10 FAV2, 10 FAV3, 5 FAV4, 5 FAV5, 5 FAV6, 5 FAV7, 5 FAV8 and 5 FAV9. Each FAV symbol is assigned to a controller OFB (refer to section 2.2).
- ⑥ Once animations are defined for the first FAV symbol, repeat steps ① to ⑤ for each of the other symbols of the same type.

**Note**

If two numbers are assigned to the same controller front panel, multiplexing is impossible. The user must then delete all existing animations (using Edit/Delete), then redefine the screen animation.

For more information on FAV and PFAV symbol animation, refer to the Appendix, section 2.7-2.

---

### **TOUCHES or TOUCHES1 Symbol**

- ① Pull down the **Library** menu and select **Use**. The complete list of symbols available is displayed.
- ② Select a symbol to animate, in this case TOUCHES1, then confirm the selection made. Read the message reminding the user of the function of the mouse button and click on OK. The TOUCHES1 symbol is displayed surrounded by a dotted line.
- ③ Start the procedure to define animations for the selected TOUCHES1 symbol by clicking on the left mouse button.

#### **Note**

Use of the Library/Create or Library/Delete action is not allowed when using predefined symbols: FAV, PFAV or TOUCHES.

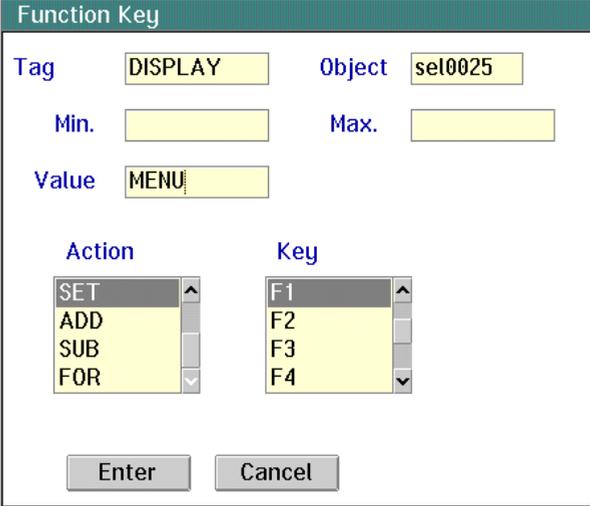
#### **Reminder**

For FAV front panels, use the TOUCHES symbol and for FAVi front panels (i = 1 to 9), use the TOUCHES1 symbol.

### 2.3-3 Animating a Function Key

This type of animation lets the user assign a change of screen to a keyboard function key (F1 in the SCREEN screen, for example). The assignment procedure is as follows:

- ① Select the graphic object to animate by positioning the cursor on it and clicking on the left mouse button. The selected object is displayed surrounded by four selection points.
- ② Pull down the **Animate** menu and select **Function Key....** The following dialog box is displayed:



The dialog box titled "Function Key" contains the following fields and controls:

- Tag:** A text field containing "DISPLAY".
- Object:** A text field containing "set0025".
- Min.:** An empty text field.
- Max.:** An empty text field.
- Value:** A text field containing "MENU".
- Action:** A list box with options: SET, ADD, SUB, FOR. "SET" is selected.
- Key:** A list box with options: F1, F2, F3, F4. "F1" is selected.
- Buttons:** "Enter" and "Cancel" buttons at the bottom.

- ③ In the Tag field enter : **DISPLAY**. This predefined variable lets the user select the current screen.
- ④ In the Value field enter : **MENU** or **OVEN\_4**. This field gives the name of the screen which is assigned to the DISPLAY variable and thereby becomes the current screen.
- ⑤ Define the action assigned to the selected keyboard function key: **SET**. This action assigns the screen defined by the Value screen to the variable defined in the Tag field.
- ⑥ Define the keyboard key assigned to the SET action: **F1** or **F2**.
- ⑦ Confirm the selections and entries made.

### 2.3-4 Animating the Alarm Banner Line

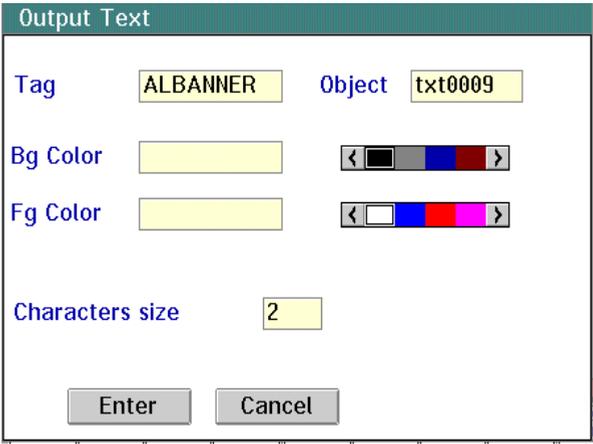
Animating the alarm banner line is done by assigning the ALARMS task alarm banner line to the graphics zone drawn using GED. Proceed as follows:

- ① Select a graphic object to animate by positioning the cursor on it and clicking on it with the left mouse button. The object will remain displayed with four selection points around it.

#### Attention

**When the object is selected, the cursor is positioned in the lower left corner of the first character of the alarm message.**

- ② Pull down the **Animate** menu and select **Output Text....** The following dialog box is displayed:



The screenshot shows a dialog box titled "Output Text". It has the following fields and controls:

- Tag:** A text box containing the text "ALBANNER".
- Object:** A text box containing the text "txt0009".
- Bg Color:** A yellow text box followed by a color palette with four color swatches: black, grey, blue, and red.
- Fg Color:** A yellow text box followed by a color palette with four color swatches: white, blue, red, and magenta.
- Characters size:** A text box containing the number "2".
- Buttons:** "Enter" and "Cancel" buttons at the bottom.

- ③ In the Tag field enter : **ALBANNER**. This predefined variable lets the user assign the ALARMS task alarm banner to the selected graphics field.
- ④ Select the background color. The selected color must be the same as that of the banner drawn in GED.
- ⑤ Select the character color. The message displayed by the alarm banner line will be displayed in this color.
- ⑥ Confirm the selections made.

### 2.3-5 Modifying the Value Display Format

Each front panel displays the process variable (or true ratio coefficient), setpoint (or internal ratio coefficient) and output values of the corresponding PID (or RATIO) controller. A default display format is used to display this information:

- 5 characters (xxx.x) for the process variable,
- 5 characters (xxx.x) for the setpoint,
- 5 characters (xxx.x) for the output value.

As the process variable (or true ratio coefficient) and setpoint (or internal ratio coefficient) are displayed in physical units, it is possible to modify their display format. However, to ensure that the display format remains comparable, this change must be made for both measurement values. Use the following procedure:

- ① Select the value display field to modify. To do so, place the cursor on this field and click on the left mouse button. The selected value is displayed with four selection points around it and an icon is displayed to show that the object is already animated.

**Attention : when the selection is made, the cursor is in the lower left corner of the first character displayed.**

- ② Pull down the **Animate** menu and select **Output Num...**, this will display a dialog box. For example the dialog box shown below if the display field for the process variable of the PIDF1 OFB is selected:

Output Num.

<b>Tag</b>	<input type="text" value="NIVEAU"/>	<b>Object</b>	<input type="text" value="nbr0001"/>
<b>Format</b>	<input type="text" value="99.9"/>		
<b>Bg Color</b>	<input type="text" value=""/>		<input type="button" value="◀"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="▶"/>
<b>Fg Color</b>	<input type="text" value=""/>		<input type="button" value="◀"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="▶"/>
<b>Blink</b>	<b>Colors</b>	<b>Limits</b>	
NONE	<input type="button" value="◀"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="▶"/>	<input type="text" value="0"/>	
NONE	<input type="button" value="◀"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="█"/> <input type="button" value="▶"/>	<input type="text" value="0"/>	
<b>Characters size</b>	<input type="text" value="2"/>		
<input type="button" value="Enter"/> <input type="button" value="Cancel"/>			

#### Note

Double-clicking in the display field will display the dialog box without calling it up via the Animate menu.

- 
- ③ Place the cursor on the first character in the **Format** field, then click on and hold down the left mouse button and drag the mouse cursor to select all of the characters. All selected characters will be highlighted in reverse video.
  - ④ Clear the Format field by pressing the <Del> or <Backspace> keys.
  - ⑤ Define the new format by entering a row of nines (up to 6 characters allowing for the sign and decimal point). E.g. 99.9 or 999999.
  - ⑥ Confirm the new animation parameters.

**Note**

The display format used for the output value should not be modified.

---

### 2.3-6 Modifying the Setpoint Increment Value

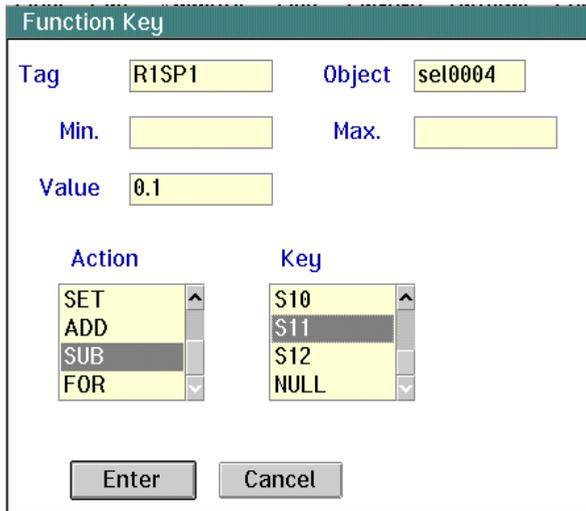
During normal operation, the user can locally modify the setpoint value (or internal ratio coefficient) or the controller output value either by entering a new value or by incrementing or decrementing the current value (using keys S12 + or S11 -). The default increment is 0.1, but this value can be modified **only for the setpoint (or internal ratio coefficient)**. Use the following procedure:

- ① Using the mouse to position the cursor, click on the left mouse button to:
  - When using an FAV front panel:
    - Select the "loop" in the letter P (\*) in PV to modify its incrementation value,
    - Select the "loop" in the letter P (\*) in SP to modify its decrementation value.
  - When using an FAV1 front panel:
    - Select the "center of the oblique part (\*)" of the letter S in SP to modify its incrementation value,
    - Select the "center of the vertical part (\*)" of the letter P in SP to modify its decrementation value.
  - When using an FAV2 to FAV6, FAV8 and FAV 9 front panel:
    - Select the "center of the oblique part (\*)" of the letter S in SP to modify its incrementation value,,
    - Select the "loop" in the letter P (\*) in SP to modify its decrementation value.
  - When using an FAV7 front panel:
    - Select the "center of the vertical part (\*)" of the letter K in the K window to modify its incrementation value,
    - Select within the K window to modify its decrementation value.

Once this is done the object is displayed with 4 selection points around it and an icon is displayed showing that the object is already animated.

(\*) These selection fields can also be selected from the **Edit** menu, **Find symbol** or **Find object** function that displays a list of symbols used and their assigned objects. Select from the list the corresponding symbol: **R1SPi [selxxx]** and confirm the selection. The selection field is then framed with four points and an icon is displayed showing that the element is already animated.

- ② Pull down the **Animate** menu and select **Function Key...**, which displays a dialog box. E.g. the dialog box displayed below for the OFB PIDF1 setpoint:



The dialog box titled "Function Key" contains the following fields and controls:

- Tag:** R1SP1
- Object:** sel0004
- Min.:** (empty field)
- Max.:** (empty field)
- Value:** 0.1
- Action:** A list box with options SET, ADD, SUB, and FOR. SUB is currently selected.
- Key:** A list box with options S10, S11, S12, and NULL. S11 is currently selected.
- Buttons:** Enter and Cancel.

- ③ Place the cursor on the first character in the **Value** field, then press the left mouse button and drag the mouse cursor to select all of the characters. They are highlighted in reverse video.
- ④ Clear the Value field by pressing the <Del> or <Backspace> keys.
- ⑤ Enter the new incrementation value. E.g. 0.5 or 10.
- ⑥ Confirm the new animation parameters.

---

### 2.3-7 Testing the Animations

This test is not required but recommended as it lets the user check that the displays are correctly located for normal operation. If a display is incorrectly positioned within the display field, the user must correct the corresponding animation, taking care with the position of the cursor when selecting the object. The cursor position used corresponds in operation to the lower left corner of the first character displayed. To run a test of the animations:

- ① Pull down the **Test** menu and select **Test**.
- ② Display the animations by clicking on the left mouse button. Refer to section 3.14, Part A of the PL7-MMI 37 documentation (TXT DM PL7 M37 V52E).
- ③ Quit the test function by clicking on the right mouse button.

### 2.3-8 Multiplexing Symbols and Symbol Elements

**Multiplexing is the last operation to perform on-screen. It is required for all screens that contain at least one FAV symbol (FAV1 to FAV 9).**

It lets the user assign a single keyboard action: value entry, setpoint status selection or operating mode selection to more than one controller front panel of the same type. This is done from a single common input: data entry field or keyboard key.

**An animated screen can only contain a single set of multiplexed inputs.**

**Modification of a screen comprising a multiplexer must always follow the procedure described in section 2.3-9.**

The number of symbols to multiplex (or number of occurrences) is given by the number of FAV symbols displayed: a maximum of 3 for FAV5 and 4 for other FAVs.

For each symbol, the number of elements that must be multiplexed is 2 for FAV7 (RATIO), 5 for FAV5 (HCOOL) and 4 for other FAVs:

- The setpoint (or ratio coefficient) status selection field,
- The process controller operating mode selection field (except FAV7),
- The setpoint (or ratio coefficient) value entry field in offline mode,
- Output value entry field in manual operating mode (except for FAV7). FAV5 (HCOOL) has two output value data entry fields: a "hot" output and a "cool" output.

#### Note

If the screen is an SVGA type, the window in which PL7-MMI 37 is executed must be enlarged, before the multiplexer animation is defined.

To define an animation of this type:

- ① Select the graphic object reserved for multiplexing by placing the cursor on it and clicking on the left mouse button. The object will then be displayed with 4 selection points around it. In operation, this field is used to enter setpoint or output values.

#### Attention:

**When the object is selected, in operation, the cursor is positioned in the lower left corner of the first character entered.**

- ② Pull down the **Animate** menu and select **Input Selection...**
- ③ Select the symbol to multiplex: FAV then confirm the selection made. The dialog box shown on the next page is displayed:

**Input Selector**

Input       Objec

Error message:

Min.       Max.

Backg  Characters

Nb of occurrence: 2      Nb of elements 4

Previous element	Next element																
<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="text-align: center;">UP</td><td style="text-align: center;">↑</td></tr> <tr><td style="text-align: center;">PUP</td><td style="text-align: center;">□</td></tr> <tr><td style="text-align: center;">LFT</td><td style="text-align: center;">■</td></tr> <tr><td style="text-align: center;">RGT</td><td style="text-align: center;">↓</td></tr> </table>	UP	↑	PUP	□	LFT	■	RGT	↓	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="text-align: center;">DWN</td><td style="text-align: center;">↑</td></tr> <tr><td style="text-align: center;">PDN</td><td style="text-align: center;">□</td></tr> <tr><td style="text-align: center;">INS</td><td style="text-align: center;">■</td></tr> <tr><td style="text-align: center;">DEL</td><td style="text-align: center;">↓</td></tr> </table>	DWN	↑	PDN	□	INS	■	DEL	↓
UP	↑																
PUP	□																
LFT	■																
RGT	↓																
DWN	↑																
PDN	□																
INS	■																
DEL	↓																

Character size

- ④ Enter the name of the Input variable: Up to a maximum of 13 characters. Valid characters are:
  - First character: A-Z, a-z, @, \$, \_ or #,
  - Other characters: A-Z, a-z, 0-9, @, \$, \_ or #.
- ⑤ Select the entry field background color. This color must be the same as that selected in GED.
- ⑥ Select the color of the characters entered.
- ⑦ Select the keyboard key used to activate, in operation, the previous element of the selected symbol: UP (Cursor Up key).
- ⑧ Select the keyboard key used to activate, in operation, the next element of the selected symbol: DWN (Cursor Down key).
- ⑨ Select character size: 1,
- ⑩ Confirm the selections and entries made.

---

### 2.3-9 Modifying an Animation in a Multiplexed Selection Screen

#### 1st. case

Multiplexed animation is not yet defined. In this case it is possible to modify the animation of a previously animated object in the normal way (refer to PL7-MMI 37 documentation).

#### 2nd. case

Multiplexed animation is already defined:

- If the animation to modify is not linked to the multiplexing (all objects except function keys S7, S8, S11 and S12), modify it in the normal way then create a new multiplexing type animation,
- If the animation to modify is linked to the input selection (function keys S7, S8, S11 and S12), it is **absolutely** necessary to delete all existing animations (Edit/Delete) then redefine screen animation.

#### Remark

If this procedure is not followed, the modifications will not be accepted and the application will not be modified.

---

### 2.3-10 Saving Animations and Exiting the Animation Editor

Before quitting a screen, the user must save any animations or modifications to animations made. To do this, pull down the **Files** menu and select **Store**.

To quit the animation editor, pull down the **Exit** menu and select **Exit**.

#### Note

To delete an animated graphic, the animations must be deleted and the file closed by selecting **Exit**. Under GED, this graphic is no longer seen as animated.

### 2.3-11 Animation Corresponding to an SCL OFB (V4 Level PLC)

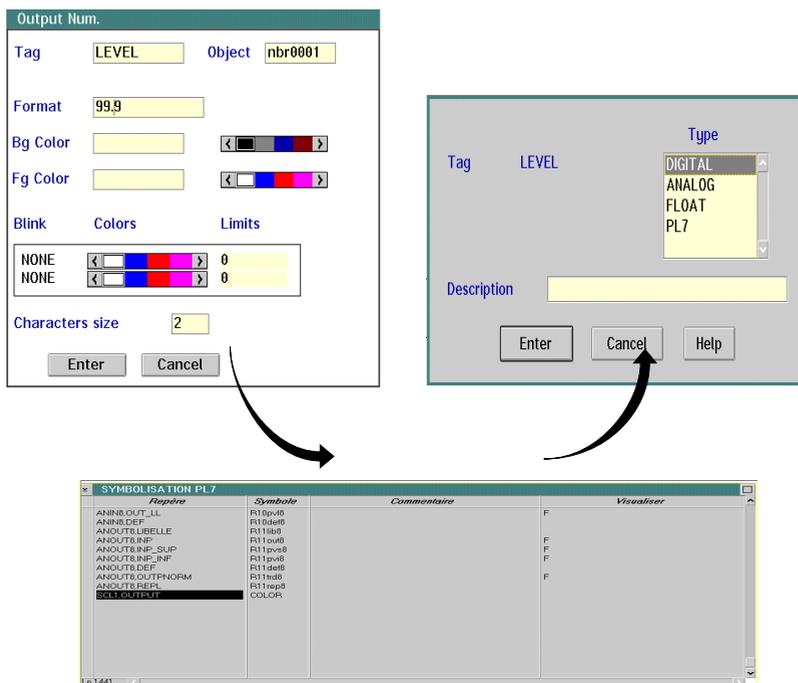
If the PLC application uses SCL function blocks for floating point display of a PL7-3 integer variable (1), the user must define a **Digital Output** type animation for each variable. Use the following procedure:

- Use GED to define an object reserved for this use in the screen where the display of the variables is required (a simple rectangle is sufficient),
- Use SDBASE to declare the symbol assigned to the variable SCLi, OUTPUT (that comprises the value to display in floating point format),
- Use ANT to define a Numeric Output animation assigned to this variable (2).

#### Note

SDBASE can be accessed from within ANT when the variable to animate is not defined.

#### Linking ANT and SDBASE definition screens



- (1) Only data from PID function blocks is automatically converted to floating point format for display. All other standard PL7-3 variables (Wi) require the use of the SCL OFB.
- (2) For more information on the procedure to follow, refer to PL7-MMI 37 documentation, section 3.9, Part A.

### 2.3-12 Animation Corresponding to an ISCL OFB (V4 Level PLCs)

If the PLC application uses ISCL function blocks so that PL7-3 can use floating point values entered by the operator (1), the user must first define a **Text Input** type animation for each one. Use the following procedure:

- Use GED to define an object reserved for this purpose in the screen where value entry is required (a simple rectangle is adequate),
- Use SDBASE to declare the symbol assigned to the ISCLi, VALUE variable (that receives the value entered by the operator),
- Use ANT to define a Text Input type animation assigned to this variable (2).

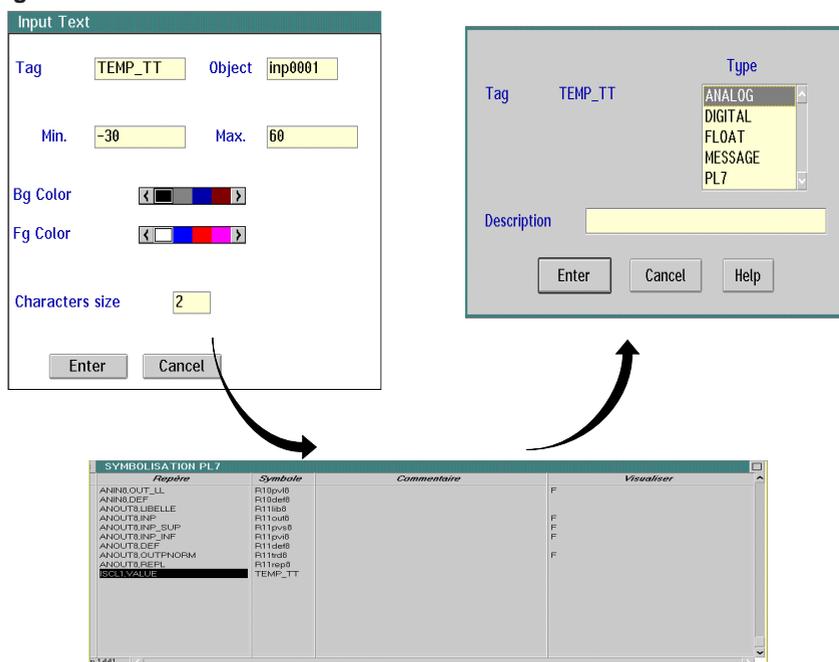
#### Reminder

The ISCLi, VALUE parameter must be declared as write only.

#### Note

SDBASE can be accessed from within ANT when the variable to animate is not defined.

#### Linking ANT and SDBASE definition screens



- (1) Only values destined for PID function blocks (setpoint, output, tuning parameters) are automatically converted from floating point to integer notation. For all other standard PL7-3 variables, the ISCL OFB must be used.
- (2) For more information on the procedures to follow, refer to PL7-MMI 37 documentation, section 3.10, Part A.

## 2.4 Defining the Process Control Password

In operation, access to tuning screens can be password protected. The password is defined during the application design phase using the following procedure:

- ① Pull down the **Generate** menu and select **Password**. The following dialog box is displayed:



The screenshot shows a dialog box titled "Passwords". It features a list box with two items: "Operation" and "Regulation". Below the list box are three input fields: "Previous password" (empty), "New" (containing "####"), and "Confirmation" (containing "####"). At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

- ② Select **Regulation**.
- ③ Perform the following operations in the sequence listed below:
  - Enter the previous password,
  - Enter the new password,
  - Confirm the new password.

Data entry is restricted to 8 characters. Blank characters (spaces) are significant. The default setting (before the first entry is made) comprises no password: "blank" password.

### Attention

**If a dedicated process control keyboard is used in normal operation TPMX KB•, use numbers for the password.**

- ④ Confirm the entries made.

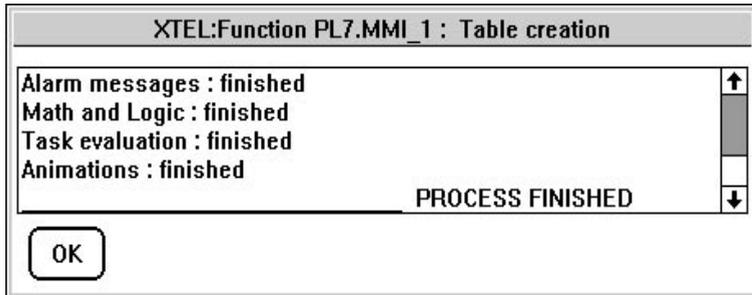
### Note

The Operation password is entered in the same way as the process control (regulation) password. It protects access to the module by transfer and control functions.

## 2.5 Generating Executable Files and Selecting Tasks

The file generation procedure is required to generate executable files for transfer to the man-machine interface module memory cartridge. Use the following procedure:

- ① Pull down the **Generate** menu and select **Table Creation** with or without a coherence check. If **With Coherence** is selected, the coherence check is performed between variables read from the XTEL-SDBASE symbols data base by the PL7-3 application and the variables read by the man-machine interface application. The following dialog box is displayed to allow the user to follow the operations taking place:



- ② When the message PROCESS FINISHED is displayed, click on the **OK** button to close the dialog box.

Task selection lets the user select the tasks used in the man-machine interface module. This lets the user define a list of files that are representative of the application. To do this:

- ③ Pull down the **Generate** menu and select **Select Tasks**, the dialog box shown on the next page is displayed:



④ Select the tasks required by the application by clicking on their name:

- ALARMS (not required),
- GRAPHIC (required),
- RUN MANAGER (required),
- FILE TRANSFER (not required),
- TIMERS (required),
- COMMUNICATION (required),
- REGULATION1 (required),
- REGULATION2 (required).

The selected tasks are highlighted in reverse video.

⑤ Confirm the selections made.

#### Notes

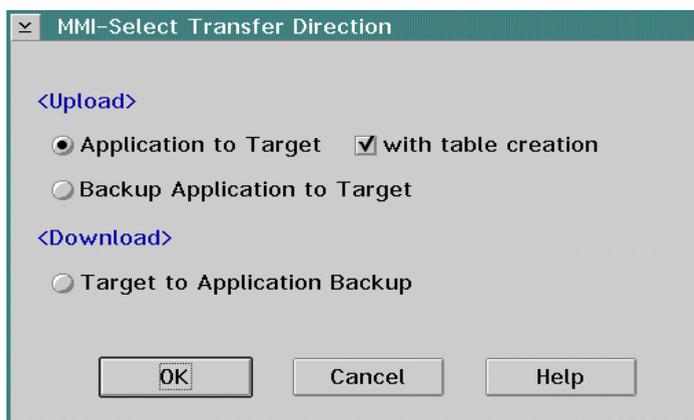
All of the required tasks must be active in normal operation (refer to the Run Manager screen description).

With PL7-MMI 37 V52, table creation is offered by default. This means it is possible to launch the file transfer to the module directly.

## 2.6 Transferring Files to the Module

This operation lets the user transfer the process control man-machine interface application to the memory cartridge in the TSX PCM 37 module. To do this:

- ① Pull down the **Transfer** menu and select **Up/Download**. After correct data entry and validation of the operating password, the following dialog box is displayed:



- ② Select **Application to Target**.
- ③ Confirm the selection made.

### Note

To transfer the application to the PCM module, the following requirements must be met:

- Terminal connected to the PLC via the PLC processor terminal port or a MAPWAY, ETHWAY, FIPWAY or FIPIO network,
- Module stopped (STOP) and the main menu displayed on-screen,
- If the module is running (RUN), ensure that the TENFT task is loaded in the module and active.

Before performing a transfer to a blank memory cartridge, it must first be formatted.

## 2.7 Appendix

### 2.7-1 Controller Front Panel Symbol Animation

This Appendix is provided for user information only, as the symbol animation procedure is fully automatic. This information may be useful when reusing the variables from these symbols elsewhere than in the pre-animated symbols.

Animating an FAV or PFAV symbol will animate the various fields within the symbol (for example, 11 for FAV or FAV1, 5 for PFAV or PFAV1, etc.).

Each field is assigned a symbol (e.g. R1PV2 for the process variable of PIDF2), that designates a data object or constant of the PIDF OFB assigned to the FAV1 symbol.

Correspondence between symbols used by PL7-MMI 37 and the controller OFB variables is ensured by XTEL-SDBASE. The correspondence table is generated when the process control (Regulation) option is declared (refer to section 1.3).

#### Example for the PID2 OFB

PL7-3 Variable	Symbol	Description
PID2,LIBELLE	Rlibel2	Loop name
PID2,UNIT	Runphy2	Process variable unit
PID2,S_PV	Rpvsc12	Process variable value
PID2,S_SP	Rspsc12	Setpoint value
PID2,S_OUT	Rousc12	Output value
PID2,S_PVMAX	Rpvsup2	Max. PV value
PID2,S_PVMIN	Rpvinf2	Min. PV value
PID2,S_PVHL	Rpvhl2	PV high level alarm
PID2,S_PVLL	Rpvll2	PV low level alarm
PID2,SP_RSP	Rtypsp2	Local/remote setpoint
PID2,MAN_AUTO	Rtypma2	MAN./AUTO. controller status

#### Example for the PIDF3 OFB

PL7-3 Variable	Symbol	Description
PIDF3,LIBELLE	R1lib3	Loop name
PIDF3,UNIT	R1unit3	Process variable unit
PIDF3,PV_USED	R1pv3	Process variable value
PIDF3,SP_USED	R1sp3	Setpoint value
PIDF3,OUT_MAN	R1out3	Output value
PIDF3,PV_SUP	R1pvs3	Max. PV value
PIDF3,PV_INF	R1pvi3	Min. PV value
PIDF3,PV_HL	R1pvhl3	PV high level alarm
PIDF3,PV_LL	R1pvll3	PV low level alarm
PIDF3,SP_RSP	R1spr3	Local/remote setpoint
PIDF3,MAN_AUTO	R1ma3	MAN./AUTO. controller status

The symbols used by PL7-MMI 37 can also be reused without the pre-animated symbols, if necessary. For example, to display a Process Variable in a synoptic screen or to compare a value with a threshold in the ALARM task.



### 2.7-2 Application Exceeding the Maximum Number of Controllers Available Under SDBASE

The number of floating-point type addressable objects available to PL7-MMI 37 is 512. This maximum number must be shared between all tasks and symbols that use this type of object.

For process control applications, remember:

- The process control (regulation) task uses 14 floating-point objects,
- Each FAV, FAV1, FAV2, FAV3, FAV4, FAV6 and FAV7 front panel display uses seven and each FAV5, 8 floating-point objects:

Object	FAV Symbol	Description
S_PV/PV_USED/KACT	Rpvsc <i>i</i> /RxPV <i>i</i> /R7KACT <i>i</i>	Process variable value
S_SP/SP_USED/K	Rspsc <i>i</i> /R1SP <i>i</i> /R7K <i>i</i>	Setpoint value
S_OUT/OUT_MAN/OUTP	Rousc <i>i</i> /R1OUT <i>i</i> /R7OUTP <i>i</i>	Output value
OUTH_W/OUTC_W	R5OUTH_W <i>i</i> /R5OUTC_W <i>i</i>	Output value (HCOOL)
S_PVMAX/PV_SUP/K_SUP	Rpvsup <i>i</i> /R1PVSi /R7SUP <i>i</i>	PV max. value
S_PVMIN/PV_INF/K_INF	Rpvinf <i>i</i> /R1PVLi /R7INF <i>i</i>	PV min. value
S_PVHL/PV_HL/KACT_HL	Rpvhl <i>i</i> /R1PVHLi /R7KHLi	PV high level alarm
S_PVLL/PV_LL/KACT_LL	Rpvll <i>i</i> /R1PVLLi /R7KLLi	PV low level alarm

As long as the number of floating point type objects remains below 512, it is possible to exceed the maximum number of controllers symbolized in the XTEL-SDBASE data base when the PROCESS CONTROL (REGULATION) task is configured: 32 PID, 20 PIDF, 10 PIDMC, 10 PIDAT, 5 MOTOR, 5 HCOOL, 5 RATIO, 5RM and 5 PIDFF. To do this, enter the corresponding OFB objects in the XTEL-SDBASE database, using the same format as those already listed there. For example, for the PIDF22 OFB:

PL7-3 Variable	Symbol
PIDF22,LIBELLE	R1libl22
PIDF22,UNIT	R1unit22
PIDF22,PV_USED	R1PV22
PIDF22,SP_USED	R1sp22
PIDF22,OUT_MAN	R1out22
PIDF22,PV_SUP	R1pvs22
PIDF22,PV_INF	R1pvi22
PIDF22,PV_HL	R1pvhl22
PIDF22,PV_LL	R1pvll22
PIDF22,SP_RSP	R1spr22
PIDF22,MAN_AUTO	R1ma22

#### Attention

PL7-PMS2 can only support up to 68 controllers (it is restricted by the capacity of the LOOP screen).

---

As PL7-MMI 37 does not perform any checks, the user must ensure that the application does not use more than 512 floating-point type objects. To ensure that this limit is not exceeded, check that not only the objects used by the process control task (process control) but those used by other PL7-MMI 37 tasks (floating-point variables in the Math and Logic task, floating point variables used for displaying values via the SCL and ISCL OFBs, etc.). The table below shows a list of the number of floating point objects used:

<b>Element</b>	<b>Number of floating point variables (FLOAT)</b>
Process Control Task	14
1 FAV controller	7
1 FAV1 controller	7
1 FAV2 controller	7
1 FAV3 controller	7
1 FAV4 controller	7
1 FAV5 controller	8
1 FAV6 controller	7
1 FAV7 controller	7
1 FAV8 controller	8
1 FAV9 controller	8
1 x FAVIN interface	5
1 x FAVOUT interface	4

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# Using a Man-Machine Interface Application

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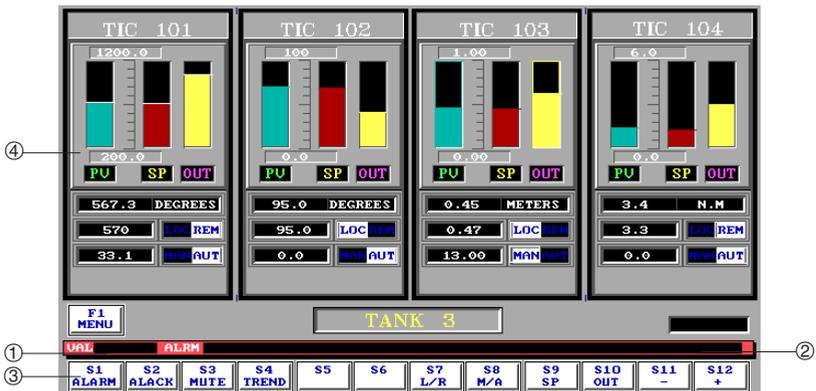
**B**

<b>Section</b>	<b>Page</b>
<b>1 Supervisory Control Screen</b>	
1.1 Screen Description	1/1
<b>2 Tuning Screens</b>	
2.1 Trend Screen Description	2/1
2.2 Tune Screen Description	2/5
<b>3 Control Loop Tuning Methodology</b>	3/1
<b>4 Process Control Operator Interface Keyboard</b>	4/1

**B**



## 1.1 Screen Description



This screen lets the user control the process control application. In this example, it is split into four parts:

- ① Data entry zone,
- ② Alarm banner line display,
- ③ Command display zone,
- ④ The controller front panel dynamic display zone.

### Data entry zone

This lets the user check the newly entered value for each selected field: setpoint or manual output value. <Enter> confirms the entries made.

### Alarm banner line display

This displays the alarm banner line controlled by the Alarms function. The information displayed includes the time the alarm occurred, D if the alarm was generated by a diagnostics OFB, \* if the alarm requires acknowledgment, the symbol name assigned to the variable that identifies the alarm, the message assigned to the alarm and the total number of alarms active at that time.

### Reminder

A supervisory control screen can only comprise controllers of the same type. In addition, if HCOOL type controllers are used, the screen can only comprise 3 front panel displays and not 4.

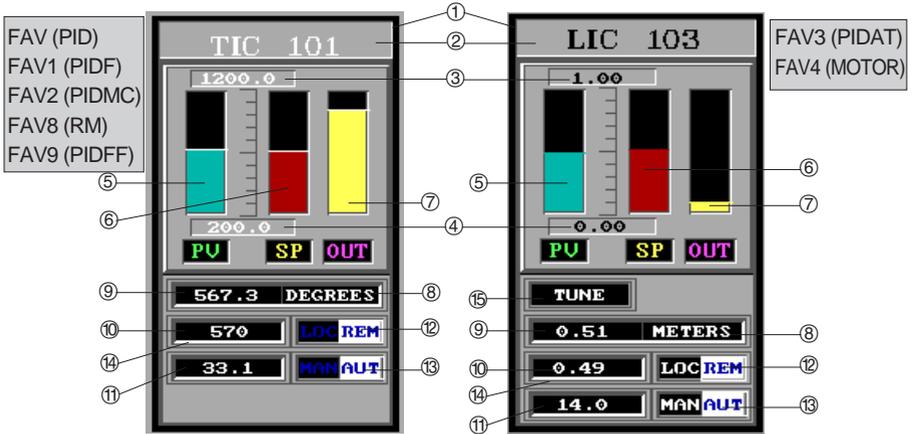
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## Command display zone

This field displays all of the commands that can be accessed by the user: command name and its assigned keyboard key:

- |                                   |   |
|-----------------------------------|---|
| <b>MENU &lt;F1&gt;</b>            | Displays the MENU screen.   |
| <b>ALARM &lt;S1&gt;</b>           | Displays the List of Alarms screen.   |
| <b>ALACK &lt;S2&gt;</b>           | Lets the user acknowledge the oldest as yet unacknowledged alarm displayed in the list of alarms. Once an alarm is acknowledged, the asterisk shown in front of the symbol is deleted and the alarm message takes the appropriate defined acknowledged alarm colors.  |
| <b>MUTE &lt;S3&gt;</b>            | If an audible alarm is triggered by an alarm, this command lets the operator mute it.   |
| <b>TREND &lt;S4&gt;</b>           | Displays the TREND tuning screen. To gain initial access to this screen, the user must first select a control loop to display the trending curves and corresponding parameters.   |
| <b>L/R &lt;S7&gt;</b>             | Modifies the type of setpoint for the selected controller: Local (LOC) or Remote (REM) setpoint. If a RATIO controller is selected, it modifies the type of internal ratio coefficient.   |
| <b>M/A &lt;S8&gt;</b>             | Modifies the operating mode of the selected process controller: Manual (MAN) or Automatic (AUT) mode.   |
| <b>SP &lt;S9&gt;</b>              | Activates the "setpoint value" (or "internal ratio coefficient" field for the selected controller. This field is then displayed with a frame and its value can be modified if LOC is selected.  |
| <b>OUT &lt;S10&gt;</b>            | Activates the "output value" field for the selected controller. This field is then displayed with a frame and its value can be modified if MAN is selected. If an HCOOL controller is selected, it activates the "hot output value" field. To access the "cool output value" field, use the cursor up and cursor down keys. |
| <b>- &lt;S11&gt;</b>              | Lets the user change the value of the selected field, by decrementing it: setpoint (or internal ratio coefficient) or manual output.  |
| <b>+ &lt;S12&gt;</b>              | Lets the user change the value of the selected field, by incrementing it: setpoint (or internal ratio coefficient) or manual mode output value.   |
| <b>&lt;&lt;-&gt;&lt;-&gt;&gt;</b> | Let the user select a controller front panel.   |
| <b>&lt;↑&gt;&lt;↓&gt;</b>         | Let the user define the active field in the selected controller front panel: setpoint (or internal ratio coefficient), output value (or hot/cool output values), type of setpoint (or internal ratio coefficient) or controller operating mode.   |
| <b>&lt;Enter&gt;</b>              | Confirms the entries made. The selected field will then display the newly entered value.  |

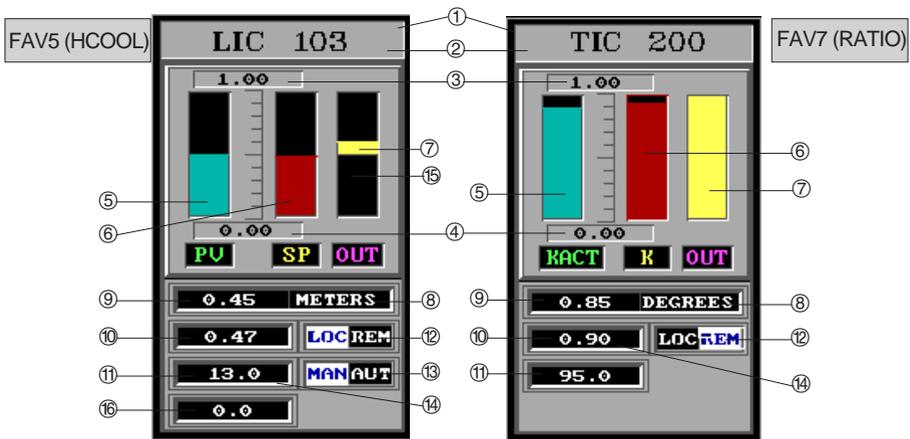
### Controller front panel dynamic display fields



- ① This field is colored to indicate the selected controller. Use the horizontal cursor keys to make the selections.
- ② Name of the control loop.
- ③ Upper limit of the process variable scale range, in physical units.
- ④ Lower limit of the process variable scale range, in physical units.
- ⑤ Process variable bargraph.
- ⑥ Setpoint bargraph.
- ⑦ Output level bargraph.
- ⑧ Type of physical units.
- ⑨ Process variable, expressed in physical units.
- ⑩ Setpoint value, expressed in physical units.
- ⑪ Output value, expressed as a percentage or in physical units (PIDFF).
- ⑫ Type of setpoint used: Local (LOC) or Remote (REM).
- ⑬ Controller operating mode: Manual (MAN) or Automatic (AUT).
- ⑭ This field is colored to indicate the selected parameter that can then be modified:
  - Modification of the value by entering a new value or by pressing keys S11 and S12,
  - Modification of the type of setpoint or controller operating mode by pressing keys S7 and S8.

The cursor up and down keys let the user select the various zones for the current controller: SP value, output value, type of SP, controller operating mode.

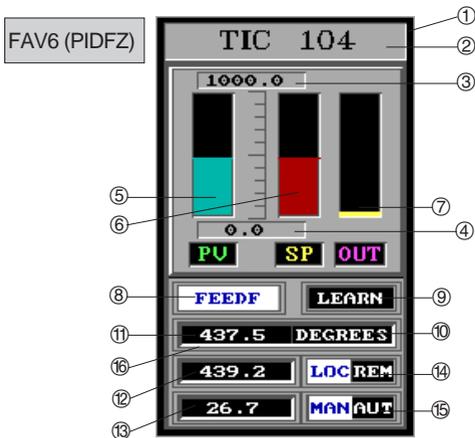
- ⑮ TUNE (PIDAT) indicator, lit to show that the controller is performing its self-tuning or POT (MOTOR) indicator, lit to show that the controller is using the motor position feedback signal.



- ① This field is colored to indicate the controller selected. Use the horizontal cursor keys to make selections.
- ② Name of the loop.
- ③ Upper limit of the process variable (HCOOL) or of the internal ratio coefficient (RATIO), expressed in physical units.
- ④ Lower limit of the process variable (HCOOL) or of the internal ratio coefficient (RATIO), expressed in physical units.
- ⑤ Bargraph showing the process variable (HCOOL) or the internal ratio coefficient (RATIO).
- ⑥ Bargraph showing the setpoint value (HCOOL) or the internal ratio coefficient (RATIO).
- ⑦ Bargraph showing the "hot" output (HCOOL) or the calculated ratio output (RATIO).
- ⑧ Type of physical units.
- ⑨ Process variable (HCOOL) or the internal ratio coefficient (RATIO), expressed in physical units.
- ⑩ Setpoint value (HCOOL) or the internal ratio coefficient (RATIO), expressed in physical units.
- ⑪ Value of the "hot" output (HCOOL) or the internal ratio "coefficient" (RATIO), expressed as a percentage.
- ⑫ Type of setpoint (HCOOL) or internal ratio coefficient (RATIO) used: LOCAL or REMote.
- ⑬ Controller operating mode: Manual (MAN) or Automatic (AUT).
- ⑭ This field is colored to indicate the selected parameter that can then be modified:
  - Modification of the value by entering a new value or by pressing keys S11 and S12,
  - Modification of the type of setpoint (or internal ratio coefficient) or the controller operating mode by pressing keys S7 and S8.

The cursor up and down keys let the user select the various zones for the current controller: setpoint value, output value, type of setpoint, controller operating mode.

- ⑮ Bargraph showing the "cool" output from the HCOOL controller.
- ⑯ Value of the "cool" output from the HCOOL controller, expressed as a percentage.



- ① This field is colored to indicate the controller selected. The controller is selected by using the horizontal cursor up and down keys.
- ② Name of the loop.
- ③ Upper limit of the process variable, expressed in physical units.
- ④ Lower limit of the process variable, expressed in physical units.
- ⑤ Process variable bargraph.
- ⑥ Setpoint bargraph.
- ⑦ Output level bargraph.
- ⑧ FEEDF indicator which lights to show that the controller is using adaptive feedforward.
- ⑨ LEARN indicator which lights to show that the controller is learning the fuzzy logic rules.
- ⑩ Type of physical units.
- ⑪ Process variable, expressed in physical units.
- ⑫ Setpoint value, expressed in physical units.
- ⑬ Output value, expressed as a percentage.
- ⑭ Type of setpoint used : Internal (LOC) or External (REM).
- ⑮ Controller operating mode : Manual (MAN) or Automatic (AUT).
- ⑯ This field is colored to indicate the selected parameter that can then be modified:
  - Modification of the value by entering a new value or by pressing keys S11 and S12,
  - Modification of the type of setpoint or controller operating mode by pressing keys S7 and S8.

The cursor up and down keys let the user select the various zones for the current controller: setpoint value, output value, type of setpoint, controller operating mode.



## 2.1 TREND Screen Description

This screen is the first of the tuning function as it lets the user select the control loop to tune. Once the selection is made, it displays the trend of the process variable, setpoint and output from the assigned controller (true ratio coefficient, internal ratio coefficient and calculated ratio output for a RATIO controller).

The first time a tuning view is called-up, the screen is "blank" of useful information as no control loop has yet been selected. **Therefore the user must first select a control loop (via key S5), before attempting to perform any other tuning operations:** e.g. accessing the TUNE screen.

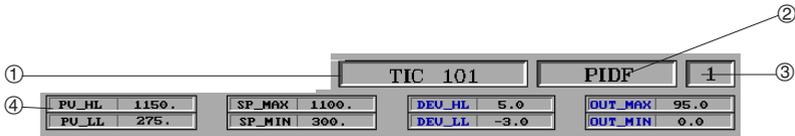


This screen is split into three main fields:

- ① Control loop thresholds and limit values display zone,
- ② Graphics zone,
- ③ Command display zone.

Like the supervisory control screen, this screen also comprises a data entry zone ④ and an alarm banner line display ⑤.

## Loop parameter display field



- ① Control loop name,
- ② Type of controller: PID, PIDF, PIDMC, PIDAT, MOTOR, HCOOL, PIDFZ, RATIO, RM OR PIDFF,
- ③ Controller number,
- ④ Loop parameters:
  - PV\_HL and PV\_LL: process variable higher and lower thresholds or KACT\_HL and KACT\_LL: higher and lower true ratio coefficient (RATIO controller) thresholds,
  - SP\_MAX and SP\_MIN: setpoint higher and lower limits or K\_MAX and K\_MIN higher and lower internal ratio coefficient limits,
  - DEV\_HL and DEV\_LL: higher and lower thresholds for the calculated deviation,
  - OUT\_MAX and OUT\_MIN: output (or outputs for HCOOL controller) level higher and lower limits.

## Graphics zone



- 
- ① Time base that defines the period between two points on a trending curve: 2s, 3s, 4s, 5s, 6s, 8s, 10s, 12s, 15s, 18s, 24s, 30s, 36s, 48s, 60s, 90s, 120s and 180s.
  - ② Time required to display all of the points of a trending curve: 500 points visible on-screen x Time Base.
  - ③ Trending curves that display the respective changes in the process variable, setpoint and output values (or true ratio coefficient, ratio coefficient and calculated ratio output coefficient for a RATIO controller). For an HCOOL controller, the curve represents the "cool" (OUTPID between 0 and 50%) or the hot (OUTPID between 50 and 100%) output.
  - ④, and ⑤  
Bargraph that displays the process variable and the setpoint respectively (or the true ratio coefficient and the internal ratio coefficient for a RATIO controller).
  - ⑥ Bargraph that displays the output value (or the calculated ratio output for a RATIO controller). This bargraph is not used for an HCOOL controller.
  - ⑦ Higher and lower thresholds of the process variable full scale range (or the true ratio coefficient for a RATIO controller), expressed in physical units.
  - ⑧ Process variable (or the true ratio coefficient for a RATIO controller), expressed in physical units.
  - ⑨ Type of physical units.
  - ⑩ Setpoint value (or the ratio coefficient for a RATIO controller), expressed in physical units.
  - ⑪ Type of setpoint (or the ratio coefficient for a RATIO controller), used: Local (LOC) or Remote (REM).
  - ⑫ Output value, expressed as a percentage or in physical units (PIDFF). For an HCOOL controller, this field displays the value of the "hot" output.
  - ⑬ Controller operating mode: Manual (MAN) or Automatic (AUT). This field has a colored frame to indicate that it is selected and that its value can therefore be modified.
  - ⑭ New value entry zone, for the selected field: internal setpoint (or ratio coefficient) or output value in manual operating mode. <Enter> confirms the entries made.
  - ⑮ Error and information message display zone.
  - ⑯ Bargraph showing the output from the HCOOL controller.
  - ⑰ POT indicator, when lit indicates that the MOTOR controller is using the electric motor position feedback signal. The TUNE indicator, when lit indicates that the PIDAT controller is performing self-tuning.
  - ⑱ Value of the HCOOL controller "cool" output.

---

## Command display zone

This field displays all of the commands that can be accessed by the user: with the command name and its assigned key:

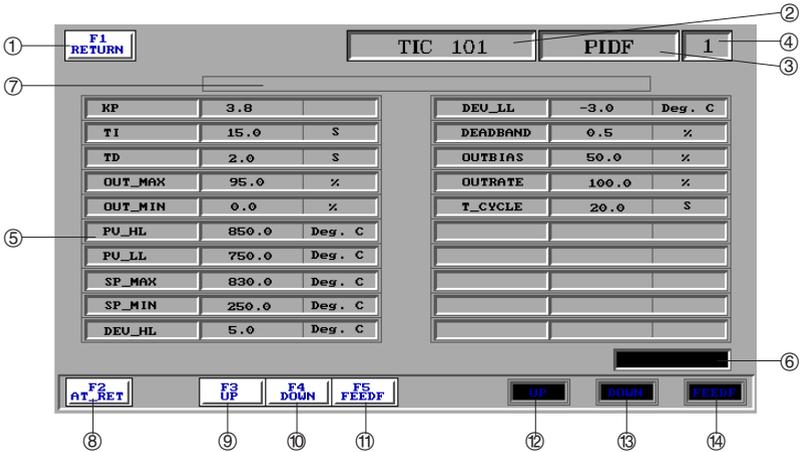
- RETURN <F1>** Displays the previous screen.
- SAVE <F2>** Saves all of the control loop tuning parameters (refer to Part C8). **This requires that the application be stored in a backed-up RAM cartridge.** No message indicates that the data was not saved if an EPROM cartridge is used.
- TIME <F3>** Modifies the time base by prompting the user with preset values.
- MENU <F4>** Displays the MENU screen.
- A\_TUNE <F5>** Starts the PIDAT controller self-tune function. The TUNE indicator lights.
- ALARM <S1>** Displays the List of Alarms screen.
- ALACK <S2>** Lets the user acknowledge the oldest unacknowledged alarm in the list of alarms. When an alarm is acknowledged, the asterisk in front of the symbol is removed and the alarm message takes the preset acknowledgment colors.
- MUTE <S3>** If an audible warning is sounded when an alarm occurs, this command lets the user mute it.
- <S4>** Not used.
- LOOP <S5>** Displays a screen that lets the user select the control loop to tune.
- TUNE <S6>** Displays the screen that lets the user set the control loop parameters.
- L/R <S7>** Modifies the type of controller setpoint or internal ratio coefficient (RATIO): Local (LOC) or Remote (REM) setpoints.
- M/A <S8>** Modifies the controller operating mode: Manual (MAN) or Automatic (AUT) mode.
- SP <S9>** Activates the "setpoint value" field. This field is highlighted and the user can then change its value.
- OUT <S10>** Activates the "output value" field. This field is highlighted and the user can then change its value. For an HCOOL controller, this key moves the cursor to the "hot" output field. The cursor up and down keys are used to access the "cool" output field.
- <S11>** Lets the user modify the value of the selected field, by decrementing it. This applies to the Local setpoint or to the manual output.
- + <S12>** Lets the user modify the value of the selected field, by incrementing it. This applies to the Local setpoint or to the manual output.
- <↑><↓>** Lets the user define the active field: setpoint value, output value, type of setpoint (or internal ratio coefficient) or controller operating mode.

## 2.2 TUNE Screen Description

This screen lets the user set the internal parameters of the controller which controls the loop.

### Important

The TUNE screen can only be accessed from the TREND screen



- ① RETURN <F1>: This command displays the previous screen: TREND.
- ② Control loop name.
- ③ Type of controller: PID, PIDF, PIDMC, PIDAT, MOTOR, HCOOL, PIDFZ, RATIO, RM or PIDFF.
- ④ Controller number.
- ⑤ Control loop internal parameter display zone. This zone displays the following information for each parameter: name, current value, type of physical units. The table on the next page gives a list of parameters which can be accessed by the user, for each type of controller.
- ⑥ Data entry zone for the new value of the selected parameter.
- ⑦ Display zone for error and warning messages.
- ⑧ During PIDAT controller self-tuning, the values defined for KP, TI and TD are automatically assigned to the corresponding parameters and therefore displayed by the TUNE screen. Selecting the AT\_RET key lets the user return to the previous values if the values generated by the self-tuning procedure are unsuitable. Selecting the AT\_RET key again toggles between the self-tuning values and the previous values.
- ⑨ If the MOTOR controller is operating without a motor position feedback signal, the UP key is used to calibrate the position of the electric motor in the positive direction.

- ⑩ If the MOTOR controller is operating without a motor position feedback signal, the DOWN key is used to calibrate the position of the electric motor in the negative direction.
- ⑪ If the controller is PIDFZ type, this key lets the user "activate" or "deactivate" the adaptive feedforward.
- ⑫ If the controller is MOTOR type, this indicator is lit to signal that calibration is in progress in the positive direction.
- ⑬ If the controller is MOTOR type, this indicator is lit to signal that calibration is in progress in the negative direction.
- ⑭ If the controller is PIDFZ type, this indicator is lit to signal that the adaptive feedforward is "activated".

To modify a parameter:

- <↑><↓> Move the cursor in the corresponding field,
- <xxx> Enter the new value that will be displayed in the data entry zone,
- <Enter> Confirms the data entry made. The new value is displayed in the currently selected field.

**Note**

Access to parameter modification is protected by the process control (Regulation) password that must be entered once to stop the current tuning operation (as long as the user does not quit the tuning screens).

**List of user accessible parameters**

Name	PID, PIDF, PIDMC, PIDAT MOTOR, PIDFZ, RM and PIDFF	HCOOL	RATIO
Controller gain	KP	KP	
Controller integration time	TI	TI	
Controller derivative time	TD	TD	
Higher output limit	OUT_MAX	OUT_MAX	OUT_MAX
Lower output limit	OUT_MIN	OUT_MIN	OUT_MIN
Process variable (or true ratio coefficient) higher threshold	PV_HL	PV_HL	KACT_HL
Process variable (or true ratio coefficient) lower threshold	PV_LL	PV_LL	KACT_LL
Setpoint (or internal ratio coefficient) higher limit	SP_MAX	SP_MAX	K_MAX
Setpoint (or internal ratio coefficient) lower limit	SP_MIN	SP_MIN	K_MIN

List of user accessible parameters (cont'd)

Name	PID, PIDF, PIDMC, PIDAT MOTOR, PIDFZ, RM and PIDFF	HCOOL	RATIO
Deviation higher threshold	DEV_HL	DEV_HL	DEV_HL
Deviation lower threshold	DEV_LL	DEV_LL	DEV_LL
Deadband	DEADBAND	DEADBAND	
Compensation for static deviation when no integral action is present	OUTBIAS	OUTBIAS	
Limit of output variation between two samples	OUTRATE	OUTRATE	
Width modulation cycle time	T_CYCLE <sup>(1)</sup>	TCYCL_H TCYCL_C	
Digital filter time constant	T_FILTER <sup>(2)</sup>		
Self-tuning step amplitude	STEP <sup>(3)</sup>		
Self-tuning step duration	TMAX <sup>(3)</sup>		
Self-tuning performance coefficient	PERF <sup>(3)</sup>		
Hysteresis value to apply to the UP and DOWN outputs	HYST <sup>(4)</sup>		
"Cool" output gain		KCOOL	
Dead band value (if positive) or overlap (if negative)		BAND_HC	
Offset coefficient between the value and controlling value			C1

- (1) Only for PID, PIDF, PIDMC and PIDAT controllers,
- (2) Only for PID controller,
- (3) Only for PIDAT controller,
- (4) Only for MOTOR controller.



Control loop tuning mainly comprises determining the Kp, Ti and Td parameters required for optimal performance. The three parameters can only be set once the following points have been determined:

- Direction of loop action (DIRECT or REVERSE),
- Filtering applicable to the measurement value,
- Sampling period (T\_OFB parameter).

For a PIDAT OFB, the Kp, Ti, Td and T\_OFB parameters are set automatically.

## 1 Preliminary tuning

### Sampling period

The T\_OFB parameter that sets the sampling period can only be accessed in PL7-3, OFB CONSTANTS mode. The value entered is automatically adjusted to the nearest multiple of the period of the task in which the OFB is executed. For example:

- Value entered: 1 sec.
- AUX0 task period: 300 ms
- True task period: 0.9 sec.

### Direction of action

The controllers default to REVERSE action (DIR\_REV bit set to 1). If the loop should be set for DIRECT action, the user must set the DIR\_REV bit to 0 in the OFB INTERNAL DATA. For operational safety reasons, this parameter cannot be modified from a man-machine interface terminal. It can only be modified from a programming terminal or from PL7-3 in DATA mode or using SYSDIAG.

### Measurement filtering

The filter constant must be selected to eliminate the "chaff" around the measurement signal, without introducing any significant delay in addition to the normal time factors involved by the process.

For a PID OFB, the value of the filtering constant T\_FILTER can be changed from the TUNE screen displayed by the man-machine interface terminal.

For a PIDF, PIDMC, PIDAT, MOTOR or HCOOL OFB, the FC parameter of the SCLF OFB determines the filter value (refer to Part C9, section 3).

## 2 Setting parameters Kp, Ti, Td

The default values for these parameters are:

- Kp = 1,
- Ti = 0 (no integral),
- Td = 0.

A number of methods are available for determining the values to give to the parameters. They are usually based on an observation of the response of the process to a change in the output value or in the setpoint value.

The parameters can be modified from the TUNE screen.

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### Selecting a loop

- From the TRENDS screen,
- Press S5 to access the loop selection screen,
- Select a loop using the cursor keys and confirm the selection by pressing ENTER. This returns the user to the TRENDS screen.

### Predetermining parameters

- Set the controller to MAN mode for open loop tuning or AUT mode for closed loop tuning (depending on the required control method),
- Apply one of the tuning methods and derive the parameter values from the results obtained,
- Press S6 to access the TUNE screen,
- Enter the values of parameters Kp, Ti, Td (when the user attempts to modify the first parameter, the terminal will request a password).

### Improving parameter value accuracy

- Press F1 (Return) to return to the TRENDS screen,
- Set the controller to AUT,
- Generate a setpoint increment step and let the measurement value stabilize,
- Make minor changes to the parameter values, if required.
- As a rule, the sequence is completed by a Setpoint increment step in the reverse direction. If this yields different settings, an average setting should be selected.

## 3 Additional tuning

The TUNE screen also lets the user define:

- High and Low Level alarm values to apply to the Process Variable in physical units (PV\_HL and PV\_LL parameters),
- High and Low Level alarm values to apply to the Deviation value in physical units (DEV\_HL and DEV\_LL parameters),
- High and Low Level values to apply to the Setpoint value in physical units (SP\_MAX and SP\_MIN parameters),
- High and Low Level alarm values to apply to the percentage value output (OUT\_MAX and OUT\_MIN parameters),
- Output bias expressed as a percentage (OUTBIAS parameter),
- Output Dead band expressed as a percentage (DEADBAND parameter),
- An output rate of change limit expressed as a percentage (OUTRATE parameter),
- With a PID OFB, a measurement filter constant expressed in seconds (T\_FILTER parameter),

- If a width modulated output is selected, the reference period expressed in seconds (T\_CYCLE parameter).

**Note**

All of the above parameters have default values that ensure that they cannot operate, except for:

- OUTBIAS : Set for 50%,
- T\_CYCLE : Set for 20 seconds.

**Tuning example for a temperature loop**

Assuming the PID parameter tuning procedure supplied the following values:

- $K_p = 2.8$
- $T_i = 15$  seconds
- $T_d = 2$  seconds

In addition, the system specifications require:

- Limiting the Setpoint to 830°,
- Triggering an alarm should the Process Variable exceed the 850° threshold,
- Stopping injection of additives during the mixing phase when the deviation (Process Variable-Setpoint) exceeds two degrees.

The tuning screen corresponding to these values looks like this:

F1 RETURN			TIC 101		PIDF		1	
KP	3.8		DEU_LL	-3.0	Deg.	C		
TI	15.0	S	DEADBAND	0.5		%		
TD	2.0	S	OUTBIAS	50.0		%		
OUT_MAX	95.0	%	OUTRATE	100.0		%		
OUT_MIN	0.0	%	T_CYCLE	20.0		S		
PU_HL	850.0	Deg.	C					
PU_LL	750.0	Deg.	C					
SP_MAX	830.0	Deg.	C					
SP_MIN	250.0	Deg.	C					
DEU_HL	5.0	Deg.	C					

UP DOWN FEEDF

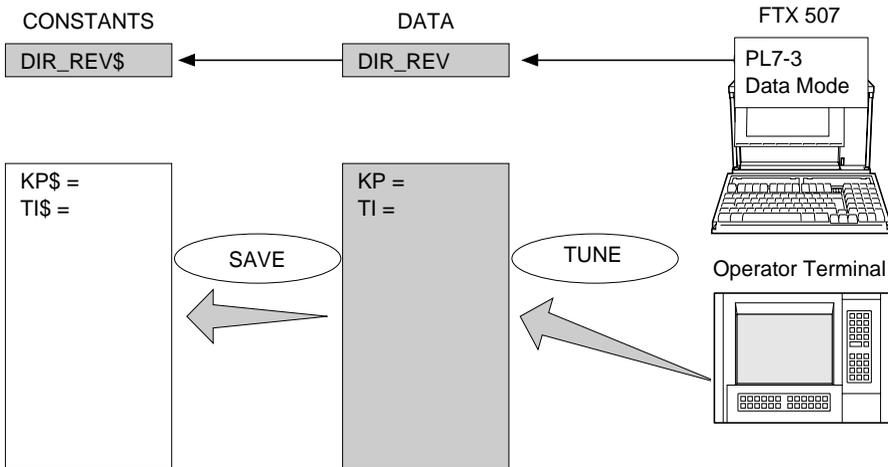
F2 AT\_RET F3 UP F4 DOWN F5 FEEDF

#### 4 Saving the parameters

This operation is ABSOLUTELY NECESSARY.

It transfers the tuning values entered until now as INTERNAL DATA to the INTERNAL CONSTANTS field.

If this operation is not performed first, the PLC may return to the default values read from the OFB after a cold restart. This may cause serious operating problems with the automated system and may be dangerous.



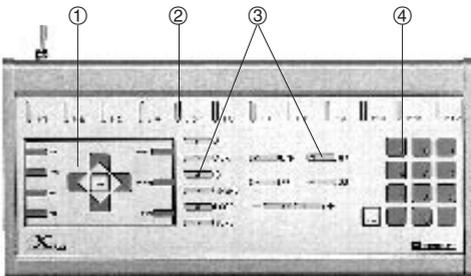
#### To save the parameters:

- Return to the TREND screen,
- Press F2 (SAVE),  
the terminal prompts the user to enter the password,
- Once the password is entered, internal data containing tuning values are transferred to the constants.

If the save fails (PLC stopped, SAVE OFB not configured, etc.), an error message is displayed in the alarm banner line in the TREND screen.

## Presentation

The optional process control operator interface keyboard is sealed, flat and can be built into any surface. It provides the operator with an easy to use presentation of all of the commands required for process control and tuning of process control applications: direct access to control loops, setpoint display, operating mode selection, supervisory control view selection, trend and tuning functions.



The keyboard is IBM PS/2 compatible and comprises:

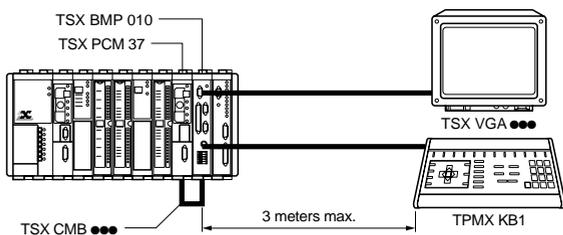
- ① Standard function keys: cursor control, tabs, validation, etc.
- ② 12 application soft keys: F1 to F12,
- ③ Dedicated function keys for direct access to process control functions: control loop parameters, operating modes, alarm acknowledgment, etc.
- ④ A numerical keypad for entering tuning values, process control passwords, etc.

## Connection

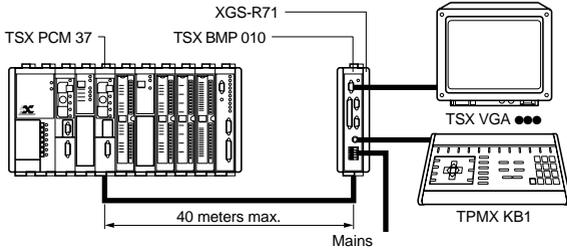
The process control keyboard can be used as an external keyboard for a monochrome or color TSX CPX 2714/3714 operator terminal. In this case it should be connected to the 6-pin MINI-DIN connector located on the front or back panel of the terminal (refer to the appropriate product documentation).

If the operator terminal comprises a process control keyboard and a monitor, connection to the TSX PCM 37 module requires a TSX BMP 010 wiring interface module installed in the PLC rack or in an XGS-R71 (single slot) or an XGS-R74 (4 slot) rack.

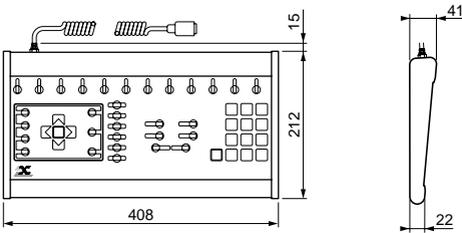
If the TSX BMP 010 rack is located in a slot in the TSX PMX 7 PLC it uses the normal rack power supply. Be sure to take into account the power consumption requirements of the keyboard when estimating the power requirements of the PLC installation.



If the TSX BMP 010 module is installed in an XGS-R7 rack, its front panel must be connected to a mains power source. In this case the PLC rack does not provide the power supply to the keyboard.



### Dimensions and weight



### Power requirements

Voltage	Power consumption in mA	
	Typical	Peak
+5V	70	100

### Service conditions

Operating temperature	0 to 55°C
Storage temperature	-25 to +65°C
Front panel seal	IP65
Immunity	ESD CEI 801.2 Level 4 Radiated fields CEI 801.3 Level 3 Conductive interference CEI 801.4 Level 3
EMI levels	EN 55022 Class A FCC Class A