PRINTRONIX®

General Purpose Input/Output (GPIO) Configuration Manager

User's Manual

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> For all printers the Purchaser will provide the end-user with a 90-day on-site warranty. Any printer or part therein found defective within one year of original shipping date from a Printronix facility shall be returned to Printronix and be repaired or replaced at the option and expense of Printronix. Purchaser shall pay shipping cost to the Printronix facility and Printronix will return the item(s) at its expense.

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> Any printer found defective within 90 days from the date of shipment to the end user will be repaired at the end user's location. If the end user is located within 100 miles of an Authorized Service Provider's location, warranty service will be performed at no charge. If the end user is located more than 100 miles from an Authorized Service Provider's location, travel time and expenses in excess of 100 miles will be billed to the end user at current rates or the printer may be shipped to the nearest Authorized Service Center for repair. If the end user elects to ship the printer for warranty repair, the end user shall pay the shipping cost to the Authorized Service Center and the printer will be returned at Printronix' expense.

The Products may be equipped with a general purpose input/output circuit board and corresponding pin connection (GPIO) which allow the Purchaser's or end user's printer to function as a controller in a computer system. Printronix publishes the specifications associated with GPIO and the pin connection and warrants that the printer's input and output parameters at the pin connection conform to those specifications. Except as expressly warranted, GPIO is sold on an "as is" basis. There are no other warranties whatsoever, express or implied, concerning GPIO.

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Table of Contents

1 *Introduction*

Overview

This manual covers both the Basic and the Advanced General Purpose Input/Output (GPIO) Manager.

The Basic GPIO Manager is available with the Advanced Tool Kit software package.

The Advanced GPIO Manager is available as a stand alone software package. It has all the functionality of the Basic GPIO Manager, with additional features.

NOTE: This manual describes all functionality of the Advanced GPIO Manager. Items that are not supported in the Basic GPIO Manager are grayed out (not selectable) in the software.

This manual describes the Printronix GPIO function available for the Printronix T5000 series Thermal printers.

NOTE: Only limited GPIO support is available for Line Matrix printers. Please contact the Customer Support Center for information before ordering Line Matrix printers with GPIO.

GPIO is both hardware and software. The hardware is the I/O board to be mounted in the printer, and the software is the GPIO Manager. The GPIO hardware is a printed circuit board containing optically isolated inputs and outputs as well as relays. The GPIO software is both a printer resident GPIO event parser and a PC-based GPIO manager that allows the user to define how the general purpose I/O hardware should behave for the given application.

The GPIO configuration manager is available as Basic GPIO Configuration Manager (BGM) and Advanced GPIO Configuration Manager (AGM). This user's manual discusses both versions.

NOTE: AGM features in the printer can only be enabled by a special security key.

Events and Actions

GPIO operation is based on Events and Actions. Events can be either printer internal such as paper out or print complete, or they can be printer external such as opto-coupler 1 active. Actions are the result of an event and can be printer internal such as paper feed or printer external such as relay 1 active or reply to host where data is transmitted over the serial, parallel, or network interface. You can also define a number of events to be acted upon without the GPIO card installed in the printer and allow the printer to be adapted for the application in use.

The Hardware

The GPIO hardware (Figure 1) consists of 16 opto-couplers, 4 SPDT relays, and the logic required to connect this hardware into the printing system.

Eight of the 16 opto-couplers are used as isolated inputs; these are the connections on which the external events happen. The remaining eight opto-couplers and the four SPDT relays are used as isolated outputs. Each of these outputs can be designated as an action in response to some event. The board is connected into the printing system through the printer's PCI bus.

None of the inputs or outputs is connected to any voltage source; it is the user's responsibility to make those connections. A separately fused 5 volt and a separately fused 24 volt are available on the 50 pin connector in which all inputs and outputs are terminated.

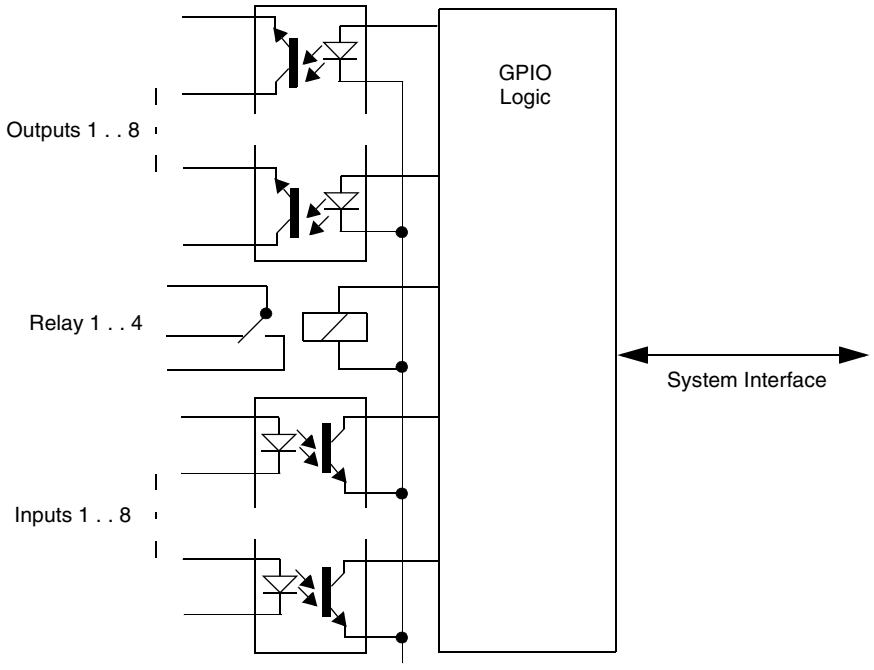


Figure 1. GPIO Hardware

2 *The GPIO Manager*

Overview

To launch the Advanced GPIO Configuration Manager, click the Start button and navigate to **Programs ▸ Printronix ▸ GPIO Manager**.

The screen in Figure 2 displays. The fields on this screen are described in detail on the following pages.

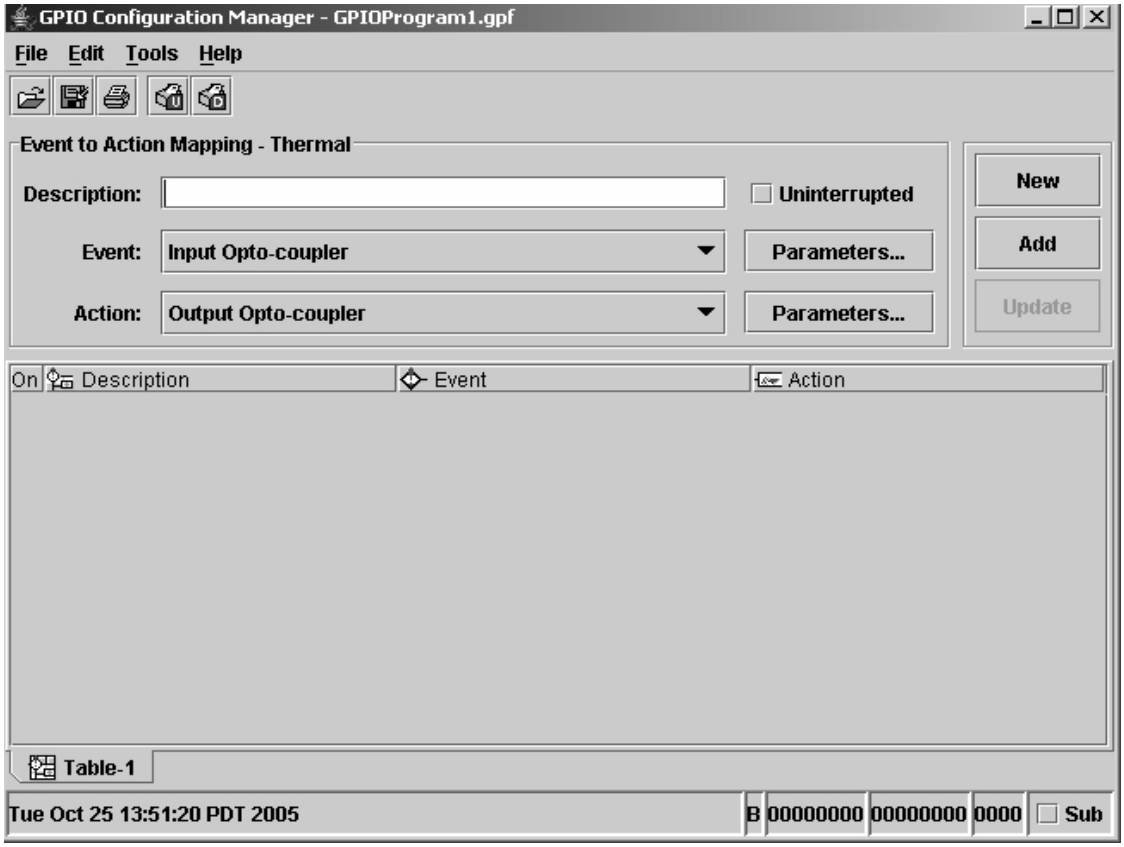


Figure 2. The GPIO Configuration Manager

The Menus

The toolbars allow the handling of files and text.

Figure 3. The GPIO Configuration Manager Toolbar

File

The File menu allows you to create, open, reopen, save a new or existing GPIO program file, or print GPIO configurations.

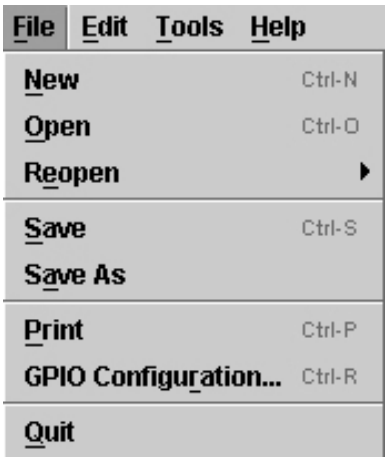


Figure 4. The File Menu

The Print option allows the mapping table to be printed for later reference. When you select **File ▸ Print**, the GPIO Print Setup dialog box opens allowing you to specify the desired print job. See Figure 5.

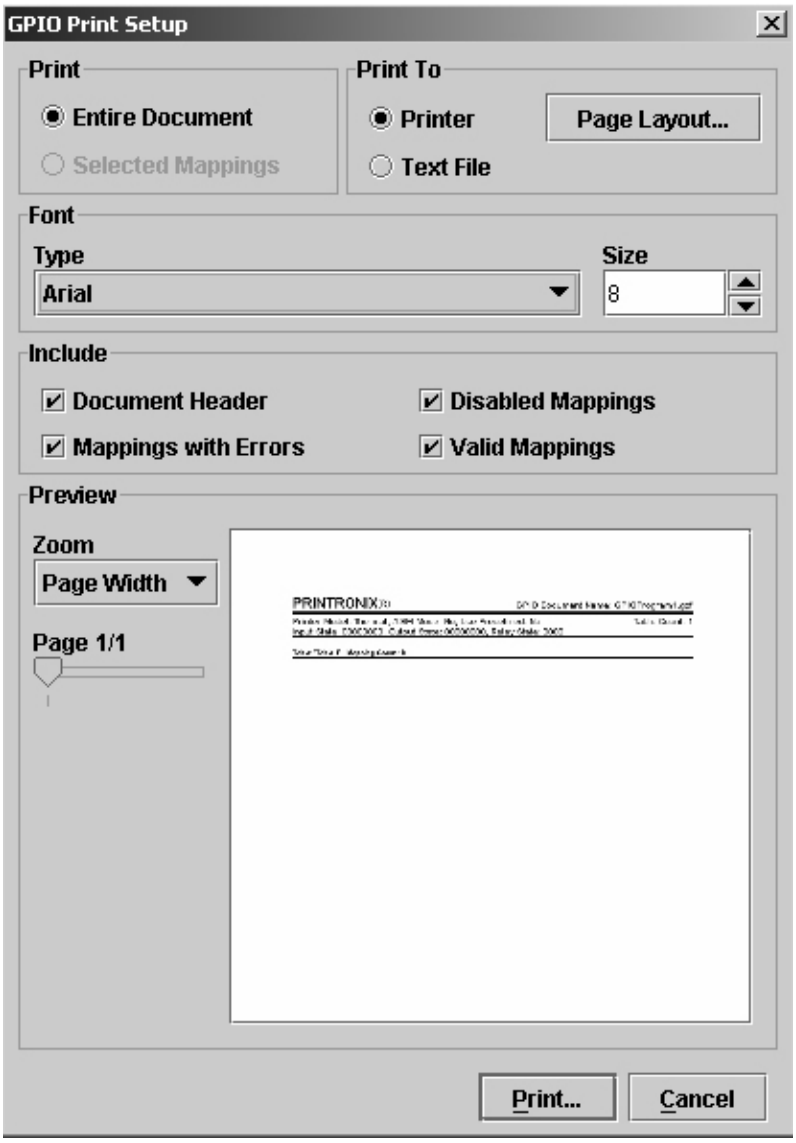


Figure 5. The GPIO Print Setup Dialog Box

When you select **File ▸ GPIO Configuration** the GPIO Configuration dialog box opens. This allows you to define the GPIO properties and power-up settings.

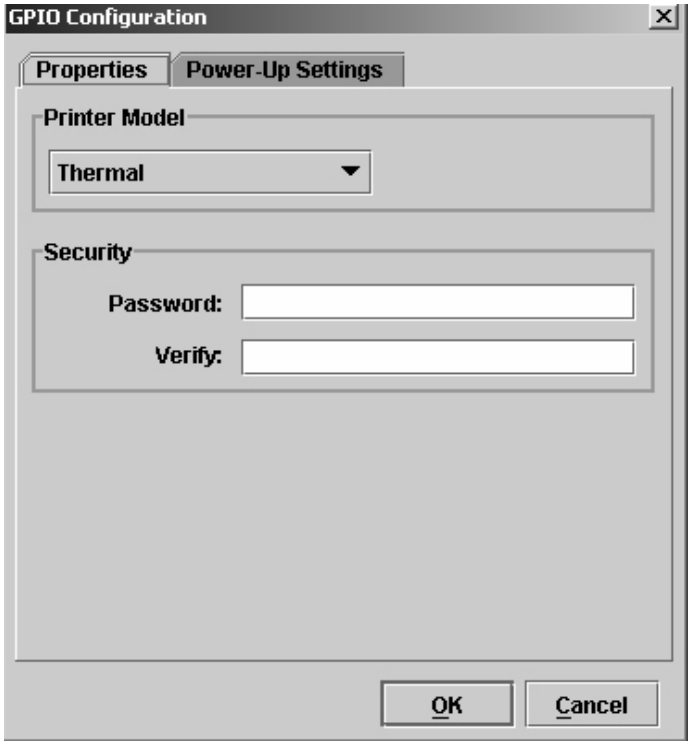


Figure 6. The GPIO Configuration Dialog Box

The Properties tab allows you to select the type of printer, either Thermal or Impact, for which the mapping table will be designed. For security, the password field allows you to password protect a mapping table.

NOTE: Password protected files can be uploaded to the GPIO manager but cannot be edited or downloaded to a printer without the password.

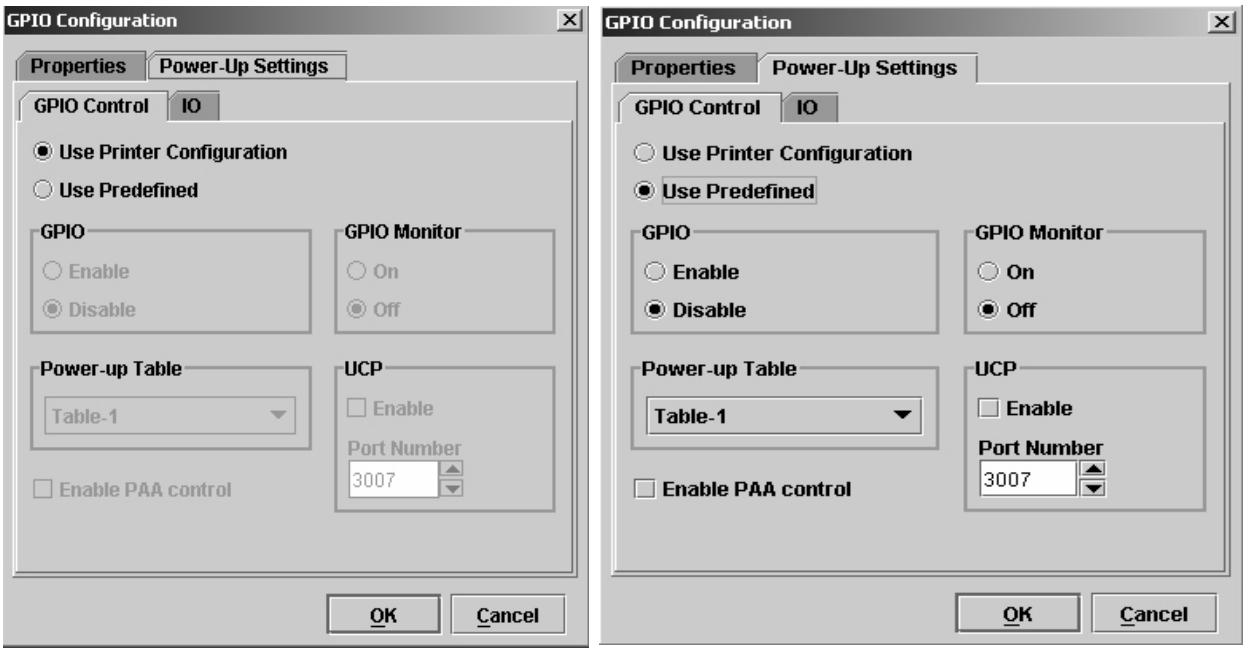


Figure 7. Power-Up Settings – GPIO Control Tab

Within the Power-Up Settings tab are two tabs, GPIO Control and IO.

NOTE: Settings made GPIO Control and IO predefining the output levels of GPIO will only be functional when the Advanced GPIO features are enabled in the printer.

The GPIO Control tab allows the specification of the GPIO power-on configuration. This can be either the printer configuration or a predefined one. If “Use Printer Configuration” is selected, initial GPIO settings will be as specified in the Printer Power-On Configuration. See Figure 7.

If “Use Predefined” is selected, you can specify the following options:

- GPIO – Enable or disable the GPIO at power-on.
- GPIO Monitor – Switches the GPIO monitor on or off. The GPIO monitor is the reflection of the opto-coupler inputs in the lower line of the LCD.
- Power-Up Table – specifies the mapping table to use following power-on.
- UCP – Universal Control Port is an offline available TCP port. To enable the UCP port, checkmark the Enable option.

NOTE: Enabling the UCP port disables the PXML port.

- Enable PAA Control – When enabled, PAA control matches from the active CST table is reported to GPIO by the Data Field Changed event. The predefined data field PAA State is used to generate the event. GPIO can check this data field for changes. See “Data Field Events” on page 37. PAA delays further data processing until GPIO acknowledges the event. GPIO acknowledges the event by setting the PAA State field to either NACK or ACK. When GPIO replies with NACK, PAA ignores the match and sends the data to the emulation it is bound to. When GPIO replies with ACK, PAA executes the match as defined in the CST.

NOTE: GPIO does not always acknowledge the PAA trigger. If you use this feature, make sure the event is always acknowledged.

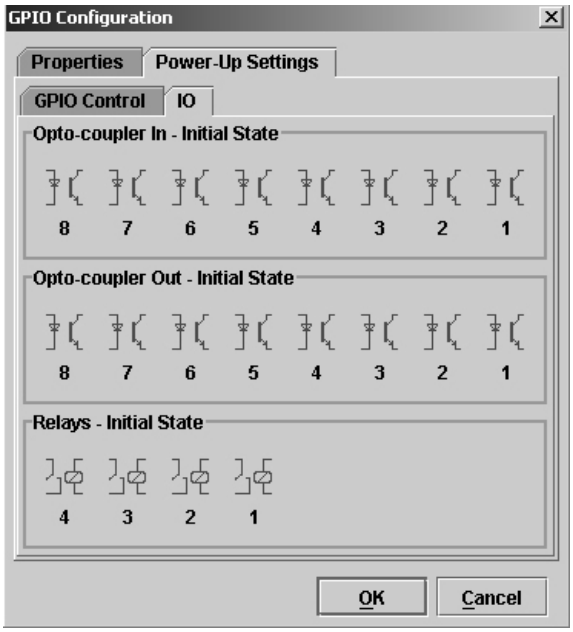


Figure 8. Power-Up Configuration – IO Tab

The Power-Up Settings – IO tab allows you to indicate what input conditions can be expected and what output condition should be available at power-on. By clicking the symbols the opto-coupler inputs or outputs can be activated and the relays can be made to switch to the other position.

Edit

The Edit menu allows you to define, delete, and rename mapping tables. You can also define data fields and reports to customize a mapping table. New mapping tables can be added to the tables that will be downloaded to the printer and existing mapping tables can be deleted or renamed.

NOTE: Definitions for New Mapping Table, Delete Mapping Table, Define Data Fields, Define Reports, and Define Timers will only be functional when the Advanced GPIO features are enabled in the printer.

Figure 9. The Edit Menu

Tools

The Tools menu allows you upload a mapping table from the printer and to download a mapping table to the printer. You also have the option to select the last selected upload printer or the last selected download printer. This option allows you to quickly select a printer previously used for uploading or downloading without having to go to the RMS printer database for your selection.

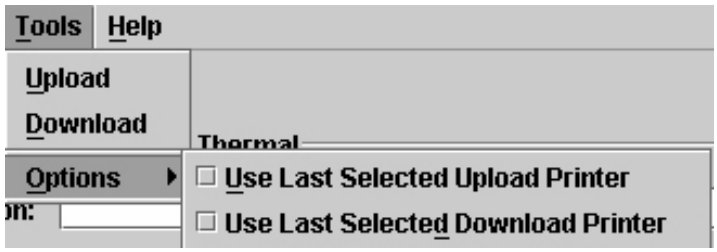


Figure 10. The Tools Menu

Help

The About option provides basic information about the GPIO Configuration Manager as seen in the startup splash screen.

The Entry Fields

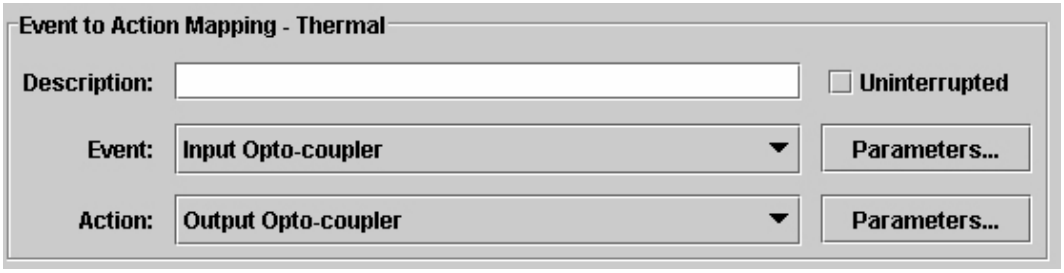


Figure 11. The Event To Action Mapping Fields

Setting the criteria for mapping tables takes place in the Event to Action Mapping section (see Figure 11). The Description field allows you can enter a descriptive name to indicate the use of the event and its related action.

NOTE: The window header indicates which printer type (thermal or line matrix) the mapping table is created for. Figure 11 indicates a Thermal printer.

The Event and Action fields allow you to select an event and apply an action to the selected event. Table 1 on page 17 lists the events currently available in the software.

The Parameters button allows you to select additional conditions related to the event (Figure 12).

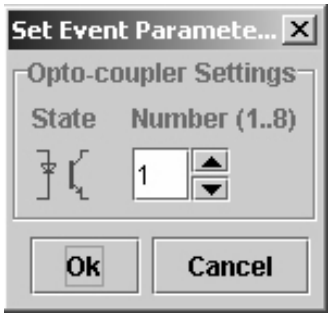


Figure 12. Setting Event Parameters

The action field allows you to select the action that is to be taken on the specified event. Table 2 on page 24 lists the actions currently available in the software.

The parameter button allows you to select additional conditions related to the action. Figure 13 displays parameters for the Output Opto-coupler and Output Relay actions.

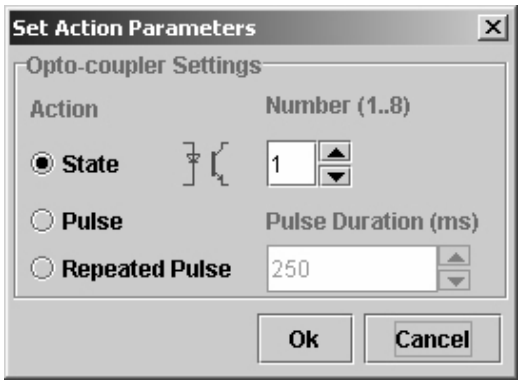


Figure 13. Setting Action Parameters

Events and Actions

The Events

Table 1 lists the available events and the related parameters. Events parameters are available for the Input Opto-Couplers, Panel Key Pressed events, Printer Error and Warning events (including RFID and ODV related errors), and PAA events (related to Data fields and Timers).

Table 1: Events And Parameters

Events	Printer Type	Parameters
Input Opto-Coupler	Thermal, Line Matrix	Opto-Coupler Number (1..8), Active, Inactive
Printer Powered Up	Thermal, Line Matrix	n.a
Printer Online	Thermal, Line Matrix	n.a
Printer Offline	Thermal, Line Matrix	n.a
Printer Paused	Thermal	n.a
Power Save Mode Active	Thermal, Line Matrix	n.a
Power Save Mode Cleared	Thermal, Line Matrix	n.a
Start Data Processing	Thermal, Line Matrix	n.a
End Data Processing	Thermal, Line Matrix	n.a
Printer Buffers Empty	Thermal, Line Matrix	n.a
Single Form Printing Invoked [1]	Thermal, Line Matrix	n.a
Cont. Form Printing Invoked [1]	Thermal, Line Matrix	n.a
Label Pending	Thermal	n.a
Start Printing	Thermal, Line Matrix	n.a
End Printing	Thermal, Line Matrix	n.a.
Start Paper Move	Thermal, Line Matrix (only when Single Page Printing is active)	n.a
Label Printed	Thermal, Line Matrix	n.a
Label Present	Thermal	n.a
Label Taken	Thermal	n.a
Job Printed	Thermal	n.a
End Paper Move	Line Matrix	n.a

Table 1: Events And Parameters

Printer Error	Thermal, Line Matrix Thermal, Line Matrix Thermal, Line Matrix Thermal Thermal Thermal Thermal Thermal Line Matrix Line Matrix Line Matrix Line Matrix	Any Paper Out Paper Jam Ribbon Out TOF Detect Fault Head Open RFID Tag Failed RFID Max Retry Ribbon Stall Platen Open Stacker Fault Stacker Full
Printer Warning	Thermal Thermal	Any Ribbon Low
Panel Key	Thermal, Line Matrix	Key Identifier
ODV Status	Thermal	Unscanable Code, Quality error – Any or a specific one (list), all ODV errors cleared.
PAA Event	Thermal, Line Matrix	Event identifier
Data Field Changed [1]	Thermal, Line Matrix	Data Field, Condition, Type, Value
Timer Expired [1]	Thermal, Line Matrix	Timer Identifier
Table Entered [1]	Thermal, Line Matrix	n.a
Table Exited [1]	Thermal, Line Matrix	n.a
UCP Data In [1]	Thermal	Value
[1] Only functional with the Advanced Features enabled in the printer.		

Event Descriptions

- **Input Opto-Couplers**

  For external input signals you can specify the number of the opto-coupler to view and the level in which the event is seen as active. Click the opto-coupler symbol to select the active state.

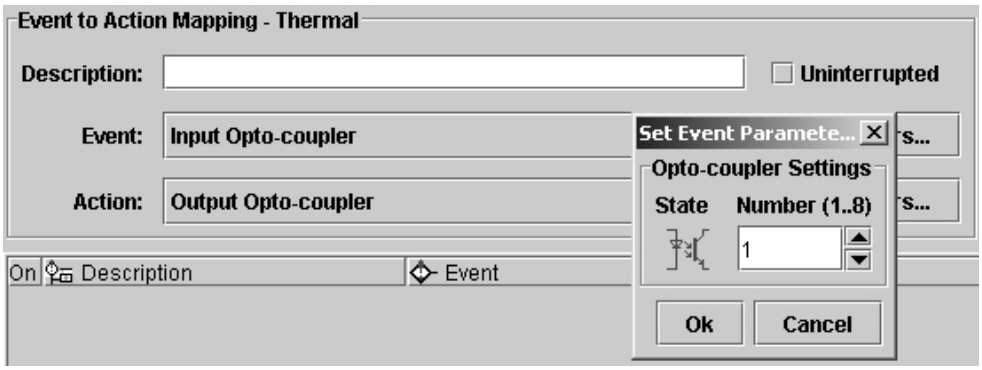


Figure 14. Setting the Opto-coupler Number and State

NOTE: With the Advanced Features enabled in the printer, it is possible to handle all eight opto-coupler input as a special Data Field (see “Data Fields” on page 33). This results in 248 different input combinations that can be used to trigger an action.

- **Printer Powered Up**

  This event is delayed until the moment the printer reaches the Powered-up-online or Powered-up-offline state. The delay is required so the printer can finish its power-on reset cycle before any reaction to an event generates.

NOTE: With the advanced features enabled in the printer, GPIO will either start up using the printer configuration or a predefined configuration. Select **File ▸ GPIO Configuration** then select the Power-Up Settings, GPIO Control tab to set the power-up option.

- **Printer Online**

  When the printer goes online by pressing the Pause key, the action related to this event is accepted.

- **Printer Offline**

  When the printer goes offline by pressing the Pause key or the menu key, or if there is any other reason that causes the printer to switch offline, the action related to this event is accepted.

- **Printer Paused**

  This event happens when the printer pauses because of the “pause printer” action. The printer will accept data from the host and parse this data until its buffers are full. No printing will take place. The print engine is offline but the printer’s data processing unit is still online.

- **Power Save Mode Active**

  This event signals the moment when the printer enters Power Save Mode.

- **Power-Save Mode Cleared**

  This event signals when the printer becomes active again.

- **Start Data Processing**

  This event signals the start of the processing of received data. This is not the same as the Start Printing event.

- **End Data Processing**

  This event signals the end of the data processing cycle. This is not the same as the end printing event.

- **Printer Buffers Empty**

  This event takes place as soon as the print buffers are emptied.

- **Single Form Printing Invoked**

  This event happens on the Enter Single Label Mode action. It indicates that this mode has been entered.

- **Continuous Form Printing Invoked**

  This event indicates that the Single Form Mode is terminated and that normal, continuous printing is active.

- **Label Pending**

  This event generates when the printer is in Local mode (i.e., the print engine is temporarily stopped) and all incoming data has been processed.

- **Start Printing**

  This event happens when the printer starts printing. The printer starts printing when all data processing is done, there is actual data to print, and the printer is no longer in local mode. The event will not happen on “paper moves without print.”

- **End Printing**

  This event indicates the end of actual printing. The paper may still be moving as printing does not always stop at top of form.

- **Start Paper Move**

  This event indicates the beginning of the paper motion.

- **Label Printed**

  This event occurs when a number of labels stored in the printer have finished printing. If the labels print as a single job without any wait time, the event will be a short pulse. If the printer is placed in local mode and the labels are printed using the *print next label* action, the event will happen once for each label.

- **Label Present**

  In label peel off applications, this event happens when the label present sensor detects a label in position (ready for application). It may be used to signal the availability of a label to an applicator system.

- **Label Taken**

  This event generates when the label is taken from its ready to apply position. It can be used to tell the host that a new label can be printed.

- **Job Printed**

  This event generates if all print jobs in the buffer have printed.

- **End Paper Move**

  It indicates the end of the paper motion.

- **Printer Error/Printer Warning**

  Events that signal printer errors and warnings. They allow selection of the actual error or warning that is to be seen as the event.

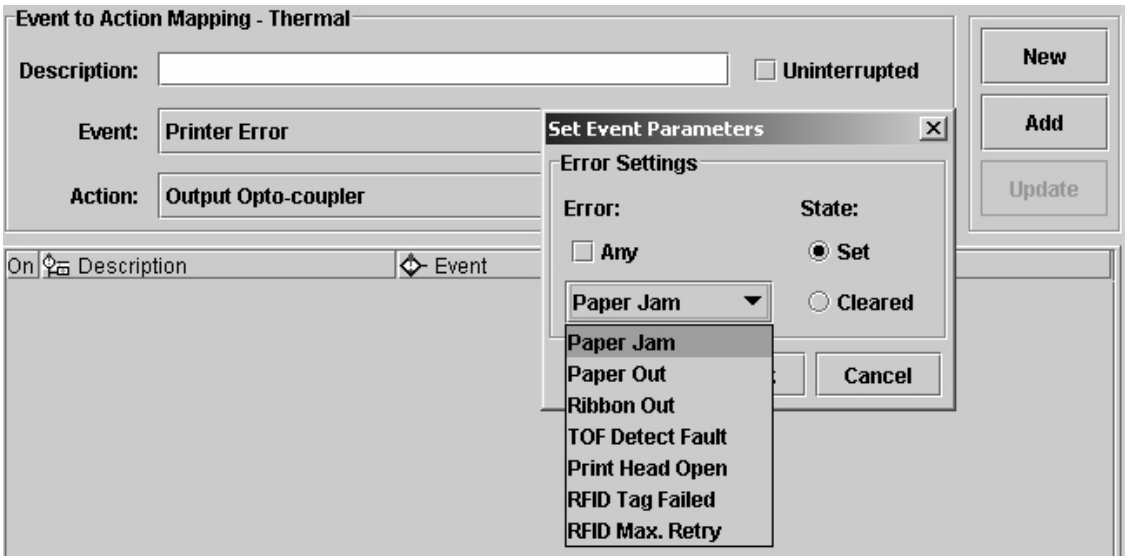


Figure 15. Setting Event Parameters

To select the Printer Error event, click the Event drop-down menu and select Printer Error as the event parameter. The Set Event Parameters dialog box opens. Click the Any box to uncheck the setting. A list of errors (or warnings) is now available for selection. From the Error drop-down menu, select the required parameter.

The Set state identifies the event when the problem happens. The Cleared state specifies the event when the problem is solved.

TOF Detect Fault happens if the T5000 does not find a Top of Form indicator (or a gap) within a specified amount of time after printing starts. It can be used to prevent the feeding of blank labels in print and apply applications.

- **Panel Key**

  This is an event in which the operator panel keys are parameters. The event allows you to change the function of the keys or to disable selective keys. For example, if the panel key event Menu results in the action Consume (or do nothing) the menu key has been disabled.

NOTE: When the Advanced Features are enabled in the printer, this allows an event to be generated when multiple keys are pressed simultaneously. Many additional key combinations can be used to trigger an action.

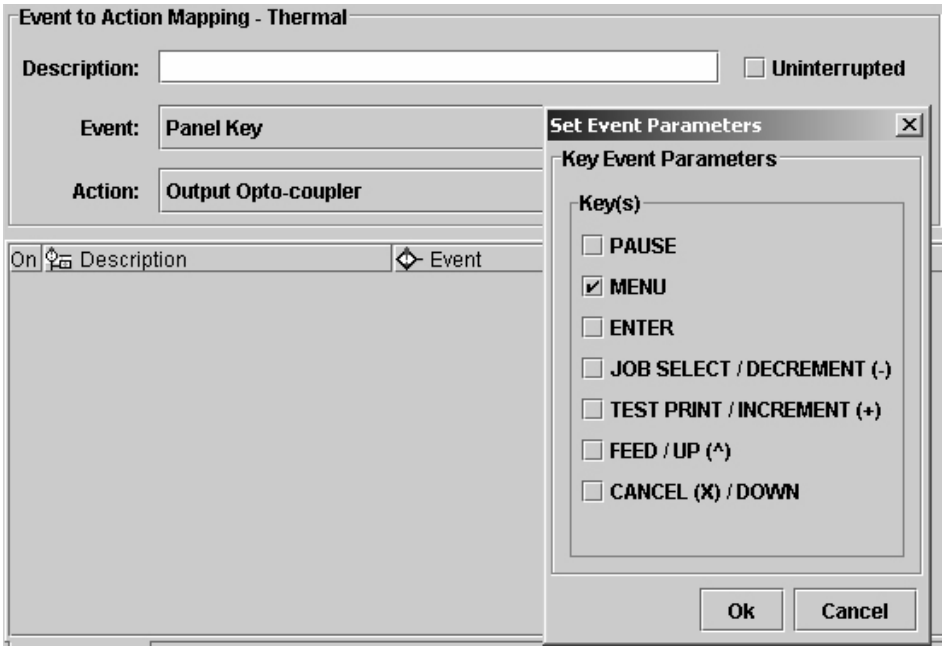


Figure 16. Setting Panel Key Event Parameters

- **ODV Status**

  This selection allows you to react to output from the Online Data Validator. The parameters allow you to program GPIO to act if there is no barcode, if there is any or a specific error in the barcode, or when all ODV errors have been cleared.

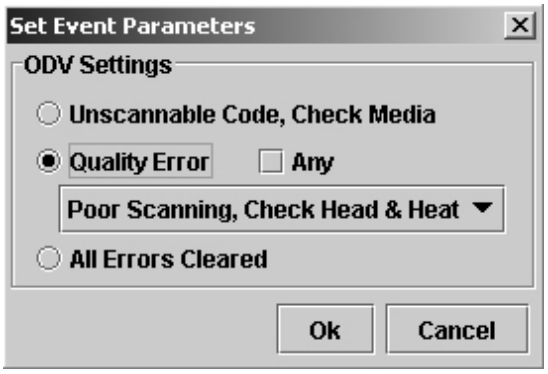


Figure 17. Setting ODV Parameters

- **PAA**

  PAA generates an event on a user specified input string. A large number (32000 or more) of PAA events can be generated through the use of an identifier.

- **Data Field Changed**

  This event happens if the value in a given data field changes. Certain conditions are applicable, see “Data Fields” on page 33.

- **Timer Expired**

  This event happens when a user defined timer expires or when a user defined time is reached. See “Timers” on page 46.

- **Table Entered**

  This event happens when a new mapping table is entered. The event can be used to execute actions regarding new tables. For example, when you want to check the content of a datafield and no other events are available.

- **Table Exited**

  This event generates before going to a new table. This event can also be used to execute last minute actions. For instance, if we want to go from table 1 to either table 2 or 3 and if a variable needs to be initialized, we could use the table exited event. This way we only have to specify the initial value once.

- **UCP Data In**

  This event generates when the data received on the Universal Control Port (UCP) matches the data defined with the parameters of this event. This event requires that the UCP port be enabled; a warning dialog will be shown if this option is not enabled. This message displays only once for each GPF editing sesion.

NOTE: The events Datafield Changed, Timer Expired, Table Entered, and Table Exited, and UPC Data In are only functional with the Advanced Features enabled in the printer.

Actions

The Action field allows you to specify which action should be linked (or mapped) to the selected event. Table 2 lists all possible actions and related parameters.

Table 2. Event Actions and Parameters

Actions	Printer Type	Parameters
Output Opto-Coupler	Thermal, Line Matrix	Opto-Coupler Number (1..8), Activate, Deactivate, Pulse Once, Pulse Repeat
Output Relay	Thermal, Line Matrix	Relay Number (1..4), Activate, Deactivate, Pulse Once, Pulse Repeat
Printer Online	Thermal, Line Matrix	n.a
Printer Offline	Thermal, Line Matrix	n.a
On/Offline Switch	Thermal, Line Matrix	n.a
Clear Buffer	Thermal, Line Matrix	n.a
Pause Printing	Thermal	n.a
Start Printing	Thermal	n.a
Print Next Label	Thermal, Line Matrix	n.a
Reprint Last Label	Thermal	n.a
Form Feed	Thermal, Line Matrix	n.a
Move Paper	Thermal, Line Matrix	TOF, Specified Distance Forward/ Backward
Cut Once	Thermal	n.a **NOTE:** When an Online Data Validator is installed, the Cut Once action is not executed.
Flush Next Label [1]	Thermal	n.a.
Enter Single Form Printing [1]	Thermal, Line Matrix	n.a.
Enter Cont. Form Printing [1]	Thermal, Line Matrix	n.a.
RFID: Program Next Label [1]	Thermal	n.a.
Lock Panel	Thermal, Line Matrix	n.a.
Unlock Panel	Thermal, Line Matrix	n.a.
Key Handling	Thermal, Line Matrix	Consume
Beep [1]	Thermal, Line Matrix	Beep Count

Table 2. Event Actions and Parameters

Actions	Printer Type	Parameters
Blink [1]	Thermal, Line Matrix	On, Off, Blink
Disable GPIO Events	Thermal, Line Matrix	n.a.
Enable GPIO Events	Thermal, Line Matrix	n.a.
Reply to Host	Thermal, Line Matrix	Data to be Transmitted, Interface to use
Wait	Thermal, Line Matrix	Time to Wait in mSeconds
PAA Control: Reset CST	Thermal, Line Matrix	n.a.
Select Mapping Table [1]	Thermal, Line Matrix	Name of Table to switch to, Previous Table
Data Field [1]	Thermal, Line Matrix	Destination, Operator, Evaluate, Source, Type
Send Report [1]	Thermal, Line Matrix	Name, Destination, Duration
Timers/RTC [1]	Thermal, Line Matrix	Name, Duration, Repeat
[1] Only functional with the Advanced features enabled in the printer.		

Action Descriptions

- **Output Opto-Couplers**

  The opto-coupler number to activate can be specified as well as the level (or state) required for this output. Select the state by clicking the opto-coupler symbol. If the Pulse parameter is selected, the pulse duration can be set in increments of 50 msec between 50 and 2,147,483,647 msec. This allows pulses up to 24.8 days in duration. If Repeated Pulse is selected, the pulse will repeat with a 50% duty cycle until deactivated.

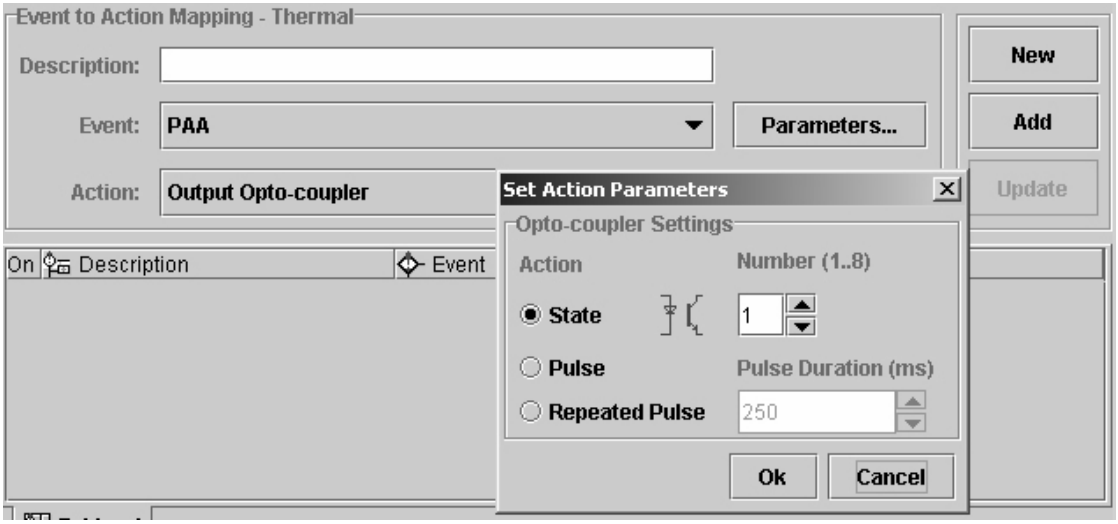


Figure 18. Setting Ouput Opto-coupler Action Parameters

- **Output Relay**

  The relay number to activate can be specified as well as the level (or state) required for this output. You can select the state by clicking the relay symbol. Pulsed behavior for the relays is equivalent to the pulsed behavior of the opto-coupled outputs.

NOTE: The Advanced Features enabled in the printer allow handling all eight opto-coupler outputs as well as the relays through a Data Field. See “Data Fields” on page 33. This gives the single outputs a large number of output combinations that can be used to initialize external actions.

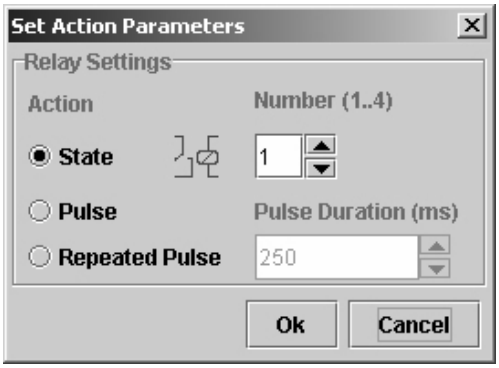


Figure 19. Output Relay Settings

- **Printer Offline/Printer Online**

  These two actions switch the printer offline or online.

- **On/Offline Switch**

  This action allows the printer to be switched offline if it is online, and to be switched online if it is offline. The switch works as a toggle.

- **Clear Buffer**

  A host or application controlled memory clear.

- **Pause Printing**

  This action results in the print engine going offline with the interface to the host still active. This allows receiving and pre-processing of host data until the buffer is full.

- **Start Printing**

  If there is data in the buffer, the printer starts printing until either it is switched offline or paused through the Pause Printing action.

- **Print Next Label**

  This action can have different functions. If GPIO Print & Apply is enabled, the action is Print Next RFID Label. In Single Label Printing Mode, the action is Print Next Label. If the user switches the printer to Pause mode without going into Single Label Printing Mode, the Print Next Label also functions similar to the previous version of GPIO.

IMPORTANT **Do not place the printer in Pause mode and select the Single Label Printing Mode, this stops the engine and prevents the printer from printing.**

- **Reprint Last Printed Label**

  Reprints the last page printed.

- **Form Feed**

  Performs a form feed.

- **Move Paper**

  This action allows the movement of paper either to the next top-of-form (the gap) or, if required for specific applicator functions, a specified distance forward or backward. See Figure 20.

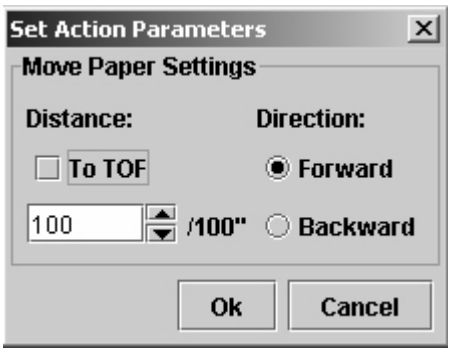


Figure 20. Setting Move Paper Action Parameters

- **Cut Once**

  Cuts the media in the current position.

- **Flush Next Label**

  This action removes a single form (the one that is ready to be printed) from the queue in the printer. It can be used in Secure Printing configurations where two printers are interconnected through GPIO and one printer is ready to take over printing if the first printer develops a problem.

- **Enter Single Label Printing**

  This action prints one label at a time.

- **Enter Continuous Label Printing**

  This action continuously prints the jobs in the entire buffer.

- **RFID: Program Next Label**

  This action is specifically designed for RFID Print and Apply applications where the programming of the RFID tag in the label does not have to occur simultaneously with the printing of the actual text on the label.

- **Lock Operator Panel / Unlock Operator Panel**

  Once executed, the front panel will be locked or unlocked. When locked, the panel can still be accessed through the virtual front panel of the Printronix Remote Management Software Advanced Tool Kit. If the Disable Event Parser has been executed, the front panel will be unlocked.

- **Key Handling**

  This action allows the user to specify how the actual Key Event should be handled. Selecting *Consume* results in the original key function not being executed (it is consumed by GPIO).

- **Beep and Blink**

  These actions allow the beeper to beep a specified number of Times New Roman. The Online lamp on the printer switches on, off or blinks at the normal printer controlled rate.

- **Enable GPIO Events/Disable GPIO Events**

  These actions allow you to switch on or off the event parsing of GPIO. When disabled, the only action GPIO will execute is the enable event parser action.

- **Reply to Host**

  The Reply to Host action allows the user to specify a data stream that will transmit to the host when the selected event takes place and to select the interface that should be used for this data transmission. Data entry can be in ASCII or in hexadecimal. The entry mode can be selected with the arrow keys: up arrow for ASCII entry mode and down arrow for Hex entry mode. See Figure 21.

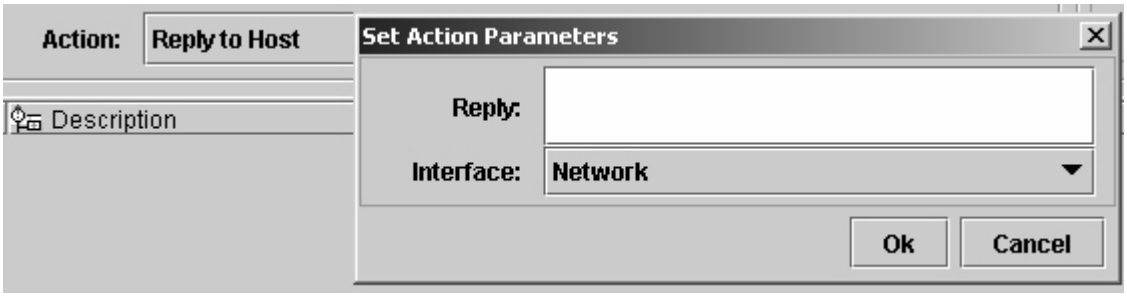


Figure 21. Setting Reply to Host Action Parameters

- **Wait**

  The parameter for this action specifies the time in 1/1000 seconds that GPIO will wait until the next action executes.

- **PAA Control: CST Reset**

  This action resets the Use Once flags of the currently active PAA CST.

- **Select Mapping Table**

  This action allows you to select one out of 64 mapping tables on a given event. If only a single mapping table has been defined, this selection is not available. The mapping table is selected by its name or by selecting *previous*. Selecting *previous* allows you to quickly return to the table previously active. The nesting of returns is allowed.

- **Data Field**

  This action allows you to modify the data field on a given event. Several logical or arithmetical functions can be applied to the data in the data field. See “Data Fields” on page 33.

- **Send Report**

  This action transmits a report to either the host computer through a selected interface or to the printer front panel LCD. For the LCD the user can select the upper or lower display line and the time the message will be visible. See “Reports” on page 39.

- **Timer**

  This action allows the start and stop of timers. This can either be for a single delay time or be based on the Real Time Clock (battery backed-up or CPU). See “Timers” on page 46.

NOTE: The actions Select Mapping Table, Data Field, Send Report, Beep and Blink, and Timer is only available with the Advanced Features enabled in the printer.

Entry Control Buttons

The mapping table control buttons are used as follows:

- **New**. Clears the Name field and sets the Event, Action, and related parameters to default.
- **Add**. Adds a new Event-to-Action mapping to the current GPIO program.
- **Update**. Re-enters an Event-to-Action mapping after editing.

Click the buttons to copy an entry from the mapping table to the entry/edit fields for subsequent modification. Click the Update button to update the entry in the mapping table with the new data.

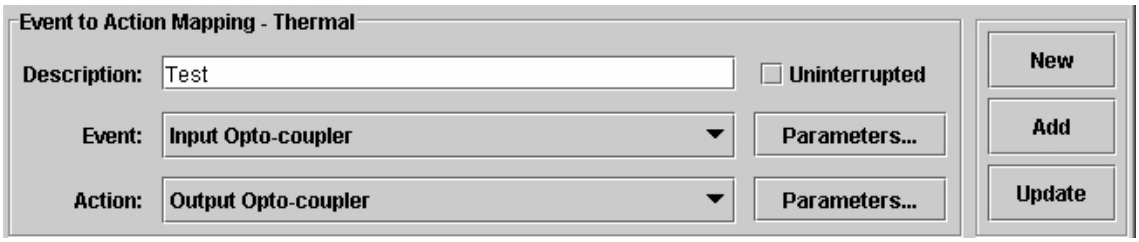


Figure 22. Event to Action Mapping Entry Control Buttons

The Uninterrupted checkbox is used to allow GPIO to finish an action without being interrupted. For instance, if an event results in a timer action the timer may be required to expire completely before another action is performed. Events happening during this uninterrupted time will be queued and reacted upon once the uninterruptable action is complete.

NOTE: The queued events will be acted upon directly and in sequence. Any timing will be lost.

Multiple Actions

If required, GPIO can execute a number of actions on a single event. Multiple actions specified for a single event will be executed in the order they are entered in the mapping table.

Figure 23 shows a mapping table where the first action is to enable GPIO events by making the Input Opto-coupler event active. The second action is to disable GPIO events by making the Input Opto-coupler event inactive. The third action is to perform a form feed. Since the GPIO Configuration Manager performs mappings in sequence, this program will not produce a clean sheet because the Form Feed action follows the GPIO disable command. A form feed cannot happen when all GPIO events are disabled first.

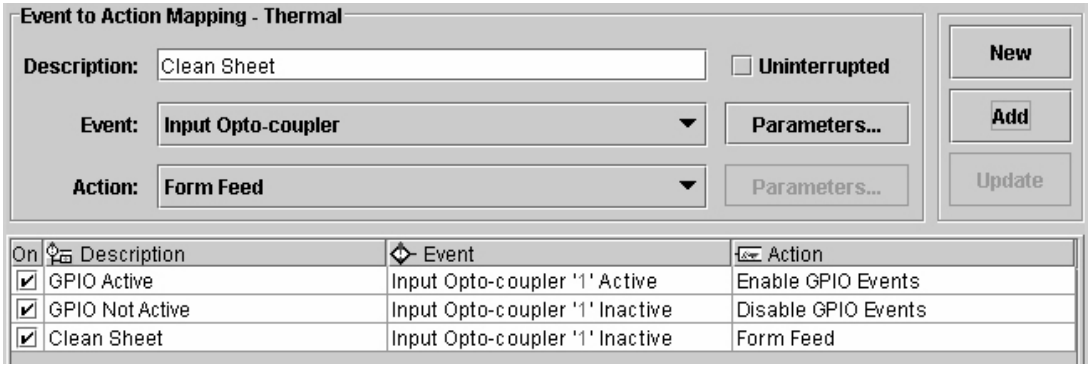


Figure 23. Incorrect Setup of Multiple Actions

Figure 24 shows a correct mapping table; a form feed is executed before the actual disabling of GPIO.

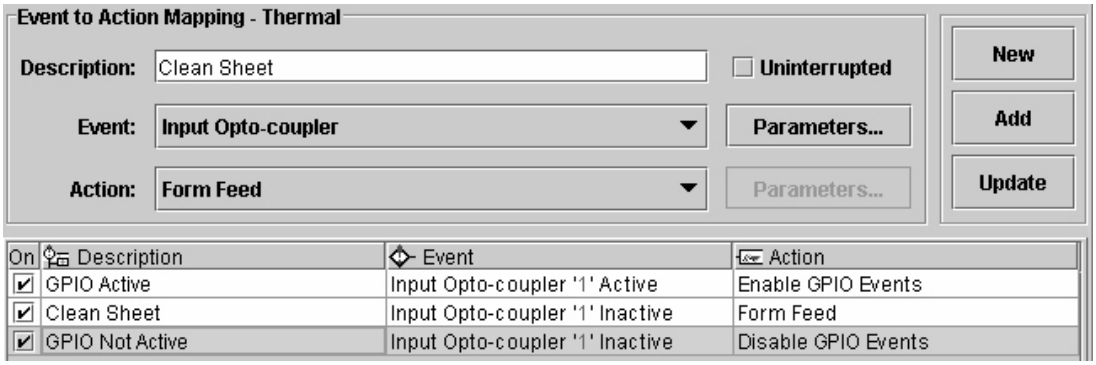


Figure 24. Correct Setup of Multiple Actions

To change the sequence in which the entries appear in the table, click and drag the entry to a different location in the table.

The ON Flag

You can use the On flag to temporarily disable entries in the GPIO mapping table. This is useful if an extensive mapping table is generated with many events leading to the same action. The On flag allows you to test each event reaction separately.

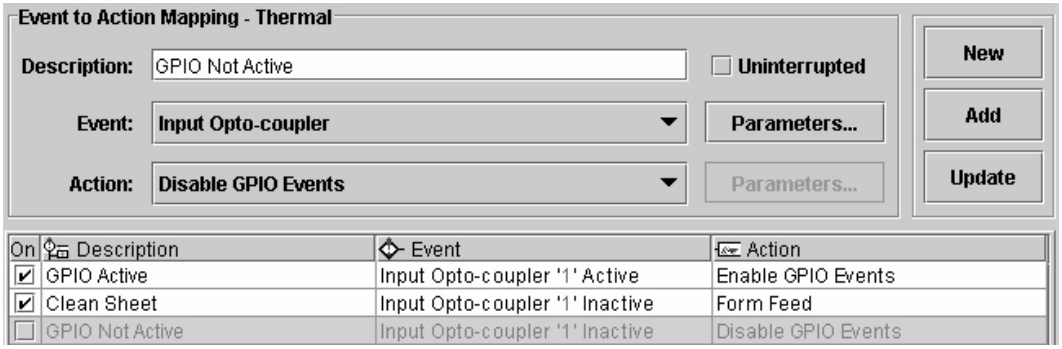


Figure 25. Using the On Flag to Enable or Disable an Action

The Status Line

The status line displays information related to GPIO. The tabs marked Table-1 and Table-2 allow selection of different event to action mappings. With the Advanced Features enabled, it is possible to select up to 64 tables. With the Advanced Features disabled, only a single table is available.

Figure 26. Viewing Status Line Information

The status line displays the date and time as well as the type of GPIO features used in the table. The ‘A’ indicates that at least one advanced feature is present. To run the mapping table in the printer the Advanced Features need to be enabled by the security key. Tables using only basic features do not require the security key to be loaded to the printer.

The series of zeros (or ones) are a reflection of the initial input and output states defined during the GPIO configuration. The first set of eight zeros represent the initial input opto-coupler state, the second set of eight zeros represent the initial output opto-coupler state, and the last set of four zeros represent the relays.

The Sub checkbox needs to be checked if a GPIO mapping table is to be used as a subroutine. A table marked Sub will put the name of the table from which the selection is done on the stack. This name is used when the “select previous table” action is done to select the correct table to return to.

Data Fields

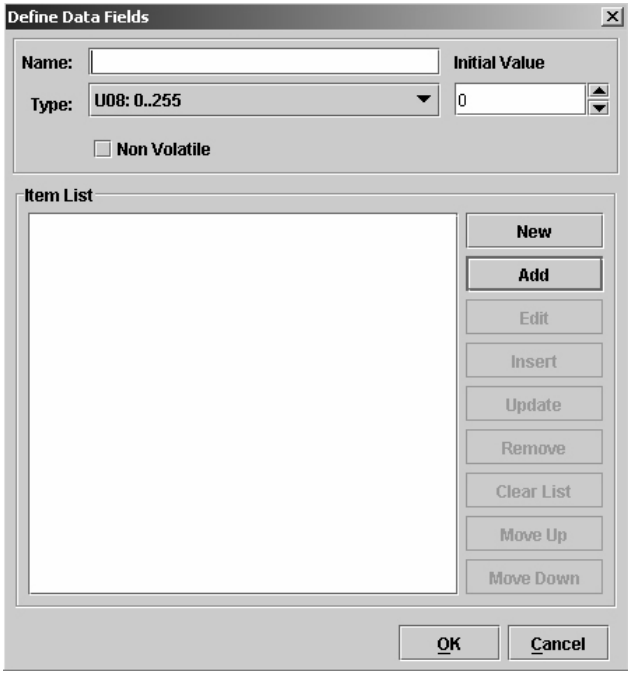


Figure 27. The Define Data Fields Dialog Box

Data fields are storage locations in the printer's resident memory. To define a data field, select **Edit ▸ Define Data Fields**. The Define Data Fields dialog box opens (Figure 27).

The Name field allows the user to create a data field descriptive to the user's needs. The Type drop down menu allows you to choose one of seven different types of data including 8, 16, or 32 bit signed or unsigned values and a string value. The Initial Value field allows you to set an initial value for the data type specified.

Checking the Non Volatile check box specifies that if a value in the data field has changed during the operation of the printer and the printer is powered down, the lastest value of the data field will be the initial value when the printer is powered on. For example, if the data field contains a label count of 10,000 and that after printing 1,200 forms the printer is turned off due to error, with Non Volatile selected, the printer prints another 8,800 forms when the printer goes online again. If Non Volatile is not selected, the printer will print another 10,000 forms.

Data Field Events And Actions

Data Field Actions are used to modify the content of the Data Field which results in an event.

An example is provided to better understand how Data Field Actions work in correlation to Data Field Events. For this example, we have a printer with a forms count defined in a data field in which after each form prints, the count is updated to reflect the correct number of forms still to be printed. Once the count reaches zero, we want a message to display in the second line of the front panel. To do this, we need to define a Data Field and enter the total forms count (Figure 28).

Data Field Actions

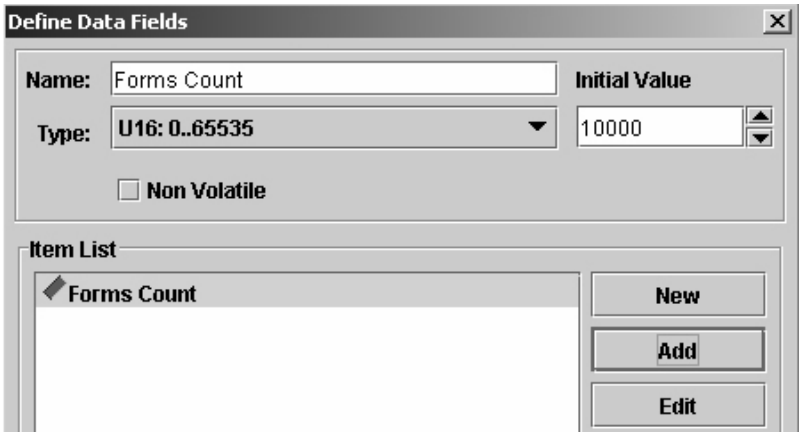


Figure 28. Defining Data Fields

1. Select **Edit ▸ Define Data Fields**.
2. Enter a descriptive name in the **Name** field.
3. Select the **Data Field Type** and enter the **Initial Value**.

   The data field type can be signed or unsigned bytes (-128..+127 and 0..255), signed and unsigned words (-32768..+32767), signed and unsigned long words (-2147483648..+ 2147483647), and ASCII strings.
4. Click **Add** to add the data field to the item list.

Once the data field is defined and added to the list, make sure that the count decrements by one each time a form prints. To set the parameters, use the Label Printed event and the Data Field action. In the Data Field parameter block specify what you want to happen when the event Label Printed occurs.

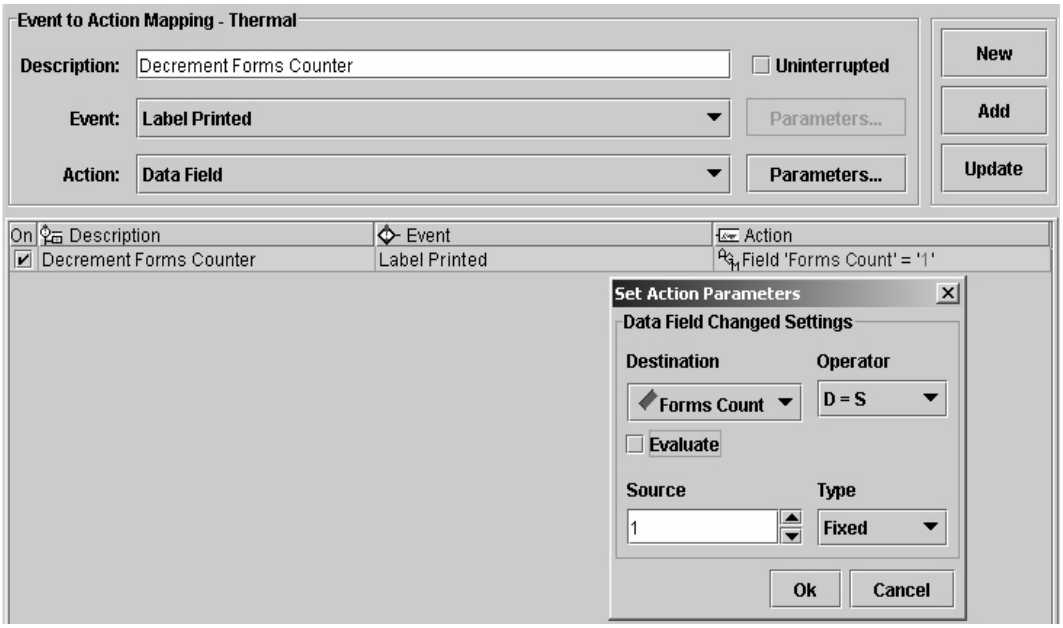


Figure 29. Setting Action Parameters

There may be an instance where you want to indicate an exact operation to perform on the Data Field. To decrement the label count by one each time a form prints, specify this event to happen in the Data Field parameter block when a label printing occurs. The value in the Source field will be used during the operation on the Data Field. To decrement the forms count by one for each label printed, set the Source value to 1. If more Data Fields are defined, one of those could be used as the Source value. To select the Source type, click the Type drop down menu and select Fixed or another defined data field. Operator Data Field Settings are defined in Table 3.

Table 3. Operator Data Field Setting

Operator	Results
D = S	Destination becomes Source
D = D + S	Destination ‘plus’ Source
D = D - S	Destination ‘minus’ Source
D = D * S	Destination ‘Times New Roman’ Source
D = D / S	Destination ‘divided by’ Source
D = D % S	Destination ‘mod’ Source

Table 3. Operator Data Field Setting

Operator	Results
D = D | S	Destination ‘Logical OR’ with Source
D = D & S	Destination ‘Logical AND’ with Source
D = D ^ S	Destination ‘Logical EXOR’ with Source
D = D &~ S	Destination ‘Logical AND’ with ‘Inverted’ Source
D = ~ S	Destination becomes ‘Inverted’ Source
D = D >> S	Destination ‘Logical Shift Right’ Source Times New Roman
D = D << S	Destination ‘Logical Shift Left’ Source Times New Roman

First specify the data field itself, in this case a single (U16 Forms Count). If there are numerous data fields, select the one in which the action should apply. Next we need to set the operators to indicate the event we want to happen to this data field. The Source field sets the value in which we want the data field count to decrement by.

For this example, use D = D - S (Figure 30) which results in the mapping table entry as seen in Figure 31.

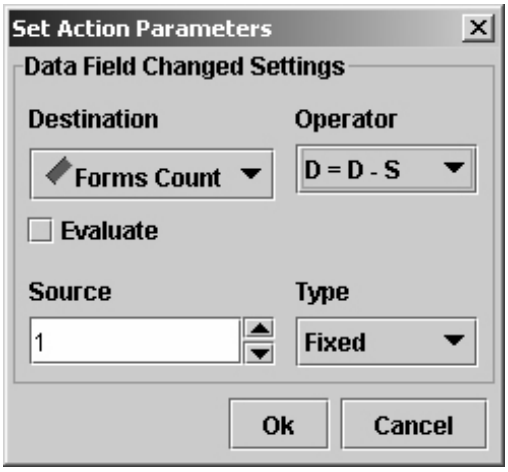


Figure 30. Setting Operator Parameters for a Data Field

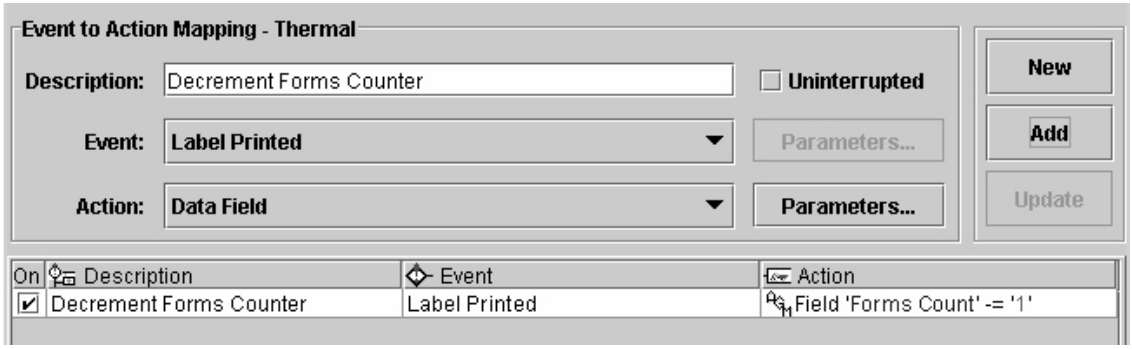


Figure 31. Generating a Mapping Table Entry

Now each time a label or form prints, the value in the data field forms count decrements by one. Next make sure that when the last form prints, a message is sent to the front panel display as defined by setting a data field event.

Data Field Events

To have a message sent to the front panel display indicating the number of forms still to be printed, you will need to keep track of the forms count. For this example create a new entry in the table named “Update LCD: Printing”. Use Data Field Changed as the event. Each time the data field changes, a specific event generates.

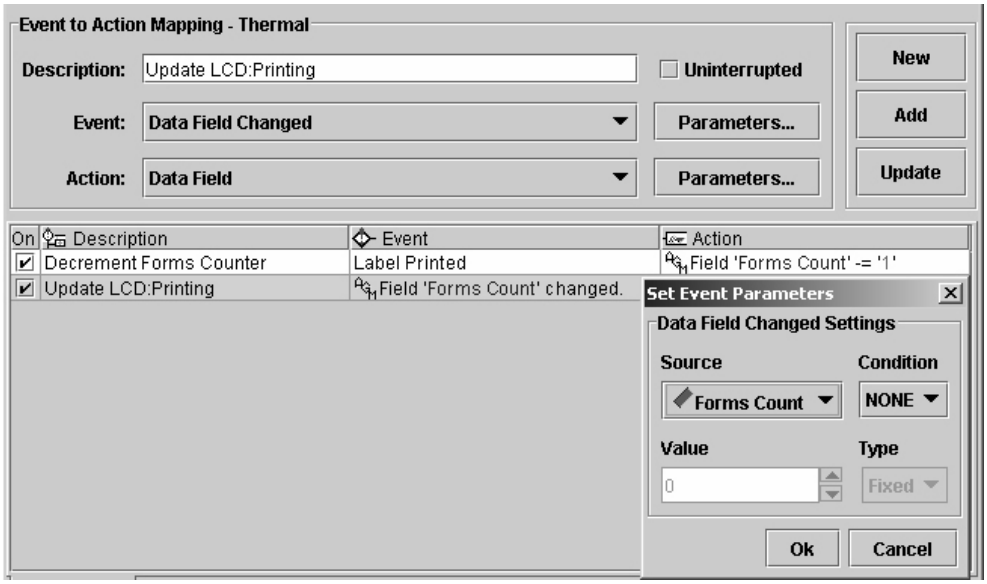


Figure 32. Creating a Event to Action Mapping Entry

1. Enter **Update LCD:Printing** in the Description field to create a new table entry.
2. Select **Data Field Changed** as the event. The Set Event Parameters dialog box opens.

The Source drop down menu is the data field for which the event is active. The Value field allows you to specify the number you want the Source to be compared. The Condition field indicates when exactly the related action takes place.

The following conditions are available:

Table 4. Conditions and Actions

Condition	
None	No condition, action taken on each change of Source (data field)
= =	'Equal' – action taken if Source equals Value
! =	'Unequal' – action taken if Source and Value are different
<	'Smaller Than' – action taken if Source is smaller than Value
< =	'Smaller Than or Equal To' – action taken if Source is smaller than or equal to Value
>	'Larger Than' – action taken if Source is larger than Value
> =	'Larger Than or Equal To' – action taken if Source is larger than or equal to Value

To set a forms counter, create two programmed entries, **Update LCD:Printing** and **Update LCD:Done**.

- Update LCD:Printing

  In the event that there is an unconditional change to the forms count, **Label Countdown** displays in the second line of the LCD.

- Update LCD:Done

  In the event that the forms count reaches zero, the message **Label Printing Done** displays in the second line of the LCD.

- Ready Signal

  In the event that the forms count reaches zero, the printer will beep five Times New Roman.

NOTE: When it is necessary to check/validate the value of a data field on a certain event, the user has to map a "Data Field" action to the event and check the "Evaluate" option. This will generate a "Data Field Changed" event similar to when the data field actually changes.

The resulting mapping table in Figure 33 allows you to keep track of printed labels.

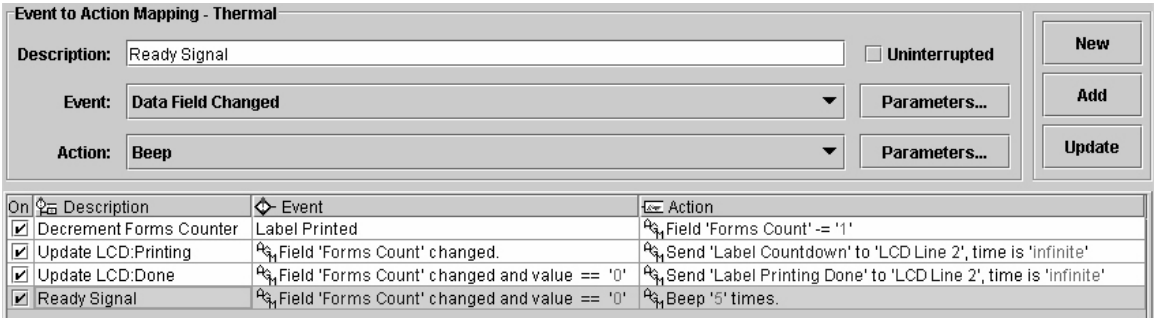


Figure 33. Creating a Forms Counter Entry

Reports

Reports are messages that can be sent to a number of destinations in the printer. A report is created by specifying one or more sections and by indicating the sequence in which these sections should be combined to form the report. Depending on the destination it may be required to indicate how long the report will be active.

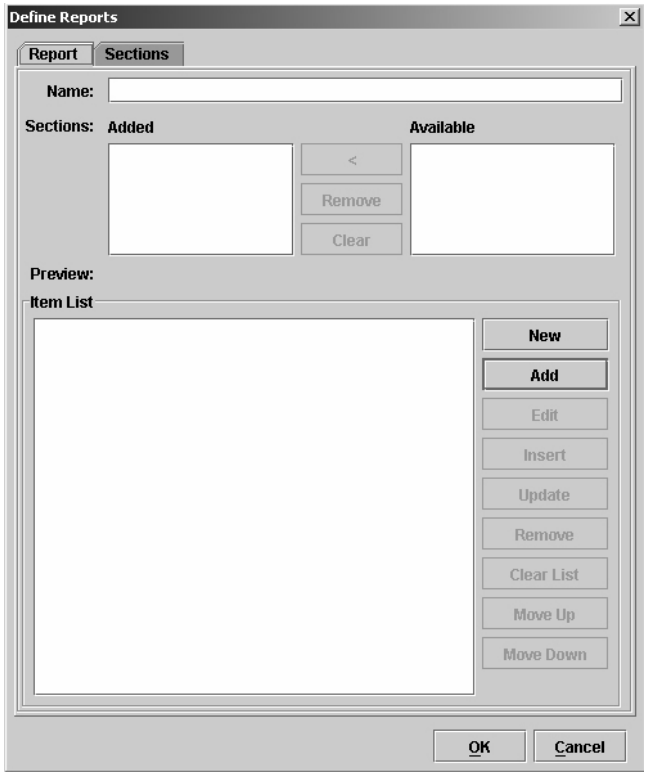


Figure 34. The Define Reports Dialog Box

Defining Reports

Continuing with the previous example, we want to receive a message on the printer's front panel LCD that all forms have been printed.

To define a report do the following:

1. Select **Edit ▸ Define Reports**. The Define Reports dialog box opens with the Report tab active (Figure 34). Two tabs are available, the Report and Sections tabs.

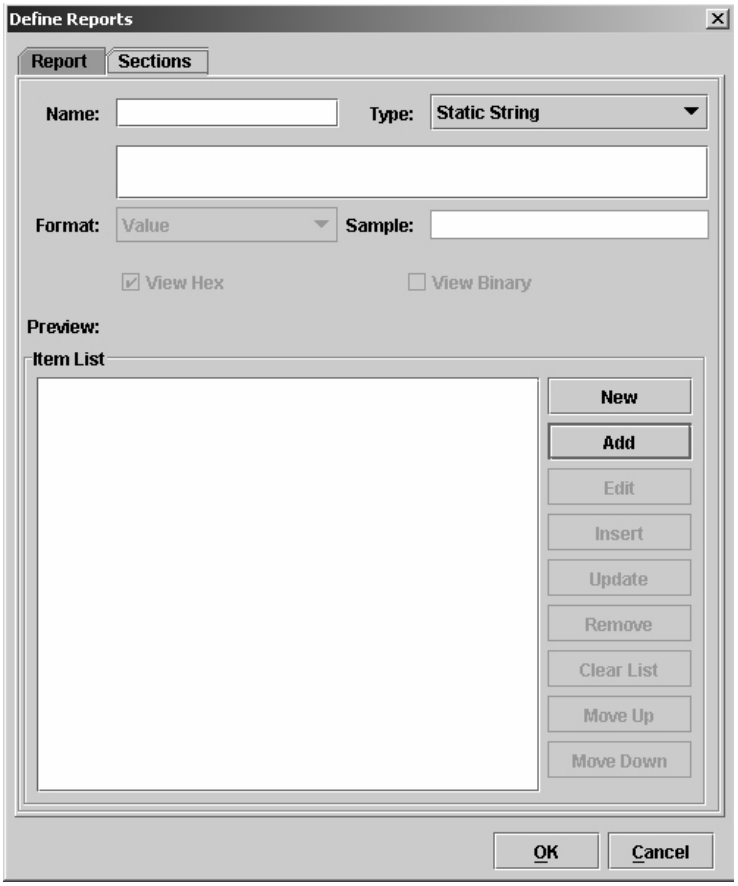


Figure 35. The Sections Tab of the Define Reports Dialog Box

2. Click the **Sections** tab (Figure 35). We will use this tab to define all sections needed to make the full report. The printer front panel LCD is has a maximum of 16 characters available per line to display the message.

Creating Sections

In continuing with the example, let us define the message as ‘ALL DONE [xxxxx] where xxxxx represents the remaining count. This divides the report in four sections:

- **# OF LABELS** is the header section during printing
- **ALL DONE [** is the header used when all printing is done
- **xxxxx** is the forms counter data field content
- **]** ends the section.

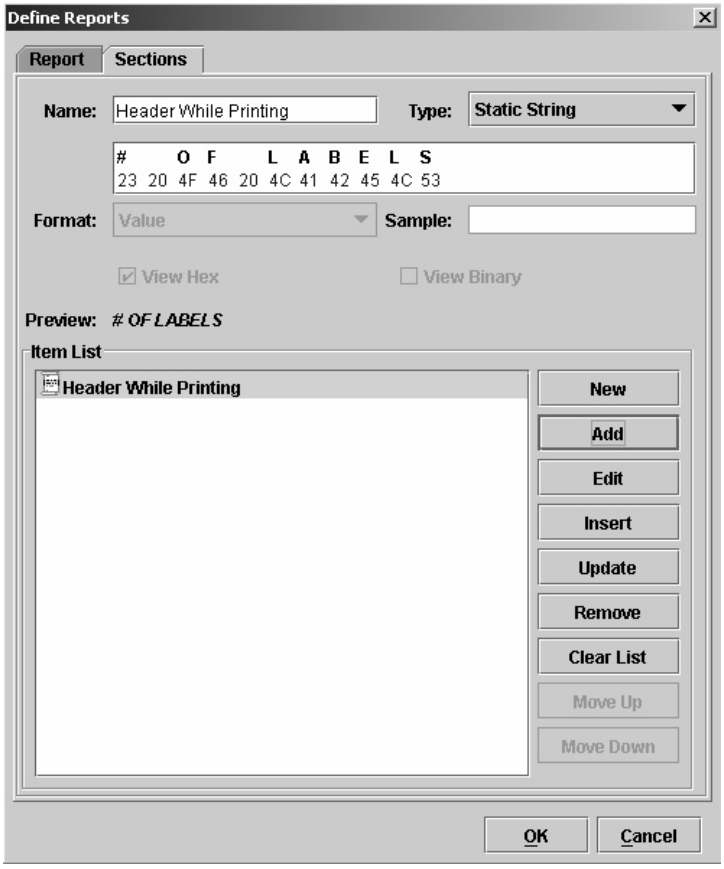


Figure 36. Defining a Header Section

1. Type **Header While Printing** in the Name field.
2. Select **Static String** in the **Type** drop down menu.
3. Type **# OF LABELS** in the data pane.
4. Click **Add**. The Header section is added to the Item List pane (Figure 36).
5. Click the **New** button and type **Header When Done Printing** in the Name field to define a second section.
6. Select **Static String** in the **Type** drop down menu.
7. Type **ALL DONE [** in the data pane.

8. Click **Add**. The Header When Done Printing section is added to the Item List pane.
9. Click the **New** button and type **Forms Count** in the Name field to define a third section.
10. Select **Data Field** in the **Type** drop down menu.
11. Select **Value** as the Format.
12. Click **Add**. The Forms Count section is added to the Item List pane.

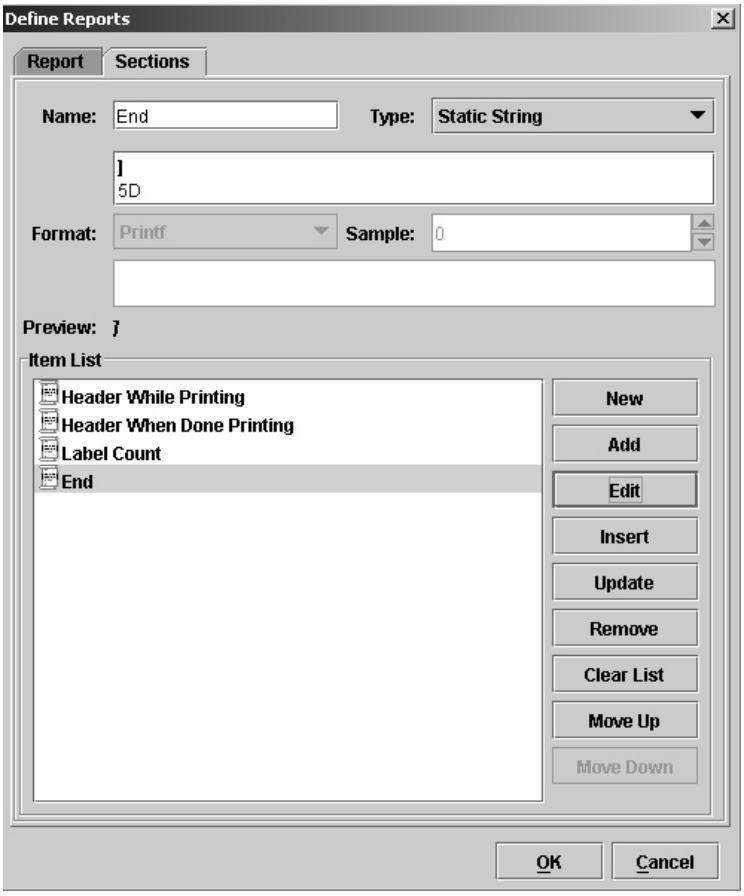


Figure 37. Creating a Sections Item List

13. Click the **New** button and type **End** in the Name field to define a fourth section.
14. Select **Static String** in the Type drop down menu.
15. Type **]** in the data pane.
16. Click **Add**. The End section is added to the Item List pane (Figure 37).

Creating Reports

We want to generate two reports using the sections just created. One report to generate during printing and the other to generate after printing is complete.

The first report, Label Count, is created with two sections: Header While Printing and Forms Count. This will give the following text on the LCD: # of Labels xxxx, where xxxx is the remaining label count.

The second report, Label Printing Done, is created with three sections: Header When Done Printing, Forms Count, and End. This will give the following text on the LCD: ALL DONE [xxxx] where xxxx is the remaining label count.

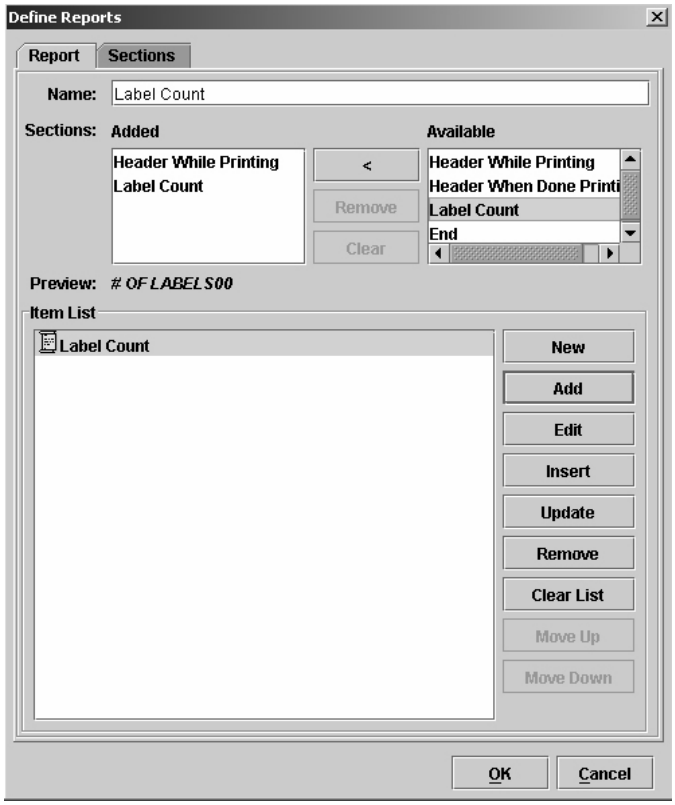


Figure 38. Adding Available Sections

1. Click the **Report** tab.
2. Type **Label Count** in the **Name** field.
3. Click the **Header While Printing** section under **Available**.
4. Click the **<** button to add the Header section.
5. Click the **Label** section under **Available**.
6. Click the **<** button to add the Label Count section.
7. Click the **Add** button. Label Count is added to the item list (Figure 38).

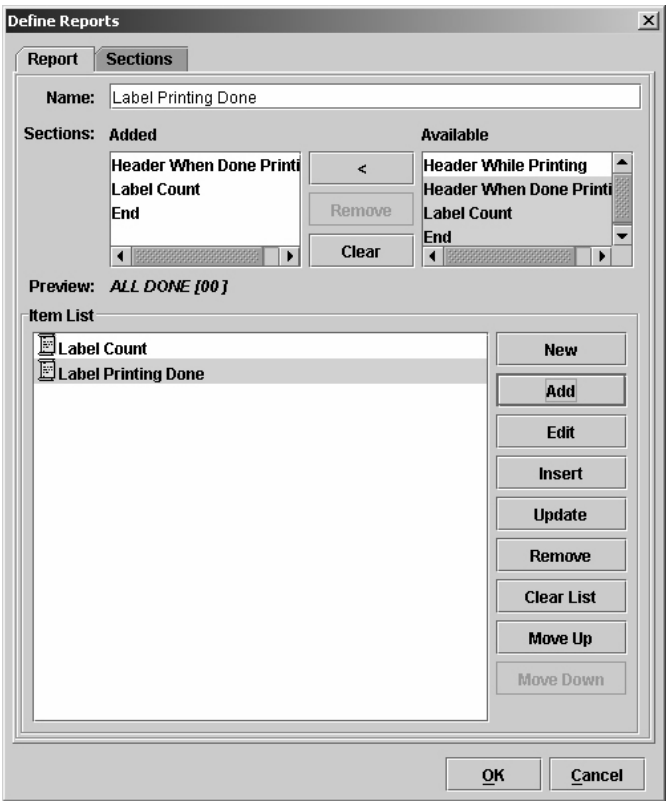


Figure 39. Adding Sections to a Report

8. Click the **New** button.
9. Type **Label Printing Done** in the Name field.
10. Click **Header When Done Printing** under Available.
11. Hold the **Control** key and click **Label Count** and **End** under Available.
12. Click the **<** button to add the Header When Done Printing, Label Count, and End sections.
13. Click the **Add** button. Label Printing Done is added to the item list. See Figure 39.
14. Click **OK** to close the dialog box.

Using Reports

To make sure the correct report is transmitted to the front panel LCD, add the following entry to the mapping table.

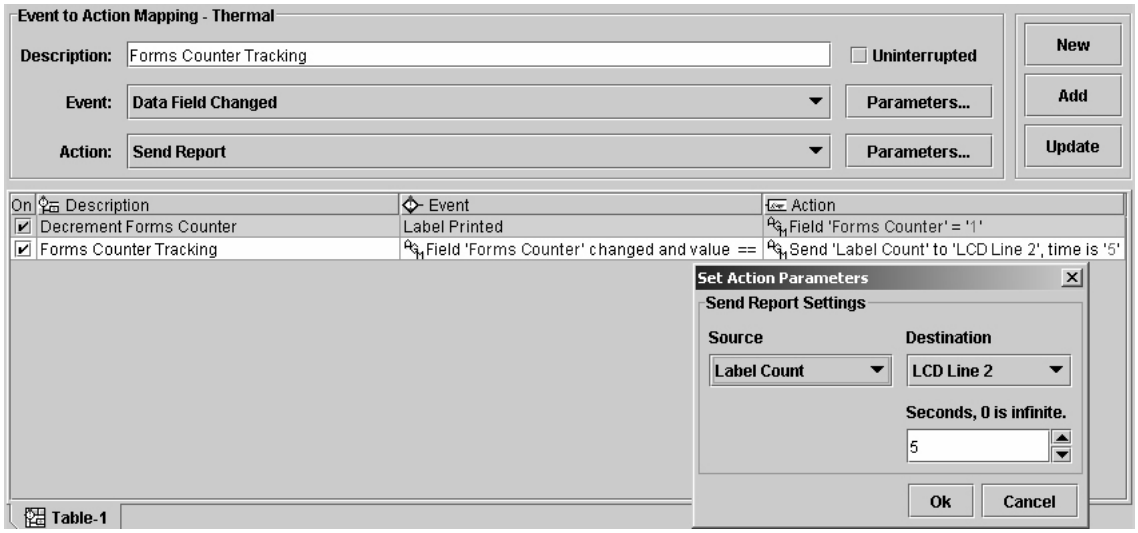


Figure 40. Defining Entries in the GPIO Manager

Once the report has been defined and the Send Report action has been selected, the parameter block allows you to specify what is to be done with this report.

The Source drop down menu allows you to select a report previously created. The Destination options tell the system where to transmit the report. The Seconds field sets the time the report will be visible (applicable only to the front panel LCD). See Figure 40.

Timers

The Advanced GPIO Manager allows timers to be used for different purposes. A timer can be programmed to create a delay between an event and an action or it can be programmed to generate an event at a specific time each day or even at a specific day and time each week.

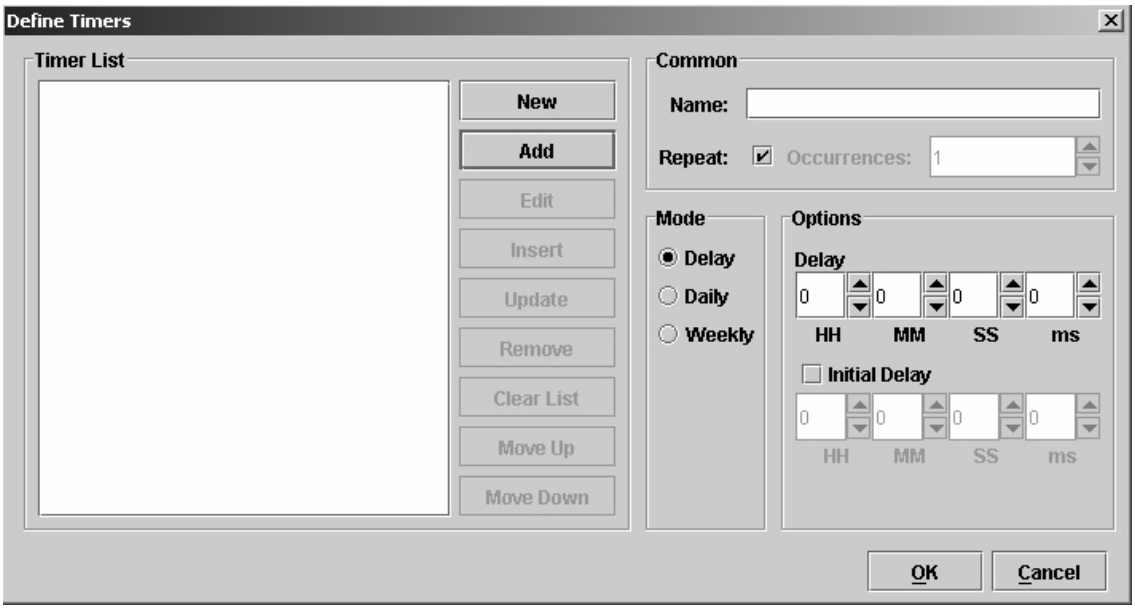


Figure 41. The Define Timers Dialog Box

Three modes are available: Delay, Daily, and Weekly which is discussed in the following sections.

Delay Timer Mode

The Delay mode allows you to delay an action by a specified amount of time. For example, a printer is used on a production line and the operator is responsible for reloading ribbon when the printer runs out of ribbon. The operator normally requires approximately 1.5 minutes to replace the ribbon but if it takes more than 2 minutes we want the printer to prompt an action.

1. Select **Edit ▸ Define Timers**. The Define Timers dialog box opens with the Delay mode selected by default.
2. Type **Ribbon Reloading Error** in the Name field.
3. Checkmark the Initial Delay checkbox to enable the initial delay parameters.

4. Enter **2** in the MM field under Initial Delay.

   This specifies a two minute initial delay in which the operator has two minutes to reload ribbon. If the operator is able to change the ribbon and place the printer online within two minutes, the delay timer stops. If the operator is unable to change the ribbon within the two minutes, then the delay timer starts and the printer gives a warning. The delay timer will repeat for a specified amount of time until the error is cleared.

5. Enter **10** in the SS field under Delay.

   If the operator is unable to change the ribbon within two minutes as specified in the previous step, then the delay timer starts in 10 seconds. In 10 seconds the printer will give a warning. The warning will repeat every 10 seconds until the error is cleared.

6. Click **Add**. The Ribbon Reloading Error delay timer is added to the Timer list. See Figure 42.

7. Click **OK**.

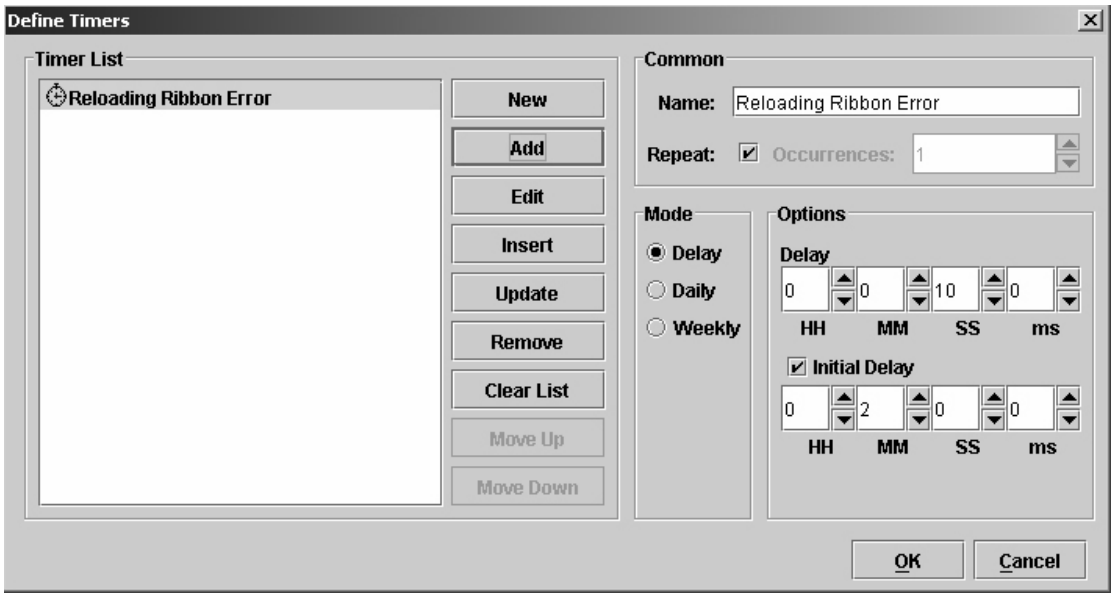


Figure 42. Setting a Delay Timer

Daily Timer Mode

To generate an event at a specific time each day, use the Daily timer mode. For example, you may want the printer to send a status report to the host system everyday at 12:45 p.m. The status report can include a number of datafields that keep track of paper, ribbon, or number of labels printed, etc. To program the timer to generate the status report, do the following.

1. Select **Edit ▸ Define Timers**.
2. Type **Daily Status** in the Name field.
3. Select **Daily** as the mode.
4. Enter **12** in the Hour field and **45** in the Minute field.
5. Make sure the Repeat box is checkmarked. This ensures that a status report will be sent everyday at 12:45 p.m.

   If you want to specify a certain amount of days for the printer to send a status report, uncheck the Repeat box and enter a value in the Occurances field. For instance, to have the printer send a status report for only five days, uncheck the Repeat box and enter **5** in the Occurances field.
6. Click **Add**. The Daily Status timer is added to the Timer List. See Figure 43.
7. Click **OK**.

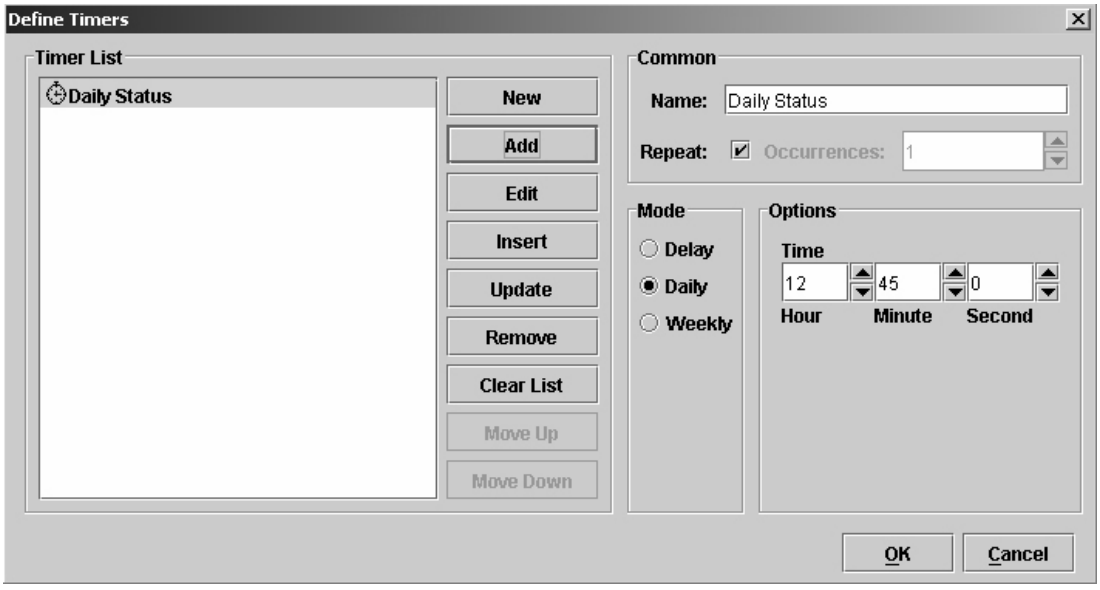


Figure 43. Setting a Daily Timer

Weekly Timer Mode

To generate an event on a specific time and day, use the Weekly timer mode. In continuing with the previous example, if you want the printer to generate a report to the host printer on certain days of the week at the same time, do the following.

1. Select **Edit ▸ Define Timers**.
2. Type **Weekly Status** in the Name field.
3. Select **Weekly** as the mode.
4. Enter **12** in the Hour field and **45** in the Minute field.
5. Checkmark **Monday** and **Friday**. This specifies that an event will occur at 12:45 p.m. on Mondays and Fridays each week.

   If you want to specify a certain amount of weeks for the printer to send a status report, uncheck the Repeat box and enter a value in the Occurances field. For instance, to have the printer send a status report for only five weeks, uncheck the Repeat box and enter **5** in the Occurances field. For this example, the printer sends a status report to the host printer on Mondays and Fridays at 12:45 p.m. for the next five weeks.
6. Click **Add**. The Weekly Status timer is added to the Timer List. See Figure 44.
7. Click **OK**.

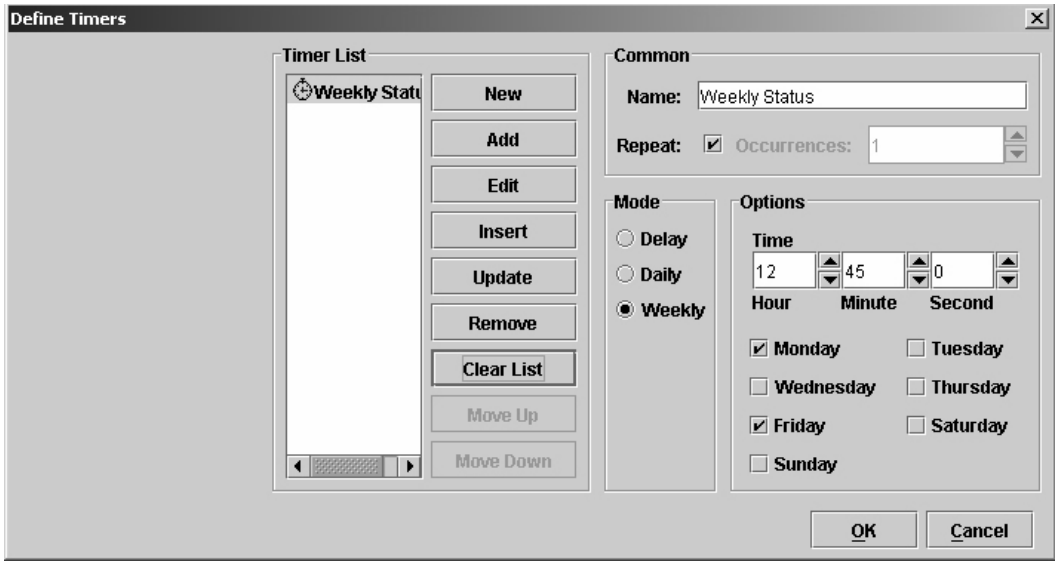


Figure 44. Setting a Weekly Timer

Using Timers

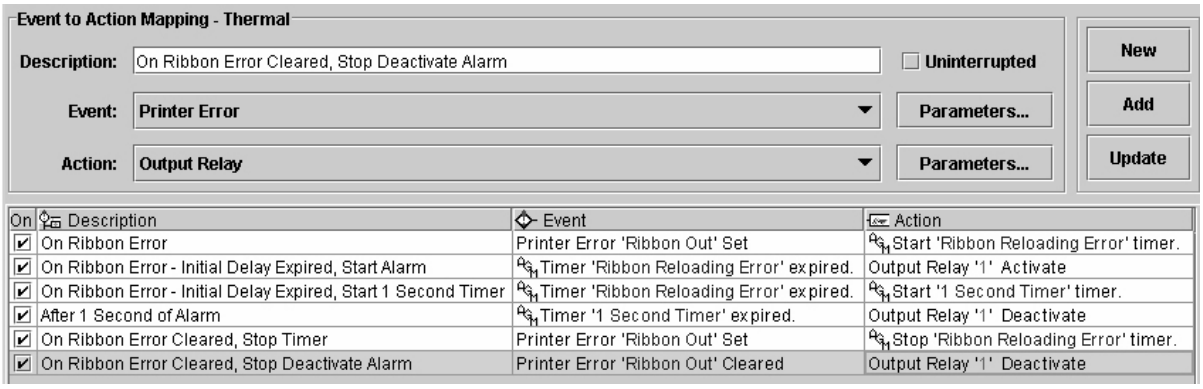


Figure 45. Using Timers to Activate an Alarm

When there is a ribbon error, the “On Ribbon Error” timer starts (Figure 45). First there is a two minute initial delay for the operator to change the ribbon. If the initial delay expires, it generates a timer expired event in which relay 1 activates. Relay 1 is set to sound an alarm. With a one second delay we make sure the relay is activated for only a short time. After 10 seconds, if the ribbon error is still there, the alarm sounds again. This will continue until the ribbon error is cleared at which time we will stop the “On Ribbon Error” timer and will deactivate relay 1.

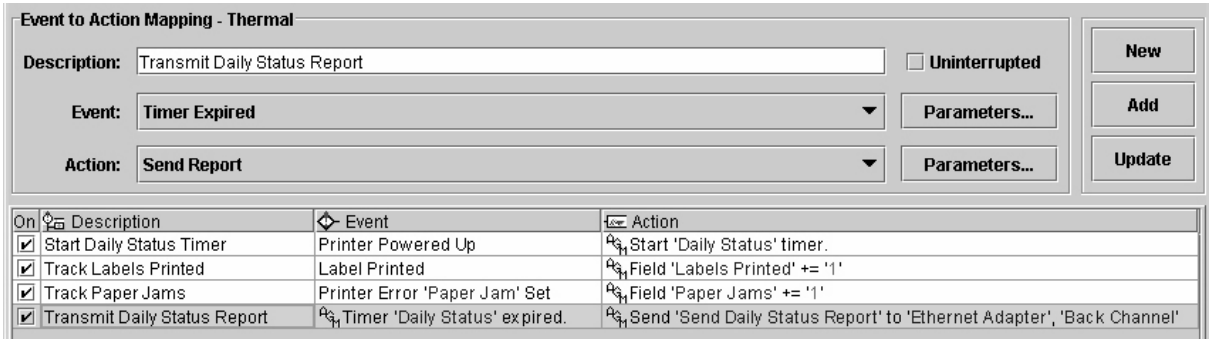


Figure 46. Using Daily Timers

To set a daily status timer, we define two data fields:

- Labels Printed – keeps track of the number of labels printed by incrementing the data field for each label printed.
- Paper Jams – keeps track of the number of paper jams by incrementing the data field for each paper jam.

Daily at 12:45 we want to transmit the number of printed labels and paper jams to the host. The format for this information should be “Labels printed: {number};Ribbons used: {number}[CR][LF]”. Based on a number of sections, we create a report called Daily Status Report. See Figure 46.

Once defined, the timer needs to start at power-up. GPIO uses its own timer based on the Real Time Clock. During the day, the data fields are updated for each label printed and each paper jam occurrence. As soon as the timer expires, the daily status report transmits to the printer.

For a weekly status report, set the timer setting to transmit the report weekly.

3 *Mapping*

Download Mapping Tables

Once the mapping table has been designed and tested using the GPIO testbox it must be downloaded to the printer. This can be done in three ways:

Method 1: Using Normal Download Mode

1. Save the mapping table from within the GPIO manager using the default file name extension. This creates a downloadable file.
2. Set the printer in download mode (power-on with Menu and Down key pressed)
3. Send the file to the printer in a DOS box (also called Command Prompt); type **copy/b filename.ext lpt1**.

Method 2: Using RMS/PPM

1. Save the mapping table from within the GPIO Manager using the default file name extension. This creates a downloadable file.
2. Attach the saved file as a download file to a printer and use the upgrade utility.

Once downloaded, the printer resident GPIO event parser detects the file and enables GPIO.

Method 3: Using the GPIO Download Facility

1. Click the Download  button on the GPIO toolbar.
2. Enter the required passwords for the GPIO program file and/or the communication sessions.
3. In the connection tab, specify the access method and configure the network or serial modem (if applicable).
4. Click OK to download the active mapping table(s) to the printer.

Once the mapping table is downloaded, the printer resident GPIO event parser will detect the file and enable GPIO.

Preloaded Table

If a GPIO board is installed in the printer but no user defined mapping table has been loaded, the printer will revert to a preloaded table.

Simple printer menus allow for programming three of the 11 (seven outputs, four inputs) pre-defined interface signals to a particular polarity or logic function that meets all typical print and apply requirements. They can also be compatible with all the features available on other manufacturers' external I/O interfaces. This allows easy migration of Printronix T5000e or T5000r printers to new or existing systems. Field interface is accomplished through an industry standard 50-pin D type connector.

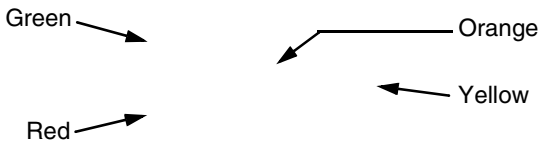
Input	Function	Notes
1	Reprint	Requires 16 Mbyte Printer Memory Option
2	Start Print	Polarity programmable via printer menu
3	Feed	
4	Pause	
5..8	Not Used	

Output	Function	Notes
1	Ribbon Low	
2	Ribbon Out	
3	Media Out	
4	Error/Service Required	
5	End Print	8 modes selectable via printer menu
6	Data Ready/On Line	Selectable via printer menu
7	Not Used	
8	Power On	

Mapping Examples

Indicator Lights Example

Imagine a factory floor with a number of printers. Over each printer are mounted lights that are controlled by the GPIO interface. The lights indicate the printer's status with the following conditions:



Light	Conditions
Green	Printer online, waiting for a print job or is currently printing, no warnings
Green and Orange	Ribbon low warning, printing continues
Green and Yellow	Label waiting for operator remove, printing stopped
Red	Printer offline, no errors
Red and Orange	Printer offline, ribbon out
Red and Yellow	Printer offline, paper out

The following table shows all input required for printer control, hardware interface, and connection.

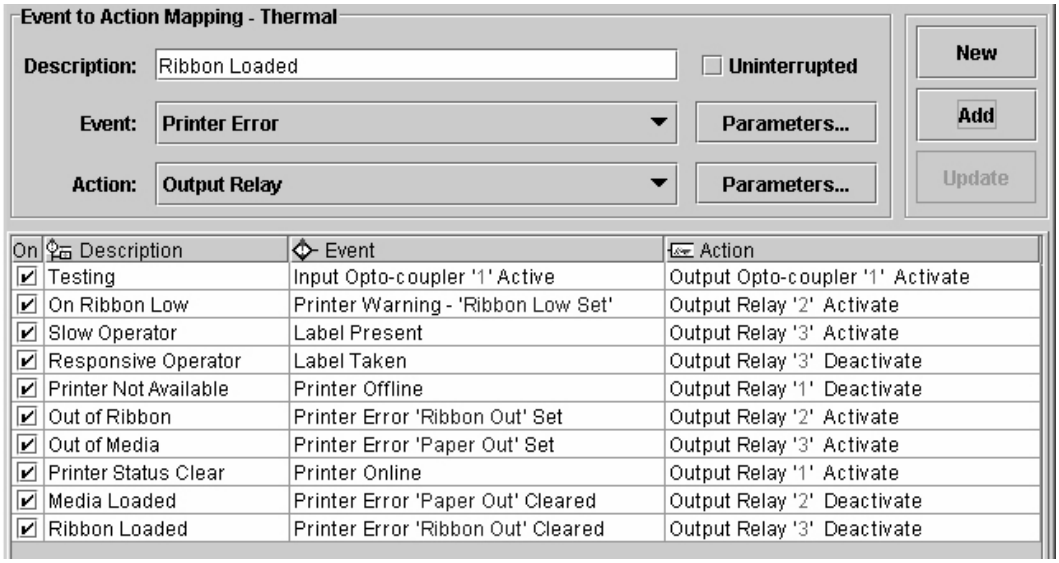


Figure 47. Setting Events and Actions for Printer Control

The connections made on the printer's I/O connector are displayed in the diagram below.

Figure 48. I/O Connections

Applicator Example

Imagine that a printer is connected to an applicator. When the printer has a label ready for the applicator to handle, it signals this event by activating one of the outputs. As soon as the applicator takes the label, the signal to the applicator will be removed until the next label is present. This way a simple interface connection between an applicator and printer is established. If any printer error occurs, relay 1 will activate and result in additional action. Once the problem is solved, placing the printer online clears the error report and printing can start again.

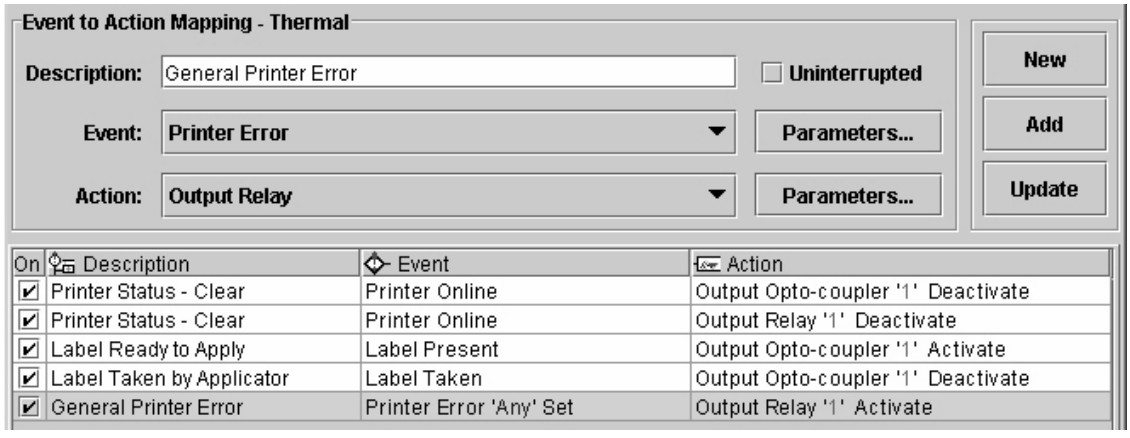
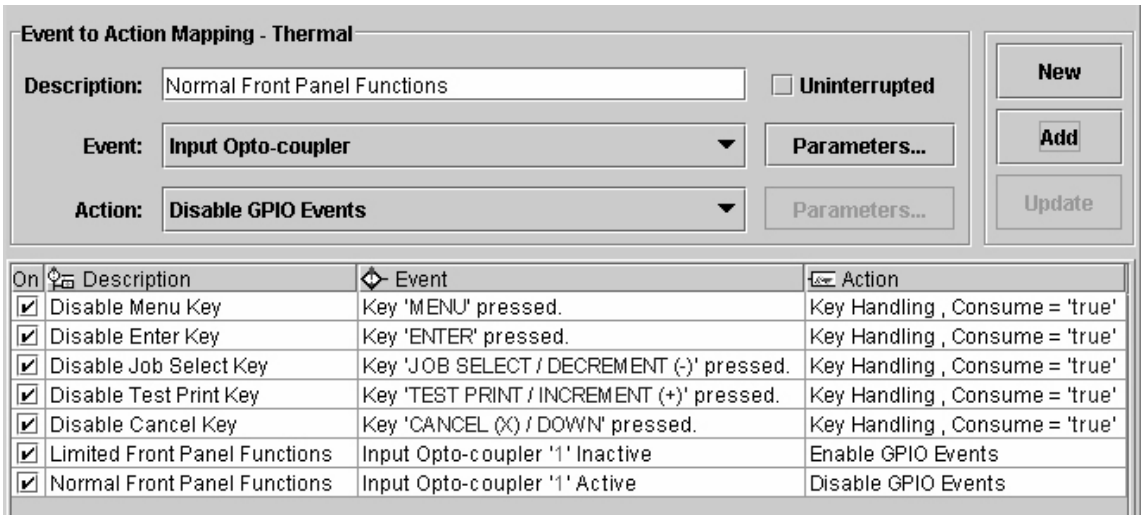


Figure 49. Setting Events and Actions for Print and Apply

Protected Printer Example

To protect the printer's configuration from being overwritten, disable the front panel buttons that are not used daily. The Online and Feed buttons should remain active while the rest disabled. The mapping table listed in Figure 50 shows this function.

If the GPIO board is installed in the printer these functions may be rendered inactive by deactivating the event parser using a special connector. If the connector is installed, the event parser is disabled and the panel functions as a panel on a printer. This allows service engineers access to all printer configurations. Once the connector is removed the panel remains protected.



On	Description	Event	Action
☑	Disable Menu Key	Key 'MENU' pressed.	Key Handling , Consume = 'true'
☑	Disable Enter Key	Key 'ENTER' pressed.	Key Handling , Consume = 'true'
☑	Disable Job Select Key	Key 'JOB SELECT / DECREMENT (-)' pressed.	Key Handling , Consume = 'true'
☑	Disable Test Print Key	Key 'TEST PRINT / INCREMENT (+)' pressed.	Key Handling , Consume = 'true'
☑	Disable Cancel Key	Key 'CANCEL (X) / DOWN' pressed.	Key Handling , Consume = 'true'
☑	Limited Front Panel Functions	Input Opto-coupler '1' Inactive	Enable GPIO Events
☑	Normal Front Panel Functions	Input Opto-coupler '1' Active	Disable GPIO Events

Figure 50. Setting Events and Actions to Disable Front Panel Keys

If the two last entries in the mapping are entered, the following connector wiring results in a tool that can be used to enable or disable the normal front panel functions.

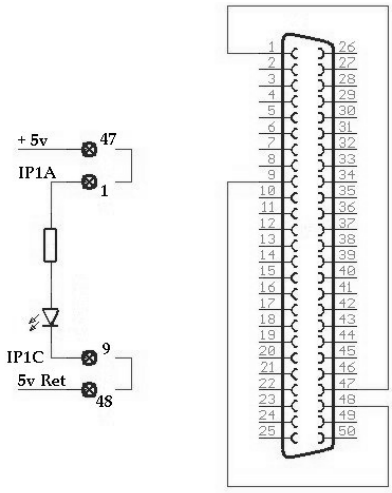


Figure 51. Connector Wiring for Protected Printers

Panel Selected Label Printing

Imagine that the requirement is to print one of three labels without host intervention. To do this, the operator needs to have a selection mechanism at the printer.

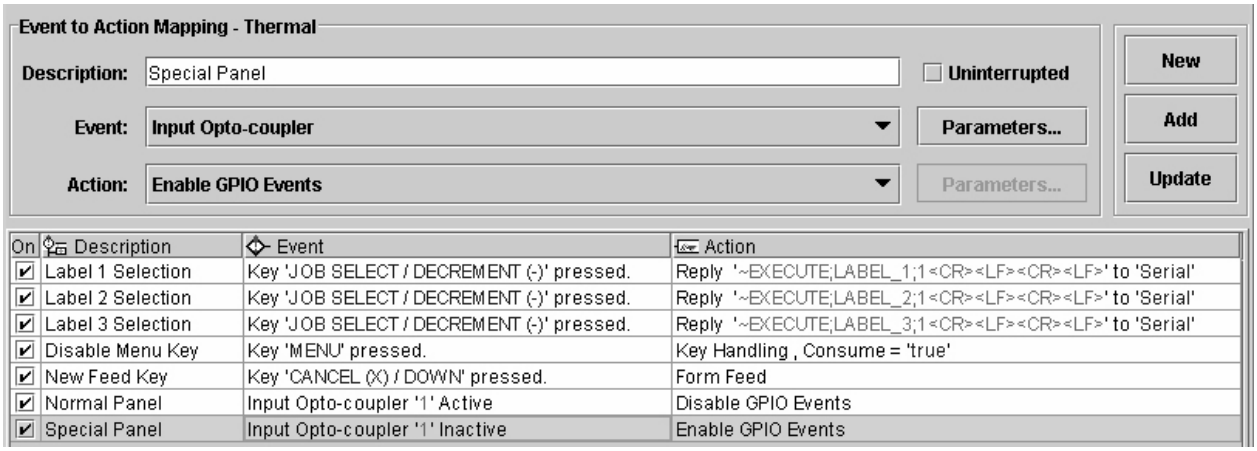
For this application, store the three labels (PGL files) in the printer. The three labels named label_1, label_2, and label_3 sit in the printer waiting for the ~EXECUTE command.

The mapping table in Figure 52 disables the Menu and Enter keys, reassigns the Feed function to the Down key, and the – key as the original Feed key. The + key sends the following data streams to the host via the serial port:

- the – key sends ~EXECUTE;Label_1;1<T><T>~NORMAL<T>
- the Feed key sends ~EXECUTE;Label_2;1<T><T>~NORMAL<T>
- the + key sends ~EXECUTE;Label_3;1<T><T>~NORMAL<T>

For more information, refer to the *PGL Programmer's Reference Manual*.

The mapping also creates the possibility of changing this modified printer into a normal one by plugging in the special connector from the Protected Printer example on page 57.



On	Description	Event	Action
☑	Label 1 Selection	Key 'JOB SELECT / DECREMENT (-)' pressed.	Reply '~EXECUTE;LABEL_1;1<CR><LF><CR><LF>' to 'Serial'
☑	Label 2 Selection	Key 'JOB SELECT / DECREMENT (-)' pressed.	Reply '~EXECUTE;LABEL_2;1<CR><LF><CR><LF>' to 'Serial'
☑	Label 3 Selection	Key 'JOB SELECT / DECREMENT (-)' pressed.	Reply '~EXECUTE;LABEL_3;1<CR><LF><CR><LF>' to 'Serial'
☑	Disable Menu Key	Key 'MENU' pressed.	Key Handling , Consume = 'true'
☑	New Feed Key	Key 'CANCEL (X) / DOWN' pressed.	Form Feed
☑	Normal Panel	Input Opto-coupler '1' Active	Disable GPIO Events
☑	Special Panel	Input Opto-coupler '1' Inactive	Enable GPIO Events

Figure 52. Panel Selected Label Printing Mapping Table

When port switching is enabled, the serial port is the only port with which the printer can communicate to itself. To make the printer communicate to itself a special serial connector is required that connects the transmit data output to the receive data input. When one of the three front panel buttons is pressed, the printer receives a message through the serial port sent out of that serial port by the same printer.

The serial connector in 25 pin and 9 pin is displayed in Figure 53.

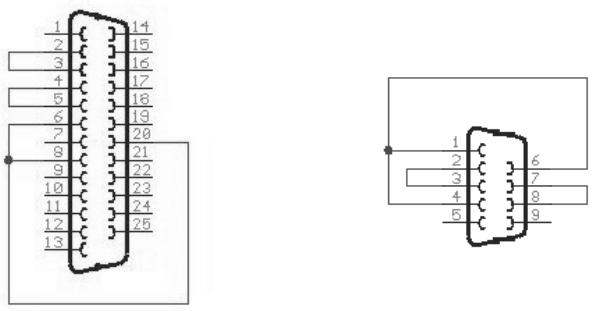


Figure 53. 25 Pin and 9 Pin Serial Connectors

Once the PGL files and GPIO mapping table have been downloaded, and the special serial connector is installed on the printer, the printer will print label_1 when the – key is pressed, label_2 when the Feed key is pressed, and label_3 when the + key is pressed. The printer performs a form feed when the Down key is pressed. The Menu and Enter keys are non-functional.

Panel with GPIO Disabled

Panel with GPIO Enabled

Figure 54. Panels with GPIO Disabled and Enabled

This works without the GPIO board installed in the printer; all it requires is the specially wired connector at the serial port. As indicated, it could also be combined with the Protected Printer example (see page 57). A connector placed at the GPIO port could disable all this and allow a service engineer to work on the printer without restrictions.

Pin Code Protected Printer

The printer configuration protection described in the example on page 57 requires a special connector to disable GPIO so a service or application engineer can work on the printer without restrictions. The special connector requires one of the inputs to be specifically saved for protection purposes. You can use software to protect the printer using a PIN code that can be entered through the front panel.

Imagine that the panel is partly disabled and the Online key, the Feed key and the Menu key are the only keys active. The Pause and Feed keys are operational because they are required for daily printer operation. The Menu key does not allow the user to open the configuration menu, instead it will ask for a PIN code before allowing the user to change the configuration.

For this application the front panel keys get a value between 1 through 7 assigned to them using a datafield. A three digit PIN code allows any value between 111 through 777 to be used. For example, the assignment list include:

Panel Key	Number Assigned
Pause	1
Minus	2
Feed	3
Plus	4
Menu	5
Down	6
Enter	7

We'll use three more data fields named new_pin, pin_number and pin_entry_count. The pin_number data field contains the actual PIN number required to enable the configuration. The final result of entering code will be compared with this data field. If the codes and data fields match, the configuration will be enabled. If they do not match, the user is allowed two more chances. After that a message is sent to the host and the printer locks up. Use the new_pin data field to create the PIN number.

On each entry we'll send a message to line 2 of the LCD. For this example we'll use three messages with the following content:

- message one_pin contains '*--'
- message two_pin contains '**-'
- message three is either 'PIN accepted' or 'PIN incorrect'

When a key is pressed, the value of the corresponding data field is added to the value in new_pin (which initially contains 0). If the down key is pressed, new_pin now contains 6. If this is not the last (third) entry, the content of new_pin is multiplied by 10 (effectively shifting it over 1 decimal place). The message one_pin is sent to the LCD that now shows ‘PIN number: *--‘.

If the Feed key is pressed next, the value in the related data field (3) is added to new_pin which now contains 63. Again, it is not the last entry so new_pin is multiplied by 10, the content changes to 630 and the message two_pin is sent to the LCD to show ‘PIN number: **-‘.

If the Menu key is the third and last key pressed, the value 5 is added to new_pin. The content is now 635. Since this is the last key the number will not be multiplied by 10. Instead, we will send a message to the LCD. We now have the complete PIN code entered, compare it with the PIN code stored in the printer. This is done by a simple comparison of two data fields, new_pin and pin_number.

If the values match we’ll make all keys available to the user. If the values don’t match we’ll increase the ‘pin_entry_count’ by one and start over. If the ‘pin_entry_count’ reaches three some message will be transmitted to the host and the complete panel will be blocked.

Data Fields, Reports, and Timers

The following (U16) data fields need to be created for this application where the content of the pin_number data field can be any value between 111 and 777.

Data Field Name	Initial Value
Pause_Key	1
Minus_Key	2
Up-Key	3
Plus_Key	4
Menu_Key	5
Down_Key	6
Enter_Key	7
Pin_Entry_Count	0
New_Pin	0
Pin_Number	635

Next to the data fields are status reports and information sent to the host if there is an error. The six reports listed in Table 5 need to be generated. Each report only has a single section that may have the same name as the report.

Table 5. Report Names, Sections, and Content

Report Name	Section Name	Content
pin_empty	pin_empty	PINumber:---
one_pin	pin_1	PINumber:*--
two_pin	pin_2	PInumber:**-
pin_accepted	pin_ok	PIN accepted
incorrect_pin	pin_error	PIN incorrect
locked	locked	*Printer Locked*

The PIN number appliction is described by reviewing each of the mapping tables and explaining each entry in that table.

Tables

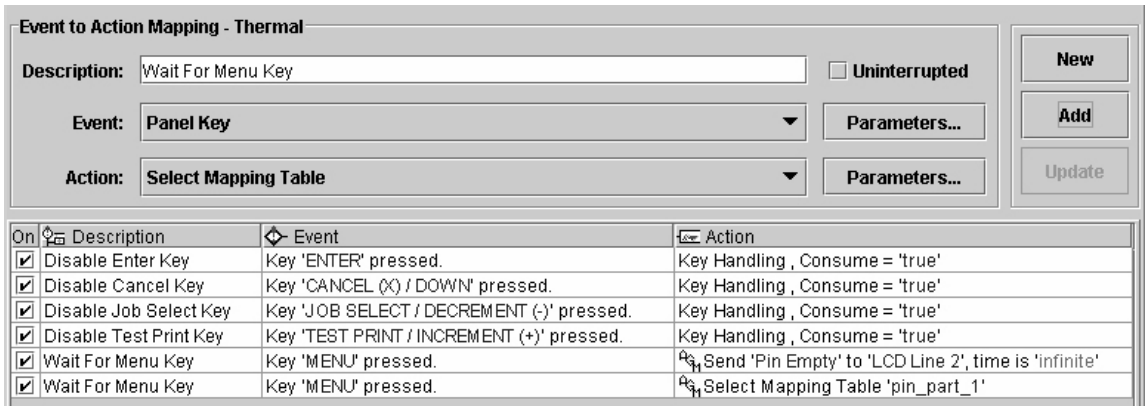


Figure 55. Power_On Mapping Table

Table 5 does not show all entries in a power-on table, just those that are important for the PIN number application. The first four entries disable the important keys by “consuming” the key function, that is, the action that normally would result from pressing the key will not execute. The Pause and Feed key are left unchanged but as soon as the menu key is pressed the specified actions execute. First the original function is consumed, then the pin_empty message displays in Line 2 of the LCD, and the pin_part_1 mapping table is selected.

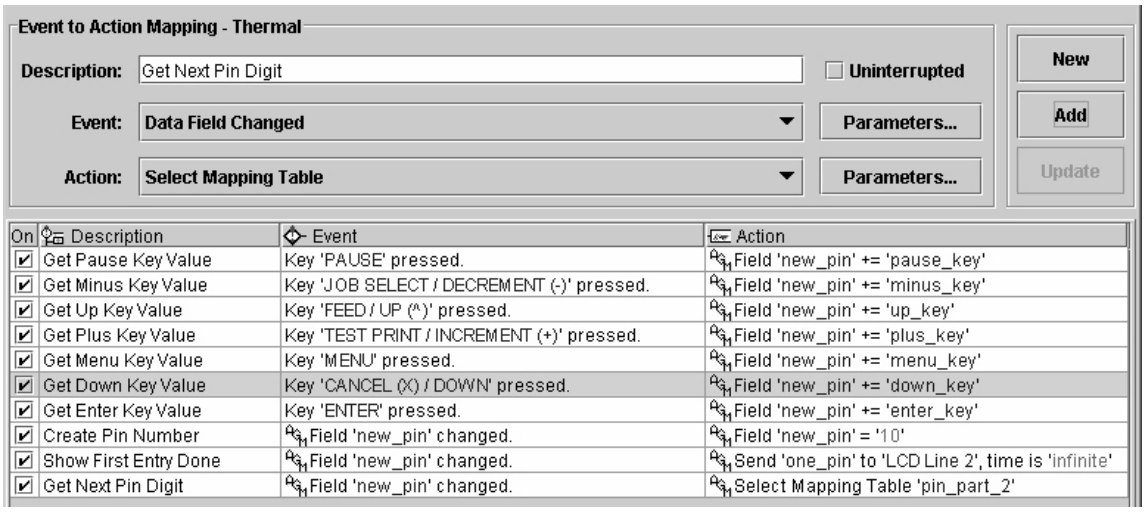


Figure 56. Pin_Part_1 Mapping Table

If a key is pressed for the first 7 entries, the value of the related data field is added to the new_pin data field, which is multiplied by 10 to shift the content one decimal place over. Since we now have the first part of the PIN number in a data field, we'll display the one_pin message on the LCD and switch to the pin_part_2 table.

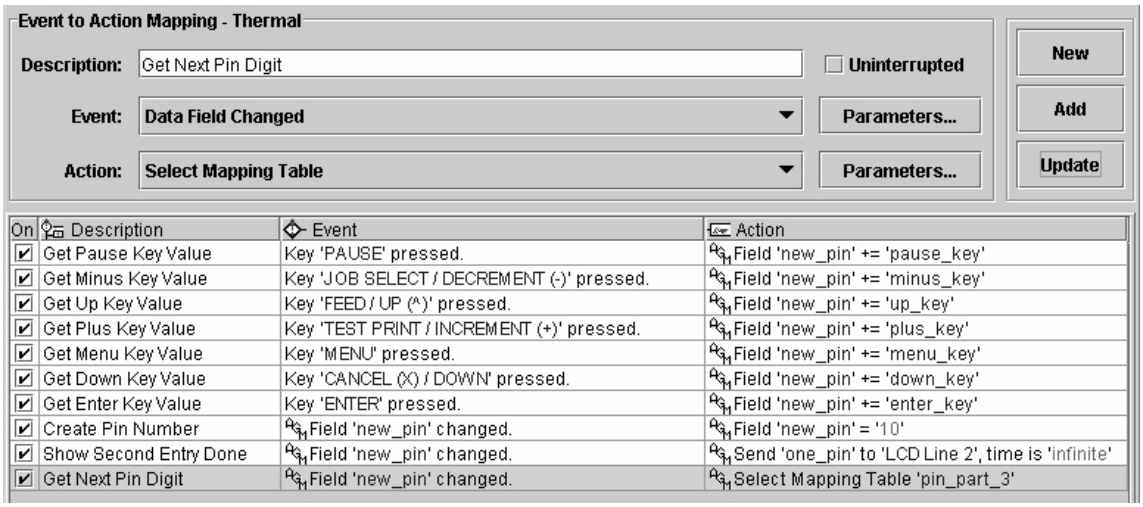
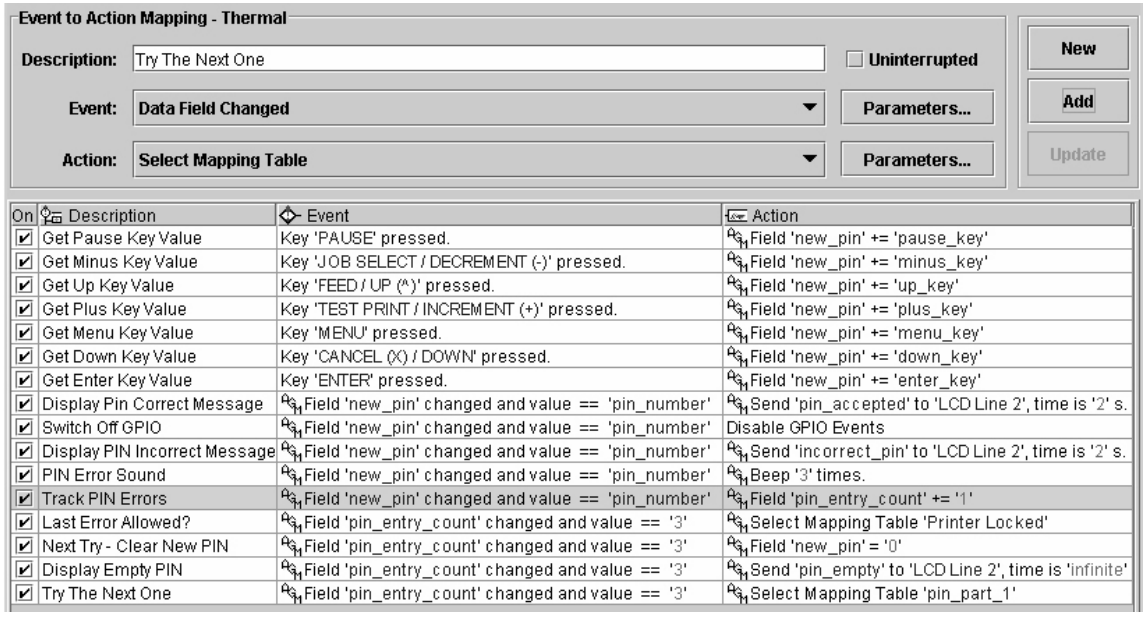


Figure 57. Pin_Part_2 Mapping Table

The Pin_Part_2 mapping table is similar to the Pin_Part_1 mapping table. If a key is pressed for the first 7 entries, the value of the related data field is added to the new_pin data field, which is multiplied by 10. The message two_pin will display to indicate that two numbers of the PIN code have been entered and to select the pin_part_3 table.



On	Description	Event	Action
☑	Get Pause Key Value	Key 'PAUSE' pressed.	Field 'new_pin' += 'pause_key'
☑	Get Minus Key Value	Key 'JOB SELECT / DECREMENT (-)' pressed.	Field 'new_pin' += 'minus_key'
☑	Get Up Key Value	Key 'FEED / UP (^)' pressed.	Field 'new_pin' += 'up_key'
☑	Get Plus Key Value	Key 'TEST PRINT / INCREMENT (+)' pressed.	Field 'new_pin' += 'plus_key'
☑	Get Menu Key Value	Key 'MENU' pressed.	Field 'new_pin' += 'menu_key'
☑	Get Down Key Value	Key 'CANCEL (X) / DOWN' pressed.	Field 'new_pin' += 'down_key'
☑	Get Enter Key Value	Key 'ENTER' pressed.	Field 'new_pin' += 'enter_key'
☑	Display Pin Correct Message	Field 'new_pin' changed and value == 'pin_number'	Send 'pin_accepted' to 'LCD Line 2', time is '2' s.
☑	Switch Off GPIO	Field 'new_pin' changed and value == 'pin_number'	Disable GPIO Events
☑	Display PIN Incorrect Message	Field 'new_pin' changed and value == 'pin_number'	Send 'incorrect_pin' to 'LCD Line 2', time is '2' s.
☑	PIN Error Sound	Field 'new_pin' changed and value == 'pin_number'	Beep '3' times.
☑	Track PIN Errors	Field 'new_pin' changed and value == 'pin_number'	Field 'pin_entry_count' += '1'
☑	Last Error Allowed?	Field 'pin_entry_count' changed and value == '3'	Select Mapping Table 'Printer Locked'
☑	Next Try - Clear New PIN	Field 'pin_entry_count' changed and value == '3'	Field 'new_pin' = '0'
☑	Display Empty PIN	Field 'pin_entry_count' changed and value == '3'	Send 'pin_empty' to 'LCD Line 2', time is 'infinite'
☑	Try The Next One	Field 'pin_entry_count' changed and value == '3'	Select Mapping Table 'pin_part_1'

Figure 58. Pin_Part_3 Mapping Table

The Pin_Part_3 mapping table starts with the same seven entries. The value is added to new_pin but this time we do not multiply the value by 10; we now have the complete PIN code. The message displayed depends on the result of the comparison beween the new_pin data field and the pin_number data field. If the two values are the same, the message pin_accepted will display and GPIO will be disabled, allowing the printer to function as a normal printer. Configuration changes can be made and saved. A power cycle is required to reactivate GPIO and its printer protection function.

If the two numbers do not match the pin_incorrect message displays on the LCD. The printer will beep three Times New Roman and the pin error count increments. This value is tested to see if this was the third trial. If not, the user is given another try.

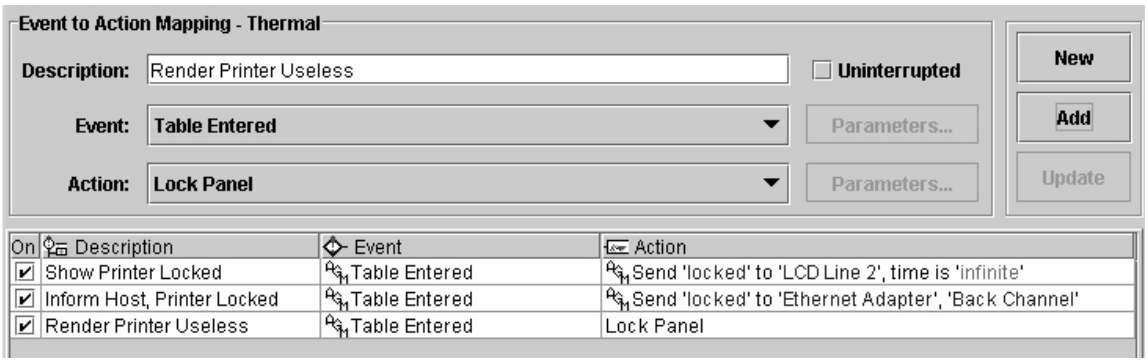


Figure 59. Prt_Locked Mapping Table

If it is the third try, the event generator timer starts and the Prt_Locked mapping table is selected. In this table we'll inform the user that the printer is locked by displaying the Printer Locked message on the LCD. We'll inform the host by sending a message through the interface and disable the printer front panel, making it useless until a power cycle has been done.

The program could be easier to enter by using the new subroutine function. The seven entries related to the pressing of the keys to generate the PIN code could be made a subroutine. This would improve printer memory usage and save time on typing.

A Technical Information

Opto-couplers

The opto-couplers are Vishay SFH6916 or equivalent with the following basic specifications:

NOTE: Please check the Vishay SFH6916 datasheet for electrical specifications.

GaAs Light Emitting Diode

Reverse Voltage (Vr)	: 6 V
Forward Current (DC)	: 50 mA
Peak Forward Current (Ifp)	: 2.5 A

NPN Silicon Phototransistor

Isolation Voltage (Vr)	: 3750 V r.m.s.
Collector to Emitter voltage (Vceo)	: 70 V
Collector current	: 50 mA
High switching speed	
UL approved	

The inputs of the GPIO board (the LEDs of 8 opto-couplers) are protected against overcurrent by the inclusion of a 4700 Ohm resistor in the anode connection. This allows for an input voltage range between 5 and 24 VDC.

The opto-coupler outputs are open collector transistors. By design the output current available is set at 3 ma. max. This value is based on an opto-coupler current transfer ratio of 100% at an ambient temperature of 50 degrees C. Load currents greater than 3 ma. will cause the transistor to come out of saturation, resulting in a rise in the output voltage and possible damage to the transistor.

WARNING **For safety purposes a volate no greater than 42 volts DC should be applied to the GPIO board.**

The GPIO board has a provision for mounting resistors, either in the connection between the actual output pin and the collector of the output transistor or from a common connector pin (17) to the collector of the output resistor. See the drawing in Appendix C.

Relays

Relays are the NAiS TX type and are 2-Amp high capacity relays with the following basic specifications:

NOTE: Please check the NAiS TX type relay datasheet for complete electrical specifications.

Surge withstand between coil and contacts	: 2500 V
Breakdown voltage between coil and contact	: 2000 V
Nominal switching capacity	: 2 A @ 30 V
Maximum switching voltage	: 220 V DC
Maximum switching current	: 2 A
Contact settling time	: 4 mS (max)

The relays are type DPDT of which a single SPDT contact is made available on the I/O connector.

WARNING **For safety purposes do not apply a voltage greater than 42 volts DC to the GPIO board even though the relay is rated at 220 volts DC.**

Voltages

Two voltages available on the I/O connector are 5 and 24 volts DC. Using self-healing fuses, both voltages are separately fused at 500 mA for 5 volts and 250 mA for 24 volts. These voltages share the same ground. To guarantee complete galvanic isolation between the printer and the equipment that is connected through the GPIO interface, use a separate power source for the equipment the printer is connected to and make sure the I/O connector housing on the printer side is not connected to ground.

NOTE: Be aware that the 24 volts require a special connection inside the printer and that this voltage is not available when a cutter is installed in the Thermal printer.

I/O Connector

The I/O connector is a 3 row, 50 pin, D type connector. Inputs and outputs of opto-couplers and relays are wired to this connector so that creating inputs using common anodes or cathodes or outputs using common emitters or collectors is fairly simple. The two voltages and their respective returns are also wired to this connector.

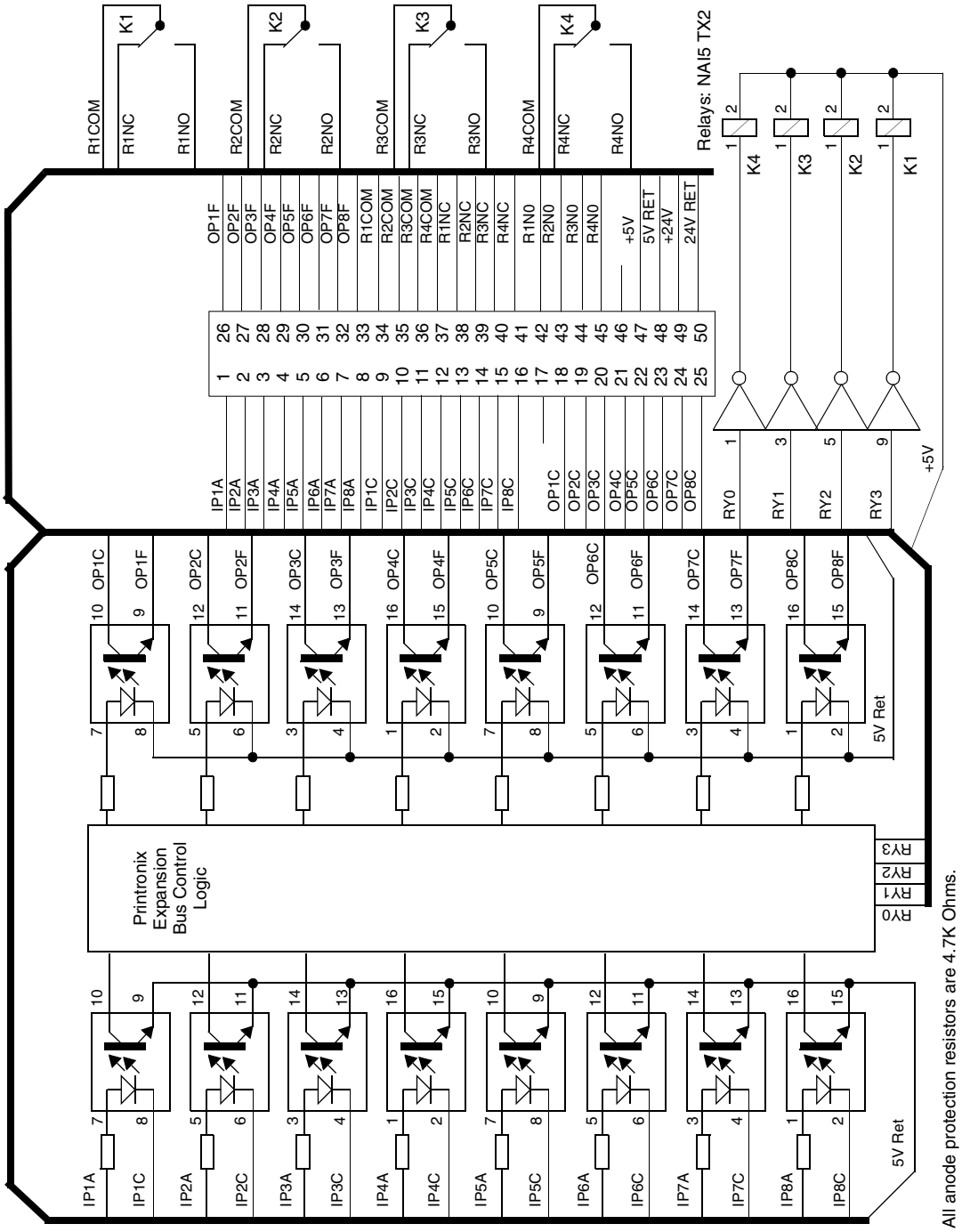
Table 6 specifies the connector wiring where IPxA represents the anode connection of the Input Opto Coupler diode and IPxC represents the cathode connection of the diode. OPxC represents the collector of the output transistor, and OPxE represents the emitter of the transistor. RxCM represents the common connection of the SPDT relay contact, RxNC represents the Normally Closed, and RxNO the Normally Open contact.

Table 6 : Connector Wiring

1: IP1A	18: OP1C	34:R1CM
2: IP2A	19: OP2C	35:R2CM
3: IP3A	20: OP3C	36:R3CM
4: IP4A	21: OP4C	37:R4CM
5: IP5A	22: OP5C	38:R1NC
6: IP6A	23: OP6C	39:R2NC
7: IP7A	24: OP7C	40:R3NC
8: IP8A	25: OP8C	41:R4NC
9: IP1C	26: OP1E	42:R1NO
10: IP2C	27: OP2E	43:R2NO
11: IP3C	28: OP3E	44:R3NO
12: IP4C	29: OP4E	45:R4NO
13: IP5C	30: OP5E	46: n.c.
14: IP6C	31: OP6E	47:+5V
15: IP7C	32: OP7E	48:5Vret
16: IP8C	33: OP8E	49:+24V
17: (*)		50:24Vret

(*) Pin 17 is connected to a number of through holes on the GPIO printed circuit board. It can be used to supply power (via a user-installed resistor) to the collectors of the output transistors. See the diagram of the outputs in Appendix C.

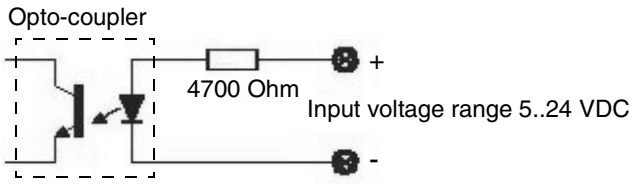
B *Basic GPIO Schematic Diagram*



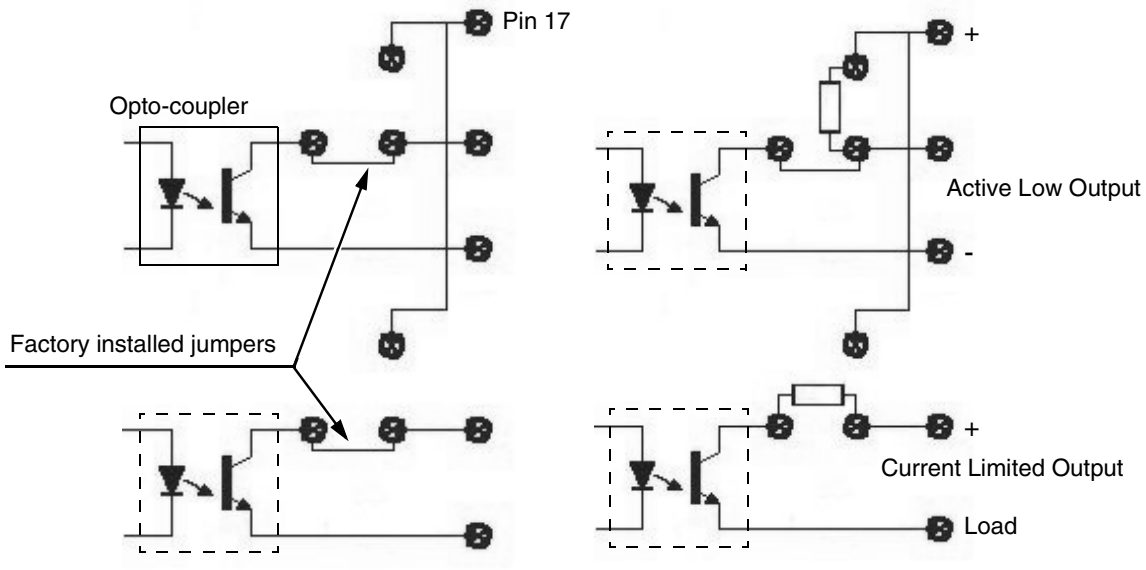
Appendix B

C *Electrical Inputs And Outputs*

GPIO Opto-coupled Input Circuit



GPIO Opto-coupled Output Circuit



Factory Default Configuration

User Selectable Configurations

Appendix C GPIO Opto-coupled Output Circuit

D Contact Information

Printronix Customer Support Center

IMPORTANT **Please have the following information available prior to calling the Printronix Customer Support Center:**

- Model number
- Serial number (located on the back of the printer)
- Installed options (i.e., interface and host type if applicable to the problem)
- Configuration printout:

  Thermal Printer
  See “Printing A Configuration” in the *Quick Setup Guide*.

  Line Matrix Printer
  Press PRT CONFIG on the control panel, then press Enter.
- Is the problem with a new install or an existing printer?
- Description of the problem (be specific)
- Good and bad samples that clearly show the problem (faxing or emailing of these samples may be required)

Americas	(714) 368-2686
Europe, Middle East, and Africa	(31) 24 6489 311
Asia Pacific	(65) 6548 4114
China	(86) 800-999-6836

http://www.printronix.com/support.aspx

Printronix Supplies Department

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Corporate Offices

Printronix, Inc.
15345 Barranca Parkway
Irvine, CA 92618
U.S.A.
Phone: (714) 368-2300
Fax: (714) 368-2600

Printronix Inc.
c/o Printronix Nederland BV
Bijsterhuizen 11-38
6546 AS Nijmegen
The Netherlands
Phone: (31) 24 6489489
Fax: (31) 24 6489499

Printronix Schweiz GmbH
42 Changi South Street 1
Changi South Industrial Estate
Singapore 486763
Phone: (65) 6542 0110
Fax: (65) 6546 1588

Printronix Commercial (Shanghai) Co. Ltd
22F, Eton Building East
No.555, Pudong Av.
Shanghai City, 200120, P R China
Phone: (86) 400 886 5598
Fax: (86-21) 5138 0564

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