CSZ Dimension® II Series 8705 Multi-Loop Process Controller

User's Manual

November 1994

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Section 1

Introducing CSZ Dimension II

Section 1 Introducing CSZ Dimension II

What is CSZ Dimension II

A powerful, easy to use dual loop process controller from Research, Inc., CSZ Dimension II features a wide range of configuration, control, setpoint programming, monitoring and alarming for your environmental chamber applications. The systems described in this manual are designed to provide superior digital PID control in general-purpose control applications. Standard as well as specialized thermocouple, RTD, and linear inputs can be used to provide complete closed-loop control of temperature and other variables.

An intelligent unit equipped with its own microprocessor, the CSZ Dimension II universal operator interface features a unique backlit display, highly visible in the most adverse lighting conditions. Large, easily readable characters and a wide range of graphic displays give operators the information they need with clarity and precision. To move from screen to screen, the front panel is equipped with a large diamond shaped four-way display select key used to select graphic icons representing a full range of configuration and operation functions. For parameter selection and data entry, a large multi-function knob is available.

CSZ Dimension II programmer functions permit the use of programs up to 256 segments (750 segments optional), with segment times from .1 second to 99 hours. Also, you can assign analog outputs for either process control, customer events, or retransmission of profile characteristics. Time-proportioned outputs are also able to be configured, and a wide variety of alarm and event schemes are user-selectable.

Other CSZ Dimension II features include:

- User-selectable graphic displays (X-Y graphs, bar graphs, numeric)
- User-defined scaling and screen display terminology
- Setpoint programming with graphic profile displays
- Automatic or manual start/stop of stored batch programs
- Up to two control loops with auto-tuning, setpoint ramping and part temperature control
- Up to twelve analog inputs for both control and monitoring
- Up to four analog outputs for control
- One setpoint programmer
- PID control with direct, reverse, or bi-modal control action
- PID control with "step/response" auto-tuning
- Bumpless transfer for manual/auto modes
- Full set of high, low, and deviation alarm functions
- Instant alarm display and response capabilities

- Three levels of system security with passcode control
- Large, easy to use multi-function knob for data entry and parameter selection
- Large diamond shaped four-way display select key and graphic icons for quick screen access
- Dedicated "help" key for on-screen display of messages and operating instructions
- Two user-programmable "macro keys" for simple one-key activation of user-defined command strings
- Serial communications, RS-232/RS-422 and optionally, and IEEE-488
- Electronic storage of system configuration files and programs on compact, removable memory cards
- Supervisory control of multiple controllers via an optional PC-based host software package such as Research, Inc.'s Micrihost® PC software package

CSZ Dimension II Conventions

In CSZ Dimension II documentation and on-screen instructions, you will be instructed to enter various system commands and information with operator interface front panel controls. The following conventions are used:

- Operator interface display entries are printed in UPPER-CASE CHARACTERS in the documentation.
- Pressing the operator interface multi-function knob has the same effect as pressing the Enter or Return key on a computer keyboard. When you see "press **ENTER**" printed in an instruction, press the knob to enter a selection or command into the system.
- The operator interface multi-function knob can be turned clockwise or counterclockwise to scroll through or select information. In the documentation, CW = clockwise and CCW = counterclockwise.
- The operator interface continuously displays a set of graphic icons on the right-hand side of the screen. The meanings of these graphic symbols are defined in section 2 of this manual.
- The operator interface displays a graphic SELECTOR BOX which indicates the currently active data entry field or selection on a screen. In its "home" position, the selector box is displayed as a blinking square graphic object between the screen title and time indicator on the top line of the screen.
- When a window is displayed on a screen, the selector box disappears and another box with a smaller box inside is displayed.
- When an icon or data entry field is displayed in reverse video on a screen, that icon or field is currently selected (except for function icons.)
- Non-Critical Alarms – When a non-critical alarm becomes active, the alarm icon begins to blink. When all alarms are acknowledged on the Alarm Status screen, the icon stops blinking.
- Critical Alarms – When a critical alarm occurs, an informational window will be displayed as to the cause. The unit will not reset until the alarm condition has been cleared and the alarm acknowledged. (Please refer to Fig. 2–21 for more information.)

Terminology

Terms used in the documentation that may be unfamiliar to you are defined below.

Auto-tuning
Controller-initiated calculation of tuning constants for a PID control loop.

Bi-modal
Reverse- and direct-acting control outputs used for heating/cooling.

CAT
Current-adjusting transmitter for variable signal control.

DAT
Duration-adjusting transmitter for time-proportioned on/off (contact) control.

Direct-acting
Control output used for cooling.

Icons
Graphic symbols displayed on the right-hand side of CSZ Dimension II displays representing specific operation or configuration functions.

Memory Card
Removable data cartridge used to store CSZ Dimension II setpoint profile programs or configuration data.

PAT
Position-adjusting transmitter for valve position control.

PC
Personal computer.

Reverse-acting
Control output used for heating.

Selector Box
The moveable graphic "box" that indicates where you may enter or select information on CSZ Dimension II displays. In its "home" (inactive) position, the selector box is located between the screen title and time indicator on the top line of the screen.

How to Get Help

On many operator interface displays, messages are displayed that will tell you how to proceed or how to correct an error. Also, pop-up "help" windows can be called up by simply pressing the **Help** key (?). (Press the Help key again, or the knob, to make the window disappear.)

If you can't find the answer you need on a specific display or "help" window, refer to the glossary or reference section.

If you need assistance from CSZ Dimension II technical support personnel, call:

CSZ Dimension II Technical Support
Cincinnati Sub-Zero
12011 Mosteller Road
Cincinnati, Ohio 45241
1-513-772-8810

Notes

Universal Operator Interface

Section 2

Section 2 Universal Operator Interface

Introduction

The CSZ Dimension II universal operator interface is a self-contained, intelligent unit equipped with its own on-board microprocessor and memory. The operator interface provides all the tools needed for system configuration, operation, and monitoring.

In all hardware configurations, operator interface functions and features are identical. Operator interface features include:

- An easy-to-use set of controls for both configuration and operation
- A set of highly readable, backlit screen displays using both text and process graphics
- Dedicated "help" key
- Multi-function knob for data entry and parameter selection
- Two user-programmable "macro keys" for combining often used multiple steps into one function
- User definable displays
- Screens in text/numeric, X-Y charts, bar charts
- User definable screens and process terminology
- An integrated memory card slot that can read from and write to removable data storage memory cards

Front Panel Controls

The following paragraphs identify and describe the CSZ Dimension II universal operator interface front panel controls shown in Fig. 2–1.

Help Key

Located in the upper right-hand corner of the front panel, the help key is designed to perform two functions:

- Cancel an entry. Pressing the help key when entering a value will cancel the entry.
- Provide on-screen help. Pressing the help key opens a "help" window containing instructions for the currently accessed field. Pressing the help key a second time, or the knob, closes the window.

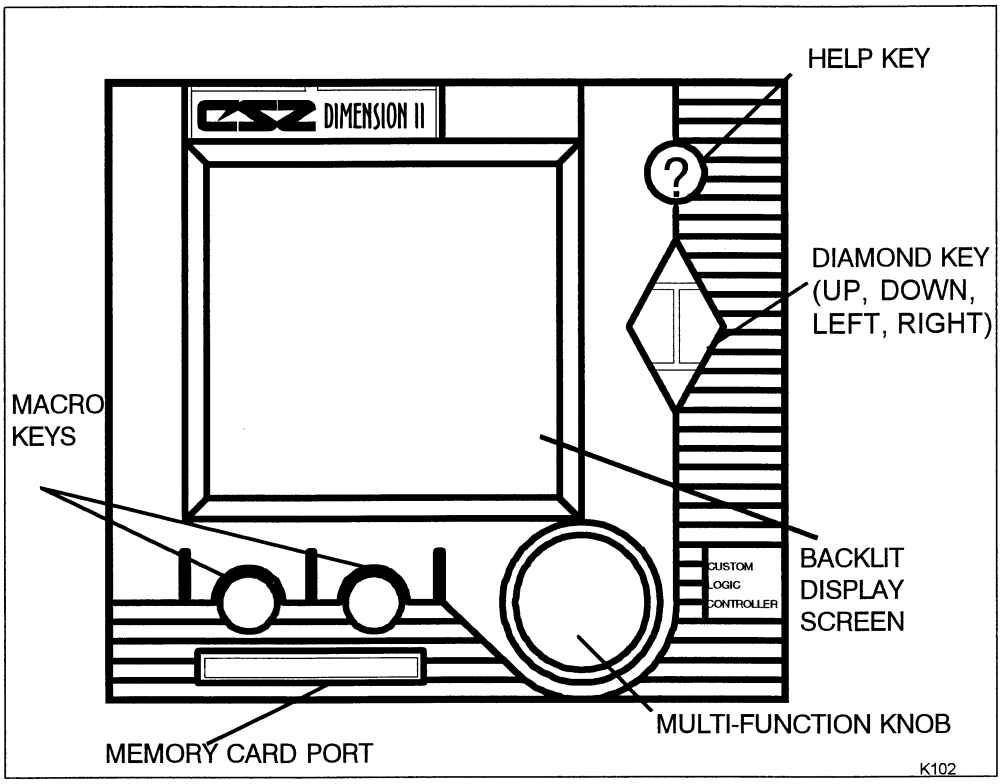


Fig. 2–1.
CSZ Dimension II Universal Operator Interface Front Panel

Note: *During some operations, help messages are displayed automatically if you attempt to perform actions not permitted on the currently displayed screen.*

Most help messages are an integral part of system software and are not user-definable. However, on the Alarm Display Configuration screen, you may enter alarm-specific messages that will be displayed when the help key is pressed at the Alarm Status screen.

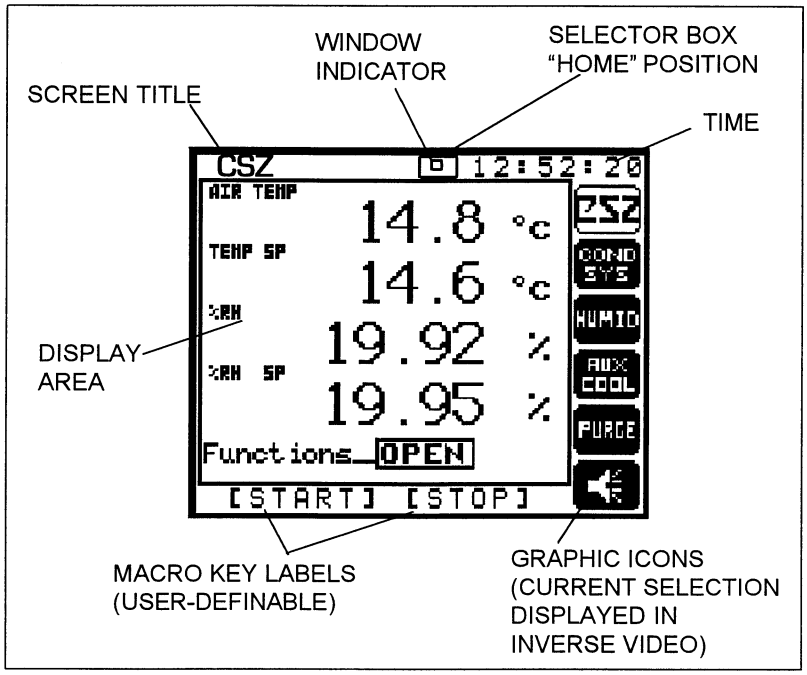
Diamond Key (Four-way Keypad)

The universal operator interface screen displays are organized in a horizontal/vertical hierarchy. A set of six graphic icons displayed on the right side of the screen shows where you are located vertically in the screen display hierarchy (by displaying the icon in reverse video). (See Fig. 2–2.)

The diamond key located directly below the help key is used to perform one function: to exit from the currently displayed screen and to call up another screen. The diamond key has four selections:

UP—Accesses the next icon up and displays the first screen for the icon.
DOWN—Accesses the next icon down and displays the first screen for the icon.
LEFT—Displays the next screen to the left.
RIGHT—Displays the next screen to the right.

Fig. 2–2.
CSZ Dimension II Screen Display Format



Multi-Function Knob

The multi-function knob is used to move the graphic "selector box" from field to field on CSZ Dimension II screen displays. In its "home" (inactive) position, the selector box is located between the screen title and time indicator on the top line of the screen. If a window is displayed, a second, smaller box is displayed inside another box to the left of the selector box (Fig. 2–2).

The following sequence explains how you can make selections and enter or change information on CSZ Dimension II screen displays.

Macro Keys

The two "macro keys" located below the display screen can be user-defined to execute a string of commands, (e.g. to start and stop specific control actions). Each key can be user-labeled (eg. "START" and "STOP") and are displayed directly above each key on the bottom row of the screen (see Fig. 2–2). The label and function assigned to each macro key are displayed and available on all system screens.

Macro key functions are typically programmed into the CSZ Dimension II system by the control systems supervisor or administrator. If you are not sure which functions have been programmed into the macro keys on your unit, be sure to consult with your supervisor before attempting to use the keys (See pg. 4-14 to program the macro keys).

Memory Card Slot

A slot is provided on the operator interface front panel for insertion of a credit card-sized memory card. The operator interface can read from, write to, display a directory, delete, or format memory cards.

Information that can be stored on CSZ Dimension II memory cards includes:

- Programmer profile programs 1–8 (Recipes)
- Total memory image of CSZ Dimension II configuration and operational parameters (Mem-Img)
- Display configuration (Dsp Conf)
- Macro key configuration (MacroKy_)
- User written CLC program (BASIC)

(See pp. 2-31, 32, 33, 34 for instructions on using the memory card.)

Screen Display Format

Screen backlighting can be manually turned on or off, or can be set to automatically turn on and off at specific times. As shown in Fig. 2–2, every CSZ Dimension II screen display includes the following common elements:

SCREEN TITLE—The title of the currently displayed screen is displayed on the top row of the screen. (Most screen titles are user-definable.)

SELECTOR BOX "HOME" POSITION—A blinking graphic "box" displayed on the top row of the screen indicates that the selector box (controlled by turning the multi-function knob) is located in its "home" (inactive) position. Whenever you call up a new screen, the selector box is displayed in its home position.

Note: *A second, smaller box is displayed inside another graphic box to the left of the selector box in the "home" position when a window is called up in the display area (see Fig. 2–2).*

Note*: On the CSZ screen and the Prod-Limit screen the home position for the selector box is on the OPEN function.*

CURRENT TIME—The current time is displayed in the right-hand corner. Current time is displayed in standard 24-hour (HH:MM:SS) format.

GRAPHIC ICONS—For the CSZ screen and the Prod-Limit screen, the middle four icons (Cond Sys, Humid, Aux Cool, Purge) act as indicating lights and are displayed in inverse video when that particular function is turned on. The diamond key can select between the CSZ icon and the alarm icon only. On all other screens, the right-hand side of the screen displays six graphic icons, or symbols, which represent various system functions. The currently selected icon (selectable with diamond key) is displayed in inverse video.

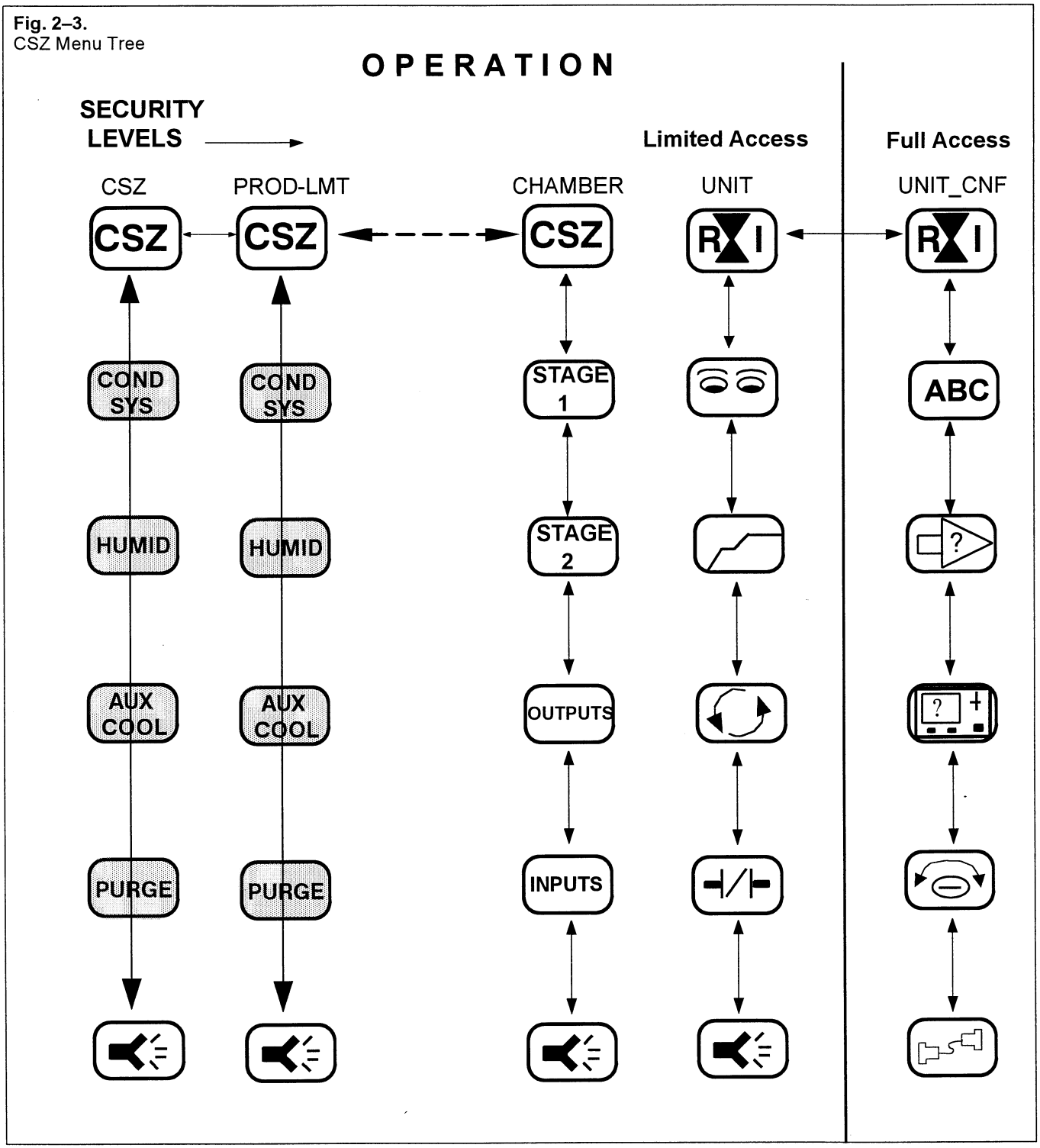
MACRO KEY LABELS—The bottom row of the screen always displays user-definable labels for the two macro keys located directly below the screen.

DISPLAY AREA—The contents of the screen currently called up is displayed in the "display area" shown in Fig. 2–2. The location of the selector box (when away from the "home" position) is depicted by a graphic box or rectangle surrounding the currently selected data entry field or selection.

Graphic Icons and Screen Display Groups - Menu Tree

The CSZ Dimension II is divided into Operation and Configuration sections. On the Operation side, a user with limited access can view CSZ and RI operation parameters. A user with Full Access can view the above Operation areas as well as the RI Configuration side. A diagram of this screen hierarchy is listed below in Figure 2-3.

Fig. 2–3.
CSZ Menu Tree



CSZ Operation Icons and Screen Display Groups

CSZ Default Screen and Product Hi/Low Limit Screen

1. When a screen is first displayed after being powered-up, the selector box is located in the OPEN position near the bottom of the screen.
2. If you press the Help key, a help window is displayed that describes how to turn the chamber on/off.
3. Press the Help key again, or the knob, to close the help window.
4. If any items on the screen are selectable, the knob can be turned CW to move the selector box to the first selectable item on the screen.
5. If the multi-function knob is pressed, the item is selected and one of two actions occurs:
   - A window opens for further input.
   - The selected item is displayed in inverse video and you can change the item in one of the following ways:

     CHARACTER ENTRY – Display one character at a time by turning the knob CW or CCW and press **ENTER** when the character you wish to select is displayed. This input method displays the full ASCII alphanumeric character set as the knob is turned.

     NUMBER ENTRY – Display one number at a time by turning the knob CW or CCW and press **ENTER** when the number you wish to select is displayed. This input method displays numbers in the correct format as the knob is turned. Parameters such as time, date, and passcodes are set with limits, as are control parameters and variables.

Note: *If a number is entered outside of a field's designated range, the number will not be accepted. The previous value will be redisplayed in the data entry field. Length varies from field to field.*

PARAMETER SELECTION – As the knob is turned CW or CCW, a list of selectable items is displayed, for example, "LOOP01, LOOP02, LOOP03." When the correct entry is displayed, press **ENTER** to select the item.

FUNCTION SELECTION – Some entries are functions that will be executed when **ENTER** is pressed. For example, scrolling to the "CLOSE" entry in a window and pressing **ENTER** closes the window.

Note: *If an item is selectable (selector box can be moved to it), the help key can be pressed and a help message for the item in the selector box will be displayed. If an item is selected by pressing ENTER, a screen change cannot be made until the selector box reappears.*

CSZ Default Screen

The CSZ screen (Fig. 2–4) is the first screen displayed when the Dimension II is powered up. The following information and functions are available at this screen:

AIR TEMP Displays air temperature process variable
TEMP SP Displays air temperature setpoint
%RH Displays relative humidity process variable
%RH SP Displays relative humidity setpoint
Functions Opens a window that permits the user to select **ON**, **OFF**, or **PGM** mode for any of four unit functions.

CSZ Screen Function Window – Entering Unit Functions

Three modes are available for each function (Fig. 2–5):

ON Turns the corresponding function on and illuminates the Icon pointed to by the arrow in inverse video. (Black letters, light grey background)
OFF Turns the corresponding function off, and displays the Icon pointed to by the arrow in normal video. (Light grey letters, black background)
PGM Allows the X_Events from a programmed recipe to control the function.

Fig. 2–4.
CSZ Display Screen.

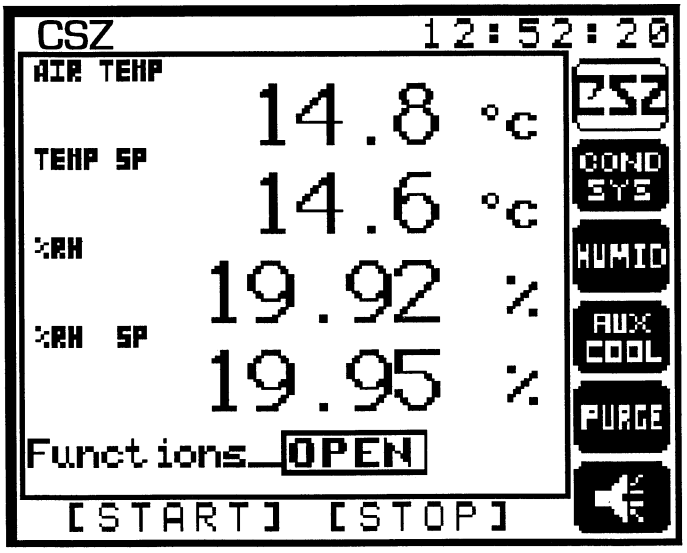
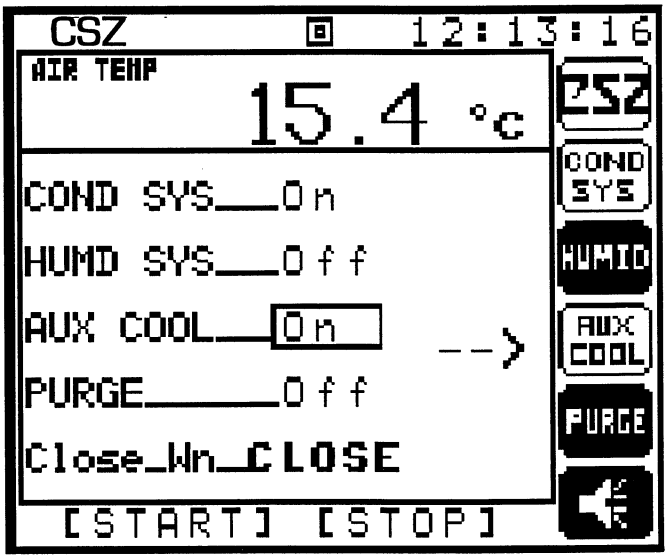


Fig. 2–5.
CSZ Screen Function Window.



Product Limit Screen

The following information and functions are available at this screen (Fig. 2–6):

PRODTEMP	Displays the product temperature process variable.
Hi Limit	The value at which the product limit high temperature alarm will shut down the chamber.
Lo Limit	The value at which the product limit low temperature alarm will shut down the chamber.
Alarm	Alarm status **OK** or **Tripped**.
Alm Type	Select what type of alarm, either **LATCH** or **NONLATCH**.
Alm Hyst	The number of degrees the chamber must be inside the alarm limits before the unit will reset.
Functions	Opens a window that permits the user to select **ON**, **OFF**, or **PGM** mode for any of four unit functions.

Function Window - Entering Unit Functions

Performs the same functions as window on the CSZ power up screen (Fig. 2–7).

Fig. 2–6.
Product Limit Screen.

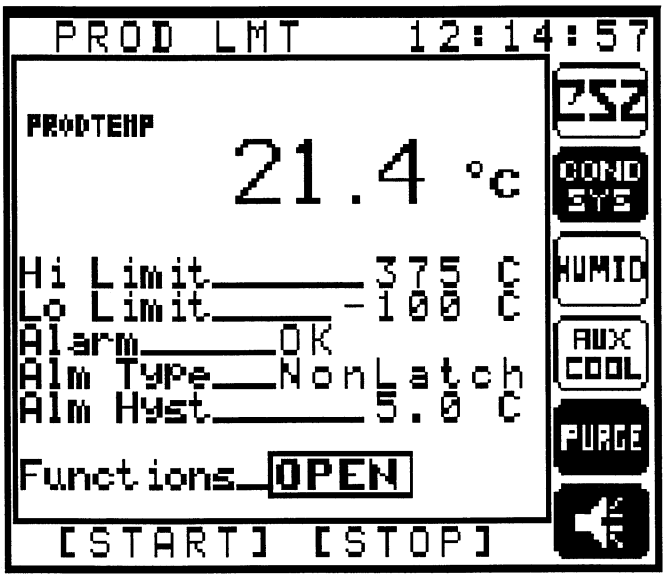
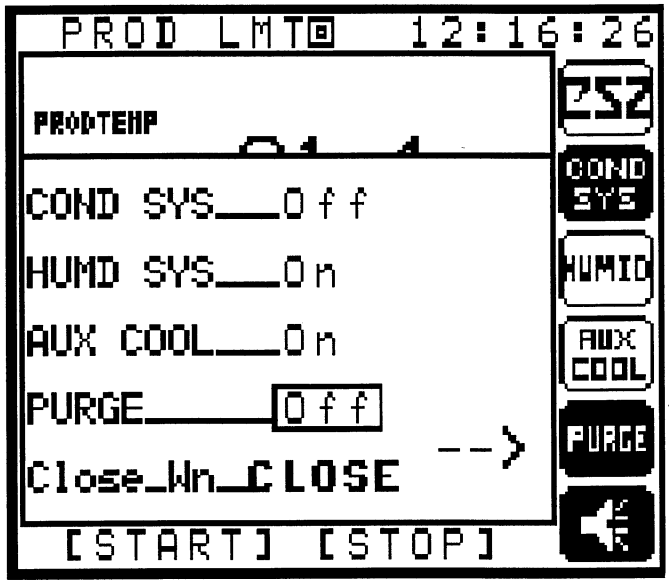


Fig. 2–7.
Product Limit Screen Function Window.



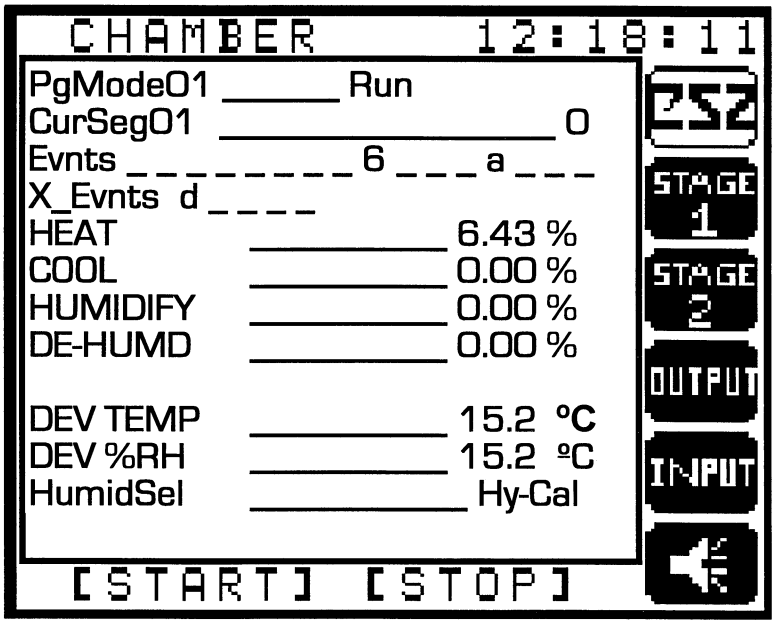
Chamber Screen

The chamber screen is an informational and an operator changeable screen. The parameters that can be selected and changed by the operator are as follows:

Program Mode	Selects **Run** or **HoldOper** mode. Changes the status of the programmer.
***Current Segment**	Displays the current segment number.
Events	Changes and displays status of 12 external events (1–9, a–c).
X_Events	Changes and displays status of four extended events (d–g). These will determine which system function is on if in **PGM** mode (Cond Sys, Humid, AuxCool, Purge).
HEAT	Amount of output for the heating control loop. In manual mode, the amount of output can be set by the operator.
COOL	Amount of output for cooling control loop. In manual mode, the amount of output can be set by the operator.
HUMIDIFY	Amount of output for humidity loop. In manual mode, the amount of output can be set by the operator.
DE-HUMID	Amount of output for de-humidify loop. In manual mode, the amount of output can be set by the operator.
***DEV TEMP**	The deviation of the temperature setpoint from the process variable.
***DEV%RH**	The deviation of the relative humidity setpoint from the process variable.
HUMIDSEL	Selects whether a Hy-Cal RH probe is being used.

*Parameters are read only. User cannot change.

Fig. 2–8.
Chamber Screen.



Stage #1 Screen

The Stage #1 Screen is an informational screen only. It displays the stage 1 compressor information including (Fig. 2–9):

AIR TEMP Displays the air temperature reading in the chamber from a thermocouple located in the air stream at the discharge of the plenum.

REL HUM Displays the percentage of relative humidity reading from a sensor located in the air stream at the discharge of the plenum.

HI_PRESS Displays the refrigeration high pressure reading taken from the transducer (PT1) located on the discharge side of the compressor. A backup mechanical pressure switch is also installed for protection of the compressor.

LO_PRESS Displays the refrigeration low pressure reading taken from the transducer (PT2) located on the suction side of the compressor.

DISCHRGE Displays the discharge line temperature reading taken from a thermocouple located on the discharge line of the compressor.

OIL_PRESS Indicates the status of the oil pressure switch input. (Note: Not all models of chambers are equipped with an oil pressure safety switch).

RUN_TIME Indicates the total number of hours the Stage 1 compressor has been running. This value can be reset in the field by performing a cold-start operation (see pg. 4-17 on sysmode).

#_STARTS Indicates the number of times the Stage 1 compressor has been started. This value can be reset by performing a COLDSTART on the unit (see section pg. 4-17 on sysmode).

T_OUTCUR The current value of the time out timer.

T_OUTPRE The time-out timer will shut down the compressors when cooling has not been used for the set number of seconds. The compressors will not shut down while the HUMD SYS is on. (Range 30-180 seconds, default 90 seconds)

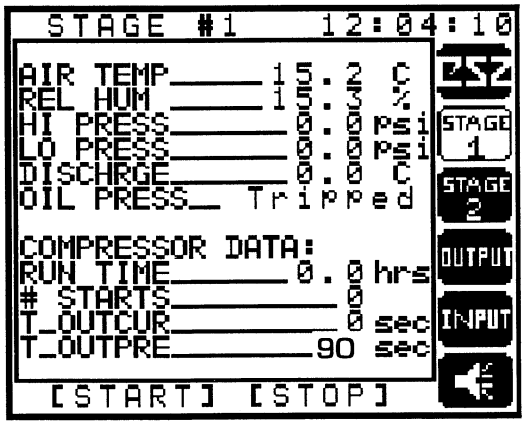


Fig. 2–9.
Stage #1 Screen.

Stage #2 Screen

The stage #2 screen is also an informational screen only. It displays the stage 2 compressor information including (Fig. 2–10):

(Same descriptions as Stage #1)

STAG_CUR The current value of the stagger start timer.

STAG_PRE The stagger start timer starts the stage 2 compressor, the set number of seconds after the stage 1 compressor starts. (Range 30-120, default 60 seconds)

Fig. 2–10.
Stage #2 Screen.

Output Screens

There are two different types of outputs being displayed on the output screens. These screens are informational only and give the operator or serviceman indication as to what is being outputted from the controller.

Analog Out Screen

The Analog Out Screen displays the values of the four analog outputs (Fig 2-11).

Note: These outputs are also available as events. Standard options will use these outputs. These outputs can be configured as 0-20mA, 0-5V or 0-5v (time proportioned). A relay board can be added to allow 120v to be switched by these outputs.

Digital Out Screen

The Digital Out Screen displays the status of the contact outputs (Fig. 2–12).

FANS Indicates the status of the output that controls the air circulator fans.

COMPR_#1 Indicates the status of the output that controls the Stage #1 compressor.

HEATER Indicates the status of the output that controls the heating control relay.

COOLING Indicates the status of the output that controls the cooling solenoid.

BY-PASS Indicates the status of the output that controls the by-pass solenoid.

COMPR_#2 Indicates the status of the output that controls the stage #2 compressor.

HUM_COMP Indicates the status of the output that controls the humidify air compressor.

RH_COOL Indicates the status of the output that controls the cooling solenoid (RH Mode).

Digital Out Screen (Cont'd)

HUMIDIFY Indicates the status of the output that controls the humidity solenoid.

DE-HUMD Indicates the status of the output that controls the de-humidify wet coil solenoid.

MAX HEAT Indicates whether the controller is calling for maximum heat (used only with a dual stage heating system).

HORN Indicates the status of the sonalert audible alarm output.

Fig. 2–11.
Analog Output Screen.

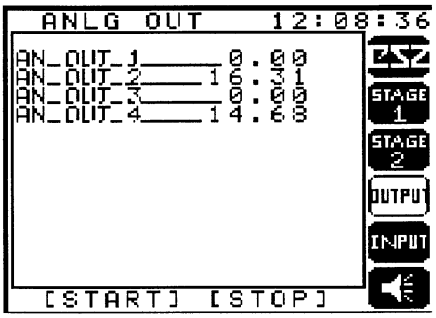


Fig. 2–12.
Digital Output Screen.

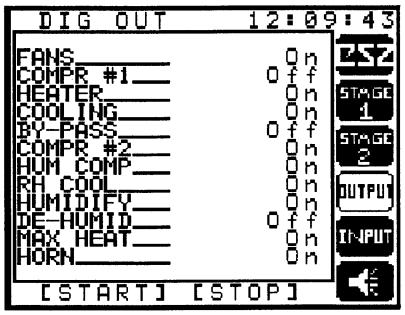
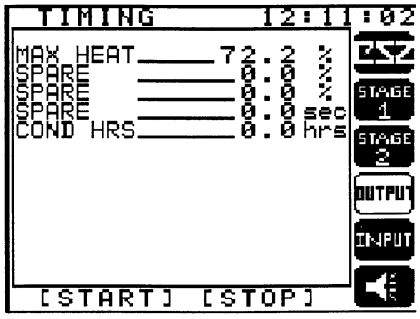


Fig. 2–13.
Timing Screen.



Timing Screen

MAX HEAT Selects the heating output value to cycle on max heat. When set to 0%, the max and min cycle together (Fig. 2–13).

COND HRS Indicates the total number of hours the air circulators (conditioning system) have been running on the chamber. This valve cannot be reset in the field and is permanently stored in non-volatile memory.

Input Screens

Analog In Screen

There are also two different types of inputs being displayed on the input screens. Those screens are informational only and give the operator or serviceman indication as to what is being input into the controller.

The Analog Screen displays the values of the six analog inputs wired into the analog base unit (Fig. 2-14).

Air_Temp Displays the air temperature reading in the chamber from a thermocouple located in the air stream at the discharge of the plenum.

% Rel_Hum Displays the percentage of relative humidity reading from a sensor located in the air stream at the discharge of the plenum.

Prod_Temp Displays the product temperature reading from a thermocouple that is located inside the chamber (coiled up) and dedicated for the customer's part.

Hi_Limit Displays the chamber air temperature reading from a thermocouple located just above the heating element behind the plenum. This sensor is a redundant sensor for chamber protection only.

AnIgIn_5 SPARE
AnIgIn_6 SPARE

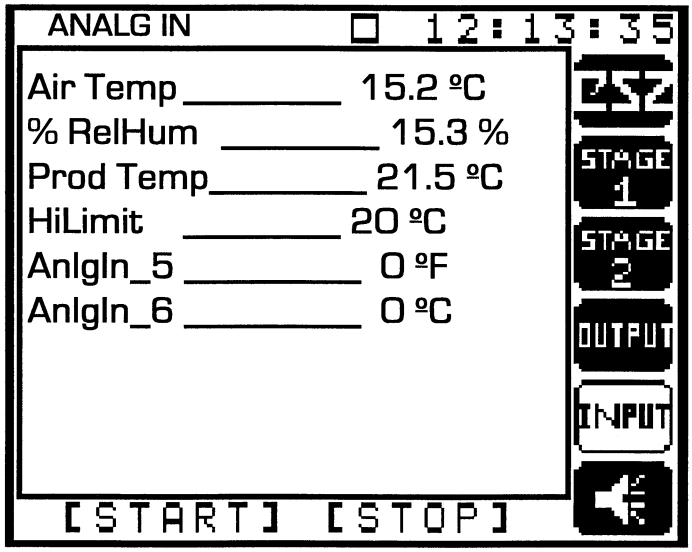


Fig. 2–14.
Analog Input Screen

Digital In Screen

The Digital In Screen displays the status of the contact inputs (Fig. 2–15).

ExtLimit Indicates the status of an external high/low limit control (an optional feature). If the input is on, the limit control is in a good state.

1PS Indicates the status of the mechanical back-up pressure switch for the Stage #1 compressor. This switch is factory set at 310 psi, and will automatically reset when the pressure drops below its trip point. However, a critical alarm must be reset by the operator once the pressure switch has automatically reset itself.

4PS Indicates the status of the mechanical back-up pressure switch for the Stage #2 compressor. This switch is factory set at 310 psi and will automatically reset when the pressure drops below its trip point. However, a critical alarm must be reset by the operator once the pressure switch has automatically reset itself.

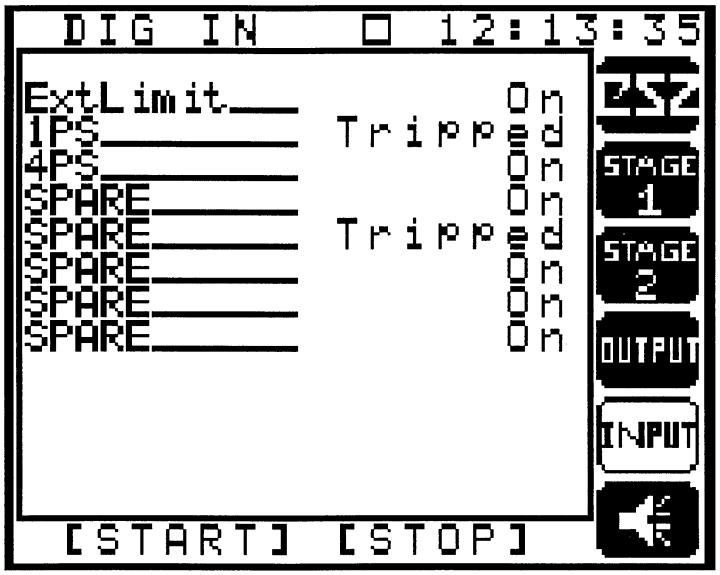


Fig. 2–15.
Digital Input Screen

Alarms

Alarm Acknowledge Screen

The Dimension II system includes two types of Alarm displays to help the operator with alarm handling during daily operation: The Alarm Acknowledge screen and the Alarm Set Up screen. To access Alarm displays use the diamond key to select the alarm icon. To call up specific Alarm displays, press the diamond key LEFT or RIGHT.

When an alarm becomes active the Alarm icon flashes, regardless of which Dimension screen is currently called up. Acknowledge alarms as follows:

1 Use the diamond key to access the Alarm Displays icon. The system will display the Alarm Acknowledge screen shown in Fig. 2-16.

2 Use the knob to select the alarm you wish to acknowledge.

3 Press the Help key to display a user-entered help message, if any.

4 Press ENTER to acknowledge the alarm. If the alarm cannot be acknowledged (example: an open sensor), the alarm description will not change and the icon will continue to flash. If the alarm is acknowledged, the description will change to "NO ALARM" and the icon will stop flashing.

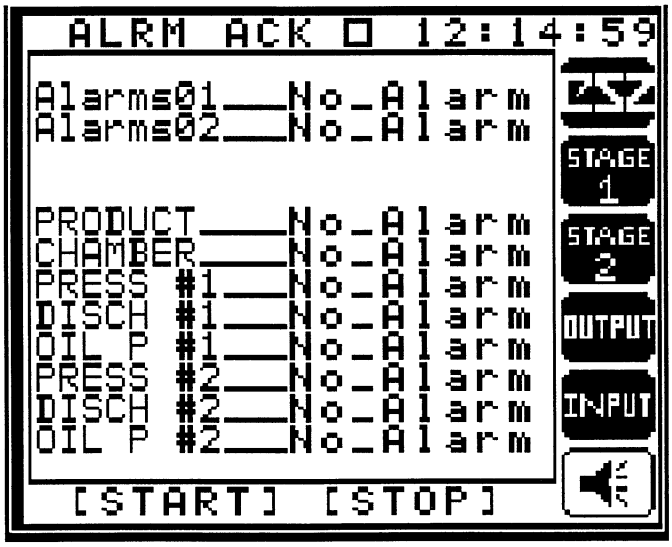


Fig. 2–16.
Alarm Acknowledge Screen.

Listed below are brief descriptions for each parameter on the Alarm Acknowledge Screen:

ALARM01: Indicates that an alarm has occurred for control loop 1 (temperature loop).

ALARM02: Indicates that an alarm has occurred for control loop 2 (humidity loop).

PRODUCT: Indicates that either a Prod Lo or Prod Hi condition has occurred in the chamber. The limits for this alarm are adjustable by the operator on the Prod_limit screen.

CHAMBER: Indicates that a high temperature condition has occurred in the chamber. This limit is set by the factory and cannot be changed by the operator. It is solely to protect the chamber from a run away condition.

PRESS_#1: Not Active.

DISCH_#1: Not Active.

BACKUP#1: Indicates that the system #1 (HFC-404A) compressor has exceeded its high pressure limit. This limit is set by the factory and cannot be changed by the operator.

PRESS_#2: Not Active.

DISCH_#2: Not Active.

BACKUP#2: Same as BACKUP#1 except for system 2 (HFC-23).

Alarm Setup Screen

As shown in Fig. 2-17, the Dimension II alarm types are listed on the alarm Setup screen. To check or modify specific alarm limits, the operator first moves the selector box to an alarm type in the list, scrolls through a list of input or loop numbers, and then presses ENTER to display a window. At the FULL or LIMITED access level, alarm limits displayed in the window can be modified. If a limit is in an alarm condition, the limit will flash.

For analog input alarms, high and low input alarm limits can be set for each input. For loop alarms, an alarm group number as well as process variable limits and deviation alarms can be selected. Five groups of alarm settings are provided for each control loop. The setpoint programmer selects which group of alarm settings is enabled during each segment.

Fig. 2–17.
Alarm Setup Screen.

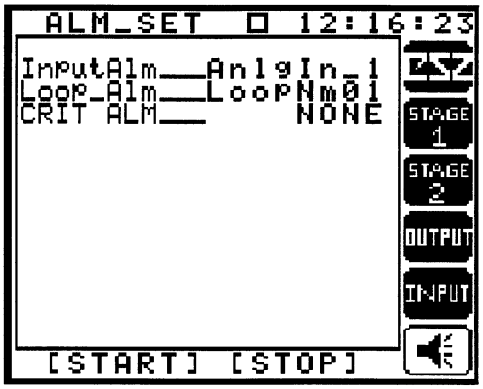
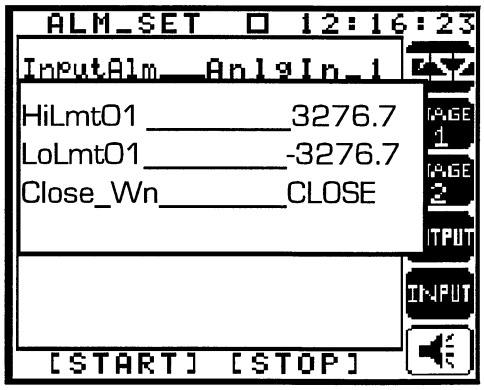


Fig. 2–18.
Input Alarm Limit Setup Window



Analog Input Alarms

1. Use the knob to select the INPUT ALARM field.
2. Select the analog input for which you wish to assign high and low alarm limits.
3. The system will display the Input Alarm Limit Setup window shown in Fig. 2-18.
4. Enter high and low alarm limits for the selected input.
5. Close window.

Note: *If a limit is in an alarm condition, the limit will flash.*

Loop Alarms

1. Select the LOOP ALARM field and select the loop for which you wish to assign high and low alarm limits. The system will display the Loop Alarm Limit Setup window shown in figure 2-19.

2. Select the ALARM GROUP field and select the alarm group (1-5) for which you wish to assign high and low alarm limits. The system will display the current values for the alarm group you selected.

Note: *If a limit is in an alarm condition, the limit will flash.*

3. Set High/High, Low/Low, High and Low alarm process variable limits and the High/High, Low/Low, High and Low process variable deviation from setpoint limits for the selected loop and group. When you are finished with the first loop and group, set limits for all other loops and groups in the same way. The available alarms are described below:

   HiHiPV — A high PV alarm point designated as high/high to indicate it can be used as a second HiPV trip point just outside the HiPV setting to act as a shutdown condition after HiPV has indicated a warning condition.

   HiPV — A high PV alarm point that trips when its limit is exceeded.

   LoLoPV — A low PV alarm point designated as low/low to indicate it can be used as a second LoPV trip point just outside of the LoPV setting to act as a shutdown condition after LoPV has indicated a warning condition.

   LoPV — A low PV alarm point that trips when its limit is exceeded.

Note: *Five groups of alarm settings are provided for each control loop. The setpoint programmer selects which group of alarm settings is enabled during each segment.* ***The setpoint source must be set to programmer for running a program.***

Loop Alarms (Cont'd)

HiHiPV — A Hi Dev alarm point designated as high/high to indicate it can be used as a second Hi Dev trip point just outside the Hi Dev setting to act as a shutdown condition after Hi Dev has indicated a warning condition.

HiDev — A high deviation alarm point that trips when the PV exceeds its band width.

LoLoDV — A low deviation alarm point designated as low/low to indicate it can be used as a second LoDev trip point just outside the LowDev second has indicated a warning condition.

LoDV — A low deviation alarm point that trips when the PV exceeds its band width.

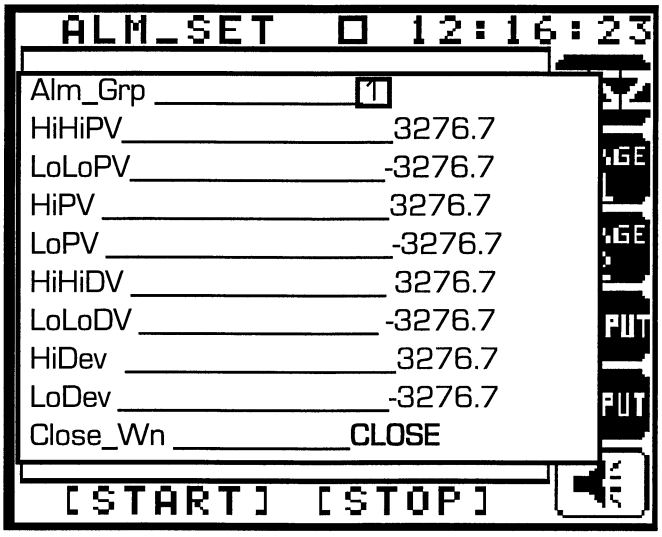


Fig. 2–19.
Loop Alarm Limit Setup Window.

Critical Alarm Window

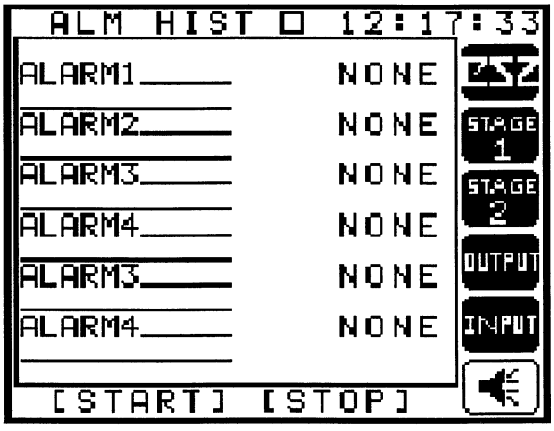
When a critical alarm occurs, an informational window will be displayed as to the cause of the alarm (Fig. 2–20). To silence the alarm press the multifunctional knob once. To clear the alarm press the knob a second time. The unit will not reset until the alarm condition has been cleared and the alarm acknowledged.

CRIT_ALM indicates that one of the following critical alarms has occurred.

CRITALM	Critical Alarm Message
Chamb Lo	Chamber limit has exceeded min temperature setting.
Chamb Hi	Chamber limit has exceeded max temperature setting.
Prod Lo	Product Limit has exceeded min temperature setting.
Prod Hi	Product limit has exceeded max temperature setting.
23Backup	Mechanical backup safety on HFC-23 system has tripped.
404Backup	Mechanical backup safety on HFC-404A system has tripped.
Prod Lim	External product Hi/Lo limit has indicated a temp out of range.
Multiple	Multiple alarms have occurred simultaneously.

Fig. 2–20.
Critical Alarm Window.

Fig. 2–21.
Critical Alarm Window.



ALARM HISTORY Screen

The alarm history screen logs the six most recent alarms that have occurred in the system along with the date and time of day when the alarm became active (Fig. 2-21). This display is a read-only display and can only be reset by performing a cold start and the system.

CSZ DII Screen Map

The following diagrams describe and illustrate CSZ Dimension II Operation screens. The four letters (e.g., R3C1) above each screen in Figures 2–22, 2-23, and 2-24 indicate the relative position of each screen in the operation screen map. For example, the CSZ Alarm Set screen titled ALM_SET is labeled R2C2 to indicate its position as **Row 2**, **Column 2**.

Fig. 2-22. CSZ Dimension II map of screens

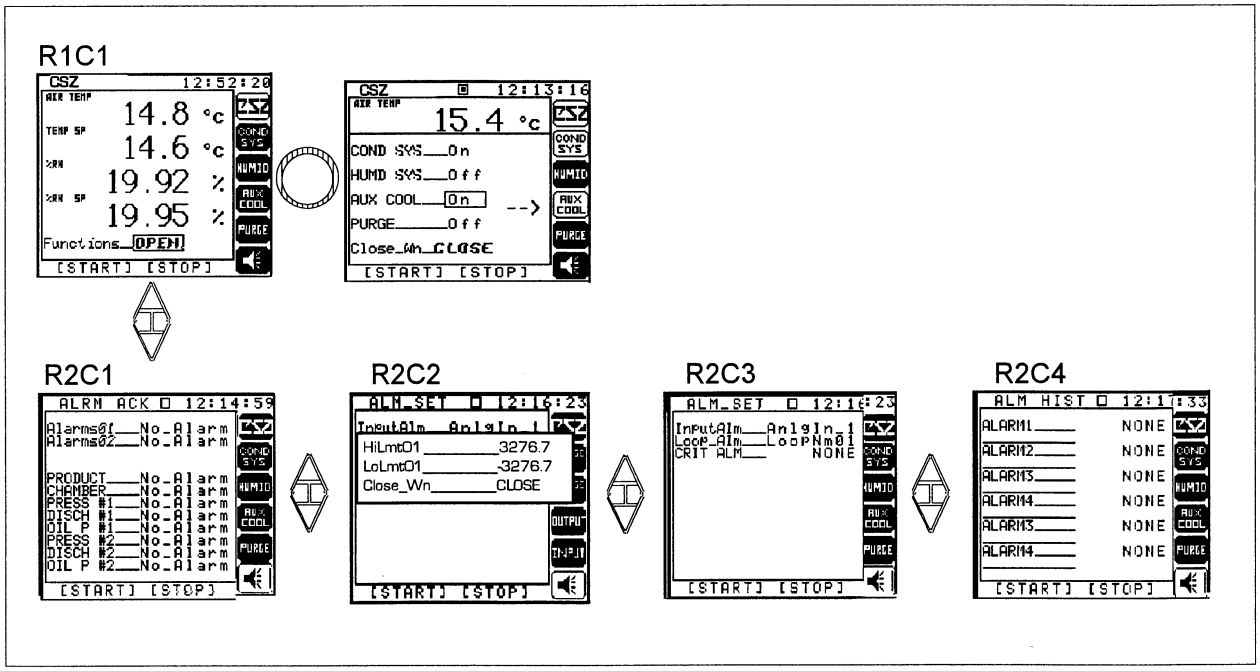


Fig. 2-23. CSZ Dimension II map of Prod-Limit screens.

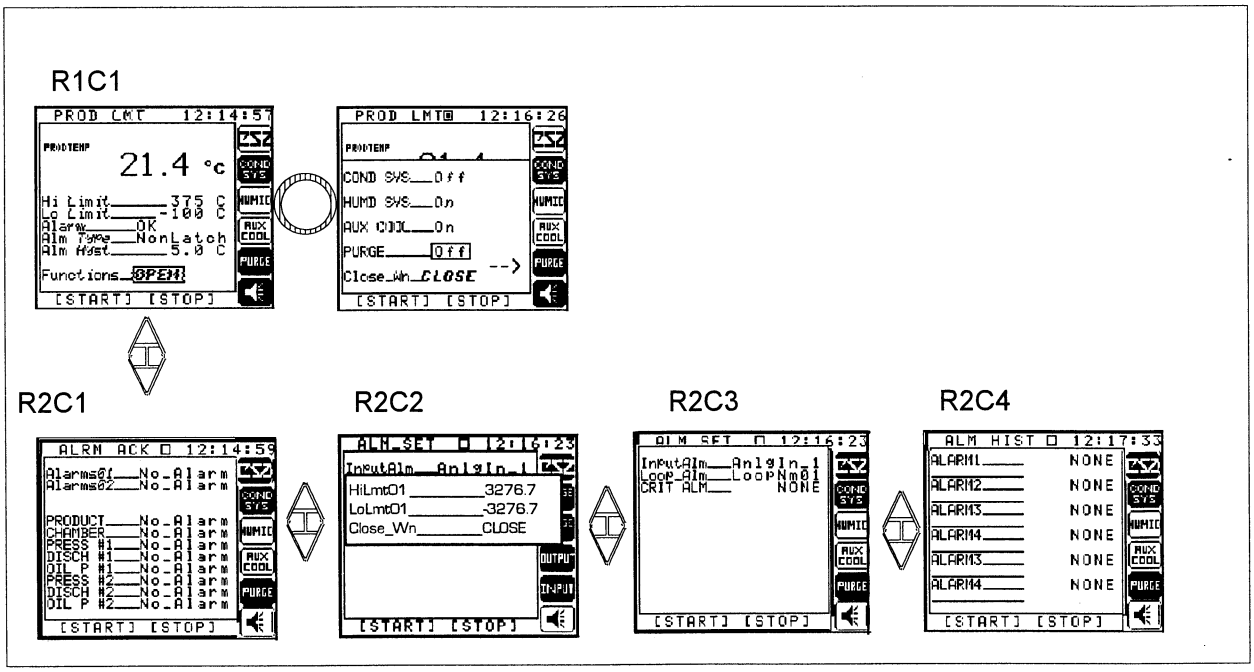
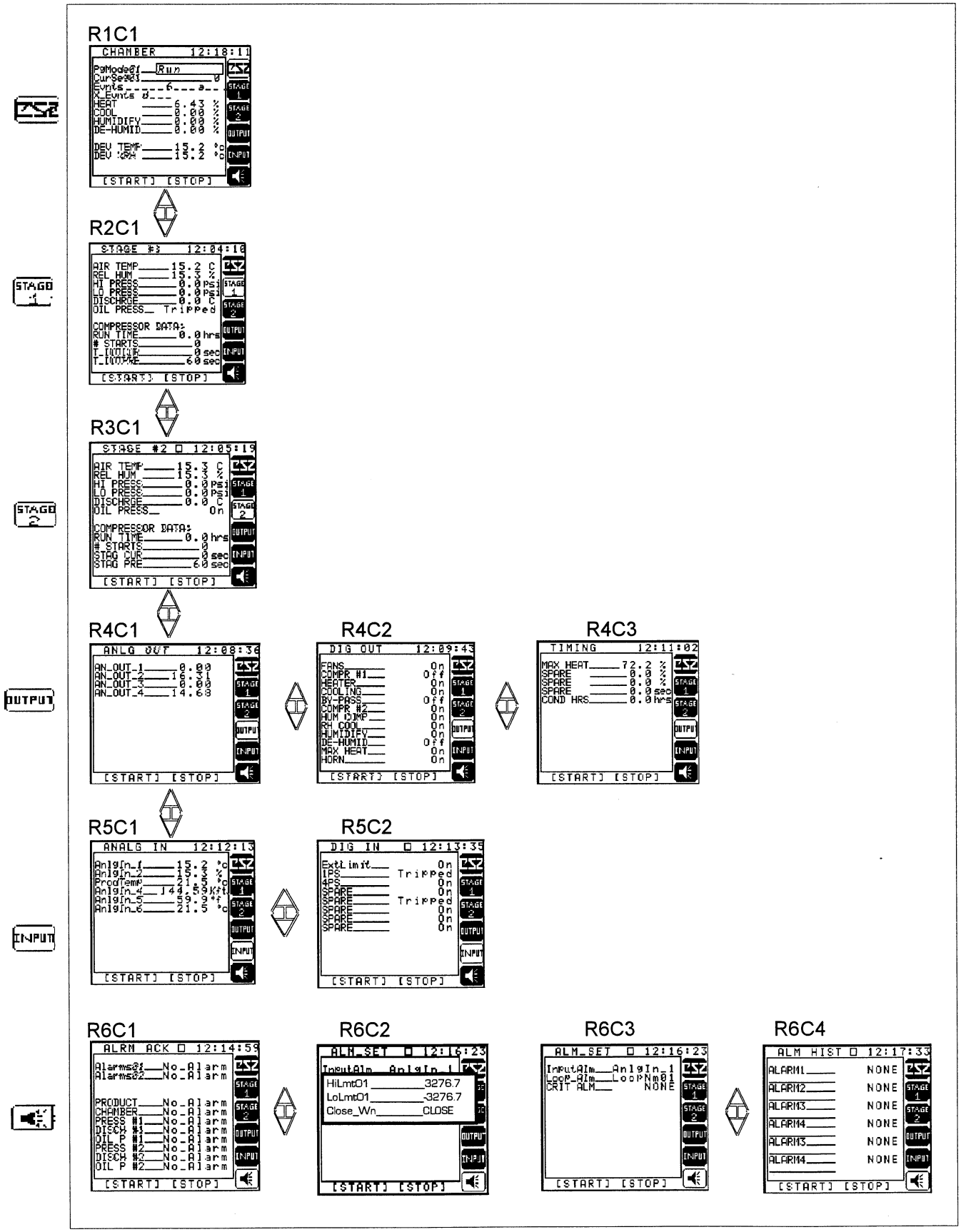


Fig. 2-24. CSZ Dimension II map of Chamber screens



RI Operation Icons and Screen Display Groups

The CSZ Dimension II universal operator interface screen displays on the RI side are divided into two areas: Configuration screens and Operation screens. Each area is further divided into six functional groups represented by graphic icons (Fig. 2–25).

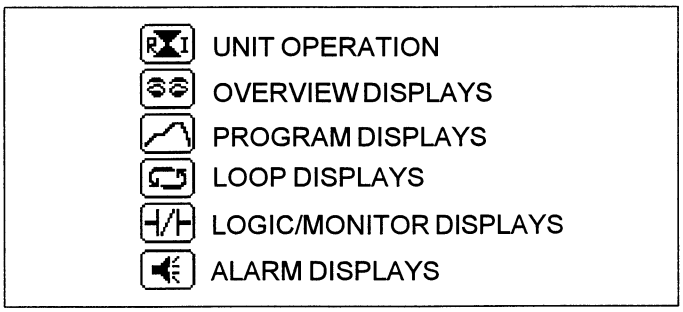


Fig. 2–25.
Operation Graphic Icon Titles and Screen Display Groups

The first icon in each of the two major areas represents the Unit screen, depicted as the Research, Inc. logo. A switch can be made between the two icon groups under the following conditions:

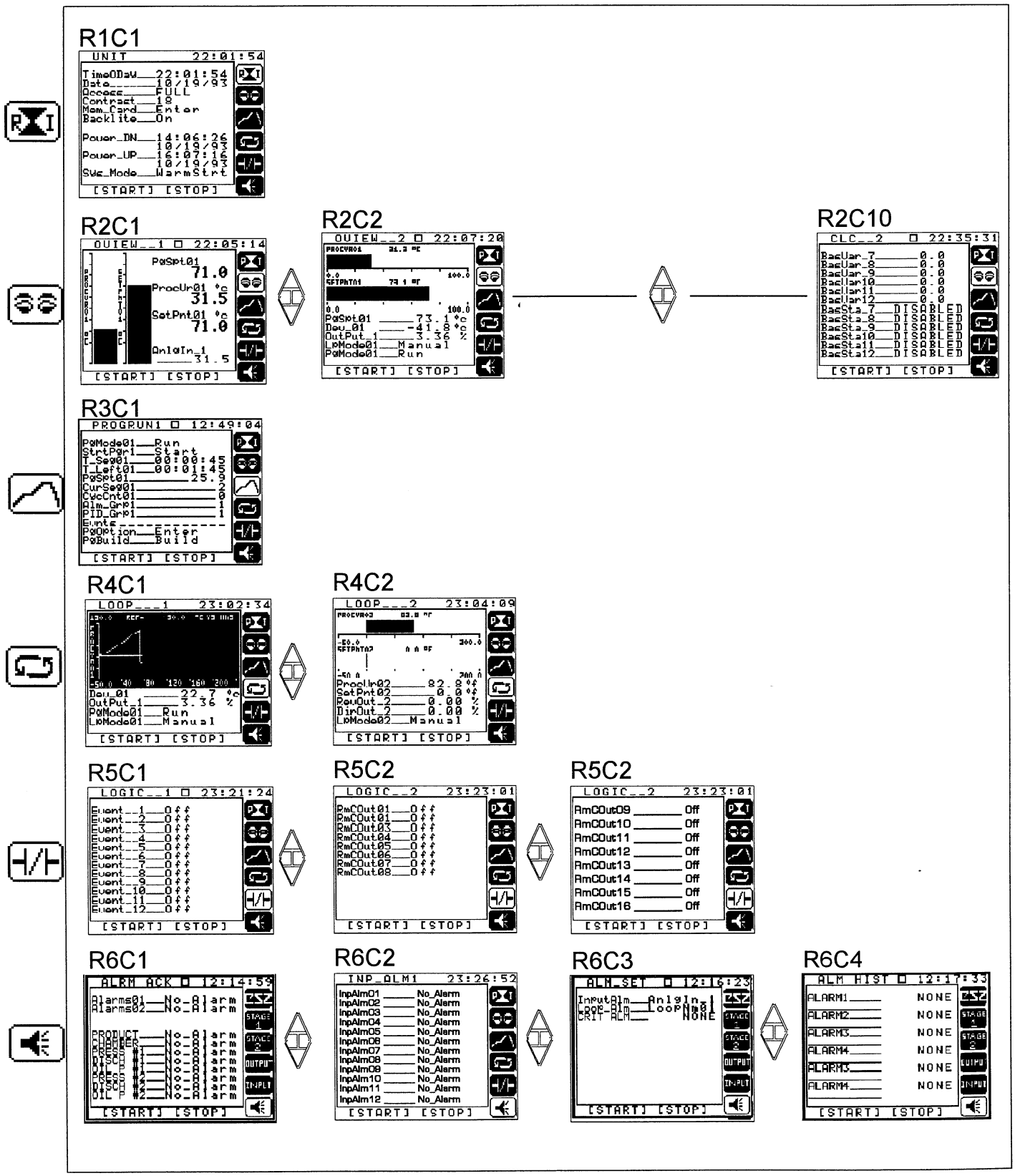
- Select the unit icon using the diamond key
- The **FULL** pass code must be entered on the Unit Operation screen in order to access the Unit Configuration screen
- Pressing the diamond key right will switch from the Unit screen to the unit configuration when **FULL** access is active

As shown in Fig. 2–26, CSZ Dimension II RI Operation screens are divided into six groups, with each group identified on-screen by a graphic icon:

- Unit Operation Screen
- Overview Displays
- Program Displays
- Loop Displays
- Logic/Monitor Displays
- Alarm Displays

The following sections describe and illustrate CSZ Dimension II RI Operation screens. The four letters (e.g., R3C1) above each screen in Fig. 2–26 indicate the relative position of each screen in the operation screen map. For example, the Programmer Run screen titled PROGRUN1 is labeled R3C1 to indicate its position as Row 3, Column 1.

Fig. 2–26. CSZ Dimension II Map of Operation Screens



Selecting Icons and Screens

Universal operator interface screen displays are organized in a horizontal/ vertical software hierarchy:

- A set of six graphic icons displayed on the right side of the screen shows where you are located vertically in the hierarchy. The currently active icon is always displayed in inverse video.

The diamond keypad located directly below the help key is used to perform one function – to exit from the currently displayed screen and to call up another screen. The keypad consists of four physically integrated but separate keys. The UP and DOWN diamond keys are used to moved vertically through the screen display hierarchy from icon to icon. The LEFT and RIGHT diamond keys are used to move horizontally from display to display.

The screens (and functions) accessible at each icon are as follows:

UNIT OPERATION-Change date/time, enter passcodes, change display screen contrast, memory card operation, set screen backlighting mode, display time/date of last power-down/power-up and system mode (warm start or cold start).

OVERVIEW DISPLAYS-User-defined Overview displays.

PROGRAM DISPLAYS-Program Run and Build screens, Program Options window, Profile Display window.

LOOP DISPLAYS-User-Defined Loop display screens, loop control windows, loop auto-tune windows.

LOGIC/MONITOR DISPLAYS – Logic point/status display screens.

ALARM DISPLAYS – Alarm Status and Limit Setting screens.

Unit Operation Screen

The following information and functions are available on the Unit Operations screen as shown in Fig. 2–27:

TimeOfDay – Displays real time in standard 24-hour **HH:MM:SS** format. User-accessible.

Date – Displays current date in standard **MM/DD/YY** format. User-accessible.

Access – Displays current Access level (**FULL**, **LIMITED**, **NONE**). User-accessible. (A window permits passcode entry.)

Contrast – Displays value (0-26) representing the current display contrast/ brightness level. User-accessible.

Mem_Card – Permits user to read from, write to, format, delete files, or read the directory of a memory card. See the last topic in this section for detailed operation.

BACKLITE – When you select this field, a window opens in which you may select **SET** and then select **ON** (backlight always on), **OFF** (backlight always off), or **CYCLE** (backlight turns on and off at specified times). The **ON** and **OFF** fields allow the user to set the on/off cycle times.

POWER_DN – Displays the date and time of the last power-down. Not accessible.

POWER_UP – Displays the time and date of the last power-up. Not accessible.

SYS_MODE – Indicates system was powered up with a warm start (default factory configuration), auto start, or cold start.

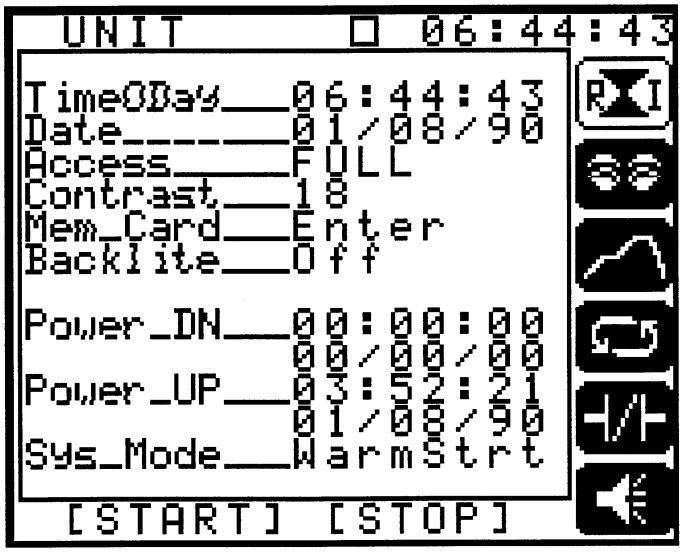


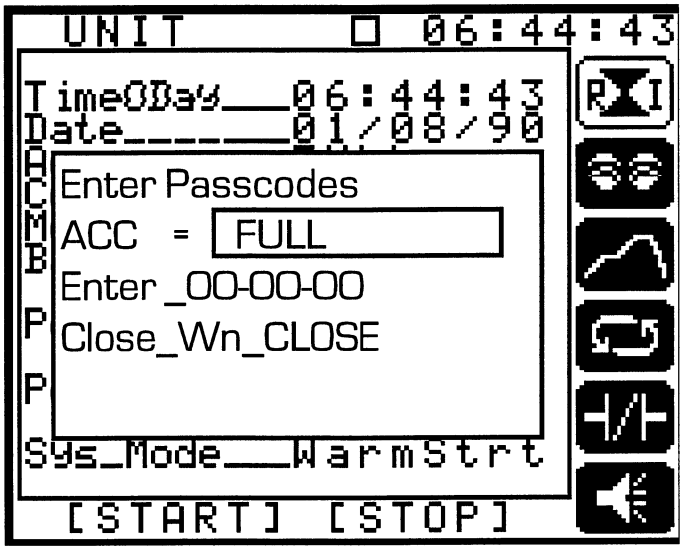
Fig. 2–27.
Unit Operation Screen.

Entering Your Passcode

If passcodes have not been assigned to your system (**ACCESS** = **FULL** on Unit Operation screen), you may disregard this topic. If passcodes have been assigned, obtain your passcode from your controller operations supervisor and proceed as follows:

1. When you attempt to access a restricted function or screen, the system will display a message instructing you to enter the correct passcode.
2. From any screen in the system, use the diamond key to access the Unit Operation icon (RI logo).
3. Select the **ACCESS** field and the system will display the window shown in Fig. 2–28.
4. Press **ENTER**. The first two digits of a 6-digit passcode will be highlighted.

Fig. 2–28.
Passcode Access Window



5. Turn the knob CW or CCW until the first two digits of your passcode are displayed.
6. Press **ENTER**. The second two digits of the passcode will be highlighted. Enter the correct number and repeat this procedure for the final two digits.
7. Press **ENTER**. If your passcode entry is correct, the system will display an ACCESS GRANTED message.

Note: *You may attempt to enter the correct passcode as many times as you wish.*

Note: *If no passcodes are assigned, the code defaults to 00-00-00.*

8. Close the window. The system will now display the new access level in the ACCESS field. You may now access functions and screens available under the access level you selected.

A slot is provided on the operator interface front panel for insertion of credit card-sized memory cards. Configuration, control parameters and data can be retrieved from or stored on these cards.

Information that can be stored on Dimension II memory cards includes:

- Setpoint profile programs 1-8 (Recipes)
- Total memory image of Dimension II Configuration and operational parameters (Mem-Img)
- Display configuration (DSP Conf)
- Macro key configuration (Macroky_)
- User written CLC (option) programs (basic)

Whenever you make changes to Dimension II parameters or data, the new information should be saved on a memory card.

Memory Card Operation

Important: If the system is set up for a "warm start," all parameters and data residing in memory will be maintained by battery power (up to several years) after a power-down and the system will resume where it left off when powered up again. If the system is set up for a "cold start", however, all data and configuration parameters residing in memory will be erased when line power is removed. All configuration and operational parameters then must be reconfigured or reloaded from memory cards.

The following procedure explains how you can save your new configuration data onto removable memory cards. With your information saved on one or more memory cards, you can load the data into Dimension II system memory at any time.

Save your data onto memory cards as follows:

1. Use the diamond key to access the Unit Operation icon. The system will display the Unit Operation screen.

2. Insert a memory card into the card slot on the operator interface front panel.

3. Use the knob to select the **MEM_CARD** field. The system will display

Important: If you wish to write data to a memory card, be sure that the write-protect switch on the card is set to the "NO" position.

3. Use the knob to select the **MEM_CARD** field. The system will display the Memory Card Operation Window shown in Fig. 2-29. The following information and functions are provided in this window:

   - The first line describes the current status of the memory card slot: INSERT **MEMORY CARD** or **UNFORMATTED MEMORY CARD**. If a card is not installed, "**INSERT MEMCRD**" is displayed. If an installed card has to been initialized and is unreadable, "**UNFORMAT MEMCARD**" will be displayed.

   - The function **(FUNC)** selection field permits you to scroll through and select from a list of functions including **READ**, **WRITE**, **DIRECT**(ory), **FORMAT**, and **DELETE**.

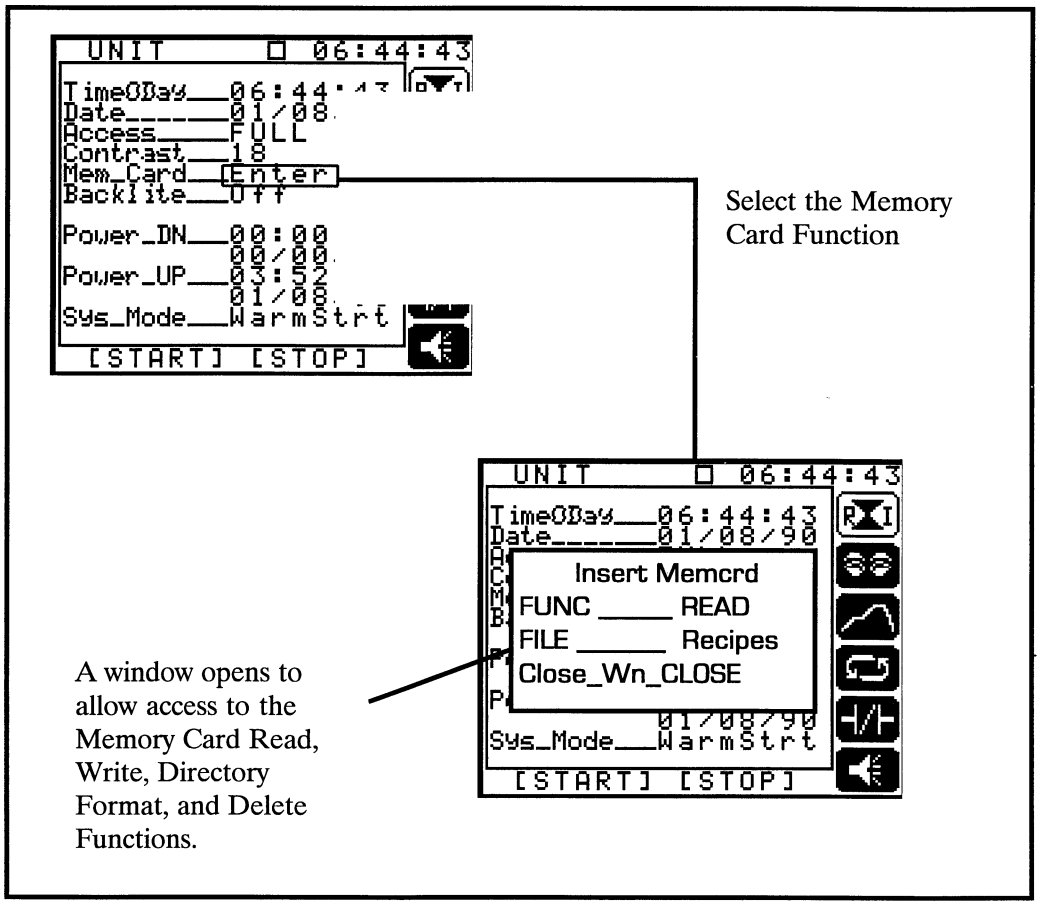


Fig. 2–29.
Memory Card Operation Window

   - When you select the **DIRECT**(ory) function, a window permits you to scroll through the directory of files on the card. The name, date, and size (Kbytes) of each file are displayed.

- If READ or WRITE is selected and a RAM card is installed, the selector box moves to the FILE field where the file to be written or read can be specified.

- A status line displays card status parameters including write-protect on/off, battery low/good, read/write fail, and file too large.

4. If necessary, format the installed memory card.

5. To write a file to a card, select the FUNC field. Select the WRITE function. The selector box will move to the FILE field. Select or enter the name of the file that is to be written to the card.

   If additional information is required, a window will open with prompts for more information. Enter the additional information as required.

   At this point, your configuration data will be written to the memory card under the file name you specified.

To read a memory card file into system memory, follow the above procedure but specify READ rather than WRITE function as required.

Memory Card Information

The memory card files contain the following Dimension II information:

1. Mem_Img (Memory Image):

   - Unit configuration: Full and limited access passwords, system mode, Macro Key tag names.
   - Glossary configuration: System glossary (GLOS_SYS), programmer glossary (GLOS_PRG) excluding Recipe Tag Names (ProgName), Loop glossary (GLOS_LOP), I/O glossary (GLOS_IO).
   - Process configuration: Programmer configuration (CONF_PRG), Loop configuration (CONF_LOP) including Auto Tune parameters, Alarm configuration (CONF_ALM), Output configuration (CONF_OUT).
   - Analog Input configuration: (not calibration.)
   - Analog Output configuration: (not calibration).
   - Remote Output configuration.
   - Time Proportioning Output configuration.
   - Contact Output configuration.
   - Communication configuration.
   - The following Process Settings: Programmer Option settings (PgOption), Analog Input Alarm settings (InputAlm), Manual Reset (ManRst), Setpoint Source (SptSrc), Loop Mode (LpMode).

2. DspConf_ (Dimension Display Configuration)

   - Overview display screens (DCON_OVR).
   - Programmer display screens (DCON_PRG).
   - Loop display screens (DCON_LOP).
   - Logic display screens (DCON_LOG).

3. MacroKy_(Macro Key Configuration)

   - Macro key number 1 function configuration (MacroKy1) excluding tag name.
   - Macro key number 2 function configuration (MacroKy2) excluding tag name.
   - Loop display screens (DCON_LOP).
   - Logic display screens (DCON_LOG).

4. Basic (CLC option support):

   - To be determined by engineering.

5. Recipes (Recipes):

   - The programmer build (PgBuild) segment table of 256 segments.
   - Loop PID parameters for PID groups 1-5: (Gain, Reset, Rate).
   - Loop Alarm settings for Alarm Groups 1-5: (Loop_Alm): (HiHiPV, LoLoPV, HiPV, LoPV, HiHiDV, LoLoDV, HiDev, LoDev).
   - Recipe Tag Names (ProgName) for the programmer glossary.
   - Starting Segment numbers (Start_Seg) associates with the eight program recipe tag names (default names Recipe_1 to Recipe_8).

6. Items Not Stored on Card:

   - Time of Day
   - Date
   - Contrast
   - Backlite
   - UNIT_CNF glossary name parameter
   - Mnemonic (linear range characters for process variable units)
   - EngUnits (Centigrade, Fahrenheit, Linear): The engineering units are not changed by memory card functions unless the "Input type" parameter selected in the Dimension is different than stored on the memory card. When the memory card restores the Input type to a Thermocouple or RTD, the EngUnits are set to Centigrade. When the memory card restores the input type to Current or Voltage ranges, the EngUnits are set to Linear.

Overview Display Screens

The CSZ Dimension II can be configured to display up to eight (ten if CLC option purchased) user-defined Overview displays. These screens permit the operator to view and control your process in a variety of formats.

To access Overview displays, press the diamond key until the Overview icon is displayed. To call up specific Overview displays, press the diamond key LEFT or RIGHT.

Overview displays can be configured in the form of X-Y graphs, horizontal or vertical bar graphs, large-character numeric displays, or text displays.

The following are the typical default overview screens shipped from the factory and types of screens that can be configured. They may have been changed for your application.

X-Y Graph Overview Display

As shown in Fig. 2–30, the X-Y graph Overview display option features an X-Y graph combined with information in text format. Up to four of these displays can be configured, with each display trending and displaying two user-selected variables. The time base for sampling is seconds, minutes, or hours, with a sampling rate from 1 to 100.

The horizontal axis displays one sample per pixel, with the cumulative time displayed every 20 pixels. The vertical limits are user-entered, and the vertical axis is 50 pixels high. The value of the reference mark and the units of the X and Y axes are displayed at the top of the graph. For example, the units are displayed in Fig. 2–30 as °F and seconds.

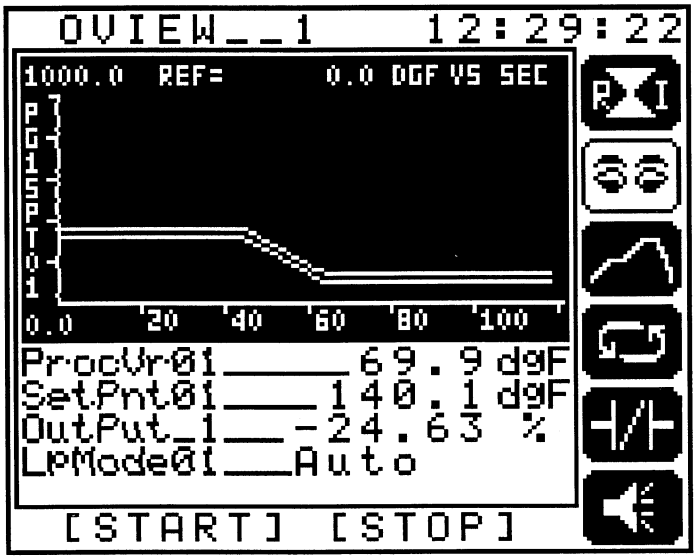


Fig. 2–30.
X-Y Graph Overview Display

By moving the selector box to the REF numeric field at the top of the graphic display and pressing **ENTER**, a horizontal reference mark on the right margin of the screen can be displayed and moved along the Y axis by turning the multi-function knob. As the reference mark moves up (CW) or down (CCW) on the graph, the precise value in the REF field changes accordingly. The graph itself can consist of the selected process variable, and, if selected, the associated setpoint versus time.

This screen also displays up to four lines of user-selectable information below the graph. If the selector box can be moved into a field, the variable can be selected and manipulated.

Horizontal Bar Graph Overview Display

As shown in Fig. 2–31, the horizontal bar graph Overview displays two user-selectable variables in bar-graph format and up to five lines of text. The horizontal ranges are user-selectable. If the selector box can be moved into a text field, the variable can be selected and manipulated.

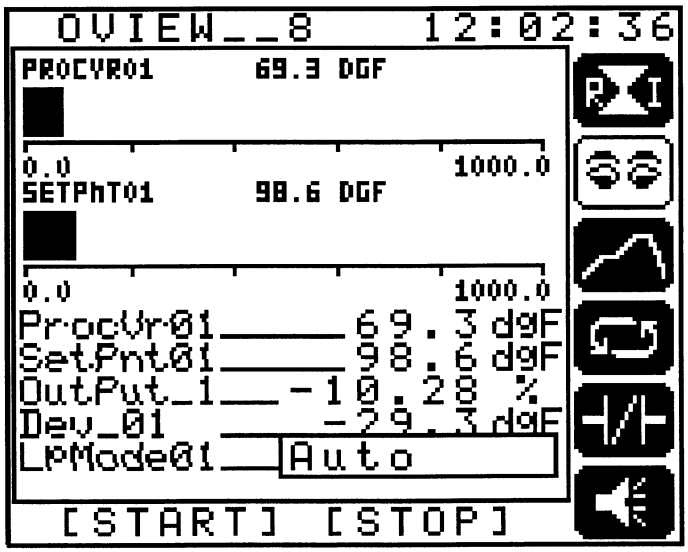


Fig. 2–31.
Horizontal Bar Graph Overview Display

Vertical Bar Graph Overview Displays

Vertical bar graph Overview displays can be user-defined as two-, three-, or four-bar graphs. Vertical bar graph configurations include:

TWO-BAR GRAPH – On the two-bar graph, the vertical axis displays tick marks. The variable tag name is displayed to the left of the vertical axis of each bar, and numeric values are displayed in large characters to the right. Two lines of user-selectable text can be displayed to the right (Fig. 2–32).

THREE-BAR GRAPH – The three-bar graph displays three labeled bar graphs, numeric values below each graph, and one line of user-selectable text (Fig. 2–33).

FOUR-BAR GRAPH – The four-bar graph display is identical to the three-bar graph except that four bars with no user-selectable text are displayed (Fig. 2–34).

Fig. 2–32.
Vertical Bar Graph Overview Display

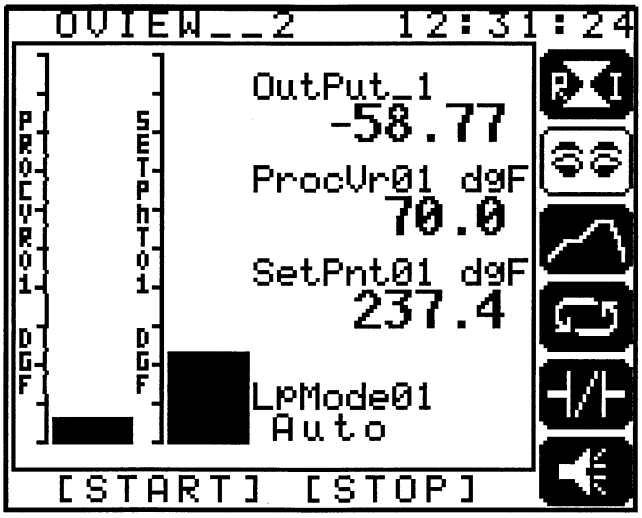


Fig. 2–33.
Vertical Three Bar Graph Overview Display

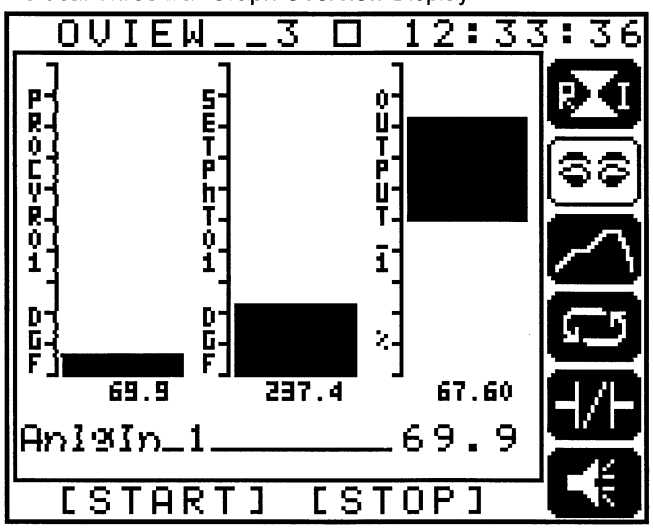
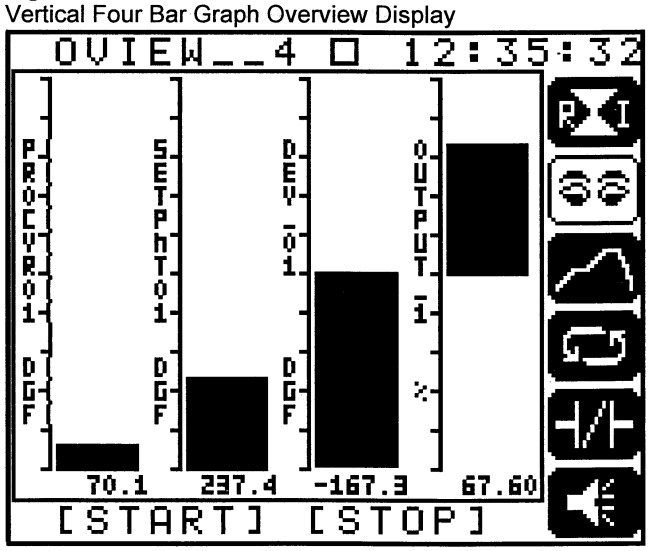


Fig. 2–34.
Vertical Four Bar Graph Overview Display

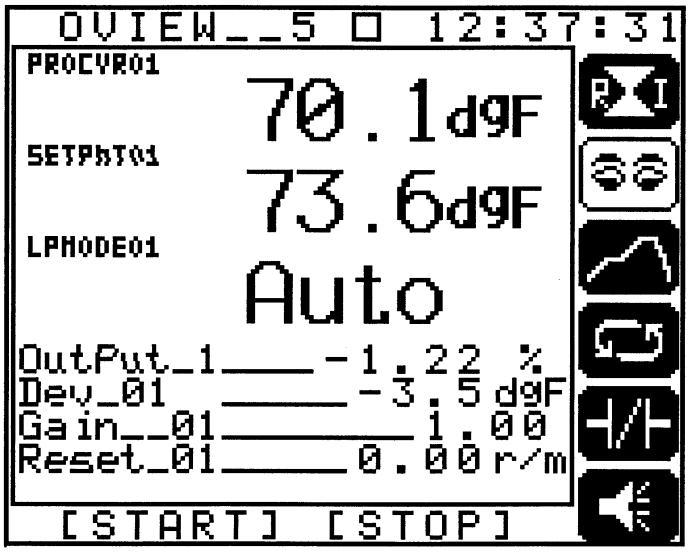


Mixed Numeric/Text Overview Displays

Refer to Fig. 2–35. Mixed numeric/text Overview displays can be user-configured to display numeric values and text in three possible modes:

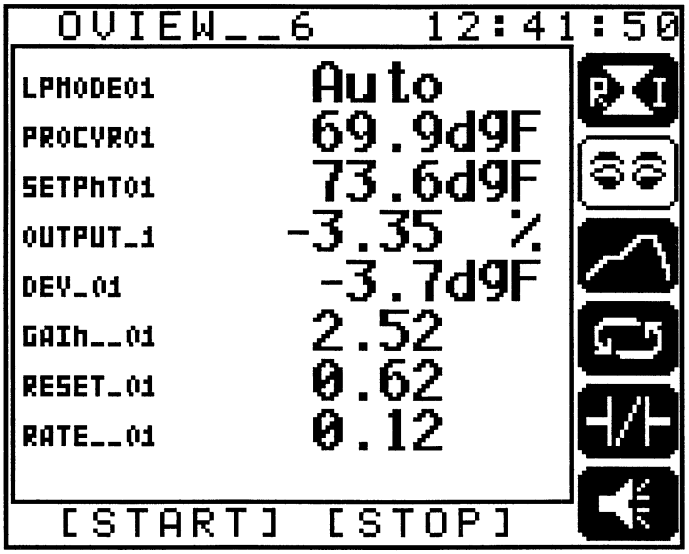
3X Mode – Displays three user-selectable variables as numeric characters three times larger than normal text. Also displays tag names, engineering units, and up to four lines of user-selectable text. If the selector box can be moved into a text field, the variable can be selected and manipulated.

Fig. 2–35.
Mixed Numeric/Text Overview Display (3X)



2X Mode – Displays up to eight user-selectable variables as numeric characters two times larger than normal text (Fig. 2–36.). Displays tag names at normal height. (All fields view-only.)

Fig. 2–36.
Mixed Numeric/Text Overview Display (2X)



1X Mode – Displays up to 12 lines of user-selectable variables in normal text mode. If the selector box can be moved into a text field, the variable can be selected and manipulated (Fig. 2–37).

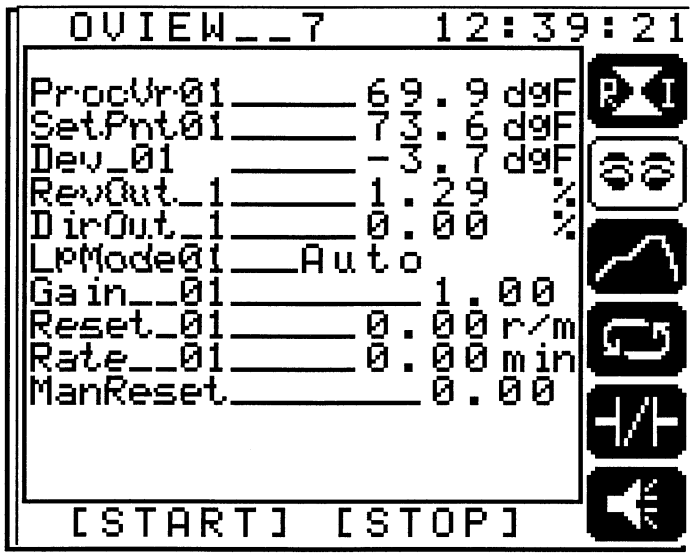


Fig. 2–37.
Mixed Numeric/Text Overview Display (1X)

Section 3

Programmer Operation

Section 3 Programmer Operation

Programmer Status Screen

From the Program Run screen shown in Fig. 3–1, you access operating functions for the CSZ Dimension II programmer. Described below is how to read the status screen:

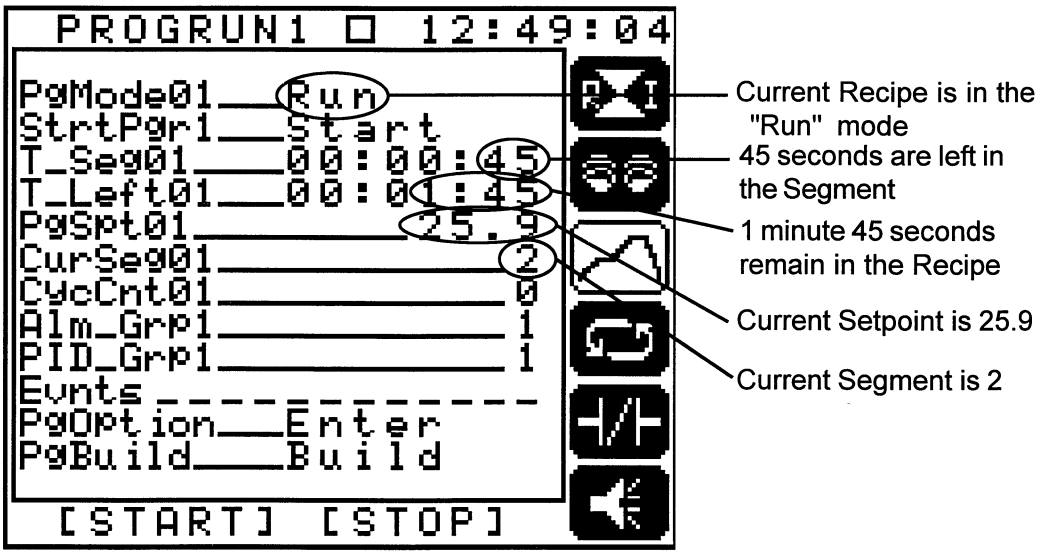
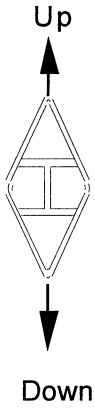


Fig. 3–1.
Program Run Screen.



Programmer Terminology

Press the diamond key UP or DOWN until the Program icon is displayed. The system will display a Program Run screen (Fig. 3–1). The Program Run screen is used to select, start, hold, run, or modify a program. Program Run screen functions are as follows:

StrtPgr1 Program start for programmer 01. Opens a window to select a program to start at a starting segment, select the recipe (which automatically selects the starting segment of the recipe) and to start the program.

T_Seg01 Time segment for programmer 01. Displays time into segment.

T_Left01 Time left for programmer 01. Displays time left in the entire recipe.

PgSpt01 Program setpoint for programmer 01. Displays program setpoint. By selecting this parameter a window will be opened allowing the operator to change the setpoint for loop 1 or loop 2.

CurSeg01 Current segment for programmer 01. Displays the number of the current segment.

CycCnt01 Cycle count for programmer 01. Displays the number of program mer recycles remaining. When recycles are programmed in, and CycCnt counts to zero, the programmer will move to the next numeric segment from the current segment.

Alm_Grp1 Alarm group for programmer 01. Displays the currently active alarm group (1–5). Alarm Group 2 is recommended for Guaranteed Soak operation.

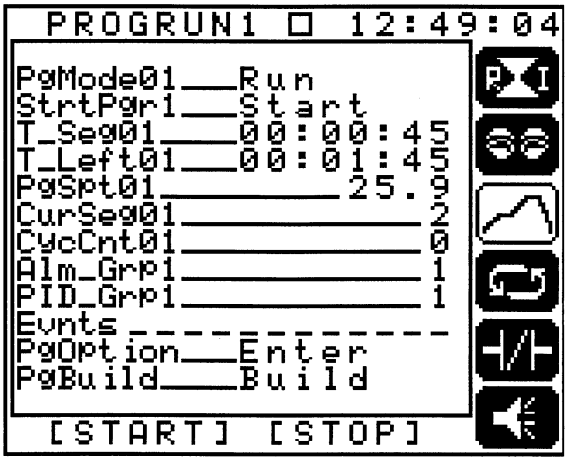


Fig. 3-2. Program Status Display

PID_Grp1 - PID group for programmer 01. Not Active

Evnts - Events for programmer 01. Displays which of 12 external events are currently on (1–9, a–c).

PgOption - Program options. Displays options such as time-of-day start, time of week start, remote setpoint source, etc.

PgBuild - Program build. Opens a window where the operator can build a ramp/soak temp/RH profile.

Program Options

When PGOPTION is selected at the Program Run screen, a window permitting time/day program start initiation is displayed. Fast forward, abort, and remote input start functions can also be selected in this window.

At the Program Run screen (Fig. 3–3), you may call up a window (Fig. 3–4) to configure programmer start/abort functions. Select PGOPTION to configure the following parameters:

TODStrt1 Enter time of day to start programmer.

DOWStrt1 Enter day of week to start programmer.

TOD_Sseg Select the starting segment for the programmer to start at for a Time of Day start

TODSEn01 Enable/disable programmer TOD/DOW start.

PgFFwd01 Enable/disable programmer fast forward function.

Abort01 Enable to go to segment 0 (abort). Disable to resume recipe.

Rm_Sseg Select the starting segment for the programmer to start at if remote start is used to start a programmer.

RmStrt01 Initiates programmer start at the remote starting segment.

SpBias01 Select bias value to be added to all profile setpoints for programmer.

Timebase Programmer update rate in hours/minutes/seconds or minutes/seconds/tenths of seconds. Sets the value only for the programmer you have selected.

Fig. 3–3.
Program Run Screen

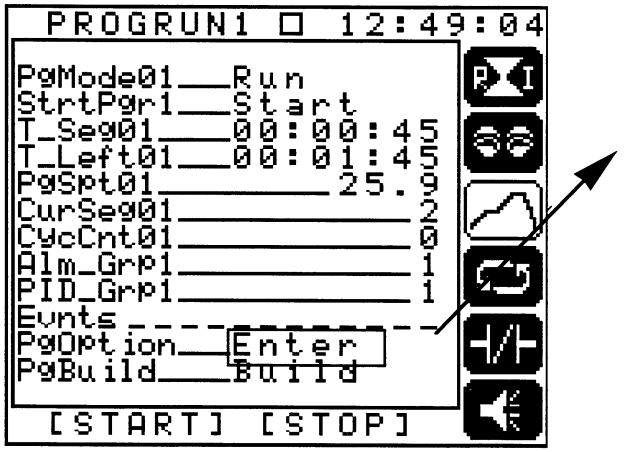
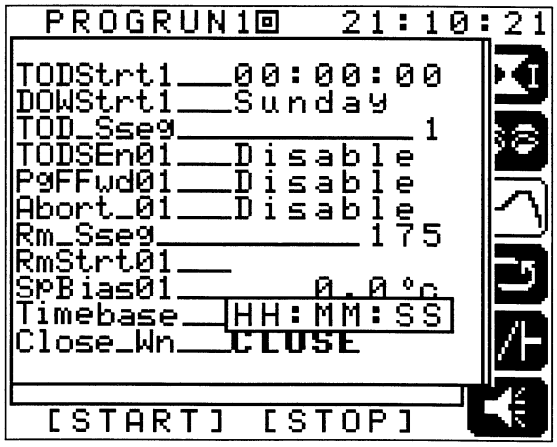


Fig. 3–4.
Program Option Window



Building a Setpoint Program

Recipe Build Screen

When **PGBUILD** is selected at the Program Run screen, the Recipe Build window shown in Fig. 3–5 is displayed.

Fig. 3-5.
Recipe Build Window

1. Move the selector box to the **SlectPg** field, and select the recipe (1–8) that you wish to build or modify. The currently active parameters for the recipe you selected will be displayed. Build or modify the recipe as follows:

   Start_Seg – Displays the "start" segment number for the selected recipe.

   Segment – Select segment number 001 through 255. (Segment 000 is dedicated to serve as a recipe "abort" function. After a recipe abort using this segment, the recipe will restart at the point where it stopped.)

> ***Note:*** *For running a program, the setpoint source must be set to programmer. For single setpoint operation set to operator.*

Note: *The Dimension II is set up to have 8 recipes and a "pool" of 255 segments. Each recipe has a starting segment (0–255) and a block of segments the operator sets aside for it. It is the responsibility of the operator to set the correct starting segments and allocate sufficient segments to not overlap the succeeding recipes. For example, use the following grid to set up your profiles.*

Recipe # or Name	Starting Segment	Number of Allocated Segments	Segments Go To–From
1	1	19	1–19
2	20	20	20–39
3	40	35	40–74
4	75	50	75–124
5	125	35	125–159
6	160	40	160–199
7	200	20	200–219
8	220	35	220–255

Pg1Spt01 – Programmer 01, setpoint for loop 1 (temp.). Enter recipe profile setpoint value (the setpoint the programmer will try to reach in the displayed segment). A window appears, to enter setpoints for Spt01 (Temp) and Spt02 (Humidity).

Seg_Time – Enter segment time up to 99 hours. This is the time to ramp to the entered setpoint or soak at the entered setpoint.

Evnts – Select the desired events to turn on at the start of the segment and to be on the segment duration time (events 1–9, a–c).

Recycles – Specify 000 to 255 (repeat cycles).

Note: *When recycles are programmed in and the cycle counter decreases to zero, the program advances to the next numeric segment.*

Next _Seg – Specify 000 to 255 for the number of the next segment used to sequence the segments of the recipe, end a Recipe, and Recycle back to the desired segment.

Note: *When the next segment number is the same as the current segment number a* ***recipe end*** *is indicated.*

ALARM GROUP – Select alarm group 1–5. (Activate specific alarms groups at specific times in the cycle to maintain close tolerance-used for Guaranteed Soak.)

PID GROUP – Not Active for a bi-modal control such as used on an environmental chamber.

DISPLAY – Call up graphic recipe profile "build" window.

Internal X-Events

This window is displayed when the cursor is moved to the **Evnts** parameter in the program screen. The **X_Evnts** will control the system functions in the following manner
(Fig. 3-6):

d – Controls the Cond System
e – Controls the Humd System
f – Controls the Aux Cool
g – Controls the Purging

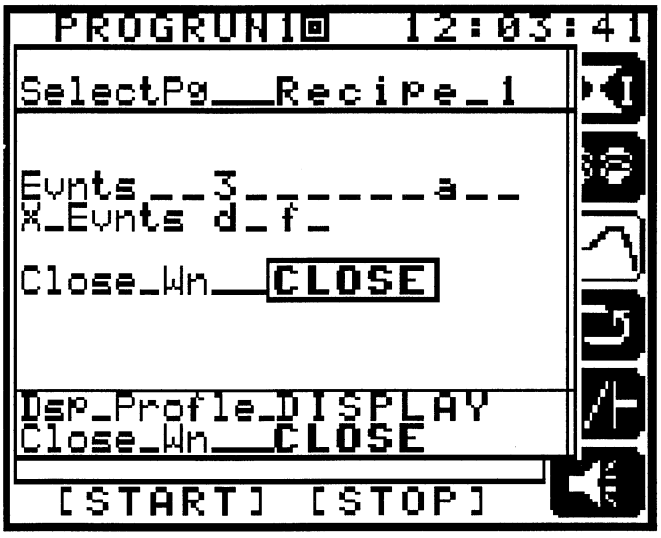


Fig. 3-6.
Program Run Screen
Events Window.

Example Recipe

Graphing a Recipe

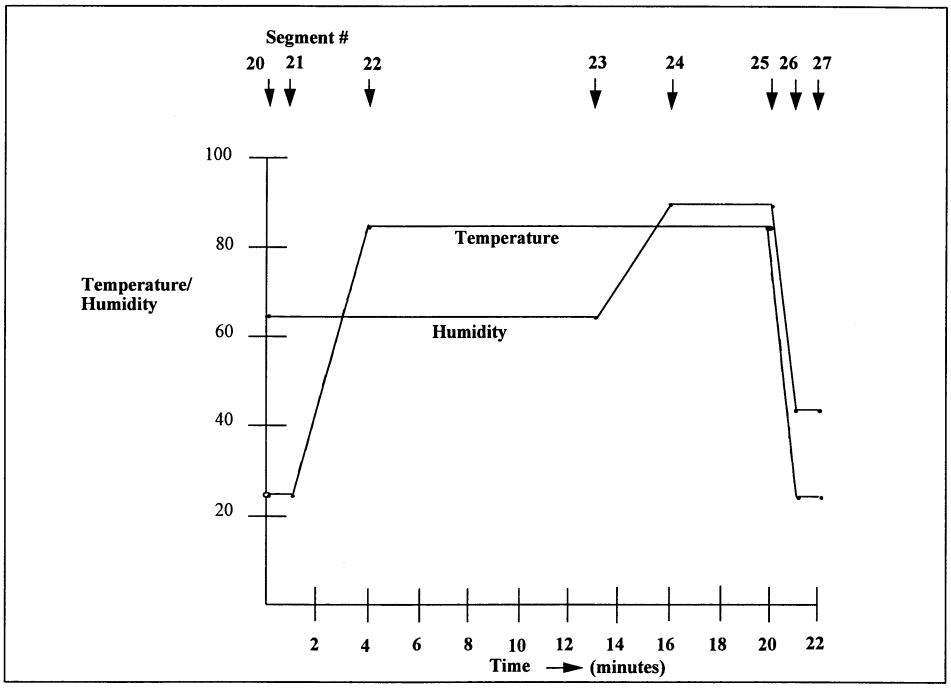


Fig. 3-7.
Graph of test to be performed.

Convert Graph Table

SETPOINT PROGRAM WORKSHEET

Program # Recipe 1–8	2									
Start Segment	020									
Segment # 0–179	020	021	022	023	024	025	026	027		
Profile/ Stepoint 1 T Temp	25.0	25.0	85.0	85.0	85.0	85.0	25.0	25.0		
2 Humidity	65.0	65.0	65.0	65.0	90.0	90.0	50.0	50.0		
3										
4										
Segment Time (00:00:01 to 99:59:59)	00:00:00	00:01:00	00:03:00	00:09:00	00:04:00	00:03:00	00:01:00	00:01:00		
Events On										
1										
2										
3										
4										
5										
6										
7										
8										
9										
A										
B										
C										
D Fan	ON	ON	ON	ON	ON	ON	ON	OFF		
E Humidity	ON	ON	ON	ON	ON	ON	ON	OFF		
F Aux Cool										
G Purge										
(0–255) Recycles										
Next Segment	021	022	023	024	025	026	027	027		
Alarm Group (1–5)										
PID Group (1–5)										

Fig. 3-8.
Converting graph to table entries.

SETPOINT PROGRAM WORKSHEET

Each recipe has unique "Start Segment" number. Recipe 1 uses segments 1-20 (example).

Segment 1 established initial SP for temperature. Note zero time.

Event D for our example turns on the circulation fan.

"Next Segment" established the sequence of the segment in the recipes. When segment 021 is complete, the program advances to segment 022, etc.

Program # Recipe 1–8		2								
Start Segment		(020)								
Segment # 0–179		020	021	022	023	024	025	026	(027)	
Profile/ Stepoint	1 Temp	25.0	25.0	85.0	85.0	85.0	85.0	25.0	25.0	
	2 Humidity	65.0	65.0	65.0	65.0	90.0	90.0	50.0	50.0	
	3									
	4									
Segment Time (00:00:01 to 99:59:59)		00:00:00	00:01:00	00:03:00	00:09:00	00:04:00	00:03:00	00:01:00	00:01:00	
Events On										
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	A									
	B									
	C									
	D Fan	ON	ON	ON	ON	ON	ON	ON	OFF	
	E Humidity	ON	ON	ON	ON	ON	ON	ON	OFF	
	F Aux Cool									
	G Purge									
(0–255) Recycles										
Next Segment		021	022	023	024	025	026	027	(027)	
Alarm Group (1–5)										
PID Group (1–5)										

Recycles
Alarm Group
PID Group

Not needed for this example. See advanced features.

Program End is achieved when Next Segment # is entered same as the current segment.

Fig. 3-9.
Table explanation.

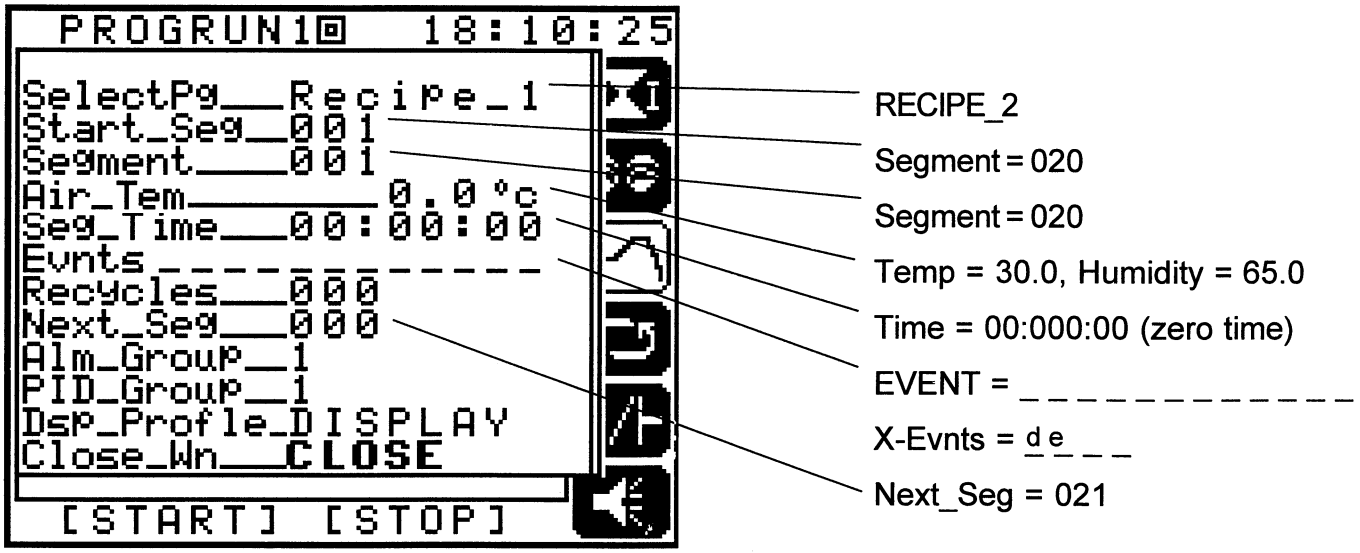
SETPOINT PROGRAM WORKSHEET

Program # Recipe 1–8										
Start Segment										
Segment # 0–179										
Profile/ Stepoint 1 Temp										
2 Humid										
3										
4										
Segment Time (00:00:01 to 99:59:59)										
Events On										
1										
2										
3										
4										
5										
6										
7										
8										
9										
A										
B										
C										
D Cond Sys										
E Humid										
F Aux Cool										
G Purge										
(0–255) Recycles										
Next Segment										
Alarm Group (1–5)										
PID Group (1–5)										

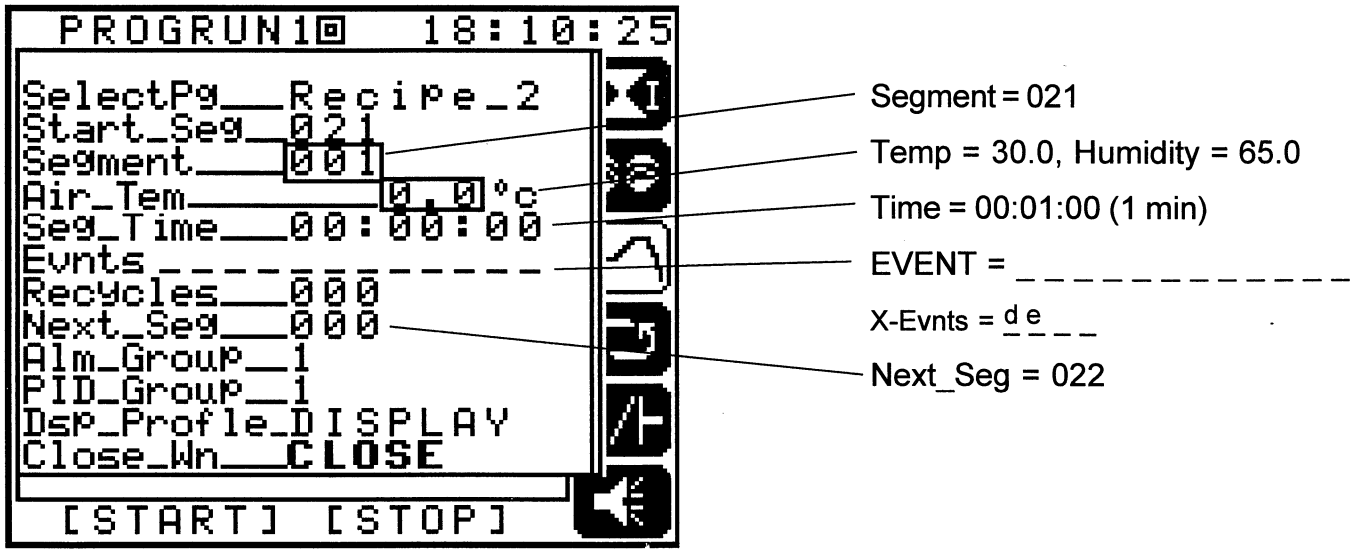
Entering Data From Table into Dimension II Program

Use knob to select items for beginning segment.

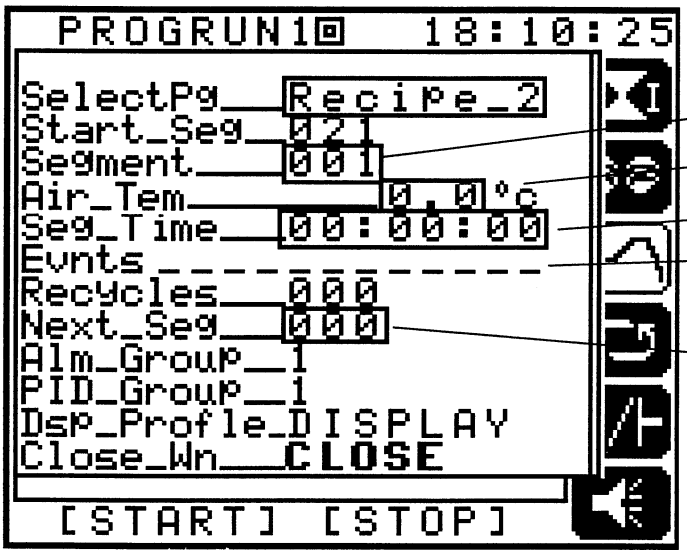
1. Enter 020 segment of recipe from data in first column of table.



2. Enter 021 segment of recipe from data in second column of table.



3. Enter 022 segment of recipe from data in third column of table.



Segment = 022

Temp = 85.0, Humidity = 65.0

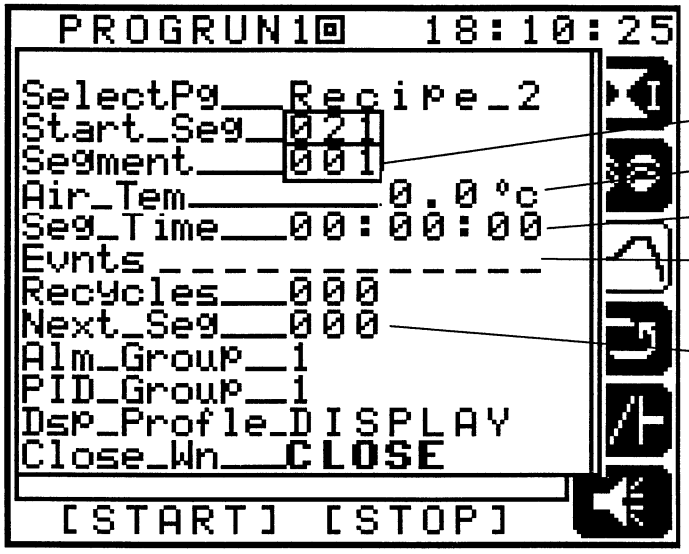
Time = 00:03:00 (3 min)

EVENT = _ _ _ _ _ _ _ _ _ _ _ _

X-Evnts = d e _ _ _

Next_Seg = 023

4. Enter 023 segment of recipe from data in fourth column of table.



Segment = 023

Temp = 85.0, Humidity = 65.0

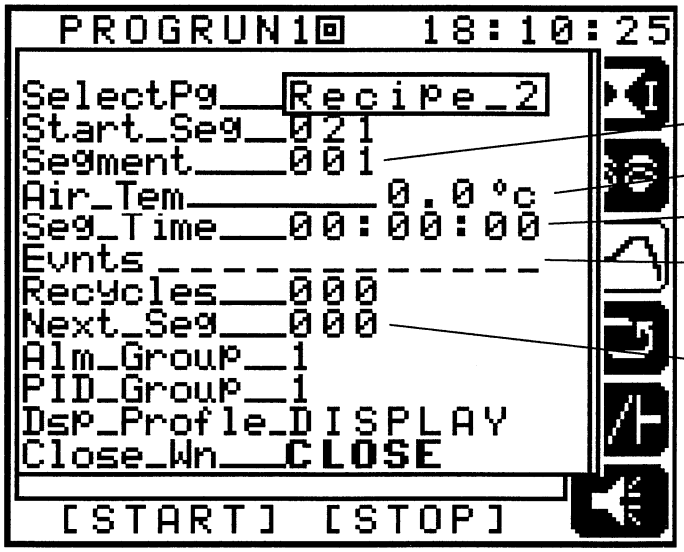
Time = 00:09:00 (9 min)

EVENT = _ _ _ _ _ _ _ _ _ _ _ _

X-Evnts = d e _ _ _

Next_Seg = 024

5.Enter 024 segment of recipe from data in fifth column of table.



Segment = 024

Temp = 85.0, Humidity = 90.0

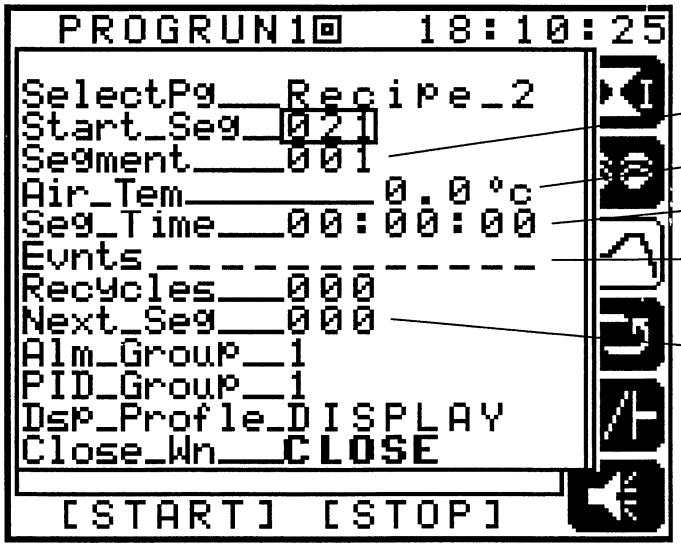
Time = 00:04:00 (4 min)

EVENT = _ _ _ _ _ _ _ _ _ _ _ _

X-Evnts = d e _ _ _

Next_Seg = 025

6.Enter 025 segment of recipe from data in sixth column of table.



Segment = 025

Temp = 85.0, Humidity = 90.0

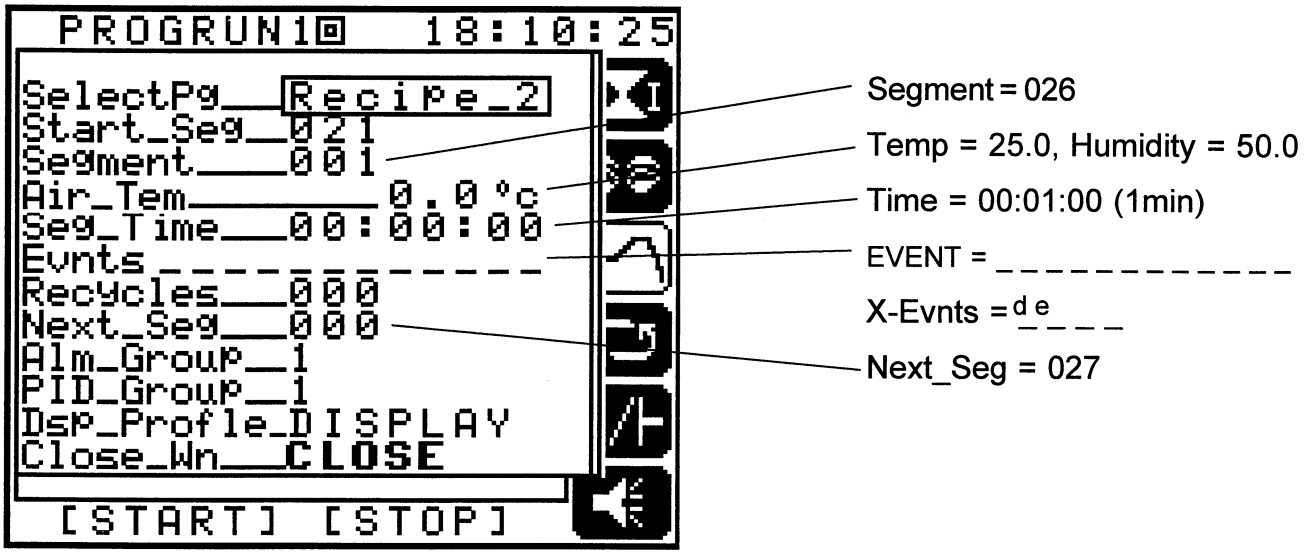
Time = 00:03:00 (3 min)

EVENT = d e _ _ _ _ _ _ _ _ _ _

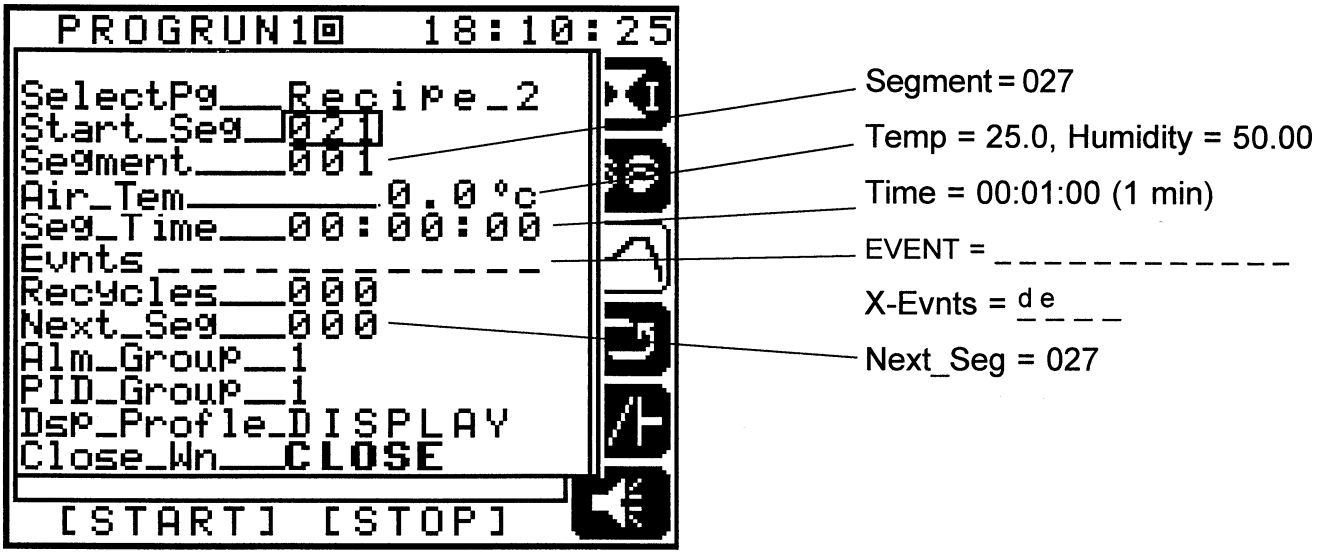
X-Evnts = _ _ _ _

Next_Seg = 026

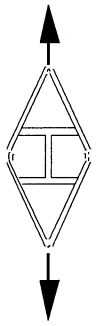
7.Enter 026 segment of recipe from data in seventh column of table.



8. Enter 027 segment of recipe from data in eighth column of table.



Run a Recipe



Start a Recipe

Described below are the possible methods of starting a recipe. They are as follows:

Operator Start

Press the diamond key UP or DOWN until the Program icon is displayed. The system will display a Program Run screen (Fig. 3–10). From the Program Run screen, select Start and a window will open (see Fig. 3-11). The operator can select any particular Recipe, and by moving the cursor to start and pressing enter, the start selection will initiate a Recipe Start. Close the start window and you will view the current programmer status.

Fig. 3-10.
Program Run Screen

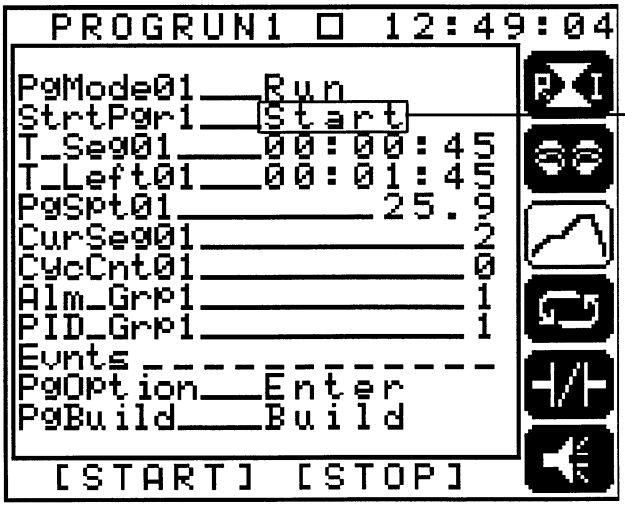
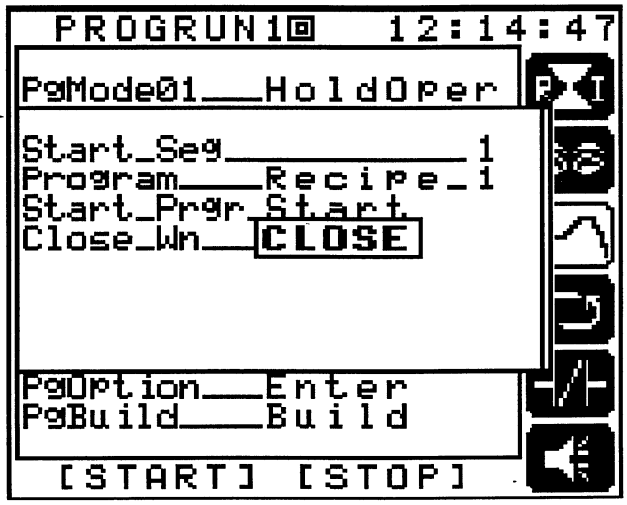


Fig. 3-11.
Program Start Window



Alternate Recipe Starts

1. Macro Keys configured to "start" a Recipe from the Display mounted push button. (See Macro Key Configuration for more information).

Once a Recipe is started the Program mode changes to Run indicating the clock or time-base is counting. The programmer will continue to display Run and count down time until the Recipe ends. The display will change to PgEnd.

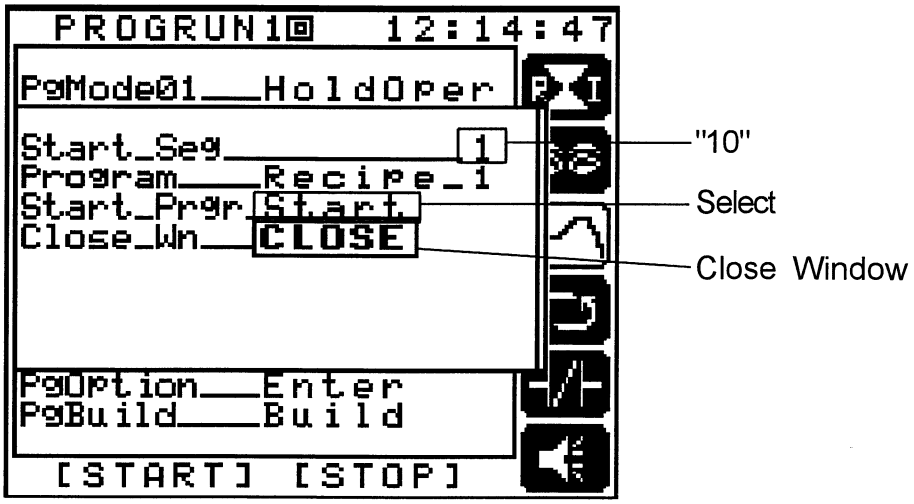
Stop a Recipe

The user may need to stop or end the current Recipe while the PgMode =Run. The following choices are available:

1. **Restart the Recipe at the End Segment**
   If for example, Recipe 1 uses Segments 1-10 with Segment 10 as the ending segment, select "10" as the start of the Recipe. (Fig. 3-12)

   As an alternative, define a unique stop segment that can be used with all Recipes. For example, Segment 250. You may (not required) assign a Recipe number to this "Stop" segment. Then the user will select a Recipe number and not need to remember the stop segment number.

Fig. 3-12.
Stop a Recipe



2. **Use "Stop" Macro Key**
   Configure the Macro Key to start a user defined Recipe (example Recipe 8) to "stop" the current Recipe and start Recipe 8.

   Recipe 8 will be defined with safe setpoints, minimum time and perhaps the events turned off. Its start segment is user defined.

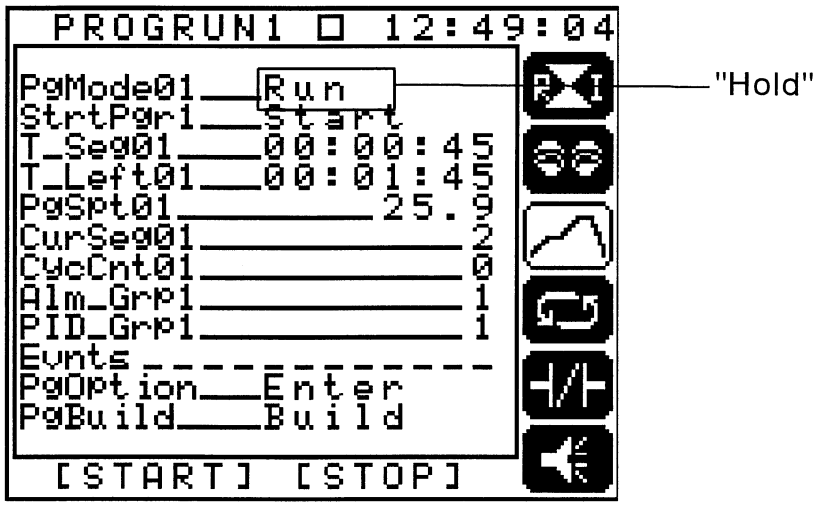
   The control loops can also be set to manual and all control outputs set to zero with the macro key configuration.

Hold Function

If desired, the user can stop the Programmer from running by putting the PgMode to Hold with all the current conditions active.

Select "Run" and change to "Hold". The Setpoint, Alarm Group, PID Group or Events can be selected and changed. These changes will become active immediately, when the cursor knob is pushed after the selection. (Fig. 3-13)

Fig. 3-13.
Putting the Programmer in "Hold"



Hold/Run can also be activated by Alarms as with Guaranteed Soak or by a remote input configuration choice.

> ***Note:*** *1. If the Programmer is returned to "Run" from a "Hold" condition,. all changes will remain active.*
> *2. If the setpoint value was changed, the setpoint will now Ramp to the programmed setpoint value at the rate determined by the time left in the segment.*
> *3. If the events were changed, their condition will remain until the next segment is reached.*

Advanced Features

Recycles

Used to repeat a segment or group of segments. The entry is available on each segment and must jump to a previous segment.

Range is zero to 255 cycles.

Note: Maximum of 25 segments can be configured with recycles. If more than 25 segments with recycles are programmed, controller will go to program end.

The cycle counter on the Program Run display keeps track of remaining cycles during the process.

Recycles is used with Next Seg to direct the sequence of the program.

When the Recycles are complete the programmer automatically advanced to the next higher segment.

Note:
1. *Recycles cannot be used to repeat the current segment. Next segment is the director of program and if set to the current segment the program will end.*
2. *Maximum of 25 segments can contain recycles.*
3. *Program automatically advances when recycles are complete.*

PID Groups - Not Used

Entry of values (1-5) into PID group selection will not have any effect. This is because the selection for the active PID group is decided by the control loop requirement and not made a concern for the user when building the Recipes.

Alarm Groups

Selecting Alarm group (1-5) can be made on a segment-per-segment basis. The typical use is to switch to different limits at various times in the Recipe. Usually to activate or deactivate a Guaranteed Soak function.

Alarm Groups will only become active if selected in the program segment and value are set for the alarm in the desired alarm group.

(See Alarm Settings for entry).

Guaranteed Soak

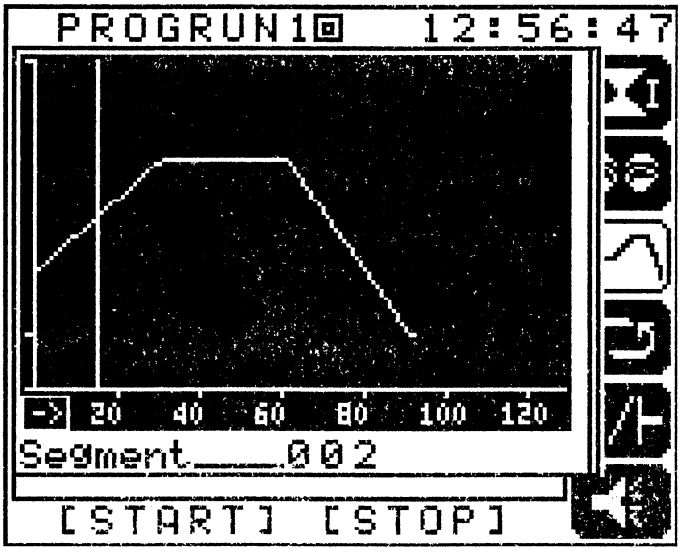
Uses Hi and Lo Deviation alarms to put the programmer into "Hold" allowing the process to "catch-up" with a change in setpoint. By switching alarm groups, tight and wide alarm limits can be activated at diffferent segments of the program. The use of Guaranteed Soak will speed-up the test cycle and still maintain correct times for the soak period.

View a Recipe

Display Profile

When first called up, the text-based Recipe Build screen displays default segment (001) parameters in tabular form. During the recipe building process, a window displaying an X-Y graph of the current state of the recipe can be called up by using the **DISPLAY** selection. As shown in Fig. 3–14, this window dynamically displays the setpoint recipe to ensure proper recipe entry. As the recipe develops, the graphic profile scrolls horizontally. When entries are made or edited, successive recipe segments are displayed according to the new values.

Fig. 3-14.
X-Y Graph Display



The vertical axis of the recipe profile displays five labeled tick marks. The vertical axis labels are normalized such that if the variable range is –1000 to 1000, the tick marks will read –100, –50, 0, 50, 100. The horizontal and vertical axis displays tick marks. The horizontal time scale is set on the Program Display Configuration screen (DCON_PRG).

At the bottom of the profile X-Y graph is a line of text that scrolls through the selections on the Recipe Build Window. Using the knob, the items scroll as if the items were displayed on a full screen. These values can be modified by using the multi-function knob editing functions.

As values are entered for profile segments, the profile is graphically displayed. If, for example, the process setpoint is chosen for editing, the text process variable displayed will change when the knob is turned. On the X-Y graph, a line moves up and down on the display representing the relative value of the process variable. When the segment time is changed, the X-Y graph displays that segment, expanding or contracting along the horizontal axis.

When the recipe grows larger than the display screen, the profile will scroll horizontally. Also, the Zoom factor can be changed to condense or expand the display. If a segment is edited that has following segments, anything that follows that segment will be graphically erased. When the edited segment is entered, all segments will then be displayed.

Also, when you move the selector box to the small arrow field on the display and press **ENTER**, a vertical reference line is displayed. This line can be moved horizontally by turning the knob. Moving the selector box to the **CLOSE** field closes the graphic window and returns you to the Recipe Build screen.

Loop Display Screens

The Dimension II system can be configured to display one user-defined display for each loop. These screens can be used for operator interaction with a wide range of control loop functions.

Press the diamond key UP or DOWN until the Loop icon is displayed. To call up specific Loop displays, press the diamond key LEFT or RIGHT to scroll through the displays.

Each control loop has a dedicated display, and Loop displays can be configured with two loop parameters displayed in the top half of the display areas in the form of X-Y graphs, bar graphs, or large numeric characters. Also, windows can be accessed from these screens for specialized functions such as loop setup and auto-tuning. These control and display options are described in the following paragraphs.

X-Y Graph Loop Display Screen

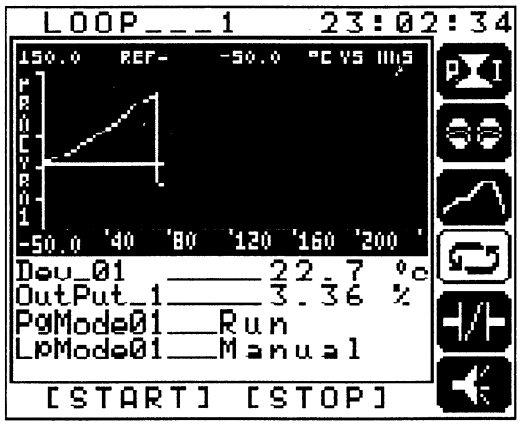


Fig. 3-15.
X-Y Graph Loop Display Screen

As shown in Fig. 3-15, the X-Y graph Loop display features an X-Y graph on the upper half of the screen. The vertical axis has user-definable limits with the limits displayed above and below the axis. The variable tag name is displayed vertically to the left of the vertical axis. The horizontal time scale also features user-definable limits.

The graph displays a history of loop performance, with up to 100 samples of process data displayed. The value of the reference mark and the units of the X and Y axes are displayed above the graph. For example, the units can be displayed as °C versus minutes.

By moving the selector box to the REF numeric field at the top of the graphic display and pressing ENTER, a horizontal reference mark can be displayed and moved along the Y axis by turning the multi-function knob. As the reference mark moved up (CW) or down (CFW) on the graph, the precise value in the REF field changes accordingly. The graph itself can consists of a selected process variable, and, if selected, the associated setpoint versus time. This screen also displays up to three lines of user-selected text below the graph, as well as the following field:

LPMODE01: Loop setup window (access to loop setup and auto-turning functions). User-accessible. See the Loop Control section following the Loop Display screen sections for information on the Loop Setup window.

Bar Graph Loop Display Screen

As shown in Fig. 3-16, the horizontal bar graph loop display can display two user-selectable variables and up to four user-selectable lines of text. The horizontal ranges are user-selectable. If the selector box can be moved into a text field, the variable can be selected and manipulated. The following field is also included:

LPMODE01: Loop setup window (access to loop setup and auto-turning functions). User-accessible. See the Loop Control section following the Loop Display screen sections for information on the Loop Setup window.

Numeric Character Loop Display

As shown in Fig. 3-17, this display is similar to the bar graph but displays three parameters as large numeric characters.

This screen also displays four lines of user-selected test, as well as the following field:

LPMODE01: Loop setup window (access to loop setup and auto-turning functions). User-accessible. See the Loop Control section following the Loop Display screen sections for information on the Loop Setup window.

Fig. 3-16.
Bar Graph Loop
Display Screen

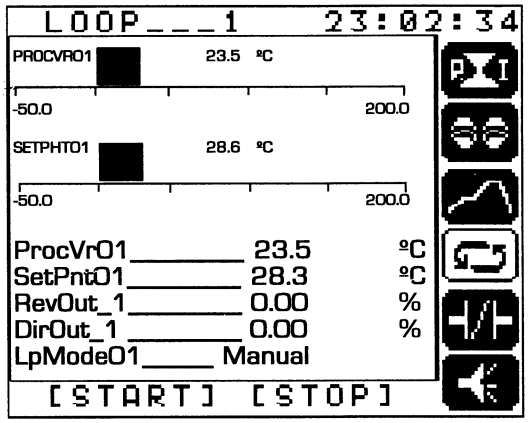
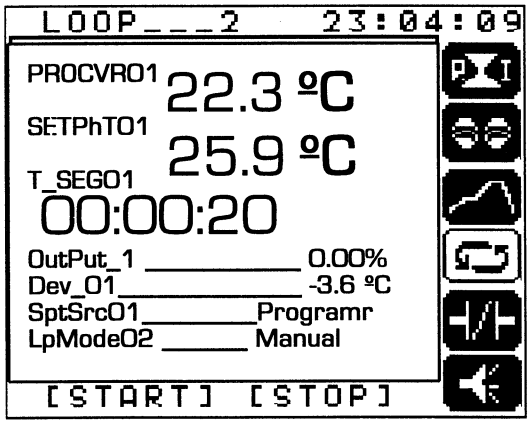


Fig. 3-17.
Numeric Character Loop
Display Screen



Loop Control

The Loop Setup Window shown in Fig. 3-18 can be accessed from any Loop display screen (X-Y Graph, Bar Graph, Numeric Character) in the Operation area. To call up this window, first press the diamond key until the Loop Operation icon is selected and then call up the Loop display (display type, loop number) you wish to work with by pressing the diamond key. Then use the knob to select the LPMODE01 (AUTO/ MANUAL) field. Fig. 3-18 willl appear

Loop gain, reset, rate, and manual reset can be adjusted in this window, along with loop (mode) status, PID group, and set point source. In addition, a specialized loop auto-tuning window can be called up from within this window.

Loop Setup Window parameter selections and entries include:

LpMode01: Select auto or manual mode.
RevOut_1: Enter loop output value.
DirOut_1: Enter loop output value.
SptSrc01: Select setpoint source (operator, remote, programmer).
ManReset: Enter manual reset value.
PID_Grp: Select PID group (1-5).
Gain: Enter gain value (0.0 to 327.0).
Reset: Enter reset value (0.0 to 300.0 repeats/minute).
Rate: Enter rate value (0.0 to 200.0 minutes with 1- second resolution).
AutoTune: Call up loop auto-tuning window. (See following topic.)
Close_Wn: Closes window.

Note: *For further explanation of PID theory reference "The Fundamentals of PID." Contact our Literature Department at (612) 941-3300 for a copy.*

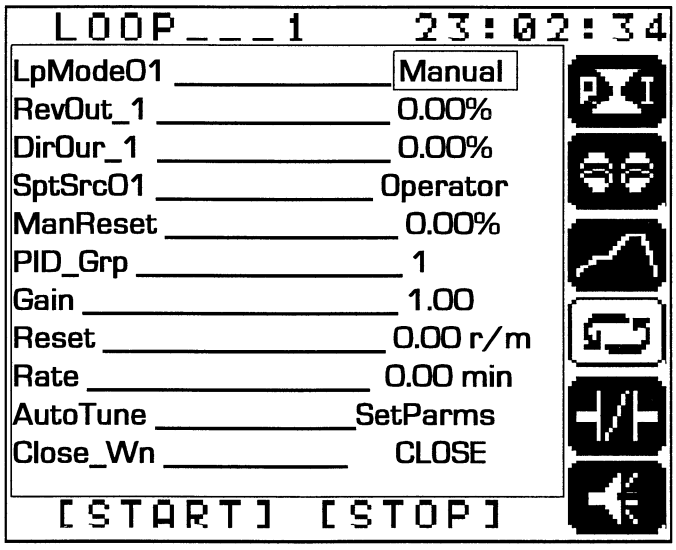


Fig. 3-18.
Loop Setup Window

Loop Auto-Tuning

Note: *Prior to starting auto-tuning, the following items must be considered:*

1. *OUTPUT ACTION: Reverse or Direct.*
2. *SAMPLE RATE: 20-30 for typical applications.*
3. *LOOP MODE: Manual.*
4. *PROCESS OPERATION: At some nominal, and relatively stable, operating point.*

Read the TUNE section in Appendix A for further discussion and calculations.

The loop Auto-Tune Window shown in Fig. 3-19 can be accessed from any Loop display screen (X-Y Graph, Bar Graph, Numeric Character). Select the AUTOTUNE window from the Loop Setup window (Loop Display, Loop Mode).

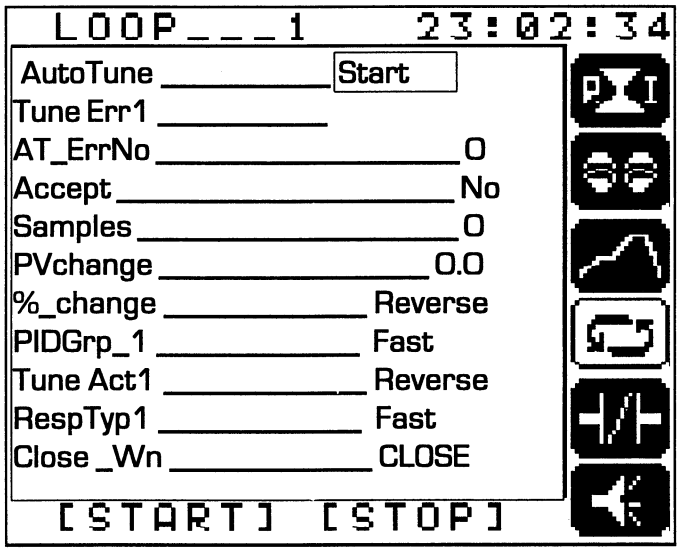


Fig. 3-19.
Loop Auto-Tune Window

The purpose of this window is to perform an automated loop tuning function during initial system setup. This function is intended to save time and provide increased control efficiency and accuracy.

On this screen, you can initiate auto-tuning for the selected loop, view the calculated values, and accept or reject the values for use with the loop. Tuning status and the calculated gain, reset, and rate are displayed.

Loop Auto-Tune Window selections and displayed information include:

AutoTune: Select Start to initiate auto-tuning, Abort to cancel auto tuning.

TuneErr1: ERROR indicated auto-tuning errors; FALSE indicates successful auto-tuning.

At_ErrNo: Displays error number (and description when ENTER pressed).

Accept: Select YES to accept auto-tuning values for the loop.

Samples: Displays the number of samples taken during the auto-tune session.

PVchange: Displays the amount of PV change.

%_change: Displays the percentage of PV change since the last sample. Auto-tune is complete when change is <1 percent.

PIDGrp_1: Select PID group (1-5) into which calculated values will be entered.

TuneAct1: Select output action (direct, reverse).

RespType1: Select response type (Fast, medium, slow).

Close_Wn: Closes window.

When auto-tuning is initiated, the control output is BUMPED by a user-defined amount. The process variable is then monitored to determine how the process reacted to the BUMP. Gain, Reset, and rate calculations are derived from this reaction. After auto-tune is complete, the control output is returned to its original condition and the calculated PID values are displayed.

Logic Display Screens

Refer to Figs. 3-20 and 3-21. The Dimension II system can be configured to display, in text mode, up to four Logic displays. The first display, shown in Fig. 3-20, always displays the current status of events only. The remaining three displays are user-configurable and can include logic information similar to the samples shown in Fig. 3-21. Each screen can display up to 12 lines of information such as the current status of contact inputs, relay outputs, and events (logic points and other variables).

Fig. 3-20.
Logic_1 Display Screen

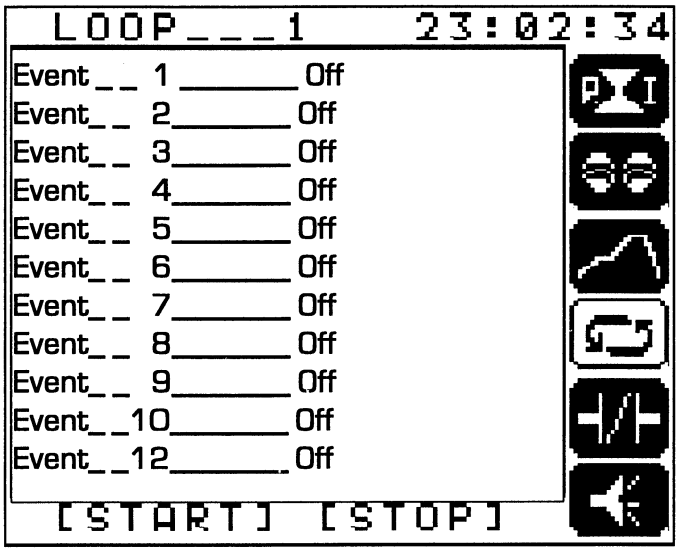
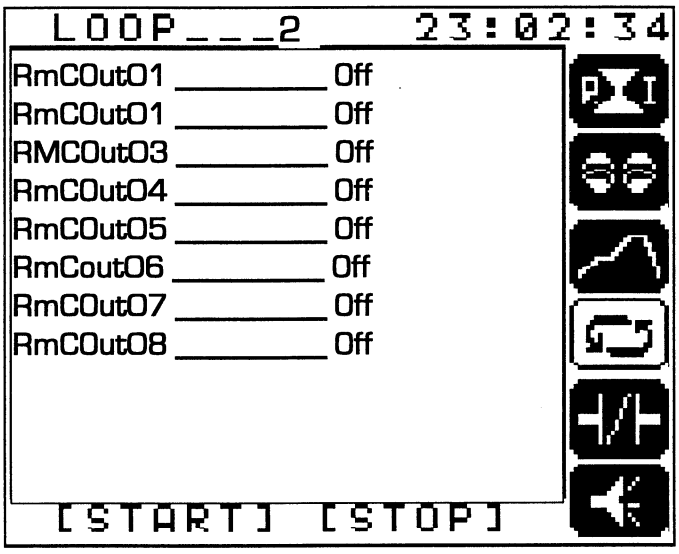


Fig. 3-21.
Logic_2 Display Screen



Use the diamond key to select he Logic icon. To call up specific Logic displays, press the diamond key LEFT or RIGHT.

As shown, variable tag names are displayed on the left side of the screen and current status is displayed to the right.

Section 4

Unit Configuration

Section 4 Unit Configuration

What is Configuration?

Configuration is the name used to describe the process of setting up the Dimension II for your application. In other words, Configuration is choosing and selecting specific options and features you want to use from the lists of available functions.

How is Configuration Accomplished?

The Dimension II may be configured using the operator interface. The following paragraphs provide the information required to accomplish configuration.

The Dimension II may also be configured using the JumpStart program on the floppy disk included with your controller. The JumpStart program is software that can be installed on your PC to create a custom Dimension II controller configuration for your specific application. JumpStart turns your PC into an easy to use, powerful tool to accomplish the configuration process. Please refer to the JumpStart User's Manual for instructions on how to load and use the program.

This section explains how to "personalize" the Dimension II to suit your specific operating environment and control scheme using the operator interface. (Refer to section 3 for process control operation instructions.) The following topics are included in this section:

- Before you configure
- Moving around the configuration screens
- Configuration screens overview
- Making configuration selections
- Control loop configuration
- Setpoint programmer configuration
- Alarm and logic configuration
- Output configuration
- Glossary (tag names) configuration
- Operator Interface display configuration
- Input/Output configuration and calibration
- Setting up security access passcodes
- Defining macro keys
- Setting system start mode
- Saving control configuration data (memory cards)

Before You Configure

Before you proceed, be sure to read and observe the following guidelines:

1. Be sure that your Dimension II system has been installed properly as described in section 2 of this manual.
2. Power up the system by applying AC power to the control cage (connector J7). After several seconds the start-up routine and diagnostics will be finished and the system will display the Unit Operation screen.
3. When you are finished making unit configuration changes, you should save your configuration data onto a memory card as described under the Setting System Start Mode topic in this section.

Important: If you do not save your configuration data onto a memory card, it could be lost when power is removed from the system. (See discussion of "warm start" and "cold start" under the last topic in this section.)

Moving Around the Configuration Screens

Fig. 4–1 illustrates a map of the screens used for configuration. Dimension II Configuration screens are organized into six groups or rows, with each row identified on-screen by a graphic icon:


Unit Configuration Screen


Glossary Configuration Screens


Process Configuration Screens

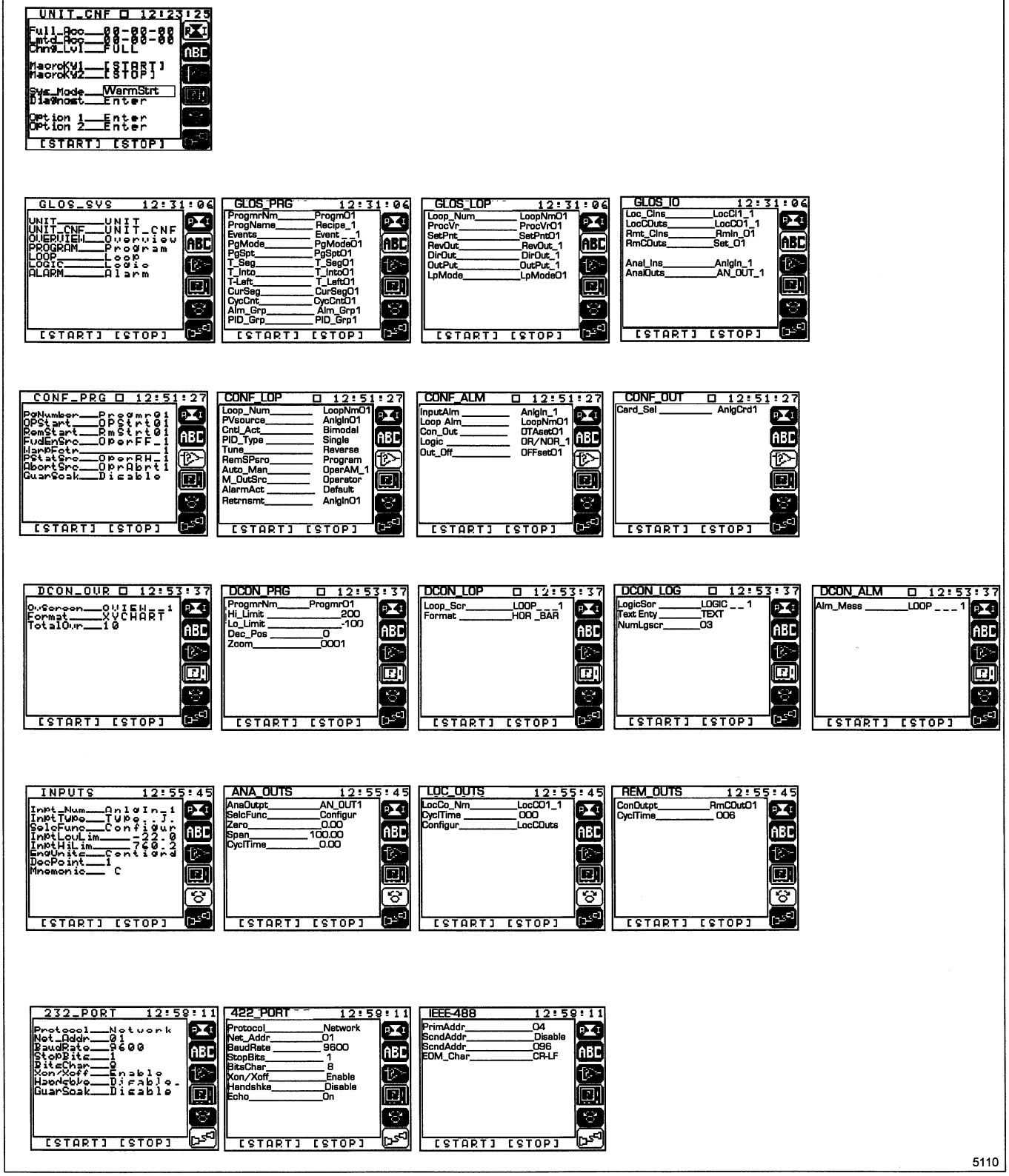

Display Configuration Screens


Hardware I/O Setup and Calibration Screens


Communications Setup Screens

Several rows have multiple screens. Each screen in the row groups together a related set of configuration parameters.

Fig. 4–1.
Map of Screens Used for Configuration



The four letters (e.g., R3C1) near each screen in Fig. 4–1 indicate the relative position of each screen in the configuration screen map. For example, the Programmer Configuration Screen titled CONF_PRG is labled R3C1 to indicate its position as Row 3, Column 1.

The diamond shaped key on the Operator Interface is used to select the screen you need to move to configure a specific parameter. The diamond key is used to move up or down and left or right as described below:

Moving Up or Down a Row

Figure 4–2 illustrates how to use the diamond key to move up or down a row in the configuration screens map.

Moving From Screen to Screen Across a Row

Figure 4–3 illustrates how to use the diamond key to move left or right across a row of screens.

Configuration Screens Overview

Configuration is accomplished by entering information with the operator interface on variety of special purpose configuration screens.

The following paragraphs describe highlights of each group (row) of Dimension II Configuration screens.

Unit Configuration Screen

The Unit Configuration screen is accessed by first pressing the diamond key UP or DOWN until the Unit icon (RI logo) is highlighted. If you are in the Operation area, press the diamond key LEFT or RIGHT to switch to the Configuration area. (If the system access level is "NONE", or "LIMITED" you must also enter the correct passcode.)

The Unit Configuration screen is used to configure or perform a variety of unit or system level functions: passcode assignment, changing access level, building macro key functions, setting system power up mode, running built-in self diagnostics, and displaying the model number and options installed in your unit.

Fig. 4–2
The Diamond Key – Moving Up or Down a Row of Screens

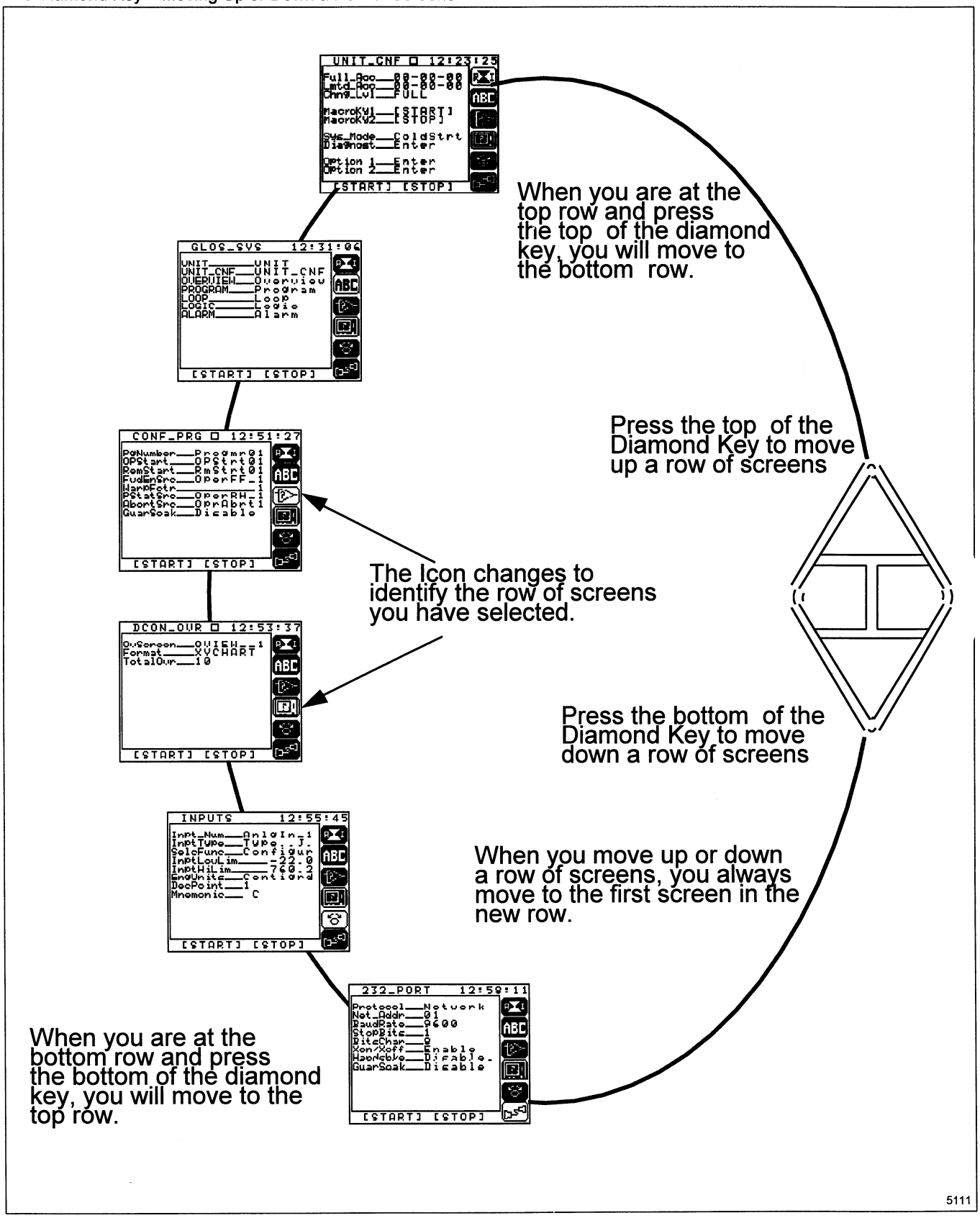
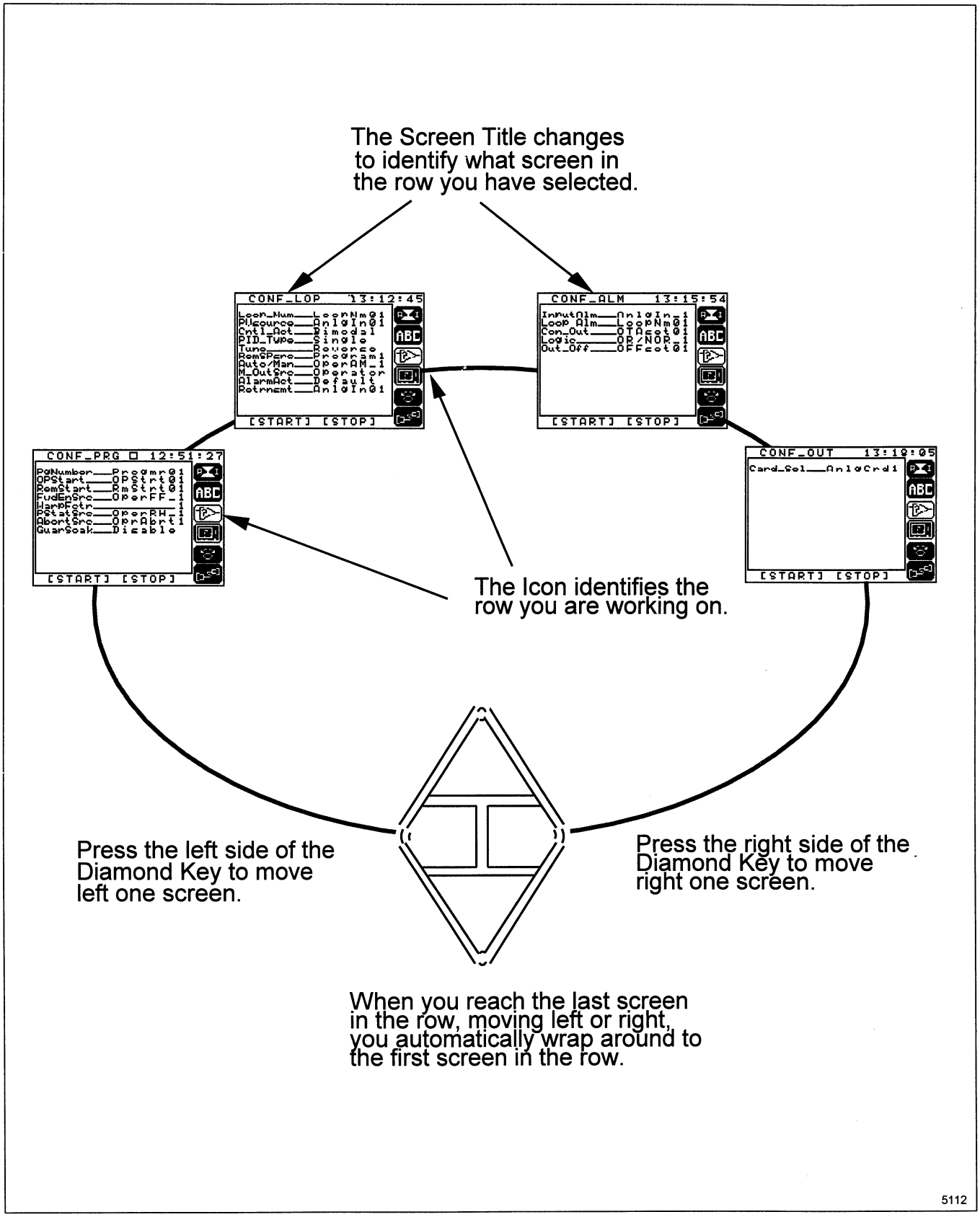


Fig. 4–3.
The Diamond Key – Moving Left or Right Across a Row of Screens



Glossary Configuration Screens

Glossary Configuration screens are used to modify 8-character parameter tag names and screen titles. Whenever a tag name or screen title is changed, the change is reflected anywhere the tag name or title is used. On Glossary Configuration screens, both the original (default) names and new names are displayed.

Process Configuration Screens

Process Configuration screens are used to configure and modify Dimension II system control strategy including loops, setpoint programmers, alarms, logic and I/O patching.

Display Configuration Screens

Display Configuration screens are used to select the format and configure the content of Dimension II Operation displays. A variety of selections permit you to choose what information is displayed and how it is displayed.

I/O Setup and Calibration Screens

These are used to set up and calibrate the inputs and outputs connected to Dimension II I/O modules. Functions performed on these screens include I/O type selection, zero/span adjustment, engineering units selection, decimal and mnemonic selection, cycle time, and high and low limits selection. Dedicated screens are provided for specific input and output types (analog, time-proportioned, contact).

Communication Setup Screens

These screens are used to configure RS-232, RS-422 or IEEE 488 communications. If multiple Dimension II systems are connected on a network to a supervisory PC, this screen is also used to assign a network address to the control cage. (See Appendix B for communications information.)

Making Configuration Selections

Making configuration selections is accomplished by entering information with the knob on the Operator Interface. The specific techniques for using the knob to enter or change configuration parameters are similar to the techniques used on the operation screens.

Some selections are made directly on the primary configuration screens. Other selections are made in "windows" that open in response to your specific parameter selections.

The configuration process is dynamic. As you enter selections, the Dimension II keeps track of your choices and prompts you for additional selections where needed. The Dimension II will also delete choices that are no longer necessary as you proceed. You may see the parameter list in the windows change as you enter selections as the Dimension II prompts you for the necessary information.

Before you begin configuration, review the parameter entry techniques in Figs. 4–4, 4–5, and 4–6 on the following pages to familiarize yourself with:

- Selecting a parameter by scrolling through a list on the primary configuration screen (Fig. 4–4).
- Selecting parameters in configuration windows (Fig. 4–5).
- Selecting multiple parameters in configuration windows that change (prompt you for more selections) as you enter or change parameters (Fig. 4–6).

Fig. 4–4.
Using the Knob to Scroll Through List of Parameters

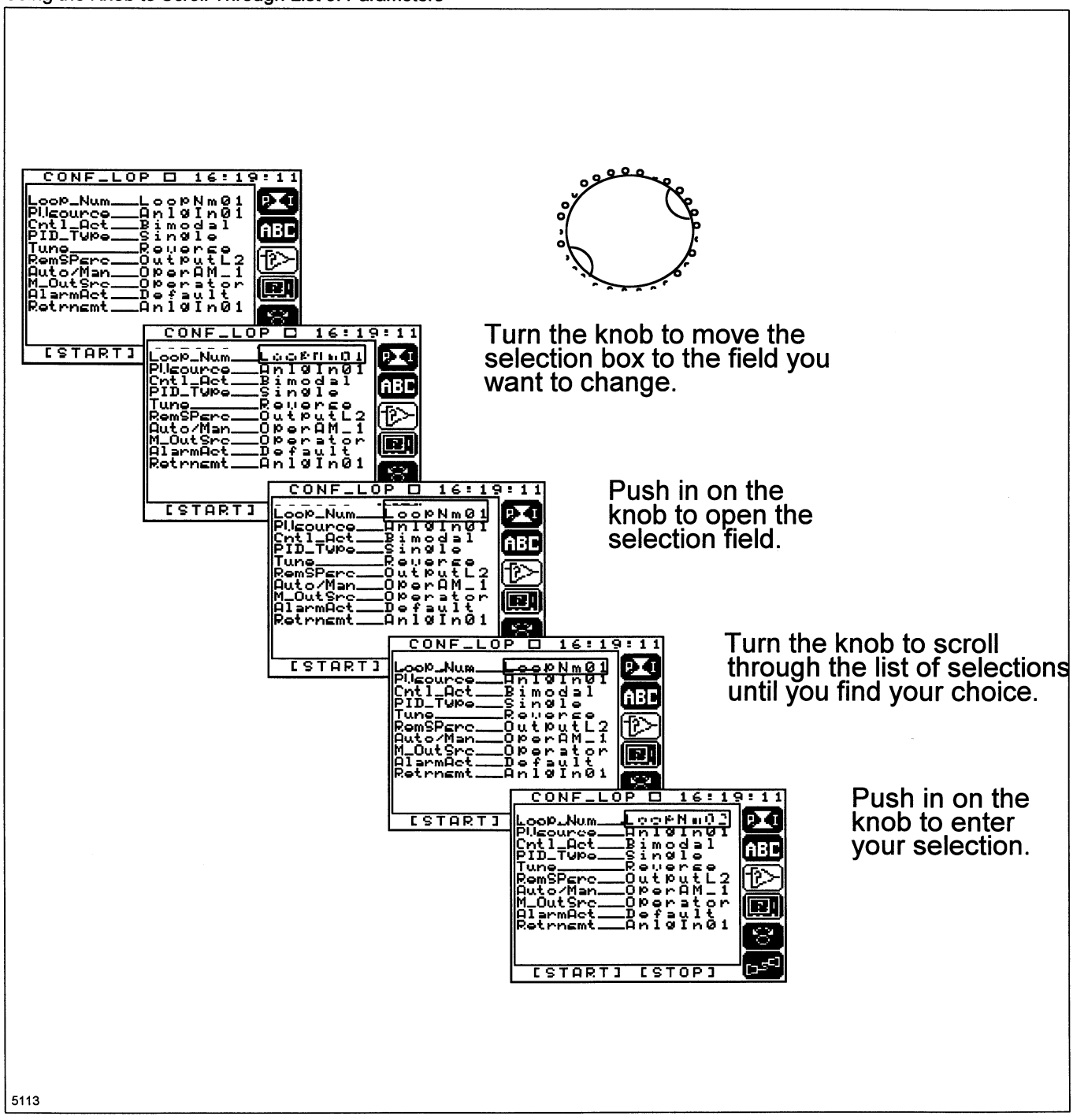


Fig. 4–5.
Selecting Parameters in Configuration Windows

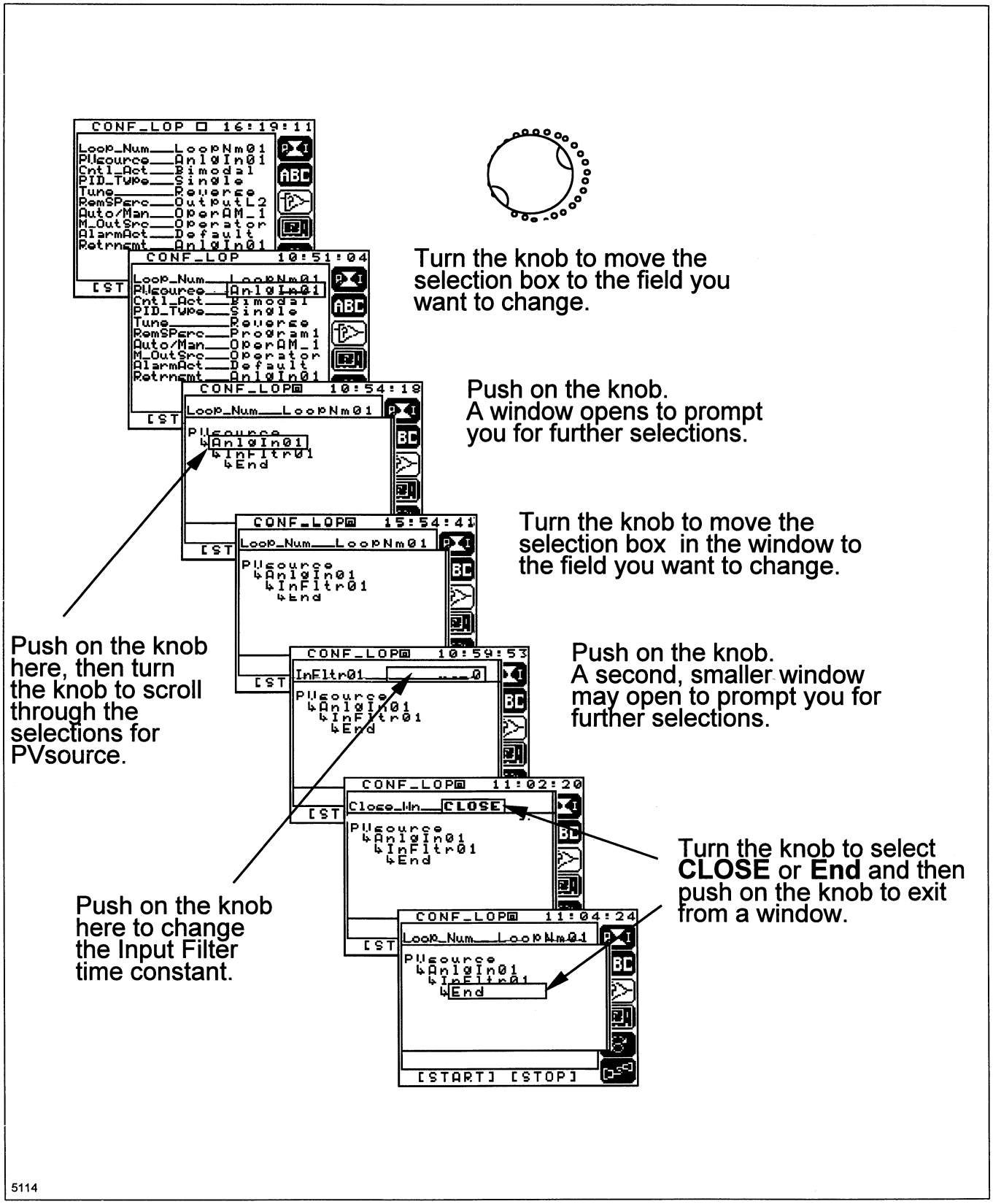
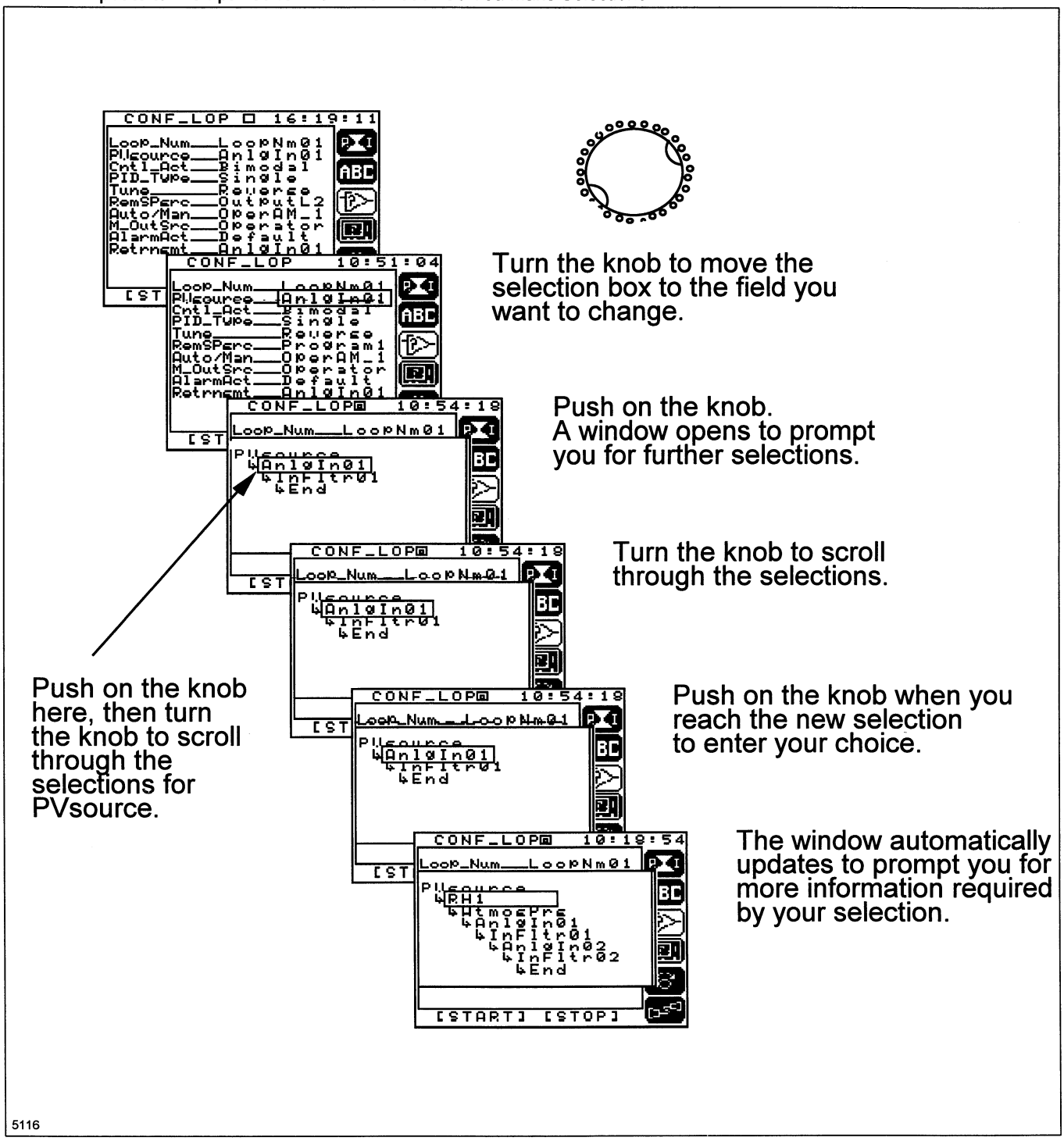


Fig. 4–6.
Windows Update to Prompt You for New Information as You Make Selections



Unit Configuration Screens

UNIT CNF Screen

Full_Acc Area where you can enter three two-digit numbers (passcode) to grant operator Full Access. The user may then change all control parameters (both operation and configuration) under this user state (Fig. 4-7).

Lmtd_Acc Area where you can enter three two-digit numbers (passcode) to grant operator Limited Access. The user is then granted partial access to the unit (on the operation side)

Chng_Lvl Shows current access level selected (**Full**, **Limited**, or **None**)

MacroK1
MacroK2 Displays current "label" or "tagname" (and function) for each of the two macro keys located directly below the display screen. With these keys you have the ability to simplify operation by redefining each key to perform a selectable function for a specific loop.

> ***Note:*** *These key lables are displayed on the bottom row of* ***all*** *screens.*

Sys_Mode The CSZ Dimension II can be set to one of three system mode parameters: **Warm Start** – Unit functions will default to **OFF** on power up, **AutoStart** – All settings are saved on power up, and **Cold Start** – All data residing in memory will be erased when line power is removed.

Diagnost Opens a series of windows used to display the current software version number and run diagnostic performance tests on both the control cage and operator interface.

Option 1
Option 2 Lists the features, functions and capabilities of the Dimension II model you purchased compared to the maximum configuration available to purchase.

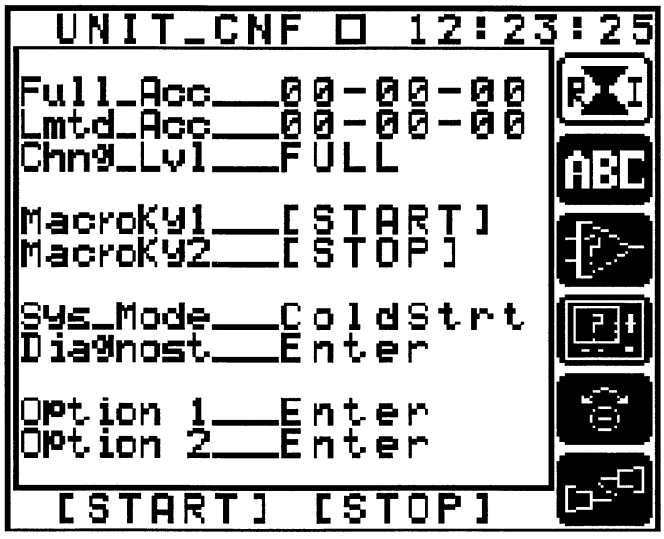


Fig. 4–7.
Unit Configuration screen

Setting Up Security Access Passcodes

You may configure your Dimension II system for one of three security access levels:

- **FULL** – Full access granted (operation and configuration)
- **LIMITED** – Partial access granted (operation)
- **NONE** – No access granted (view-only)

With the **NONE** or **LIMITED** level set, system users must enter a 6-digit passcode (three 2-digit fields, 00–99 in each field) before they can gain full or partial access to the system. With no passcodes configured (**FULL** status), all users may access all system functions.

After system power-up, and moving to the Unit Operation screen, the currently active access level is displayed in the **ACCESS** field. If **LIMITED** or **NONE** is displayed, a user must enter at least one passcode in a window that appears when the **ACCESS** field is selected. If the correct passcode is entered, the desired access level is granted.

Security access passcodes are set up as follows:

1. With the unit in the default "**FULL**" access mode, use the diamond key to access the Unit Configuration icon. The system will display the Unit Configuration screen shown in Fig. 4–7.
2. Use the knob to select the **FULL_ACC** field. (Default "**FULL**" = full access granted.)
3. Select the three 2-digit codes.
4. Move the selector box to the **LMTD_ACC** field and enter codes in the same manner.

5. Move the selector box to the **CHNG_LVL** field. Select the access level you wish to activate: **FULL**, **LIMITED**, or **NONE**.

   The access level you selected will be displayed in the **CHNG_LVL** field and the access codes you entered will be blanked out.

6. Use the diamond key to access the Unit Operation screen. The access level you selected will be displayed in the **ACCESS** field.

7. To gain **FULL** or **LIMITED** access, select the **ACCESS** field, and enter the correct passcode in the window. When you close the window, the current access level will be displayed.

> **Important:** To remove passcode protection from the **NONE** or **LIMITED** level, you must first enter the correct passcode in the **ACCESS** field on the Unit Operation screen. You must then access the Unit Configuration screen and enter six zeros (**00-00-00**) into the passcode field. Passcode protection will then be removed from the system and "**FULL**" access will be allowed.

Defining Macro Keys

The labels and functions of the two "macro keys" located directly below the display screen may be redefined at any time during operation. With these keys, you have the ability to simplify operation by redefining each key to perform a selectable function for a specific loop.

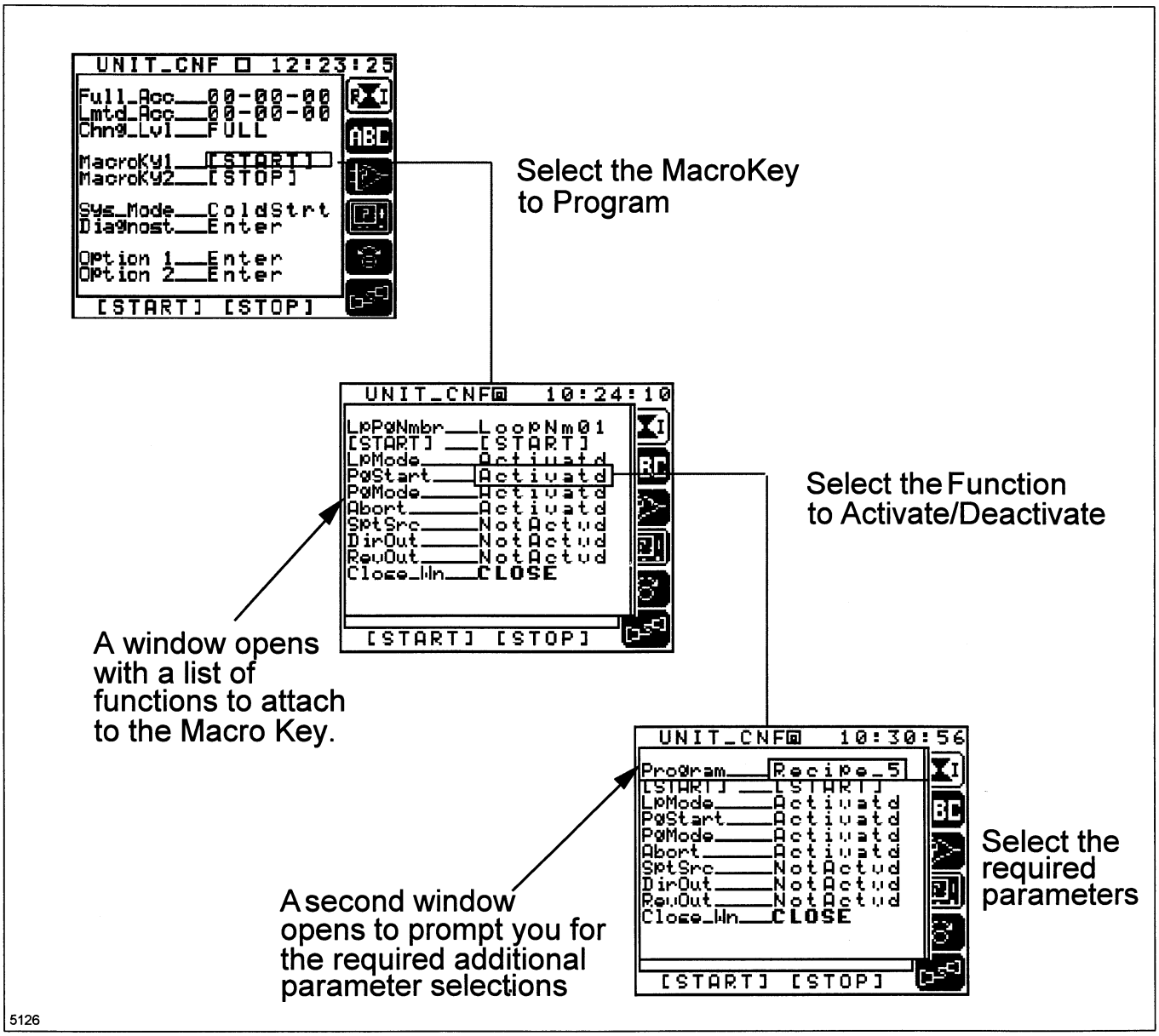
Macro key labels are displayed on the bottom row of all screens. Configure macro key labels and functions as follows:

1. Use the diamond key to move to the Unit Configuration icon. The system will display the Unit Configuration screen shown in Fig. 4–8.
2. Use the knob to select the **MACROKY1** field.
3. The system will display the macro key Setup window shown in Fig. 4–8.
4. Use the knob to select the **LPPGNMBR** field. Select the desired loop/ programmer combination.
5. To rename the key, select the **[START]** field. The selector box will highlight the first character field of the 8-character macro key label.

> ***Note:*** *Each macro key label can consist of up to eight characters. All ASCII characters are available, including uppercase letters, lowercase letters, numbers, special characters, punctuation, and spaces.*

6. Use the knob to select the desired character. The character will be entered in the first field and the selector box will highlight the second character field. Repeat this procedure until you have entered a character (or space) in each character position in the label.

Fig. 4–8.
Defining Macro Keys



7. Use the knob to select the first function you wish to perform with the macro key.
8. Select **ACTIVATD**. The system will display **ACTIVATD** in this field and permit you to select various program or loop operation parameters.
9. Repeat this process with the other parameters listed on this screen.
10. When you are finished making selections for this loop/programmer combination you may repeat this procedure for another loop/programmer combination.
11. Repeat the above procedure to enter a new label and function for the second macro key.

Setting System Start Mode

The CSZ Dimension II can be set up to handle memory contents in one of three ways when line power is removed from the system:

- AUTO START – All parameters and data residing in memory will be maintained by battery power (up to several years) after a power-down and the system will resume where it left off when powered up again.
- COLD START – All data residing in memory will be erased when line power is removed. The original factory default settings for all parameters and data will be in effect when the unit is powered up again.
- WARM START- All parameters and data residing in memory will be maintained by battery power after a power-down except the four function parameters for Cond Sys, Humid, Aux Cool, and Purge. These will default to off.

Note: *Analog input/output calibration and configuration is retained in separate memory and is not affected by a system cold start.*

Set the system start mode as follows:

1. Use the diamond key to move to the Unit Configuration icon. The system will display the Unit Configuration screen shown in Fig. 4–9.
2. Use the knob to select the **SYS_MODE** field.
3. Select **WARMSTRT** or **COLDSTRT** or **AUTOSTART**. The mode you selected is now active, and will remain active until you change it again.

Diagnostic and Troubleshooting

Refer to section 5 for Diagnostics and Troubleshooting.

Fig. 4–9.
Selecting WarmStart or ColdStart

Option 1 and 2 Information

The following procedure lists the features, functions and capabilities of the Dimension II model you purchased compared to the maximum configuration available to purchase.

1. Use the diamond key to move to the Unit Configuration screen shown in Fig. 4–7.
2. Use the knob to select the **OPTION1** field. The Option 1 window will be displayed as shown in Fig. 4–10. The following information is provided in this window:
   - **Loops** – The number of loops
   - **Programmr** – The number of programmers
   - **Ana_Ins** – The number of analog inputs
   - **Ana_Outs** – The number of analog outputs
   - **Local CI** – The number of local contact inputs
   - **Local CO** – The number of local contact outputs
   - **422** – RS-422 communications
   - **232** – RS-232 communications
   - **488** – IEEE-488 communications
   - **CLC** – Custom Logic and Control

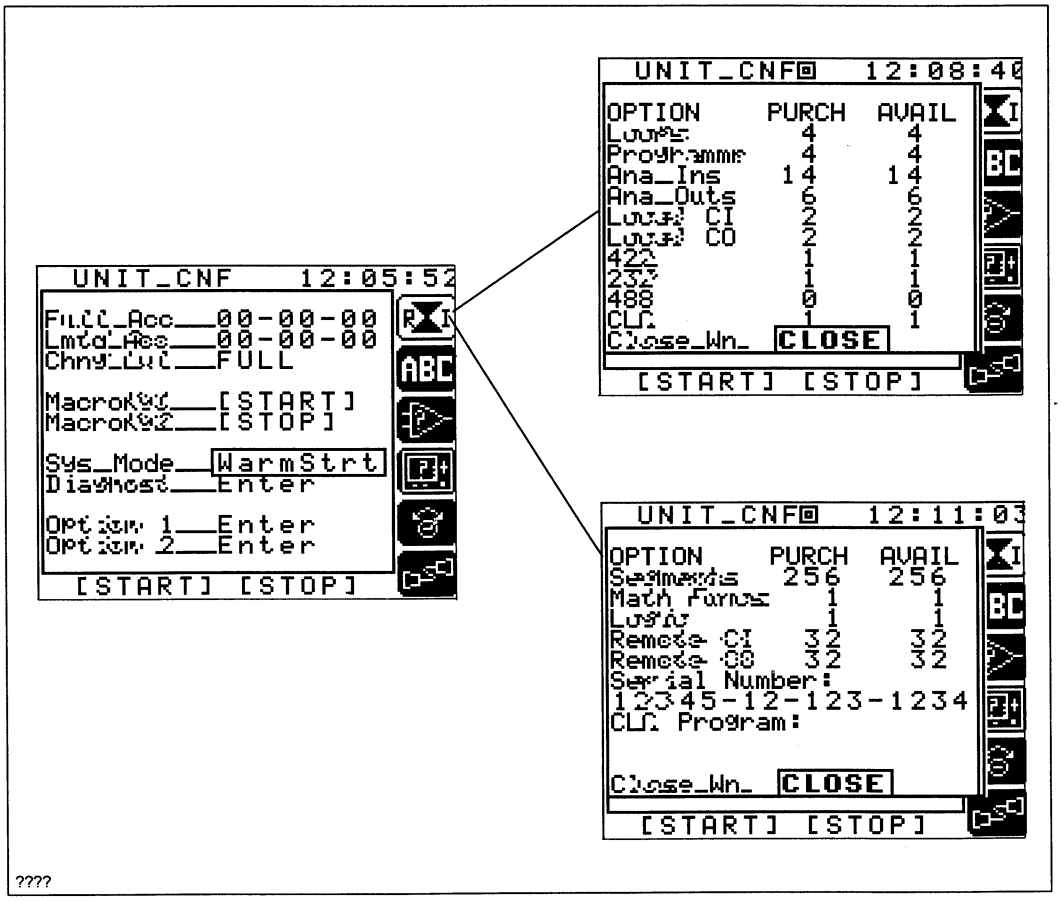


Fig. 4–10.
Option Information

3. Repeat step 2 to select the **OPTION2** field. The following information is provided in this window:
   - **Segments** – The number of profile segments
   - **Math Funcs** – Math functions
   - **Logic** – Logic
   - **Remote CI** – The number of remote contact inputs
   - **Remote CO** – The number of remote contact outputs

Additionally, the Dimension II serial number and any special CLC programs furnished by Research, Inc. is displayed.

If any items you purchased are missing or you require additional items, contact your local sales representative or Research, Inc. at 612-829-8317.

Glossary (tag names) Configuration

Dimension II uses a wide range of terminology to describe screen types, program parameters, loop parameters, and inputs/outputs. For example, each Operation screen in the system is labeled with a unique tag name on the top row of the screen. Also, tag names for specific inputs and outputs are used on many screens throughout the system. These tag names and labels are stored in system "glossaries."

Glossary Configuration screens are used to modify 8-character parameter tag names and screen titles. Whenever a tag name or screen title is changed, the change is reflected anywhere the tag name or title is used on the operation screens. On Glossary Configuration screens, both the original (default) names and new names are displayed.

Note: *All default terminology used in the Dimension II system is listed and defined in appendix A.*

Unit Glossary Configuration Screen

Refer to Fig. 4–11. The Unit Glossary Configuration screen is used to change the screen titles of all Operation screens and the Unit Configuration screen. (Most Dimension II Configuration screen titles are not changeable.) A screen title is displayed on the top line of each Operation display, and the title for each screen is unique.

For Unit, Unit_Cnf, Overview, Program, Loop, Logic and Alarm screen titles, a one-line entry or window is displayed in which you can scroll through and modify the title of each screen.

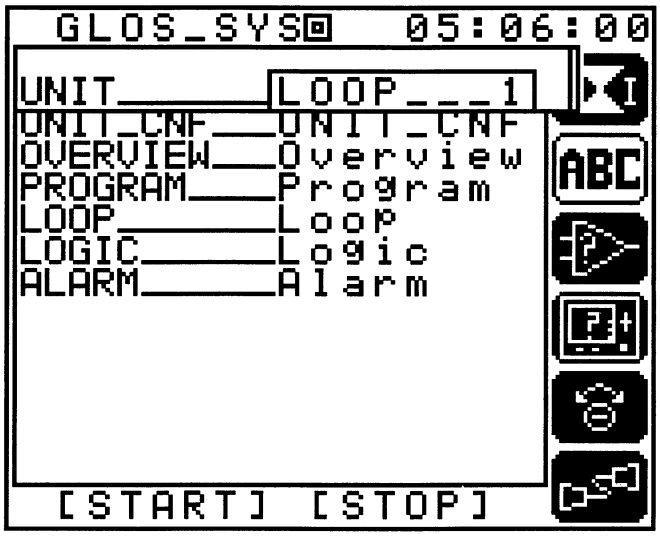


Fig. 4–11.
Unit Glossary Configuration Screen

Programmer Glossary Configuration Screen

Refer to Fig. 4–12. The Programmer Glossary Configuration screen is used to change the tag names used in Dimension II system programmers.

When a programmer number (1–8) is selected in the first field, tag names for Programmer mode, programmer setpoint, time left in segment, time into segment, time left in programmer, current segment number, cycle count, alarm group and PID group can be modified. When Program name is selected, a one line window is displayed, the tag names for up to 8 program names can be modified. When the events field is selected, a one-line window is displayed, the tag names for up to 12 events can be modified. The tag names can be modified for each individual programmer selected.

Fig. 4–12.
Program Glossary Configuration Screen

Loop Glossary Configuration Screen

The Loop Glossary Configuration screen can be used to change the tag names used on Loop displays. When a loop number is selected on this screen, the parameters shown in Fig. 4–13 are displayed for the selected loop. The tag names for process variable, setpoint, reverse output, direct output, output, and loop mode can be modified.

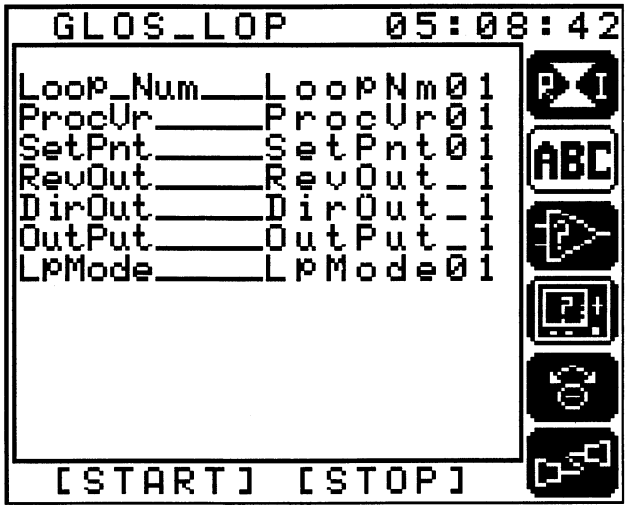


Fig. 4–13.
Loop Glossary
Configuration Screen

Input/Output Glossary Configuration Screen

Refer to Fig. 4–14. The Input/Output Glossary Configuration screen is used to change the tag names used for I/O. Tag names can be modified for contact inputs and outputs, contact I/O on/off states, and analog inputs and outputs.

One of four sets of on/off state terminology (on/off, open/closed, true/false, run/stop) can be assigned to each contact I/O on the Logic Display Configuration screen.

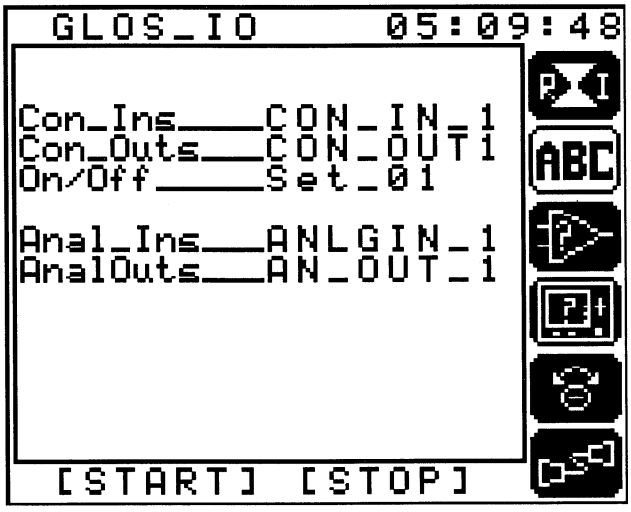


Fig. 4–14.
Input/Output Glossary
Configuration Screen

Process Configuration

Setpoint Programmer Configuration

Refer to Fig. 4–15. The Programmer Configuration screen is used to Configure setpoint programmer parameters as follows:

1. Use the diamond key to move to the Programmer Configuration screen shown in Fig. 4–15.
2. Use the knob to move the **PROGRAMMER NUMBER** field.
3. Select the programmer you wish to configure (1–8). The system will display the selected programmer's currently active parameters.
4. Configure programmer parameters as follows:

   OPStart – Selects the Operator Start source. When this point is "ON" the programmer will start running at the segment identified as starting segment.

Operator	**OpStrt##**
Contact Inputs	**RemCI_##**
	LocCI#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_# (optional)

   RemStart – Selects the Remote Start source. When this point is "ON" the programmer will start running at the segment identified at RemSeg##. Selections include:

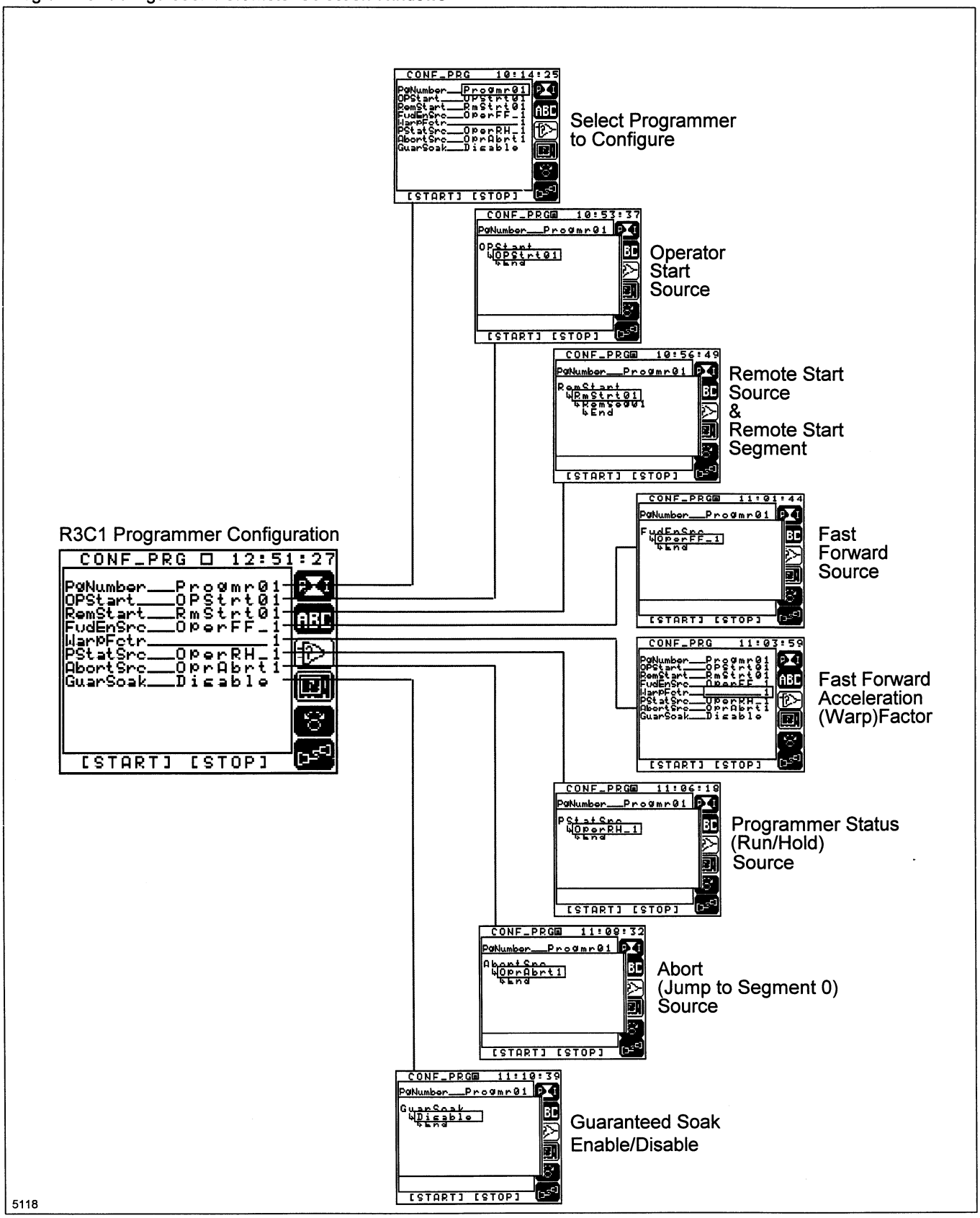
Operator	**RmStrt##**
Contact Inputs	**RemCI_##**
	LocCI#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_# (optional)

   RemSeg## – The starting segment used when the Remote Start is "ON".

   FwdEnSrc – Selects the Fast Forward Enable Source. When this point is "ON" the programmer runs through the program at an accelerated rate. The rate is adjusted by WarpFctr. Selections include:

Operator	**OperFF##**
Contact Inputs	**RemCI_##**
	LocCI#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_# (optional)

Fig. 4–15.
Programmer Configuration Parameter Selection Windows



Warp Fctr – Selects the Fast Forward Warp Factor. The warp factor is a multiplier applied to the normal programmer time base. A warp factor of 10 will cause the programmer to run ten times normal speed.

PStatSrc – Selects the Status Source to switch the programmer between Run and Hold. Selections include:

Operator	**OperRH##**
Contact Inputs	**RemIn_##**
	LocCl#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_# (optional)

AbortSrc – Selects the Abort program source. When "ON" the programmer goes into an abort routine starting at segment 0. When "OFF" the programmer resumes recipe from the point at which program was aborted. Selections include:

Operator	**OprAbrt#**
Contact Inputs	**RemIn #**
	LocCl#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_# (optional)

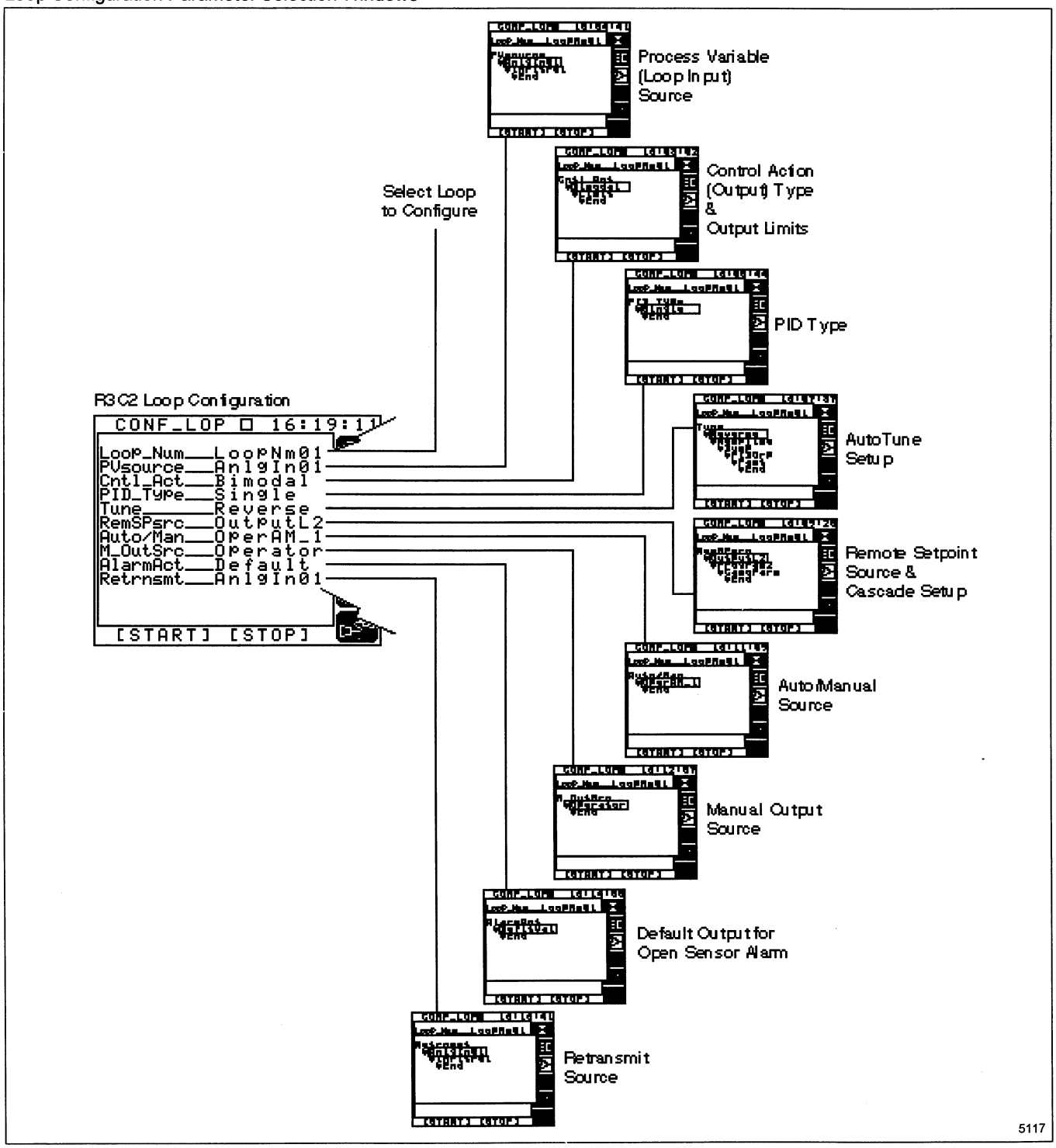
GuarSoak – Selects guaranteed soak. When guaranteed soak is enabled the programmer will Hold when ever deviation limits are exceeded. The limits are entered on the ALM_SET display at Loop_Alm. The **HiDev** and **LoDev** alarm settings are used by guaranteed soak.

Note: *An alarm condition occurs if alarm limits are exceeded during guaranteed soak.*

Control Loop Configuration

Refer to Fig. 4–16. The Loop Configuration screen is used to perform the loop configuration process. Primary selections made on this screen open windows for configuration parameter selection.

Fig. 4–16.
Loop Configuration Parameter Selection Windows



Configure Dimension loop parameters and characteristics as follows:

1. Use the diamond key to move to the Loop Configuration screen shown in Fig. 4–16.
2. Use the knob to select the **LOOP NUMBER** field.
3. Select the tag name of the loop you wish to configure. (Tag names may be changed as described in Defining Glossary Terminology in this section.)
4. The system will display the currently active parameters and characteristics for the loop you selected.
5. Modify control loop parameters and characteristics as follows:

   PVsource – Selects the process variable source (loop input) to be used by the selected loop. Selections Include:

   AnlgIn## – (## = 01–06) The process variable will come from the selected analog input.
   AnaIn# – (# = 1, 6) The process variable will come from the first analog input specified. If this input detects an open sensor (burn out), thermocouple control is transferred to the second input. The factory default for control loop output value is zero. To change this value, select **AlarmAct** and enter an alternate percent output default.

   Calc___# – (# = 1–4) The process variable will be calculated by the following equation.

   [(AnlgIn01 * Mult01) + (AnlgIn02 * Mult02) +
   (AnlgIn03 * Mult03) + (AnlgIn04 * Mult04)]/scale

   RH1/RH2 – The process variable will be a relative humidity calculation. The temperatures of the dry and wet bulbs (thermocouples or RTDs) are compared and, based on a psychometric table, the relative humidity is calculated. An Atmospheric Pressure setting may also be entered with sea level equaling 1.0.

   CLCInpt1/2 – The process variable will be calculated by the optional CLC program.

Note: *Also note that the temperature setpoint can be used in place of the actual dry bulb temperature measurement when the RH calculation is being made. This method provides more stable temperature and RH control in some applications.*

FltConst – Most process variable selections allow an entry for an input digital filtering value (Flt Const). The entry is the time constant in seconds of a low pass filter. As the time constant increases, the amount of filtering increases. Typical settings range from 1 to 5. Filter range is from 0 to 100 seconds. Default is zero.

Control_Act – Selects the control action for the selected loop.

- **None** – This loop not used.
- **Reverse** – This loop is used for a reverse acting process. In a reverse acting process the process variable input increases as the control loop output tends to decrease. A heating loop is usually reverse acting.
- **Direct** – This loop is used for a direct acting process. In a direct acting process the process variable input increases as the control loop out tends to increase. A cooling loop is usually direct acting.
- **Bimodal** – This loop is used for both reverse and direct. A process that has both heating and cooling capability would use bimodal control. Two control outputs are used.
- **Limit**– Control action selections allow entering output limit values (limit). These values will limit the control output.
  - **RvHiLmt1** – Reverse output high limit
  - **RvLoLmt1** – Reverse output low limit
  - **DrHiLmt1** – Direct output high limit
  - **DrLoLmt1** – Direct output low limit
  - **Deadband** – The amount of percent output before the process starts to respond to an applied output.

PID_Type – Selects the type of PID groups that will be used by the selected control loop. (See table 4–1.)

- **Single** – A single set of PID tuning constants are used (Group 1).
- **Dual** – Two sets of PID tuning constants are used. One set (Group 1) is used for a reverse acting (heating) control output and the second set (Group 2) is used for a direct acting (cooling) control output. Typically, when Dual PID type is selected bimodal control action has also been selected.
- **Progmmed** – Five programmed sets of PID tuning constants (Groups 1–5) are used. The setpoint programmer selects the group to be in effect.
- **SelAdapt** – Up to five sets of PID tuning constants may be used. A process value (BreakPnt) is assigned to each group number. As the process variable changes the appropriate group is enabled. In regions between breakpoints, the control interpolates between tuning constants.

Table 4–1. Active PID Groups by Type Selected

PID Type	PID Groups				
	1	2	3	4	5
Single	X	Not Active			
Dual	X	X	Not Active		
Program	X	X	X	X	X
Select Adaptive	X	X	X	X	X
X = Active					

Tune – Selects auto tuning default parameters.

- **Reverse/Direct** – Selects either reverse or direct as the default type of process to be tuned.
- **RespTime** – This is the time it takes the process to stabilize after a step change in the output. This will determine the time auto tune will take to evaluate the process and calculate PID parameters.
- **Bump** – Selects the amount of output increase (or decrease) that will be applied when auto-tuning is started. A setting of 10 to 20 percent is typical.
- **PIDGrp** – Selects the default PID group to which the tuning parameters will be transferred.
- **Fast/Medium/Slow** – Selects the default response speed desired. Fast will calculate PID parameters that cause the control loop to be highly responsive. Overshooting will occur when reaching setpoint.

RemSPsrc – Selects the remote setpoint source for the selected control loop. The remote setpoint is used when **Remote** is selected for the setpoint source on the loop operation display.

- **Program#** – Selects one of the programmed profiles to be the remote setpoint.
- **AnIgIn##** – Selects one of the analog inputs to the remote setpoint.
- **OutputL#** – Selects one of the control loop outputs to be the remote setpoint. This selection is most commonly made to implement cascade control. When this selection is made additional parameters are presented for blending and scaling.
- **SetPntL#** – Selects one of the control loop setpoints to be the remote setpoint. This selection would be used to have one loop track another loop.
- **CCLInpt#** – Selects one of two calculated inputs from the optional CLC program.

Note: *Part temperature, or cascade, control uses two control loops: one to control the part temperature (primary loop) and one to control the process temperature (secondary loop). Blended part temperature control, on the other hand, blends a portion of the part temperature setpoint with the process temperature setpoint. Blended control is typically used to maintain precise control with setpoint ramping.*

Auto/Man – Selects how the control loop is switched between automatic (closed loop) and manual (open loop). Selections include:

Operator	**OperAM_#**
Contact Inputs	**RemCI_##**
	LocCI#_#
Logic	**OR_Set##**
	NORSet##
	ANDSet##
	NANDSet#
	CLC_IN_#

M_OutSrc – Selects the source for the control loop manual output adjustment.

- **Operator** – The control loop manual output is adjusted from the operator interface panel.
- **Remote** – The control loop manual output is adjusted from one of two sources, an analog input (**AnIgIn##**) or a control loop output (**OutputL#**).

AlarmAct – Selects the open sensor alarm action.

- **DefltVal** – Sets the control loop output default value that will be used when an open sensor (thermocouple break) is detected. A setting of 0.00 is most common.

Retrnsmt – Selects a process variable, setpoint, or profile to be retransmitted by an analog output. Refer to Analog Output Setup, in this section, for additional configuration information.

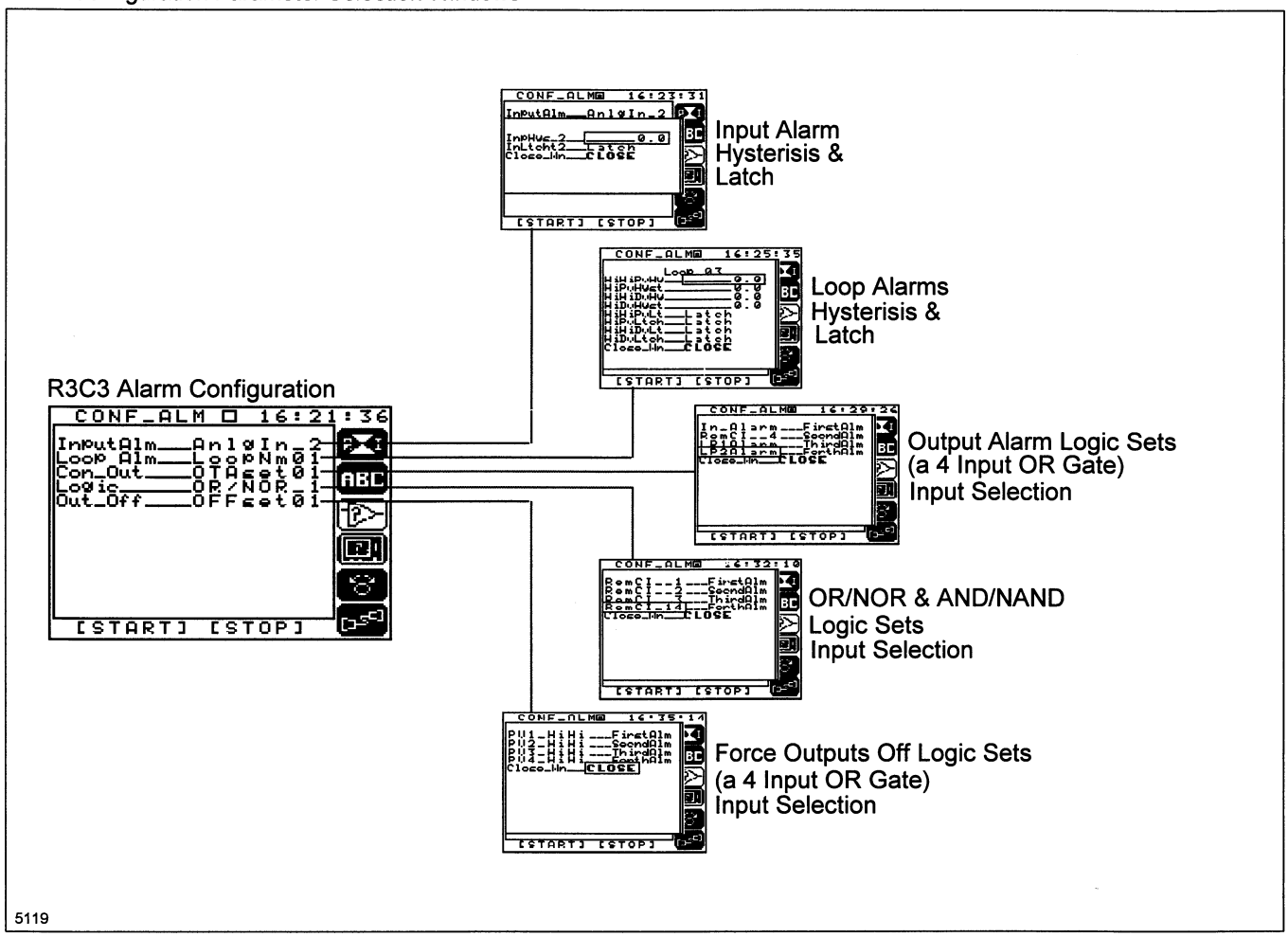
Alarm and Logic Configuration

Refer to Fig. 4–17. The Alarm Configuration screen is used to enter or modify alarm parameters and alarm management strategies. Some of the selections made on this screen open windows for parameter configuration selections. Configure Dimension II alarms as follows:

1. Use the diamond key to move to the Alarm Configuration screen shown in Fig. 4–17.
2. Use the knob to select the **InputAlm** field.
3. Select the tag name of the analog input for which you wish to configure alarm parameters. (Tag names may be changed as described in Glossary (tag names) Configuration in this section.)
4. The system will display the Input Alarm Hysteresis/Latch Window shown in Fig. 4–17.
5. Enter the desired input hysteresis value, **InptHys_#**, and select **Latch** or **Unlatch** for the selected input alarm.
6. Close the window and select the **LOOP ALARM** field.
7. Select a loop number. The system will display the Loop Alarm Hysteresis/Latch Window shown in Fig. 4–17.
8. Enter hysteresis values and latch/unlatch characteristics for the selected loop in the Loop Alarm Hysteresis/Latch Window.
9. When done, close the window.

Note: *A user-entered help message can be displayed when the Help key is pressed with an alarm for a specific loop displayed on the Alarm Status screen. Refer to Alarm Status Screen Help Message Entry in the Operator Interface display configuration section for message entry instructions.*

Fig. 4–17.
Alarm Configuration Parameter Selection Windows



Alarms and contact inputs can be used as inputs to logic boxes to produce logical combinations. The combined logical output from these boxes can be used to energize relay outputs, operate controller/programmer functions and turn control outputs off.

Several types of logic boxes are available. The definition and use of the different types are:

Con_Out – Contact output assignment (**OutSet##**) selections. Allows four alarm conditions and/or contact inputs to be logically "OR'd" together to energize a contact relay output.

Logic – Internal logic (**OR/NOR-#**, **AND/NAND#**) selections. Allows four alarm conditions and/or contact inputs to be logically combined (OR/NOR/AND/NAND) to operate an internal logic point.

Out_Off – Control outputs off assignment (**OFFSet##**) selections. Allows four alarm conditions and/or contact inputs to be logically "OR'd" together to force all control outputs of the loop number specified by **##** to off.

To configure the inputs of the logic boxes, select the desired type and open the window to enter your input selections as illustrated in Fig. 4–17.

Output Configuration

Each Analog I/O Module has four analog outputs. Each analog output may be configured for milliamp or voltage, and also may be used in a time-proportioning mode to drive external relays. Two low level digital outputs may be available on each I/O card. And, the expansion remote Contact I/O Modules provide up to eight contact outputs. The digital and contact outputs may be configured as event, logic or time proportioned output points.

The output configuration screen will automatically update the selections that are available based on the options you purchased with your Dimension II system.

Configure available analog and contact outputs as follows:

1. Use the diamond key to move to the Output Configuration (**CONF_OUT**) screen.
2. Use the knob to select the **CARD_SEL** field.
3. Select the name of the output card type you want to configure (see Fig. 4–18). The available selections are:

   AnlgCrd# – This selects the four analog outputs of Analog I/O card 1-3 for configuration.
   LocCo#_# – This selects the two digital outputs of Analog I/O card # for configuration. (Available ony if digital I/O ordered and not the high speed communications expansion port.)
   RmCOBrd# – This selects the eight contact outputs of Remote Contact I/O card # (Model 8781) for configuration.
4. The system will display an output type assignment window.
5. Use the knob to select and enter the assignment desired for each output listed in the window. The selections for analog outputs are shown in table 4–2. The selections for time proportioned and contact outputs are shown in table 4–3.
6. Repeat this process for all analog, time-proportioned, and contact outputs, selecting each I/O card and point as described in tables 4–2 and 4–3.

Table 4–2. Analog Output Selections

DevOutL#	Deviation of control loop #
RevOutL#	Reverse acting output of control loop #
DirOutL#	Direct acting output of control loop #
SPxmitL#	Setpoint retransmit of control loop #
Retrans#	Retransmit setup #
Event_##	Event ## when high, output is full on
OutSet##	Logic set ## when true, output is full on

Fig. 4–18.
Output Configuration Parameter Selection Windows

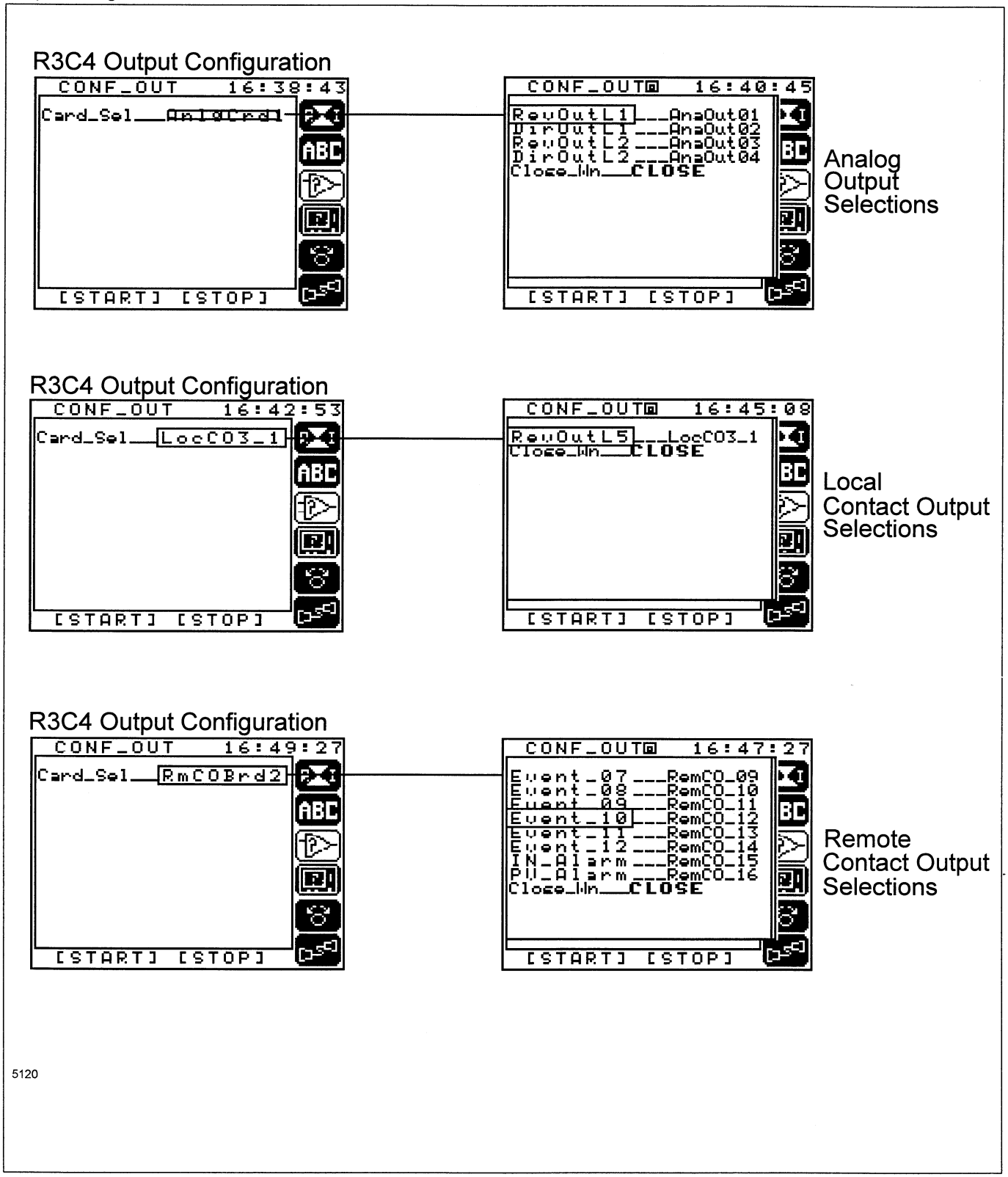


Table 4–3. Contact Output Selections

DevOutL#	Deviation of control loop #
RevOutL#	Reverse acting output of control loop #
DirOutL#	Direct acting output of control loop #
SPxmitL#	Setpoint retransmit of control loop #
Retrans#	Retransmit # (1–4)
Glob_Alm	Global alarm (any alarm)
IN_Alarm	Any input alarm
PV_Alarm	Any Process variable alarm
DV_Alarm	Any deviation alarm
LP#Alarm	Any alarm of control loop #
OutSet##	Output assignment logic setup ## (1–4)
Event_##	Programmed event ## (1–12)
OperAM_#	Operator Auto/Manual for control loop #
OperRH_#	Operator Run/Hold for programmer #
PrgEnd_#	Program end for programmer #
RemCI__#	Remote contact input (1–16)
CLC_Out#	CLC (optional) calculated output (1–2)

Operation Display Configuration Screens

In addition to terminology (glossary) changes, Dimension II Operation displays can be "custom-built" to present process information in the best format possible to suit specific application requirements. The Display Configuration screens described in the following paragraphs are used to select the number, format, and contents of these Operation display types:

- OVERVIEW DISPLAYS
- PROGRAMMER DISPLAYS
- LOOP DISPLAYS
- LOGIC DISPLAYS
- ALARM STATUS DISPLAYS

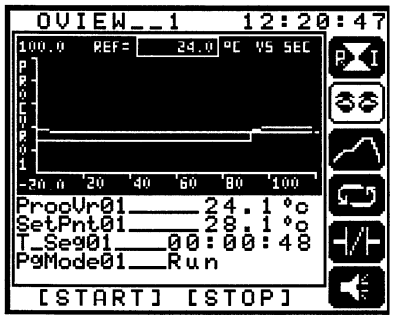
Overview Display Configuration

The Overview Display Configuration screen and several support windows are used to select display formats and configure display characteristics to Dimension II Overview displays. Up to eight Overview displays and optionally, two additional CLC displays, may be selected and configured.

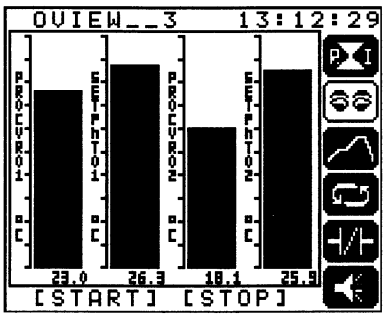
The display formats available are shown in Fig. 4–19.

Fig. 4–19.
Display Formats for Overview Display Configuration Screens.

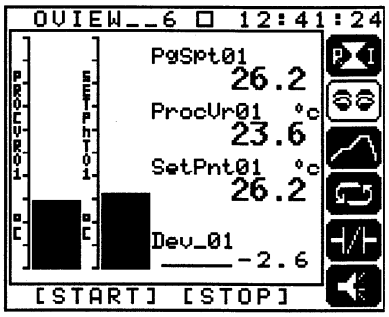
XY CHART – Two parameters may be charted versus time and four parameters may be displayed as text.



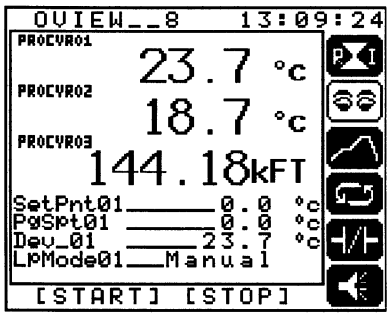
VER_BAR4 – Four parameters may be displayed in bar graph format.



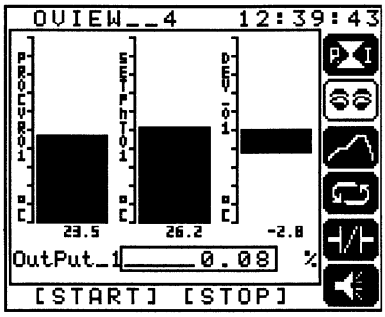
VER_BAR2 – Two parameters may be displayed as vertical bar graphs.



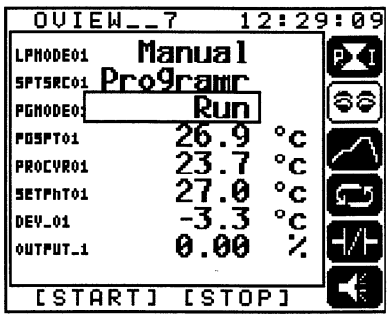
TEXT_3X – Three parameters may be displayed in 3X text format and four parameters may be displayed as text.



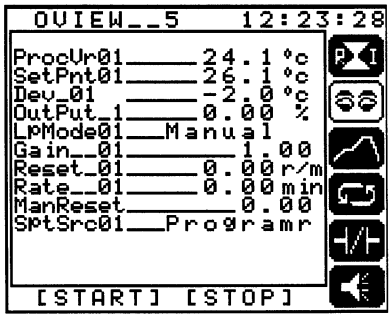
VER_BAR3 – Three parameters may be displayed in bar graph format. One parameter may be displayed as text.



TEXT_2X – Eight parameters may be displayed in 2X text format.



TEXT – 12 parameters may be displayed in text format.



HOR_BAR – Two parameters are displayed in a horizontal bar format and five parameters may be displayed as text.

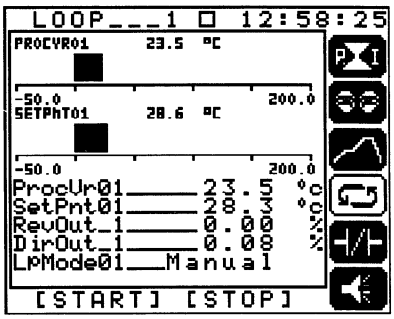


Table 4–4 gives a listing of all parameters that may be selected and displayed in the formats shown in Fig. 4–19. The ProcVr, SetPnt, Pg#Spt, Dev, DirOut, RevOut and Output can be selected for trending and graphing.

Table 4–4. Selectable Parameters for Format Displays

R/W Parameter	Description
ProcVr##	Process Variable of loop ##
SetPnt##	Setpoint of loop ##
Pg#Spt##	Programmed Setpoint from programmer ##
Dev_##	Deviation of loop ##
DirOut_#	Direct Acting Control Output of loop #
RevOut_#	Reverse Acting Control Output of loop #
Output_#	Control Output of loop #
LpMode##	Loop Mode of loop ##
PgMode##	Programmer Mode of programmer ##
CycCnt##	Cycle Count of programmer ##
CurSeg##	Current Segment of programmer ##
RmStSeg##	Remote Start Segment of programmer ##
T_Seg##	Time Left in Segment of programmer ##
T_Into##	Time Into program for programmer ##
T_Left##	Time Left in program for programmer ##
Ratio_##	Cascade Ratio factor for loop ##
Blend_##	Cascade Blend factor for loop ##
Scale_##	Cascade Scale factor for loop ##
SpBias##	Setpoint Bias for loop ##
Gain_##	PID Gain for loop ##
Reset_##	PID Reset for loop ##
Rate__##	PID Rate for loop ##
SptSrc##	Setpoint Source for loop ##
ManReset	Manual Reset
BasVar_#	CLC (optional) Basic Variable #
BasSta##	CLC (optional) Basic Variable Status #

Build Dimension II Overview displays as follows:

1. Use the diamond key to move to the Overview Display Configuration screen shown in Fig. 4–20.
2. Use the knob to select the **TOTALOVR** field.
3. Select the desired number of overview displays to configure and use for operation.
4. Use the knob to select the **OVSCREEN** field.
5. Select the desired overview display title number (1–8) to configure.
6. Use the knob to select the **FORMAT** field.
7. Select the screen format from the available choices: Horizontal Bar, X-Y Chart, Vertical Bar (2-, 3-, or 4-bar), Text (1X, 2X, 3X).

   When the format is selected, and the system will display a configuration window for the selected format.

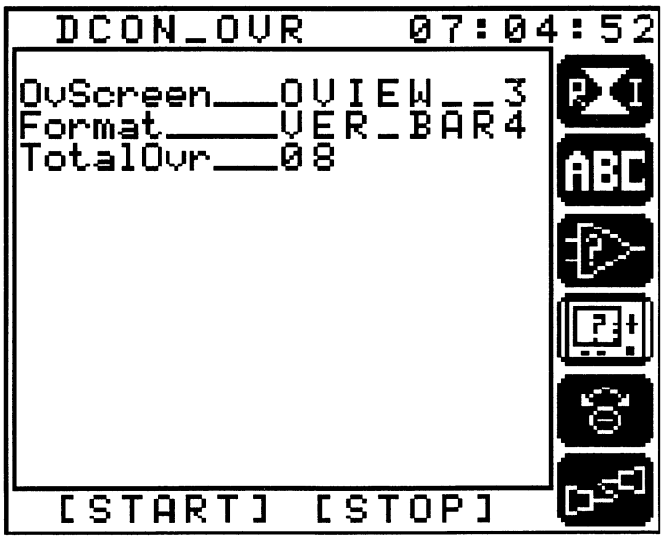


Fig. 4–20.
Overview Display Configuration Screen

8. In the window, select the parameters to be displayed on the Overview display as prompted. Parameters include variables to be displayed, high and low PV limits, time base, sample rate, and up to four line definitions (displayed text from table 4–4).

The new configuration is now loaded in memory, and should be saved onto a memory card.

Programmer Display Configuration

The Programmer Display Configuration screen is used to select display characteristics for programmer profile graphic displays. These settings are the defaults that scale the profile graphic displays. The settings can be modified on the profile graphic display when it is selected.

Set graphic display characteristics as follows:

1. Use the diamond key to move to the Programmer Display Configuration screen shown in Fig. 4–21.
2. Use the knob to select the **PROGMRNM** field.
3. Select the number of the display you wish to configure.
4. Use the knob to select the **HI_LIMIT** field.
5. Select the desired upper limit for programmer profile displays.

Note: *On the vertical scale, the limits selected are the real values of the setpoint.*

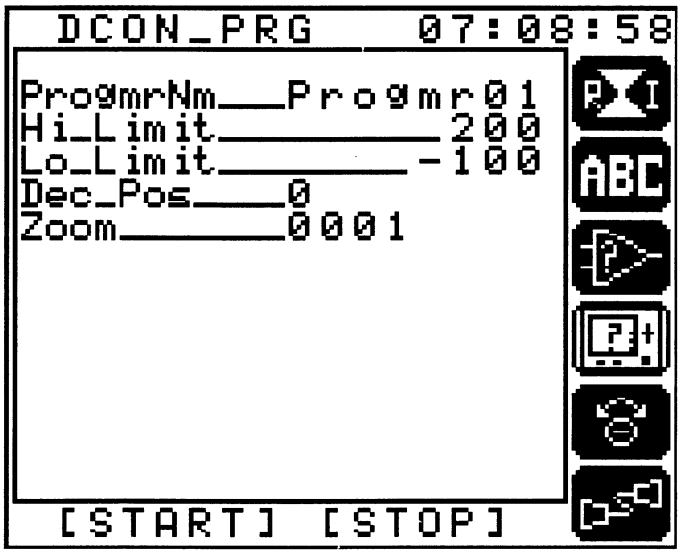


Fig. 4–21.
Program Display Configuration Screen

6. Using the same method, select the **LO_LIMIT** (lower limit) and decimal position for programmer profile displays.
7. Use the knob to select the **ZOOM** field.
8. Select the desired horizontal time axis (zoom factor).

Note: *For the zoom factor, the information needed is the amount of time, in seconds/pixel, that the horizontal axis represents (range = 1–3600). The length should be chosen such that the longest segment can be displayed in at least 100 pixels.*

The new configuration is now loaded in memory, and can be saved onto a memory card.

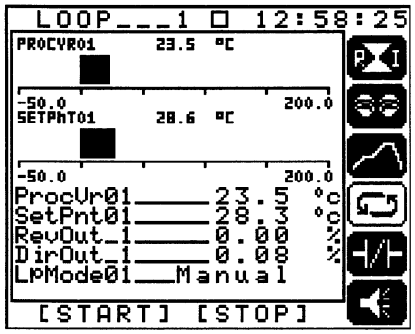
Loop Display Configuration

The Loop Display Configuration screen and several support windows are used to assign display characteristics to Dimension II Loop displays.

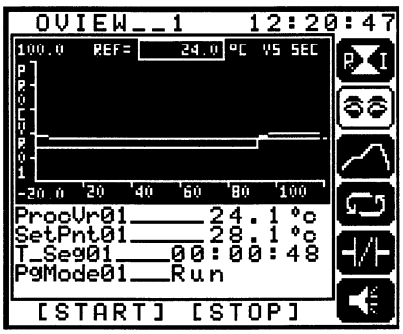
As shown in Fig. 4–22, there are three display formats available for control loop displays. In any of the display formats shown in Fig. 4–22, the parameters listed in table 4–4 may be selected.

Fig. 4–22.
Available Display Formats for Control Loop Screen

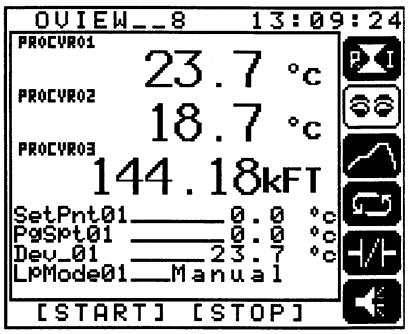
HOR_BAR – Two parameters are displayed in a horizontal bar format and five parameters may be displayed as text.



XY CHART – Two parameters are charted versus time and four parameters may be displayed as text.



TEXT_3X – Three parameters may be displayed in 3X text format and four parameters may be displayed as text.



Build Dimension II Loop displays as follows:

1. Use the diamond key to move to the Loop Display Configuration screen shown in Fig. 4–23.
2. Use the knob to select the **LOOP_SCR** field.
3. Select the desired loop display title/number.
4. If you wish to change the display configuration, use the knob to select the **FORMAT** field.
5. Select your format choice from the list of available formats: Horizontal Bar, X-Y Chart, Text 3X. The system will display a configuration window for the selected format.
6. In the window, select parameters that will be displayed on the new Loop display as prompted. Parameters (refer to table 4–4) include graphic representations of specific values and displayed text.

The new configuration is now loaded in memory, and can be saved onto a memory card.

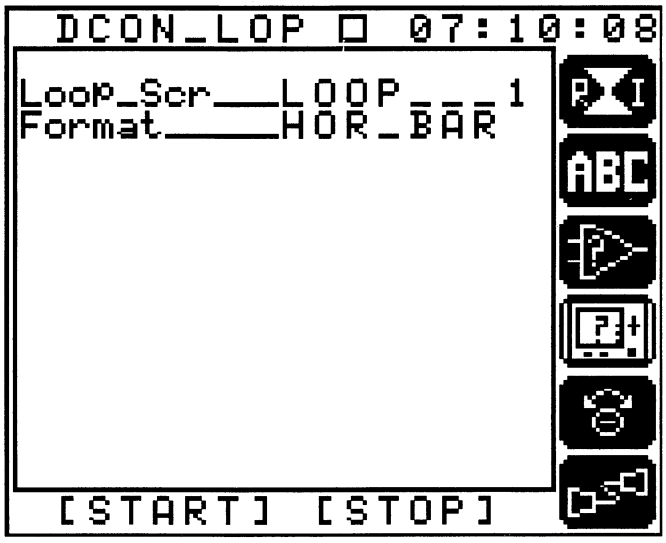


Fig. 4–23.
Loop Display
Configuration Screen

Logic Display Configuration

The Logic Display Configuration screen and several support windows are used to select events and logic points that will be displayed on Dimension II Logic displays. Two screens are provided with the factory default configuration. Up to three screens may be selected and configured.

Build Dimension II Logic displays as follows:

1. Use the diamond key to move to the Logic Display Configuration screen shown in Fig. 4–24.
2. Use the knob to select the **NUMLGSCR** field.
3. Select the desired number of logic displays (1–3).

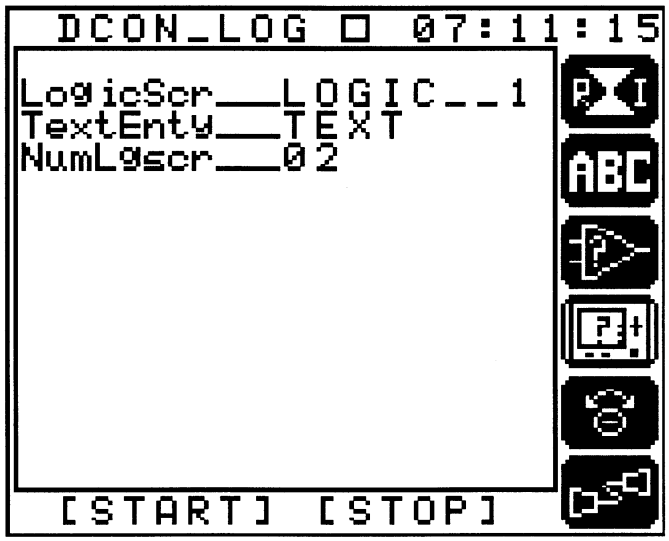


Fig. 4–24.
Logic Display Configuration Screen

4. Use the knob to select the **LOGICSCR** field.
5. Select the desired logic display title/number.
6. Use the knob to select the **TEXTENTY** field.
7. Press **ENTER** twice. The system will display a window from which you can select up to 12 lines of text that will display selected events and/or logic points.
8. Select the event or logic point that will be displayed on each text line.
9. After each selection, select the set of terms that best describes the on/off state of the event or point, e.g. ON/OFF, START/STOP, ENABLE/DISABLE. (These terms are listed, and can be redefined, on the GLOS_IO screen.)

The new configuration is now loaded in memory, and can be saved onto a memory card.

Alarm Status Screen Help Message Configuration

The Alarm Help Message Entry screen is used to enter help messages that will be displayed for specific alarms when the Help key is pressed at the Alarm Status screen.

Enter Alarm Status screen help messages as follows:

1. Use the diamond key to move to the Alarm Help Message Entry screen shown in Fig. 4–25.
2. Use the knob to select the **ALM_MESS** field.
3. Select the loop name/number for which you wish to enter a help message.
4. The system will display a window in which you can enter a help message up to 95 characters in length.
5. When you are finished entering your message, move the selector box to the last field ("C") and press **ENTER**.

The message is now entered into memory, and will be displayed when the help key is pressed with an alarm for this loop displayed on the Alarm Status screen. Repeat this procedure to enter help messages for other loops, and note that your new configuration can be saved onto a memory card.

Fig. 4–25.
Alarm Help Message Entry Screen

Input/Output Configuration and Calibration

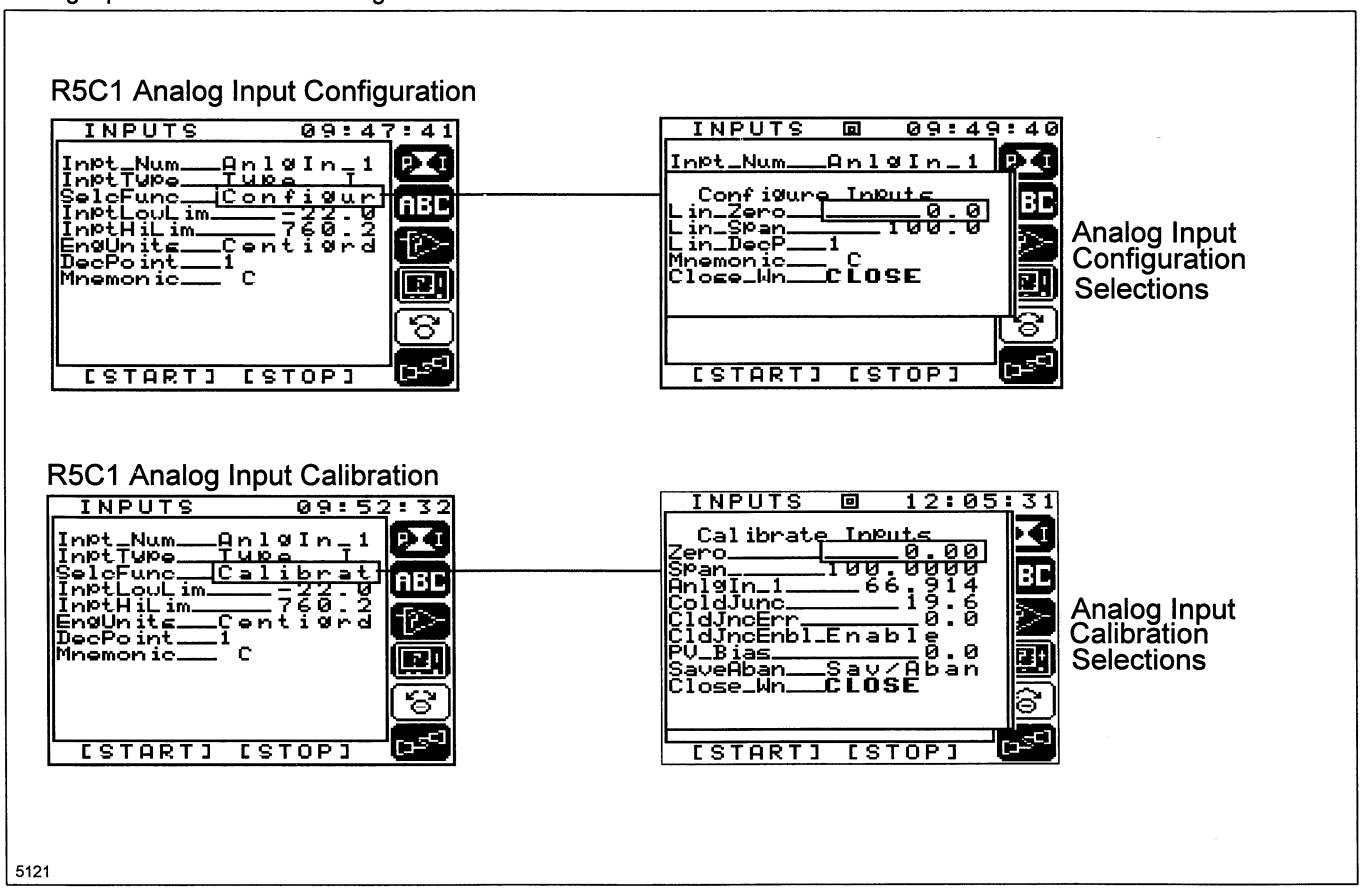
I/O setup screens are used to configure and calibrate Dimension Analog and Contact I/O Module inputs and outputs. Use these screens as described in the following paragraphs.

Analog Input Configuration and Calibration

Dimension analog input processing provides high accuracy for thermocouple, millivolt, voltage, milliamp, and RTD sensor types. Each Analog I/O Card provides up to six universal analog inputs, and up to three cards can be installed in a single control cage. Configure and calibrate analog inputs as follows:

1. Use the diamond key to move right, to the UNIT_CNF screen, down arrow to the Analog Input Configuration and Calibration icon. The system will display the Analog Input Setup screen shown in Fig. 4–26.
2. Rotate the knob to select the **INPUT NUMBER** field. Press knob to highlight that field. Rotate knob to select the input number or tag name you wish to configure. Press knob again to store that field.

Fig. 4–26.
Analog Input Calibration and Configuration



3. Tag names should be recorded on documentation forms as described in section 2, and may be changed as described in the Glossary (tag names) Configuration in this section.

4. The system will display the currently active parameters and characteristics for the analog input you selected. Modify the analog input parameters and characteristics as follows:

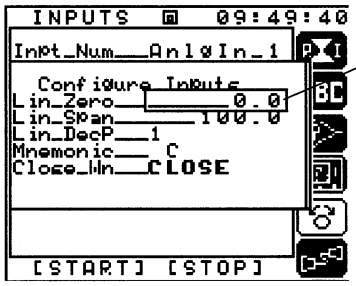
   INPTTYPE – Selects analog input type from a list of selections by pressing the knob to highlight the field and rotating the knob to the proper input type.

   (See Appendix D, table 1 of technical bulletins for descriptions of all selectable analog input types.)

   In addition to the thermocouple, RTD's and linear inputs, there are four range types labeled PG_CH_01, PG_CH_02, PG_CH_03, and PG_CH_04. These are used by the factory to calibrate the four independent programmable gain ranges for the analog inputs.

   SelcFunc – Selects the input Configuration Function or the input Calibration Function for the analog input designated by input number. Either selection opens a window.

   - **Configur** – The parameters in this window (see Fig. 4–26) affect linear input ranges only. Linear input ranges are 0–5 volts, 0–10 volts, 4–20 mA and 0–20 mA. The configuration window allows changing the linear input zero (Lin_Zero), the linear input span (Lin_Span), the linear input decimal point position (Lin_Decp) and the linear input engineering units mnemonic.



Lin_Zero sets the zero (low) point for the selected linear input. See table 4–5 for range of settings. See examples of possible settings on page 4-46.

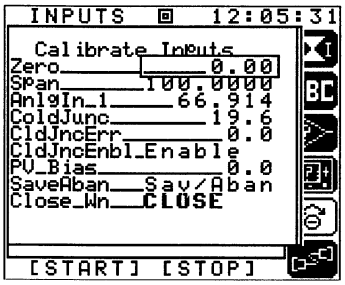
Lin_Span sets the span (high) point for the selected linear input. See table 4–5 for range of settings. See examples of possible settings on page 4-46.

Lin_Decp sets the placement of the decimal point for the selected linear input. See table 4–3 for the range of settings. See examples of possible settings on page 4-46.

Mnemonic selects 3 character engineering mnemonic tag for the selected linear input.

Table 4–5. The Maximum Range of Numbers that can be used for Linear Input Zero/Span and Decimal Point Placement

Dec Point	Zero	Span
0	–32767.	32767.
1	–3276.7	3276.7
2	–327.67	327.67
3	–32.767	32.767
4	–3.2767	3.2767
5	–0.32767	0.32767



- **Calibrate** – The Calibrate window (see Fig. 4–26) allows the user to set up the hardware associated with the inputs to match some external voltage source. It changes the offset (Zero) and gain (Span) of the hardware front end via software. There are two approaches to analog input calibration.

  Approach One: Adjust the **PV_Bias** setting to match with other equipment, such as a chart recorder. This is the most common calibration adjustment. No external equipment (voltage source or meter) is needed.

  Approach Two: Adjust the **Zero**, **Span** and **ColdJunc** settings to calibrate a specific type of input range. This will calibrate an input to a specific sensor (i.e. Type J thermocouple). To proceed with recalibration a precision voltage, millivoltage, current or decade resistance source is needed, depending on the type of input to be calibrated.

  A. Connect the calibration source to the analog input terminals to be calibrated. See section 2, Fig. 2–5a.
  B. Set **CldJncEnbl** to Disable. This will disable cold junction compensation with thermocouple ranges allowing for recalibration without concern for the cold junction millivoltage offset.
  C. Set the calibration source to a signal simulating the low end of the input range. Adjust the **Zero** setting on the Dimension.
  D. Set the calibration source to a signal simulating the high end of the input range. Adjust the **Span** setting on the Dimension.
  E. Set **ColdJncEnbl** to Enable.
  F. Measure the cold junction temperature at the analog input connector and adjust the **CldJncErr** setting until the **ColdJunc** reading matches the measured temperature.

  The Zero and Span parameters in the Calibrate window are NOT the same as the Lin_Span and Lin_Zero parameters in the Configure window.

  Zero sets the calibration for the low end of the input range.

  Span sets the calibration for the high end of the input range.

  AnlgIn## displays the actual input level of the selected input.

  ColdJunc is the cold junction temperature in °C. This parameter always reads in °C even if the thermocouple is set up to read in Fahrenheit. It measures the temperature at the connector where the thermocouple wires and connector pins make contact. This junction then is compensated for in the temperature calculation.

  CldJncErr is the Cold Junction Error parameter in °C. This is added to the ColdJunc temperature in order to compensate for error in the cold junction sensor. This parameter is adjusted (plus or minus) until the **ColdJunc** temperature reading is equal to the reading given by an external temperature measuring device that is attached to input connector P4.

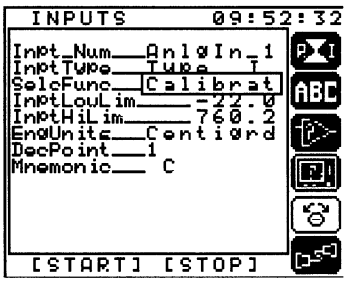
CldJncEnbl is used to enable or disable the Cold Junction function. This parameter is active only when a thermocouple is the selected input type. When it is set to **Enable**, the temperature reading from the thermocouple (ProcVr0X) is compensated by the cold junction temperature. When it is set to **Disable** the **ProcVr0X** is not compensated by the cold junction temperature. The Disable mode is used to check the accuracy of linearization tables.

PV_Bias sets the process variable bias. This value biases the entire input range. If a bias value of 1.0 is entered the process variable is increased by 1.0.

Save/Aban allows saving or abandoning the calibration parameter values. This allows a user to change the calibration and observe the result without permanently changing the parameters. Newly entered values that are not saved will be lost when the unit is powered down.

Close_WN – Closes Calibrate screen and back to Input screen.

InptLowLim – This parameter defaults to the lower limit of the input type selected. For T/Cs and RTDs this is the full usable range of the sensor. Changing this parameter limits the low (zero) value that can be entered as a setpoint. This parameter is used by the PID control algorithm together with the InptHiLim parameter to establish the range of the input to be controlled. See examples of possible setting on page 4-42.



InptHiLim – This parameter defaults to the higher limit of the input type selected. For T/Cs and RTDs this is the full usable range of the sensor. Changing this parameter limits the high (span) value that can be entered as a setpoint. This parameter is used by the PID control algorithm together with the InptLowLim parameter to establish the range of the input to be controlled. See examples of possible settings on page 4-42.

EngUnits – When an RTD or thermocouple is selected under the InptType field, this parameter allows a selection between °F and °C. If a linear input type has been selected this will always show Linear and cannot be changed.

DecPoint – Displays the number of positions to the left of the decimal point. When a linear range is selected (i.e. 0–10, 0–5, 0–20, 4–20) the decimal point defaults to 2, and can be changed under the Configur window. When a thermocouple or RTD range is selected the decimal point normally defaults to 1 (except for thermocouples B, G and D these default to 0). The decimal position can NOT be changed for RTDs or T/Cs.

Mnemonic – This parameter will read either 'F' or 'C' for all thermocouples and RTDs depending on the status of the EngUnits field. If a linear input type is selected, the three character field mnemonic can be user configurable to reflect the units required (e.g. RPM or PSI, etc.).

!! IMPORTANT NOTE !!

The current Dimension software is NOT a full floating point system. All numbers (including programmer profiles) are stored internally as 16 bit integers. A decimal point is added for parameter entry and display. It requires (as can be seen in the input and output configuration screens) a "decimal position" parameter. It effects PVs, SPs and Profiles, and analog outputs (when output is used as a retransmit).

Note the following:

1. Programmer profiles will have the same number of decimal points as the corresponding PV. e.g.:

   PV 1 = XXX.X – Profile 1 = XXX.X (e.g. Thermocouple) (1 dp)
   PV 2 = XX.XX – Profile 2 = XX.XX (e.g. linear) (2 dp)
   PV 3 = XXXX – Profile 3 = XXXX (e.g. linear (0 dp)
   PV 4 = X.XXX – Profile 4 = X.XXX (e.g. linear) (3 dp).

   Example: If we enter the PROG build screen under Programmer 1 we can enter a setpoint profile value of **50.0** degrees. If we move to PROG build screen under Programmer 2 and look at the Profile value we just entered under Programmer 1 we will see: **5.00**.

   This occurs because the profile value always assumes the same number of decimal points as the PV. This can lead to strange things as noted above. It is wise then to build the profile with the programmer that will drive the setpoint with the right number of decimal points (i.e. use PROGRUN3 screen and window to build segment data that will drive loop 3). Another point: If the input range (i.e. decimal position) is changed, the profile values will also change. So if a setpoint program resides in memory with a profile value of **25.0** for PROGRUN1 screen, and the input range is changed to a decimal position of 2, the new profile value will appear as **2.50**.

Examples using Lin_Zero, Lin_Span, Lin_Decp, InptLowLim and InptHiLim are on page 4-46.

Example 1:

0 to 10 volts input to represent 0.00 to 100.00%

Lin_Zero = 0.00
Lin_Span = 100.00
Lin_DecP = 2
InptLowLim = 0.00
InptHiLim = 100.00

Setpoint entries limited to 0.00 to 100.00.

If the user wishes to limit his setpoints to 10% (1 volt) to 90% (9 volts):

Lin_Zero = 0.00
Lin_Span = 100.00
Lin_DecP = 2
InptLowLim = 10.00
InptHiLim = 90.00

Setpoint entries limited to 10.00 to 90.00.

Example 2:

0 to 10 volts to represent –100.0 to 900.00°C:

Lin_Zero = –100.0
Lin_Span = 900.00
Lin_DecP = 1
InptLowLim = –100.0 (will automatically default when Span/Zero/Dp are changed)
InptHiLim = 900.00

Setpoint entries limited to –100.0 to 900.00.

If the user wishes to limit his setpoints to 0 degrees (1 volt in) and 400 degrees (5 volts in):

Lin_Zero = –100.0
Lin_Span = 900.00
Lin_DecP = 1
InptLowLim = 0.0
InptHiLim = 400.00

Setpoint entries limited to 0.0 to 400.00.

Example 3:

Negative slopes ARE allowed: 0 to 10 volts represents 1000 to 0 rpm respectively:

Lin_Zero = 1000
Lin_Span = 0
Lin_DecP = 0
InptLowLim = 0 (Will automatically default when Span/Zero/Dp are changed)
InptHiLim = 1000

If the user wishes to limit his setpoints to 100 rpm (9 volts in) and 900 rpm (1 volt in):

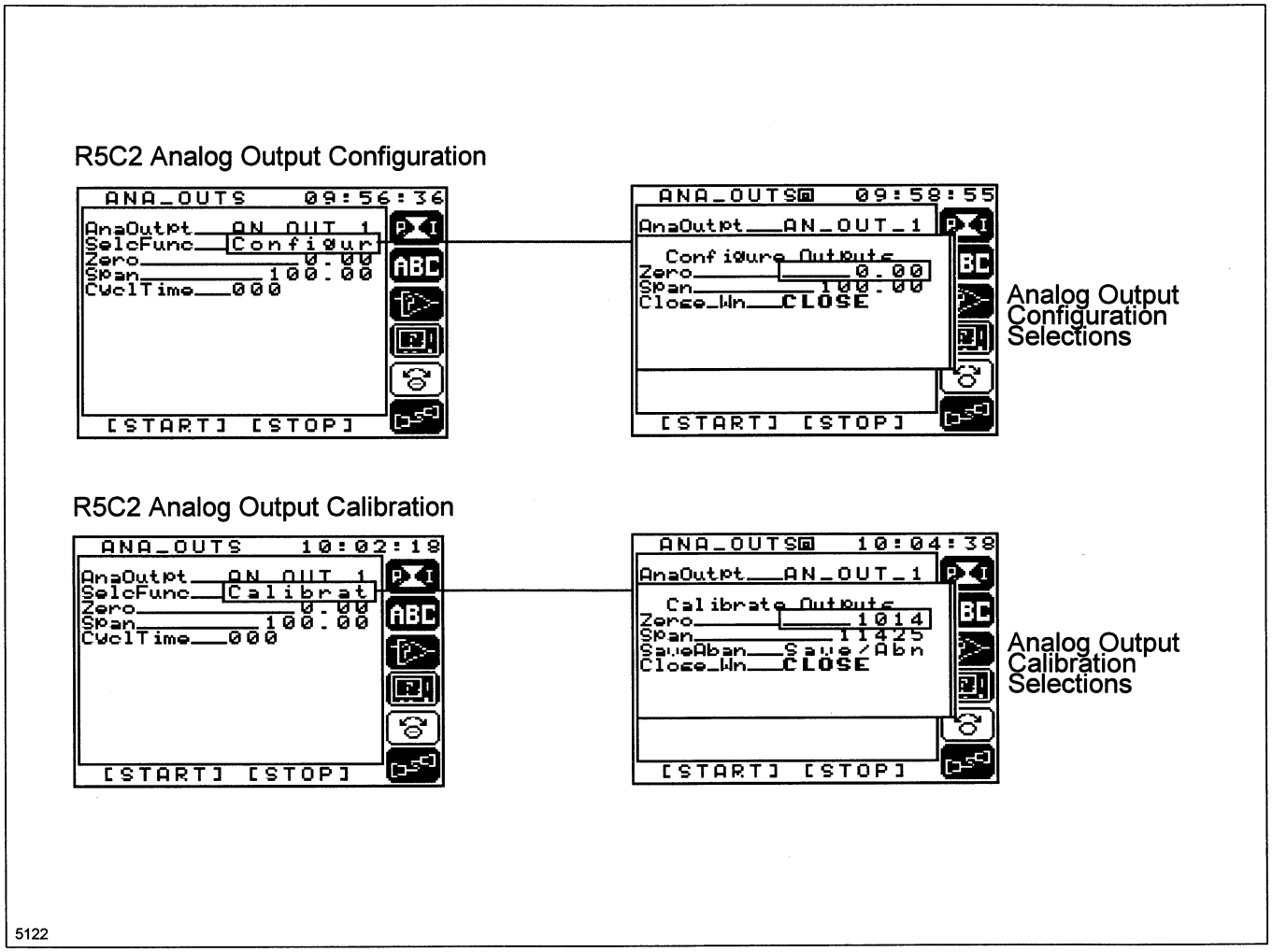
Lin_Zero = 1000
Lin_Span = 0
Lin_DecP = 0
InptLowLim = 100
InptHiLim = 900

Setpoint entries limited to 100 to 900 rpm.

Analog and Contact Output Calibration

1. Use the diamond key to move to the Analog Output Setup screen shown in Fig. 4–27.
2. Rotate the knob to select the **ANAOUTPT** field.
3. Press the knob to highlight, rotate knob to select the tag name of the analog output you wish to configure.

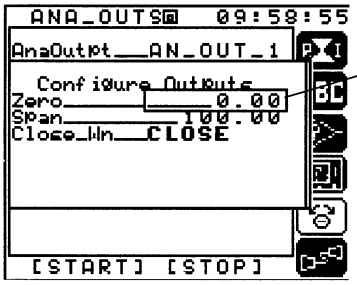
Fig. 4–27.
Analog Output Calibration and Configuration



4. The system will display the currently active parameters and characteristics for the analog output you selected. Modify analog output parameters and characteristics as follows:

SelcFunc – Selects the analog output configuration function or the analog output calibration function. Each function opens a window.

- **Configur** – Opens a window to allow setting the output zero and span values. Each 0–5V or 0–20 mA analog output configuration defaults to:



Zero = 0.00
Span = 100.00

For 4–20 mA output the configuration defaults to:

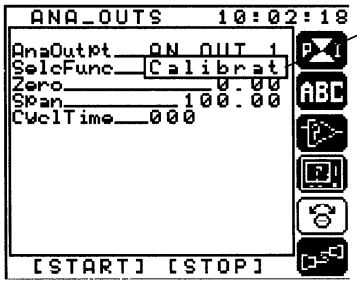
Zero = –25.00
Span = 100.00

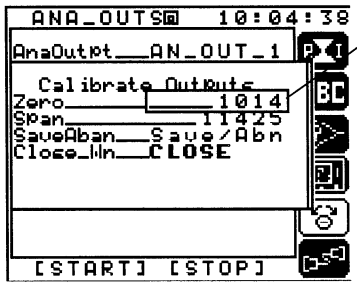
Example:
A 4 to 20 mA output
An output of 0.00 gives 4 mA out
An output of 100.00 gives 20 mA out

Slopes CAN be negative (inverted):
Zero = 100.00
Span = 0.00

An output of 0.00 gives 20 mA out
An output of 100.00 gives 4 mA out

Also see the example on page 4-52 for configuration staged outputs. Change **SelcFunc** to Calibrate. See Fig. 4–27.





- **Calibrat** – Opens a window to allow setting the zero and span calibration points (see Fig. 4–27). These points are different from the zero and span in the configure window. The calibration zero and span values calibrate the output to provide the correct voltage or current out. To calibrate, connect a volt meter to the appropriate terminals and adjust the span and zero values. When complete, save your calibration settings by selecting save. If you wish to revert to the original settings select abandon.
- **Close_WN** – Close.
- **Zero** – Displays the zero value setup in the configuration window.
- **Span** – Displays the span value setup in the configuration window.
- **CyclTime** – Selects the cycle time in seconds. If the cycle time is set to 0 this output will function as a analog proportional output. If the cycle time is set to any value greater than 0 this output will function as a time proportioning output. See section 2 for information on setting jumpers for time proportioning relay drive.

Note on Decimal position of analog outputs.
The analog outputs normally have 2 decimal points when used in a control loop. The span/zero under the ANA_OUTS Configur window will also have 2 decimal points. The input decimal positions have no effect on outputs when used as the control loop output. But when retransmitting a SP, PV, Profile, or Calc_X the output decimal position (and output Span/Zero) will follow the decimal position of the value being retransmitted.

Example:

PV 1 is a linear input with 3 decimal points. Analog output 1 is set to retransmit this input, the analog output value (and Span/Zero values under the ANA_OUTS screen, Configur window) will also have 3 decimal points.

Note: *When setting up a retransmit, the ANA_OUTS configured Span/Zero settings should match the PV input InptLowLim and InptHiLim settings respectively.*

Example:

Retransmit an analog input with a range of 900–1500°F to a 4–20 mA analog output.

Zero = [(1500–900)/1500] x 100 = 40.00
Span = 100.00

CAUTION!

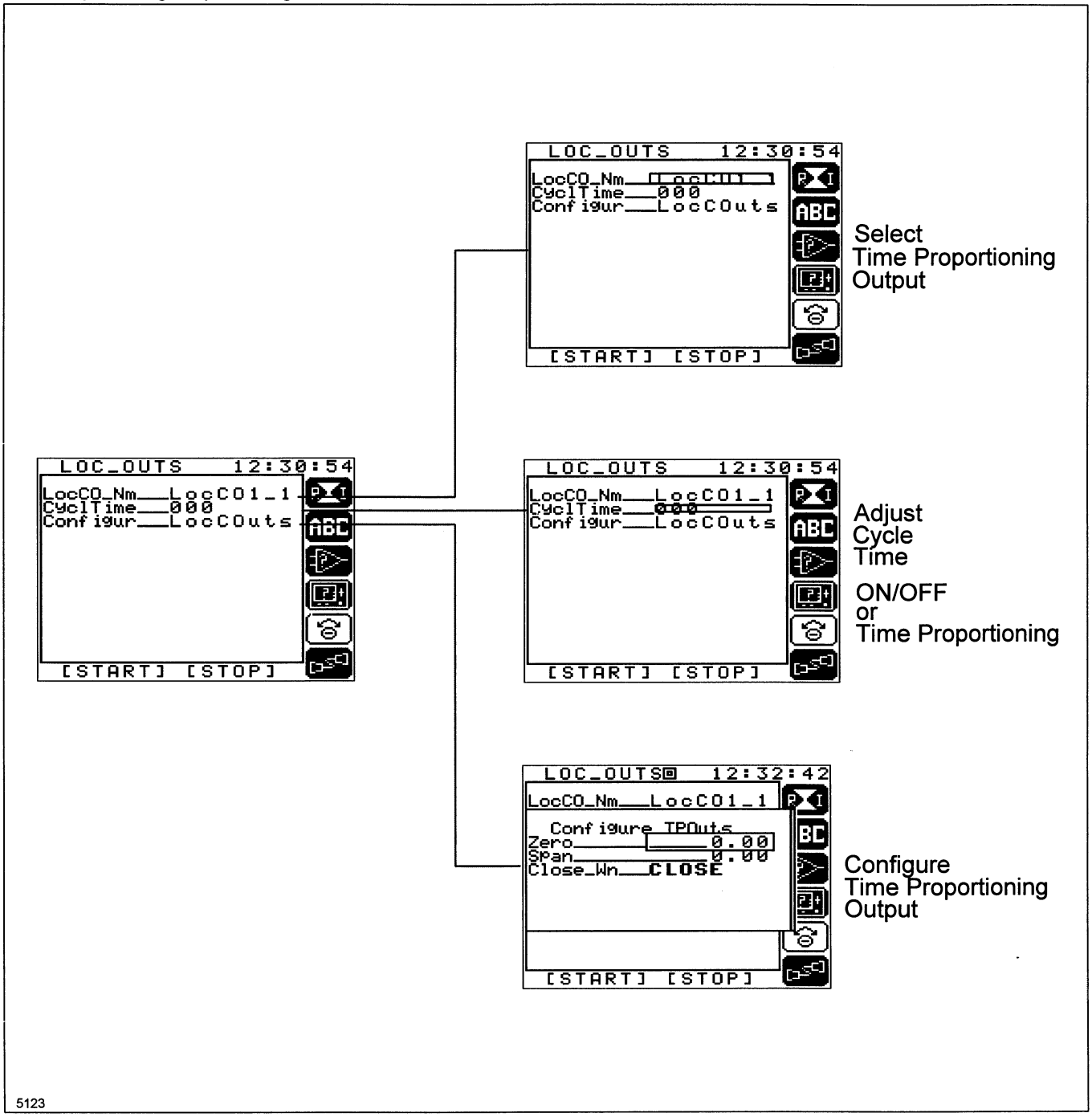
The input types and retransmit configuration should be set up BEFORE the output configured span and zero are set to match the input hi and low limits, since the decimal position of the analog outputs does not change until the Retransmit parameter is set under the CONF_LOP screen and the parameter to be retransmitted is set under the CONF_OUT screen.

5. Use the diamond key to move to the LOC_OUTS (local contact outputs) (see Fig. 4–28). Use the knob to select the **LocCO_Nm** field. Select the number of the local output you wish to configure. Modify local contact output parameters and characteristics as follows:

   CyclTime – Sets the cycle time in seconds. If the cycle time is set to 0 this output will function as a on/off output. If the cycle time is set to any value greater than 0 this output will function as a time proportioning output.

   Configur – Opens a window to select the zero and span values for this local contact output (see Fig. 4–28).

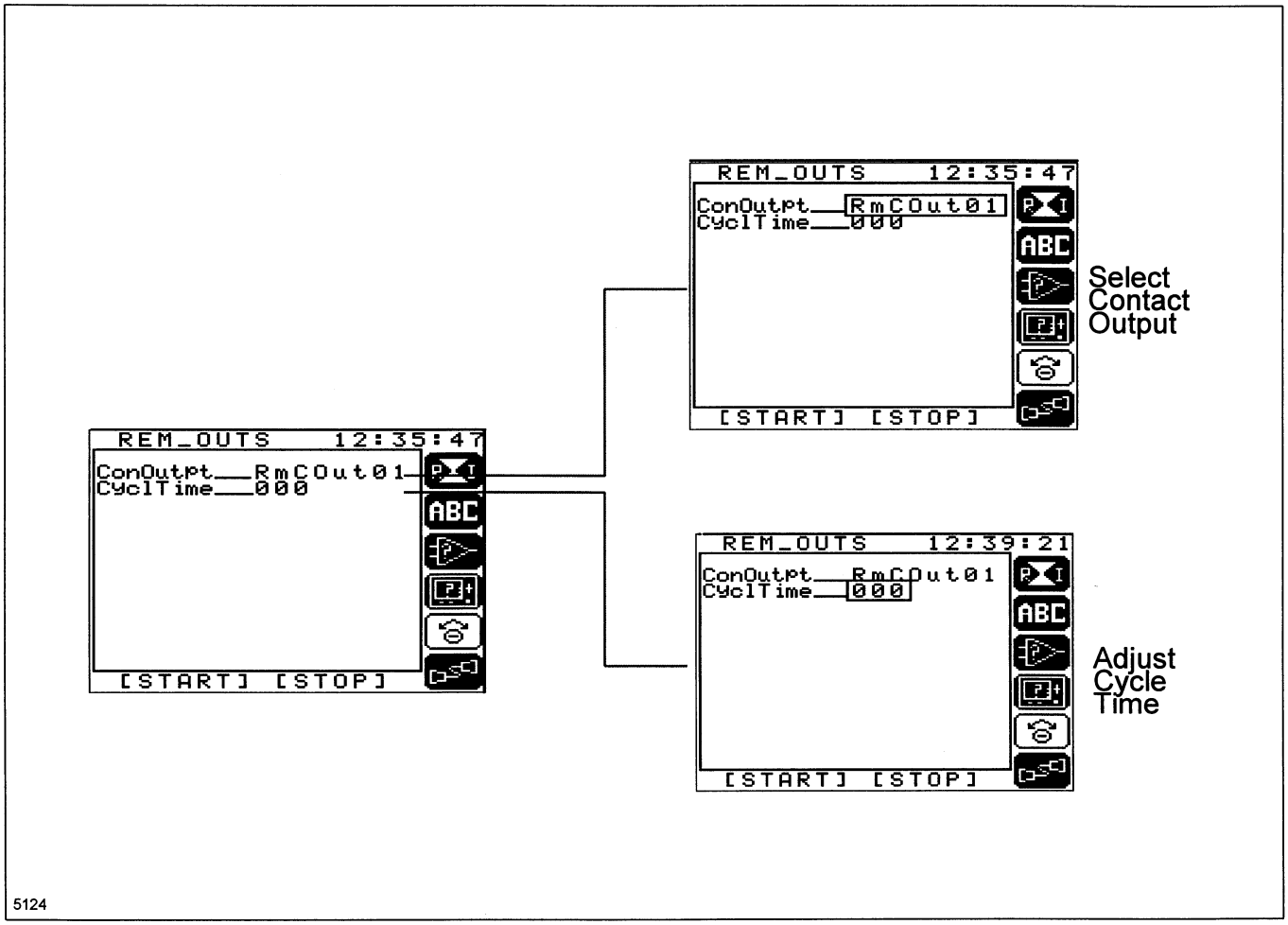
Fig. 4–28.
Time Proportioning Output Configuration



6. Use the diamond key to move to REM_OUTS (contact outputs) (see Fig. 4–29). Use the knob to select the **ConOutpt** field. Select the tag name of the contact output you wish to configure. Modify contact outputs as follows:

   CyclTime – Sets the cycle time in seconds. If you wish to use a contact output as a time proportioned control output select a cycle time greater than 0.

Fig. 4–29.
Contact Output Configuration



Example of Output Staging

Analog outputs (and TP outputs on the analog card) can be used for output "staging":

0 to 25% control loop output corresponds to 0 to 5 volts on output 1
25 to 50% control loop to 0 to 5 volts on output 2
50 to 75% control loop to 0 to 5 volts on output 3
75 to 100% control loop to 0 to 5 volts on output 4

to configure:

	Zero	**Span**
Output1	0.00	25.00
Output2	25.00	50.00
Output3	50.00	75.00
Output4	75.00	100.00

Span and Zero values can be negative also:

Zero = –100.00
Span = 100.00

For 0–5 volt output:

0.00% = 2.5 volts
100.00% = 5.0 volts
–100.00% = 0.0 volts

Note: *In Dimension II software, the process box configuration does NOT ALLOW –100.00 to +100.00 outputs (i.e. both direct and reverse outputs to one physical analog output) to be configured. Therefore, "split-range" outputs can NOT be done.*

Saving Unit Configuration Data

When you are finished configuring or modifying Dimension II configuration parameters, your new configuration data should be saved in a file on a memory card.

> **Important:** If the system is set up for a "warm start," all parameters and data residing in memory will be maintained by battery power (up to several years) after a power-down and the system will resume where it left off when powered up again. If the system is set up for a "cold start," however, all data residing in memory will be erased when line power is removed. Configuration parameters must be reconfigured or reloaded from memory cards.

Refer to Section 3, Using Memory Cards topic for the procedure to save your unit configuration.

Communications Configuration

The Dimension II can be configured for RS-232 (standard) or RS-422 (option) communication. See Appendix B for information on how to configure your unit for serial communications.

Notes

Section 5

Diagnostics and Troubleshooting

Section 5 Diagnostics and Troubleshooting

This section explains how to diagnose and correct Dimension II operation and communication problems. Descriptions of self-diagnostics, built-in help functions, error-advise messages, and a troubleshooting checklist are included.

CAUTION!

Dimension II maintenance and repair philosophy is based on unit replacement. Do not attemp to perform troubleshooting or repair procedures that are not described in this section.

If you need assistance from Dimension technical support personnel, call:

Dimension II Technical Support
Research, Inc., Minneapolis, Minnesota
1-612-829-8317

Diagnostic Testing

As shown in Fig. 5-1, the Unit Configuration screen provides access to a Dimension II self-diagnostics functions. The DIAGNOST field opens a series of windows used to display the current software version number and run diagnostic performance tests on both the control cage and operator interface components.

Run Dimension self-diagnostics as follows:

1. Use the diamond key to access the Unit Configuration screen (Fig. 5-1).
2. Turn the knob CW until the selector box moves to the **DIAGNOST** field.
3. Press **ENTER**. The system will display the Diagnostics window shown in Fig. 5-2. This window provides access to the control cage and operator interface diagnostic test functions.
4. To initiate control cage diagnostics, move the selector box to the **CC_DIAG_RUN** field and press **ENTER**.

Fig. 5-1.
Unit Configuration Screen

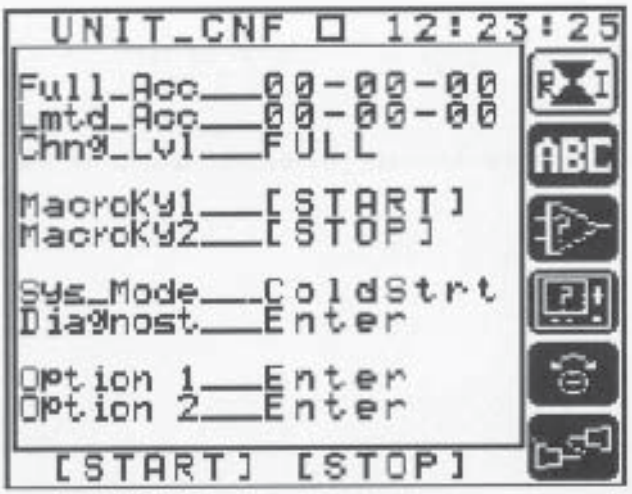
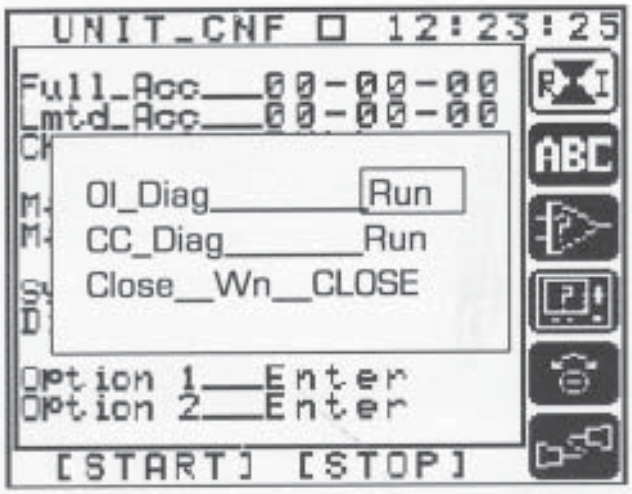


Fig. 5-2.
Dimension Diagnostics Window



5. The system will check the status and version number of CPU (8725 and OI CPU), Contact I/O, and Analog I/O boards installed in the control cage, and then will display the status window shown in Fig. 5-3. Press **ENTER** to close the window.

6. To initiate operator interface diagnostics, move the selector box to the **OI_DIAG_RUN** field and press **ENTER**.

7. The system will display the version number of the operator interface board. Use the **KEYPD** and **KNOB** fields (Fig. 5-4) to check diamond key and knob directional functions. Move the selector box to **CLOSE** field and press **ENTER** to close the window.

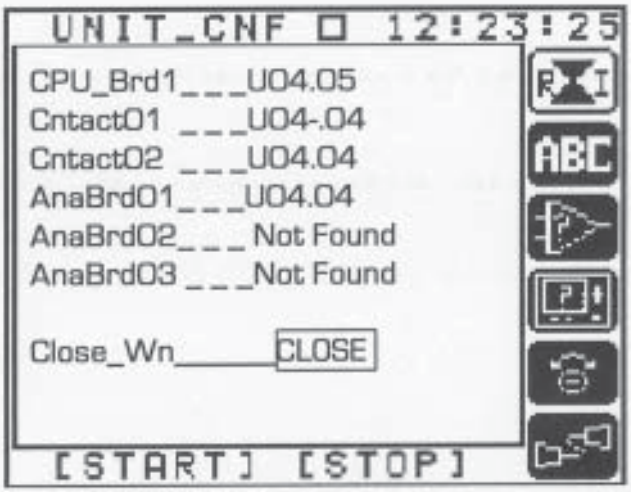


Fig. 5-3.
Control Cage Test Status Window

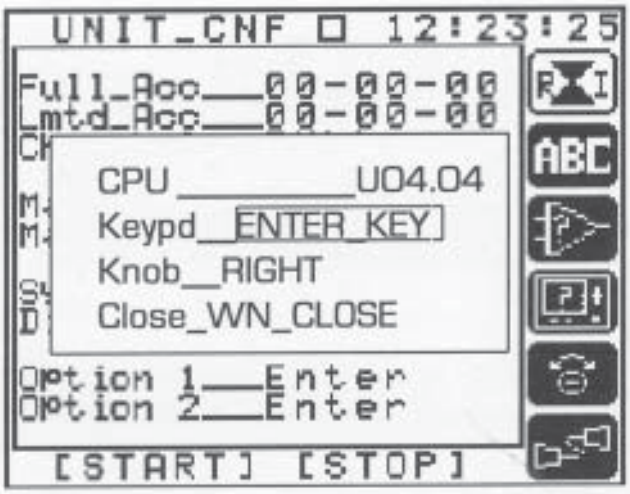


Fig. 5-4.
Operator Interface Test Status Window

Help Messages

On some Dimension II operator interface display screens, "help" messages are displayed that will tell you how to proceed or how to correct an error. Also, pop-up help windows can be called up at most screens and fields by pressing the Help key ⓘ. When a help window is displayed, press the Help key a second time, or the knob, to make the window disappear.

Input Fluctuation Conditions

The Dimension user may find with some applications the analog inputs connected to the Dimension to be unstable, or jump around. This section should guide the user to correct this type or problem.

The Dimension uses multiplexed inputs. This means the analog inputs on the same Dimension analog input card are not electrically isolated from one another. A voltage between the inputs greater than the specifications allow will cause fluctuation, or inaccurate process variable readings.

Another cause of Input fluctuation problems are due to common mode voltages exceeding specifications. Common mode voltages are measured from the Dimension input to frame ground. Sometimes it is difficult to measure this voltage accurately due to the impedance of the measuring device and characteristics of the induced electrical voltages. These voltages can be caused by electromechanical interference (EMI), Radio frequency interference (RFI), or resistive coupling from an electrical heater (or source) to the Dimension input. For example, a Dimension input may pick up common mode voltages from an electrical heater through a ceramic thermocouple, as the resistance of hot ceramic is not infinite.

Solutions to Fluctuation Problems:

1. It is important that the Dimension Frame ground connection on the power input is used.

2. Jumper the plus and minus connections of unused Dimension inputs. This is particularly important with unused inputs configured as "thermocouple with burnout".

3. When using thermocouple inputs that are electrically floating (for example a ceramic sheathed thermocouple), ground the negative lead of each thermocouple to frame ground. This will eliminate the common mode voltages.

4. Wire 4-20 mA transmitters that are powered by an external supply as follows: Power supply positive to the transmitter positive, transmitter negative to Dimension analog input positive, and Dimension negative to the power supply negative.

5. Determine if fluctuation problems are being caused by adjacent channel voltage differences. The easiest way to test for this is to remove one input from the Dimension and jumper the terminals on the Dimension where the input was connected and note if the fluctuation is eliminated. Repeat this test using the other input. If the fluctuation is eliminated in both cases, then the problems are input to input related. The user should determine if the inputs can be made "common" to one another. Otherwise, they require isolation.

Error/Advise Messages

When operator or system faults occur, software-generated error/advise messages will be displayed.

Important: Be sure to note the message and reference displayed at the time of a fault. Note exactly what operations you were doing, any entries or configuration changes you were doing, and any other pertinent information to communicate with Research, Inc. technical service to help isolate the problem. If you encounter problems, check your system against the error/advise messages in table 5-1. If the problems still exist, call Research, Inc. technical service.

Table 5-1. Dimension II Error/Advise Messages

REFERENCE	ERROR/ADVISE MESSAGE	ACTION
ADV0	Only four x-y graphs can be displayed on both the Loop and Overview Screens.	Select a different type of display for this loop or overview.
ADV1	Need to close a window before the Macro Key can be executed.	Close window before pressing Macro key.
ADV2	Fatal Error: OI Fail to set CRC for the BBDir module.	Possible system failure. Call Research, Inc. for technical support.
ADV3 Error 401	ConCage Error: Bad assignment parameter.	Possible communications error. Check Host or CLC software.
ADV4 Error 402	ConCage Error: Bad string variable.	Check Host or CLC software.
ADV5 Error 403	ConCage Error: Illegal system variable.	Check Host or CLC software.
ADV6 Error 404	ConCage Error: Illegal Assignment.	Check Host or CLC software. Also possible OI or CPU failure. Call for technical support.
ADV7 Error 405	ConCage Error: Bad Path Name.	Check Host or CLC software.
ADV8 Error 406	ConCage Error: Incomplete Path List.	Check Host or CLC software.
ADV9 Error 407	ConCage Error: Read Only Parameter.	Host or CLC software is trying to write to a read only parameter.
ADV10 Error 408	ConCage Error: Buffer Overflow.	CLC software error or a system fault.
ADV11 Error 409	ConCage Error: Illegal tag name assignment.	Host or CLC software problem. Check the software code.
ADV12 Error 800	ConCage Error: SPI Read timeout error.	Dimension II is not communicating with the analog board. Call technical support.

Table 5-1. Dimension II Error/Advise Messages

REFERENCE	ERROR/ADVISE MESSAGE	ACTION
ADV13	Comm Error	Check communications setup and connections.
ADV14 Error 410	ConCage Error: Card Not Available.	Install or reset I/O card.
ADV15 Error 500	ConCage Error: Network timeout error.	Check communications setup and connections.
ADV16 Error 700	Fatal Error ConCage can't find system mod.	This block of errors typically refer to Dimension II operating system and control software problems. The problems are related to hardware failures in the OI, CPU or Analog card. Call technical service for assistance.
ADV 17 Error 701	Fatal Error: ConCage can't move mod to EE.	
ADV18 Error 702	Fatal Error: ConCage can't build BB dir.	
ADV19 Error 703	Fatal Error: ConCage, not enough Ram in BB.	
ADV20 Error 704	Fatal Error: ConCage can't build Recipe Dir.	
ADV21 Error 705	Fatal Error: ConCage can't link to Cfgpths.	
ADV22 Error 706	Fatal Error: ConCage can't link to Rng_Rom.	
ADV23 Error 707	Fatal Error: ConCage can't link to Fbattr1.	
ADV24 Error 708	Fatal Error: ConCage can't link to SysBB.	
ADV25 Error 709	Fatal Error: ConCage can't open SPI device.	
ADV26 Error 710	Fatal Error: ConCage can't set EE CRC.	
ADV27 Error 711	Fatal Error: ConCage can't attach Process Box.	
ADV28 Error 777	Fatal Error: Dead task	
ADV29	Fatal Error: Unknown type.	
ADV30 Error 801	ConCage Error: SPI Write timeout error.	
ADV31	Access Not allowed. FULL Access required.	Enter required passcode.
ADV32	Access Not Allowed. FULL or LIMITED Access required.	Enter required passcode.
ADV33	System Error: Message Not Found.	Message not available. Press **ENTER**.

Troubleshooting Guide

If you encounter Dimension II operation or communications problems, we recommend that you first check your system against the troubleshooting checklist in table 5-2. If problems still exist, call Dimension II Technical Support.

Table 5-2. Dimension II Troubleshooting Checklist

PROBLEM	POSSIBLE CAUSE/SOLUTION
No display	Check AC power source and cable connections. Check operator interface-to-control cage cable connection. Check for low line condition. Cold start or send the unit to factory as the contract/ brightness could have been set to 0.
RAM verify error message	Battery low or dead. Defective RAM memory chip.
EPROM verify error message	Noise may have corrupted memory. Defective EPROM memory chip.
Switches/jumpers error message	I/O board may have improper address settings.
On startup, indicates missing I/O board	I/O board may not be plugged in. I/O board may have improper address settings.
No process variables appear on display	Incorrect range numbers. I/O board not found. Faulty I/O connections.
Analog outputs are off	Check for open sensor alarm condition.
Entered value not accepted	Out of range.
System locks up when relay/event turns on	Noise interference.
Communications do not work.	Incorrect setting (RS-232/RS-422) Faulty connection.

Appendix
A

Operator Interface Display Terminology

Appendix A

Operator Interface Display Terminology

Note: *A "+" instead of a "–" between the screen parameter abbreviation and the description means that this parameter may be assigned to an overview display. ## is an abbreviation of a 2-digital numerical entry (e.g. "Alarm ##" could be "Alarm 01".*

Abort – Programmer Abort 

Use: One of the possible actions that can be selected when defining a macro key.

Selection: Macro key 1 & 2; NotActvd or Activatd

Remarks: Selecting Activatd will cause the programmer identified by LpPgNmbr to Abort when the macro key is pressed. Selecting NotActvd disables the macro key from causing this action.

Abort_## – Programmer Abort Enable 

Use: This field will either place the associated programmer (##) in the abort mode or remove it from the abort mode.

Selections: Enable/Disable

Remarks: Placing the programmer in abort mode causes the programmer to save the current state of the programmer and start a new program run at Segment 0. The Programmer will remain in the Abort Mode until the Abort is disabled. When the Abort is disabled, the programmer will restore the previous state it was in and continue running as if nothing happened.

AbortSrc – Programmer Abort Source 

Use: This field is used to select the source for the program abort initiation.

Selections: CONF_PRG screen; AbrtSrc1–AbrtSrc8
LGASet01–LGASet04
ConIn__1–ConIn__8
RemCl 1–16
NANDSet 1–4
ANDSet 1–4
OR_Set 1–4
NORSet 1–4
CLC_IN 1–2

Remarks: The AbrtSrc1–AbrtSrc8 selections correspond with the initiation of an Abort through the Operator Interface. The selection of AbrtSrc1 would place the programmer in the Abort Mode when the Abort_01 field was selected to Enable. LGASet01–LGASet04 selections correspond with the initiation of an abort through a logic function. Thus an abort could be started when an alarm condition occurred or an Opensensor. A latched alarm would cause the programmer to remain in the Abort Mode until that alarm was acknowledged. An unlatched alarm would remove the programmer from abort as soon as the alarm condition cleared. ConIn__1–ConIn__8 selections correspond with the initiation of an abort through a contact input. This would allow an abort to start from a remote location. If all four programmers abort sources were selected to be the same, then all four programmers would go into the abort mode when the appropriate Abort source became true.

AbrtSrc – Operator Abort Source Selection# 

Use: Operator abort source for setpoint programmer.

Remarks: See AbortScr

ACC – Security Access Level 

Use: To display current access level.

Selection: None

Remarks: This entry will display the current access level. If the correct access code is entered for FULL or LIMITED access the status message 'Access Granted' wil lbe displayed at the bottom of the window with this entry being updated to reflect the new level (see Access).

Accept – Accept Auto-tuning PID Parameters 

Use: To accept the calculated PID parameters and transfer them into use for the control loop.

Selections: Yes or No

Remarks: True will transfer the calculated PID parameters. The appropriate PID Group needs to be selected.

Access – Security Access Level 

Use: To display the current access level and to enter a passcode to change the current access level.

Selection: UNIT screen; opens a window

Remarks: FULL allows complete access to all parameters. LIMITED allows access to all operating parameters and does not allow access to configuration parameters. NONE allows access to view all operating parameters but does allow access to change them.

ALARM – Alarm Screen Titles 

Use: To select the Alarm screen titles for change.

Selections: GLOS_YS screen; NONE, LIMITED or FULL (opens a window)

Remarks: Enter any desired ascii string for screen title. Some selections may appear for which no screen exists, these selections can be ignored. Screen titles are considered tagnames and are saved on the memory cartridge in the Mem_Img file.

AlarmAct – Alarm Action 

Use: To set the output value that the control loop will default to if a thermocouple input opens.

Selections: CONF_LOP screen; Output Percentage

Remarks: The default value will be used for the control loop output if a thermocouple input opens (sensor break). A default value of 0 is most common. Factory default is 0.

Alarms## – Alarm Status 

Use: To display alarm status.

Selections: LOOP_ALM screen; Alarm acknowledged by selecting "Alarms##" and pressing knob.

Remarks: An operator message may be displayed by pressing the "?" key when an alarm field is selected. (See Alm_Mess)

Alm_Group – Alarm Group 

Use: To select the alarm group that will be active in the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; 1–5; Dsp_Profile screen

Remarks: Each alarm group may contain a different set of loop alarm settings. (See Loop_Alm)

Alm_Grp# + Alarm Group  

Use: To display the currently active alarm group.

Selections: PROGRUN# screen; ALM_Set

Remarks: One of the five alarm settings groups is active at all times. The setpoint programmer selects which group is active.

Alm_Mess – Alarm Message 

Use: To select a user entered alarm help message.

Selections: DCON_ALM screen; LOOP__1 to LOOP__8 (opens a window)

Remarks: Enter an alarm help message using the knob. Default message is Arr_Temp. Press the knob and move the cursor block to the large 'C' to close this window. The help message can be displayed on the ALARM__1 status screen when the given alarm is selected and the help key is pressed.

Anal_Ins – Analog Input Tagnames 

Use: Opens a window to allow changing the tagnames used for analog inputs.

Selection: GLOS_IO screen; 8 characters

Remarks: Select up to eight characters to form a new name.

AnalOuts – Analog Output Tagnames 

Use: Opens a window to allow changing the tagnames used for analog outputs.

Selection: GLOS_IO screen; 8 characters

Remarks: Select up to eight characters to form a new name.

AnaOutpt – Analog Output 

Use: Selects an analog output for configuration or calibration.

Selections: ANA_OUTS screen; AN_OUT_1 to AN_OUT_8

Remarks: Analog outputs one through four are found on the first analog I/O module. Analog outputs five through eight are found on the second analog I/O module. See calibration instructions for more information.

AT_ErrNo – Auto Tune Error Number 

Use: To display the error number when an auto tuning error occurs.

Selection: None

Remarks:
Error 600: Loop is not in manual.
Error 604: PV not responding to output change.
Error 605: Process not moving fast enough, increase sample rate.
Error 606: Manual output changed during tuning process.
Error 607: System error.
Error 608: Buffer full
Error 609: User Abort

Auto/Man – Control Loop Automatic/Manual 

Use: This field is to select how the loop will be switched from Auto to Manual mode.

Selections: CONF_LOOP screen; OperAM_1–OperAM_8
RemCl 01–16
CLC_IN 1–2
LocII X–X
NANDset 01–04
ANDset 01–04
OR_set 01–04
NORset 01–04

Remarks: The OperAM_1–OperAM_8 selections correspond with the switching from Auto to Manual (or vise versa) through the Operator Interface. The selection of OperAM_1 would place the loop in Auto when LpMode01 was selected to Auto and the loop would go into manual when the LpMode01 was selected to Manual. LpMode01 can be found under the LOOP__1 screen in the LpMode01 window. AND/OR/NOR/NAND selections correspond with the switching from auto to manual (or vise versa) through a logic function. Thus the loop mode could be switched when an alarm condition occurred or an Open Sensor. A latched alarm would cause the loop to remain in Manual until that alarm was acknowledged. An unlatched alarm would revert to the auto mode as soon as the alarm condition went away. The alarm logic can be switch if a low alarm is used instead of a high alarm. Using a contact input through the logic sets, cause the logic of the contact input to be inverted. RemCl 01–16 selections correspond with the switching from auto to manual (or vise versa) through a contact input. This would allow the loop status to be switched from a remote location. If it is desired to have the contact input logic inverted, use the contact inputs through the logic sets (see above). If all four loops have their LpModes selected to be the same source, then all four loops would switch form Auto to Manual at the same time by one action.

AutoTune – Auto Tuning 

Use: To initiate Auto Tuning of control loop PID parameters.

Selections: Loop_# screen; LpMode_#; SetParms; Start, Abort

Remarks: Set the Start to initiate auto tuning. The control loop must be in Manual and the process should be stable. Change to Abort to stop.

Backlite – Display Back Lighting 

Use: To set the state of the backlight.

Selection: UNIT screen; opens a window

Remarks: The present state, on or off, of the backlight is shown. The window opens to allow the backlight to be turned on, off or cycled on and off. If Cycle is selected at the Set parameter the backlighting is turned on and off at the time entered for On and Off. Time is entered in 24 hour Hours:Minutes:Seconds (HH:MM:SS) format.

BaudRate – Communications Baud Rate 

Use: To select the communications baud rate for this unit.

Selections: 232_PORT and 422_PORT screens; 300, 1200, 2400, 4800, 9600 or 19200

Remarks: Select the communications baud rate to match your computer. The two most common selections are 9600 or 19200.

BitsChar – Bits per Character 

Use: To select the number of data bits in a character.

Selections: 232_PORT and 422_PORT screens; 7 or 8

Remarks: Select to match your computer. The most common selection is 8 bits per character.

Blend_## + Cascade Blend  

Use: To apply a blending factor to the cascaded setpoint.

Selection: Numeric

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc) and cascade blending is desired. The formula used is [(Primary control loop output * Ratio##) + (Primary control loop setpoint * Blend_##)] / Scale_## = Secondary control loop setpoint.

CalcGain – Calculated Gainn 

Use: To display the PID Gain calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

CalcRate – Calculated Rate 

Use: To display the PID Rate calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

CalcRST – Calculated Reset 

Use: To display the PID Reset calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

Card_Sel – Card Select 

Use: This field is used to configure which control output signal is to drive which hardware output port.

Selections: CONF_OUT screen; AnlgCrd1/TP_Crd1
AnlgCrd2/TP_Crd2
LocCO3_1–2
RmCOBrd 1–2

Remarks: AnlgCrd1 refers to the four analog outputs on analog card 1. TP__Crd1 refers to the two time proportioning on analog card 1. AnlgCrd2 refers to the four analog outputs on analog card 2. TP__Crd2 refers to the two time proportioned on analog card 2. Analog outputs can be used for control outputs, pv or sp retransmits. When selection pv or sp retransmits, the output high and low limit must match the pv or sp range. Time proportioned outputs can be used as time proportioned analog output or as a contact output. The difference being the setting of the cycle time. If the cycle time = 0, the output acts as a contact output otherwise, it is a TP output. Contact outputs can be setup as either contact outputs or time proportioned outputs. Setting the cycle time to some value other than 0 causes the contact output to become a TP output. If retransmitting a PV or SP on a contact output, the range must be 0.00 to 100.00 since the output limits can not be changed for contact outputs.

CC_Diag – Control Cage Diagnostics 

Use: To check the status of the control cage boards.

Selection: Diagnost; Opens a window.

Remarks: This window is informational only, it displays the current software level for the CPU, Contact and Analog boards in the control cage. If the boards are not found, 'NotFound' will be displayed. If the boards have a failure, the error number will be displayed.

Chng_Lvl – Change Access Level 

Use: To change the access level from a higher level to a lower level.

Selections: If current Access = FULL, the FULL, LIMITED or NONE is selectable.
If current Access = LIMITED, then LIMITED or NONE is selectable.
If current Access = NONE, then this entry is not selectable.

Remarks: If LIMITED is selected, then the passcode for FULL access is blanked from the display. If NONE is selected, then both the FULL and LIMITED access passcodes are blanked from the display. In order to restore a higher access level it is necessary to enter the correct passcode by selecting 'Access' on the UNIT screen. All parameters on the UNIT_CNF side require an access level of FULL to modify. All parameters on the operating UNIT side require a level of LIMITED to modify. Only the Macro Keys and 'Access' selection are selectable with an access level of NONE. An access level of FULL allows any parameter to be modified.

Cntl_Act – Control Loop Control Action 

Use: To select the type of control action for the control loop.

Selections: CONF_LOP screen; None, Reverse, Direct or Bimodal.

Remarks: This field will open a window to allow selection of control action. None. Selects no control action. Control loop is not used. Reverse. Selects reverse acting control. Reverse acting control is used for processes where when the input signal increases the output signal needs to decrease to maintain control. Most heating processes use reverse acting control. Direct. Selects direct acting control. Direct acting control is used for processes where when the input signal increases the output signal needs to increase to maintain control. Most cooling processes use direct acting control. Bimodal. Bimodal control is used two control outputs are utilized to provide both a reverse and a direct acting output. When making these selections a Limit setting is presented. The Limit setting allows entry of output limit values.

ColdStrt – Cold Start Power Up Mode 

Use: To select cold start power up mode.

Remarks: See Sys_Mode.

Con_Ins – Contact Input Tagnames 

Use: Opens a window to allow changing the tagnames used for contact inputs.

Selection: GLOS_IO screen; 8 characters

Remarks: Select up to eight characters to form a new name.

Con_Out – Contact Output Logic Assignment 

Use: To make internal logic assignments that can be used to operate contact outputs.

Selections: CONF_ALM; Con_Out OTASet01–OTASet04

Remarks: Opens a window that allows selecting up to four alarm conditions and contact input states that will operate contact outputs.

Con_Outs – Contact Output Tagnames 

Use: Opens a window to allow changing the tagnames used for contact outputs.

Selection: GLOS_IO screen; 8 characters

Remarks: Select up to eight characters to form a new name.

Configur – Configuration 

Use: To configure inputs and outputs.

Selections: ANA_OUTS or INPUTS screen; SelcFunc; opens window

Remarks: See calibration instructions. Allows selection of linear zero and span values.

ConOutpt – Contact Output 

Use: To select a contact output to be configured for time proportioning action.

Selections: CON_OUTS screen; RmCOut01 through RmCOut16

Remarks: The contact outputs are on the contact I/O module. See calibration instructions for more information.

Contrast – Display Contrast Level 

Use: Set contrast level

Selection: Contrast; 1 to 26

Remarks: Contrast will vary according to vertical viewing level. Selected contrast setting is saved if 'Warmstrt' is selected as Sys_Mode.

CPU_Brd 1 – CPU Software Revision Level 

Use: To display the software revision level.

Selections: UNIT_CNF screen, Diagnost; CC-Diag

Remarks: None

CurSeg## + Current Segment Number  

Use: To display the currently active segment of the setpoint programmer.

Selection: PROGRUN# screen; None

Remarks: None

CycCnt## + Cycle Counter  

Use: To display the number programmer recycles that are remaining.

Selection: PROGRUN# screen; 0–255

Remarks: Maximum of eight segments may be configured with recycles. If more than eight segments with recycles are entered, controller will go to program end.

Cycle – Backlighting Cycle 

Use: To enable backlighting cycling.

Selections: Backlite, Set; time on, time off

Remarks: See Backlite and Set.

CyclTime – Time Proportioning Cycle Time 

Use: To select the time proportioning cycle time for an output.

Selections: ANA_OUTS, TP_OUTS or CON_OUTS screen; 0 to 255 seconds

Remarks: A setting of 0 disables time proportioning. When analog outputs are selected for time proportioning action, jumpers on the analog I/O module must be changed. See calibration instructions for more information.

Date – Calendar Date 

Use: To display and set Date.

Selections: UNIT screen; Month/Day/Year (MM/DD/YY)

Remarks: Enter current calendar date.

Dec_Pos – Decimal Point Position 

Use: To select a decimal position for hi and lo limits of the profile display on PROGRUN screens.

Selection: DCON_PRG screen; 1 to 5

Remarks: The decimal position will change both the hi and lo limits of the profile display which is selected on the PgBuild window of the PROGRUN screens.

DecPoint – Decimal Point Position 

Use: To display the current number of decimal point positions for linear inputs.

Selection: INPUTS screen; Configure, 0–5

Remarks: The parameter will display 0 or 1 for all thermocouple and RTD inputs. If a linear input type is selected, the number of decimal point positions can be user configured (see SelcFunc).

DELETE – Memory Card Delete Function 

Use: To delete a file from a memory card.

Selection: Mem_Card, Delete

Remarks: See FUNC; ***Note:*** *Memory Card must be inserted for this to appear.*

Dev_## + Control Loop Deviation 

Use: To display the control loop deviation from setpoint for control loop ##.

Selection: None

Remarks: The deviation is calculated by subtracting the setpoint from the process variable. (PV–SP=DEV)

Diagnost – Diagnostics 

Use: To run basic diagnostics of Dimension II.

Selection: UNIT_CNF screen, Diagnost

Remarks: Opens a window to run diagnostics on the operator interface and the control cage.

DIRECT – Memory Card Directory Function 

Use: To list a directory of memory card files.

Remarks: See FUNC; ***Note:*** *Memory Card must be inserted for this to appear.*

DirOut_# + Control Loop Direct Output  

Use: To access the control loop reverse output value for loop #.

Selections: OVIEW__# or LOOP__# screens; LpMode##; 0.0% to 100.0%

Remarks: This field is only changeable when the control loop is in manual mode (see LpMode##). A direct output is usually used for cooling.

DOWStrt# – Day of Week Start 

Use: To set the day of week on which the programmer will start.

Selections: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.

Remarks: TOD_Strt must be set to Enable (see TOD_Strt).

DspConf – Memory Card Display Configuration File Type 

Use: Mem_Card; FILE; To read, write or delete a display configuration file type.

Remarks: See FILE

Dsp_Profile – Display Profile 

Use: Opens a window to graphically display the setpoint program profile.

Selections: PROGRUN# screen; PgBuild, Dsp_Profile

Remarks: See section 3.

Echo – Communication Echo 

Use: To select echo.

Selections: 232_PORT and 422_PORT screens; ON or OFF

Remarks: Echo should be set to ON when communications to the Dimension II is interactive using a dumb terminal.

EngUnits – Engineering Units 

Use: To select engineering units for an input type.

Selections: INPUTS screen; Centigrd, Fahrenht, Linear

Remarks: When an RTD or thermocouple is selected under the InptType field, this parameter allows a selection between degrees centigrade and degrees fahrenheit. If a linear input type has been selected this will always show Linear and cannot be changed.

Enter – Enter Passcodes 

Use: To enter a access level passcode.

Selection: Access; Enter a passcode to change the security access level.

Remarks: If any invalid passcode is entered access is denied and the access level does not change. Access passcodes are defined on the UNIT_CNF screen. (see Access) The default code of 04-01-57 will always gain FULL access.

Enter – Enter Diagnostics 

Use: Open Window of diagnostic selections

Selection: Diagnost

Remarks: See Diagnost

Event_## – Programmed Events 

Use: Tagnames to display programmed event states.

Selection: LOGIC_# screen; None

Remarks: Displays the status of all events. Tagnames are changed in the Glossary.

Events – Event Tagnames 

Use: To select tagnames for events.

Selection: GLOS_PRG screen; Tagname

Remarks: The programmer event tagnames can be changed. When this entry is selected a window opens to allow access to all 12 event tagnames.

Evnts – Events 

Use: To select the events that will be "ON" during the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; 123456789abc

Remarks: Selecting 1 through c indicates the event(s) that will be activated. When the programmer is in hold event states may be manipulated by the operator.

FILE – Memory Card File Type 

Use: To select a file type for a memory cartridge function.

Selections: Mem_Card; Recipes, SysConf_, Mem_Img, DspConf_, MacroKy_, Basic

Remarks: File names can be changed but the default file names determine what is stored for each file type. The default file types are: Recipes – this file type stores all program segment information for all 256 segments. SysConf_ – this file stores communication parameters set on the COMM screen. Mem_Img – this file stores all system configuration settings, calibration settings, and tagnames. DspConf_ – this file stores all changes to display configuration for the OVER-VIEW, LOOP, and LOGIC screens. MacroKy_ – this file stores the Macro Keys programs.

FORMAT – Memory Card Format Function 

Use: To format a memory card.

Selection: Mem_Card; FUNC

Remarks: See FUNC

Format – Display Format 

Use: To select a format for display configuration.

Selections: DCON_OVR screen; HOR_BAR, XYCHART, VER_BAR2, VER_BAR3, VER_BAR4, TEXT_3X, TEXT_2X, TEXT

Remarks: Display configuration changes can be stored on the memory cartridge in the DspConf_ file type. HOR_BAR – displays 2 horizontal bar graphs at the top of the screen, with 5 lines of text below. XYCHART – displays 2 parameters in a strip chart like display at the top of the screen with 4 lines of text below. Only 4 XYCHARTS are allowed. Trending of data starts when the screen is displayed for the first time and continues until power down. VER_BAR2 – displays 2 vertical bar graphs to the left of the screen with the 2 selected bar graph parameters also displayed in 2X text to right of the bargraphs. There is also two additional selections – one 2X text on top, and 1X text on the bottom. VER_BAR3 – displays 3 vertical bar graphs, with one line of text at the bottom. VER_BAR4 – displays 4 vertical bar graphs. TEXT_3X – displays 3 parameters in 3X text at the top, with 4 lines of text at the bottom. TEXT_2X – displays 8 parameters in 2X text. TEXT – displays 12 parameters in 1X text.

Full_Acc – Full Access Passcode 

Use: To enter a passcode for FULL Access.

Selections: UNIT screen; Full_Acc, 00-00-00, three 2 digit numbers.

Remarks: This is the passcode that will need to be entered to bring the unit to FULL access if the present access is LIMITED or NONE. The current access must be FULL to select this entry.

FUNC – Memory Card Function 

Use: To select a memory card function.

Selections: UNIT screen; Mem_Card; Func; READ, WRITE, DIRECT, FORMAT, DELETE

Remarks: READ reads the selected FILE from the memory card into unit memory.

WRITE writes the selected FILE from unit memory to the memory card.

DIRECT lists the directory of FILEs on the memory card.

FORMAT formats a memory card. Memory card must be formatted before a read, or write can be made to the card.

DELETE deletes a selected FILE from the memory card. The default file name determines what is stored in the file. The status message 'Writing . . . ' appears when a file is being written, the Mem_Img file is long and takes about a minute and a half to write. Recipes – this file type stores all program segment information for all 256 segments. SysConf_ – this file stores communication parameters set on the COMM screen. Mem_Img – this file stores all system configuration settings, calibration settings, and tagnames. DspConf_ – this file stores all changes to display configuration for the OVERVIEW, LOOP, and LOGIC screens. Macroky_ – this file stores the Macro Keys programs.

FwdEnSrc – Programmer Fast Forward Enable Source 

Use: This is used to select the action to enable program fast forward.

Selections: CONF_PRG; OperFF_1–OperFF_4, RemCI1–8, OR_set 1–4, NORset 1–4, ANDset 1–4 NANDset 1–4

Remarks: The OperFF_1–OperFF_4 selections correspond with the initiation of fast forwarding through a program via the Operator Interface. The selection of OperFF_1 would place the programmer in fast forward when the PgFFwd01 field (in the progrun screen in the PGOption window) is selected to Enable. RemCI selections correspond with the initiation of the fast forward through a contact input. This would allow fast forwarding through a program form a remote location. OR/NOR/AND/NAND selections correspond to internal logic assignments. This could allow fast forward to be initiated from one of several points. If all four programmers fast forward sources were selected to be the same, then all four programmers would be placed in fast forward when the appropriate fast forward source became true. The rate at which the programmers execute is determined by the warp factor. If the warp factor is set to 10 and the programmer fast forward was enabled, then the programmer would run the recipe in a tenth of the time it would normally take to complete that recipe.

Gain__## + Control Loop PID Gain  

Use: To set PID gain for control loop ##.

Selections: LOOP screens; LpMode##; 0.01 to 327.67

Remarks: Gain is a multiplication term expressing how the control loop output varies with respect to the control loop deviation (process variable – setpoint). The effect of gain on the control loop output can be calculated from the following equation: Output % = Deviation/Input Span * Gain.

GuarSoak – Guaranteed Soak 

Use: Opens a window to allow enabling the program guaranteed soak function.

Selections: CONF_PRG screen; GuarSoak; ENABLE, DISABLE

Remarks: Guaranteed soak causes the programmer to HOLD when either Hi or Lo deviation limits are exceeded. The deviations limits are set at the ALM_SET screen using the Loop_Alm parameter for the loop associated with this programmer. Programmer one is associated with loop one and so forth.

Handshke – Handshake 

Use: To select hardware handshaking.

Selections: 422_PORT or 232_PORT screen; Enable or Disable

Remarks: Set to match your computer.

Hi_Limit – High Limit 

Use: To set default high limit for Profile display.

Selection: DCON_PRG screen; Numeric

Remarks: Limit depends on input range

InFltrXX – Filter Constant 

Use: To enter filtering value.

Selections: CONF_LOP screen, PV Source; AnlgInxx; 0–100

Remarks: Range 0–100 seconds, 0 default. A function of time. Higher time constant = more filter.

Inpt_Num – Input Number 

Use:

Selects which input is to be set up.

Selections: INPUTS screen; ANLGIN_1 to ANLGIN_18

Remarks: Number of Analog inputs depends on Dimension II unit purchased, i.e., 8705 or 8725.

InptHiLim – Input High Limit 

Use: To select the upper limit for the input type selected.

Selection: INPUTS screen; Numeric

Remarks: This parameter is used when Thermocouple or RTD inputs are selected. These limits are used by the PID control algorithm as the range of the input to be controlled. They are also used by the operator interface to limit operator setpoint entries. The limits are stored in the EEPROM of the analog I/O card.

InptLowLim – Input Low Limit 

Use: To select the lower limit for the input type selected.

Selection: INPUTS screen; Numeric

Remarks: This parameter is used when Thermocouple or RTD inputs are selected. These limits are used by the PID control algorithm as the range of the input to be controlled. They are also used by the operator interface to limit operator setpoint entries. The limits are stored in the EEPROM of the analog I/O card.

InptType – Input Type 

Use: Selects the desired input type.

Selections: INPUTS screen; Type..J., Type..K., Type..T., Type..R., Type..S., Type..E., Type..N., PltnI.II, Type..B., Type..G., Type..C., Type..D., RTD.am.1, RTD.eu.1, 0–100mv, 0–10volt, 0–5volt., 4–20ma.., 0–20ma.., PG_CH_01, PG_CH_02, PG_CH_03, PG_CH_04, Altitude, NiNi Mo.

Remarks: In addition analog I/O jumpers must be set accordingly. In addition to the thermocouple types, RTD's and linear inputs, there are four channels labeled PG_CH_01, PG_CH_02, PG_CH_03, and PG_CH_04. These are used by the factory to calibrate the four independent programmable gain channels for the analog inputs. See calibration instructions for more information.

InputAlm – Input Alarm  

Use: In CONF_ALM opens a window to select input alarm hysteresis value and latching action. In Alm_Set opens a window to select alarm limits.

Selections: ALM_SET or CONF_ALM screen; ANLGIN_1 to ANLGIN_4

Remarks: Hysteresis value and the latching action are valid for both Hi and Lo alarms.

Keypd – Keypad Test 

Use: To test the correct action of the front panel keypad.

Selections: UNIT_CNF screen; Diagnost; OI_Diag; ENTR_KEY, MACRO1_KY, MACRO2_KY, UP_KEY, DOWN_KEY, LEFT_KEY, RGHT_KEY or HELP_KEY.

Remarks: Press the knob to enter and exit the keypad test.

Knob – Rotary Knob Test 

Use: To test the correct action of the rotary knob.

Selections: UNIT_CNF screen; Diagnost; OI_Diag; RIGHT or LEFT

Remarks: Press the knob to enter and exit test.

Lmtd_Acc – Limited Access Passcode 

Use: To enter a passcode for LIMITED Access.

Selections: UNIT_CNF screen; 00-00-00, three 2 digit numbers.

Remarks: This is the passcode that will be entered to bring the unit to LIMITED access. The present access must be LIMITED or FULL to select this entry.

Lo_Limit – Low Limit 

Use: To set default low limit for Profile display.

Selection: DCON_PRG screen; Numeric.

Remarks: Limit depends on input range.

Logic – Internal Logic Assignment 

Use: To make internal logic assignments that can used by the control loops and setpoint programmers.

Selections: CONF_ALM screen; OR/NOR_1–4, AND/NAND_1–4

Remarks: Opens a window that allows selecting up to four alarm conditions and contact input states that will operate an internal logic point (OR/NOR or AND/NAND 01–04). This logic point can be used by control loops and setpoint programmers.

LogicScr – Logic Display Screen 

Use: To select a Logic screen for configuration.

Selection: DCON_LOG screen; LOGIC__1 to LOGIC__4

Remarks: This entry selects which Logic screen will be configured for display. Selection may be limited by the number of logic screens set (see NumLgscr). Display configuration information can be stored on the memory card in the file type DspConf_.

Loop_Alm – Loop Alarm  

Use: To select a loop to enter alarm limits.

Selections: ALM_SET or CONF_ALM screen; LoopNm01 to LoopNm08

Remarks: On the CONF_ALM screen the hysteresis and latch state are entered for the selected loop. On the ALM_SET screen the alarm group is selected first and then the PV and DEVIATION alarm limits can be set for the selected loop and group. Hysteresis and latching selections are valid for both Hi and Lo alarms.

Loop_Num – Loop Number  

Use: To select a loop number.

Selections: GLOS_SYS or CONF_LOP screen; LOOP or LOOP_Num; LoopNm01 to LoopNm08

Remarks: On the CONF_LOP screen this entry selects the loop for configuration. On the GLOS_LOP screen this entry selects which loop's tagnames will be edited.

Loop_Scr – Loop Display Screen 

Use: To select a loop screen for display configuration.

Selections: DCON_LOP screen; Loop screen tagnames, LOOP___1 to LOOP___8

Remarks: Selects Loop screen for display configuration. The entry 'Format' will be updated to show the present display configuration of the selected Loop screen.

LpMode## + Loop Mode 

Use: To access control loop mode.

Selections: LOOP_# screen; Auto or Manual

Remarks: Select Auto for closed loop control. On the LOOP__# displays this will open a window.

LpPgNmbr – Loop/Programmer Number 

Use: To select the control loop and setpoint programmer number to which macro key definitions will be made.

Selections: UNIT_CNF screen; Macroky1 and Macroky2, LoopNm01–LoopNm08

Remarks: See Macroky

M_OutSrc – Manual Output Source 

Use: This field is used to select the source for the manual output.

Selections: CONF_LOP screen; Operator and Remote

Remarks: If operator is selected as the manual output source, then the manual output is determined by the value entered by the user in the LOOP___1 screen under the reverse output or the direct output entries. If remote is selected, then the manual output is determined by an analog input or a loop output. One use of setting the manual output source to another loops output would be to use two different sensors for one control loop. A high PV alarm could be set to transfer loop one from auto to manual and a low PV alarm to transfer loop two from manual to auto. When loop one is in manual, the control output comes form loop two and when loop one is in auto, the control output comes from loop one. Note that if Output Lx is selected for the remote source, the cascade parameters should be set to allow the proper ranging of the output. Refer to RemSpsrc section (page 4-14)for accessing the cascade parameters.

Macroky – Memory Card Macro Keys File Type 

Use: To read, write or delete a macro key file type.

Selection: UNIT screen; Mem_Card

Remarks: See FILE

Macroky – Macro Key Definitions 

Use: To program the Macro Keys.

Selection: UNIT_CNF screen; opens a window.

Remarks: The functions that are activated on the Macroky window will be executed in the order that they are listed on the window. For example, if LpMode and Abort are activated then when the associated Macroky is executed the LpMode command will be executed then the Abort command.

ManReset – Manual Reset 

Use: To set the control loop manual reset value.

Selections: LOOP_# screen, LpMode##; –100.00 to 100.00

Remarks: Manual reset is summed to the control loop output. When used, the manual reset value is usually the same as the control loop output % in a steady state condition.

Mem_Card – Memory Card Functions 

Use: To execute a memory card function.

Selection: UNIT screen; opens a window

Remarks: See FUNC and FILE glossary descriptions.

Mem_Img – Memory Card Memory Image File Type 

Use: To read, write or delete a memory image file type.

Selections: UNIT screen; Mem_Card; FILE

Remarks: See FILE

Mnemonic – Engineering Unit's Mnemonic 

Use: To display the current engineering unit's mnemonic.

Selection: INPUTS screen

Remarks: This parameter will read either 'F' or 'C' for all thermocouples and RTD's depending on the status of the Eng Units field. If a linear input type is selected, the three character field mnemonic can be user configured (see SelcFunc).

Net_Addr – Network Address 

Use: To select the network address of serial communications.

Selection: 232_PORT or 422_PORT screen; 1–99

Remarks: The selection identifies the address of this unit on a communications network. Each unit on the same network must have a unique address.

Next_Seg – Next Segment 

Use: To select the segment to be executed after the currently accessed segment.

Selections: PROGRUN1 screen; PgBuild; 1–255

Remarks: Any segment, including the currently accessed segment, may be selected. If the currently accessed segment is selected, a program end will be indicated and programmer operation will be halted at this point.

NumLgscr – Number of Logic Display Screens 

Use: To select the number of Logic screens.

Selection: DCON_LOG screen; 1 to 4

Remarks: The number of logic screens that will be displayed are entered here. A minimum of 1 to a maximum of 4 screens are allowed. This information is stored on the memory card in the file type DspConf_. Note that if Output Lx is selected for the remote source, the cascade parameters should be set to allow the proper ranging of the output. Refer to RemSpsrc section for accessing the cascade parameters.

Off – Backlighting Off 

Use: To display and set the backlighting mode.

Selection: Backlite

Remarks: See Backlite and Set

OI_Diag – Operator Interface Diagnostics 

Use: To select Operator Interface diagnostics.

Selections: UNIT_CNF screen, Diagnost; Opens a window.

Remarks: The diagnostics displays the software revision level. The keypad and knob can also be tested. (See Keypd and Knob.)

On/Off – On/Off Tagnames 

Use: Opens a window to allow changing the tagnames used for 'on' and 'off' states.

Selection: GLOS_IO screen; 8 characters

Remarks: Four pairs of on/off names can be selected. These names can be assigned to contact inputs, contact outputs and programmed events on the DCON_LOG screen.

On – Backlighting On 

Use: To display and set the backlighting mode.

Selection: Backlite

Remarks: See Backlite and Set

OPStart – Operator Program Start 

Use: This field is used to select the source for starting a programmer via the operator start.

Selections: CONF_PRG screen; OPStrt01–OPStrt04, OR_set 01–04, NORset 01–04, RemCl 1–8, ANDset 01–04, NANDset 1–4

Remarks: The OPStrt01–OPStrt04 selections correspond with starting a programmer through the Operator Interface. When OPStart is set to OPStrt01, the programmer can be started when the Start_Prgr parameter set to start. This parameter can be found on the PROGRUN screen in the StrtPgr1 window. OR/NOR/ AND/NAND selections correspond with Starting a programmer through a logic function. RemCI 1–8 selections correspond with starting a programmer through a contact input. This would allow an abort to start from a remote location. If all four programmers' Operator start sources were selected to be the same, then all four programmers would start when the appropriate source became true. There are three different ways to start a programmer. One is through an operator start, another is through a remote start, and the third is via a time of day start. Each of these has a user defined starting segment. Both the operator start and remote start can be initiated through the operator interface, or a contact input, or through a logic function. The only difference between these starts is where on the operator interface the start sequence is initiated. The operator start is found on the PROGRUN screen under the StrtPgr1 window. The remote start is found on the PROGRUN screen under toe PgOption window.

Out_Off – Control Outputs Off 

Use: To make internal logic assignments that will cause all control loop outputs to turn off.

Selections: CONF_ALM screen; OFFSet01–OFFSet08

Remarks: Opens a window that allows selecting up to four alarm conditions and contact inputs that will cause all control outputs to turn off.

Output_# + Control Loop Output 

Use: To display the control loop output value.

Selection: None

Remarks: Displays both the reverse and direct output levels. Direct is displayed as 0 to +100% and reverse is displayed as 0 to –100%. This field is only changable when the control loop is in manual mode (see LpMode##).

OvScreen – Overview Display Screen 

Use: To select an overview screen for display configuration.

Selections: DCON_OVR screen; OVScreen; OVIEW__1 to OVIEW__9

Remarks: The number of overview screens selectable will be limited by the entry TotalOvr which is the number of Overview screens that will be displayed. The present display configuration of the selected screen will be displayed in the entry 'Format'.

PgBuild – Programmer Build 

Use: Opens window to define program parameters.

Selection: PROGRUN# screen, PgBuild

Remarks: Provides access to build setpoint programs.

PgFFwd## – Program Fast Forward 

Use: To enable program fast forward.

Selections: PROGRUN#; PgOption; Enable, Disable

Remarks: When enabled the program will execute at the speed set by WarpFctr.

PgMode## + Programmer Mode  

Use: Tagname to select Programmer Mode.

Selections: OVIEW__# or PROGRUN# screens; Run or Hold – Tagname

Remarks: Run places the programmer in run at the current point in the program. This is usually used after a program hold. Hold places the programmer in hold at the current point in the program. This field will display PG_END when the program runs to completion. This tagname can be changed on the GLOS_PRG screen. The tagname will be used throughout the unit.

PgNumber – Programmer Number 

Use: To select a Programmer for configuration.

Selections: CONF_PRG screen; Progmr01 to Progmr08

Remarks: This entry selects the Programmer for configuration.

PgOption – Programmer Options 

Use: Opens a window.

Selection: PROGRUN# screen; None

Remarks: Provides access to Time of Day start, Fast Forward, Abort and Remote Start.

PgSpt## + Programmed Setpoint  

Use: To display the programmed setpoint generated by the setpoint programmer.

Selections: OVIEW__# or PROGRUN# screens

Remarks: This setpoint is used by the control loop when the setpoint source is set to Programr. (See SptSrc##).

PID_Group – PID Group 

Use: To select the group of PID parameters that will be active in the currently accessed segment.

Selection: PROGRUN# screen; PgBuild; 1–5

Remarks: This entry is only valid if programmed PID groups has been selected (see PID_Type).

PID_Grp# + PID Group  

Use: To display the currently active PID group for control loop #.

Selections: PROGRUN# or LOOP__# screens; None

Remarks: One of the five PID groups is active at all times (see PID_Type).

PID_Grp – PID Group 

Use: To select the PID group to which the calculated PID parameters will be transferred.

Selections: LOOP_# screen; LpMode##; 1–5

Remarks: See PID_Type.

PID_Type – PID Type 

Use: To select the type and number of PID groups to be used by this control loop.

Selections: CONF_LOP screens; Single, Dual, Progmmed and SelAdapt.

Remarks: Single uses one set of PID values, group 1. Dual uses two sets of PID values, group 1 and group 2. Group 1 is active for a reverse acting output value and group 2 is active for a direct acting output value. This is normally used with bimodal control (see Cntl_Act). Progmmed uses up to five sets of PID values in conjunction with the setpoint programmer. When a setpoint program is developed PID groups can be selected on a per segment basis. SelAdapt uses up to five sets of PID values in conjunction with the process variable input value. Breakpoints are entered to identify regions for which a set of PID values will be active. When process input is between breakpoints the PID values are interpolated.

Power_DN – Power Down Time and Date 

Use: To display time and date of the last time the unit was powered down.

Selection: Unit screen

Remarks: None

Power_UP – Power Up Time and Date 

Use: To display time and date of the last time the unit was powered up.

Selection: Unit screen

Remarks: None

PrBias## + Profile Bias  

Use: To enter a control loop setpoint bias for loop ##.

Selection: Numeric

Remarks: The profile bias is summed with a programmed setpoint and then used by the control loop as its setpoint. This is accessed from the PGoption screen.

Prof_XX – Program Profile 

Use: To set the value to which the programmer will ramp the setpoint in the currently accessed segment.

Selections: PROGRUN# screen, PgBuild; Numeric

Remarks: This value is a setpoint for the adjoining control loop. The setpoint source must be set to programmer to be in effect. When the program is in hold the profile value may be manipulated by the operator.

Protocol – Communications Protocol 

Use: Selects the type of communications protocol.

Selections: 232_PORT or 422_PORT screens; Terminal or Network.

Remarks: Terminal protocol is used with RS-232. Network protocol is used with RS-422 and provides complete error detection and correction.

ProcVr## + Process Variable  

Use: Tagname for Process Variable of control loop ##.

Selections: OVIEW__# or PROGRUN screens; None

Remarks: Displays the current process input value for a control loop. This tagname can be changed on the GLOS_LOP screen. The tagname will be used throughout the unit.

ProgmrNm – Programmer Number 

Use: To select a programmer for display configuration.

Selections: DCON_PRG screen; Progmr01 to Progmr08

Remarks: The entries on the DCON_PRG screen are used to configure the profile displays of the PROGRUN screens.

ProgName – Program Name 

Use: To select a program name to change.

Selection: GLOS_PRG screen; Tagname

Remarks: The program names (tagnames) can be changed at this entry. When this entry is selected a window opens to allow access to all 8 program names.

PStatSrc – Programmer Status Source 

Use: This field is to select how the programmer will be switched from run to hold.

Selections: CONF_PRG screen; OperRH_1–OperRH_4
RemCl 1–8
OR_set 1–4
NORset 1–4
ANDset 1–4
NANDset 1–4

Remarks: The OperRH_1–OperRH_4 selections correspond with the switching from Auto to Manual (or vise versa) through the Operator Interface. The selection of OperRH_1 would place the programmer in HOLD when PgMode01 was selected to HOLD and the programmer would go into RUN when the LpMode01 was selected to RUN. LpMode01 can be found under the PROGRUN1 screen. OR/NOR/AND/NAND selections correspond with the switching from RUN to HOLD (or vise versa) through a logic function. Thus the programmer mode could be switched when an alarm condition occurred, or an opensensor, or a contact input, or even all three. A latched alarm would cause the loop to remain in HOLD until that alarm was acknowledge. An unlatched alarm would revert to the RUN mode as soon as the alarm condition went away. The alarm logic can be switch if a low alarm is used instead of a high alarm. Using a contact input through the logic sets, cause the logic of the contact input to be inverted. One application would be if all four programmer are to be synchronized together, a guaranteed soak could be achieved by using deviation alarms. If the DV_Alarm was used in a ANDset2 and all the programmer had their programmer status source tied to ANDset2, then when any loop had an deviation alarm, all four programmers would be placed in hold until that alarm condition went away. RemCl 1–8 selections correspond with the switching from RUN to HOLD (or vise versa) through a contact input. If all four loops have their Pg Mode selected to be the same source, then all four loops would switch from RUN to HOLD at the same time.

PVsource – Process Variable Source 

Use: To select a source to be used for the process variable.

Selections: CONF_LOP screen; AnlgIn01–AnlgIn06
AnaIn1_2
AnaIn3_4
AnaIn5–6
Calc___1
Calc___2
RH1
RH2

Remarks: There are four different types of inputs that can be used as the process variable. The first is an analog input, next is an option to use inputs 1 and 2, 3 and 4, or 5 and 6, third is a calculated input, and fourth is a wet bulb/dry bulb calculation of RH. In every case the PV can be digitally filtered. The amount of filtering is set by entering a filter constant. A filter constant of 0 means no filtering. If AnlgIn01 is selected, then the first analog input on analog card one is use as the

process variable for that loop. If AnaIn1_2 is selected, then analog input 1 is used for the PV until it burns out. In that condition, analog input 2 takes over. If both inputs are burned out, then an open sensor condition is in effect. If Calc__1 is selected, then the process variable is derived from the following equation: PV =(IN1*Mtlpler1 + IN2*Mltpler2 + IN3*Mltpler3 + IN4*Mltpler4)/ Scale where –IN1 – IN4 = analog input 1 – 4–Mltpler1 Mltpler4 = constant 1 – 4- Scale = a constant. Be sure to note decimal alignments and not to exceed the maximum values of 32767 to –32767 (no decimal points). If RH is selected, then the process variable is a calculation of the relative humidity based on a dry bulb/wet bulb criteria. The Dry bulb can be any of the four analog inputs or any of the four setpoints. The Wet bulb can be any of the four analog inputs. The default selections are Dry bulb = analog input 1 and Wet bulb = analog input 2. The RH calculation also used atmospheric pressure. The atmospheric pressure can be set from 0.7 to 1.2 with 1.0 = sea level.

Rate__## + Control Loop PID Rate  

Use: To set PID rate for control loop ##.

Selection: LOOP_# screen; LpMode##; RemSPsrc; 0.00 (off) to 200.00

Remarks: The rate factor is used to anticipate and correct for the process lag and adjust the output to avoid over shoot. The feect of Rate on the control loop output can be calculated by the following formula:

$$\text{Output \%} = \text{Rate} \times \frac{\text{PV \% Current} - \text{PV \% Last}}{\text{Minutes between PV current and PV Last}}$$

Ratio## + Cascade Ratio Factor  

Use: To apply a multiplier to the cascade setpoint.

Selection: CONF_LOP screen; Numeric

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc). The Cascade multiplier applies a multiplication factor to the output of the primary control loop before it is used as a setpoint by the secondary control loop. The formula used is [(Primary control loop output * Ratio##) + (Primary control loop setpoint * Blend_##)] / Scale_## = Secondary control loop setpoint.

READ – Read from Memory Card Function 

Use: To initiate reading a file from a memory card

Selections: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC

Recipes – Memory Card Recipe File Type 

Use: To read, write or delete recipe file types.

Selections: UNIT screen; Mem_Card; FUNC

Remarks: See FILE

Recycles – Recycles 

Use: To set the number of times a portion of the program will be repeated.

Selections: PROGRUN# screen; PgBuild; 0–255

Remarks: An entry of 0 indicates no recycling. Any other entry will cause the program to continue executing a looping series of segments for the numbers set for recycle. After the number of recycles is completed the programmer will increment to the next sequential segment.

REF= – Reference Marker 

Use: To move Reference marker on XYCHARTs.

Selection: OVIEW_XX; Numeric

Remarks: The Reference marker on the right side of the vertical axis is a means to get a more accurate reading of the XYCHART trends.

RemSegXX + Remote Start Segment  

Use: To access the starting segment to be used when a remote start is initiated.

Selections: CONF_PRG screen; RemStart; Run Start; 1 to 255 (option to 749).

Remarks: See RemStart.

RemSPsrc – Remote Setpoint Source 

Use: To select a source to be used for the setpoint when the setpoint source (SptSrc##) is set to the remote mode.

Selections: CONF_LOP screen; AnlgIn01–AnlgIn06, Program1–Program4, OutputL1–OutputL4, SetPnt1–SetPnt4.

Remarks: There are three different types of inputs that can be used as the remote setpoint source; analog inputs, programmer profile outputs, or control loop outputs. One reason for using analog inputs for the remote setpoint source could be to use an external potentiometer to manual setpoint the Dimension II. Programmer profile outputs can be used to synchronize loops that are running the same profile. Control loop outputs are used for a cascade configuration. When using cascade in the Dimension II, the control loop output needs to be multiplied by a ratio to conform to the proper input limits. For example if the furnace temperature runs from 0 to 1300°C then the ratio should be –13. (full scale reverse output) * (ratio) = Remote Setpoint (–100%) * (–13) = 1300. When using Blended cascade, the setpoint of the first loop is multiplied by a blend factor and this is added to the output * the ratio. (BlndFctr) * (SP Loop 1) + (RevOutput) * (ratio) = Remote Setpoint. In this case if the BlndFctr is set to 0. 2 and the Maximum setpoint for Loop 1 is 1000°C then the Ratio should be set to –11. (0.2) (1000°C max) + (–100%) (–11) = 1300.

Remote Setpoint – RemStart 

Use: This field is used to select the source for starting a programmer from a remote source.

Selections: CONF_PRG screen; RmStrt01–RmStrt04, OR_set 1–4, NORset 1–4, ANDset 1–4, NANDset 1–4, RemCl 1–8

Remarks: See OPStart

Reset_## + Control Loop PID Reset 

Use: To set PID Reset for control loop ##.

Selection: LpModexx; 0.00 (off) to 300.00

Remarks: The reset factor is used to correct for process losses. Reset adds or subtracts from the control loop output. The effect of Reset can be calculated by the following equation:

Output % = Reset x Elapsed Time in minutes x Deviation/Input span.

RespTyp# – Auto Tune Response Type 

Use: To select the type of control loop response when Auto Tuning is calculating PID parameters.

Selections: LpModeXX; AutoTune; SetParms; Slow, Medium, Fast

Remarks: A Slow setting will have no overshoot and will take the longest to respond to a disturbance. A Medium setting will have little or no overshoot, but will take longer to respond. A Fast setting will respond to a disturbance as quickly as possible with some overshoot.

Retrnsmt – Retransmit 

Use: To select a source that will be retransmitted by an analog output.

Selections: CONF_LOP; AnlgIn01–AnlgIn06, AnaIn1_2, AnaIn3_4, AnaIn 5_6, Calc__1, Calc__2, Calc__3, Calc__4, RH, SetPntL1–SetPntL4, Program1–Program8

Remarks: The setup on this window refers to the selection of Retrans1–Retrans4 on the output configuration screen (CONF_OUT). Setting up the Retrnsmt for loop 2 corresponds to the Retrans2 on the output configuration screen. When retransmitting a value that has limits other than 0.00 to 100.00 the zero and the span of the analog outputs should be adjusted to match those new limits.

RevOut_# + Control Loop Reverse Output  

Use: To access the control loop reverse output value for loop #.

Selections: OVIEW__# or LOOP__# screens; LpMode##; 0.0% to 100.0%

Remarks: This field is only changable when the control loop is in manaul mode (see LpMode##). A reverse output is usually used for heating.

RmCOut## – Contact Outputs 

Use: Tagnames to display the state of contact outputs.

Selection: LOGIC_2 screen; None

Remarks: Tagnames are configured in the glossary.

Scale_## + Cascade Scale Factor  

Use: To apply a scaling factor to a cascaded setpoint.

Selection: Numeric

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc, page 4-14). The formula used is [(Primary control loop setpoint * Ratio_##)] / Scale_## = Secondary control loop setpoint. (The Blend_## parameter should be set to zero for cascade control.)

Segment – Program Segment 

Use: To select the program segment to edit or review.

Selections: PROGRUN# screen; PgBuild; 1–255 (option to 749)

Remarks: None

Seg_Time – Segment Time 

Use: To set the time duration of the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; HH:MM:SS (Hours:Minutes:Seconds)

Remarks: Segment time is selectable from one second to 99 hours.

SelcFunc – Select Functions 

Use: On the INPUTS screen to calibrate all types of inputs or to configure scaling and engineering units for linear inputs. On the ANA_OUTS screen to calibrate analog outputs or configure the zero and span of analog outputs.

Selections: ANA_OUTS screen or INPUTS screen; Calibrat or Configur

Remarks: Opens window for calibration or configuration. If selecting Calibrat see calibration section for instructions. On the INPUTS screen selecting Configur will open a window which allows setting the limits for linear zero (Lin_Zero), linear span (Lin_Span) and linear decimal point position (Lin_Decp). A three character engineering unit's mnemonic may also be selected. These parameters affect linear input ranges ONLY! On the ANA_OUTS screen selecting Configur will open a window which allows setting the zero and span. See calibration instructions for more information.

Set – Set Backlighting Mode 

Use: To select the backlighting mode.

Selections: Backlite; On, Off or Cycle

Remarks: Cycle causes the backlighting to turn on at the time set for On and off at the time set for Off. See Backlite

Control Loop Setpoint + SetPnt## 

Use: Tagname for control loop Setpoint for loop ##.

Selections: OVIEW__# screens and LOOP XX screens; Numeric Tagname

Remarks: Setpoint value to which the control will control. The setpoint is setable by this field when the setpoint source (SptSrc) is set to Operator. This tagname can be changed on the GLOS_LOP screen. The tagname will be used throughout the unit.

Span – Output Span 

Use: Displays the span (maximum) value of an output.

Selections: INPUTS or ANA_OUTS screen; SelecFunc; Calibrate; Numeric

Remarks: See calibration instructions for setup information.

SptSrc## + Control Loop Setpoint Source 

Use: To select the source of the setpoint for a control loop.

Selections: LOOP__## screen; LpMode##; Operator, Programr, Remote

Remarks: When set to Operator, the setpoint is entered by the operator. When set to Programr, the setpoint is generated by the setpoint programmer. When set to Remote, the setpoint comes from a source defined in control loop configuration (see RemSpsrc).

Start_Seg – Programmer Starting Segment 

Use: To select a starting segment.

Selections: PROGRUN# screen; PgBuild; 1–255

Remarks: Selects the segment number at which the programmer will start running when a program start is performed.

StopBits – Communications Stop Bits 

Use: To select the number of stop bits.

Selections: 232_PORT or 422_PORT; 1 or 2

Remarks: Select to match your computer. The most common selection is 1 stop bit.

StrtPgr# – Start Programmer 

Use: To start a program running.

Selections: PROGRUN# screen; opens a window – Tagname

Remarks: Opens a window to select a starting segment and/or a program name. The programmer can be started by selecting Start.

Sys_Mode – System Mode 

Use: To display and set the system power up mode.

Selections: UNIT screen; WarmStrt or ColdStrt

Remarks: This parameter is changeable only on the UNIT_CNF screen. WarmStrt will warm start the unit on power up restoring all parameters at the time of power down. ColdStrt will cold start the unit on power up clearing memory but saving Analog I/O calibration and configuration.

T_Into## + Time Into Program 

Use: To display the total elapsed time of the currently running program.

Selection: PROG_RUN# screen; None

Remarks: None

T_Left## + Time Left in Program 

Use: To display the time remaining in the currently running setpoint program.

Selection: PROG_RUN# screen; None

Remarks: None

T_Seg## + Time Left in Segment 

Use: Tagname for time left in current segment of the setpoint programmer.

Selection: PROG_RUN# or OVIEW__# screens; Display only Tagname.

Remarks: Time left in the current segment. Time is displayed as Hours:Minutes:Seconds. This tagname can be changed on the GLOS_PRG screen. The tagname will be used throughout the unit.

TextEnty – Text Entry 

Use: To enter text selections for display configuration.

Selections: DCON_LOG screen; TEXT, opens a window

Remarks: This entry opens a window which allows the user to select an Event or Contact I/O for display for each line of a selected Logic screen. Up to 12 items may be selected for each logic screen.

TimeODay – Time of Day 

Use: To enter Time of Day.

Selections: UNIT screen; Hours:Minutes:Seconds (HH:MM:SS)

Remarks: The time is entered and displayed in a 24 hour format.

TODSEn## – Time of Day Start Enable 

Use: To enable a programmer time of day start.

Selections: PROG_RUN# screen; PgOption; Enable, Disable

Remarks: When set to Enable will start program running from the start segment (TOD_Sseg) at the time and day identified by TODStrt and DOWStrt.

TOD_Sseg – Time of Day Starting Segment 

Use: To set the program starting segment when a time of day start occurs.

Selections: PROG_RUN# screen; PgOption; 1–255 (option to 749)

Remarks: None

TODStrt# – Time of Day Start 

Use: To set the time of day at which a programmer will start.

Selections: PROG_RUN# screen; PgOption; HH:MM:SS (Hours:Minutes:Seconds)

Remarks: TIme is set in standard 24 hour format. TOD_Strt must be set to Enable (see TOD_Strt).

TotalOvr – Total Number of Overview Display Screens 

Use: To select the total number of Overview screens.

Selections: DCON_OVR screen; 1 to 9

Remarks: This entry along with all display configuration information can be saved on a memory card in the file type DspConf_. Display configuration information is also saved when WarmStrt is selected as Sys_Mode.

Tune – PID Tune 

Use: This field is used to setup auto-tuning parameters.

Selections: CONF_LOP screen; Reverse, Direct, Sample rate, Bump, PID group, Response speed

Remarks: Prior to starting auto-tuning, the following should be set up in the CONF_LOP display.

Output Action: Reverse or Direct. This determines which direction to bump the output.

RESPTIME determines the time it takes the process to stabilize after a step change in the output. This will determine the time auto-tune will take to evaluate the process and calculate PID parameters.

BUMP–1 to 100%: Determines the amount of output change to a process.
PIDGRP–1 TO 5: Determines which PID group is to receive the calculated PID parameters.

FAST/MEDIUM/SLOW: Determines the response speed of the closed loop system. A FAST setting will respond to a disturbance in the system as quickly as possible with some overshoot. A MEDIUM setting will have little or no overshoot, but will take longer to respond. A SLOW setting will have no overshoot and will take the longest to respond to the disturbance.
If a thermocouple is to be used that has a greater range than the capacity of the oven, the Input Low Limit and Input High Limit should be set to reflect the usable range of the oven. For Example if a J thermocouple is selected the low limit is –22.0°C and the High is 760.2°C. If the chamber can only reach a temperature of 200°C with the output full on, then the usable range is 0 to 200°C. Therefore, to provide the best control as possible, set the Input high Limit to 200.0°C and the low limit to 0.0°C. Before starting the Auto-tune function, the process should be stabilize at some non-zero condition. For example, set the reverse output to 5% and let the PV stabilize.

TuneAct# – Auto Tuning Action 

Use: To select reverse or direct tuning action.

Selections: LpMode##; AutoTune; SetParms; Reverse, Direct

Remarks: Select reverse when tuning a reverse acting process such as a heating process. Select direct when tuning a direct acting process such as a cooling process.

TuneErr# – Auto Tuning Error 

Use: To indicate an error has occurred when auto tuning.

Selections: LOOP_# screen; LpMode##; Autotune; SetParms; None

Remarks: Error code number will appear, press help for explanation of error.

UNIT – Unit Screen Title 

Use: Screen title tagname.

Selection: GLOS_SYS screen; No selection.

Remarks: This screen is the default screen upon power-up. The tagname can be changed on the GLOS_SYS screen.

WarmStrt – Warm Start Power Up Mode 

Use: To select warm start power up mode.

Selection: UNIT CONF screen; Sys_Mode

Remarks: See Sys_Mode.

WarpFctr – Warp Factor 

Use: Determines the speed at which the programmer will execute when fast forward is enabled.

Selection: CONF_PRG screen; 1–1000

Remarks: If 2 is selected, the program will run at twice its normal rate (see FwdEnSrc).

WRITE – Write to Memory Card Function 

Use: To initiate writing a file to a memory card.

Selections: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC

Xon/Xoff – Xon and Xoff 

Use: To select X-on/X-off software handshaking.

Selections: 232_PORT or 422_PORT screen; Enable or Disable

Remarks: Set to match your computer.

Zero – Output Zero 

Use: Displays the zero (minimum) value of an output.

Selection: ANA_OUTS screen; Numeric

Remarks: See calibration instructions for setup information.

Zoom – Profile Zoom  

Use: Zoom factor on Profile displays.

Selection: DCON_PRG screen; 1 to 3600

Remarks: The zoom factor alters the time base for the profile display. It can be thought of as the number of seconds per pixel on the display. For example if the segment time equals 10 minutes (600 seconds) then with a zoom factor of 60, the segment would have a horizontal length of 10 pixels, or 60 seconds per pixel (zoom factor = 60).

Notes

Appendix
B

Serial Communications

Appendix B

Serial Communications

This appendix explains how to communicate with Dimension II Series 8705, 8725 controllers, via an RS-232 or RS-422 serial link, from a terminal or host computer. All parameters needed for terminal or network mode communications are described.

Communications Overview

Serial communications capability is available to link Dimension II units with a terminal or a host computer. The following topics are discussed in this appendix:

- ***Communication types***
- ***Data access methods***

Communication types refer to handshaking techniques that permit communication to occur. Data access refers to the methods by which Dimension II data can be viewed or changed.

The two communication types available for Dimension II are:

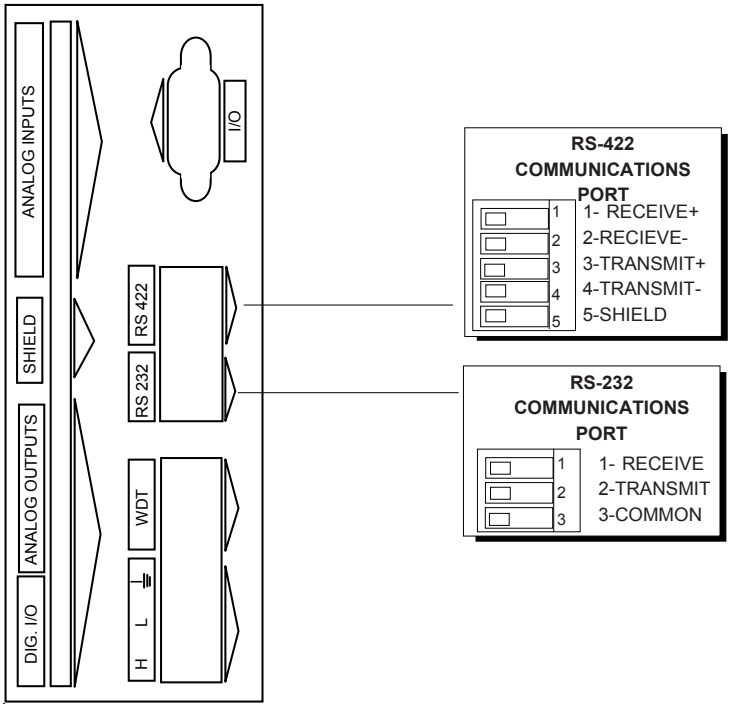
- ***Terminal mode***
- ***Network mode***

A selection for **Serial I/O** exists and is only used with the Dimension Custom Logic and Control (CLC) option. Use of the Serial I/O selection is described in the Dimension Custom Logic and Control manual.

In the terminal mode, a simple X-on/off handshaking procedure may, at the user's option, be used for data transfer. If used, this handshaking is enabled and disabled on a dedicated Dimension II communications screen. In the network mode (also called Data Link Control, or DLC), data is transferred in blocks, and ASCII control characters are used to regulate data flow.

Important: Network mode may be used only with a host computer. Terminal mode can be used by either a host computer or a terminal.

RS-422/RS-232 Communications



RS-422 Communications Port

This (4-pin for 8705, 6-pin for 8725) terminal block connector can be used to connect Dimension II to a supervisory PC. Dimension II communication functions are described in Appendix B.

RS-232 Communcations Port

This digitial communications (3-pin for 8705,9 pin for 8725) terminal block connector port can be used for general-purpose RS-232 point-to-point communications. Dimension II communications functions are described in Appendix B.

Shield Connection

Note: *The following shield connection procedure is recommended for typical Dimension II applications. However, different connection procedures may be required in order to match a particular operating environment or host computer.*

Use of the **SHIELD** connection minimizes pickup of electrical noise by the communications wiring.

The communications cable used for **RS-422** connections should include a metal sheath. This metal sheath is called the "shield." The shield surrounds the communications wires to keep out electrical interference.

In most cases, the shield functions best if DC current flow in the shield is blocked and AC voltages are effectively drained to ground. This is best achieved as follows:

1. To block DC current in the shield, connect the shield directly to chassis ground at the host computer and nowhere else.
2. To drain AC voltages to ground, connect the shield to the **SHIELD** terminal, which is connected to chassis ground through a capacitor (see Fig. B–4).
3. In a distributed network, connect the cable shield to chassis ground of the host computer and to the **SHIELD** terminal of each Dimension II.

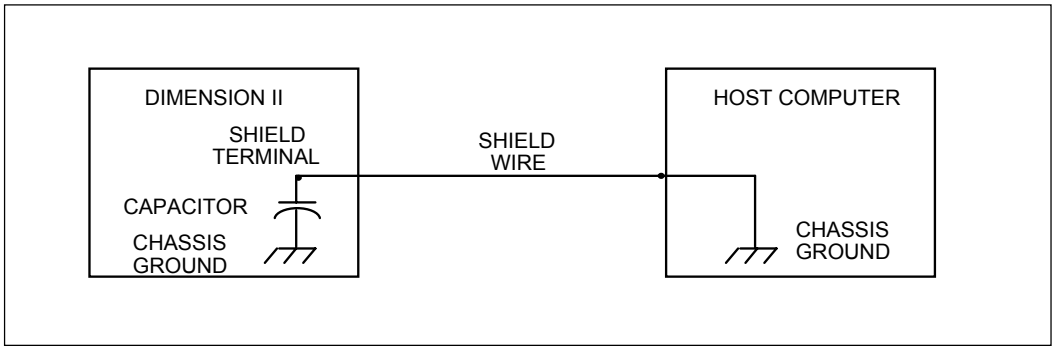


Fig. B–2.
SHIELD terminal wiring diagram

TA088002-001

Terminal Mode

Terminal mode is a simple handshaking technique that, at the user's option, allows a terminal or a host computer to control the data flow from Dimension II by using two ASCII control characters: X-on and X-off. Table B–1 illustrates different methods of documenting these control characters.

Table B–1. Dimension X-on/X-off Control Characters

Type	X-on	X-off
ASCII Name	DC1	DC3
HEX Number	11	13
Decimal Number	17	19

When Dimension II receives an X-off character, it stops transmitting characters through the communication port. The controller remains in this state until it receives an X-on character, at which time it resumes transmission.

The X-on/off characters are the only special control characters used for terminal mode communication. A station address or checksum is not required.

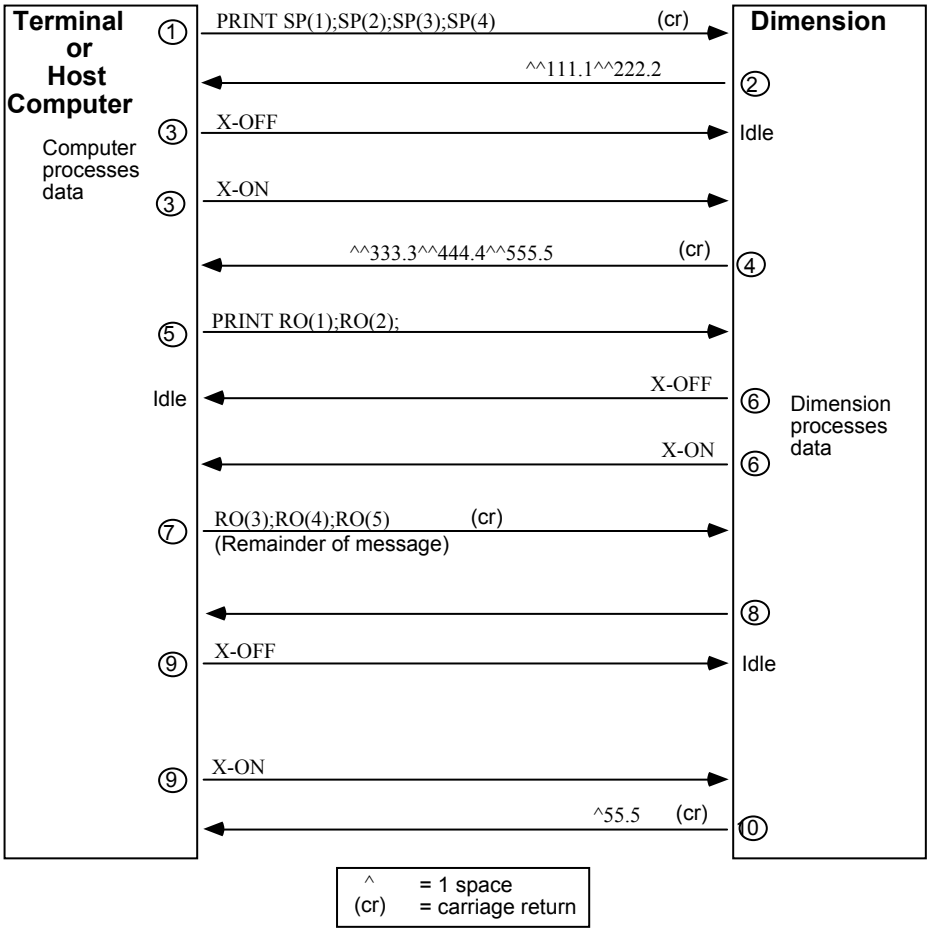
When a computer terminal is connected to Dimension II and is set for terminal mode, the X-on character is usually **Control Q** (press the **Control** key and then, while holding down the **Control** key, also press **Q**). The X-off character is usually **Control S** (press the **Control** key and, while holding down the **Control** key, also press **S**). Under most circumstances, a terminal does not need a software driver because most terminals have built-in X-on/off communications. **Control S** and **Control Q** are the only two control characters that are needed once the terminal is connected to the controller.

Fig. B–5 illustrates the communication sequence for a message exchanged using X-on/off communications.

Software Drivers

Most host computers have terminal drivers that support X-on/off. If not, the Network Mode topic on page B-9 contains the information needed to write a software driver using the network mode.

Fig. B–3.
Terminal Mode (X-on/off) Communications Sequences



Error Checking

Terminal mode does not use error checking. The terminal or computer assumes that data is valid even if an error occurs during transmission. Error codes, however, are generated by Dimension II for items such as syntax errors and number errors. (See Error Messages in this appendix.)

TA088002-001

Setting Up the Terminal Mode

Set up Dimension II terminal mode as follows:

1. With the unit in the "FULL" access mode, use the diamond key to access the Communications Configuration screen shown in Fig. B–6.
2. Use the diamond key to select the **232_Port** Configuration screen for RS-232 communications or **422_Port** Configuration screen for RS-422 communications.

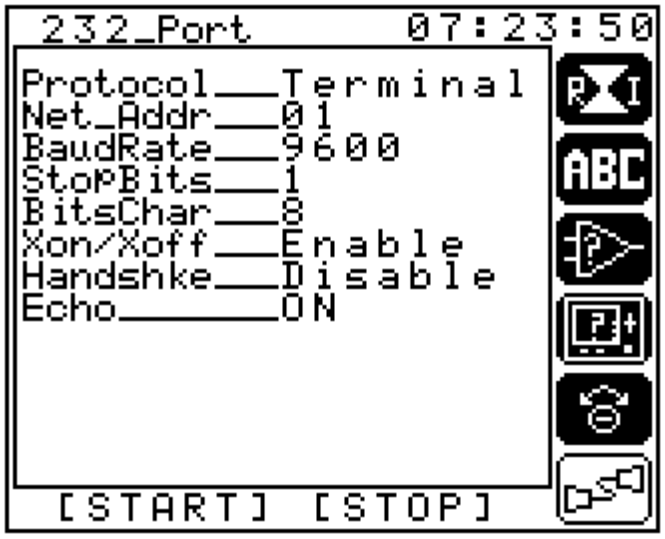


Fig. B–4. Communications Configuration Screen.

3. Use the knob to select the PROTOCOL field.
4. Select TERMINAL mode (no error checking).
5. Ignore the network address setting (network mode only), but set all other variables on the Communications Configuration screen to match the configuration of the terminal or host computer.

> **Important:** When the echo mode is enabled, all characters sent to the controller except X-on/off are immediately sent back to the terminal or computer. When using terminal mode, select the echo mode for terminals but not for computers.

6. Hardware handshake is not supported with Dimension II. Set this parameter to DISABLE.
7. With the controller set for WARMSTRT, remove AC power from Dimension II.
8. Check that the host computer or terminal is powered up and electrically connected to the controller.

9. Apply AC power to the controller. The controller performs its startup routines, after which the terminal or host computer displays:

```
Dimension II terminal mode v3.0
(c) 1993 Research Inc.
```

Note: *If there is no response on your terminal or host computer following step 9, it is possible that the settings given do not work with your application. Try other baud rates and settings, making sure that the settings on the Dimension II Communications Setup screen are also set on your terminal or computer.*

Test the terminal mode by entering the following message at the terminal or computer keyboard:

```
PR TD
```
(press **ENTER** or **RETURN**)

Response: `13:47:03` (current time)

If an error number appears rather than a number as a response to the command, refer to table B–5 in this appendix to identify the error that occurred.

Terminal Mode Data Access

Once the terminal mode is established on Dimension II, the system variable data access method can be used as described under SYSTEM VARIABLE DATA ACCESS in this appendix.

Network Mode

Network mode (DLC) is a more advanced communication protocol intended for use with a host computer. This mode defines the sequence and format for communication with Dimension II and consists of request and response messages, which are framed by control characters. These messages are transmitted as an entire block. If equipped with a user-developed software driver that understands the selected protocol, the computer dictates when Dimension II transmits blocks of characters. Communication is always initiated by the computer; at no time can Dimension II transmit unless the host computer requests data to be transmitted.

Software Driver

When using a host computer in the network mode, a software driver must be running on the host computer. The following topics explain how the protocol operates, and this information can be used to write a software communications driver for a host computer. Host software products are also available from Research, Inc.

Setting Up the Network Mode

Set up Dimension II network mode as follows:

1. With the unit in the "FULL" access mode, use the diamond key to access the Communications Configuration screen shown in Fig. B–6.
2. Use the diamond key to select the **232_Port** Configuration screen for RS-232 communications or **422_Port** Configuration screen for RS-422 communications.
3. Use the knob to select the PROTOCOL field.
4. Select NETWORK mode (error checking used).
5. Use the knob to select the NET_ADDR field.
6. Select a network address number (01–99) for the controller. (This address is used only with NETWORK selected and must be unique.)
7. Set other variables on the Communications Setup screen to match the configuration of the host computer. (Note that X–ON/OFF, Handshke and ECHO have no effect in the network mode.)
8. With the controller set for WARMSTRT, remove AC power from Dimension II.
9. Check that the host computer is powered up and electrically connected to Dimension II.
10. Connect AC power to Dimension II. No response is displayed in either the Dimension II or the host computer. Dimension II simply performs its normal startup routines.
11. To test whether the network mode is set up correctly, start your software driver or run the 'DRIVER' program found on the JumpStart II diskette:
    A. On your computer, change to the JUMPII directory.
    B. Type **'DRIVER' <CR>**.
    C. Select the COM port you are connected to.
    D. Select the station address.
    E. Select 2 seconds for Character Timeout.
    F. Set "caps lock" **ON** on your keyboard.
    G. At the Comnd: prompt, enter **PR TD** and press return.
    Response: XX:XX:XX the Time of Day
    H. Enter ! to end program or @ to start over.

If an error number appears rather than a number as a response to the command, refer to table B–5 in this appendix to identify the error that occurred.

Note: *If there is no response on your host computer following step 11, the settings given may not work with your application. Try other baud rates and settings, making sure that the settings on the Dimension II Communications Setup screen are also set to match your computer. Remember, the Dimension II AC power must be cycled off and on with the Dimension II in Warm Start for communications changes to take effect.*

Network Mode Request and Response Messages

Two types of messages are used with network mode protocol: request messages and response messages. The host computer initiates request messages; the controller answers with response messages. The controller always generates one message in response to a request message from the host computer. Both message types require ACK/NAK handshaking control characters for proper operation.

Network Mode Control Characters – Special handshaking control characters frame the messages between the computer and Dimension II. The five control characters used in Dimension II serial communication are:

STX (Start of TeXt: used to begin a request or response message)
ETX (End of TeXt: used to end a request or response message)
ENQ (ENQuiry: to prompt a response message from the controller)
ACK (ACKnowledge: to verify proper communication)
NAK (Not-AcKnowledge: to verify improper communication)

See table B–3 for the numeric equivalents of these characters.

Note: *Control characters may* NOT *be used in the station address or data field portions of a message.*

Network Mode Communication Sequence – Fig. B–7 illustrates the communication sequence for a message between a host computer and Dimension II. Each communication begins with the transmission of a request message from the computer to Dimension II, which then transmits either an ACK or a NAK control character back to the computer. An ACK confirms that the request message has been received without error. A NAK indicates that an error occurred and the request message should be retransmitted.

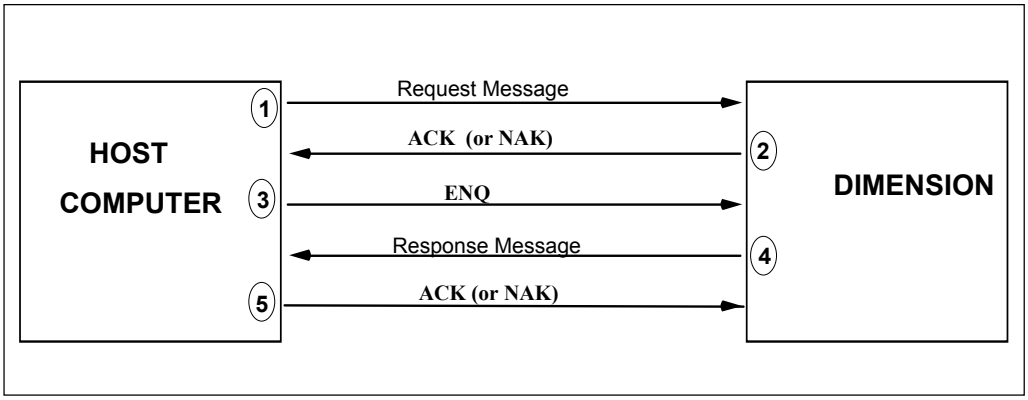


Fig. B–5.
Dimension II Serial Communications Message Sequence

Once the request from the computer has been acknowledged, the controller is ready to transmit the response message. To request the response, the computer transmits an ENQ control character, upon receipt of which the controller transmits the response message and then waits for an ACK or NAK from the computer. If the controller receives a NAK, it automatically retransmits its response message up to four times. After the fourth NAK, the controller enters an idle state, waiting for another STX.

Once a response message is received and acknowledged by the computer, Dimension II is ready to receive another request message.

Network Mode Request and Response Message Formats

Both request and response messages follow the same general format, as illustrated in Fig. B–8. The only difference is the structure of the data field. The following paragraphs explain in detail each element of the format.

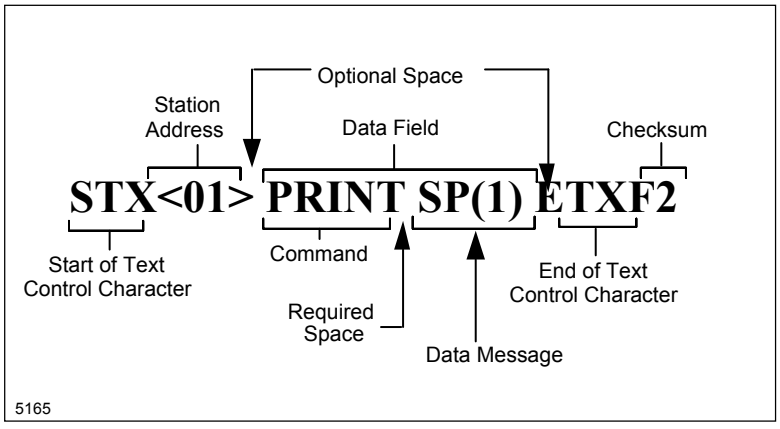


Fig. B–6.
Dimension II Serial Communications Request Message Format

In the example of a message format shown in Fig. B–8, the checksum (F2) is calculated with the two optional spaces. If one optional space were removed from the message, the checksum would be D2; if both optional spaces were removed, the checksum would be B2.

Start of Text – The STX control character begins any request or response message. If communication with the controller is interrupted, a new STX must be sent by the computer to reestablish communication. An STX at any time during communication cancels the communication in progress and begins a new message sequence.

Station Address – A station address must be included in all request and response messages. Station addresses must be enclosed by brackets and be two digits long, e.g. <01>, <09>, <14>, etc. Spaces are not allowed between STX and the station address.

The station address for each controller is set using the Dimension II Communications Setup screen NET_ADDR field. Valid addresses are 00 through 99, even though only 31 stations may be used by an RS-422 network at a time.

Request Message Data Field – A request message requires that a ***command*** and a ***data message*** follow the station address. The request message format requires a space between the command characters and the data message (e.g. between PRINT and SP(1) in Fig. B–8).

Commands – The command is one of the two elements in the request message data field (Fig. B–8). There are five valid commands: PRINT, LET, LI (LIST), STAG and CTAG. The command determines whether the data message will monitor (PRINT) a system variable, change (LET) a system variable, display (LIST) all permissible parameters, show a display tagname (STAG) for a system variable, or change a display tagname (CTAG) for a system variable. If a command is not specified, LET is assumed. The Dimension II will recognize the first two letters of PRINT, LET, and LIST, you can transmit LE for LET, PR for PRINT, or LI for LIST. However, STAG and CTAG cannot be abbreviated and LIST must be abbreviated. Also, a PRINT command may include comment text enclosed in quotes. Comment text will be returned in the response message. For example:

Request message:
PR "The Dimension II setpoint is"; SP(1)
Response message:
The Dimension II setpoint is 10.0

Data Message – The data message is one of the two elements in the data field and can be up to 120 characters long. The data message always begins with a system variable that identifies the type of information (setpoint, deviation, process variable, etc.) to be changed or monitored. Also, several system variables may be included in the same data message by separating the system variables with semicolons, e.g. SP(1); PV(2); DV(2). The process of linking two or more system variables together in this manner is referred to as concatenation.

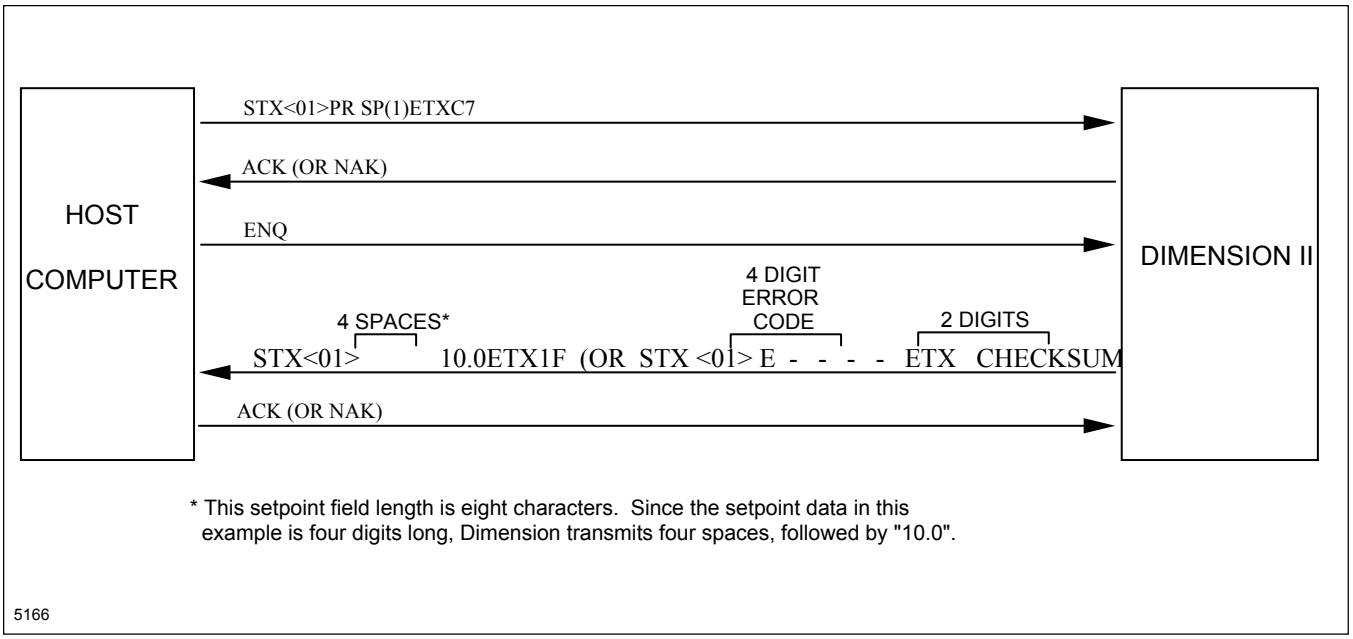
For a PRINT command, the data message consists of just the desired system variable(s) (see Fig. B–9). For example:

- To monitor the channel 2 setpoint: PR SP(2).
- To monitor the channel 2 setpoint and deviation: PR SP(2); DV(2).

The PRINT command can also include comment text enclosed in quotes and placed in front of the system variable(s). For example:

- PR "The Ch 2 setpoint is:"; SP(2)
- PR "Ch 2 is:";SP(2); "deviation 2 is:"; DV(2) (one continuous message)

Fig. B–7. Dimension II Serial Communications Message Format for a PRINT Command

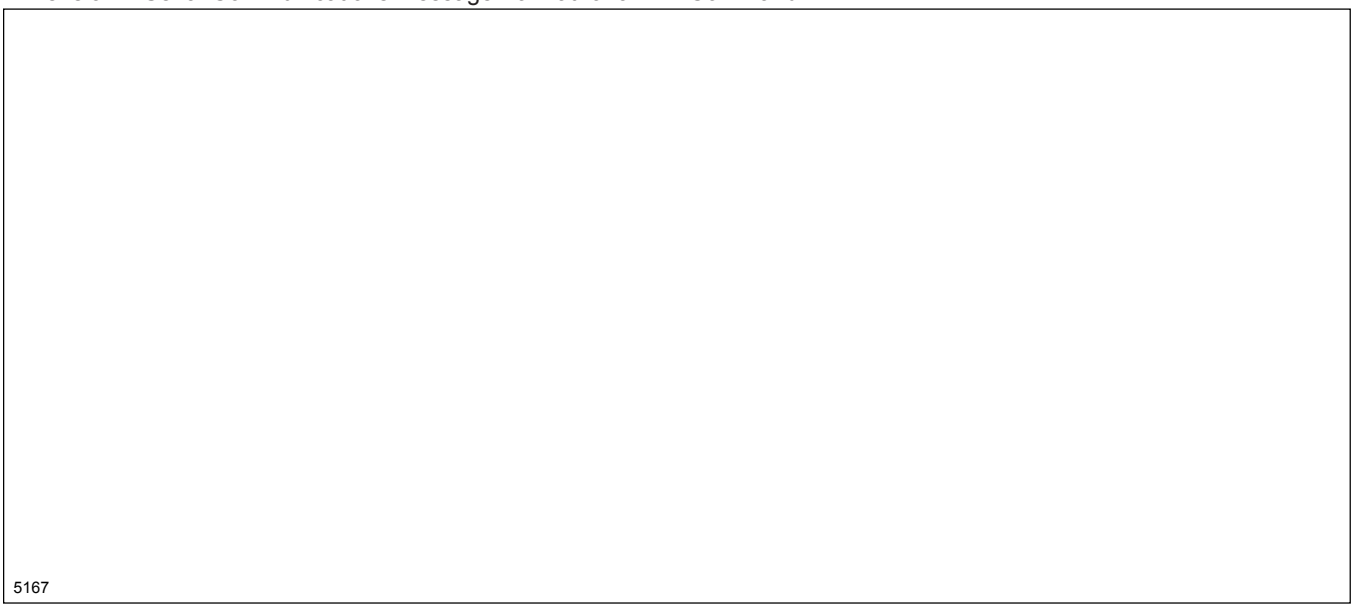


For a LET command, the data message contains the new system variable value, preceded by an equal sign and enclosed in single or double quotation marks (Fig. B–10). Note that a LET command cannot include comment text. For example, to enter a channel 2 setpoint of 59.6:

LE SP(2)=␣59.6␣

Note: *The LE is optional; see example below.*

Fig. B–8.
Dimension II Serial Communications Message Format for a LET Command.



To enter a setpoint of 60.5 for both channels:

SP(1)=␣60.5␣;SP(2)=␣60.5␣

Since no command is specified in this example, LET is assumed.

Response Message Data Field – The format of the response message is determined by the type of request message command. If the response message is replying to a LET or CTAG command, a pound sign (**#**) or ***error message*** follows the station address. If the response message is replying to a PRINT, LIST, or STAG command, either a data message or an error message follows the station address. There are no spaces in a response message except those required by a system variable field length, error message, or spaces in the comment text included by the user. The pound sign (**#**), data messages, and error messages are explained under System Variable Data Access in this appendix.

End of Text Control Character

The ETX control character ends all messages. A space between the data field and the ETX message is optional. A space may *not* be used between the ETX and the checksum (a space after ETX will be interpreted as being part of the checksum).

Checksum

To verify the accuracy of each transmission, a two-character checksum is included at the end of each request and response message. The checksum is based on the 8-bit binary sum of all characters from the STX to and including the ETX. The checksum characters are the two least significant hex digits in the sum. Table B–2 illustrates the checksum generation process.

Table B–2. Checksum Generation Example

Sample ASCII Message*:
STX<01> LET SP(1)="56.3" ETX97

MESSAGE CHARACTER	HEX EQUIVALENT	HEX RUNNING SUM
STX	02	02
<	3C	3E
0	30	6E
1	31	9F
>	3E	DD
SPACE	20	FD
L	4C	149
E	45	18E
T	54	1E2
SPACE	20	202
S	53	255
P	50	2A5
(	28	2CD
1	31	2FE
)	29	327
=	3D	364
"	22	386
5	35	3BB
6	36	3F1
.	2E	41F
3	33	452
"	22	474
SPACE	20	494
ETX	03	497
		97 (CHECKSUM)

* The first and last spaces and the **T** in **LET** are optional; they are included in this example only for clarity. The only space required is between **LET** and **SP(1)**. This example message could also be written:

STX<01>LE SP(1)="56.3"ETX03

Table B–3. ASCII Character Codes in Hexadecimal and Decimal

For information on hex-to-decimal and decimal-to-hex conversion, see table B–3.

Error Checking

The network mode contains a full set of error codes. Refer to table B–5 in this appendix for a listing and explanation of these codes.

Test Program

We have written the test program found in Fig. B–11 to test communications between a host computer and the Dimension II controller using Network mode. This is not a complete communication driver program. This program was

Fig. B–9.
Test Program

```
10 REM ****** FULL PROTOCOL COMMUNICATIONS TEST PROGRAM ******
20 OPEN "COM2:9600,N,8,1,RS,CS,DS" FOR RANDOM AS #1
30 CLS
40 PRINT #1, CHR$(2); "<01>SP(1)=□10'"; CHR$(3); "F1";
50 GOSUB 100
60 PRINT #1, CHR$(2); "<01>PR SP(1)"; CHR$(3); "C7";
70 GOSUB 100
80 CLOSE #1
90 END
100 A = TIMER + 2
110 IF LOC(1) > 0 GOTO 140
120 IF TIMER > A GOTO 300
130 GOTO 110
140 B$ = INPUT$(1, #1)
150 IF ASC(B$) = 6 THEN PRINT "ACK"
160 IF ASC(B$) = 6 THEN PRINT #1, CHR$(5);
170 IF ASC(B$) = 21 GOTO 250
180 IF ASC(B$) = 2 THEN PRINT "STX"
190 IF ASC(B$) = 3 GOTO 220
200 IF ASC(B$) > 6 THEN PRINT B$;
210 GOTO 100
220 PRINT "ETX";
230 PRINT INPUT$(2, #1)
240 RETURN
250 PRINT "CONTROLLER SENT CHECKSUM ERROR (NAK)"
260 RETURN
300 PRINT "NO RESPONSE FROM CONTROLLER"
310 RETURN
```

written using the Basic language and is compatible with QBASIC and GWBASIC.

The program changes loop 1 setpoint to 10 and then prints the setpoint. Correct output is displayed as follows:

```
ACK
STX
<01>#ETX03
ACK
STX
<01>.....10ETX01
```

Test Program output.

System Variable Data Access

Access to Dimension II parameters via terminal or network communciations is accomplished using "System Variables". A System Variable is a two or three character abbreviation which corresponds to a certain parameter in the Dimension II. In addition, many system variables take a numeric "subscript" surrounded by parentheses which specifies a specific member of a group of parameters. For example, the system variable for a setpoint is 'SP' and it takes a subscript which indicates the channel for which it is used. The full variable name would then be 'SP(x)' where x is a number from 1 to 8. Other system variables take no subscripts, and some take two. The System Variable Descriptions section of this appendix lists and describes all Dimension II system variables in alphabetical order.

System Variable Commands

There are five valid commands for accessing system variables:

PRINT – Read a system variable
LET – Write a system variable
LIST – Display possible values for a system variable
STAG – Show the Tagname of a system variable
CTAG – Change the Tagname of a system variable

The PRINT, LET and LIST commands may be shortened to just two letters (PR, LE, LI), but the STAG and CTAG commands may not be truncated. All commands must be in capital letters, and if a command is not specified, LET is assumed. Each command is explained further below.

PRINT Commands

When using a PRINT command, you may either print only the desired system variable(s) or you may print both text and the desired system variables.

The following two examples use a PRINT command consisting of only the desired system variable(s):

- To monitor the channel 2 setpoint: `PR SP(2)`
- To monitor the channel 2 setpoint and deviation: `PR SP(2);DV(2)`

The following two examples use a PRINT command with both text and the variables:

- `PR "The channel 2 setpoint is:";SP(2)`
- `PR "Setpoint 2 is:";SP(2); "Deviation 2 is:";DV(2)`

Response Message to a PRINT Command – When the response message is replying to a PRINT command, either a data message or an error message follows the station address. There are no spaces in a response message except those required by the system variable field length, error message, or spaces in comment text included by the user.

A response message contains the system variable information requested by a PRINT command. In addition, any comment text included in the request message will be returned in the response message.

Each system variable has a field length. Any unused characters in the field length are transmitted as spaces in the response message.

For example, the field length for the setpoint is eight characters. If the setpoint data requested is 10.0, the data response message would look like this:

```
^^^^10.0
```

where ^ = one space.

If the PRINT command is concatenated, the response data is also linked together. For example, the response data for setpoint (field length = 8), reverse output (field length = 8), loop status (field length = 1), and process variable (field length = 8) might look like this:

```
^^^^10.0^^^25.20A^^^35.63
```

If the PRINT command included text, the response data includes that text. For example, the response data for the message:

```
PR "The channel 2 setpoint is:";SP(2)
```

might look like this:

```
The channel 2 setpoint is:^^^^10.0
```

PRINT Request Error Messages – An error message indicates that the PRINT request message was unsuccessful. The error message is an `E` followed by a four-digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in table B–5 in this

appendix.

LET Commands

For a LET command, the data message contains the new system variable value, preceded by an equals sign and enclosed in single or double quotation marks. A LET command cannot include comment text. Two examples are:

To enter a channel 2 setpoint of 59.6:
LE SP(2)="59.6"

To enter a setpoint of 60.5 into both channels 1 and 2:
SP(1)="60.5";SP(2)="60.5"

Response Message to a LET Command – If the response message is replying to a LET command, either a pound sign (#) or an error message follows the station address. A # response indicates that Dimension II has correctly executed a LET command.

LET Request Error Message – An error message indicates that the LET request message was unsuccessful. The error message is an E, followed by a four digit number. The number identifies what was wrong with the request message, e.g. a syntax error. All error messages are listed in table B–5 in this appendix.

LIST Commands

The LIST command provides a useful "help" function that can be used during communications. To display all parameters (entries) on-screen that can be used with a PRINT or LET command (see table B–4), type LI followed by the 2- or 3-character system variable and the channel number in parentheses. The system will display all possible entries than can be used with the variable, capitalized correctly and separated by commas. For example, to list all parameters that can be used with the Loop Status system variable, type LI LS(1) and press **ENTER**. (This function works with system variables which have a finite number of possible settings.)

STAG Commands

The Tagname of a system variable is the label used on the Dimension II operator interface for that variable. For example, the default tagname for the setpoint of loop 1 is "SetPnt01". So PR SP(1) would read the value of the loop 1 setpoint, and STAG SP(1) would read the label used for the setpoint of loop 1. The STAG command is used to show the operator interface tagname used for a system variable. The data message contains the system variable abbreviation and a subscript if applicable. Multiple tagnames may be requested in a single command. The following examples show the use of the STAG command:

- To monitor the channel 1 process variable tagname: STAG PV(1)

Table B–4. System Variables

Code	Title	Access	Code	Title	Access
AB	Abort Enable	R,W,P	EU	Engineering Units	R,W,I
ACL	Access Level	R	EV	Event Outputs	R,*
ACP	Accept Input	R,W,L	FPC	Full Passcode	R,W
ACY	Analog Output Time-Proportioning Cycle Time	R,W,O	GAS	Global Alarm Status	R
			GN	Gain	R,W,L
AGP	Alarm Group	R,W,*	HH2	RS-232 Hardware Handshaking	R,W
AHY	Alarm Hysteresis	R,W,L	HH4	RS-422 Hardware Handshaking	R,W
AI	Analog Input	R,I	IAS	Input Alarm Status	R,I
AK	Alarm Acknowledge	W,L,I	IH	Input High Alarm	R,W,I
AL	Alarm Screen Titles	R,W,T,S	IHL	Input High Limit	R,W,I
ALL	All Input Range Names	R,*	IHY	Input Alarm Hysteresis	R,W,I
ALT	Alarm Latch	R,W,L	IL	Input Low Alarm	R,W,I
AO	Analog Output	R,O	ILL	Input Low Limit	R,W,I
AS	Alarm Status	R,L	ILT	Input Alarm Latch	R,W,I
ATD	Activate Time of Day Start	R,W,P	LG	Logic Screen Titles	R,W,T,S
BC2	RS-232 Bits/Character	R,W	LND	Linear Analog Input Decimal Position	R,W,I
BC4	RS-422 Bits/Character	R,W			
BD2	RS-232 Baud Rate	R,W	LNS	Linear Analog Input Span	R,W,I
BD4	RS-422 Baud Rate	R,W	LNZ	Linear Analog Input Zero	R,W,I
BEU	CLC Basic Engineering Units	R,W	LP	Loop Screen Titles	R,W,T,S
BF	Blend Factor	R,W,L	LPC	Limited Passcode	R,W
BHL	CLC Basic High Limit	R,W	LS	Loop Status	R,W,L
BLL	CLC Basic Low Limit	R,W	MC1	Macro Name #1	R,W,T
BLV	CLC Basic List Variable	R,W	MC2	Macro Name #2	R,W,T
BND	CLC Basic Number of Decimals	R,W	MI	Memory Image	R,W,*
BNV	CLC Basic Numeric Variable	R,W	MR	Manual Reset	R,W,L
BSV	CLC Basic String Variable	R,W	NA2	RS-232 Network Address	R,W
CAG	Current Alarm Group	R,L	NA4	RS-422 Network Address	R,W
CC	ReCycle Counter	R,P	NAI	Number of Analog Inputs	R
CCY	Contact Output Time-Proportioning Cycle Time	R,W,C	NAO	Number of Analog Outputs	R
			NCI	Number of Contact Inputs	R
CD	Calculated Rate	R,L	NCO	Number of Contact Outputs	R
CEV	Current Events	R,P	NL	Number of Loops	R
CI	Configuration Image	R,W,*	NM2	RS-232 Protocol	R,W
CIN	Contact In	R,C	NM4	RS-422 Protocol	R,W
CJ	Cold Junction Temperature	R,I	NP	Number of Programmers	R
CJE	Cold Junction Error	R,W,I	NS	Number of Segments	R,P
CM	Cascade Multiplier	R,W,L	NTP	Number of Time-Proportioning Outputs	R
CO	Contact Out	R,C			
CP	Calculated Gain	R,L	OA	Output Action	R,W,L
CPG	Current PID Group	R,L	OC	Output Change	R,W,L
CRS	Calculated Reset	R,L	OLS	Analog Output Linear Span	R,W,O
CS	Current Segment Number	R,P	OLZ	Analog Output Linear Zero	R,W,O
CSP	Current Span Reference	R,W,I	OT	Output	R,W,L
CZE	Current Input Zero	R,W,I	OV	Overview Screen Titles	R,W,T,S
DF	Digital Filter	R,W,I	P1	Programmer Profile 1 value	R,W,P
DH	Direct Output High Limit	R,W,L	P2	Programmer Profile 2 value	R,W,P
DL	Direct Output Low Limit	R,W,L	P3	Programmer Profile 3 value	R,W,P
DO	Direct Output (in percent)	R,W,L	P4	Programmer Profile 4 value	R,W,P
DOW	Day of Week Start	R,W,P	P5	Programmer Profile 5 value	R,W,P
DT	Date	R,W	P6	Programmer Profile 6 value	R,W,P
DV	Deviation	R,L	P7	Programmer Profile 7 value	R,W,P
EO2	RS-232 Echo Mode	R,W	P8	Programmer Profile 8 value	R,W,P
EO4	RS-422 Echo Mode	R,W	PDD	Power Down Date	R

Table B–4. System Variables (Con't)

Code	Title	Access	Code	Title	Access
PDT	Power Down Time	R	RT	Rate	R,W,L
PG	Programmer Screen Titles	R,W,T,S	SA	Setpoint Adjust	R,W,*
PID	PID Group	R,W,*	SB2	RS-232 Stop Bits	R,W
PS	Programmer Mode Status	R,W,P	SB4	RS-422 Stop Bits	R,W
PS1	Programmer Start Segment 1 (Remote Start)	R,W,P	SC	Scale	R,W,L
			SG	Segment Data	R,W,*
PS2	Programmer Start Segment 2 (Unused)	R,W,P	SMD	System Mode	R,W
			SP	Setpoint	R,W,L
PS3	Programmer Start Segment 3 (TOD Start)	R,W,P	SPS	Setpoint Source	R,W,L
			SR	Sampling Rate	R,W,L
PS4	Programmer Start Segment 4 (Operator Start)	R,W,P	SS	System Status	R,W
			SY	System Screen Title	R,W,T
PT	PID Type	R,W,L	TCY	Time-Proportioning Cycle Time	R,W,C
PUD	Power Up Date	R	TD	Time-of-Day (TOD)	R,W
PUT	Power Up Time	R	TDD	Tuning Complete	R,L
PV	Process Variable	R,L	TDS	Time of Day Start	R,W,P
QS2	RS-232 XON/XOFF Mode	R,W	TEN	Tuning Error Number	R,L
QS4	RS-422 XON/XOFF Mode	R,W	TER	Tuning Error	R,L
RH	Reverse Output High Limit	R,W,L	TL	Time Left in Segment (SEGtime)	R,P
RI	Recipe Image	R,W,*	TLP	Time Left in Program	R,P
RL	Reverse Output Low Limit	R,W,L	TP	Time into Program	R,P
RO	Reverse Output (in percent)	R,W,L	TS	Tuning Status	R,W,L
RS	Reset	R,W,L	TYP	Analog Input Type	R,W,I
RSD	Response Speed	R,W,L	UT	Engineering Units Type	R,W,I
RSS	Remote Start Segment	R,W,P			

Access Code Legend:

R – Read	I – Input Subscript
W – Write	P – Programmer Subscript
T – Tagnames Only	O – Output Subscript
S – Screen Subscript	C – Contact Subscript
L – Loop Subscript	* – Miscellaneous Subscript

- To monitor the channel 2 setpoint and process variable tagnames: STAG SP(2);PV(2)
- To monitor the first macro key title: STAG MC 1

Response Message to a STAG Command – When the response message is replying to a STAG command, either a data message or an error message follows the station address. There are no spaces in a response message except those included in the system variable tagname, or the error message. Each response message contains the tagnames requested with no separators, and each tagname has a length of 8 characters. The following examples are the responses to the command examples above:

- Command: STAG PV(1)
  Response: ProcVr01
- Command: STAG SP(2);PV(2)
  Response: SetPnt02ProcVr02
- Command: STAG MC 1
  Response: [START]^

where ^ = one space.

STAG Request Error Messages – An error message indicates that the STAG request message was unsuccessful. The error message is an E followed by a four digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in table B–5 in this appendix.

CTAG Commands

For a CTAG command, the data message contains the new system variable tagname, preceded by an equal sign and enclosed in single or double quotation marks. The new tagname MUST have a length of 8 characters. Some examples:

- To change the channel 1 process variable tagname:
  CTAG PV(1)="Tempratr"
- To change the channel 2 setpoint tagname:
  CTAG SP(2)"Target^^"
- To change the first macro key title: CTAG MC 1="RUN^^^^^"

where ^ = one space. New tagnames will appear on Dimension II operator interface screens as soon as a new screen is displayed.

Response Message to a CTAG Command – If the response message is replying to a CTAG command, either a pound sign (#) or an error message follows the station addresss. A # response indicates that the Dimension has correctly executed the CTAG command.

CTAG Request Error Message – An error message indicates that the CTAG request message was unsuccessful. The error message is an E followed by a

four digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in table B–5 in this appendix.

System Variable Descriptions

Table B–4 lists all Dimension II system variables that can be used for communications. The format and operation of all Dimension II system variables are described on the following pages. The variables are organized alphabetically by system variable code, e.g., AB, ACL, ACP, etc. The following information is provided for each system variable:

System variable code: a two- or three-letter abbreviation for each system variable. For example, SP is the code for the "setpoint" system variable.

System variable name: For example, "setpoint."

Purpose: A description of the typical use of the variable.

Use: Describes valid commands (PR, LE, STAG, CTAG), field length, format.

Remarks: Information for the operation and use of the variable. If the format is complex, additional format information is provided.

Examples: Illustrate commands using the variable in a request message and the subsequent response message. When necessary, additional explanations are provided.

Note: *The caret symbol (^) indicates the position of spaces in commands and responses. In LET and CTAG commands, spaces must be typed after an alphabetical entry so the total number of characters matches the field length. Spaces are not required for numeric entries.*

AB — Programmer Abort Enable

Purpose: To Enable or Disable programmer abort.

Use: PRINT format: PR AB(P), where P is programmer number
LET format:
LE AB(P)=␣Enable␣ – enables abort
LE AB(P)=␣Disable␣ – disables abort
Field length: 8

Remarks: Programmer number is 1 through 8. If an abort signal is sent to programmer P when it is running, it will immediately go to the abort segment (segment 0) if AB(P) is "Enable".

Examples: PRINT request: PR AB(1)

PRINT response: ␣Disable␣
LET request: LE AB(1)=␣Enable␣
LET response: #

ACL — Access Level

Purpose: To view controller security access (passcode) level.

Use: PRINT format: PR ACL
Field length: 8
Value: FULL, LIMITED, NONE

Remarks: Full access to all Operation and Configuration functions = FULL
Access to all Operation functions = LIMITED
View-only access to Operation screens = NONE

Examples: PRINT request: PR ACL
PRINT response: ^^^^FULL

ACP — Accept Input

Purpose: To view or change the status (accept, reject) of calculated PID autotuning parameters.

Use: PRINT format: PR ACP(L), where L is loop number.
LET format: LE ACP(L)=␣x␣, where L is loop number, x is accept/reject status.
Field length: 8
Value: Yes, No

Remarks: Accept autotuning parameters = Yes
Reject autotuning parameters = No

Examples: PRINT request: PR ACP(1)
PRINT response: Yes^^^^^
LET request: LE ACP(1)=␣No␣
LET response: #

ACY — Analog Output Time-Proportioning Cycle Time

Purpose: To view or change the cycle time of an analog output that has been configured, via jumpers, to function as a time-proportioned output.

Use: PRINT format: PR ACY(L), where L is loop number.
LET format: LE ACY(L)=␣XXX␣, where L is loop number, XXX is number of seconds.
Field length: 3
Value: XXX (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned analog output). Range is 1 to 255 seconds.

Examples: PRINT request: PR ACY(1)

PRINT response: 000
LET request: LE ACY(1)=␂10␃
LET response: #

AGP — Alarm Group

Purpose: To view or change the settings of an entire alarm group.

Use: PRINT format: PR AGP(L,G), where L is loop number and G is group number.
LET format: LE AGP(L,G)=␂A,B,C,D,E,F,G,H␃ where L is loop, G is group , and

A is Hi Hi Process Variable alarm limit
B is Lo Lo Process Variable alarm limit
C is Hi Process Variable alarm limit
D is Lo Process Variable alarm limit
E is Hi Hi Deviation alarm limit
F is Lo Lo Deviation alarm limit
G is Hi Deviation alarm limit
H is Lo Deviation alarm limit

Field length: 71

Remarks: Each Dimension II control loop has five groups of values available to determine HiHiPvLmt, HiPvLmt, LoLoPvLmt, LoPvLmt, HiHiDevLmt, HiDevLmt, LoLoDevLmt, and LoDevLmt (group range is 1 to 5).

When changing those values, all eight positions must have a number even if all the numbers are the same value.

Examples: PRINT request: PR AGP(1,1)
PRINT response:
^^3276.7,^-3276.7,^^3276.7,^-3276.7,
^^3276.7,^-3276.7,^^3276.7,^-3276.7
LET request: LE AGP(1)=␂300,0,200,10,10,10,5,5␃
LET response: #

AHY — Alarm Hysteresis

Purpose: To view or change the hysteresis values of a Loop alarm.

Use: PRINT format: PR AHY(L), where L is loop number.

LET format: LE AHY(L)=␂A,B,C,D␃

Where: A is Hi Hi & Lo Lo PV alarm hysteresis value
B is Hi & Lo PV alarm hysteresis value
C is Hi Hi & Lo Lo Deviation alarm hysteresis value
D is Hi & Lo Deviation alarm hysteresis value

Field length: 35

Remarks: Hysteresis range for loop alarms is equal to the input range in use. All four values must be specified in a LET command.

Examples: PRINT request: PR AHY(1)
PRINT response: ^^^^10.0,^^^^^0.0,^^^^^0.0,^^^^^0.0

LET request: LE AHY(1)=␣5,5,2,2␣
LET response: #

AI — Analog Input

Purpose: To view the current value of an analog input.

Use: PRINT format: PR AI(I), where I is analog input number.
Field length: 8
Value: XXXXXX.X (analog input value)

Examples: PRINT request: PR AI(1)
PRINT response: ^^^^21.0

AK — Alarm Acknowledge

Purpose: This is a write-only parameter which acknowledges loop or analog input alarms.

Use: LET format: LE AK(X)=␣A␣ where X is a loop or input number
Field length: 8

Remarks: If desired, use alarm status (AS) to view current alarms for a loop, or input alarm status (IAS) to view alarms for an analog input. AK(X) will acknowledge all alarms for loop X and input X at the same time. If there is no loop X, then only alarms for input X will be acknowledged. The quotation marks should contain "A" or "ALL", although any characters will be accepted. There is no way to acknowledge some alarms for a loop and not others.

Examples: LET request: LE AK(1)=␣A␣ (for loop 1 and input 1)
LET response: #
LET request: LE AK(12)="A" (for input 12)
LET response: #

AL — Alarm Screen Titles

Purpose: To view or change the titles of Alarm Display screens.

Use: STAG format: PR AL(S), where S is alarm screen number.
CTAG format: LE AL(S)=␣X␣, where S is alarm screen number, X is screen title.
Field length: 8

Remarks: Default screen titles include LOOP_ALM, ALM_SET, INP_ALM, INP_ALM2.

Examples: STAG request: STAG AL(1)
STAG response: LOOP_ALM
CTAG request: CTAG AL(1)=␣ALM1^^^^␣
CTAG response: #

ALL — All Input Range Names

Purpose: To view all input ranges supported by an analog card.

Use: PRINT format: PR ALL(A), where A is analog card number (1, 2 or 3).
Field length: Variable

Remarks: This command lists, in a string, all input ranges supported by the analog card.

Examples: PRINT request: PR ALL(2)
PRINT response: [RANGE NAME], [RANGE NAME], [RANGE NAME],....

ALT — Alarm Latch

Purpose: To view or change whether an alarm condition for a given alarm will be latched or unlatched when an alarm occurs. Setting applies to both high and low alarms.

Use: PRINT format: `PR ALT(L)`, where `L` is loop number.
LET format: `LE ALT(L)=▯A,B,C,D▯`, where:
- `A` is Hi Hi & Lo Lo PV alarm latch/unlatch value
- `B` is Hi & Lo PV alarm latch/unlatch value
- `C` is Hi Hi & Lo Lo Deviation alarm latch/unlatch value
- `D` is Hi & Lo Deviation alarm latch/unlatch value

Field length: 35
Value: Latch, Unlatch

Remarks: Alarm condition latched = `Latch`
Alarm condition unlatched = `Unlatch`
All four values must be specified in a LET command.

Examples: PRINT request: `PR ALT(1)`
PRINT response:
`Latch^^^,Latch^^^,Unlatch^,Unlatch^`
LET request:
`LE ALT(1)=▯Unlatch^,Latch^^^,Unlatch^,Unlatch^▯`
LET response:
`LE ALT(L)=▯Latch^^^,Latch^^^,Unlatch^,Unlatch^▯`

AO — Analog Output

Purpose: To view or change the value of an analog output.

Use: PRINT format: `PR AO(O)`, where `O` is output number.
Field length: 8
Value: XXXXXX.X (0 to 100 percent)

Remarks: Default value is 0 percent.

Examples: PRINT request: `PR AO(1)`
PRINT response: `^^^^25.0`

AS — Alarm Status

Purpose: Read only parameter.

Use: PRINT format: `PR AS(L)`, where `L` is loop number.
Field length: 8

Remarks: Will always return one of the following eight character strings.

Opensens	Open Sensor
Hi_Hi_PV	high high process variable alarm is active
Lo_Lo_PV	low low process variable alarm is active
High__PV	high process variable alarm is active
Low__PV	low process variable alarm is active
HiHi_Dev	high high deviation alarm is active
LoLo_Dev	low low deviation alarm is active
High_Dev	high deviation alarm is active
Low_Dev	low deviation alarm is active
No_Alarm	no alarm is active

Examples: PRINT request: `PR AS(1)`
PRINT response: `No_Alarm`

ATD — Activate Time of Day Start

Purpose: To view or change the enabled/disabled status of clock-driven programmer time-of-day start.

Use: PRINT format: PR ATD(P), where P is programmer number.
LET format: LE ATD(P)=␣X␣, where X is Enable or Disable.
Field length: 8
Value: Enable, Disable

Remarks: Activate time-of-day programmer start = Enable
Disable time-of-day programmer start = Disable

Examples: PRINT request: PR ATD(1)
PRINT response: Disable^
LET request: LE ATD(1)=␣Enable^^␣
LET response: #

BC2 — RS-232 Bits/Character

Purpose: To view or change the number of bits per character used for RS-232 communications.

Use: PRINT format: PR BC2
LET format: LE BC2=␣X␣, where X is 7 or 8.
Field length: 1
Value: 7, 8

Remarks: 7 bits per character = 7,8 bits per character = 8
Examples: PRINT request: PR BC2
PRINT response: 7
LET request: LE BC2=␣8␣
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

BC4 — RS-422 Bits/Character

Purpose: To view or change the number of bits per character used for RS-422 communications.

Use: PRINT format: PR BC4
LET format: LE BC4=␣X␣, where X is 7 or 8.
Field length: 1
Value: 7, 8

Remarks: 7 bits per character = 7, 8 bits per character = 8
Examples: PRINT request: PR BC4
PRINT response: 7
LET request: LE BC4=␣8␣
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

BD2 — RS-232 Baud Rate

Purpose: To view or change the baud rate used for RS-232 communications.

Use: PRINT format: PR BD2
LET format: LE BD2=□X□, where X is baud rate.
Field length: 8
Value: 300, 1200, 2400, 4800, 9600, 19200

Remarks: Terminal and controller must have matching baud rate.

Examples: PRINT request: PR BD2
PRINT response: 4800^^^^
LET request: LE BD2=□9600□
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

BD4 — RS-422 Baud Rate

Purpose: To view or change the baud rate used for RS-422 communications.

Use: PRINT format: PR BD4
LET format: LE BD4=□X□, where X is baud rate.
Field length: 8
Value: 300, 1200, 2400, 4800, 9600, 19200

Remarks: Terminal and controller must have matching baud rate.

Examples: PRINT request: PR BD4
PRINT response: 4800^^^^
LET request: LE BD4=□9600□
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

BEU — CLC Basic Engineering Units

Purpose: To view or change the engineering units used with numeric CLC variables

Use: PRINT format: PR BEU (V), where V is variable number (1–32).
LET format: LE BEU(V)="XXX", where V is variable number and XXX is a three character string.
Field length: 3

Remarks: BEU(V) is used as the units for BNV(V), BHL(V), and BLL(V).
V can be any number from 1 to 32.

Examples: PRINT request: PR BEU (1)
PRINT response: F^^
LET request: LE BEU (23)="C^^"
LET response: #

BF — Blend Factor

Purpose: To view or change the blend factor value used with cascade control functions.

Use: PRINT format: PR BF(L), where L is loop number.
LET format: LE BF(L)=□X□, where X is the blend factor.
Field length: 8
Value: XXXXXX.X (–32767 to +32767)

Remarks: Blend factor is used as follows: (percent output * ratio + setpoint * blend factor) / scale factor

Examples: PRINT request: PR BF(1)
PRINT response: ^^^^^^^5
LET request: LE BF(1)=□6□
LET response: #

BHL — CLC Basic High Limit

Purpose: To view or change the highest acceptable value for the corresponding BNV variable.

Use: PRINT format: PR BHL(V), where V is variable number (1–32).
LET format: LE BHL(V)="X", where V is variable number, and X is a number.
Field length: 8

Remarks: BHL(V) is used to check operator input for BNV(V). No number higher than BHL(V) will be accepted for BNV(V). V can be any number from 1 to 32.

Examples: PRINT request: PR BHL(1)
PRINT response: ^^^100.0
LET request: LE BHL(12)="250"
LET response: #

BLL — CLC Basic Low Limit

Purpose: To view or change the lowest acceptable value for the corresponding BNV variable.

Use: PRINT format: PR BLL(V), where V is variable number (1–32).
LET format: LE BLL(V)="X", where V is variable number, and X is a number.
Field length: 8

Remarks: BLL(V) is used to check operator input for BNV(V). No number lower than BLL(V) will be accepted for BNV(V). V can be any number from 1 to 32.

Examples: PRINT request: PR BLL(1)
PRINT response: ^^^10.0
LET request: LE BLL(12)="0"
LET response: #

BLV — CLC Basic List Variable

Purpose: To view or change the four selections available for the corresponding BSV variable.

Use: PRINT format: PR BLV(V), where V is variable number (1–32).
LET format:
LE BLV(V)="AAAAAAAA,BBBBBBBB,CCCCCCCC,DDDDDDDD", where AAAAAAAA,BBBBBBBB,CCCCCCCC,DDDDDDDD are 8-character strings.
Field length: 35

Remarks: BLV(V) is the set of four string values which BSV(V) may take. The meaning and use of these strings is determined by the user via CLC programming. When changing BLV, the full 35 characters MUST be entered, with a comma as the 9th, 18th, and 27th characters. V can be any number from 1 to 32.
PR BLV(V) is equivalent to LI BSV(V).

Examples: PRINT request: PR BLV(2)
PRINT response: Run^^^^^^,Hold^^^^,Abort^^^,^^^^^^^^
LET request:
LE BLV(14)="Up^^^^^^,Down^^^^,Left^^^^,Right^^^"
LET response: #

BND — CLC Basic Number of Decimals

Purpose: To view or change the number of decimal places used for the corresponding BNV, BHL, and BLL.

Use: PRINT format: PR BND(V), where V is variable number (1–32).
LET format: LE BND(V)="X", where V is variable number, and X is a number.
Field length: 1

Remarks: BND(V) is the number of decimal places which are shown when displaying BNV(V), BHL(V) and BLL(V). V can be any number from 1 to 32.

Examples: PRINT request: PR BND(1)
PRINT response: 2
LET request: LE BND(4)="1"
LET response: #

BNV — CLC Basic Numeric Variable

Purpose: To view or change a CLC numeric variable.

Use: PRINT format: PR BNV(V), where V is variable number (1–32).
LET format: LE BNV(V)="X", where V is variable number, and X is a number.
Field length: 8

Remarks: BNV(1) to BNV(32) are general-use numeric variables for CLC programming. Their meaning and use is determined by the user. BHL(V) and BLL(V) control acceptable input for BNV(V), and BND(V) and BEU(V) control how it is displayed on the Dimension II operator interface.

Examples: PRINT request: PR BNV(4)
PRINT response: ^^^123.4
LET request: LE BNV(1)="100"
LET response: #

BSV — CLC Basic String Variable

Purpose: To view or change a CLC string variable.

Use: PRINT format: **PR BSV(V)**, where **V** is variable number (1–32).
LET format: **LE BSV(V)="XXXXXXXX"**, where **V** is variable number, and **XXXXXXXX** is an 8 character string.
Field length: 8

Remarks: **BSV(1)** to **BSV(32)** are general-use string-type variables for CLC programming. Their meaning and use is determined by the user. **BLV(V)** controls the choices available on the Dimension II operator interface for **BSV(V)**.

Examples: PRINT request: **PR BSV(1)**
PRINT response: **Enable^^**
LET request: **LE BSV(1)="Disable^"**
LET response: **#**

CAG — Current Alarm Group

Purpose: To view the number of the currently active alarm group.

Use: PRINT format: **PR CAG(P)**, where **P** is programmer number.
Field length: 8
Value: 1–5

Remarks: Displays the number of the alarm group currently being used.

Examples: PRINT request: **PR CAG(1)**
PRINT response: **^^^^^^^3**

CC — ReCycle Counter

Purpose: To monitor the number of recycles left for a programmer.

Use: PRINT format: **PR CC(P)**, where **P** is programmer.
Value: XXX
Field length: 8

Remarks: Dimension II can recycle (repeat a segment sequence) up to 255 times, i.e., the recycle value can be from 0 to 255. When the recycle value reaches zero, the programmer ignores **NEXT SEG** and proceeds to **SEG+1**.

Examples: PRINT request: **PR CC(1)**
PRINT response: **^^^^^^10**
(indicating that the programmer has 10 recycles left).

CCY — Contact Output Time-Proportioning Cycle Time

Purpose: To view or change the cycle time of a contact output being used as a time-proportioned output.

Use: PRINT format: **PR CCY(C)**, where **C** is contact output number.
LET format: **LE CCY(C)="XXX"**, where **C** is contact output number, **XXX** is number of seconds.
Field length: 3
Value: (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned contact output). Range is 1 to 255 seconds.

Examples: PRINT request: PR CCY(1)

PRINT response: 000
LET request: LE CCY(1)=□10"
LET response: #

CD — Calculated Rate

Purpose: To view the rate calculated by the auto-tuning function.

Use: PRINT format: PR CD(L), where L is loop number.
Field length: 8
Value: XXXXX.XX

Remarks: Displays the rate that will be used if auto-tuning values are accepted.

Examples: PRINT request: PR CD(1)
PRINT response: ^^^^2.00

CEV — Current Events

Purpose: To view or change the state into which a programmer is attempting to place the events.

Use: PRINT format: PR CEV(P), where P is programmer.
LET format: LE CEV(P)="XXXXXXXXXXXX"where P is programmer, and XXXXXXXXXXXX is a 12 character string of event states.
Field length: 12
Value: If specific events (1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c) are displayed or included in the LET command, the programmer is set to turn those events on. If underscores "_" are displayed or included in the LET command, the programmer is set to turn events in those locations off.

Remarks: The LET command will only work if the programmer's status is Hold or PG_END. Otherwise CEV reverts to the event state programmed by the current segment. This variable is different from EV (Event Outputs) in that EV displays the actual current state of a single event, and CEV displays the state into which a specific programmer is programmed to set all events.

Examples: PRINT request: PR CEV(1)
PRINT response: 1__4__7___b_
LET request: LE CEV(1)="___45__8___c"
LET response: #

CI — Configuration Image

Purpose: Allows uploading and downloading of EEPROM information (including operator interface and network configuration).

Use: PRINT format: PR CI(C,B), where C is CPU number, B is Block number.
LET format: LE CI(C,B)=□_____□, where the information inside the quotation marks depends on the block being changed.
Field length: Block 0 = 3, all other blocks = 128. All other blocks: 128

Remarks: CI is useful in network mode only when information is being uploaded or downloaded. Block 0 contains the number of blocks for the complete configuration image (e.g., 64). The information in all other blocks depends on the block being viewed. C is always 1.

Examples: PRINT request: PR CI(1,0)
PRINT response: 64

LET request: LE CI(1,1)=□000AFC76ED...□ (128 characters).
LET response: #

CIN — Contact In

Purpose: To view the state of a contact input.

Use: PRINT format: PR CIN(C), where C is the contact input number.
Field length: 8
Value: Tag name from one of the four possible sets of on/off labels for contacts.

Remarks: Each Dimension II controller has four pairs of on/off labels. Each contact input or output can be configured to use one of these four sets of labels. So, the four pairs might be "On"/"Off", "Open"/"Closed", "True"/"False" and "Run"/"Stop" and the user can assign contact input 4 to read "Open" or "Closed". The CIN parameter returns the state of the contact input using the labels chosen for the particular contact.

Examples: PRINT request: PR CIN(3)
PRINT response: Off^^^^^

CJ — Cold Junction Temperature

Purpose: To view the actual cold junction temperature for a thermocouple input.

Use: PRINT format: PR CJ(I), where I is the input number.
Field length: 8
Value: XXXXXX.X (temperature in degrees C)

Remarks: Thermocouple cold junction temperature is always expressed in degrees C.

Examples: PRINT request: PR CJ(1)
PRINT response: ^^^^25.0

CJE — Cold Junction Error

Purpose: To view or change the cold junction error for a thermocouple input.

Use: PRINT format: PR CJE(I), where I is input number.
LET format: LE CJE(I)=□X□, where I is input number and X is amount of cold junction error compensation.
Field length: 8

Remarks: Cold junction error can be set from –10.0 to +10.0°C.

Examples: PRINT request: PR CJE(1)
PRINT response: ^^^^^2.2
LET request: LE CJE(1)=□2.5□
LET response: #

CM — Cascade Multiplier

Purpose: To view or change the multiplier used for cascade control with a remote setpoint.

Use: PRINT format: PR CM(L), where L is loop number.
LET format: LE CM(L)=□X□, where L is loop number, X is the multiplier.
Field length: 8
Value: XXXXXXXX (–32767 to +32767)

Remarks: A decimal point in the multiplier is not permitted.

Examples: PRINT request: `PR CM(1)`
PRINT response: `^^^^^^^2`
LET request: `LE CM(1)=030`
LET response: #

CO — Contact Out

Purpose: To view the state of a contact output.

Use: PRINT format: `PR CO(C)`, where `C` is the contact output number.
Field length: 8
Value: Tag name from one of the four possible sets of on/off labels for contacts.

Remarks: Each Dimension II controller has four pairs of on/off labels. Each contact input or output can be configured to use one of these four sets of labels. So, the four pairs might be "On"/"Off", "Open"/"Closed", "True"/"False" and "Run"/"Stop" and the user can assign contact output 2 to read "Open" or "Closed". The CO parameter returns the state of the contact output using the labels chosen for the particular contact.

Examples: PRINT request: `PR CO(2)`
PRINT response: `Off^^^^^`

CP — Calculated Gain

Purpose: To view the gain calculated by the auto-tuning function.

Use: PRINT format: `PR CP(L)`, where `L` is loop number.
Field length: 8

Remarks: Displays the gain that will be used if auto-tuning values are accepted.

Examples: PRINT request: `PR CP(1)`
PRINT response: `^^^^1.00`

CPG — Current PID Group

Purpose: To view the currently active PID group for a loop.

Use: PRINT format: `PR CPG(L)`, where `L` is loop number.
Field length: 8
Value: 1–5

Remarks: Displays the number of the PID group currently being used.

Examples: PRINT request: `PR CPG(1)`
PRINT response: `^^^^^^^2`

CRS — Calculated Reset

Purpose: To view the reset calculated by the auto-tuning function.

Use: PRINT format: `PR CRS(L)`, where `L` is loop number.
Field length: 8

Remarks: Displays the reset that will be used if auto-tuning values are accepted.

Examples: PRINT request: `PR CRS(1)`
PRINT response: `^^^^1.00`

CS — Current Segment Number

Purpose: To monitor the current segment number for a given programmer.

Use: PRINT format: PR CS(P), where P is programmer.
Field length: 8

Remarks: Dimension II units have segments 0 to 255 (0 to 749 with Extended Segments Option).

Examples: PRINT request: PR CS(1)
PRINT response: ^^^^^^^3
(The response indicates that the current segment for programmer 1 is segment 3.)

CSP — Current Span Reference

Purpose: To view or change the span reference determined during calibration.

Use: PRINT format: PR CSP(I), where I is analog input number.
LET format: LE CSP(1)=□X□, where I is analog input number, X is span reference value.
Field length: 8
Value: XXXX.XXX

Remarks: This reference number should not be changed unless an input channel is being recalibrated.

Examples: PRINT request: PR CSP(1)
PRINT response: ^100.323
LET request: LE CSP(1)=□100.356□
LET response: #

CZE — Current Input Zero

Purpose: To view or change the current input zero value determined during calibration.

Use: PRINT format: PR CZE(I), where I is analog input number.
LET format: LE CZE(I)=□X□, where I is analog input number, X is input zero value.
Field length: 8
Value: XXXXXX.X

Remarks: This reference number should not be changed unless an input channel is being recalibrated.

Examples: PRINT request: PR CZE(1)
PRINT response: ^^^^^7.9
LET request: LE CZE(1)=□7.7□
LET response: #

DF — Digital Filter

Purpose: To monitor or change the digital filter value of an analog input.

Use: PRINT format: PR DF(I), where I is input number.
LET format: LE DF(I)=□XXX□, where I is input number, XXX is filter value.
Field length: 8
Value: XXX (0 to 100)

Remarks: The filter is used to "average" the input reading so that minor fluctuations are eliminated. The digital filter setting may be from 0 to 100; the higher the

number, the greater the amount of filtering. When set to 0, the filtering feature is disabled.

Examples: PRINT request: PR DF(1)
PRINT response: ^^^^^^^0
LET request: LE DF(1)=␣12␣
LET response: #

DH — Direct Output High Limit

Purpose: To monitor or change the direct output high limit (DH) for a control loop. This feature allows the user to set the maximum output percentage for direct outputs.

Use: PRINT format: PR DH(L), where L is loop.
LET format: LE DH(L)=␣XXX.X␣
Field length: 8
Value: XXX.X

Remarks: The high limit can be set anywhere from 00.0% to 100.0%.
The direct output high limit can never be less than the direct output low limit.

Examples: PRINT request: PR DH(1)
PRINT response: ^^100.00
LET request: LE DH(1)=␣90.00␣
LET response: #

DL — Direct Output Low Limit

Purpose: To monitor or change the direct output low limit (DL) for a control loop. This feature allows the user to set the minimum output percentage for direct outputs.

Use: PRINT format: PR DL(L), where L is loop.
LET format: LE DL(L)=␣XXX.X␣
Field length: 8
Value: XXX.X

Remarks: The low limit can be set anywhere from 00.0% to 100.0%. The direct output low limit can never be greater than the direct output high limit.

Examples: PRINT request: PR DL(1)
PRINT response: ^^^^0.00
LET request: LE DL(1)=␣10.0␣
LET response: #

DO — Direct Output (in percent)

Purpose: To monitor or change the direct output.

Use: PRINT format: PR DO(L), where L is loop.
LET format: LE DO(L)=␣XXX.X␣
Field length: 8
Value: XXX.X (0.00–100.00)

Remarks: The direct output may be monitored (displayed) at any time. Control outputs may be changed only when the control loop is in the manual mode.

Examples: PRINT request: PR DO(1)
PRINT response: ^^^50.00

LET request: LE DO(1)=□75□
LET response: #

DOW — Day of Week Start

Purpose: To view or change the day of the week on which a specific programmer is to start.

Use: PRINT format: PR DOW(P), where P is programmer number.
LET format: LE DOW(P)=□X□, where P is programmer number, X is day of week.
Field length: 8
Value: See remarks.

Remarks: Enter days as follows: Sunday, Monday, Tuesday, Wednsday, Thursday, Friday, Saturday.

Examples: PRINT request: PR DOW(1)
PRINT response: Sunday^^
LET request: LE DOW(1)=□Monday^^□
LET response: #

DT — Date

Purpose: To monitor or set the date.

Use: PRINT format: PR DT
LET format: LE DT=□MM/DD/YY□
Field length: 8
Value: MM/DD/YY

Remarks: MM = month, DD = day, YY = year.

Examples: PRINT request: PR DT 93
PRINT response: 12/03/89
LET request: LE DT=□12/15/93□
LET response: #

DV — Deviation

Purpose: To monitor the deviation.

Use: PRINT format: PR DV(L), where L is loop.
Field length: 8
Value: Depends on the range in use.

Remarks: The format for the deviation value matches the range in use.

Examples: PRINT request: PR DV(1)
PRINT response: ^^^^21.3

EO2 — RS-232 Terminal Echo Mode

Purpose: To view or change the terminal echo mode (on/off) used during

RS-232 communications.

Use: PRINT format: PR EO2
LET format: LE EO2=␣X␣, where X is echo mode.
Field length: 8
Value: See remarks.

Remarks: Echo mode on = ON
Echo mode off = OFF

Examples: PRINT request: PR EO2
PRINT response: ON^^^^^^
LET request: LE EO2=␣OFF^^^^^␣
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

EO4 — RS-422 Terminal Echo Mode

Purpose: To view or change the terminal echo mode (on/off) used during RS-422 communications.

Use: PRINT format: PR EO4
LET format: LE EO4=␣X␣, where X is echo mode.
Field length: 8
Value: See remarks.

Remarks: Echo mode on = ON
Echo mode off = OFF

Examples: PRINT request: PR EO4
PRINT response: ON^^^^^^
LET request: LE EO4=␣OFF^^^^^␣
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

EU — Engineering Units

Purpose: To monitor or select the engineering units of an analog input.

Use: PRINT format: PR EU(I), where I is input.
LET format: LE EV(I)="XXX", where I is input and XXX is the 3 alphanumeric characters.
Field length: 3

Remarks: F = Fahrenheit, C = Celsius, and XXX = Linear.
Linear engineering units are user-configurable.

Examples: PRINT request: PR EU(1)
PRINT response: ^C^

LET request: LE EV(3)="%^H"
LET response: #

EV — Event Outputs

Purpose: To monitor the actual state of the programmed event outputs.

Use: PRINT format: PR EV(E), where E is event # (1–12).
Field length: 8
Value: ␣ON␣ or ␣OFF␣

Remarks: This reports the on/off state of the Dimension II events. Each programmer may set them, but each event has only one state at a time.

Examples: PRINT request: PR EV(1)
PRINT response: OFF^^^^^

FPC — Full Passcode

Purpose: To view or change the passcode required to change the security access level to "FULL" status.

Use: PRINT format: PR FPC
LET format: LE FPC =␣X␣, where X is passcode.
Field length: 8
Value: XX-XX-XX

Remarks: The FULL passcode permits access to all system Operation and Configuration functions.

Examples: PRINT request: PR FPC
PRINT response: 01–02–03
LET request: LE FPC =␣01–03–05␣
LET response: #

GAS — Global Alarm Status

Purpose: To view global alarm status.

Use: PRINT format: PR GAS
Field length: 8
Value: No_Alarm, Alarm

Remarks: No active global alarm = No_Alarm
Active global alarm = Alarm

Examples: PRINT request: PR GAS
PRINT response: No_Alarm

GN — Gain

Purpose: To view or change the actual gain (proportional) value.

Use: PRINT format: PR GN(L), where L is loop.
LET format: LE GN(L)="X", where L is loop and X is the new gain value.
Field length: 8
Value: XX.XX

Remarks: This system variable prints the actual gain value for a control loop. LET sets gain for the current PID group.

Examples: PRINT request: PR GN(1)
PRINT response: ^^^^3.50
LET request: LE GN(2)="1.00"
LET response: #

HH2 — RS-232 Hardware Handshaking

Purpose: To view or change the hardware handshaking mode (on/off) used during RS-232 communications.

Use: PRINT format: PR HH2
LET format: LE HH2=□X□, where X is handshaking mode.
Field length: 8
Value: Enable, Disable

Remarks: Hardware handshaking on = Enable, Hardware handshaking off = Disable
Examples: PRINT request: PR HH2
PRINT response: Disable^
LET request: LE HH2=□Enable^^□
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

HH4 — RS-422 Hardware Handshaking

Purpose: To view or change the hardware handshaking mode (on/off) used during RS-422 communications.

Use: PRINT format: PR HH4
LET format: LE HH4=□X□, where X is handshaking mode.
Field length: 8
Value: Enable, Disable

Remarks: Hardware handshaking on = Enable , Hardware handshaking off = Disable
Examples: PRINT request: PR HH4
PRINT response: Disable^
LET request: LE HH4=□Enable^^□
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

H — Input High Alarm

Purpose: To view or change the input high alarm limit for an analog input.

Use: PRINT format: PR IH(I), where I is analog input number.
LET format: LE IH(I)=␣X␣, where I is analog input number, X is input high alarm limit value.
Field length: 8

Remarks: Range is dependent on input range.

Examples: PRINT request: PR IH(I)
PRINT response: ^^^^25.6
LET request: LE IH(1)=␣29.2␣
LET response: #

IHL — Input High Limit

Purpose: To view or change the input high limit for an analog input.

Use: PRINT format: PR IHL(I), where I is analog input number.
LET format: LE IHL(I)=␣X␣, where I is analog input number, X is input high limit value.
Field length: 8

Remarks: The value range defaults to the range of the configured input type. The setpoint and process variable will never exceed this limit. PID calculations and other limits are affected when a change is made.

Examples: PRINT request: PR IHL(I)
PRINT response: ^^^^25.6
LET request: LE IHL(1)=␣29.2␣
LET response: #

IHY — Input Alarm Hysteresis

Purpose: To view or change the hysteresis value of an input alarm.

Use: PRINT format: PR IHY(I), where I is input number.
LET format: LE IHY(I)=␣XXXXXX.X␣, where I is input number, XXXXXX.X is hysteresis value.
Field length: 8
Value: XXXXXX.X (–1392.8 to +1392.8)

Remarks: Range is same as input range (e.g. IHL ILL)

Examples: PRINT request: PR IHY(I)
PRINT response: ^^^^11.0
LET request: LE IHY(1)=␣13␣
LET response: #

IL — Input Low Alarm

Purpose: To view or change the input low alarm limit for an analog input.

Use: PRINT format: PR IL(I), where I is analog input number.
LET format: LE IL(I)=␣X␣, where I is analog input number, X is input low alarm limit value.
Field length: 8

Remarks: Range is dependent on input range.

Examples: PRINT request: PR IL

PRINT response: ^^^^12.5
LET request: LE ILL(1)=␣14.2␣
LET response: #

ILL — Input Low Limit

Purpose: To view or change the input low limit for an analog input.

Use: PRINT format: PR ILL(I), where I is analog input number.
LET format: LE ILL(I)=␣X␣, where I is analog input number, X is input low limit value.
Field length: 8

Remarks: The value range defaults to the range of the configured input type. The setpoint and process variable will never exceed this limit. PID calculations and other limits are affected when a change is made.

Examples: PRINT request: PR ILL(1)
PRINT response: ^^^^12.2
LET request: LE ILL(1)=␣16.3␣
LET response: #

ILT — Input Alarm Latch

Purpose: To view or change whether an alarm condition for a given input will be latched or unlatched when an alarm occurs. Setting applies to both high and low alarms.

Use: PRINT format: PR ILT(I), where I is input number.
LET format: LE ILT(I)=␣X␣, where I is input number, X is Latch or Unlatch.
Field length: 8
Value: Latch, Unlatch

Remarks: Alarm condition latched = Latch, Alarm condition unlatched = Unlatch

Examples: PRINT request: PR ILT(1)
PRINT response: Latch^^^
LET request: LE ILT(1)=␣Unlatch^␣
LET response: #

LG — Logic Screen Titles

Purpose: To view or change the titles of Logic Display screens.

Use: STAG format: STAG LG(S), where S is a logic screen number.
CTAG format: CTAG LG(S)=␣X␣, where S is logic screen number, X is screen title.
Field length: 8

Remarks: Default screen titles include LOGIC__1 through LOGIC__8.

Examples: STAG request: STAG LG(1)
STAG response: LOGIC__1
CTAG request: CTAG LG(1)=␣LOG1^^^^␣
CTAG response: #

LND — Linear Analog Input Decimal Position

Purpose: To view or change the decimal position for a linear analog input.

Use: PRINT format: PR LND(I), where I is analog input number.
LET format: LE LND(I)=␣X␣, where I is analog input number, X is number representing decimal position.
Field length: 1
Value: decimal position (1–5)

Remarks: This variable can be changed only for linear analog inputs.

Examples: PRINT request: PR LND(1)
PRINT response: 3
LET request: LE LND(1)=␣2␣
LET response: #

LNS — Linear Analog Input Span

Purpose: To view or change the span for a linear analog input determined during calibration.

Use: PRINT format: PR LNS(I), where I is analog input number.
LET format: LE LNS(I)=␣X␣, where I is analog input number, X is span value.
Field length: 8
Value: 0 to 100 percent

Remarks: This number defaults to 100 percent.

Examples: PRINT request: PR LNS(1)
PRINT response: ^100.000
LET request: LE LNS(1)=␣99.356␣
LET response: #

LNZ — Linear Analog Input Zero

Purpose: To view or change the input zero value for a linear analog input determined during calibration.

Use: PRINT format: PR LNZ(I), where I is analog input number.
LET format: LE LNZ(I)=␣X␣, where I is analog input number, X is input zero value.
Field length: 8
Value: XXXXXX.X

Remarks: This value defaults to zero percent.

Examples: PRINT request: PR LNZ(1)
PRINT response: ^^^^^0.0
LET request: LE LNZ(1)=␣2.2␣
LET response: #

LP — Loop Screen Titles

Purpose: To view or change the titles of Loop Display screens.

Use: STAG format: STAG LP(S), where S is a loop screen number.
CTAG format: CTAG LP(S)=␣X␣, where S is loop screen number, X is screen title.
Field length: 8

Remarks: Default screen titles include LOOP___1 through LOOP___8.

Examples: STAG request: STAG LP(1)
STAG response: LOOP___1

CTAG request: CTAG LP(1)=␣LP1^^^^^␣
CTAG response: #

LPC — Limited Passcode

Purpose: To view or change the passcode required to change the security access level to "LIMITED" status.

Use: PRINT format: PR LPC
LET format: LE LPC=␣X␣, where X is passcode.
Field length: 8
Value: XX-XX-XX

Remarks: The LIMITED passcode permits access to all system Operation functions.

Examples: PRINT request: PR LPC
PRINT response: 03–02–01
LET request: LE LPC=␣05–03–01␣
LET response: #

LS — Loop Status

Purpose: To set a control loop's mode of operation (auto or manual).

Use: PRINT format: PR LS(L), where L is loop.
LET format: LE LS(L)=␣M␣ or ␣A␣
Field length: 8
Value: Manual or Auto

Remarks: In the LET message above:
A = Control loop is in the automatic mode.
M = Control loop is in the manual mode.
In the manual mode, the operator may adjust the output.
No control action occurs in the manual mode.
In the auto mode, the output is determined automatically by the PID feature.

Examples: PRINT request: PR LS(1)
PRINT response: Auto^^^^
LET request: LE LS(1)=␣M␣
LET response: #

MC1 — Macro Name #1

Purpose: To view or change the tag name for Macro Key 1 displayed on the Operator Interface display.

Use: STAG format: STAG MC1
CTAG format: CTAG MC1=␣X␣, where X is tag name.
Field length: 8

Remarks: Default tag name is [START].

Examples: STAG request: STAG MC1
STAG response: [START]^
CTAG request: CTAG MC1=␣ON^^^^^^␣
CTAG response: #

MC2 — Macro Name #2

Purpose: To view or change the tag name for Macro Key 2 displayed on the Operator Interface display.

Use: STAG format: STAG MC2
CTAG format: CTAG MC2=□X□, where X is tag name.
Field length: 8

Remarks: Default tag name is [STOP].

Examples: STAG request: STAG MC2
STAG response: [STOP]^^
CTAG request: CTAG MC2=□OFF^^^^^□
CTAG response: #

MI — Memory Image

Purpose: Allows uploading and downloading of battery-backed memory (including patching and parameters).

Use: PRINT format: PR MI(C,B), where C is CPU number, B is Block number.
LET format: LE MI(C,B)=□ □
where the information inside quotation marks varies according to the block being changed.
Field length: Block 0 = 3, all other blocks = 128

Remarks: Memory image is useful in network mode only when downloading or uploading information.
Block 0 contains the number of blocks for the complete memory image (e.g., 64). All other blocks contain different information depending on which block is viewed. C is always 1.

Examples: PRINT request: PR MI(1,0)
PRINT response: 64
LET request: LE MI(1,1)=□000AFC76ED...□ (128 characters)
LET response: #

MR — Manual Reset

Purpose: To monitor or change the manual reset (bias) value.

Use: PRINT format: PR MR(L), where L is Loop.
LET format: LE MR(L)=□+□XX.X□
Field length: 8
Value: +□XX.X (–100.00 to 100.00)

Remarks: Manual reset adds a fixed bias onto the control calculation when a control loop is in automatic mode.

Examples: PRINT request: PR MR(1)
PRINT response: ^^^^0.00
LET request: LE MR(1)=□2.00□
LET response: #

NA2 — RS-232 Network Address

Purpose: To view or change the network address of the controller for RS-232 communications in network mode.

Use: PRINT format: PR NA2
LET format: LE NA2=␣X␣, where X is network address number.
Field length: 2
Value: Network address 1 through 99.

Remarks: This address (1–99) must match on both the host computer and the controller.

Examples: PRINT request: PR NA2
PRINT response: 01
LET request: LE NA2=␣23␣
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

NA4 — RS-422 Network Address

Purpose: To view or change the network address of the controller for RS-422 communications in network mode.

Use: PRINT format: PR NA4
LET format: LE NA4=␣X␣, where X is network address number.
Field length: 8
Value: Network address 1 through 99.

Remarks: This address (1–99) must match on both the host computer and the controller.

Examples: PRINT request: PR NA4
PRINT response: ^^^^^^22
LET request: LE NA4=␣23␣
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

NAI — Number of Analog Inputs

Purpose: To view the number of analog inputs used by the controller.

Use: PRINT format: PR NAI
Field length: 2

Remarks: Dimension II accommodates up to six analog inputs per card, with a maximum of three cards per controller.

Examples: PRINT request: PR NAI
PRINT response: 04

NAO — Number of Analog Outputs

Purpose: To view the number of analog outputs used by the controller.

Use: PRINT format: PR NAO

Field length: 2
Value: See remarks.

Remarks: Dimension II accommodates up to four analog outputs per card, with a maximum of three cards per controller.

Examples: PRINT request: PR NAO
PRINT response: 04

NCI — Number of Contact Inputs

Purpose: To view the number of contact inputs used by the controller.

Use: PRINT format: PR NCI
Field length: 2
Value: See remarks.

Remarks: Dimension II can have both local and remote contacts. This variable returns the total number of them configured as contact inputs.

Examples: PRINT request: PR NCI
PRINT response: 08

NCO — Number of Contact Outputs

Purpose: To view the number of contact outputs used by the controller.

Use: PRINT format: PR NCO
Field length: 2
Value: See remarks.

Remarks: Dimension II can have both local and remote contacts. This variable returns the total number of them configured as contact outputs.

Examples: PRINT request: PR NCO
PRINT response: 04

NL — Number of Loops

Purpose: To monitor the number of loops in a controller.

Use: PRINT format: PR NL
Field length: 2

Remarks: Dimension II units have 1-8 PID control loops.

Examples: PRINT request: PR NL
PRINT response: 02

NM2 — RS-232 Network/Terminal Mode

Purpose: To view or change the protocol (network/terminal) mode used for RS-232 communications.

Use: PRINT format: PR NM2
LET format: LE NM2=□X□, where X is mode.
Field length: 8

Remarks: Terminal mode = Terminal
Network mode = Network

Examples: PRINT request: PR NM2
PRINT response: Terminal
LET request: LE NM2=□Network^□

LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

NM4 — RS-422 Network/Terminal Mode

Purpose: To view or change the protocol (network/terminal) mode used for RS-422 communications.

Use: PRINT format: `PR NM4`
LET format: `LE NM4=␣X␣`, where `X` is mode.
Field length: 8

Remarks: Terminal mode = Terminal
Network mode = Network

Examples: PRINT request: `PR NM4`
PRINT response: `Terminal`
LET request: `LE NM4=␣Network^␣`
LET response: #

Note: *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

NP — Number of Programmers

Purpose: To monitor the number of programmers in a controller.

Use: PRINT format: `PR NP`
Field length: 2
Value: XX

Remarks: Dimension II units have 1 to 8 programmers.

Examples: PRINT request: `PR NP`
PRINT response: `04`

NS — Number of Segments

Purpose: To monitor the number of segments in a controller.

Use: PRINT format: `PR NS(P)`, where `P` is programmer.
Field length: 3
Value: XXX

Remarks: Dimension II controllers have a single table of 256 segments which are shared by all programmers. This parameter returns the same number no matter what `P` is. This returns 750 if the Extended Segments Option is present.

Examples: PRINT request: `PR NS(1)`
PRINT response: `256`

OA — Output Action

Purpose: To view or change the output action of a loop output for auto tuning.

Use: PRINT format: PR OA(L), where L is loop number.
LET format: LE OA(L)=␣X␣, where X is output action type.
Field length: 8
Value: Reverse, Direct

Remarks: Output action types = Reverse, Direct

Examples: PRINT request: PR OA(1)
PRINT response: Direct^^
LET request: LE OA(1)=␣Reverse␣
LET response: #

OC — Output Change

Purpose: Used for auto tuning. To view or change an analog output value.

Use: PRINT format: PR OC(L), where L is loop number.
LET format: LE OC(L)="X", where L is loop number and X is output change.
Field length: 8
Value: 0.0 to 100.0 percent

Remarks: To change an output value, type the percentage by which you wish to increase (bump) the output. The example below reflects an output increase from 5 to 15 percent.

Examples: PRINT request: PR OC(1)
PRINT response: ^^^^5.00
LET request: LE OC(1)=␣10␣
LET response: #

OLS — Analog Output Linear Span

Purpose: To view or change the span for a linear analog output determined during calibration.

Use: PRINT format: PR OLS(O), where O is output number.
LET format: LE OLS(O)=␣X␣, where O is loop number, X is span value.
Field length: 8
Value: XXXX.XXX (0.0 to 100.0 percent)

Remarks: This number defaults to 100 percent.

Examples: PRINT request: PR OLS(1)
PRINT response: ^100.000
LET request: LE OLS(1)=␣99.500␣
LET response: #

OLZ — Analog Output Linear Zero

Purpose: To view or change the zero value for a linear analog output determined during calibration.

Use: PRINT format: PR OLZ(O), where O is output number.
LET format: LE OLZ(O)=␣X␣, where O is output number, X is zero value.
Field length: 8
Value: XXXX.XXX

Remarks: This number defaults to zero percent.

Examples: PRINT request: PR OLZ(1)
PRINT response: ^^^0.000

LET request: LE OLZ(1)=␣1.400␣
LET response: #

OT — Output

Purpose: To view or change the output of a loop.

Use: PRINT format: PR OT(L), where L is loop number.
LET format: LE OT(L)=␣X␣, where X is output value.
Field length: 8
Value: –100.0 to 100.0 percent

Remarks: Range is from –100 to +100 percent, where –100 is full reverse out and +100 is full direct out. In this way, the output of specific loops can be changed.

Examples: PRINT request: PR OT(1)
PRINT response: ^^^^^100
LET request: LE OT(1)=␣–100␣
LET response: #

OV — Overview Screen Titles

Purpose: To view or change the titles of Overview Display screens.

Use: STAG format: STAG OV(S), where S is overview screen number.
CTAG format: CTAG OV(S)=␣X␣, where S is overview screen number, X is screen title.
Field length: 8
Value: See remarks.

Remarks: Default screen titles include OVIEW__1 through OVIEW__8.

Examples: STAG request: STAG OV(1)
STAG response: OVIEW__1
CTAG request: CTAG OV(1)=␣OVW1^^^^␣
CTAG response: #

P1 — Programmer Profile 1 Values

Purpose: To view or change the first profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P1(P), where P is programmer number.
LET format: LE P1(P)="X", where P is programmer number and X is the first setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 1 will have if loop 1 is configured to take its setpoint from the selected programmer. A LET command for P1(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P1(1)
PRINT response: ^^^98.60
LET request: LE P1(3)="100.7"
LET response: #

P2 — Programmer Profile 2 Values

Purpose: To view or change the second profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P2(P), where P is programmer number.
LET format: LE P2(P)="X", where P is programmer number and X is the second setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 2 will have if loop 2 is configured to take its setpoint from the selected programmer. A LET command for P2(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P2(1)
PRINT response: ^^^98.60
LET request: LE P2(3)="100.7"
LET response: #

P3 — Programmer Profile 3 Values

Purpose: To view or change the third profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P3(P), where P is programmer number.
LET format: LE P3(P)="X", where P is programmer number and X is the third setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 3 will have if loop 3 is configured to take its setpoint from the selected programmer. A LET command for P3(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P3(1)
PRINT response: ^^^98.60
LET request: LE P3(3)="100.7"
LET response: #

P4 — Programmer Profile 4 Values

Purpose: To view or change the fourth profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P4(P), where P is programmer number.
LET format: LE P4(P)="X", where P is programmer number and X is the fourth setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 4 will have if loop 4 is configured to take its setpoint from the selected programmer. A LET command for P4(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more informa-

tion on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P4(1)
PRINT response: ^^^98.60
LET request: LE P4(3)="100.7"
LET response: #

P5 — Programmer Profile 5 Values

Purpose: To view or change the fifth profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P5(P), where P is programmer number.
LET format: LE P5(P)="X", where P is programmer number and X is the fifth setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 5 will have if loop 5 is configured to take its setpoint from the selected programmer. A LET command for P5(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P5(1)
PRINT response: ^^^98.60
LET request: LE P5(3)="100.7"
LET response: #

P6 — Programmer Profile 6 Values

Purpose: To view or change the sixth profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P6(P), where P is programmer number.
LET format: LE P6(P)="X", where P is programmer number and X is the sixth setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 6 will have if loop 6 is configured to take its setpoint from the selected programmer. A LET command for P6(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P6(1)
PRINT response: ^^^98.60
LET request: LE P6(3)="100.7"
LET response: #

P7 — Programmer Profile 7 Values

Purpose: To view or change the seventh profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P7(P), where P is programmer number.
LET format: LE P7(P)="X", where P is programmer number and X is the seventh setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 7 will have if loop 7 is configured to take its setpoint from the selected programmer. A LET command for P7(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P7(1)
PRINT response: ^^^98.60
LET request: LE P7(3)="100.7"
LET response: #

P8 — Programmer Profile 8 Values

Purpose: To view or change the eighth profile value (loop setpoint) for a given programmer.

Use: PRINT format: PR P8(P), where P is programmer number.
LET format: LE P8(P)="X", where P is programmer number and X is the eighth setpoint value for programmer P.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 8 will have if loop 8 is configured to take its setpoint from the selected programmer. A LET command for P8(P) will be overridden if programmer P is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: PR P8(1)
PRINT response: ^^^98.60
LET request: LE P8(3)="100.7"
LET response: #

PDD — Power Down Date

Purpose: To view the date on which the controller was last powered down.

Use: PRINT format: PR PDD
Field length: 8
Value: MM/DD/YY

Remarks: Displayed in standard month/day/year format.

Examples: PRINT request: PR PDD
PRINT response: 08/15/90

PDT — Power Down Time

Purpose: To view the time at which the controller was last powered down.

Use: PRINT format: PR PDT
Field length: 8
Value: HH:MM:SS

Remarks: Displayed in standard hours/minutes/seconds 24-hour time format.

Examples: PRINT request: PR PDT
PRINT response: 04:19:22

PG — Programmer Screen Titles

Purpose: To view or change the titles of Programmer Display screens.

Use: STAG format: STAG PG(S), where S is programmer screen number.
CTAG format: CTAG PG(S)=□X□, where S is programmer screen number, X is screen title.
Field length: 8

Remarks: Default screen titles include PROGRUN1 through PROGRUN8.

Examples: STAG request: STAG PG(1)
STAG response: PROGRUN1
CTAG request: CTAG PG(1)=□PGM1^^^^□
CTAG response: #

PID — PID Group

Purpose: To display or change the PID parameters for a specific loop and specific group number.

Use: PRINT format: PR PID(L,G), where L is loop, G is group.
LET format: LE PID(L,G)"X,Y,Z", where L is loop, G is group, and X, Y, and Z are gain, reset and rate respectively.
Field length: 26

Remarks: Each control loop has five different groups of PID parameters (1–5).
If a loop has dual PID Type (PT), Group 1 is always the reverse-acting PID parameters and Group 2 is always the direct-acting PID parameters. If a loop has single PID Type, then Group 1 is used no matter whether reverse or direct acting. If the PID Type is programmed, then all 5 groups may be used, depending on the current programmer segment.

Examples: PRINT request: PR PID(1,1)
PRINT response: ^^^^1.00,^^^^0.00,^^^^0.00
LET request: LE PID(1,2)=□3.5,2.5,.5□
LET response: #

PS — Programmer Mode Status

Purpose: To monitor or change the programmer's mode of operation. This system variable can start or hold a programmer.

Use: PRINT format: PR PS(P), where P is programmer number.
LET format: LE PS(P)="X", where P is programmer number and X is R, S, or H.
Field length: 8

Remarks: The programmer mode system variable has two different formats: one for dis-

playing (PRINT commands) and one for changing the status (LET commands).
Status display (PRINT commands):

Run^^^^^ = Run mode.
Hold^^^^ = Hold mode.
PG_END^^ = Programmer in hold after completing a program run.

Programmer status change format (LET command):

R = PrgMode placed into run mode at current segment.
H = PrgMode placed into hold mode.
S = Starts a programmer run starting at segment in PS4 (operator start segment)

Dimension II considers a start command from the network (using PS) as an Operator start. In order to start a programmer using the PS variable, the programmer must be configured for Operator start. The CONF_PRG screen for programmer X should have the OPStart field set to "OPStrtOX".

Examples: PRINT request: PR PS(1)
PRINT response: Run^^^^^
LET request: LE PS(1)=□S□
LET response: #

PS1 — Programmer Start Segment 1 (Remote Start)

Purpose: This parameter is the same as RSS. See RSS.

PS2 — Programmer Start Segment 2

Purpose: Unused, reserved for future use.

PS3 — Programmer Start Segment 3 (Time-of-Day Start)

Purpose: To view or change the state of the Time-of-Day Start segment of the selected programmer.

Use: PRINT format: PR PS3(P), where P is programmer.
LET format: LE PS3(P)=□X□, where P is programmer number, X a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: This is the segment where the indicated programmer will start if started by the Time-of-Day Start feature.

Examples: PRINT request: PR PS3(1)
PRINT response: ^^2
LET request: LE PS3(4)=□20□
LET response: #

PS4 — Programmer Start Segment 4 (Operator Start)

Purpose: To view or change the Operator Start segment for a particular programmer.

Use: PRINT format: PR PS4(P), where P is programmer).
LET format: LE PS4(P)=□X□, where P is programmer number, X is a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: This is the segment where the indicated programmer will start if started by the

operator from the Dimension II operator interface or by use of the command LE PS(P)="S".

Examples: PRINT request: PR PS4(2)
PRINT response: ^^1
LET request: LE PS4(3)=□5□
LET response: #

PT — PID Type

Purpose: To view or change the PID type for a control loop.

Use: PRINT format: PR PT(L), where L is loop.
LET format: LE PT(L)=□X□, where X is S, D, P or A.
Field length: 1

Remarks: PID type determines whether a control loop uses single PID (S), dual PID (D), programmed PID (P), or Select Adaptive (A).
The **PID** system variable sets or views the values for each group, whereas the PT system variable sets or views the type of PID control.
When programmed PID is selected, the programmer determines the PID group to be used for each segment in the programmer.

Examples: PRINT request: PR PT(1)
PRINT response: S
LET request: LE PT(1)=□D□
LET response: #

PUD — Power Up Date

Purpose: To view the date on which the controller was last powered up.

Use: PRINT format: PR PUD
Field length: 8
Value: MM/DD/YY

Remarks: Displayed in standard month/day/year format.

Examples: PRINT request: PR PUD
PRINT response: 08/16/90

PUT — Power Up Time

Purpose: To view the time at which the controller was last powered up.

Use: PRINT format: PR PUT
Field length: 8
Value: HH:MM:SS

Remarks: Displayed in standard hours/minutes/seconds 24-hour time format.

Examples: PRINT request: PR PUT
PRINT response: 06:21:01

PV — Process Variable

Purpose: To monitor the process variable of a control loop.

Use: PRINT format: `PR PV(L)`, where `L` is loop.
Field length: 8

Remarks: The format for the process variable value matches the range in use.

Examples: PRINT request: `PR PV(1)`
PRINT response: `^^^25.74`

QS2 — RS-232 Xon/Xoff Mode

Purpose: To view or change the state of the Xon/Xoff mode for RS-232 communications.

Use: PRINT format: `PR QS2`
LET format: `LE QS2=□x□`, where `x` is the state of the Xon/Xoff communications mode.
Field length: 8
Value: Enable, Disable

Remarks: Xon/Xoff enabled = Enable
Xon/Xoff disabled = Disable

Examples: PRINT request: `PR QS2`
PRINT response: `Disable^`
LET request: `LE QS2=□Enable^^□`
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

QS4 — RS-422 Xon/Xoff Mode

Purpose: To view or change the state of the Xon/Xoff mode for RS-422 communications.

Use: PRINT format: `PR QS4`
LET format: `LE QS4=□x□`, where `x` is the state of the XON/XOFF communications mode.
Field length: 8
Value: Enable, Disable

Remarks: Xon/Xoff enabled = Enable
Xon/Xoff disabled = Disable

Examples: PRINT request: `PR QS4`
PRINT response: `Disable^`
LET request: `LE QS4=□Enable^^□`
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

RH — Reverse Output High Limit

Purpose: To monitor or change the reverse output high limit (RH). This feature allows the user to set the maximum output percentage for reverse outputs.

Use: PRINT format: PR RH(L), where L is loop.
LET format: LE RH(L)=␣XXX.X␣, where L is loop and X is the limit.
Field length: 8
Value: XXX.X (0.0 to 100.0%)

Remarks: The reverse output high limit (RH) can never be less than the reverse output low limit (RL).

Examples: PRINT request: PR RH(1)
PRINT response: ^^100.00
LET request: LE RH(1)=␣50␣
LET response: #

RI — Recipe Image

Purpose: Permits uploading and downloading of recipe information.

Use: PRINT format: PR RI (C,B), where C is CPU number, B is block number.
LET format: LE RI(C,B)=␣x␣, where C is CPU number, B is block number, x is the block of information being read or written.
Field length: Block 0 = 3, all other blocks = 128
Value: See remarks.

Remarks: RI is useful in the network mode only, when information is being uploaded or downloaded. This function creates a direct image of memory storing recipe values only (profiles, segment time, recycles, segments, alarm groups, PID groups). Block 0 contains the number of blocks for the complete recipe image. The information in all other blocks depends on the block being viewed.
C is always 1.

Examples: PRINT request: PR QS(1,0)
PRINT response: 128
LET request: LE QS(1,1)=␣000AFC76ED...␣ (128 characters)
LET response: #

RL — Reverse Output Low Limit

Purpose: To monitor or change the reverse output low limit (RL). This feature allows the user to set the minimum output percentage for reverse outputs.

Use: PRINT format: PR RL(L), where L is loop.
LET format: LE RL(L)=␣XXX.X␣, where L is loop and X is the limit.
Field length: 8
Value: XXX.X (0.0 to 100.0%)

Remarks: The reverse output low limit (RL) can never be greater than the reverse output high limit (RH).

Examples: PRINT request: PR RL(1)
PRINT response: ^^^75.00
LET request: LE RL(1)=␣25␣
LET response: #

RO — Reverse Output (in percent)

Purpose: To monitor or change the reverse output for a control loop..

Use: PRINT format: PR RO(L), where L is loop.
LET format: LE RO(L)=␣XXX.X␣, where L is loop and X is the new reverse output value.
Field length: 8
Value: XXX.X (0.0 to 100.00%)

Remarks: The reverse output (RO)may be monitored (displayed) at any time.
Control outputs may be changed only when the controller is in manual mode.

Examples: PRINT request: PR RO(1)
PRINT response: ^^^^15.0
LET request: LE RO(1)=␣20␣
LET response: #

RS — Reset

Purpose: To monitor or change the reset (integral) value currently in use for a control loop.

Use: PRINT format: PR RS(L), where L is loop.
LET format: LET RS(1)=␣X␣, where L is loop and X is the reset value.
Field length: 8
Value: XX.XX

Remarks: This system variable prints or changes the actual reset value currently in use for a control loop.

Examples: PRINT request: PR RS(1)
PRINT response: ^^^^1.00
LET request: LE RS(1)=␣2.00␣
LET response: #

RSD — Response Speed

Purpose: To view or change the process speed (fast, medium, slow) for which you wish to auto-tune parameters.

Use: PRINT format: PR RSD(L), where L is loop number.
LET format: LE RSD(L)=␣x␣, where L is loop number, x is response type.
Field length: 8
Value: Fast, Medium, Slow

Remarks: Before auto-tuning a loop, select the response speed of the process you are controlling. A process which responds quickly to a change in control output will be tuned differently from a process which responds slowly.

Examples: PRINT request: PR RSD(1)
PRINT response: Fast^^^^
LET request: LE RSD(1)=␣Medium^^␣
LET response: #

RSS — Remote Start Segment

Purpose: To change or view the remote start segment for a given programmer.

Use: PRINT format: PR RSS(P), where P is programmer.
LET format: LE RSS(P)=␣X␣, where P is programmer and X is a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: Each programmer has one Remote Start Segment (RSS) number.
This is the segment where the programmer will start running if a remote start is executed. Note that a programmer start done via the network with the PS parameter is considered an Operator start, NOT a Remote start.

Examples: PRINT request: PR RSS(1)
PRINT response: ^^^^^^^3
LET request: LE RSS(1)=␣2␣
LET response: #

RT — Rate

Purpose: To monitor or change the rate (derivative) value for a control loop.

Use: PRINT format: PR RT(L), where L is loop.
LET format: LE RT(L)=␣X␣, where L is loop number, X is the new rate value.
Value: XX.XX

Remarks: This system variable prints or changes the actual rate value currently in use for a control loop.

Examples: PRINT request: PR RT(1)
PRINT response: ^^^^1.50
LET request: LE RT(4)=␣1.1␣
LET response: #

SA — Setpoint Adjust

Purpose: Displays or changes the biasing of a profile setpoint.

Use: PRINT format: PR SA(L), where L is loop number.
LET format: LE SA(L)=␣X␣, where L is loop number, X is bias value.
Field length: 8

Remarks: This number is added to the profile setpoint of a loop when its setpoint source is "Programr". The setpoint of the loop will be equal to its profile value in the current segment plus the setpoint adjust. This allows a whole setpoint program to be shifted up or down by a fixed constant amount.

Examples: PRINT request: PR SA(1)
PRINT response: ^^^^10.0
LET request: LE SA(1)=␣1.5␣
LET response: #

SB2 — RS-232 Stop Bits

Purpose: To view or change the number of stop bits used during RS-232 communications.

Use: PRINT format: PR SB2
LET format: LE SB2=␣X␣, where X is the number of stop bits.
Field length: 1
Value: 1 or 2

Remarks: Set number of stop bits to 1 or 2. This must match your host computer's setting.

Examples: PRINT request: PR SB2
PRINT response: 2
LET request: LE SB2=␣1␣
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

SB4 — RS-422 Stop Bits

Purpose: To view or change the number of stop bits used during RS-422 communications.

Use: PRINT format: PR SB4
LET format: LE SB4=␣X␣, where X is the number of stop bits.
Field length: 1
Value: 1 or 2

Remarks: Set number of stop bits to 1 or 2. This must match your host computer's setting.

Examples: PRINT request: PR SB4
PRINT response: 2
LET request: LE SB4=␣1␣
LET response: #

> ***Note:*** *Dimension II must be powered down and then powered up again if serial communications parameters are changed.*

SC — Scale

Purpose: To view or change the scale value used with cascade control functions.

Use: PRINT format: PR SC(L), where L is loop number.
LET format: LE SC(L)=␣x␣, where L is loop number, x is the scale value.
Field length: 8
Value: XXXXXX.X (0 to 32767)

Remarks: Scale is used as follows: (percent output * ratio + setpoint * blend factor) / scale factor. How this value is used is configurable by the user.

Examples: PRINT request: PR SC(1)
PRINT response: ^^^^^^^6
LET request: LE SC(1)=␣9␣
LET response: #

SG — Segment Data

Purpose: To view or change the values of a programmer segment.

Use: PRINT format: PR SG(P,S), where P is programmer, S is segment.
LET format: LE SG(P,S) =". . . .", where P is Programmer, S is segment, and all segment values are listed between the quotes.
Field length: 105

Remarks: This variable views or changes an entire segment in the controller's segment table. Valid segment numbers are 0–255 (0–749 with the Extended Segments Option). The programmer number is irrelevant since all programmers use the same segment table, but it must be specified in the command.

The format is as follows:
P1,P2,P3,P4,P5,P6,P7,P8,HH:MM:SS,EEEEEEEEEEEE,CCC,NNN,A,P

where

P1–P8	=	The 8 profile setpoints. There are always 8 even if the controller has less than 8 loops. P1 corresponds to loop1, P2 to loop2, and so on. With the LET command, all 8 **MUST** be specified – use zeros for unused profiles.
HH:MM:SS	=	Segment time in Hours:Minutes:Seconds
EEEEEEEEEEEE	=	Events. All 12 **MUST** be specified – use 1–9, a,b, and c for events which should be on and underscores "_" for events which should be off.
CCC	=	Recycles (0–255)
NNN	=	Next segment
A	=	Alarm group
P	=	PID group

When using a LET command, **ALL** 14 parameters must be specified.

Examples: PRINT request: PR SG(1,15)
PRINT response: (one continuous message):
^^^150.0,^^^200.0,^^^^45.0,^^^^^0.0,^^^^^0.0,^^^^^0.0,
^^^^^0.0,^^^^^0.0,00:05:00,__34_6____b_,000,016,1,1
LET request: (one continuous message):
LE SG(1,1)=□25,30,44.5,100,0,0,0,0,00:10:00,
1____6_____,0,2,3,3□
LET response: #

SMD — System Mode

Purpose: To view or change the mode in which the controller will restart after the next power-down.

Use: PRINT format: PR SMD
LET format: LE SMD=□x□, where x is mode.
Field length: 8
Value: WarmStrt, ColdStrt

Remarks: WarmStrt = All current settings saved.
ColdStrt = Calibration settings saved, all others reset to factory defaults. For the LET command, □W□ and □C□ may be used.

Examples: PRINT request: PR SMD
PRINT response: ColdStrt
LET request: LE SMD=□WarmStrt□
LET response: #

SP — Setpoint

Purpose: To monitor or change the setpoint.

Use: PRINT format: PR SP(L), where L is loop.
LET format: LE SP(L)=␣+␣XXX.␣, where L is loop.
Field length: 8
Value: Depends on the range in use.

Remarks: The format for the setpoint (SP) value matches the range in use.
The setpoint may be changed only when the setpoint source (SPS) is set to Operator.

Examples: PRINT request: PR SP(1)
PRINT response: ^^^^54.0
LET request: LE SP(1)=␣87␣
LET response: #

SPS — Setpoint Source

Purpose: To view or change the setpoint source for a loop.

Use: PRINT format: PR SPS(L), where L is loop.
LET format: LE SPS(L)=␣X␣, where L is loop, X is O, R or P.
Field length: 8
Value: Operator, Remote, Programr

Remarks: This parameter determines whether a control loop receives its setpoint from the operator, a programmer, or a remote source. A calculated setpoint is considered remote.

To configure a loop to take its setpoint from a given programmer, the Setpoint Source (SPS) must be set to Programr, and the loop's Remote Setpoint Source must be set to ProgramX where X is the programmer you would like to control the loop. On the Dimension II operator interface, the Setpoint Source appears as SptSrc0X in the window accessed by clicking on the LpMode0X field of the main screen for loop X. The Remote Setpoint Source appears as RemSPsrc on the CONF_LOP screen. There is no network parameter available to set the Remote Setpoint Source.

Examples: PRINT request: PR SPS(1)
PRINT response: Operator
LET request: LE SPS(1)=␣P␣
LET response: #

SR — Sampling Rate

Purpose: To view or change the sample rate of a loop input for tuning.

Use: PRINT format: PR SR(L), where L is loop number.
LET format: LE SR(L) = ␣x␣, where L is loop number, x is sampling rate.
Field length: 8
Value: Range is 0 to 1000.

Remarks: The number of input samples taken should be at least 200. The sampling rate is in multiples of 200 milliseconds.

Examples: PRINT request: PR SR(1)
PRINT response: ^^^^^202
LET request: LE SR(1)=␣220␣
LET response: #

SS — System Status

Purpose: To indicate whether control functions are running. Also, to download information to Memory Image (MI) or Configuration Image (CI).

Use: PRINT format: PR SS
LET format: LE SS=□X□
Field length: 1
Value: R, I

Remarks: System Status (SS) indicates the current status of the functions:

R indicates functions are running (functioning normally).
I indicates idle or off line. When downloading Memory Image (MI) or Configuration Image (CI), change the SS status to I.

When the downloading process is finished, change the SS status back to R.

Examples: PRINT request: PR SS
PRINT response: I
LET request: LE SS=□R□
LET response: #

SY — System Screen Title

Purpose: To view or change the title of the system (UNIT) screen.

Use: STAG format: STAG SY
CTAG format: CTAG SY=□x□, where x is screen title.
Field length: 8
Value: See remarks.

Remarks: Default screen title is UNIT.

Examples: STAG request: STAG SY
STAG response: UNIT^^^^
CTAG request: CTAG SY=□UNIT1^^^□
CTAG response: #

TCY — Time-Proportioning Cycle Time

Purpose: To view or change the time-proportioning cycle time of a relay contact output on an analog I/O card.

Use: PRINT format: PR TCY(C), where C is contact number.
LET format: LE TCY(C)=□XXX□, where C is contact number, XXX is number of seconds.
Field length: 3
Value: XXX (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned contact output). Range is 1 to 255 seconds.

Examples: PRINT request: PR TCY(1)
PRINT response: 001
LET request: LE TCY(1)=□15□
LET response: #

TD — Time-of-Day (TOD)

Purpose: To monitor or set the time-of-day (TOD) clock.

Use: PRINT format: PR TD
LET format: LE TD=␣HH:MM:SS␣
Field length: 8
Value: HH:MM:SS

Remarks: HH = hour, MM = minutes, and SS = seconds.
The TOD clock displays military time and increments the date every 24 hours.

Examples: PRINT request: PR TD
PRINT response: 02:49:34
LET request: LE TD=␣14:55:00␣
LET response: #

TDD — Tuning Complete

Purpose: To view the status of loop auto-tuning.

Use: PRINT format: PR TDD(L), where L is loop number.
Field length: 8
Value: Yes, No

Remarks: Yes = auto-tuning complete
No = auto-tuning not complete

Examples: PRINT request: PR TDD(1)
PRINT response: No^^^^^^

TDS — Time of Day Start

Purpose: To view or change the time for the clock-driven programmer time-of-day start.

Use: PRINT format: PR TDS(P), where P is programmer number.
LET format: LE TDS(P)=␣x␣, where P is programmer number, x is time of day.
Field length: 8
Value: HH:MM:SS

Remarks: Time is displayed or set in hours/minutes/seconds 24-hour format.

Examples: PRINT request: PR TDS(1)
PRINT response: 04:14:12
LET request: LE TDS(1)=␣04:15:00␣
LET response: #

TEN — Tuning Error Number

Purpose: To view the number of an error that occurred during loop auto-tuning.

Use: PRINT format: PR TEN(L), where L is loop number.
Field length: 8

Remarks: 600 = Loop not in manual mode.
604 = PV not responding to output change.
605 = Process not moving fast enough; increase sample rate.
606 = Manual output changed during tuning process.
607 = System error.
608 = Buffer full.
609 = User abort.

Examples: PRINT request: PR TEN(1)
PRINT response: ^^^^^600

TER — Tuning Error

Purpose: To view the yes/no error status of loop auto-tuning.

Use: PRINT format: `PR TER(L)`, where `L` is loop number.
Field length: 8
Value: Error, or blank

Remarks: Error = Error occurred during auto-tuning.
(Blank) = No errors during auto-tuning.

Examples: PRINT request: `PR TER(1)`
PRINT response: `Error^^^`

TL — Time Left in Segment (SEG time)

Purpose: To monitor the amount of time left in the current segment.

Use: PRINT format: `PR TL(P)`, where `P` is programmer.
Field length: 8
Value: HH:MM:SS

Remarks: This system variable monitors the amount of time left in the current segment for a specific programmer.

Examples: PRINT request: `PR TL(1)`
PRINT response: `00:08:34`

TLP — Time Left in Program

Purpose: To view the amount of time left in a program.

Use: PRINT format: `PR TLP(P)`, where `P` is programmer number.
Field length: 8
Value: HH:MM:SS or DD-HH:MM. A "–" between DD and HH instead of a ":" indicates days field in effect.

Remarks: Displays time in hours/minutes/seconds 24-hour time format or days-hours-minutes format if remaining time exceeds 24 hours.
If end of program can't be found or if nested program recycles are present, will display XX:XX:XX.

Examples: PRINT request: `PR TLP(1)`
PRINT response: `00:09:13`

TP — Time into Program

Purpose: To monitor the amount of time the current program has been running.

Use: PRINT format: `PR TP(P)`, where `P` is programmer.
Field length: 8
Value: HH:MM:SS or DD-HH:MM

Remarks: This variable displays how long a program has been running.
The DD-HH:MM format is used only when a program has been running longer than one day.

Examples: PRINT request: `PR TP(1)`
PRINT response: `01:30:23`

TS — Tuning Status

Purpose: To view the status of, or initiate, or abort loop auto-tuning.

Use: PRINT format: PR TS(L), where L is loop number.
LET format: LE TS(L)=□x□, where L is loop, x is status.
Field length: 8
Value: Start, Abort

Remarks: If status is "Start", auto tuning is not in progress and a command of LE TS(L)="S" will start it. If status is "Abort" auto tuning is in progress and command of LE TS(L)="A" will abort it.

Examples: PRINT request: PR TS(1)
PRINT response: Start^^^
LET request: LE TS(1)=□A□
LET response: #

TYP — Analog Input Type

Purpose: To view or change the types of inputs used on an analog I/O card.

Use: PRINT format: PR TYP(I), where I is analog input number.
LET format: LE TYP(I)=□x□, where I is analog input number, x is input type.
Field length: 8
Value: See remarks.

Remarks: Use the command PR ALL(I), where I is the input number to display a list of all permissible input types.

> **Important:** Input type changes also require wiring and sensor changes.

Examples: PRINT request: PR TYP(1)
PRINT response: Type..B.
LET request: LE TYP(1)=□Type..G.□
LET response: #

UT — Engineering Units Type

Purpose: To view or change the engineering unit type used with an analog input.

Use: PRINT format: PR UT(I), where I is analog input number.
LET format: LE UT(I)=□x□, where I is analog input number, x is engineering units.
Field length: 8
Value: Centigrd, Fahrenht, Linear

Remarks: Centigrd = TC or RTD
Fahrenht = TC or RTD
Linear = Linear input

Examples: PRINT request: PR UT(1)
PRINT response: Centigrd
LET request: LE UT(1)=□Fahrenht□
LET response: #

Example of System Variable Use

This section gives an example of getting something done using the system variables via a Dimension II communications port. We explain the steps necessary to set up programmer 1 to control loops 1 and 2 (we'll call them Temperature and Humidity) through a three segment recipe which ramps up, soaks for a while, then ramps back down. We assume a few things here to make the example simpler:

A. The Network communications mode is used, but we will leave out the mechanics of the protocol (STX, address, ETX, checksum). The commands shown will work via either the RS-232 or RS-422 ports.

B. Correct tuning parameters have already been set for loops 1 and 2. If you wish to set tuning parameters over the network, see the description of the PID Group parameter.

C. Loops 1 and 2 are configured to take their setpoints from programmer 1. Each loop should have its Setpoint Source (SptSrc) set to Programr and its Remote Setpoint Source (RemSPsrc) set to Program1. For help in configuring them as such, see Section 3 under "Loop Control" and Section 4 under "Control Loop Configuration". The description of the SPS parameter in this appendix is also helpful.

D. Programmer 1 is configured to be started by the operator. Dimension II considers a start command from the network (using the PS system variable) as an Operator start. The CONF_PRG screen for programmer 1 should have the OPStart field set to OPStrt01. For help on this, see "Setpoint Programmer Configuration" in Section 4.

Starting a setpoint program requires several steps via the network, just as it does via the Dimension II operator interface:

Step 1: Place the programmer in Hold.

```
LE PS(1)=□H□
```

The programmer really should be in Hold or at PG_END before you start another recipe program, but this sets programmer 1 status to Hold if it happens to be in Run. If it is at PG_END it will remain at PG_END. If it is in Run, it will stop and hold its present setpoints. This should ensure that the following commands will be accepted.

Step 2: Create a Recipe in the Segment Table.

```
LE SG(1,1)=□90,80,0,0,0,0,0,0,01:30:00,_____________,0,2,1,1□
LE SG(1,2)=□90,80,0,0,0,0,0,0,04:00:00,_____________,0,3,1,1□
LE SG(1,3)=□25,50,0,0,0,0,0,0,01:15:00,_____________,0,3,1,1□
```

This program will increase the temperature to 90 degrees and humidity to 80% over one hour thirty minutes, hold these settings for four hours, then ramp back down to 25 degrees and 50% humidity in one hour fifteen minutes. It sets no event outputs and it uses Alarm Group 1 and PID Group 1 for the entire

program.

Step 3: Set the Operator Start Segment for the programmer.

LE PS4(1)=␣1␣ (Set the Operator Start Segment for programmer 1 to segment 1)

Step 4: Set modes of programmed loops to Auto.

LE LS(1)=␣A␣ (Set Loop Status for loop 1 to Auto)
LE LS(2)=␣A␣ (Set Loop Status for loop 2 to Auto)

Step 5: Issue the Start Programmer command.

LE PS(1)=␣S␣ (Start programmer 1 at segment in PS4(1))

Once this last command is given, programmer 1 will start running segment 1 and controlling the setpoints of loops 1 and 2. While the programmer is running, it may be held and resumed with the following commands:

LE PS(1)=␣H␣ (Hold programmer 1 at current segment)
LE PS(1)=␣R␣ (Run programmer 1 at current segment)

Error Messages

If the host computer makes an illegal request message to Dimension II, or if a syntax error occurs, Dimension II will return an error message to the host computer. All error messages use the same six-byte format: an E followed by a space, followed by a four-digit error identification number. Each type of error condition has a separate error identification number. For example, E 0403 is the error identification number for an illegal system variable. Table B–5 lists all

Table B–5. Dimension II Communication Error Messages

Error Message	Error Condition
E 0215	Illegal pathname
E 0242	Write protect (read only)
E 0244	Read error
E 0245	Write error
E 0401	Bad assignment parameter
E 0402	Bad string variable
E 0403	Illegal system variable
E 0404	Illegal assignment
E 0405	Bad pathname
E 0406	Incomplete path list
E 0407	Read only parameter
E 0408	Buffer overflow
E 0409	Illegal tagname assignment

error identification numbers and the error condition to which they call attention.

RS-422/RS-423 Communications Watchdog

A communications watchdog is applicable for RS-422 and RS-423 communications. The communications watchdog ensures that a CPU failure within a controller does not disable an entire communications network. Dimension's processor updates a watchdog timer every 20 milliseconds. If the timer is not updated after 40 milliseconds, the watchdog is activated. When the communications watchdog is activated, the port 1 **XMIT** terminals are switched to high impedance, i.e., the **XMIT** terminals are electrically removed from the network.

Notes

Notes

Appendix
C

Dimension II Setup Guides

General Operation

Quick Start
Quick Reference

Setup Guides

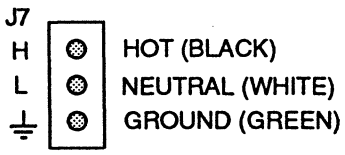
Alarm Configuration
Autotune
Bi-Modal Control
Calculating Inputs
Cascade Control
Memory Card
Redundant Inputs
Retransmit
Staged Outputs
Synchronized Programmer
Time Proportioned Outputs

Quick Start

Getting started with the Model 8710 or 8751 Operator Interface is as easy as 1-2-3 . . .

1

Take your controller out of the box, connect AC power to connector J7 on the control cage, and plug it in. (You can connect your controller to any convenient AC power source from 85–264 VAC, 47–63 Hz, without having to make any adjustments.)

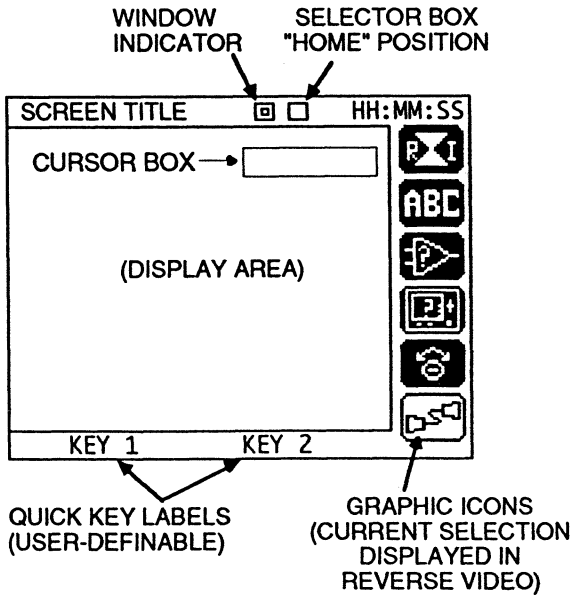


2

Since the operator interface is an intelligent unit, it will display screens with default values and tag names upon power-up. Until you actually configure Dimension for your application, you can practice using the front panel controls without actual field I/O connections.

3

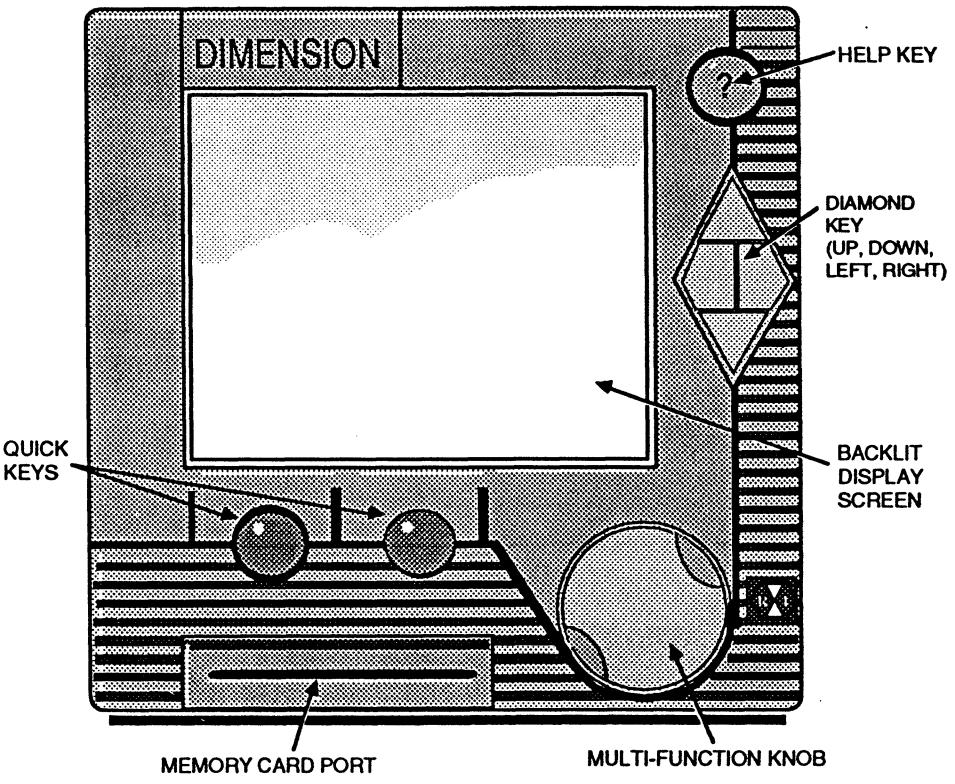
To get acquainted with your new controller, turn to the quick reference materials on the other side of this sheet.



Quick Reference

HELP Key — Press this key to display on-screen instructions during operation. When the key is pressed, a window appears on the currently displayed screen containing general operating instructions or specific instructions for operating the currently selected parameter. Press the HELP key a second time to close the window.

Diamond Key — Press these integrated keys to move from icon to icon (UP, DOWN) or from screen to screen (LEFT, RIGHT) under each icon. The currently active icon is displayed in reverse video, and the title of the currently displayed screen is shown on the top row of the screen. (Also note that the Alarm icon flashes when one or more alarms are active.)



Multi-Function Knob — TURN this knob to move the selector box to a specific field or through a list of selections on the currently displayed screen. PRESS this knob to select or activate the item displayed in the selector box. (Pressing the knob performs the same function as a standard computer keyboard Enter or Return key.)

Quick Keys — Press these two keys to perform the functions labeled on the bottom row of the display screen. Each of these keys can be user-defined to execute a string of commands by pressing a single key. (For example, each of these keys could be programmed to call up a specific display or to activate one or more control functions.)

Icons & Screen Displays — The first (top) icon in each of the two major screen areas represents the Unit screen area, depicted as the RI logo. Upon power-up, the first screen displayed is always the Unit Operation screen. You may switch between and access screens in the two major areas (Operation, Configuration) at the Unit icon (RI logo) by pressing the LEFT or RIGHT key.

OPERATION ICONS	RXI	UNIT OPERATION
		OVERVIEW DISPLAYS
		PROGRAM DISPLAYS
		LOOP DISPLAYS
		LOGIC/MONITOR DISPLAYS
		ALARM DISPLAYS
CONFIGURATION ICONS	RXI	UNIT CONFIGURATION
	ABC	GLOSSARY CONFIGURATION
		PROCESS CONFIGURATION
		DISPLAY CONFIGURATION
		HARDWARE CALIBRATION
		COMMUNICATIONS

Setup Guide

ALARM CONFIGURATION

This setup guide will describe the steps that should be followed to configure Analog Input Limits, Loop Process Variable and Deviation limits and whether the alarms are latched or unlatched.

The alarms may also be configured to set a contact output or alter the mode of a control loop when the alarm condition is set. This configuration is not covered in this setup guide.

Step 1: Enter the configuration mode of the controller by pushing the diamond key up to highlight the RI icon and pressing the key right until the Unit Configuration screen (UNIT_CONF) display is shown. Press the diamond key down twice to the Process Configuration icon, then right twice to select the Alarm Configuration screen (CONF_ALM) shown in Figure 1. This display allows entry of the analog input, loop process variable limits, hysteresis values and the alarm action. Rotate the knob moving the cursor box to **InputAlm**. Press the knob and turn the knob right to scroll through selections. Press the knob to select the entry. The window shown in Figure 2 will be displayed. This window allows the entry of the Hysteresis value and the Latched or Unlatched alarm action for the selected Analog Input. Turn the knob moving the cursor box to **InpHys_1**, press to select, turn knob to change hysteresis value and press the knob again to select. Hysteresis is the value that is entered for the window around the alarm limit in which the alarm will not turn on or off. In the same manner, move cursor to **InLtch1** and select latched or unlatched alarms. A latched alarm will require that the operator acknowledge the alarm before turning off. An unlatched alarm will turn off after system correction of the alarm. Rotate the knob moving the cursor box to **Close_Wn** and press the knob to close.

Step 2: Rotate the knob to the right and select the **LoopAlm** entry, press the knob, and turn the knob right or left to select the desired loop to configure. Press the knob to enter selection. The window shown in Figure 3 will appear. This display allows the entry of the Hysteresis values and the Latch/Unlatch status for the HIHI, HI process variable alarm and the HIHI, HI deviation alarm. Note that the HIHI and HI values are also used for the LOLO and LO values. Select the desired values for these parameters, by pressing the knob moving the cursor box to a selection, pressing the knob, rotating right to scroll though options and pressing the knob again to enter selection. Rotate the knob right to close the window, highlight **Close_Wn** and press knob.

Step 3: Press the diamond key up twice to highlight the RI icon and then right once to access the operation side

Figure 1: Alarm Configuration Screen

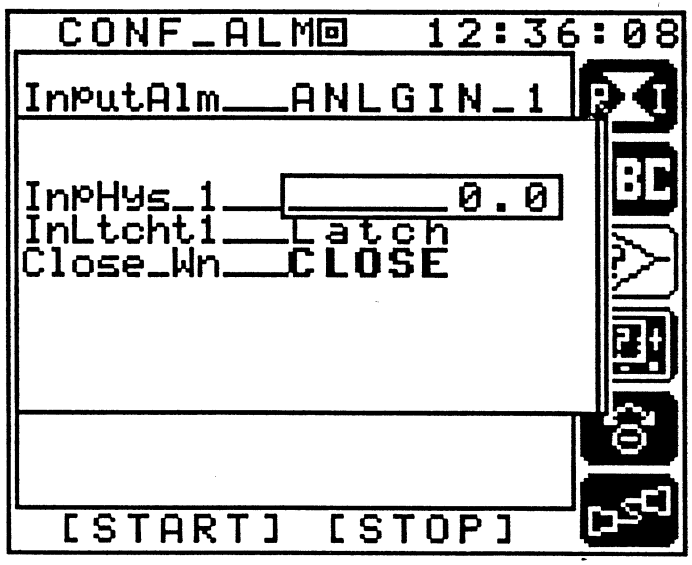


Figure 2: Analog Output Source Configuration Window

of the Dimension. Press down to highlight the Alarm icon at the bottom of the display. Press the key right once to access the **ALM_SET** set display as shown in Figure 4.

This display allows entry of the alarm limits for each alarm type for input and loop alarming. Rotate the knob and move the selector box to the **InputAlm** field and press the knob and rotate to select the desired analog input. Press the knob again to make entry. The window shown in Figure 5 will appear. From this window the high and low input limit alarm values for the analog input are entered by highlighting the entry, pressing the knob, turning right to view

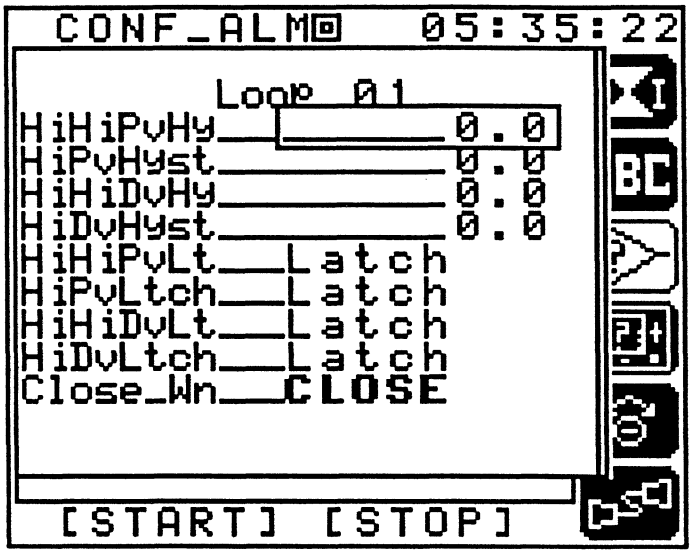


Figure 3: Alarm Setting Screen

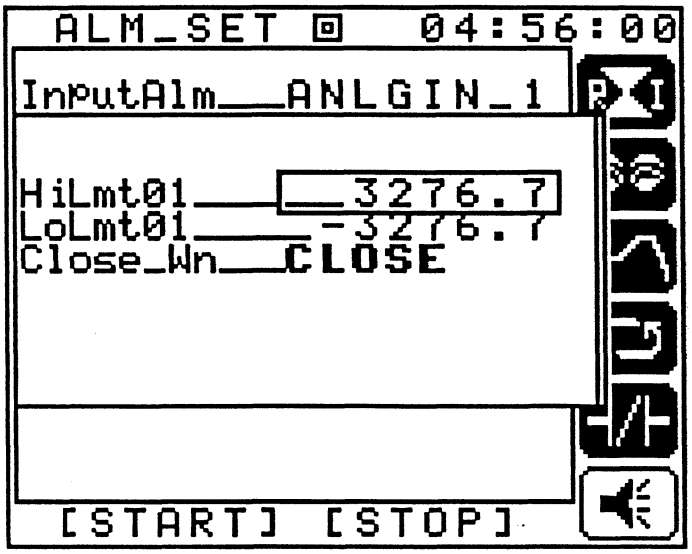


Figure 5: Alarm xxxxx window

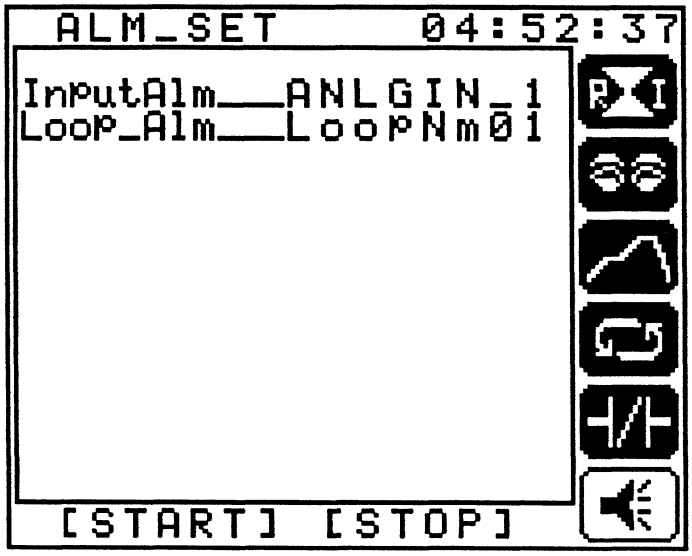


Figure 4: Alarm Group Setting Screen

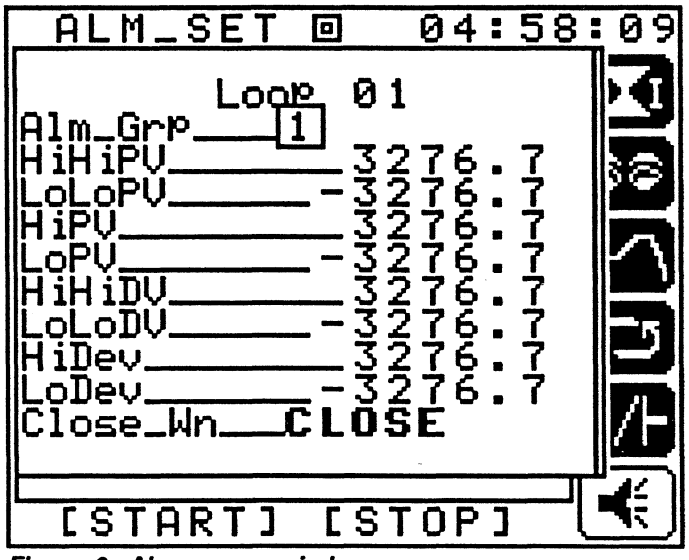


Figure 6: Alarm xxxxx window

options and pressing again to enter selection. Turn the knob moving the cursor box to **Close_Wn** entry and press the knob to return to the main Alarm Setting screen (ALM_SET) screen. Turn the knob right moving the cursor box to **Loop_Alm** field, press the knob once and rotate right to select the desired loop on which to configure loop alarm parameters. Press the knob once and the window shown in Figure 6 will be displayed. Turn the knob moving the cursor box to the **AlarmGp** entry and push knob. Turn knob to view alarm group selections and press the knob again to enter alarm group selection. Five alarm groups are available. After selecting the alarm groups, select the desired alarm values in the same manner that you selected alarm groups. Once all of the entries have been made, turn the knob right to **Close_Wn** and push knob to enter. The entered parameters will be in effect. If an alarm occurs the Alarm icon will begin to blink. Selecting this icon will display the active alarms.

Setup Guide

USING AUTOTUNE

The Dimension autotuning algorithm will attempt to model a process by monitoring the process response to a step input to the process. Once the PID parameters are calculated the operator can select the type of response desired, namely **FAST**, **MEDIUM**, or **SLOW**. The **FAST** selection is designed to give a quarter amplitude damped response and the **SLOW** response is critically damped. This setup guide uses loop 1 as an example.

Step 1: Prior to starting autotune it is necessary to set some parameters for the autotuning run. Go to the configuration side of the Dimension. Press the diamond key down and highlight the Process Configuration icon. Press the diamond key once right. The Configuration Loop (CONF_LOP) screen will appear. See Figure 1. On the CONF_LOP screen select **TUNE** by turning the multipurpose knob right moving the cursor box. Press the knob to select tune. The autotune configuration window will open. The parameters in this window have the following functions:

Reverse/Direct	Set control loop action.
RespTime	Set the estimated response time of the process. Units are in minutes.
Bump	Set the amount the output that will be bumped.
PIDGrp	Selects the PID group that the PID parameters will be saved to.
Fast/Medium/Slow	Selects the PID parameters to give the desired response.

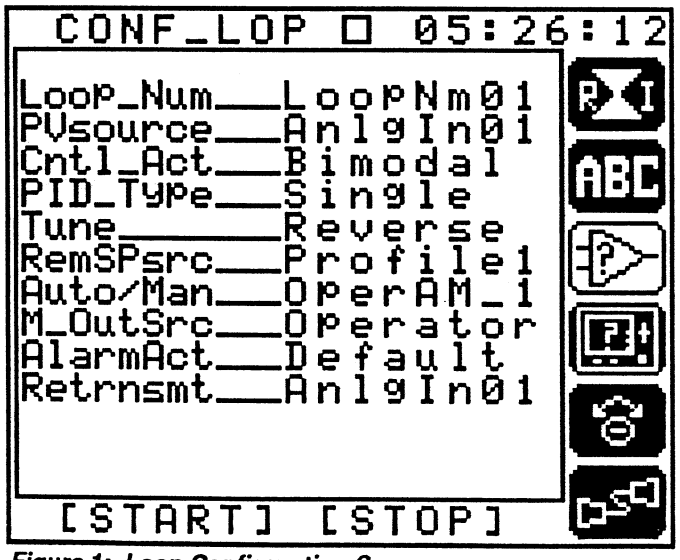


Figure 1: Loop Configuration Screen

The PIDGrp, Reverse/Direct and the Fast/Medium/Slow selections can be changed on the autotune run window and will override the selections made on this window. Once selections are made and the control loop is setup, an autotuning run can be started.

Step 2: Press the diamond key up to highlight the RI icon and press left to access the Operation side. Press the diamond key down three times to access the Loop display (LOOP__1). See Figure 2.

Turn the knob right moving the cursor box to **LpMode01**, and press the knob. The first loop window will apear. See Figure 3.

Set **LpMode01** to **Manual** by moving the cursor box to this entry and pressing the knob. The autotuning algorithm requires the Loop Status be set to Manual. Move the cursor box to the **Autotune** entry by turning the knob. Press the knob to select. This will open the autotune run window. See Figure 4. The first entry on this window, **Autotune**, will be used to **Start** or **Abort** an autotuning

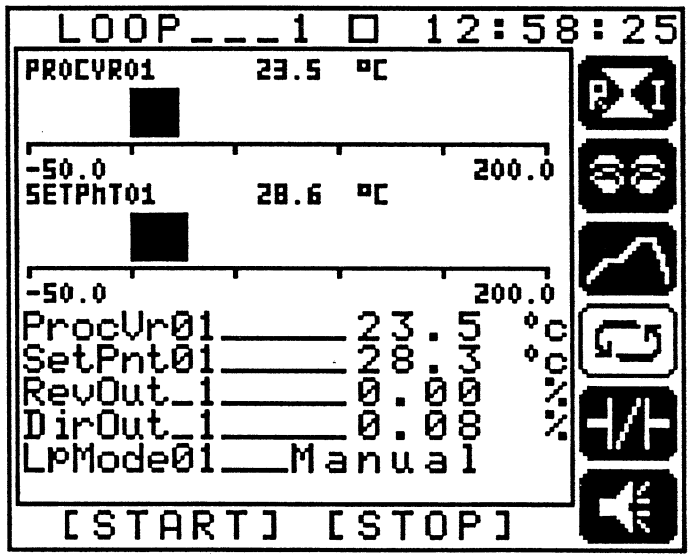


Figure 2: Loop Operating Screen

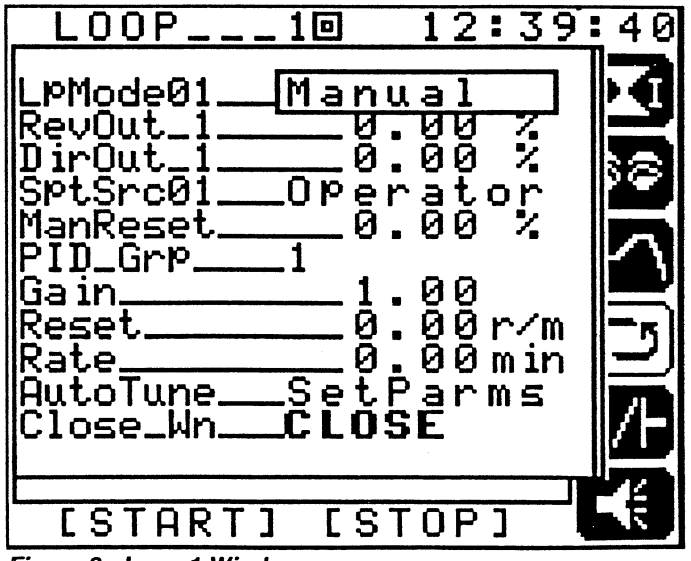


Figure 3: Loop 1 Window

run. Once an autotuning run is started, the Autotune entry will automatically change from **Start** to **Abort**.

Step 3: Monitor the variable **Samples**, **PVchange** and **%_change**. See Figure 4. The sampling rate is based on the RespTime (response time). The time between samples can be estimated by {(RespTime * 60)/500} seconds. The autotune algorithm is designed to take a minimum of 500 samples during the length of the RespTime. If an **AT_ErrNo** occurs, select this entry to get a description of the error number. If errors 604 or 605 occur, it is possible that the RespTime is too short or the output is not configured or connected properly. The PVchange entry should be monitored for a response. The autotuning algorithm will begin to calculate the %_change entry after 100 samples. This entry gives an indication of the nearness to completion for the autotuning algorithm. It is calculated by taking the difference of the last 50 samples and comparing that to the overall PVchange. When it reaches 1% the autotuning algorithm will complete by calculating the PID parameters. Upon startup, the autotuning algorithm will attempt to allocate enough memory to take a maximum of 2048 samples. The amount of memory allocated may be less depending on system use. It is therefore recommended that only one loop at a time be in the autotuning mode to give it enough memory to complete. The memory will be returned for system use upon the completion of the autotuning run. If the number of samples taken fills the memory allocated an **AT_ErrNo** of **608** will be generated. The autotuning algorithm will still calculate PID parameters on this error and complete as though a normal run was completed.

Step 4: Accepting the PID parameters. See Figure 6. The entries **Samples**, **PVchange** and **%_change** will change to **CalcGain**, **CalcRST** and **CalcRate** respectively, when PID parameters are calculated. At this time the PID parameters can be reviewed by rotating the knob right and moving the cursor box to **RespTyp1** entry and selecting **FAST**, **MEDIUM**, or **SLOW**. The PID parameters for the selected Response type will be displayed. It is also possible at this time to change the entry for PIDGrp. This is the PIDGrp where the PID parameters will be stored once they are accepted. To accept the parameters the **Accept** entry should be selected to **Yes**. Once this function is complete autotune will reset and be ready for another run. If the parameters are not to be saved the autotune entry **Abort** can be selected and autotune will be reset and ready to run again. Close windows.

NOTE: The Autotune function requires that the control loop being autotuned be in Manual mode. Any change in manual output during the autotuning run will generate an error and abort autotuning. Anytime the selection of 'Abort' is displayed for the autotune entry the autotuning run can be aborted. If the user does abort an autotuning run the entry AT_ErrNo will display an error number 609.

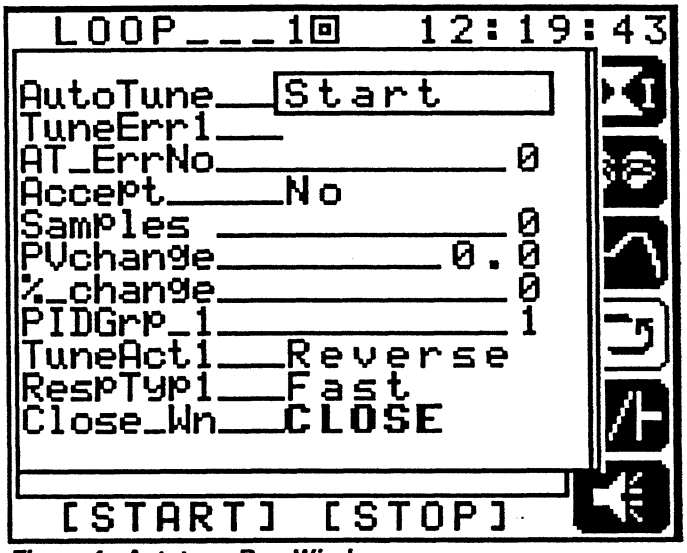


Figure 4: Autotune Run Window

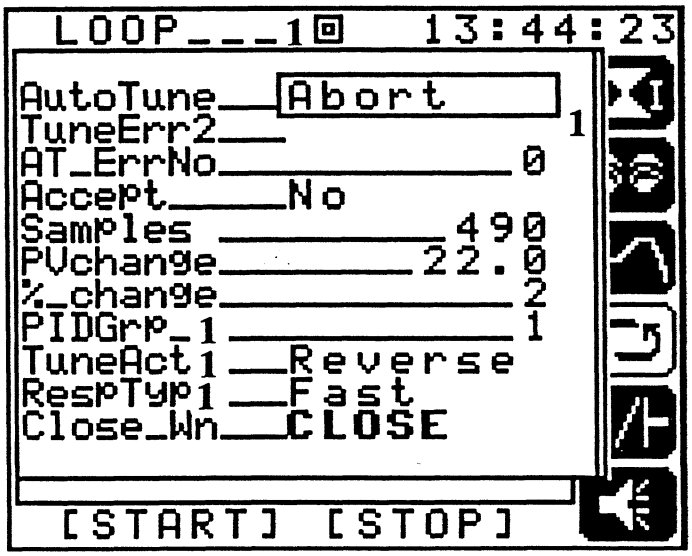


Figure 5: Autotune Run Window After Autotune Start

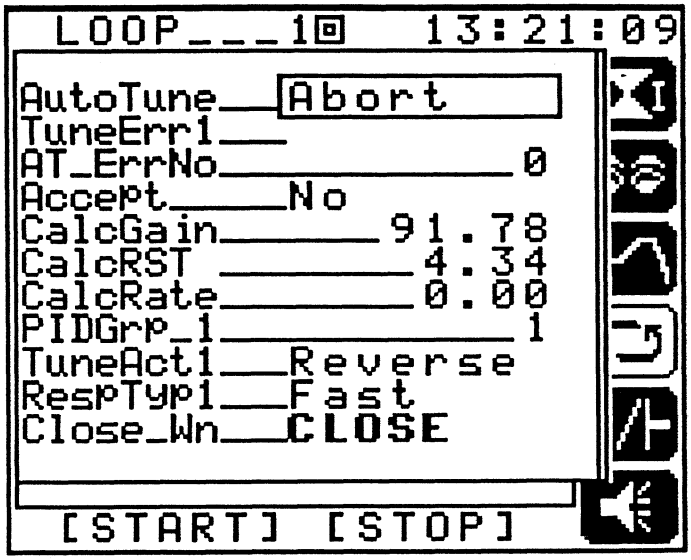


Figure 6: Autotune Run Complete Window

Setup Guide

USING BIMODAL CONTROL

The setup of bimodal control in the Dimension is very easy. Configuration of one screen is all that is required. If a unit is in its initial start-up phase, the correct parameters for bimodal operation are part of the default settings. To verify or change the settings for bimodal operation follow these five steps:

Step 1: Press the diamond keypad down to move to the Program Configuration screen (CONF_PRG) and press right to access Loop Configuration screen (CONF_LOP). See Figure 1.

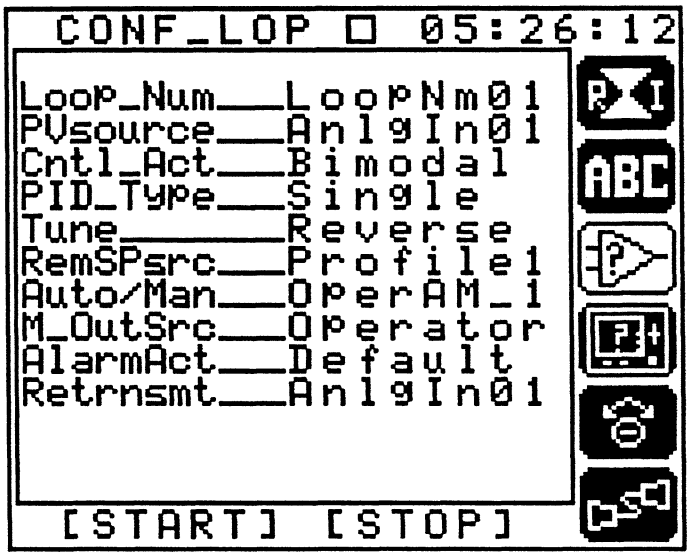


Figure 1: Loop Configuration Screen

Step 2: Turn the knob right moving the cursor box to **Loop_Num**. Press the knob and rotate right to view selections. Select the appropriate loop by pressing the knob again.

Step 3: Turn the knob right moving cursor to **Cntl_Act**. Press the knob, and a window will open.

Step 4: The first selection is **Bimodal**. Turn the knob right to view selections and press to select Bimodal.

If output limiting is desired, or a dead or overlap band is needed, this is set under the **Limit** heading. To select limits turn knob right and press to select Limit. A third small window will open. Turn the knob right or left to scroll through selections, which include reverse high limit (RvHiLmt), reverse low limit (RvLoLmt), direct high limit (DrHiLmt), and direct low limit (DrHiLmt). Also listed is the dead band parameter. Changes to any of these values can be made by turning the knob moving the cursor box to the appropriate term, pressing the knob, and entering the new value. Note: Setting the dead band to a positive value creates a "dead" area (no output), while setting a negative value will create an overlap band where both outputs are on at the same time. Turn the knob right and press to close window.

Step 5: Turn the knob moving the cursor box to **PID_type**. Typically this setting will be changed to **dual.** (For information on programmed or select adaptive PID, consult other setup guides.) When dual is specified in loop configuration, PID group one is dedicated to reverse (heating) output, and PID group two is dedicated to direct (cooling).

In addition to loop configuration, output configuration will be required. Before beginning this portion of the configuration, determine what type of outputs will be used in the bimodal process. Once this has been determined, press the diamond key right to move to the Output Configuration screen (CONF_OUT). See Figure 2. Rotate the knob moving the cursor box to **card select** (Card_Sel), press and rotate to view the output types. The analog outputs are listed under the term **AnlgCrd**, the time proportioned outputs are listed under the term **TP_Crd**, and the contact outputs are listed under **Contact**. Also listed with each term is the card number. Press the knob to select the card choice and open the configuration window. To change the source of any type of output, rotate the knob moving the cursor box to the appropriate line, and press. A list of available sources will appear. For this set-up only the reverse (RevOut) and direct (DirOut) will be used. Also note the L1-L4 which signifies which loop output will be used. Repeat this function for each loop and for each output type. Rotate the knob right moving cursor to **Close_Wn** and press knob.

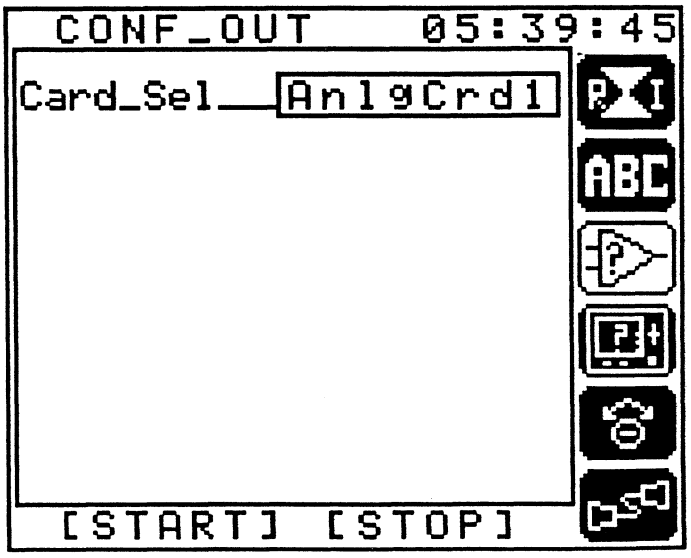


Figure 2: Output Configuration Screen

Setup Guide

USING CASCADE CONTROL

The control provided by using a single PID controller is often times inadequate for the exact part temperature control needed in many autoclaves, presses, extruders and furnaces. Other processes that may have a very slow response rate may be unstable when only one PID controller is used.

For these reasons a multi-loop or cascade control scheme is utilized. In this scheme the primary loop output sets the setpoint of the secondary loop output. The following steps will show how the Dimension Controller may be used in a cascade format. In this example loop 1 will be the primary or part temperature loop (slow responding) and loop 2 will be the secondary or air temperature loop (fast responding). For applications involving other Dimension Controller loops, substitute the appropriate loop number.

Step 1: Access the unit Configuration side of the Dimension Controller by pressing the diamond key up to highlight the RI icon. Press right to switch to the Configuration side. The title of the Unit Configuration screen (UNIT_CNF) will be shown in the upper left hand side of the display. See Figure 1. Press the diamond key up until the RI icon is highlighted, and then press the key left one time. *Note: A pass code may be required if the unit is not in full access.*

Step 2: Access the Loop Configuration screen (CONF_LOP). This is done by pressing the diamond key down two times to highlight the Configuration icon. Press right one time. The Loop Configuration screen will appear. See Figure 2.

Step 3: Turn the knob right moving the cursor box to loop number, **Loop_Num**. Change this entry to **LoopNm02** by pressing the knob and turning until loop 2 entry appears. Press the knob again to enter. Wait one moment for the loop 2 default entries to appear on the screen.

Step 4: Turn the knob right moving the cursor box to remote setpoint source, **RemSpsrc** and press the knob. A second window will open for display. Change the displayed entry to **OUTPUTL1** by turning the knob right until OUTPUTL1 appears. Press the knob to enter. A configuration tree will appear. This configuration tree will allow you to select the profile to be used, the cascade parameters, and the blending of one or two inputs into an output to determine the loop 2 setpoint. Turn the knob right moving the cursor box to cascade parameters, **CascParm**. If you press the help key (?) at this time, the following equation is displayed:

(%output*Ratio + Setpoint*Blend)÷Scale Factor

The formula is included in the help system to serve as a guideline during operation. Press the help key (?) again to close the window. Press the knob to open a third small window that will allow changes to be made to the Ratio, Blend and Scale Factor settings. Turn the knob one time and press to select Ratio. Turn the knob to change ratio value and press the knob again to enter. The ratio setting is used to determine the percentage of output from loop 1. When divided by the Scale Factor, the ratio will become the setpoint for loop 2. Turn the knob right to scroll through blend factor and scale selections using the same procedure described for ratio to change scale and blend values.

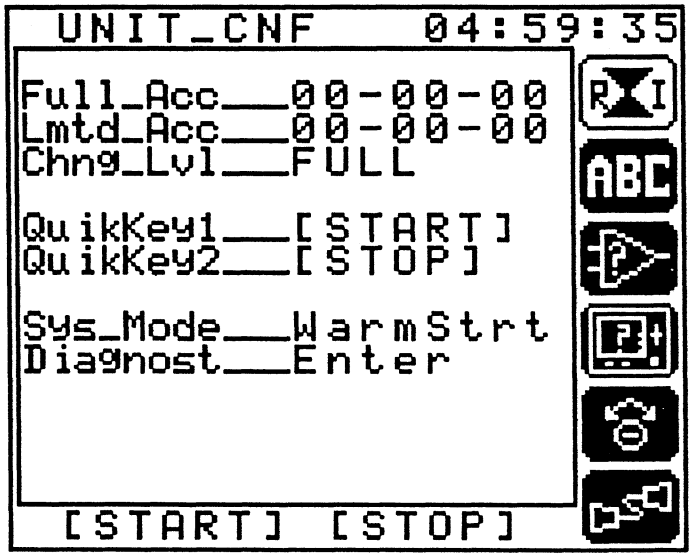


Figure 1: Unit Configuration Display

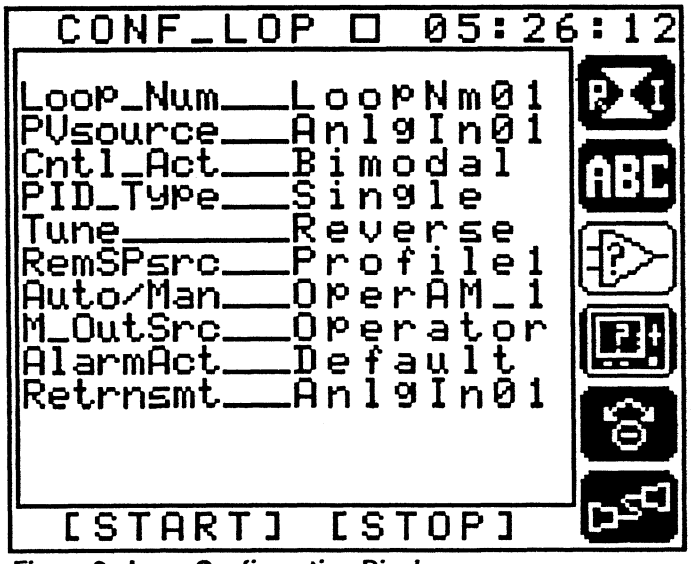


Figure 2: Loop Configuration Display

Step 5: Turn the knob right moving the cursor box to **END** and press the knob. Press the diamond key up twice to highlight the RI icon and press left once to access the operation side of the Dimension Controller.

Step 6: Press the diamond key down to the Loop Display icon and press the keypad once to the right to access **Loop 2** display. See Figure 3.

Step 7: Turn the knob moving the cursor box to loop mode, **LpMode**, and press the knob to open the Loop Setup window. Turn the knob moving the cursor to set-point source, **SptSrc02**, and press to change selection. Turn the knob until remote appears and press the knob again to enter selection.

The initial setup is now complete. Cascade loop tuning may now begin.

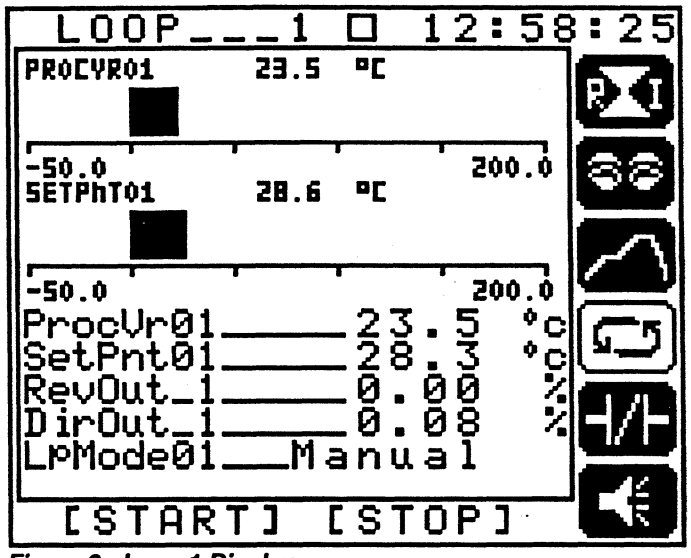


Figure 3: Loop 1 Display

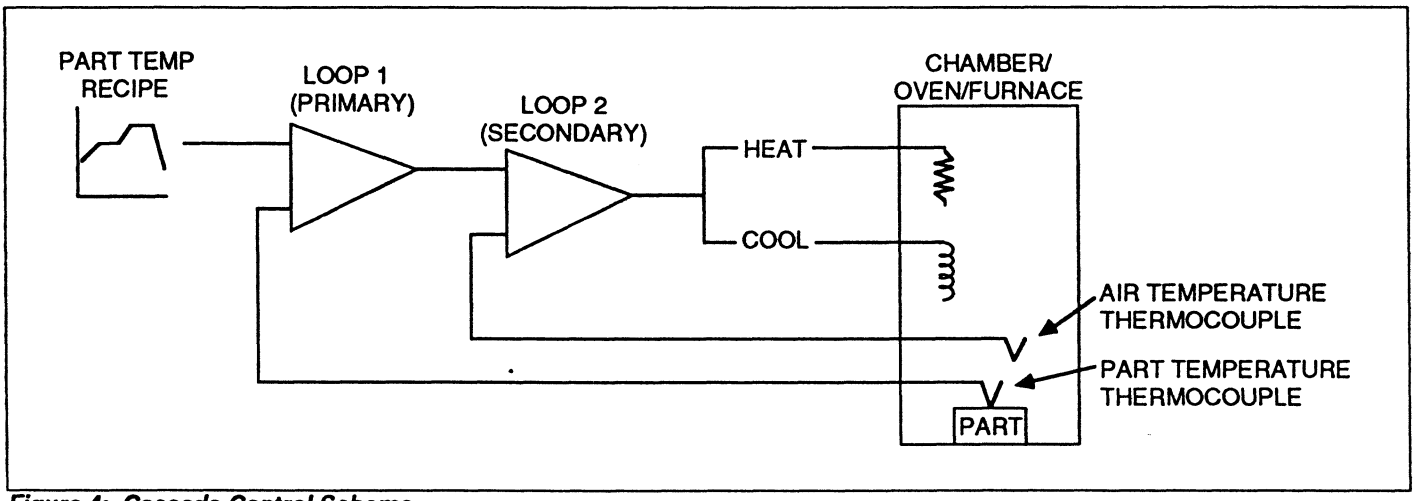


Figure 4: Cascade Control Scheme

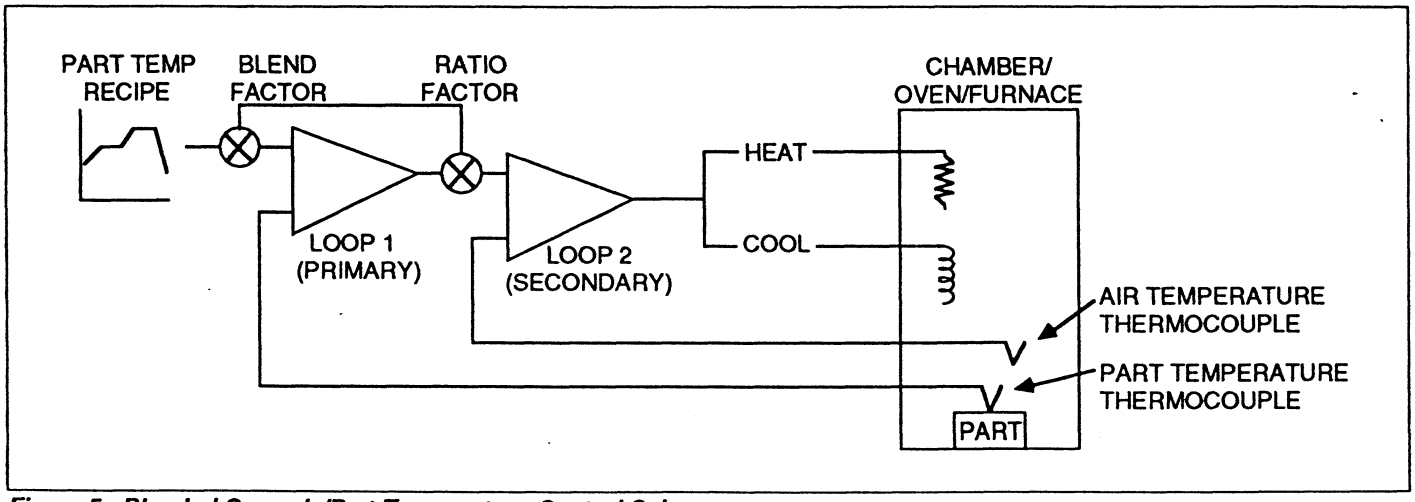


Figure 5: Blended Cascade/Part Temperature Control Scheme

Setup Guide

USING THE MEMORY CARD

Upon power-up, the Dimension Controller will be in the correct display to use the memory card. If you are in another display, scroll to the Operation side of the Dimension by pressing up on the diamond key until the RI icon [RI] is highlighted. Press the diamond key left if you are not on the operation side. The Unit Configuration (UNIT) display should appear as shown in Figure 1.

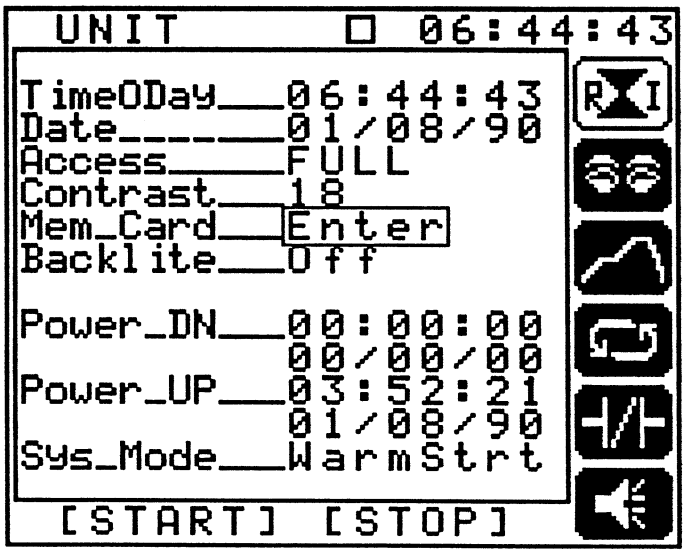


Figure 1: Unit Display

Step 1: When you are at the Unit Operation screen, turn the knob right moving the cursor box to **Mem_Card**.

Step 2: Push the knob to select the **Mem_Card** functions, a window will appear with a request to insert the memory card. Insert the memory card with the triangle indicator inserted into the memory module port located below the quick keys. Now you may select card functions, file names or close the window. Push the help key for each selection and an explanation of memory card functions will be provided. Turn the knob moving the cursor box to **FUNC_** and press the knob. Turn the knob right or left to view possible selections. Selections will include:

READ	Read selected files from the card
WRITE	Write data to the card and save as a file
DIRECT	View directory of card contents
FORMAT	Initialize card for use or erase entire contents of card
DELETE	Delete a file

Step 3: Turn the knob right moving the cursor box to **Direct** and select by depressing the knob. A window indicating file names, date and size will appear. A short message will appear if no files are found. Turn the knob right moving the cursor box to **Close_Wn** and press knob.

Step 4: To select a file, turn the knob right moving cursor to **READ** and push the knob. The **READ** command transfers data from the memory card to the Dimension Controller.

Step 5: To write or save a file, turn the knob moving the cursor box to select **WRITE** and push the knob. The write protect switch must be set to NO on the memory card. Turn the knob to select the file to be saved, then change the name if desired by pushing the knob and turning to enter a name. A window will appear to initiate the write command or exit, turn the knob right moving the cursor box to write and press to make the selection. A message will appear when the write command is completed. Turn the knob right moving cursor box to **Close_Wn** and press.

Other information:

The memory card closely resembles the floppy disk of a computer. However, the memory card is a single sided device that contains RAM memory and a battery backup. Both 16K and 32K cards are available.

To write protect your memory card, use the switch in the lower right corner of the card to select YES to write protect.

Files can be deleted or the memory card can be formatted to remove all data. In both cases the data will be destroyed.

The memory card uses a 3 volt lithium battery with a shelf life of five years. Replacement batteries are available. The part number is 079379-001. If the battery is running low a message will appear when you use the memory card.

Files types:

Recipes	A program or group of segments
Mem_Img	Memory image, setup and configuration
DspConf	Display configuration
Quikeys	Quick key configuration storage

Setup Guide

REDUNDANT INPUTS

In the middle of a process, a temperature or other sensor could fail. Production time is lost, the cost of the material can be expensive, and in the worst case, an oven or autoclave may be destroyed. Alarms on the process solve part of the problem. However, an operator must be available to respond to critical conditions that develop. The real need lies in a backup system that is low cost. The Dimension Controller offers a low-cost alternative to a redundant controller. The Dimension Controller can be configured to switch the input from an original sensor to a back-up sensor in the event of a burn-out or open condition.

Step 1: Access the configuration side of the unit by pressing the diamond key up to highlight the RI icon. Press right until the ABC icon is directly below the RI icon. Now press down until the Configuration icon is highlighted. Press right until the **CONF_LOP** screen appears. See Figure 1.

Step 2: Select loop number one. Turn the knob right moving the cursor box to **Loop_Nm**. Press the knob and rotate until the proper loop is displayed. Press the knob to make selection. Rotate the knob again moving the cursor box to the second selection, **PVsource**. Press the knob. An embedded window will appear showing a configuration tree. Press the knob and rotate until **AnaIn1_2** appears. Press the knob to select. Rotate the knob moving the cursor box to **End** and press to exit embedded window.

Loop number one will now receive its input from analog input one until an open sensor occurs. At that time, the Dimension will sense the open condition and automatically switch to the redundant input, analog input number two.

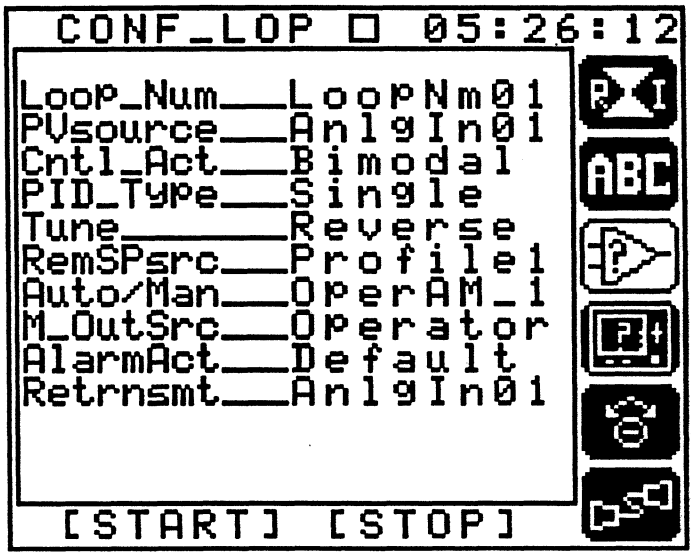


Figure 1: Loop Configuration Screen

Setup Guide

RETRANSMITTING A LOOP DEVIATION

Deviation is the difference between the loop setpoint and the process variable values. The control loop in "auto" mode will try to control to zero deviation. Because we can have both positive and negative deviation the range is twice as large. The retransmitted range is sourced from the analog input selection and will be in units associated with this input.

Example:
Loop 1 is a K thermocouple. We would like to retransmit the deviation to a chart recorder. The recorder requires a 0-5 VDC signal that represents 0 to 1000°C. But deviation can be both positive and negative, therefore the deviation is a –1000 to +1000°C range.

The output signal to the recorder is as follows:

Analog Output #4		Deviation
0.0V DC	=	+1000°C deviation
2.5V DC	=	0°C deviation
5.0V DC	=	–1000°C deviation

Step 1: Power down the Dimension Controller and remove the analog I/O board. Set the jumpers for output #4 to 0-5V DC configuration. (See Getting Started Guide for instruction.) Your Dimension Controller will arrive with a factory set 4-20 mA configuration. Power up your controller.

Step 2: Using the diamond key press up to highlight RI icon and press right to access the configuration side of the Dimension. Press down until the Program Configuration screen (CONF_PROG) appears and press right to the Output Configuration screen (CONF_OUT). See Figure 1. Turn knob right moving the cursor to **Card_Sel** and press the knob. Change the selection to **AnlgCrd1** by turning the knob and pressing. An embedded window will open to allow configuration of the analog output source. See Figure 2. The cursor box will be around the first selection, RevOutL1. Press the knob and change the selection to **DevOutL1_AnaOut04**. Turn the knob and press to close window.

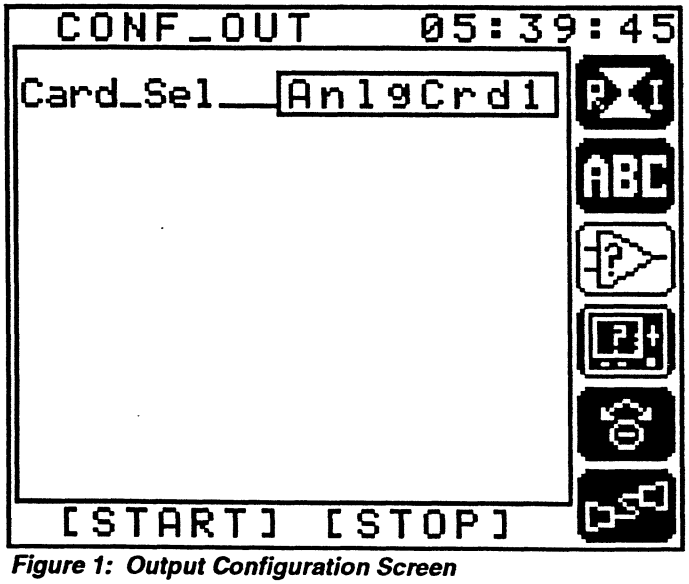


Figure 1: Output Configuration Screen

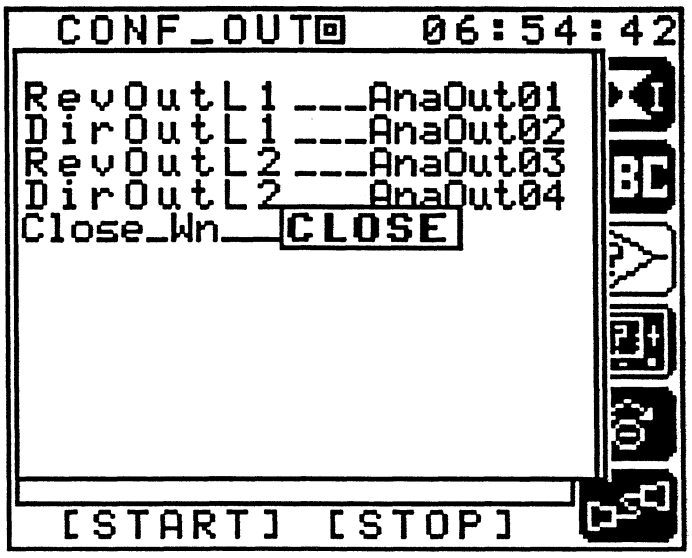


Figure 2: Analog Output Source Configuration Window

Step 3: The next step is to calibrate analog output #4 to 0-5V DC with a multimeter. Press the diamond key down to highlight the Hardware Calibration icon. The **Input** screen will appear. Press the diamond key right until the Analog Outputs screen (ANA_OUTS) appears. See Figure 3.

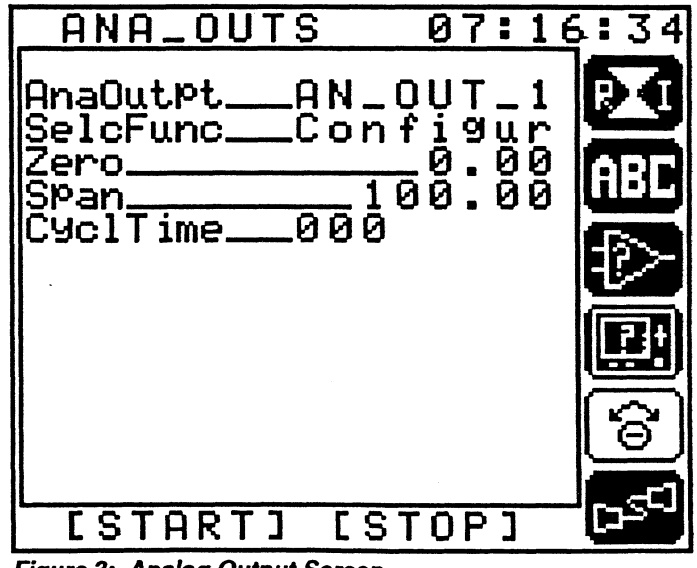


Figure 3: Analog Output Screen

Step 4: Turn the knob right moving the cursor box to **AnaOutpt**, press the knob and turn the knob again to scroll through output selections. To select the output to be calibrated, press the knob again. Turn the knob right moving the cursor box to **SelcFunc**. Press the knob and turn right or left to select configuration or calibration. Select **Calibrate** and press the knob to enter. The Calibrate Outputs screen will appear. See Figure 4.

Step 5: The calibration zero and span values calibrate the output to provide the correct voltage or current output. To calibrate, connect a volt meter to the appropriate rear terminals (see Figure 2–2 in the Dimension User's Manual) and adjust the span and zero values. When complete, save your calibration setting by turning the knob right to **SaveAban** and press the knob. Turn the knob to select either save or abandon, if you wish to revert to the original settings. Press the knob to enter selection.

Step 6: In our example on the front page, zero would be set to –1000 and the span to +1000. This step is required for all types of retransmit. (Process variable, setpoint and deviation.) Process variable and setpoint retransmit would be set to 0 and 1000. For deviation, if –100 and +100 are selected, then full and zero output signal is achieved at –100 and +100 deviation. Turn the knob moving the cursor box to **SelcFunc** again and press the knob. Change the selection to **Configure** and press the knob. An embedded widow will appear (see figure 5). Change the zero and span value by turning the knob and pressing to make selection. Note: The zero/span setting should match the process variable input **InptLowLim** and **InptHiLim** settings when setting up a retransmit. Turn the knob to close the window. The ANA_OUTS screen will appear again. Configuration is complete.

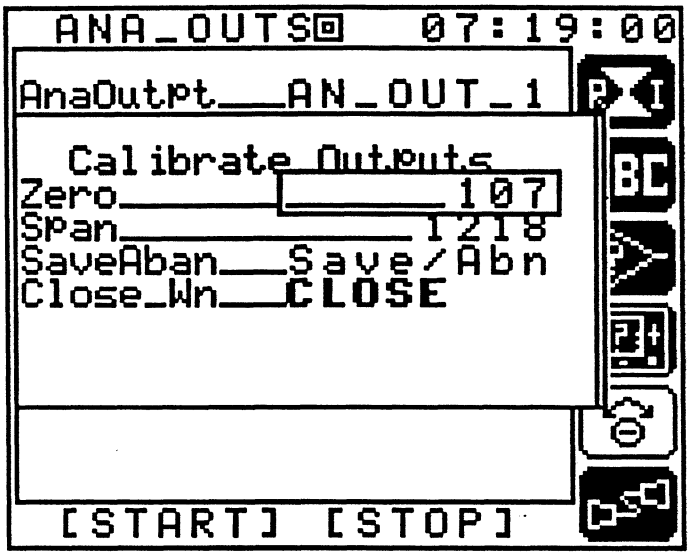


Figure 4: Analog Output Calibration Window

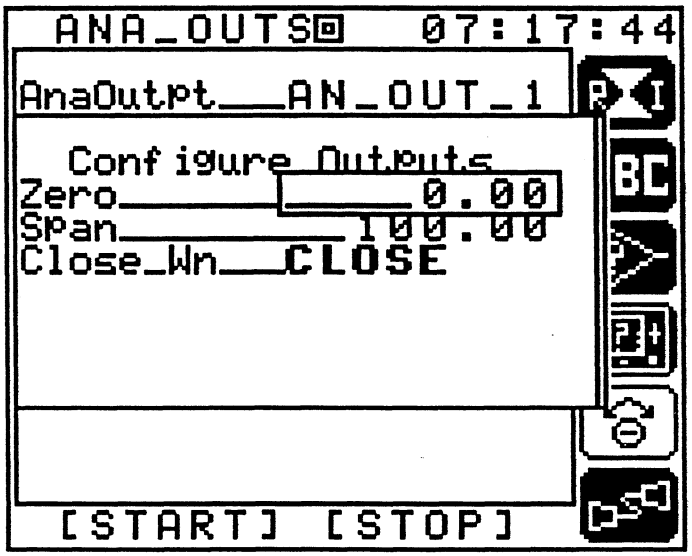


Figure 5: Analog Output Configuration Window

Setup Guide

Setting of Staged Outputs

An extension of a single control output is used to accomplish output staging. For example, if we choose to use normal and boost heating on loop 1 of our process, we will select the normal heating output to be assigned from 0 to "X" percent of control loop. Output X would be the transfer point from normal stage to stage two, boost stage. The boost heating from "X" to 100 percent of the output level.

Step 1: Step one will access the appropriate screen. Push the diamond key up until the RI icon is highlighted. Press the diamond key right or left to move from the operation side of the Dimension Controller to the configuration side. Now press the down key twice until the Process Configuration icon is highlighted. Press the key right three times until Configure Outputs screen appears. See Figure 1.

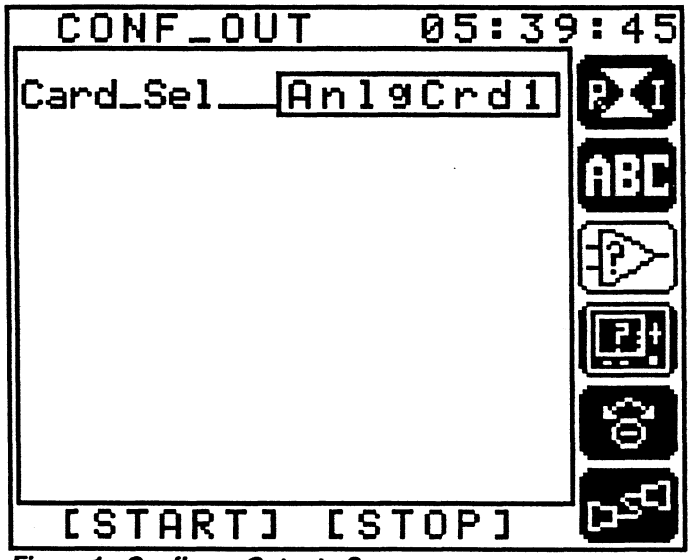


Figure 1: Configure Outputs Screen

Step 2: Step two will select the I/O card to which outputs will be assigned. Assign analog outputs on the analog card. Turn the multi-purpose knob right moving the cursor box to **Card_Sel**, and press the knob. Turn the knob right to scroll through card selections. Scroll until **AnlgCrd1** appears and press the knob to enter selection. If AnlgCrd1 is already shown when the **CONF_OUT** screen appears, select it again by turning knob to highlight **Card_Sel** and press the knob. AnlgCrd1 will now be highlighted. Simply press the knob again to select the choice. A new window will appear to allow output assignments. See Figure 2.

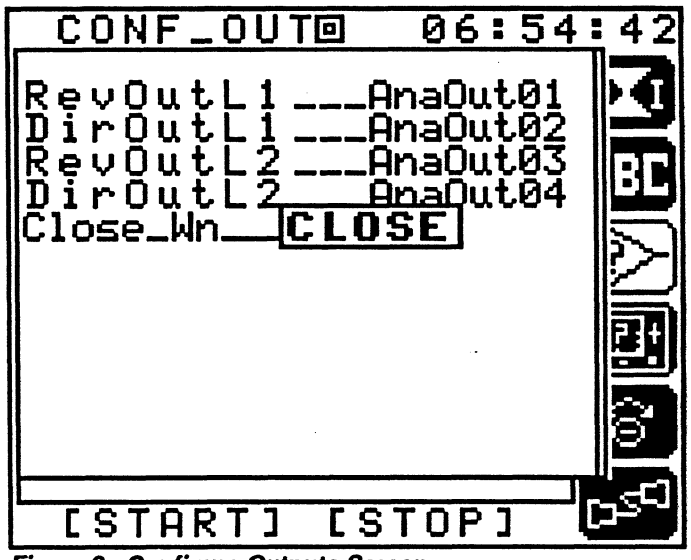


Figure 2: Configure Outputs Screen

Step 3: Step three will assign analog output one and two as reverse acting. The cursor box will surround **AnaOut01** when the new window appears. Press the knob and turn right to scroll through options until **RevOutL1** appears. Press the knob to select. Turn the knob to highlight the AnaOut02 selection and press the knob. Turn the knob to scroll through options until **RevOutL1** appears. Press the knob to select. Two analog outputs will be used as reverse outputs to control the two heating elements in our application. Analog output 1 will be assigned as normal output and analog output 2 will be assigned as the boost stage. Turn the knob right moving the cursor box to **Close_Wn** and press the knob to select. The **CONF_OUT** screen will appear.

Step 4: Step four will configure analog output one. Press the diamond key down twice to highlight the Hardware Calibration icon. Press the key right until the Analog Outputs screen (**ANA_OUTS**) appears. See Figure 3. Turn the knob right once moving the cursor box to AnaOutpt and press the knob. Turn the knob right or left until **AN_OUT_1** appears. Press the knob to select analog output 1.

Step 5: Step five will configure zero and span values for analog output one. Turn the knob right once moving cursor box to **SelcFunc**. The Configure option will be shown. Select it again by pressing the knob to highlight. Press the knob again to select. The Configure Outputs screen will

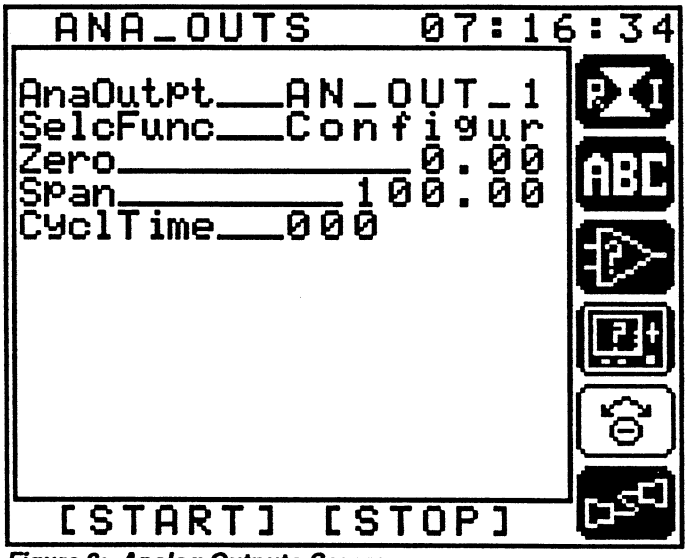


Figure 3: Analog Outputs Screen

appear. See Figure 2. Zero and Span are the selections on this window. The zero value is the minimum output value. The span value is the maximum output value. For our example we will use the following zero and span assignments for analog output 1:

zero = 0.00
span = 75.00

Press the knob to select the zero value, turn the knob to change value and press the knob again to enter new value. Follow this procedure to assign a value to the span. This arrangement will give full normal heating up to 75 percent output and will continue to give full normal heating up to 100 percent output. Proportional heating will be applied below 75 percent output on loop 1. Turn the knob again to the right moving the cursor box to **Close_Wn** and press to enter.

Step 6: Step six will configure analog output two. Turn the knob left moving cursor box to **AnaOutpt**. Press the knob and turn right to change the selection to **AN_OUT_2** and press again to enter.

Step 7: Step seven will configure the zero and span values for analog output zero. Turn the knob right once moving cursor box to **SelcFunc**. The Configure option will be shown. Select it again by pressing the knob to highlight and press the knob to select. The Configure Outputs screen will appear. As described in Step 5, assign zero and span values to analog output 2 and close the window. For our example we will be using the following zero and span assignments:

zero = 75.00
span = 100.00

From 0 to 75 percent output, normal output will be on. At 75 percent output, boost output percent will be zero. See Figure 4. On your Dimension screen, normal output is shown as 0 to 75 percent. Boost stage is shown from 75 to 100 percent output. At 87.5 percent output, boost output percent will be half. At 100 percent output, boost output percent will be full on. More output stages can be easily added using the available outputs. Staged outputs can also be used as cooling (direct acting) outputs. The limit to the number staged outputs available is dependent upon the physical number of outputs available. All staged outputs must be resident on the analog I/O card. Therefore, one may only have six staged outputs per pair of loops.

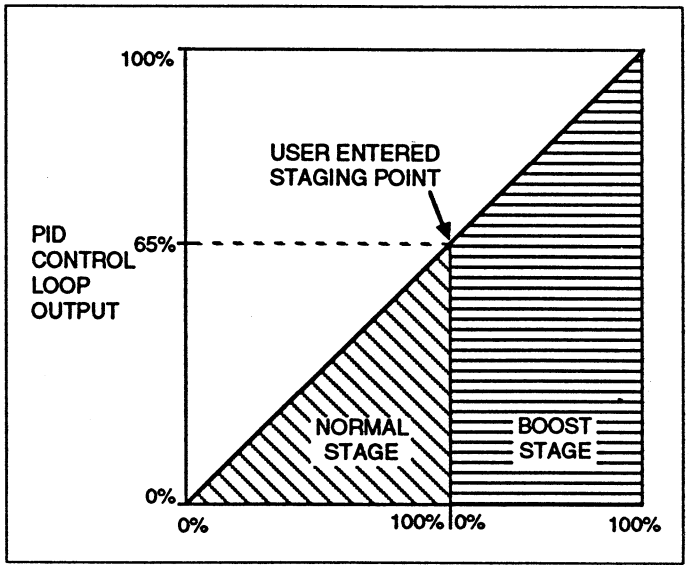


Figure 4: Staged Outputs

Setup Guide

USING TIME PROPORTIONED OUTPUTS

This guide will describe the five easy steps required to assign control loop output signals to a Dimension Time Proportion output terminal. It assumes that the rest of the loop configuration is completed as described in other setup guides and sections 2–8 of the Dimension Operator's Manual. Before continuing, all hardware configuration jumpers must be set correctly.

Time proportioned outputs provide on/off control. The amount of time an output is ON or OFF is determined by the reverse or direct Output Percentage for the control loop and the configured Cycle Time. Refer to Figure 1 for a diagram of this relationship.

The Dimension Controller has outputs available on the Analog card and the Contact card that can be selected for time proportioning. Refer to Table 1 for output selections options.

NOTE

Where an * appears in the text it represents a number, such as loop number, card number or input number.

Analog Card	Contact I/O Card
Qty 4 0-5 VDC 4-20 mA (AnlgCrd*)	Qty 8 12-280 VAC 3-60 VDC (Contact*)
Qty 2 A/C Relay Outputs (TP_Crd1)	

Table 1: Time Proportioned Output Relationship

Step 1: Access the unit configuration side of the controller. This is accomplished by pressing the diamond key up until the RI icon is highlighted, then press left once to access the Unit Configuration display (UNIT_CNF) pictured in Figure 2.

Step 2: Access the Output Configuration screen (CONF_OUT) by pressing the diamond key down twice until the Process Configuration icon is highlighted. Press right three times until the CONF_OUT screen is displayed. See Figure 3 and refer back to Table 1 for selections.

Step 3: Turn the knob right to move cursor box to **Card_Sel**. Press the knob and turn right to view selections. Press the knob once to enter the selection. A window will open to allow patching of loop outputs to the selected physical output. The following sections of this guide will explain configuration for the board options. Follow the guide for the board you have selected.

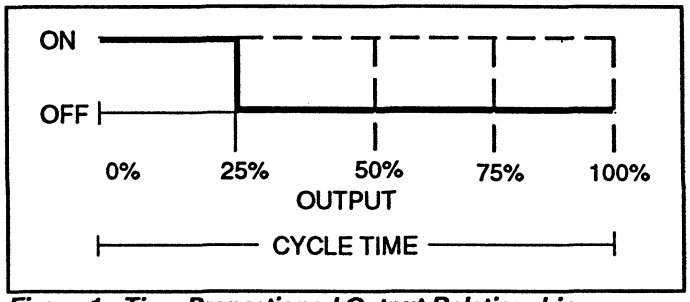


Figure 1: Time Proportioned Output Relationship

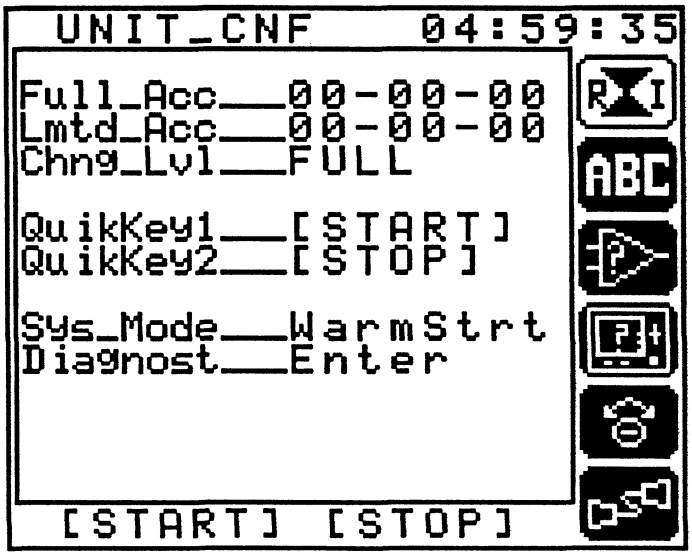


Figure 2: Unit Configuration Screen

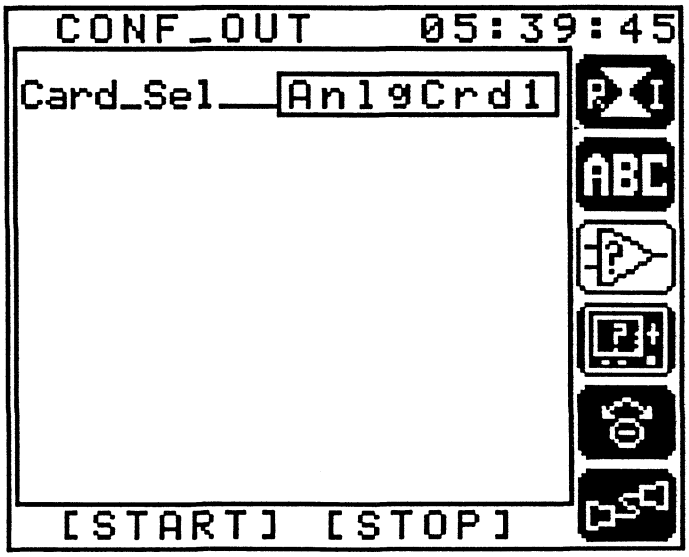


Figure 3: Configuration Output Screen

Time Proportion Analog Outputs on the Analog Card

Step 4: The previous step will have opened a new window. From the display window shown, press the knob to allow parameter selection. Rotate the knob and press to select the desired loop output to be tied to the **AnaOut***. Choices are **RevOutL*** for the selected loop Reverse Output or **DirOut*** for the Direct Output. Make this selection for each control output as required for your application. After you have made your selections, move the cursor box to the **Close_Wn** field. Press the knob to exit. Move to Step 5.

Time Proportion Relay Outputs on the Analog Card

Step 4: The previous step will have opened a new window. Press the knob to allow parameter selection. Rotate the knob and press to select the desired loop output to be tied to the **TPout***. Choices include **RevOutL*** for the selected loops Reverse Output or **DirOutL*** for the selected loop Direct Output. Make this selection for each control output as required for your application. Move the cursor box to the **Close_Wn** field. Press the knob to exit. Proceed to Step 5.

Time Proportion Outputs on the Contact I/O Card

Step 4: The previous step will have opened a new window. Press the knob to allow parameter selection. Rotate the knob and press to select the desired loop output to be tied to the **ConOut***. Choices are **RevOutL*** for the selected loop Reverse Output or **DirOutL*** for the selected loop Direct Output. Make this selection for each control output as required for your application. Move the cursor box to the **Close_Wn** field. Press the knob to exit this window.

Step 5: After patching the loop control outputs to the desired physical outputs in the proceeding section, you must now configure the desired **Cycle Time** for each time proportioned output. Access the Hardware Calibration icon by pressing the diamond key down. Press the diamond key right to select **ANA_OUTS** configuration screen. See Figure 4. Select the **AnaOutpt** that is to be configured for Time Proportioned Outputs by rotating the right and pressing to select. Turn right to view selections and press to enter selection. Access the **CyclTime** entry by turning the knob to move the cursor box. Press knob to select the parameter. Rotate the knob to select the number of seconds from 1 to 255 for the cycle time and press the knob again to enter. Follow the steps described above for **TP_OUTS** and **CON_OUTS** configuration as required. These screens are accessed by pressing the diamond key right. See Figures 5 and 6.

NOTE: A value of 0 disables time proportioning and any non-zero value enables it.

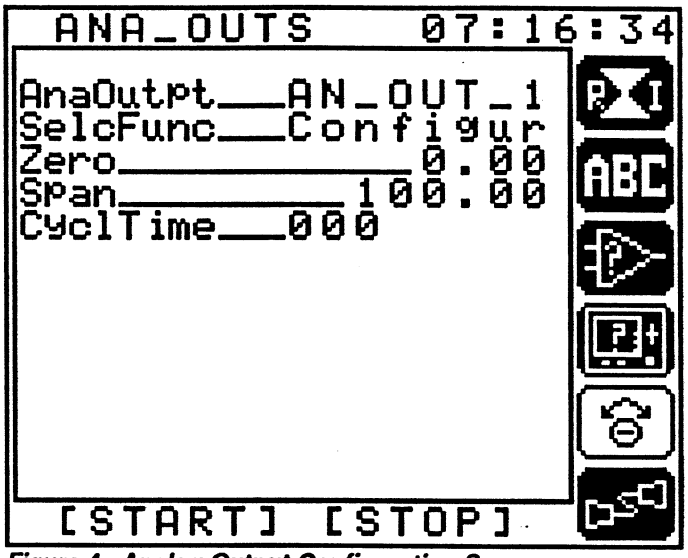


Figure 4: Analog Output Configuration Screen

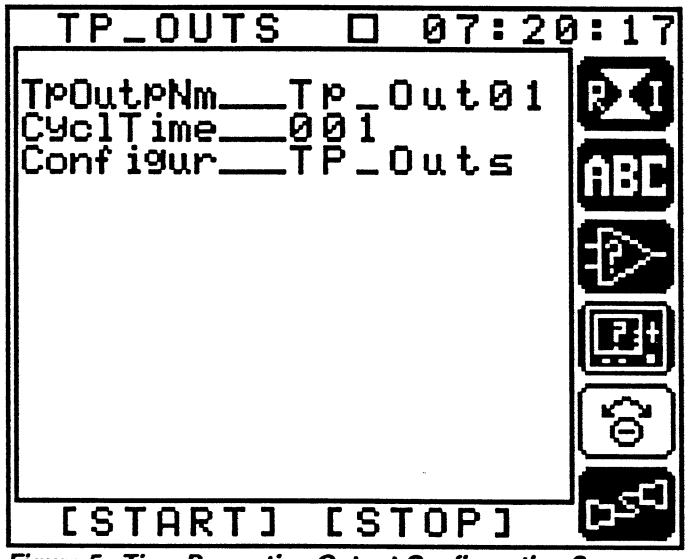


Figure 5: Time Proportion Output Configuration Screen

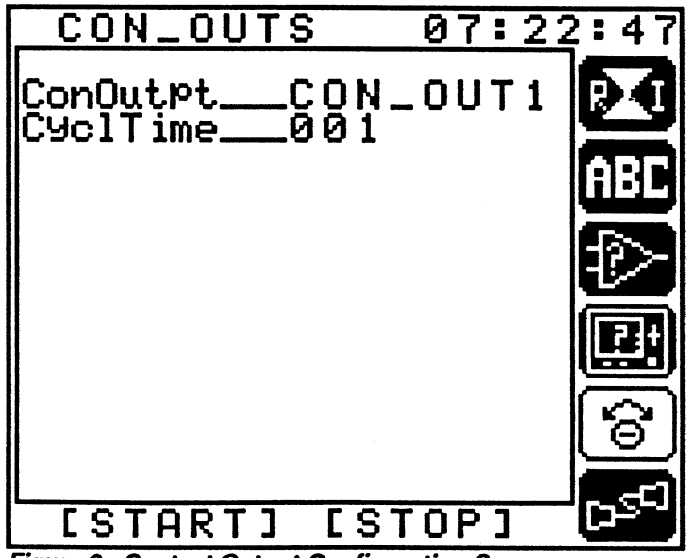


Figure 6 : Contact Output Configuration Screen

Setup Guide

CALCULATING INPUTS

The Dimension Controller provides the ability for the process variable to be derived from a calculation. This may provide increased control that a direct reading from a sensor cannot provide. For example, in a large furnace we may find the upper area of the furnace is warmer than the middle or lower areas. Placing two thermocouples in the same zone and averaging their temperatures may improve the process control. Up to four analog inputs may be averaged.

Formula for Calculation

{(AnIgIn01 x Mult01) + (AnIgIn02 x Mult02) + AnIgIn03 x Mult03) + (AnIgIn04 x Mult04)} ÷ Scale

All multipliers are set to zero and the scale is set to 100 at the factory. There are two identical calculated inputs available "CALC_1 and CALC_2".

Using the example above, we will average analog input one and two. If input one is 360° and input two is 340°, then the formula will be:

{(360 x 1) + (340 x 1)} ÷ 2

The result will be 350° for the process variable.

Step 1: This step will access the appropriate screen. Access the configuration side of the Dimension Controller by pushing the diamond key up until the RI icon is highlighted. Press the diamond key right and then push down until the Process Configuration icon is highlighted. Press the key right now until the Loop Configuration (**CONF_LOP**) screen appears. See Figure 1.

Step 2: This step will select calculated input as the process variable source. Turn the knob right moving the cursor box to **PVsource** and press the knob. A second window will open to display options. The cursor box will appear with AnIgIn01 selected. Press the knob and turn the knob right until **Calc_1** appears. Press the knob to enter selection. A second window will appear.

Note: An "open sensor" on any loop will cause a CALC value to read "open sensor".

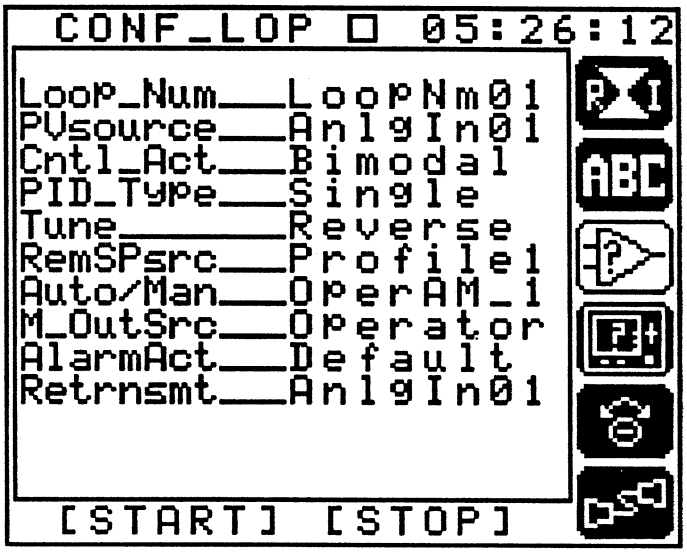


Figure 1: Loop Configuration Screen

Step 3: This step will define the calculation equation. Turn the knob right moving the cursor box to **Equation** and press the knob. A third small window will appear at the top of the screen. Press the knob and turn to select multiplier value. Press the knob to enter selection. Turn the knob right moving to the next equation value that will require setting. Multiplier one and two should be set to one, according to our example, and scale selection will be two. Using the method described above, select all values of the equation. Close window by pressing the knob.

Another application may involve the operator adding to or subtracting from the process variable indicated because exact positioning of the thermocouple is not possible. A variable signal (0–5 VDC) is summed with the actual process variable creating a calculated process variable. For example, analog input one input is 340° and the operator has added 12° to the reading. Now the process variable reading is 352°. The equation would be:

(340 x 1) + (12 x 1) + 1

This calculated input is performed to improve the control process where exact sensor placement is not possible. To execute, use the steps outlined above.

Appendix
D

Specifications and Ordering Information

Appendix D

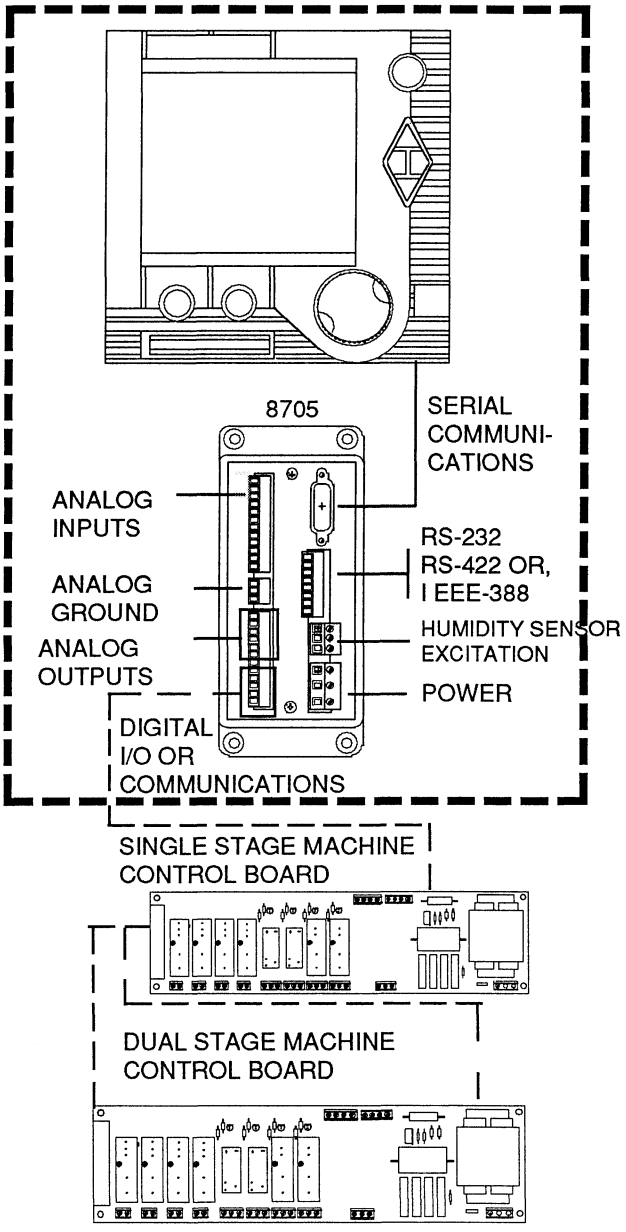
Specifications and Ordering Information

1. Model 8705 Technical Specifications and Ordering Information
2. Model 8725 Technical Specifications and Ordering Information
3. Model 8781 Technical Specifications and Ordering Information
4. Model 8782 Technical Specifications and Ordering Information

DIMENSION® II

Model 8705

Dimension II Model 8705 Controller Specifications



OI/Process Manager (CPU)

- 1–4 Loops
- 0–4 Programmers
- Displays I/O Process Control Information, Configurations and Options

Input/Output Processor Box

- 1–6 Analog Inputs
- 1–4 Analog Outputs
- 2 Digital I/O or Expansion Serial Port to Digital I/O Controller(s)
- RS-232 and RS-422 or IEEE-488

Single Stage Machine Control Board

- 6 Contact Outputs
- 1 Watch Dog Output
- 2 Contact Inputs
- 2 Pressure Sensor Inputs
- 1 Temperature Input

Dual Stage Machine Control Board

- 12 Contact Outputs
- 1 Watch Dog Output
- 8 Contact Inputs
- 4 Pressure Sensor Inputs
- 2 Temperature Input

RESEARCH INC.

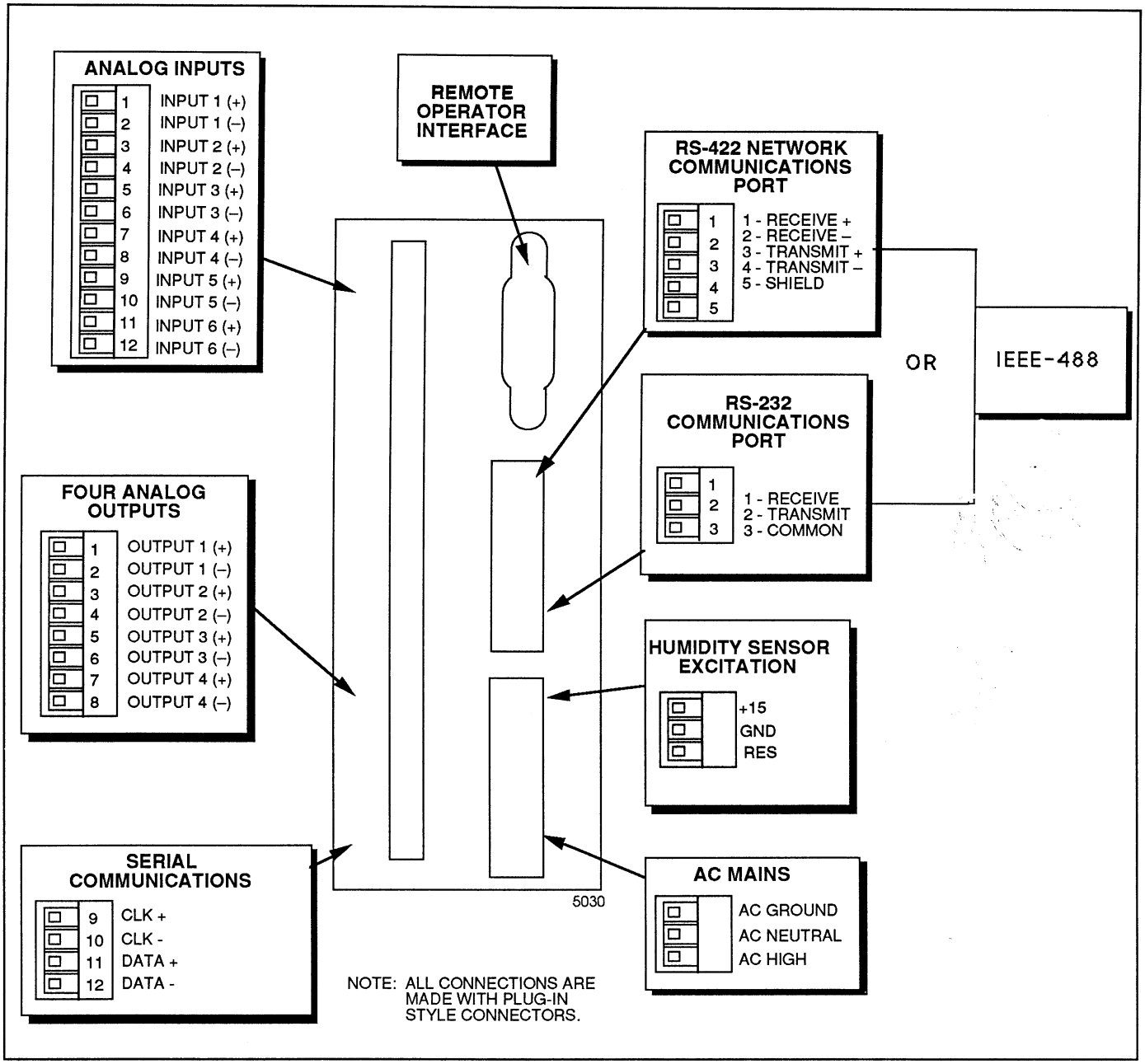
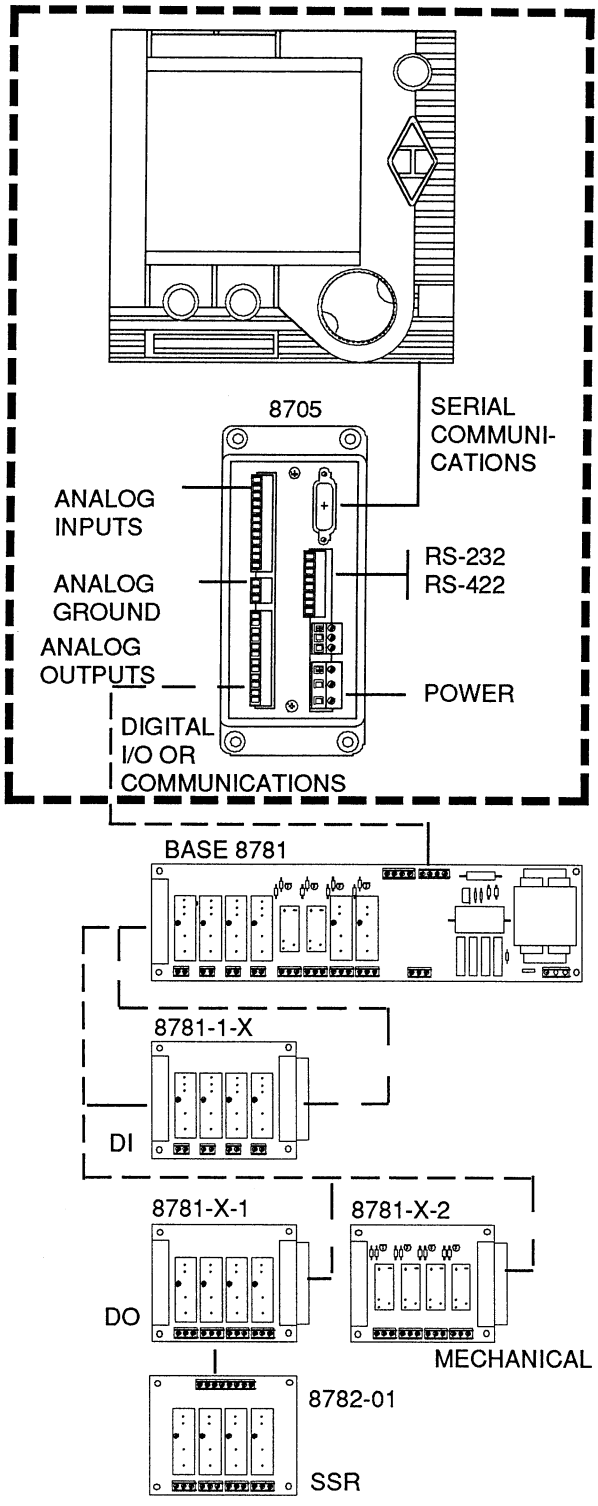


Figure 1. Typical Rear View

Specifications

	Model 8705 Control Cage	Model 8705 Operator Interface
Dimensions Overall WxHxD	2.7" x 6.375" x 8.875" (69 mm) x (162 mm) x (225 mm)	6.75" x 6.06" x 2.27" (173 mm) x (155 mm) x (58 mm)
Weight	2.2 pounds (1 kilogram)	2.0 pounds (0.9 kilograms)
Environmental Limits		
Operating Temperature	0°C to 60°C (32°F to 140°F)	0°C to 50°C (32°F to 122°F)
Storage Temperature	–25°C to 85°C (–13°F to 185°F)	–20°C to 60°C (–4°F to 140°F)
Relative Humidity	0 to 90 percent, non-condensing	10 to 90 percent, non-condensing



OI/Process Manager (CPU)

- 1–4 Loops
- 0–4 Programmers
- Displays I/O Process Control Information, Configurations and Options

Input/Output Processor Box

- 1–6 Analog Inputs
- 1–4 Analog Outputs
- 2 Digital I/O or Expansion Serial Port to Digital I/O Controller(s)
- RS-232 and RS-422 or IEEE-488

Digital I/O Expansion

- 1–2 Base Controllers, 4 Inputs, 4 Outputs
- 1–2 Expansion Racks, 4 Inputs
- 1–2 Expansion Racks with 4 SSR Outputs, or 1–2 Expansion Racks with Mechanical Relay Outputs (maximum of 2)

ALTERNATE CONFIGURATION

Voltage	102–264 VAC
Frequency	47–63 Hz
Power	10 Watts (typical)
Isolation	• Analog inputs on each analog input/output card – 1500VAC • Analog outputs on each analog input/output card – 1500VAC • Communications – 1500VAC • From AC mains – 3500VAC
Operating Modes	
Auto/Manual	Selected for each loop of control separately May be configured for simultaneous selection
Run/Hold	Selected for each programmer separately May be configured for simultaneous selection
Process Control Types	
Manual Control	0.0 to 100.0 percent reverse output and/or 0.0 to 100.0 percent direct output
Auto Control	PID Parameters (Five groups for each loop of control except Manual Reset) Gain: 0.0 to 200.0 Auto Reset: 0.0 to 75.00 repeats per minute with anti-reset windup Manual Reset: 00.0 to 99.9 percent, reverse and direct Rate: 0.00 to 99.99 minutes
Control Loops	
Number	One to four control loops
Programmer Capacities	
Number of Programmers	One to four (one programmer for each loop of control) or one total
Number of Segments	256 (shared by all programmers) or 750 shared segment programmer available
Number of Events	12 (programmed on a per segment basis)
Maximum Segment Time	99 hours
Minimum Segment Time	0.1 second
Segment Sequencing	Forward or backward jumps with nested recycling
Programmer Update Rate	0.1 seconds
Analog Inputs	
Number	One to six per analog I/O card
Types & Ranges	See Table 1
Accuracy	See Table 1
Temperature Stability	See Table 1
Repeatability	0.008 percent full scale
Resolution	Analog: 16 bits (0.0015)
Failed Sensor Detection	Available for thermocouple inputs. Controller response to a failed sensor condition is selectable as "Output Hold" or "Output to Default Value"
Filtering	Keyboard selectable
Noise Rejection	Normal Mode: 60db min. @ 50–60 Hz Common Mode: Thermocouple / RTD & Linear 0–1KHz: 90db / 70db DC: 120db / 100db
Sampling Rate	0.1 second
Input Impedance	Thermocouple and voltage: > 10M ohms Current: 500 ohms

Process Outputs	
Output Action	User configurable as reverse, direct or bi-modal
Output Signal Types	Analog: One to four outputs per Analog I/O Card Each output factory configurable as 0–5VDC, 0–20mA, 4–20mA or as on/off time-proportioning
Impedance Limits	Voltage output: 300 ohms minimum Current output: 600 ohms maximum
Compliance Voltage	Voltage output: N/A Current output: 14.5VDC minimum
Output Limiting	Separately adjustable for each output (reverse- and/or direct-acting) of each controller channel as high limit and/or low limit
Bi-Modal Band Relationship	–10.0 percent to +10.0 percent (adjoining band, deadband, and overlapping band)
Update Time	0.2 Second (Faster update speed available. Please consult factory)
Resolution	Analog: 13 bits (0.015 percent) Time-proportioned: 8 bits (0.4 percent)

Alarms	
Process	Nine alarms per control loop. High, High-high, Low, Low-low process variable and process deviation. Five groups of process alarm values. Failed sensor alarm
Input	Two alarms for each analog input. High and Low

Communications	
Types	RS-232 single drop and RS-422 multidrop or IEEE-488
Protocol	ENQ/ACK
Baud Rate	300, 1200, 2400, 9600, 19.2K
Maximum Distance	RS-232: 50 feet (15 m) RS-422: 4000 feet (1200 m)

Operator Interface	
Interconnection Cable	8 feet (2.4m) (used to connect the operator interface panel to the 8705 control cage)
Type of Display	LCD with backlighting
Display Resolution	160 pixels wide x 128 pixels high

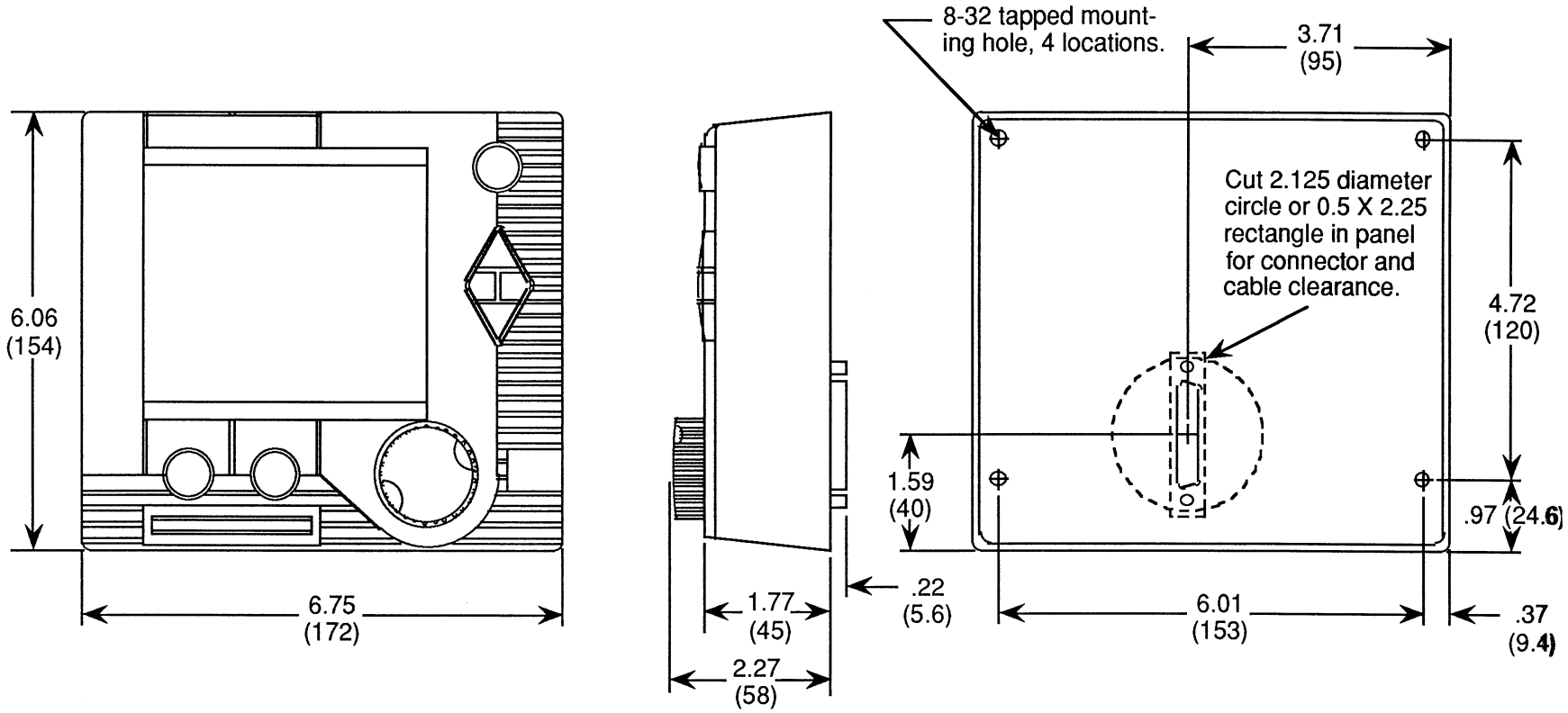
	Range	Overall Accuracy	Temperature Coefficient	
Altitude	0 to 120	@ 72°F or @ 22°C	± % FS Per °F	± %FS Per °C
	100 to120 80 to 100 50 to 80 0 to 50	±1.00%FS ±0.75%FS ±0.25%FS ±0.10%FS	.015	.008

Table 1. Standard Dimension Input Types/Ranges

Thermocouple	Range °F	Range °C	Overall Accuracy @ 72°F ± °F	Overall Accuracy @ 22°C ± °C	Temperature Coefficient ± °F Per °F	Temperature Coefficient ±°C Per °C
J	**0 to 1400**	**-20 to 760**	0.63	0.35	0.04	0.02
K	**0 to 2500**	**-20 to 1370**	0.81	0.45	0.06	0.03
T	**-328 to 752**	**-200 to 400**	0.63	0.35	0.04	0.02
R	**0 to 3200**	**-20 to 1760**				
	0 to 932	-20 to 500	1.80	1.00	0.09	0.05
	932 to 3200	500 to 1760	0.81	0.45	0.06	0.03
S	**0 to 3200**	**-20 to 1760**				
	0 to 932	-20 to 500	1.80	1.00	0.09	0.05
	932 to 3200	500 to 1760	1.00	0.55	0.06	0.03
E	**-454 to 1832**	**-270 to 1000**				
	-454 to -373	-270 to -225	4.05	2.25	0.18	0.10
	-373 to -202	-225 to -130	1.20	1.00	0.11	0.06
	-202 to 1832	-130 to 1000	0.72	0.40	0.06	0.03
N	**0 to 2370**	**-20 to 1300**				
	0 to 932	-20 to 500	1.08	0.60	0.07	0.04
	932 to 2370	500 to 1300	0.72	0.40	0.06	0.03
Platinel I I	**32 to 2580**	**0 to 1420**	0.90	0.50	0.06	0.03
NiNiMoly	**32 to 2408**	**0 to 1300**	0.9	0.5	0.06	0.03
B	**116 to 3300**	**47 to 1820**				
	116 to 374	47 to 190	10.80	6.00	0.36	0.20
	374 to 572	199 to 300	3.87	2.15	0.36	0.20
	572 to 1652	300 to 900	2.70	1.50	0.18	0.10
	1652 to 3300	900 to 1820	1.08	0.60	0.07	0.04
G	**0 to 4200**	**-20 to 2315**				
	0 to 1242	-20 to 700	6.12	3.40	0.07	0.25
	1242 to 3614	700 to 1990	1.35	0.75	0.16	0.06
	3614 to 4200	1990 to 2315	1.80	1.00	0.23	0.08
C	**0 to 4200**	**-20 to 2315**				
	0 to 3614	-20 to 1990	1.80	1.0	0.15	0.08
	3614 to 4200	1990 to 2315	2.70	1.5	0.18	0.10
D (G3)	**0 to 4200**	**-20 to 2315**				
	0 to 932	-20 to 500	2.61	1.45	0.18	0.10
	932 to 2066	500 to 1130	1.17	0.65	0.09	0.05
	2066 to 3812	1130 to 2100	1.80	1.00	0.13	0.07
	3812 to 4200	2100 to 2315	3.46	1.42	0.18	0.10
RTD						
100 ohm (European or American Alpha)	**-328 to 1166**	**-200 to 630**	0.49	0.27	0.02	0.01

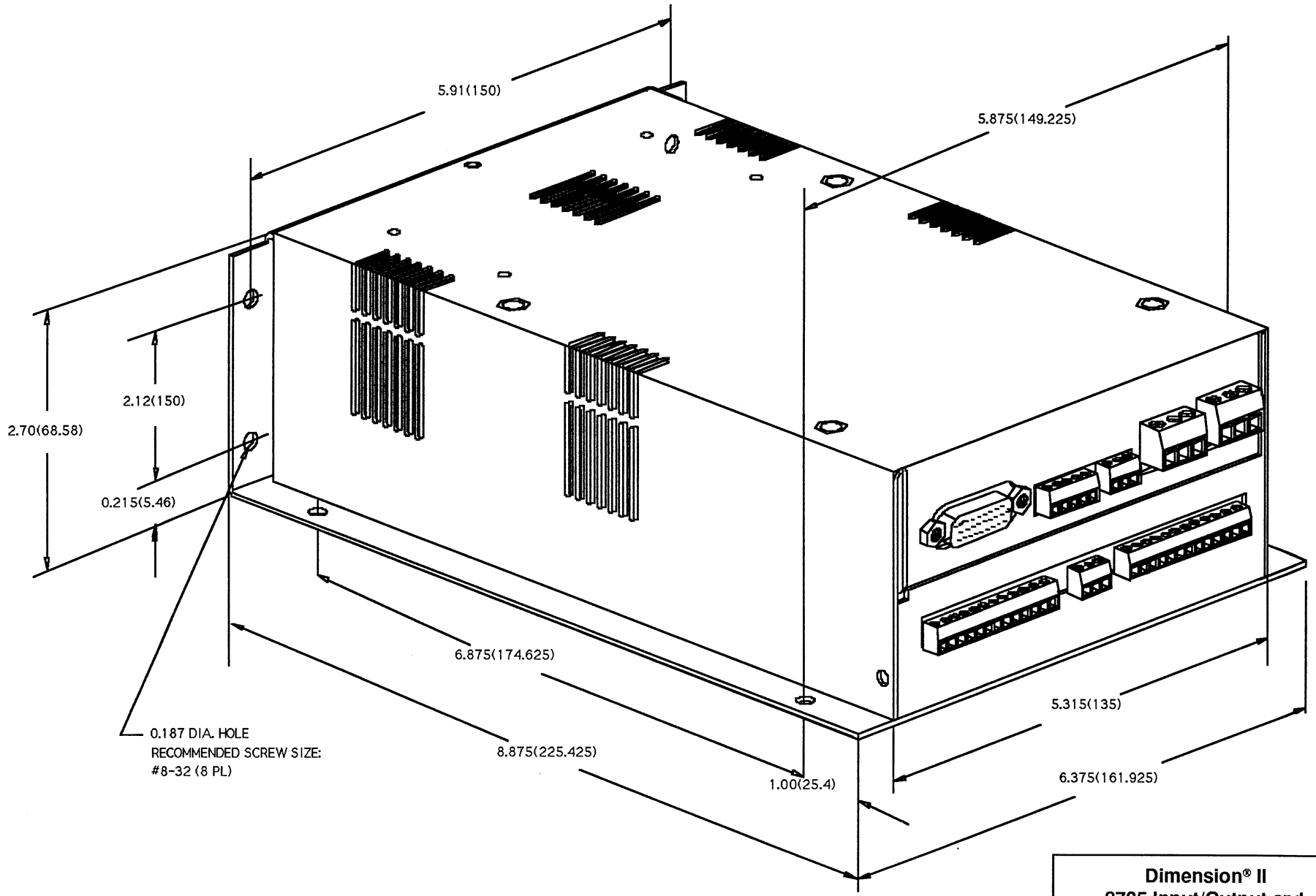
Linear	Range	Overall Accuracy @ 72°F or @ 22°C	Temperature Coefficient ±% Per °F	Temperature Coefficient ±% Per °C
Millivolt Voltage Current	**0mv to +100mv 0v to +10v 0ma to +20ma**	±0.02%FS	0.002	0.001

Note: Overall range is indicated in bold type.



Densions in inches (mm)

Dimension® II
Universal Operator Interface



Dimensions in inches (mm)

Dimension® II
8705 Input/Output and Communications Processor

Appendix
E

Glossary

Appendix E

Glossary

A

Acknowledge

A response that cancels or modifies an alarm display or alarm output. Also, the effect of acknowledging a process alarm is determined by the alarm's output response configuration (latching or not latching). (See also ALARM, LATCHING, and MANUAL ACKNOWLEDGE.)

Adjoining Band

One of three types of bi-modal band relationships. For adjoining band, only one type of output action (reverse or direct) can be active at a time. The reverse and direct outputs "adjoin" at the 0% output level (both outputs are at 0%); no dead band exists when changing from one output type to the other during either manual or automatic control. For the Dimension II, adjoining band is selected by entering a value of "0" (zero) for the controller BAND parameter. (See also BI-MODAL, BAND, DEAD BAND, and OVERLAPPING BAND.)

Alarm

A feature that provides a display and/or signal if a specified condition occurs. Dimension II has the capability of providing high/high-high/low/low-low deviation, high/high-high/low/low-low process variable, watchdog timer, and device diagnostic alarms.

Ambient

Ambient refers to the conditions of the surrounding medium (e.g., pressure, noise, temperature, etc.).

Ambient Temperature

The temperature around an object, neglecting small localized variations.

Asynchronous Communications

A method of transmitting data in which communications timing is synchronized on a character-by-character basis. Each transmitted character is preceded by a start bit and followed by a stop bit, thus permitting the interval between characters to vary.

Automatic Control

Automatic control operates on a "closed loop" basis, i.e., a measured process variable is compared to the setpoint to produce a control signal. This control signal adjusts the final control element to minimize deviation from setpoint.

B

Band

A Dimension controller parameter that determines the relationship between the reverse and direct outputs for bi-modal control configuration. The Dimension offers three types of bi-modal band relationships: adjoining band, overlapping band, and dead band. (See also ADJOINING BAND, OVERLAPPING BAND, DEAD BAND, and BI-MODAL.)

Baud Rate

Rate at which bits are transmitted per second. Synonymous with BPS, or bits per second.

Bi-Modal Band

A parameter that determines the relationships between the reverse and direct outputs for bi-modal control configurations. There are three types of bi-modal band relationships: adjoining band, overlapping band, and dead band.

When dead band is selected, only one type of output action (reverse or direct) can be active at a given time. However, dead band differs from adjoining band in that the output does not change immediately between reverse and direct. Instead, a "dead band" exists on the transition between reverse and direct control, during which both outputs remain at the minimum output value. Use of dead band ensures that transitions between reverse and direct output occur smoothly during automatic control. Without dead band, the controller may alternate between low levels of direct and reverse output, due to electrical noise or minor variations in process deviation.

In some applications it may be and advantage to have an overlapping band, where the reverse and direct outputs are both active for a specific level during the transition between reverse and direct modes.

Bi-Modal Control

A control arrangement that provides two outputs for two final control elements; one output may be direct acting, and one output may be reverse acting. (See also DIRECT ACTING CONTROL, REVERSE ACTING CONTROL, and BAND.)

Bumpless Transfer

A feature that prevents step-changes in output when changing operating modes; i.e., between MANUAL and AUTOMATIC.

Burnout

Synonymous with "Open Sensor." In this manual, sensor burnout is always referred to as "Open Sensor." (See OPEN SENSOR.)

C

Calibration

The process of measuring and correcting the operation of an instrument in relation to a standard.

Cascade

An arrangement of control loops where the setpoint of a loop may be determined by the output or other parameters of another loop(s).

Cascade Control

Cascade control works similar to automatic control except the setpoint is derived from the conditions of another loop(s). The operator cannot change the setpoint in this mode.

Closed Loop

A process control signal path which forms a closed circuit, consisting of a forward path, a feedback path, and a summing junction. The summing junction automatically adjusts the circuit operation so that the feedback signal is equal to a setpoint. (See also AUTOMATIC CONTROL and FEEDBACK.)

Cold Junction

The point at which a thermocouple's signal wires connect to an electrical circuit. Because the cold junction connections are made with dissimilar metals (e.g., thermocouple wires and brass screws), these connections provide an output voltage proportional to their temperature, just as at the "heated" junction. The cold junction is frequently referred to as the "reference junction." Connecting a thermocouple's signal wires to the Dimension IIs Rear Terminal Assembly creates a cold junction. (See also COLD JUNCTION COMPENSATION and THERMOCOUPLE.)

Cold Junction Compensation

An automatic adjustment that compensates for the voltage generated at the cold junction of a thermocouple. Due to this compensation, the adjusted signal reflects only the temperature at the heated junction (the thermocouple itself). (See also COLD JUNCTION and THERMOCOUPLE.)

Cold Start

One of two configurations for Dimension II power-up response. (See also WARM START). If AC power is applied to a Dimension that is configured for COLD START, all controller parameters and commands are set to standard "default" values; i.e., controller in manual with 0% output.

Configuration

The relative arrangement of elements in a circuit, device, or system. Also, the act of establishing such an arrangement of elements. The act of configuration typically consists of interconnecting elements, selecting (or enabling/disabling) features, and entering parameters. Some of the Dimension II hardware and software is configured to match the customer order prior to shipment from the factory. Additional hardware and software configuration is performed by the user during installation to match the specific requirements of the application. (See also PARAMETER, CONFIGURATION PARAMETER, CONFIGURATION ACCESS, HARDWARE, and SOFTWARE.)

Configuration Parameter

A user-entered setting that determines one of the basic operating characteristics of the of the system or controller, e.g., output action (reverse, direct, or bi-modal) and ranges.

Contact Input

A circuit that senses whether an input terminal is closed (connected to common) or open (not connected to common).

Control Signal

An output signal from a process controller that is used to control an element (e.g., valve, heater, etc.) which controls the process.

Controller

See PROCESS CONTROLLER.

CTS

Abbreviation for Clear To Send. CTS is a handshaking signal used in the RS-232 protocol to coordinate digital communications. (See also RS-232 and RTS.)

Cycle Time

The time period that a time-proportioned output divides into on-time and off-time; i.e., the time period during which there is a controller output for a percentage of the total time, and no controller output during the remaining time. For example, a 30% output with a 10-second CYCLE TIME consists of three seconds of on-time and seven seconds of off-time for successive 10-second periods. (See also TIME PROPORTIONING.)

Cycles

A programmer function used to repeat a series of segments, a defined number of times.

D

Dead Band

One of three types of bi-modal output relationships. When DEAD BAND is selected, only one type of output action (reverse or direct) can be active at a given time. However, DEAD BAND differs from an ADJOINING BAND in that the output does not change immediately between reverse and direct. Instead, a "dead band" exists on the transition between reverse and direct control, during which both outputs remain at the minimum output value. The actuating signal to the output circuit must reach a specific level (which determines the size of the DEAD BAND) before either output can be activated.

For the Dimension II, a DEAD BAND exists only during automatic control. Manual control with DEAD BAND is identical to manual control with ADJOINING BAND.

Use of DEAD BAND ensures that transitions between reverse and direct output occur smoothly during automatic control; without DEAD BAND, the controller may alternate between small levels of direct and reverse output, due to electrical noise or minor variations in process deviation. DEAD BAND is selected by entering a positive value for the controller BAND parameter in the Dimension II's lower display. The larger the positive BAND value, the larger the size of the DEAD BAND. (See also BI-MODAL, BAND, ADJOINING BAND, and OVERLAPPING BAND.)

Derivative Control Action (Rate)

Control action in which the control signal is adjusted according to the rate of change of the process variable. (See also RATE, GAIN, and RESET.)

Deviation

The difference between the setpoint and the actual value of the process variable. (See PROCESS VARIABLE and SETPOINT.)

– deviation = under temp.
+ deviation = over temp.

Direct Acting Control

An automatic control configuration in which the value of the control signal increases as the process variable increases (assuming a fixed setpoint). Typically used to control cooling equipment. (See also REVERSE ACTING CONTROL and BI-MODAL CONTROL.)

Droop

The term "droop" is commonly used within the process control industry to indicate OFFSET. OFFSET is a steady-state deviation from setpoint. Typically found in heating control systems if reset action is not used. (See also OFFSET, STEADY-STATE, DEVIATION, and SETPOINT.)

E

Engineering Units

The actual units of measurement. Common engineering units are degrees Fahrenheit, degrees Centigrade, pounds per square inch, minutes, etc.

Event

A programmer output that is either ON or OFF. During program RUN, each programmer EVENT is set either ON or OFF at the beginning of each segment, based on that EVENT's programmer value (ON or OFF) for that segment.

F

Feedback

1. A signal or connection used by a circuit, device, or system to monitor its own output. A feedback signal is often used to identify and correct errors automatically.
2. Synonymous with the term "process variable." (See also CLOSED LOOP and AUTOMATIC CONTROL.)

Filter

A circuit, device or software algorithm that removes or reduces an undesired component (e.g., noise) in a signal. The FILTER "averages" the process variable input signal to minimize the effects of noise and short-term process variations.

Final Control Element

Provides the force to do the work of the control loop. A device that acts directly on a process to affect the process variable. Typical final control elements are valves, electric power controllers (SCR thyristors), heating units, and cooling units. (See also PROCESS VARIABLE.)

Format

Format places the data structure on the Dimension II Memory Card and sets the density of the data. The structure of the card is referred to as blocks of data.

Full Access

One of three possible operating states for the Dimension II. In FULL ACCESS, the user can change all controller parameters. (See also LIMITED ACCESS)

G

Gain

Gain is a multiplication term expressing how the controller output varies with respect to change in input error. In general, GAIN is defined as a relationship between the input and output of a circuit:

$$\text{GAIN} = \frac{\text{Output in percent}}{\text{Input in percent}}$$

As one of the three "PID" parameters, GAIN determines the degree of proportional "P" control action. The output percent contribution from the gain term is determined by:

$$\text{Output \%} = \frac{\text{Deviation}}{\text{Input Range Span}} \times \text{Gain}$$

(See also PID, RESET, RATE, and PROPORTIONAL BAND.)

H

Hardware

Physical equipment and devices: mechanical, magnetic, electrical, or electronic. (See also SOFTWARE.)

Handshaking

The exchange of predetermined signals to coordinate digital communications between two devices.

High Deviation

The Dimension II controller parameter sets the high process variable alarm trigger level. The HI-DEV value determines the positive deviation level (deviation above setpoint) at or above which a high deviation process alarm is triggered. (See also ALARM, PROCESS MONITORING ALARM, LO-DEV LO-LO DEV, HI-HI DEV, HI-PV, HI-HI PV, LO-PV, and LO-LO PV)

High Process Variable

The Dimension II controller parameter sets the high process variable alarm trigger level. The HI-PV value determines the process variable level at or above which a high process variable alarm is triggered. (See also ALARM, PROCESS MONITORING ALARMS, LO-PV, LO-LO PV, HI-HI PV, HI-DEV, HI-HI DEV, LO-DEV, and LO-LO DEV)

I

Initialize (INI)

Initialize will prepare the Memory Card for files and create a directory on it. If the disk was used in the past, the contents will be destroyed.

Integral Control Action

See RESET.

I/O

Abbreviation for Input/Output. Typically used to designate a circuit, device, or connector that provides both input and output signals. (See also I/O BOARD and ANALOG I/O.)

I/O Board

One of the main circuit boards inside the Dimension II. The I/O BOARD contains the circuitry for the Dimension II's analog inputs, analog outputs, contact inputs, and contact outputs.

L

Latching Function

A function which determines the response of Dimension II when a process alarm occurs. If the latching function is on (LATCHING), operator acknowledgment of an alarm condition controls the alarm response. If the latching function is off (NOT LATCHING), the existence/absence of the alarm condition(s) controls the alarm response. For more details on the LATCHING FUNCTION see Section 4. (See also ALARMS.)

Limited Access

One of the possible states for the Dimension II. In Limited Access mode onluy parameters on the operation side of the Dimension II Operator Interface may be accessed (See also FULL ACCESS)

Linearization

The modification of a signal so that the signal level is directly proportional to the variable it represents. Linearization is often applied to the signal from a thermocouple or RTD, since these signals do not vary linearly with sensor temperature across the sensor's full operating range.

Linearization allows a process variable input signal to be directly compared to a linear setpoint when identifying deviation from setpoint. (See also I/0 BOARD, THERMOCOUPLE, RTD, and LINEARIZATION TABLE.)

Low Deviation Alarm (LO-DEV)

The Dimension II controller parameter sets the low deviation alarm trigger level. The LO-DEV value determines the negative deviation level (deviation below setpoint) at or below which a low deviation alarm is triggered. (See also ALARMS, PROCESS MONITORING ALARMS, HI-DEV, HI-PV, and LO-PV.)

Low Process Variable Alarm (LO-PV)

The Dimension II controller parameters sets the low process variable alarm trigger level. The LO-PV value determines the process variable level at or below which a low process variable alarm is triggered. (See also ALARMS, PROCESS MONITORING ALARMS, HI-PV, HI-DEV, and LO-DEV.)

Loop

A process control signal path. Dimension II controller channels are often referred to as loops (e.g. Loop 1 instead of channel 1). (See also CLOSED LOOP and OPEN LOOP.)

M

Manual

Pertaining to a circuit, device, or system that is operated by a person; i.e. - by hand. More specifically, one of two Dimension II controller modes, in which the controller output (in percent) is set by the operator; i.e. open loop control. (See also AUTOMATIC CONTROL and OPEN LOOP.)

Manual Control

MANUAL CONTROL operates on an "OPEN LOOP" basis; i.e., the control signal is not adjusted automatically. During manual control, the control signal can be adjusted by the operator by changing the OUTPUT PERCENT value. (See also AUTOMATIC CONTROL, MANUAL, CONTROLLER, CONTROL SIGNAL, and OPEN LOOP.)

Manual Reset

A type of reset action that is available for automatic process control. MANUAL RESET adds a user-determined fixed percentage to the controller output.

Memory Card

The MEMORY CARD is a memory module that plugs into the memory card port on the front panel of the Dimension II.The amount of data stored is dependent upon the card size (e.g. 16 K or 32 K) and the Dimension II model ordered (e.g. 8705 or 8725)

O

Open Loop

A process control signal path that forms an open circuit; i.e., feedback is not used. In open loop Manual control the operator adjusts the final control element to send energy to the process for the result desired. The result is not automatic and requires constant operator attention to correct for outside influences that tend to affect the process result. Examples of such conditions are drafts, changes in the energy source supply of voltage, stream pressure, etc. (See also CLOSED LOOP and MANUAL CONTROL.)

Open Sensor

A condition which indicates a defective process variable signal. Typically the process variable sensor will "burnout" and create an circuit at the process variable input terminals. The term "BURNOUT" is often used synonomously with "OPEN SENSOR." (See also BURNOUT, ALARMS, and OPEN SENSOR ALARM.)

Open Sensor Alarm

One of eleven possible Dimension II process monitoring alarms. The OPEN SENSOR ALARM indicates a defective process variable signal. The OPEN SENSOR ALARM can detect open-circuit conditions for thermocouples, RTDs, and millivolt input types. Note that the OPEN SENSOR ALARM does not detect open-circuit conditions in milliamp inputs. (See also OPEN SENSOR, THERMOCOUPLE, RTD, ALARMS, and PROCESS MONITORING ALARMS.)

Oscillation

Cycling of the process variable signal above and below the setpoint.

Output

A signal that is produced by a circuit or device for transfer to another circuit or device. "OUTPUT" is also used' to identify. the terminals that provide the output signal.

Overlapping Band

One of three types of bi-modal band relationships in Dimension II. When OVERLAPPING BAND is selected, both outputs (reverse and direct) can be active at the same time. This "overlap" condition occurs at the transition between reverse and direct output action, and is present for both manual and automatic control.

Use of OVERLAPPING BAND minimizes any disturbance to the process during transitions between direct and reverse control; one output is always actively in control when the other output is being turned on or off.

OVERLAPPING Band is selected by entering a negative value for the controller Band parameter on the Dimension II. The more negative the value, the larger the size of the Overlapping Band. (See also Bi-Model, Band, Adjoining Band, and Dead Band.)

P

Parameter

A variable that is assigned a specific value according to the requirements of a particular situation or application. More specifically, the user-entered values that configure the Dimension II and direct the operation of the controller(s)

Percent Output

A controller parameter which identifies the output level for a control signal as a percent of the maximum possible output.

PID

An acronym for Proportional/Integral/Derivative. PID describes a process controller design which includes proportional (GAIN) plus integral (RESET) plus derivative (RATE) action to control a process. PID controllers (like the Dimension II) are often called 3-mode controllers. (See also AUTOMATIC CONTROL, GAIN, PROPORTIONAL BAND, RESET, and RATE.)

Port

In digital communications, that part of a device which receives data from and/or transmits data to one or more external units. For the Dimension II, the term "port" refers to the hardware for a communications interface. (See also PORT 1, PORT 2, INTERFACE, and COMMUNICATIONS.)

Power Controller

An electrical device whose output is adjusted by a control signal in order to operate a final control element. The POWER CONTROLLER output is proportional to, but much larger than, the control signal. (See also PROCESS CONTROLLER, OUTPUT, and FINAL CONTROL ELEMENT.)

Power-Up Response

The initial action and operating state for a device when power is applied to it. Two types of POWER-UP RESPONSE are available for the Dimension II: COLD START and WARM START. (See also COLD START and WARM START.)

Process Controller

A control device that automatically varies its output to maintain a process variable at a setpoint. A PROCESS CONTROLLER monitors the process variable through a sensor, such as a thermocouple or RTD. The Dimension II contains a separate PROCESS CONTROLLER for each channel. The term "process controller" is typically abbreviated to "controller." (See also AUTOMATIC CONTROL, CLOSED LOOP, PROCESS VARIABLE, SETPOINT, THERMOCOUPLE, and RTD.)

Process Monitoring Alarm

An alarm that monitors a process characteristic to identify malfunctions or to check for specific conditions. The Dimension II has eleventypes of PROCESS Monitoring ALARMS for each channel. Each process alarm acts by controlling one or more user-assigned relay drive signals. (See also HI-PV, HI-HI PV, LO-PV, LO-LO PV, HI-DEV, HI-HI DEV, LO-DEV, LO-LO DEV, and OPEN SENSOR ALARM)

Process Variable

A process quantity, property or condition that is measured. Common process variables are temperature, pressure, and rate of flow, thickness and speed.

Profile

The Profile is a setpoint value that changes as a function of the programmer time base (elapsed time).

Programmer

For the Dimension II, the PROGRAMMER is a feature that determines the process SETPOINT and EVENT values during a specified period of time, based on user-entered parameters.

Proportional Band (PB)

A measure of the amount of proportional control action provided by a process controller. The PROPORTIONAL BAND value indicates the range of deviation values within which a change of deviation causes a change in the controller output. By definition, 100 percent PB is the situation where deviation is 100 percent and output is 100 percent. The PROPORTIONAL BAND limits are reached when the controller output is either fully on or fully off:

$$PB = \frac{\text{INPUT in Percent}}{\text{OUTPUT in percent}}$$

The GAIN parameter adjusts the PROPORTIONAL BAND to match the process under control. Note that the GAIN value is equal to the inverse of the PROPORTIONAL BAND value.

$$GAIN = \frac{\text{OUTPUT in Percent}}{\text{INPUT in percent}}$$

With a wide PROPORTIONAL BAND (low GAIN), the controller output changes gradually over a wide range of deviation values. With a narrow PROPORTIONAL BAND (high GAIN), the controller output changes rapidly over a narrow range of deviation values. (See also GAIN, PROPORTIONAL CONTROL, AUTOMATIC CONTROL, PROCESS CONTROLLER, and PID.)

Proportional Control

One of three types of automatic process control action. Proportional control means that the output changes as the deviation (setpoint minus the process variable) changes. Proportional control is only active over part of the process variable range. The point at which it begins is determined by the gain setting. This setting determines how fast the process will react to a given error signal. (See also GAIN, PROPORTIONAL BAND, PID, RESET, RATE, and AUTOMATIC CONTROL.)

R

Range

The region of output or process variable movement between the minimum and maximum values.

Rate (Derivative) (D)

One of three types of automatic process control action. RATE control action adjusts the control signal according to the rate of change in the process variable. RATE action acts as a supplement to GAIN and RESET control; i.e., RATE should not be used alone. RATE action is especially beneficial for a process with slow response time, since RATE action "anticipates" changes in the process variable. However, RATE action also makes the process controller more sensitive to noise and short-term Process variations. The degree of RATE action is determined by the RATE setting, which is expressed in minutes of duration; more minutes of duration indicates stronger RATE action. Note that RATE is often called "Derivative" control action. (See also PID, GAIN, RESET, and AUTOMATIC CONTROL.)

Relay

An electrical device that opens and closes a circuit according to the presence of absence of an activating (drive) signal. Two basic types of relays are available: electromechanical and solid state. An electromechanical relay uses mechanical contacts to open and close the circuit. A solid state relay is a semiconductor device (similar to a transistor) that either conducts or does not conduct. Note that a small leakage current is present even when a solid state relay is OFF (not conducting). (See also RELAY DRIVE SIGNAL, RELAY BOARD, and RELAY CABLE.)

Reset (Integral) (I)

RESET control action eliminates offset (or "droop") from setpoint. For example, with GAIN (proportional) control only, a furnace temperature can stabilize at an equilibrium value below the setpoint. At this offset value, the process controller provides just enough heat input to balance the heat losses from the furnace. Such offset can be prevented by adding RESET action to GAIN (proportional) control. The Dimension II provides both automatic RESET and manual RESET. (See also AUTO RESET, MANUAL RESET, DROOP, OFFSET, and GAIN.)

Reset Windup

Excessive AUTO RESET action which can result from operation outside of the proportional band during automatic control. All Research Inc. controllers have an anti-reset windup feature.

Retransmit

An analog signal from a process controller that represents a process characteristic. The Dimension II can provide three types of RETRANSMIT signals. setpoint, process variable and deviation. (See also ANALOG OUTPUT, SETPOINT, PROCESS VARIABLE and DEVIATION.)

Reverse Acting Control

A control arrangement in which the process controller output increases if the process variable drops below the setpoint. Typically used to control heating equipment. (See Direct Acting Control and Bi-Modal Control.)

RS-232

Acronym which stands for Report Standard #232. This report was developed by the EIA (Electronics Industry Association) and provides a hardware interface standard for digital communications. (See also RS-422 and RS-423.)

RS-422

Acronym which stands for Report Standard #422. This report was developed by the EIA (Electronics Industry Association) and provides a hardware interface standard for digital communications. (See also RS-232 and RS-423.)

RTD

Acronym for Resistance Temperature Detector. An RTD is a sensor whose resistance varies according to the RTD's temperature. When an excitation current is applied to an RTD, the voltage drop across the RTD indicates the RTD temperature.

RTS

Abbreviation for Ready To Send. RTS is a handshaking signal used in the RS232 protocol to coordinate digital communications. (See also RS-232, CTS, and HANDSHAKING.)

S

Setpoint

The desired value of the process variable.

Setpoint Programmer

A device that follows prescribed program for generating a setpoint signal. The setpoint signal is inputted to a process controller to provide programmed control of a process variable.

Shielded Line

Line or circuit that is shielded from external electric or magnetic induction. In the Dimension II manual, "SHIELDED LINE" refers to a wire enclosed within a conducting sheath. (See also COMMON MODE, GUARD, and SHIELDING WIRE.)

Shielding Wire

The conducting sheath which surrounds a SHIELDED LINE. (See also SHIELDED LINE.)

Signal Conditioner

A device which performs scaling and arithmetic functions. Some examples are square root extractors, summers, multiplier/dividers, and scalers.

Software Revision Level

A series of numbers which identify the type of software stored in the Dimension II. The SOFTWARE REVISION LEVEL appears in the Dimension II's operator interface during power up or under the "diagnost" entry under the Unit Configuration Icon on the Operator Interface. (See also COLD START.)

Span

The difference between the upper and lower range values of the process variable. Defined by the limits of the controller sensing devices (thermocouples, RTD's etc.). For example, a range of –100 to +900 degrees has a span of 1000 degrees.

Split Range Control

A type of bi-modal control except there is one analog output for both reverse and direct acting control outputs. This analog output is split where 0–50% of the analog output corresponds to the direct acting control output, and 50–100% of the analog output corresponds to the reverse acting control output.

Steady-State

A condition in which values remain essentially constant, occurring after all initial transients or fluctuating conditions have settled down.

Synchronous Communications

A method of transmitting data in which communications timing is synchronized for an entire message by the transmission of initial synch characters. No character stop or start bits are used in SYNCHRONOUS COMMUNICATIONS. (See also ASYNCHRONOUS COMMUNICATIONS and COMMUNICATIONS.)

T

Thermocouple

A temperature sensor that produces a millivoltage output signal. The thermocouple consists of two dissimilar metals joined at one end. The voltage across the thermocouple junction (also known as the heated junction) is proportional to the junction temperature. (See also COLD JUNCTION COLD JUNCTION COMPENSATION.)

Time-Proportioned Output

An output that provides periodic on/off pulses, with the relative proportion of on-time and off-time determined by an input signal. Time-proportioned outputs are often used to provide control signals to a process. The Dimension II has two time-proportioned outputs located on the Rear Terminal Assembly. (See also CYCLE TIME.)

Transient

A condition caused by a sudden change, and which persists for a relatively short time after the change.

U

Unacknowledged Alarm

See MANUAL ACKNOWLEDGE.

W

Warm Start

One of two configurations for Dimension II power-up response. If AC power is applied to a Dimension unit that is configured for Warm Start, the Dimension continues its previous operations; i.e., the Dimension restarts using the controller parameters and commands that were in memory at the time power was removed. This means that Dimension maybe turned off and back on without losing any of its existing commands or controller parameters. (See also Cold Start.)

Watchdog Alarm

The alarm feature which continuously monitors the Dimension II microprocessor to determine if the processor is functioning normally. If a processor malfunction occurs, the WATCHDOG ALARM mechanical relay (located on the rear terminal assembly) is triggered. This alarm cannot be monitored by the Dimension II display because (by definition) the alarm indicates a malfunction or loss of power in the Dimension II unit itself.

Write Protection

A feature or condition that prevents data from being entered into a memory device. Typically, the WRITE PROTECTION feature can be turned on and off by the user. WRITE PROTECTION is used as a safeguard when entering new data can erase existing data. The Dimension II Memory Card includes a WRITE PROTECTION feature that is activated by a switch on the card. (See also Memory, Memory Card)