User Manual for the
***CBREEZE* Software**
HE500TSW232

Operator Station

Thirteenth Edition
30 June 2004

MAN0023-13

PREFACE

This manual explains how to use the Horner APG Operator Station products and ***CBREEZE***™ software.

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For user manual updates, contact Horner APG, Technical Support Division, at (317) 916-4274 (USA), or +353-21-4321266 (Europe) or visit our web-site at www.horner-apg.com.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG, LLC. ("HE-APG") warrants to the original purchaser that the Operator Station manufactured by HE is free from defects in material and workmanship under normal use and service. The obligation of HE-APG under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within two (2) years from the date of manufacture or eighteen (18) months from the date of installation by the original purchaser whichever occurs first, such defect to be disclosed to the satisfaction of HE-APG after examination by HE-APG of the allegedly defective part or parts. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES AND HE-APG NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR HE-APG, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THE Operator Station. THIS WARRANTY SHALL NOT APPLY TO THE Operator Station OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. HE MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY HE. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON FOR WHOM THE Operator Station IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

In no event, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, shall HE-APG or its suppliers be liable of any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of original purchaser's customers for such damages.

To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, post paid, insured and in a suitable package.

ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG, LLC cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilising the Operator Station to appropriately design the end system, to appropriately integrate the Operator Station and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

NOTE: The programming examples shown in this manual are illustrative only. Proper machine operation is the sole responsibility of the system integrator.

DECLARATION OF EMC CONFORMITY

Manufacturer's Name: Horner Ireland Ltd.
Manufacturer's Address: Unit 1, Centrepoint, Centre Park Road, Cork, Ireland

Declares that the products Models: HE500TIU050, HE500TIU100, HE500TIU101, HE500TIU110, HE500TIU111, HE500TIU200 and HE500TIU201

Conforms to the following EMC standards:

EMC: EN 55 022, Radiated and Conducted Emissions
EN 50 082-1, RF, EFT/EFB, ESD Immunity

Supplementary Information:

The above conformity only relates to the products in a stand-alone capacity. The products are used as part of a system and are therefore classified as a component. As a component, the products are prohibited by EC regulations to carry a CE Mark for EMC conformity. Static discharge tests only apply to normal operation of the keyboards via the front panel. We would stress that the use of our products within your system, while helping to ensure compliance of your system to the same directives, do not necessarily guarantee that compliance will be achieved. We would also like to point out that the interpretation of the law concerning CE marking and its application to sub-assemblies and components is open to interpretation.

Date: 31 Mar 1999

REVISIONS TO THIS MANUAL

This version (MAN0023-12) of the ***CBREEZE*** software for the Tiu Range contains the following revisions, additions or deletions:

Added Chapter 14 for Graphical Alarm System description.
Added Chapter 15 for CompactFlash® functions.
Added Chapter 16 for Video Objects description.
Added Chapter 17 for Ethernet configuration.

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CHAPTER 1 INTRODUCTION

1.1 Scope

CBREEZE, Horner Electric's Windows™-based software, is easy-to-use. The software user's guide is contained in this manual. (See Section 1.4 for initial software installation procedures.) The current revision of software is supplied free on our WEB site www.horner-apg.com

A basic level of understanding of Microsoft Windows technology and operation is assumed. The manual assumes that the user is familiar with Windows 95, Windows 98, Windows NT, Windows 2000 or XP.

Contact your dealer for more information.

Note: The Help File in the Software contains similar information to this manual.

1.1.1 Equipment Needed

a) Software Installation CD.
b) A PC Windows 95™, Windows 98™ ,Windows NT®, Windows 2000 or Windows XP.
c) Approximately 120MB of available hard disk space.
d) TIU050/1xx/2xx/3xx/4xx/TIU5xx/TIU6xx Interface Unit.
e) PC to TIU Programming Cable HE693CBL232 or equivalent (Operator Station Hardware Manual).

Software Installation Instructions

a) Start your Windows™ Operating System.
b) Insert the Software Installation CD.
c) Click the Windows **Start** menu button and then click **Run**.
d) The **Run** dialog box appears.
e) Type **D:\setup (CD Drive letter assumed to be D:)**. Click **OK**.

1.2 Upgrade Revision Software & Firmware

1.2.1 General

To use any new features that are included in this new release on units that were purchased previous to this release, both software and firmware require updating by the user. Any new unit will be set-up for the latest version released.

1.2.2 Software Upgrade

To update the software requires that the user install the new version of software from the installation CD. You may install the new software over any previous version installed. See section 1.4 Software Installation Instructions.
To update existing projects simple open the project from the newly installed version of the software. Once the project is saved to disk the update is complete. For backup reasons we recommend that you save the new version of your project in a different location or under a different file name.

1.2.3 Firmware Upgrade

The following steps assume that a project or configuration is loaded to the Operator Station and that the user is running the latest version of software.
a) Upload the project/configuration from the unit.
b) If a customised character set is loaded to the unit then upload the character set also.
c) Choose AE from main menu Configure/Communication Settings.
d) From File menu choose Update TIU Operating System. (See Updating Operating System for more details).
e) From File menu choose Update TIU Protocol. If you are updating from firmware version 2.00 or later then you just have to update to the latest protocol file. However if you are updating from firmware

version 1.24 or earlier you most update to a Upgrade.1xx protocol file first, then update to the latest firmware revision. See Note. (See updating protocol for further information).

f) Choose Download Character Sets to TIU from File menu.

g) Choose Download Project to TIU from File menu.

Note: When updating the operating system file the screen may go blank after the protocol file is complete. Continue with the procedure as described and the display will recover.

CHAPTER 2 GETTING STARTED

2.1 Self-Test

Power up the unit with the **UP** and **ENTER** keys pressed at the same time. The unit enters a self-test mode. The self-test consists of the following four checks:

2.2 Contrast Band

This test allows the user to set the lower and upper limits of contrast. Adjust the lower limit using the **UP** or **DOWN** key and press **Enter** when done. Do the same for the upper limit.

Note: Self test - The contrast band adjustment is only available on Tiu1xxs and TIU050

2.3 Display Test

The display test continuously blinks all pixels on (black) to off. Look for any pixels stuck on or off. Exit this test by pressing and holding any key for approximately two seconds.

2.4 Keyboard Test

As each key is pressed, an indication ******* appears above that key. In the case of units with a numeric keypad, press the key and a message appears indicating the key press. Check for keys indicating multiple presses or not reporting presses. Exit this test by pressing and holding any key for approximately two seconds.

2.5 RAM Test

Test either segment 0000 or segment 1000 (on the HE500TIU100/110) of the RAM. The segment 1000 test performs a base 3 repeating test. This test detects shorted address lines and damaged memory bits. The segment 0000 test performs a Read-Modify-Write test on each byte of RAM, detecting damaged memory bits. Exit this test by selecting DONE.

2.6 Serial Loop-back Tests

Tests the PC port and the Serial Port in each of it's three modes for serial loop-back. Pre-made plugs are required to link the pins of a particular port. This takes the following form:

Table 2.1 Loop-back Test Plugs

Port Tested	Product	Type of Connector	Pins to Short
PC (J2)	HE500TIU100/110	Pin male D link connector	pin 2 to pin 3
RS-232 (J3)	HE500TIU100/110	13-pin phoenix connection	pin 6 to pin 8
RS-422/485 (J3)	HE500TIU100/110	13-pin phoenix connection	pin 2 to pin 4 and pin 3 to pin 5.
Current Loop	HE500TIU100/110	13-pin phoenix connection	pin 1 to 9, pin 10 to 11 and pin 12 to 7
PC	HE500TIU050	Pin male D link connector	pin 2 to pin 3
RS-232	HE500TIU050	8-pin phoenix connection	Pin 5 to pin 7
RS-422/485	HE500TIU050	8-pin phoenix connection	Pin 1 to pin 3, Pin 2 to pin 4
NOTE: current loop in not installed on standard models, as such a standard model will fail the current loop-back test. Current Loop is not an option on the HE500TIU050/20X.			

After starting the test, the OK counter begins to count up. Exit this test by selecting **DONE**.

2.7 Selecting the Automation Equipment (AE)

The following points are covered in this section:

a. Connecting a PC to the TIU;
b. Choosing the AE connected to the TIU,
c. Selecting the protocol to be used.

1. Install the ***CBREEZE*** software on your PC (if not already done). Double-click on ***CBREEZE*** Software icon; and the default screen shown below appears.

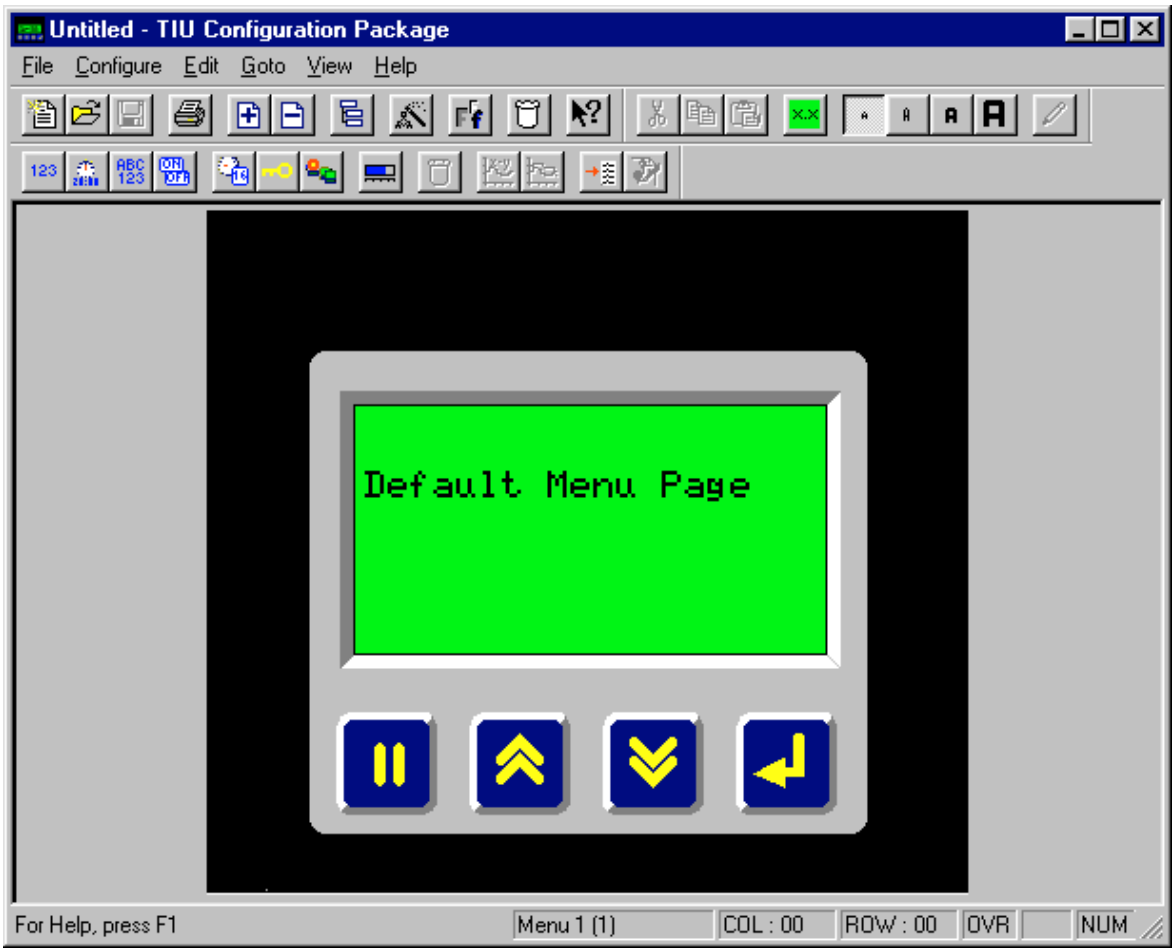


Figure 2.1 - Default Screen

2. From **Configure**, pick **Select Terminal Type** and choose the model.

3. Connect the TIU (**PC Port**) to a serial port (COM1, 2, 3 or 4) on the PC. From the **Configure** menu**,** choose **PC Comms Port** and the applicable Comm port.

4. Connect power (+24VDC) to the TIU. Power-up the unit. The type of protocol currently installed is displayed in the lower half of the screen during power-up.

5. If the AE is different than the protocol currently installed on the TIU, a new protocol must be loaded.

6. From the **Configure** menu, click **Communication Settings** and select manufacture of the AE, followed by the type. The default setting for this equipment will be displayed in the window. Click **OK** to accept.

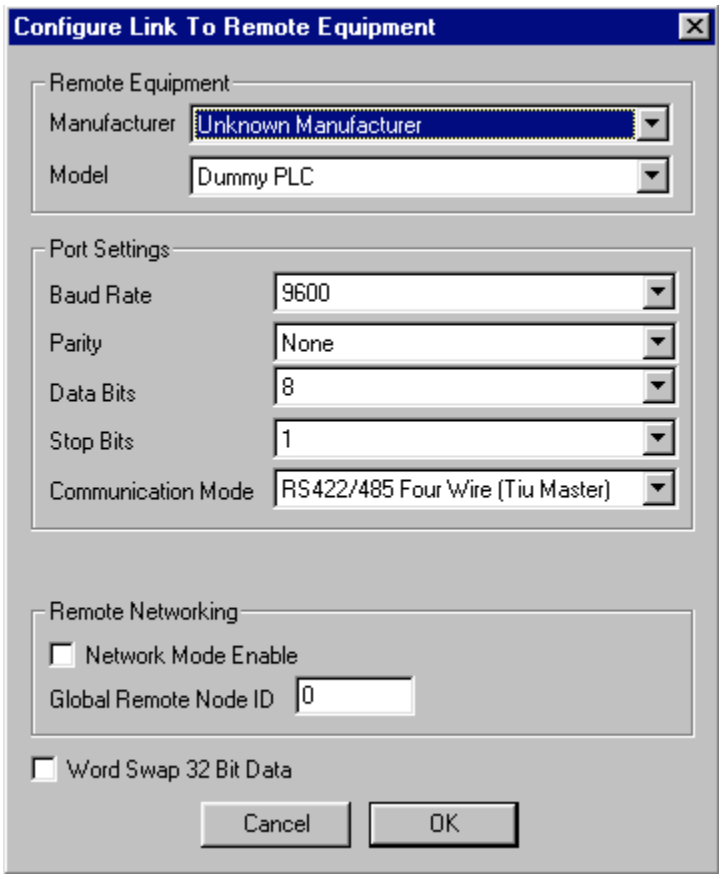


Figure 2.2 – AE Configuration Box

7. If the default setting does not match the communications settings of the AE, select the appropriate **Baud Rate**, **Parity**, **Data Bits**, **Stop Bits** and **Communication Mode**.
8. Network Mode enables the user to connect to one or many similar remote devices. Where a single device is to be accessed disable network mode and enter the station address of the connected device as the Global Remote Node ID.

Note: If connecting the TIU to a number of devices on the AE port (i.e. a multidrop system) then the Network mode enable box should be ticked, and the node id required will need to be entered whenever an automation equipment reference is required.
Note: If connecting the TIU to a single device on the AE port then the network mode enable box should be unticked and the node ID for the single device entered as the global remote ID. All references to AE equipment registers will now assume the global remote ID number entered here.

To update the protocol, select **File**, then **Update TIU Protocol**. The protocol file names take the general form: - {plc_type}_r{release number}.{ser}
Where AE type is a prefix dependent on the protocol, release number is currently 6 and {ser} is 0xx for Tiu050, 1xx for Tiu1xx, 2xx for Tiu2xx etc.

Note: Prior to release 4, protocol file names were of the form: - {plc_type}.{type} where type was LOS for

Tiu050 BOS for Tiu1xx and GOS for Tiu2xx. Dependant on the protocol and terminal type selected the standard windows file open box will be displayed with the filename selected accordingly. Select the protocol file you wish to download.

The appropriate protocol file for previously selected the automation equipment will be displayed in the file name window. Select the folder name for the appropriate terminal type (0xx for Tiu050, 1xx for Tiu1xx and 2xx for Tiu2xx). Click **OK**. A "**SYSTEM SHUTDOWN**" message appears on the TIU**.**

2.8 Proving Communications

Connect the TIU to the automated equipment using the cable drawing provided.

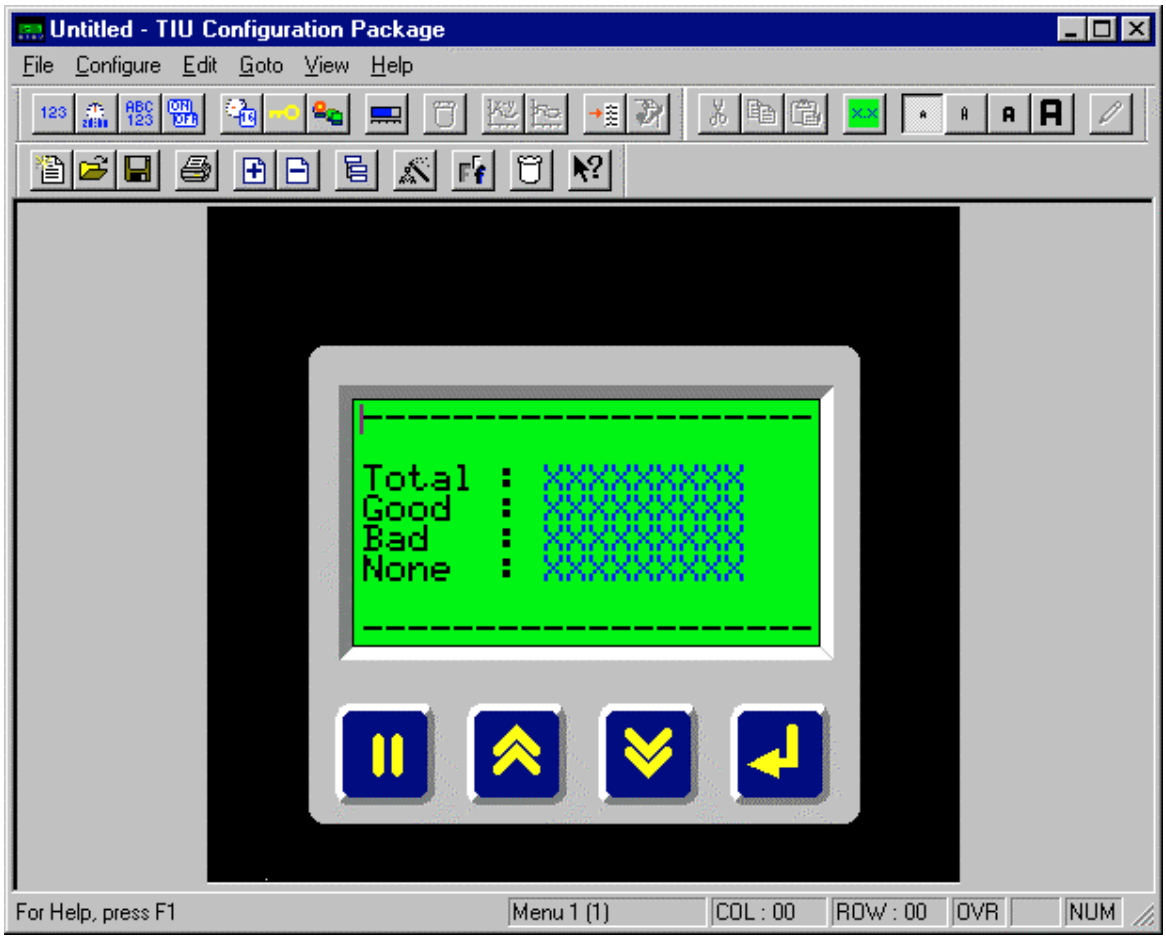


Figure 2.3 – Start-up Menu

The following steps verify communications between the TIU and the automation equipment. The figures shown here are for the HE500TIU100. Methods are exactly the same for the all products in the TIU range.

1. Click on the Wizards Icon  in the tool bar and choose **Comms Stats.** The display should then look like figure 2.3.

Note: The TIU only communicates if an embedded data is put on the screen

2. The settings can be saved. To do this, select **Save Project As** from **File**. Enter a file name and click **OK**.

3. Download the project to the TIU. To do this, from the **File** menu select **Download Project to Tiu**. A status bar appears indicating the progress of the download. On the TIU Display Screen, "**SYSTEM SHUTDOWN**" appears. A message of "**Transfer Complete**" appears when the data has been successfully downloaded.

Note: If the error "**Link Failed"** appears, check the cable connection between the PC and TIU.

4. After the transfer, the TIU resets itself and the correct automation equipment type is shown temporarily on the Display Screen.

5. On the Display Screen, the "GOOD" number of communications should be equal to the "TOTAL" number of communications. The content of the embedded data, on the top line, depends on the existing data in that register of the PLC.

2.9 Icon Descriptions

The TIU software main screen is shown in Figure 2.4. Along the top are several short cut icons. Many are standard Windows™ icons, some however, are special function.

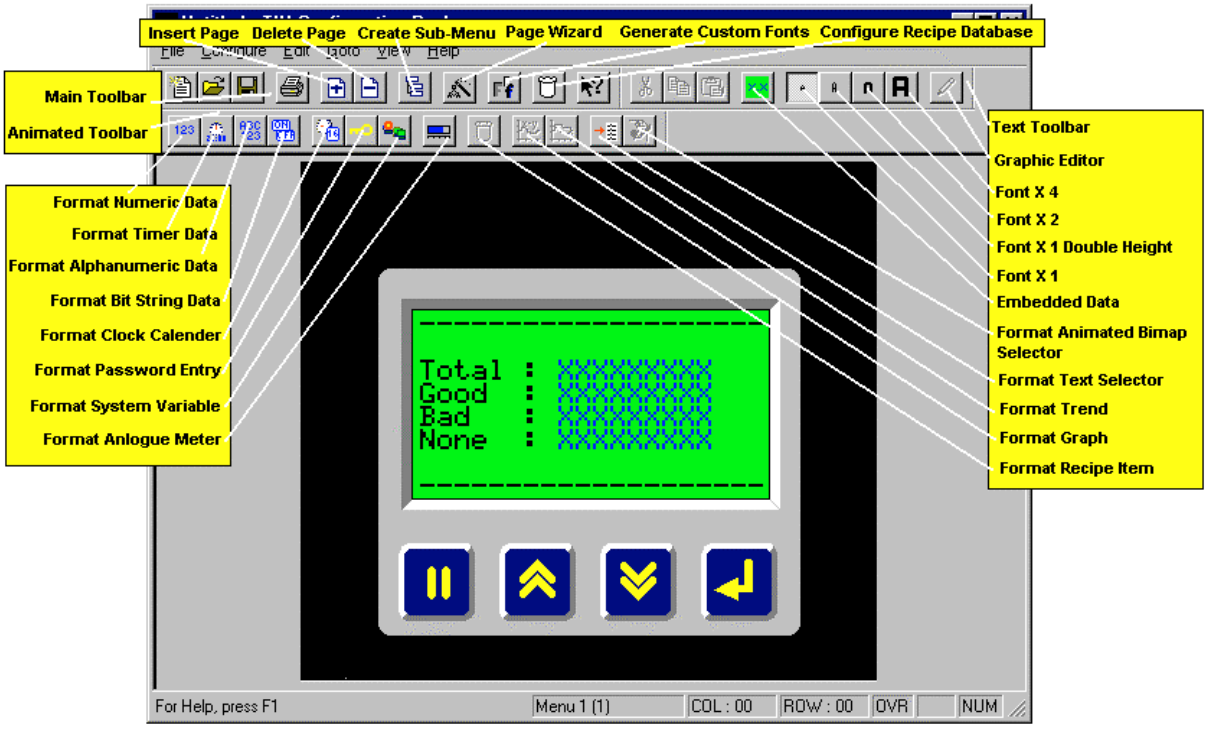


Figure 2.4 – HE500TIU050/100/110 Software Screen

2.10 Up/Down Keys

Left clicking on the "**Up**" and "**Down**" keys on the project window has the same effect as "**Up**" and "**Down**" **key presses** (i.e., scroll up/down through the current menus). Right clicking on the "**Up**" and "**Down**" keys on the project window have the same effect as Ctrl-Page Up and Ctrl-Page Down key presses (i.e., enter sub menu, and leave sub-menu, respectively). If a sub-menu does not exist a message appears saying "This page does not have a sub-menu, would you like to create one?" See Creating a sub-menu later in this manual.

2.11 Key Symbols

The symbols for the four keys can be added to display pages using the PC function keys F2-F5. The keys are assigned as follows:

1. F2 = PAUSE
2. F3 = UP
3. F4 = DOWN
4. F5 = ENTER

CHAPTER 3 ABOUT PROJECTS

3.1 Scope

This chapter describes the procedure for configuring the TIU. This includes loading, saving, downloading, uploading, verifying and updating the protocol.

3.2 About TIU Terminal

This new feature allows the programmer to see what version level the connected terminal is at and how it is configured. The information give is;

a. Operating System Version Level
b. Firmware Version Level
c. Protocol Version Level
d. Remote Equipment Manufacture
e. Remote Equipment Model

This can be used as a useful diagnostic tool when updating operating system and firmware. From the main menu click Help/About TIU Terminal, a window similar to Figure 3.1 appears.

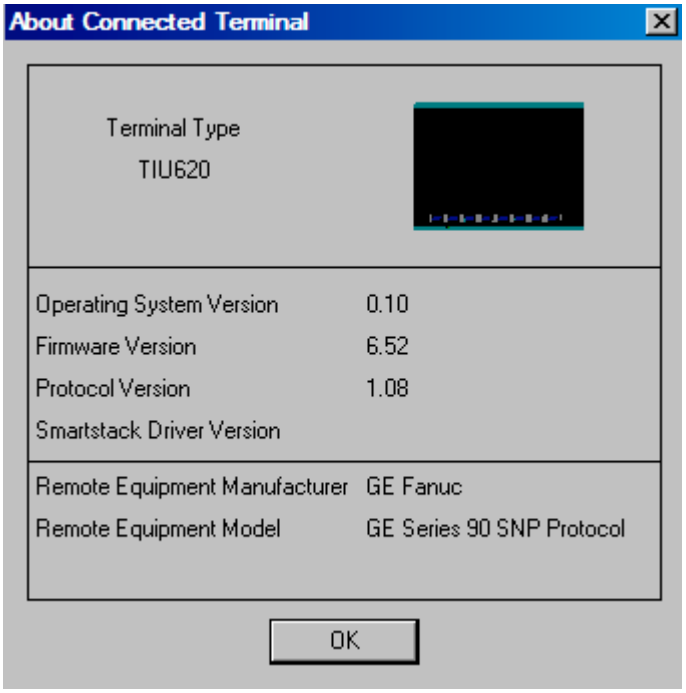


Figure 3.1 About TIU Terminal Configuration

3.3 Creating a New Project

1. Select **New** from the **File** menu.
2. The following prompt window appears:

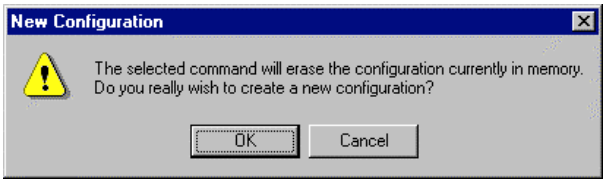


Figure 3.2 – New Project

3. Click **OK**.

3.4 Opening a Project

1. Press the "open folder" icon on the program display screen or select **Open Project** from the **File** menu.
2. Select the proper file name from the list of available projects (with "cmc" extension).
3. Click **OK**.

3.5 Saving a Project

1. If the project has been previously saved during the current session, press the "floppy" disk icon on the program display screen or select **Save Project** from the **File** menu
2. If this is the first time saving this project to a file, select **Save Project As** from the **File** menu.
3. Enter the file name and destination. Click **OK**.

3.6 Downloading a Project

Prior to the download the software checks if following conditions are correct: -

a) The correct TIU terminal is connected to the PC.
b) The correct Protocol file is loaded to the terminal.
c) The current revision operating system and firmware revision.

Note: If the message "**Link Failed**" appears, check the cables connecting the PC to the unit.

Note: If the message "This Terminal is fitted with the incorrect PLC protocol. Load the correct protocol before loading the configuration into the terminal". The project and the terminal are not set-up for the same protocol. If the project is correct then download the correct protocol file to the TIU.

1. Select **Download Project** from the **File** menu. A status bar appears; indicating the download is in progress.
2. After the project has been downloaded, the message "**Transfer Complete**" appears.
3. After the transfer, the TIU resets itself.
4. The downloaded project now runs.

3.7 Uploading a Project

1. Select **Upload Project** from the **File** menu.
2. A status bar appears; indicating the upload is in progress.

Note: If the message "**Link Failed**" appears, check the cables connecting the PC to the unit.

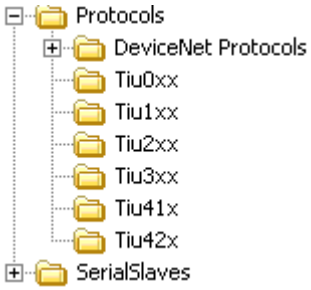
3. After the project has been uploaded, the message "**Transfer Complete**" appears.

3.8 Verifying a Project

1. Select **Verify Project** from the **File** menu.
2. A status bar appears indicating verification progress.
3. The Verify will stop at all reported errors

3.9 Updating the Protocol

When the software is installed the user decides where the main CBREEZE folder resides. During installation the following folders are created: -



In the protocol directory 7 folders are created, TIU0xx, TIU1xx, TIU2xx TIU3xx, TIU41x, TIU42x and DeviceNet Protocols. The DeviceNet Protocols folder contains two sub folders called tiu1xx and tiu2xx. The protocol files for the different terminal are loaded into these folders. The protocol files for the HE500TIU050 are loaded into Tiu0xx, the protocol files for the HE500TIU10X are loaded into Tiu10x, the protocol files for the HE500TIU20X are loaded into Tiu20x, The protocol files for the HE500TIU41x, HE500TIU51x and HE500TIU61x are loaded into the TIU41x folder, etc. There is one other folder created in the top level called SerialSlaves. Serial Slaves contains two sub folders called tiu1xx and tiu2xx.

The name of the protocol file is broken up into three sections, the protocol, the main software revision and the terminal type that protocol file is for.

Protocol Name	_	**Software Revision**	.	**Terminal Type**

Example
snp_R4.1xx
This is the protocol file for release 4 software for the GE FANUC PLC, for the HE500TIU10X
df1_R4.2xx
This is the protocol file for release 4 software for Allen Bradley PLC, for the HE500TIU20X

To Update Protocol File
1. Set Terminal Type
2. Set the required Automation Equipment in Communications Settings
3. Select **Update TIU Protocol** from the **File** menu.
4. Select the folder of the terminal you have connected to the PC. The correct file will appear for the terminal type selected and the Automation Equipment selected. Select that file and click OK.
5. A status bar appears indicating download progress.
6. After the transfer, the TIU resets itself. The correct PLC type is displayed on the TIU.
7. Next, the project loaded runs.

3.10 Updating the Operating System (Not Applicable on the TIU3xx, TIU41x/51x/61x, TIU42x/52x/62x)

1. There is a different operating system file for each terminal type. Therefore select terminal type first and the software will request the correct file name for the current terminal type selected.
2. Select **Update Operating System** from the **File** menu.
3. Choose the updated file with the “BIN” extension. The operating system files are stored in the OS folder under the CBREEZE folder. Only the correct file name will be displayed. Click **OK**.
4. A status bar appears indicating download progress.
5. During the download process, TIU displays the message “**SYSTEM SHUTDOWN**”.

3.11 Printing

Cbreeze software has printout capability. To print, select **Print** from the **File** menu or click on the **Print** icon. The system parameters (# of menu pages, # of alarm pages, # of status pages, PLC type, port settings, communication configuration, and PLC station number) and all of the pages are printed.

The printer set-up is selecting **Printer Setup** from the **File** menu. The printer set-up screen is shown in Figure 3.3.

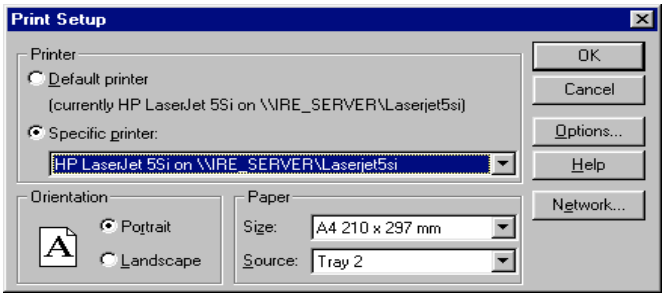


Figure 3.3 – Printer Set-up Box

3.12 To Insert a New Page

1. Click on the Insert Page Icon or from **Edit** choose **Insert Page**.
2. Pages can either be **Insert After Current Page** or **Insert Before Current Page**. Also, select the number of pages to be inserted. Click **OK**.

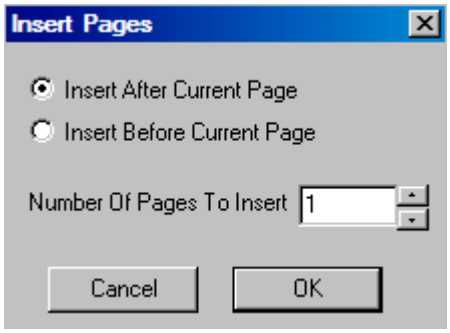


Figure 3.4 – Insert Pages Message

3. If the user goes to the last page of the project and clicks on the down key a message appears saying "There are no more pages in this menu, do you want to create some?" If the OK button is pressed the above insert menu pages appears.

3.13 Default Page Type

(Graphics Models Only)
With the HE500TIU20X, HE500TIU3XX, HE500TIU41x/51x/61x and HE500TIU42x/52x/62x series there are two types of pages.

a. Text Page
b. Graphic Page

The ***CBREEZE*** Software may be set-up to create either type of page by default or alternatively the software can be set up to display a prompt asking which type page is to be created every time a page or pages is inserted. **(Prompt On Page Creation).**

Text Page
A text page in the Graphics units is similar to the normal page created with the HE500TIU10X/11X, i.e. the same functions that are available on the HE500TIU10X/11X are also available on a **Text Page** of the Graphics unit. To use the extra graphic features of the HE500TIU20X a Graphic page must be created.

Graphic Page
A graphic page can be used to display all the features of the Text Page plus the extra features available for a Graphic Page. See chapter on **Graphic Editor** for further details of features available.

3.14 Download/Upload Character Set (Not available with the HE500TIU050)

After new characters have been created with the character generator, these characters must be downloaded to the TIU. Conversely, an existing character set in the TIU can be uploaded.

3.14.1 *To **Download** a Character Set:*

1. Select **Download Character Set to Tiu** from the **File** menu. A status bar appears; indicating the download is in progress.

Note: If the message "Link Failed" appears, check the cables connecting the PC to the unit.

2. After the project has been downloaded, the message "Transfer Complete" appears. The new character set is now loaded to the TIU.

3.14.2 *To **Upload** a Character set from the TIU:*

1. Select **Upload Character Set** from the **File** menu.
2. A status bar appears; indicating the upload is in progress.
3. After the project has been uploaded, the message "Transfer Complete" appears.

3.15 Select Terminal Type

This software package supports the projects of multiple Operator Stations (TIUs).

3.15.1 *To select the Operator Station Terminal Type:*

1. From **Configure**, pick **Select Terminal Type** and choose the model.
2. Choose the model or TIU being used. The screen changes to show the model just selected.

3.16 Delete a Page

1. Go to the page to be deleted. Click on the Delete Page icon or from **Edit** choose **Delete Page**.
2. The current page is deleted and the next page is displayed.

3.17 Font Size (Not available with the HE500TIU050)

There are four different Font Sizes: Normal, Double Height, Double Size (x2) and Four Times Size (x4). The size of an entire line is set, individual words on a line cannot have a different size then other words.

3.17.1 *To change/set the Font Size of a line:*

1. Click somewhere on the line to be adjusted.
2. Click on the desired **Font** icon. The size of the entire line is adjusted. Any characters beyond the right border of the screen are maintained but not displayed in the ***CBREEZE*** software or on the TIU.

NOTES

CHAPTER 4 EMBEDDED DATA

4.1 Scope

Embedded data fields allow data from external connected devices or internally generated data to be displayed on the screen of the Tiu. The following types are supported

- Numeric (Display / Modify)
- Alphanumeric (Display Only on the HE500TIU10X, Display / Modify on all other models)
- Timer (Display / Modify),
- Bit status (Display / Modify)
- System variable (Display Only)
- Password (Display / Modify)
- Horizontal Fill (Display Only)
- Text Selector (Display / Modify)
- Recipe Item (Display / Modify)
- Clock Calendar (Display / Modify)

Maximum embedded data fields by terminal family

Tiu Family	Maximum embedded data fields per text page	Maximum embedded data fields per graphics page
TIU050	8	N/A
TIU1XX	8	N/A
TIU2XX	24	64
TIU3XX	24	256
TIU4XX	24	256
TIU5XX	24	256
TIU6XX	24	256

Many of the sections in this chapter contain specific instructions that are intended to serve as examples only.

There are following are the various ways of embedding data on to the Tiu screen.

- Double click the Display window area.
- Click the Embed Data icon on the toolbar

- Click a specific embedded data icon from the toolbar

- Chose Edit/Embedded data from the menu.
- Press Shift and Enter Keys together.
- Right click the mouse and then select ‘Embedded Data’

Unless a specific embedded data type is chosen the following data type selection box is displayed (Fig 4.1). From this the type of data to be embedded may be chosen.

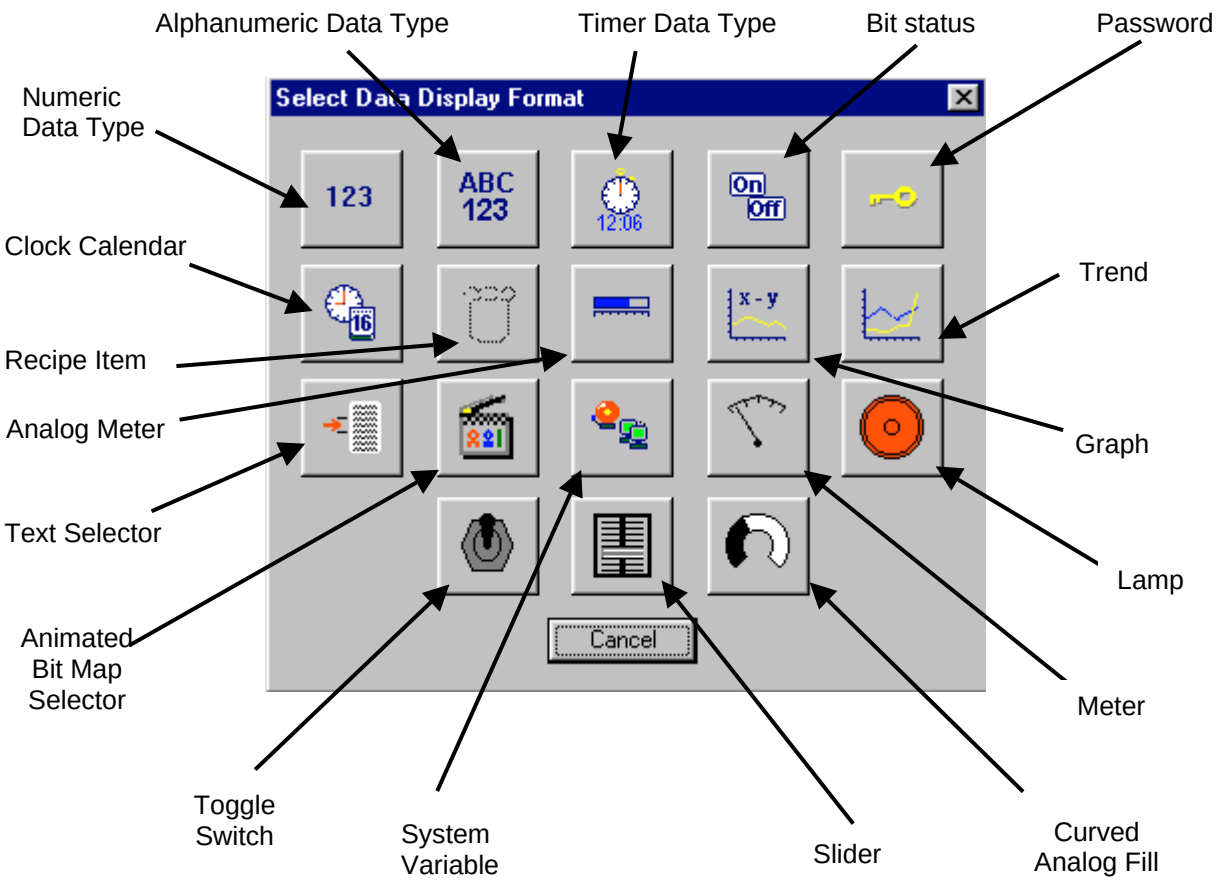


Figure 4.1 – Choose Embedded Data Type

4.2 Numeric Data

This section describes the Numeric Data formatting functions available in the Tiu Range. Use the instructions as follows to embed Numeric Data.

From the Embedded data list select **Numeric Data**, the screen shown in Figure 4.2 appears.

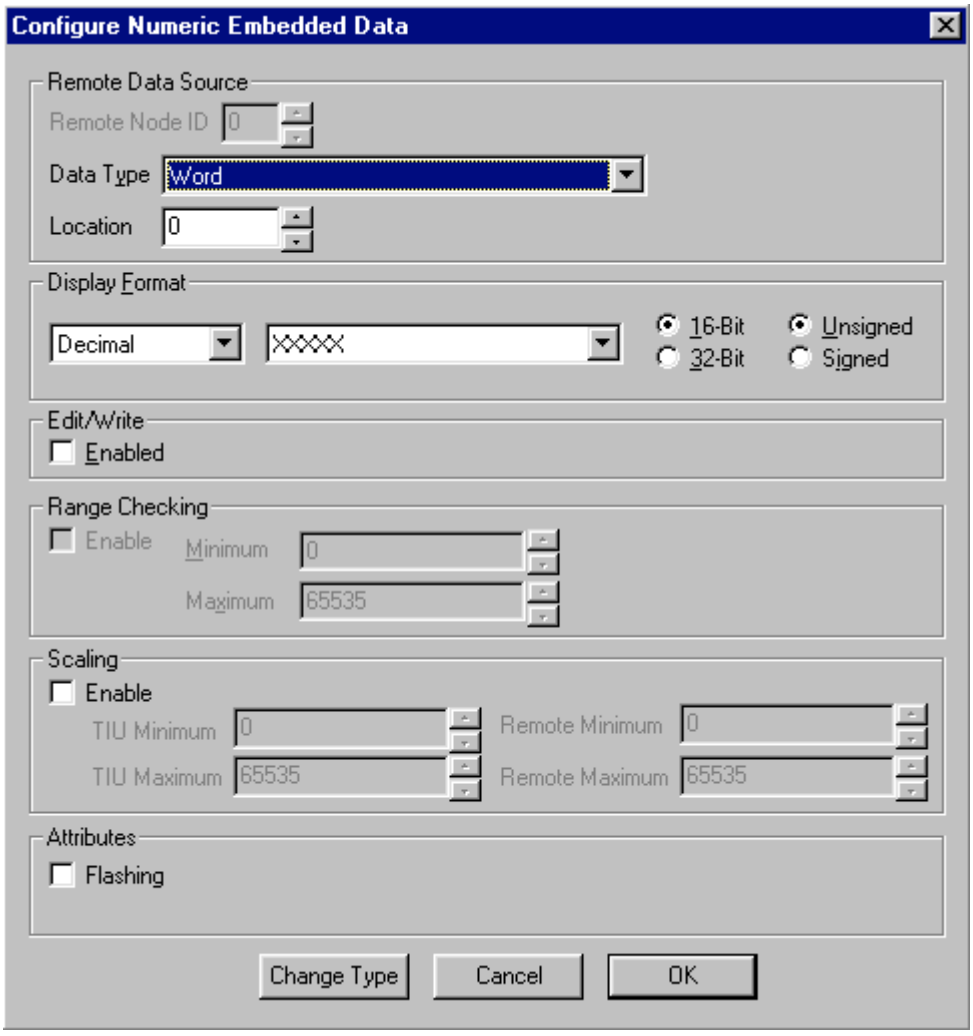


Figure 4.2 – Numeric Embedded Data Formatting

4.2.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.2.2 Display Format

Select the display format required. This may be any of hexadecimal, decimal, octal or binary.

Where decimal is selected a fixed decimal point may be added to the number. For example if XXX . X is selected 1234 is displayed as 123.4

Select whether the numeric should be 16 or 32 bit, and signed or unsigned.

Where32 bit is selected and the register type specified as stored in the AE is 16 bit (which is true of the majority of PLCs) two contiguous registers are automatically read from the AE and concatenated to form a 32 bit value.

Format	Minimum Value	Maximum Value
16 Bit Unsigned	0	65535
32 Bit Unsigned	0	4294967295
16 Bit Signed	-32768	32767
32 Bit Signed	-2147483648	2147483647

Where 16 bit is selected and the register type specified as stored in the AE is 32 bit (for example on the Moog PSC100) the upper word of the register read is automatically masked.

4.2.3 Edit/Write

Select whether the data is to be editable by the operator once the system is installed. In order for this to be the case check the 'Edit enable'

4.2.4 Range Checking

Available only when the format is selected for edit enable enabling range checking this allows the range of values entered by the operator to be restricted to be within a minimum and maximum value.

4.2.5 Scaling

Use scaling settings where the values read from the PLC need to undergo a conversion prior to being displayed on the PLC.
For example, a 12 bit analog input to the connected device gives a reading in the range 0 to 4095. This corresponds to a weight of 0 to 100 kg attached to a load cell. It is required to display this load on the Tiu display with accuracy to 0.1kg. It is possible to read the Raw value from the connected device and apply the following scaling conversion to produce the required reading on the Tiu display, with no need for any conversion mathematics within either the AE or the Tiu.

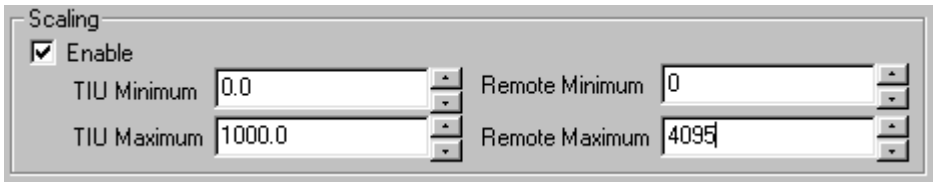


Figure 4.3 - Numeric Scaling Example

Changing data register contents from the TIU…

1. Press the Pause (||) key to select the data field for editing. The selected field becomes highlighted.
2. To increment the data, press the **Up** key. (If range checking is enabled then it will not be possible to increase the value above the maximum value specified)
3. To decrement the data, press the **Down** key. (If range checking is enabled then it will not be possible to decrease the value below the minimum value specified)
4. On Terminals other than the TIU1XX series the numeric pad may be used to key in a value directly.
5. To enter the data to the AE, press the **Enter** key. Note that if the value entered is out of bounds of the range specified, the display will briefly indicate an out of range status then revert back to edit mode with no write to the AE occurring.

4.3 Alphanumeric Data

This section describes the Alphanumeric Data formatting functions available in the Tiu Range. Use the instructions as follows to embed Alphanumeric Data.

From the Embedded data list select **Alphanumeric Data**, the screen shown in Figure 4.4 appears.

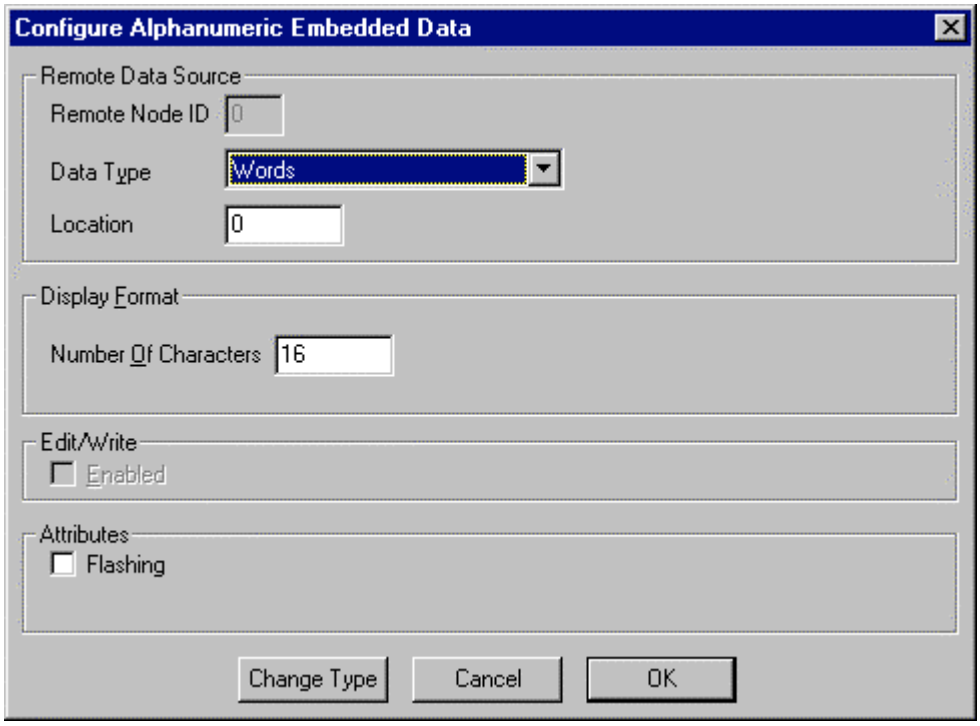


Figure 4.4 – Alphanumeric Embedded Data Formatting

4.3.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.3.2 Display Format

Select the number of characters that the displayed string should contain. The number of registers to be read in order to form the string will be determined by the string length. Each 16 bit register will provide two characters, and each 32 bit register will provide four characters.

4.3.3 Edit/Write

Select whether the data is to be editable by the operator once the system is installed. In order for this to be the case check the ‘Edit enable’

4.4 Timers

This section describes the Timer Data formatting functions available in the Tiu Range. Use the instructions as follows to embed Timer Data.
From the Embedded data list select **Timers**, the screen shown in Figure 4.5 appears.

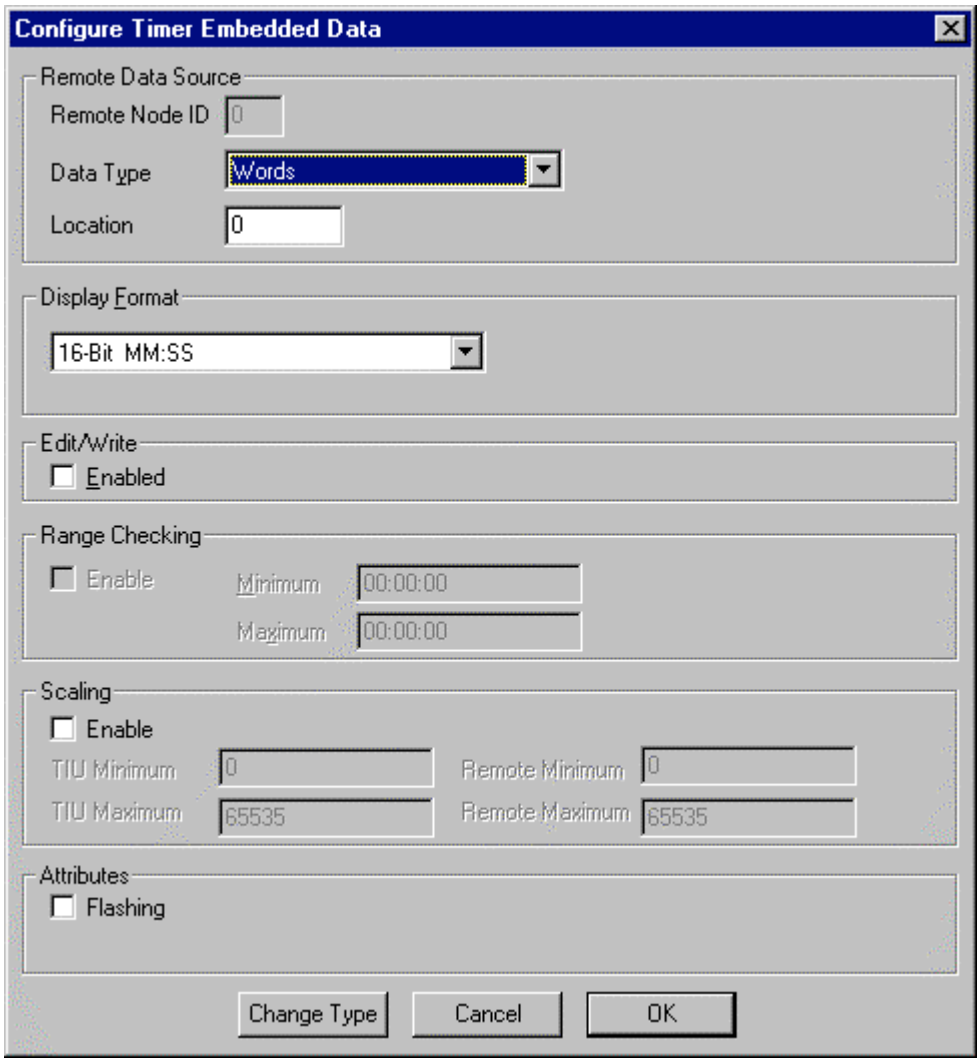


Figure 4.5 – Timer Embedded Data Formatting

4.4.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.4.2 Display Format

Select a timer format under **Format**. Table 4.1 shows the available timer format. A 32-bit timer reads two contiguous registers.

Table 4.1 – Configurations for Timer Format		
16-Bit MM:SS	12 Hour	Minutes & Seconds
16-Bit HH:MM:SS	12 Hour	Hours, Minutes & Seconds
16-Bit MM:SS_T	12 Hour	Minutes, Seconds & 10th of Seconds
16-Bit HH:MM:SS_T	12 Hour	Hours, Minutes, Seconds & 10th of Seconds*
16-Bit HH:MM	12 Hour	Hours &Minutes.
32-Bit MM:SS	24 Hour	Minutes & Seconds
32-Bit HH:MM:SS	24 Hour	Hours, Minutes & Seconds
32-Bit MM:SS_T	24 Hour	Minutes, Seconds & 10th of Seconds
32 Bit HH:MM:SS_T	24 Hour	Hours, Minutes, Seconds & 10th of Seconds
32-Bit HH:MM	24 Hour	Hours &Minutes
* up to a maximum of 1:49:13.5		

4.4.3 Edit/Write

Select whether the data is to be editable by the operator once the system is installed. In order for this to be the case check the 'Edit enable'

1. Check the **Range Checking** box to enter a **Maximum** and **Minimum range**.
2. Range checking can be entered in SECONDS; MINUTES, SECONDS; or HOURS, MINUTES, SECONDS.

4.4.4 Range Checking

Available only when the format is selected for edit enable enabling range checking this allows the range of values entered by the operator to be restricted to be within a minimum and maximum value.

4.4.5 Scaling

Use scaling settings where the values read from the PLC need to undergo a conversion prior to being displayed on the PLC.
For example, the timer to be displayed is actually counting in 0.01 second increments in the PLC. Use the following Scaling settings to convert this to a 0.01 second timer on the Tiu display, with no need for any conversion mathematics within either the AE or the Tiu.

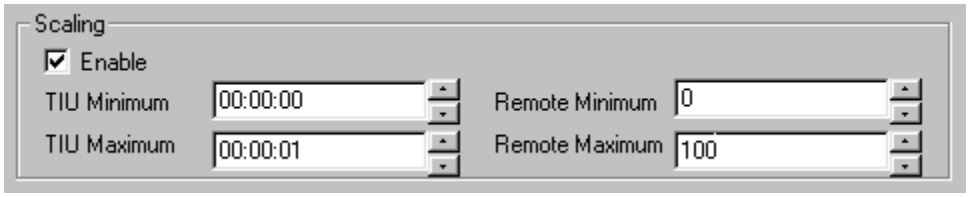


Figure 4.6 - Timer Scaling Example

To edit the data field on the Tiu

1. While displaying the appropriate page, press the **Pause** key to select the data field for editing. The selected field becomes highlighted.
2. To increment the data, press the **Up** key.
3. To decrement the data, press the **Down** key.
4. To enter the data to the PLC, press the **Enter** key. If range checking is active, then increment and decrement are only allowed between the maximum and minimum ranges.

4.5 Bit Status

This section describes the bit status functions available in the TIU. Use the instructions as follows to embed Bit Status.

From the Embedded data list select **Bit Status**, the screen shown in Figure 4.7 appears.

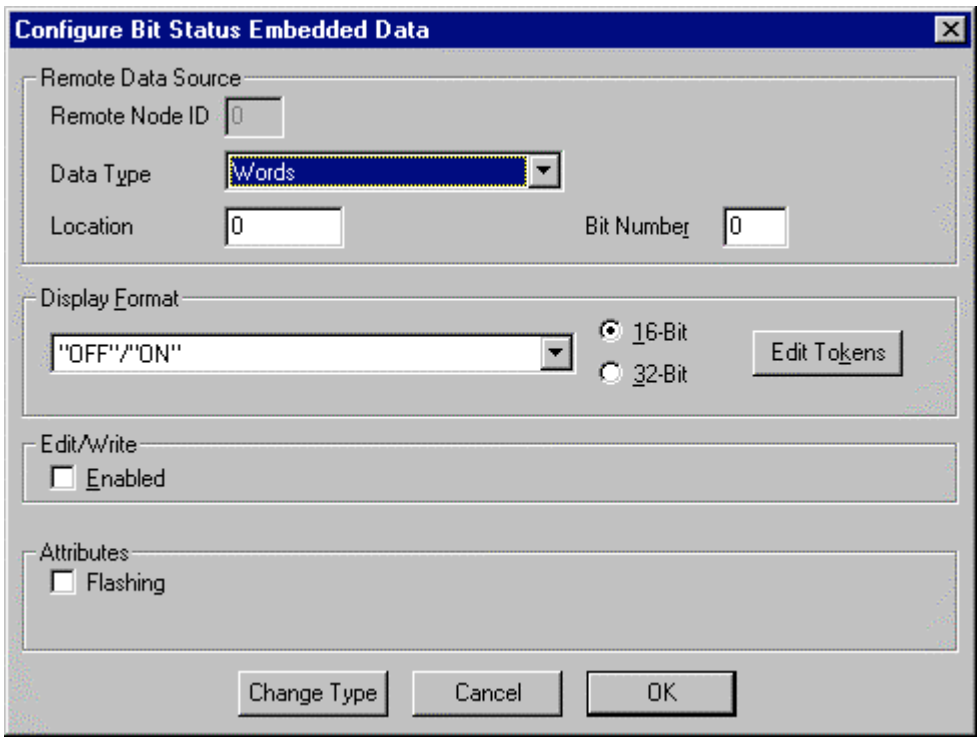


Figure 4.7 – Bit Status Embedded Data Formatting

4.5.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.
If an analog **Data Type** is chosen, then an additional bit number will be prompted for.

4.5.2 Display Format

Select a 'Token Pair' from the list of available pairs. ("OFF"/"ON" for example). To modify the list of available pairs click on the 'Edit Tokens' button, select the pait to modify and then enter the "ON" and "OFF" descriptions (up to 10 characters) in the **Enter Bit On Token** and **Enter Bit Off Token** boxes. After being modified, the modified token pair can now be selected as normal.

4.5.3 Edit/Write

Select whether the data is to be editable by the operator once the system is installed. In order for this to be the case check the 'Edit enable'

Modifying the bit value when editing is enabled

1. From the appropriate page, press the **Pause** key. The selected field becomes highlighted.
2. To turn the bit off press the Down key arrow, or if applicable the '0' key on the numeric pad.
3. To turn the bit on press the Up key arrow, or if applicable the '1' key on the numeric pad.

4. Press "**Enter**" to send the data to the PLC.

4.6 System Variables

This section describes the system variables available in the TIU. Use the instructions as follows to embed system variables.

There are six different types of system variables. To embed system variables:

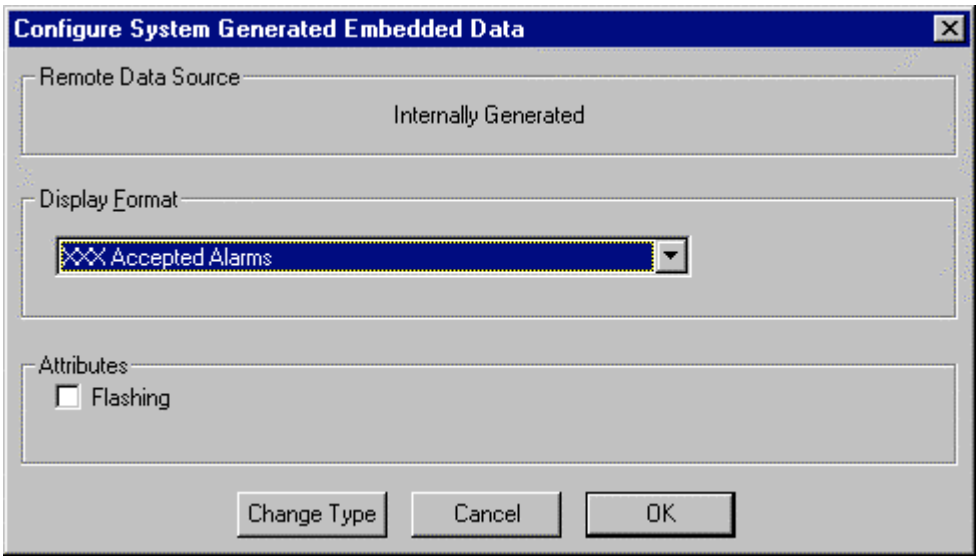


Figure 4.8 – System Variable Embedded Data Formatting

1. From the embedded data list select **System Variable**.
2. Select a system variable type under **Select System Variable** in the **Format** section.
3. Click **OK**.

4.7 Passwords

This section describes the Password function available in the TIU. Use the instructions as follows to embed Password.

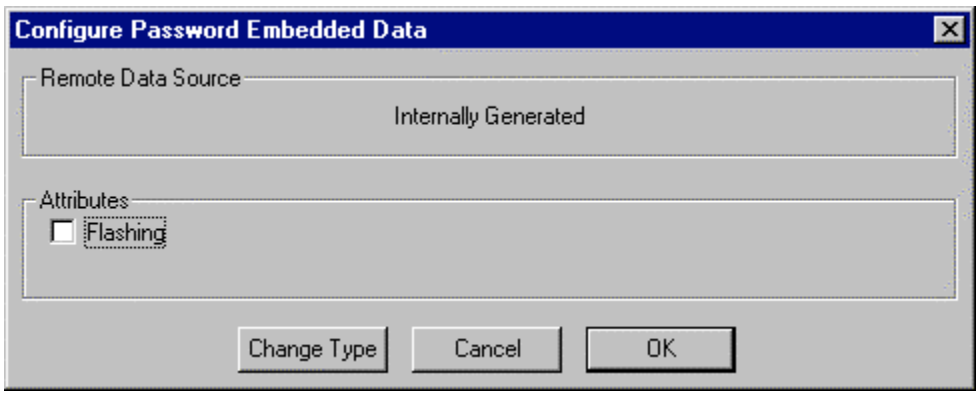


Figure 4.9 – Password Embedded Data Formatting

4.7.1 To password protect a sub-menu:

1. From the embedded data list select **Password**. A series of question marks appear on the screen. Click **OK**
2. Select **Create SubMenu** from the **Edit** menu. Enter the number of pages, you then have the option of password protecting the submenu.

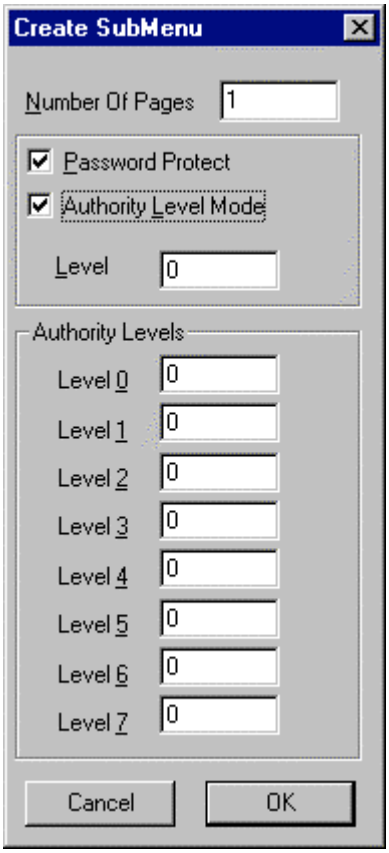


Figure 4.10 – Configure Password Authority Mode

3. There are two types of security access on sub-menus.
    - Simply one password to enter the sub-menu
    - Authority Level Mode

The Authority Level Mode allows the programmer to give security levels to each sub-menu. Click Authority Level Mode and then enter the Authority Level to that sub-menu. Each Level can be given an individual password.

4.7.2 To enter the password from the TIU:

1. In the appropriate page, press the **Pause** key. The selected field becomes highlighted.
2. Enter the password by incrementing or decrementing the data field, by pressing the **Up** or **Down** key respectively.
3. Press the **Enter** and **Up** keys simultaneously.
4. The data must be equal to the pass code in order to enter into the sub-menu.

4.8 Analog Meters

This section describes the Analog Meters function available in the TIU. Use the instructions as follows to embed Analog Meters.
An area of the display can be horizontally filled to create an analogue meter or gauge. The height of the block is fixed at the height of the current text line. To create a horizontal fill:
1. From the embedded data list select **Analog Meters**.

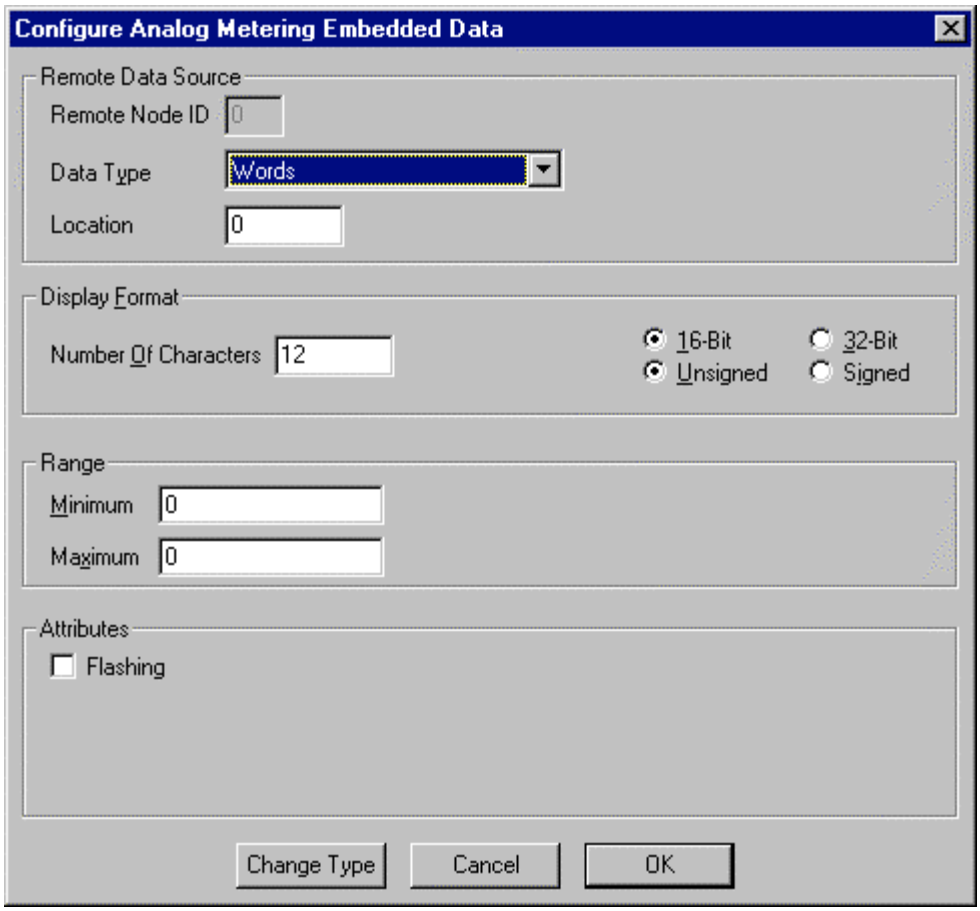


Figure 4.11 – Analog Meter Embedded Data Format

4.8.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.8.2 Display Format

Select the **Number of Characters** that the fill should occupy. The actual width and resolution of the fill will be dependant on the font size in which the fill is displayed.

4.8.3 Range

Select the values that will correspond to empty (minimum) and full (maximum) for the fill.

NOTE Only Linear Scaling is supported directly

4.9 Text Selector

This section describes the Text Selector function available in the TIU. Use the instructions as follows to embed Text Selector.

Text Tables are available in the TIU ***CBREEZE*** software. There are 250 available text tables for use and they may be numbered from 1 to 250. Each text table may have up to 256 entries (numbered 0 to 255). Entries within each table may be called up by using the selected PLC register. When the ID of the entry is called up in the PLC register, the text string (entry) is displayed. The text strings are automatically forced to the width of the longest text string in the table (selected table). Strings are automatically left justified. Text tables are typically used in situations where the operator desires a visual message when some event (such as a value change in a register) occurs.

Example: A PLC is controlling a process that manufactures one of four drink types: Cola, Lemonade, Orange Juice, and Apple Juice.

The PLC has a register that contains the value of "6" when Cola is being made, "8" when lemonade is being made, "12" when Orange Juice is being made and "24" when Apple Juice is being made. A Text table can be created with four entries, 6, 8, 12 and 24, with the text for these items being the four products. Now, the PLC register can be monitored and the appropriate text inserted into a page on the HE500TIU050/100/110.

A **maximum** of 64kBytes can be used by all of the text tables.

4.9.1 Edit Text Tables

Text tables can be edited from the HE500TIU050/100/110. To choose the Text Selector function:

1. Select **Text Selector** embedded data list.

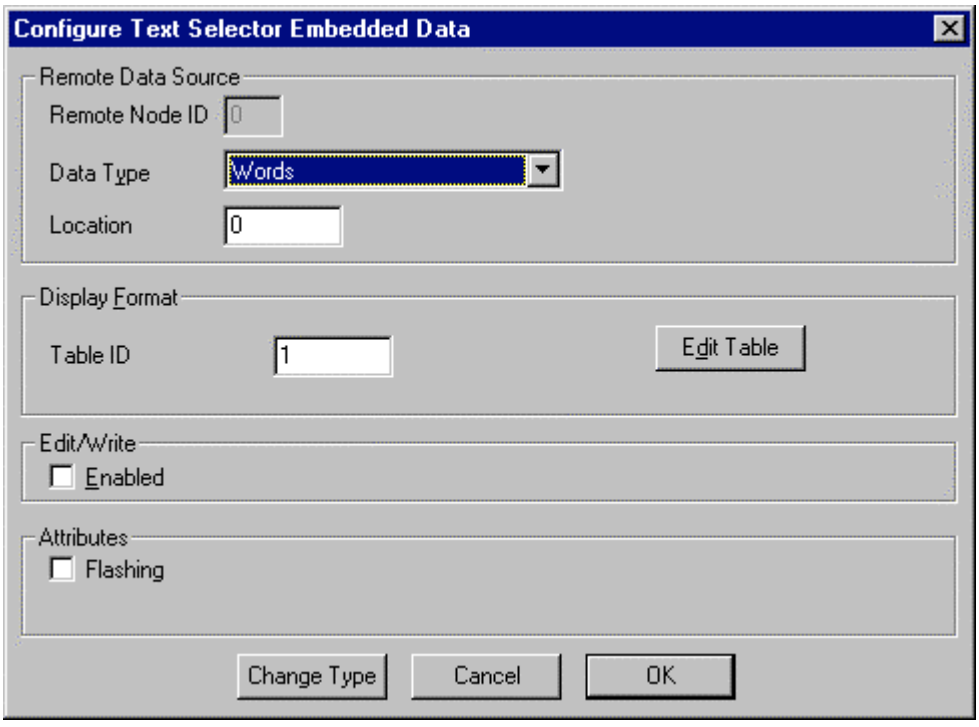


Figure 4.12 – Text Selector Embedded Data Format

4.9.2 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.9.3 Display Format

Select a text **Table ID** number (1-250).
To modify the entries within a text table click the edit table button.

4.9.4 Edit Enable

Select this check box to enable the editing of the register controlling the text table direct from the front panel of the Tiu.

4.10 Editing a text table's entries

To create/edit/delete entries, click the **Edit Table** button. The Text Table editor dialog box appears as in Figure 4.13

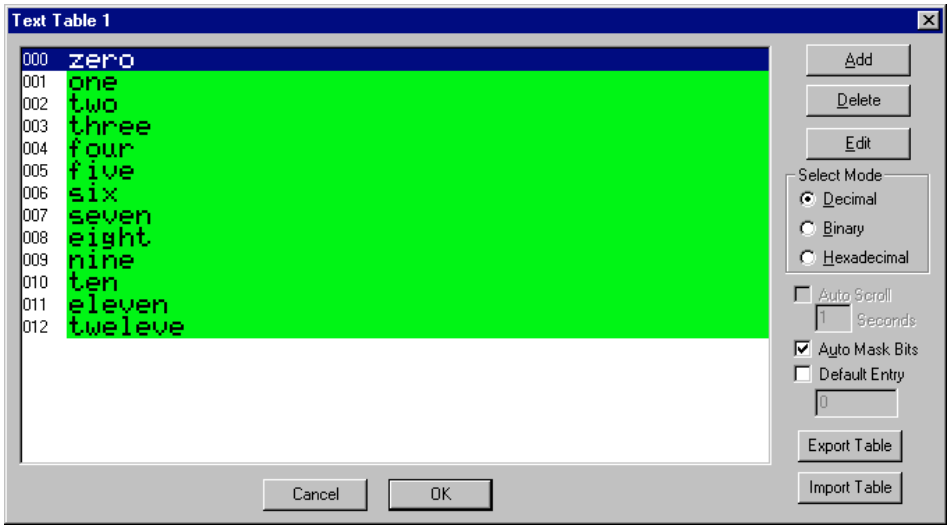


Figure 4.13 – Text Table Editor

A Text Table box appears and the user has the ability to **Add**, **Delete**, and **Edit** text strings.

4.10.1 To Add an Table Entry

1. Click Add. Figure 4.14 is displayed.

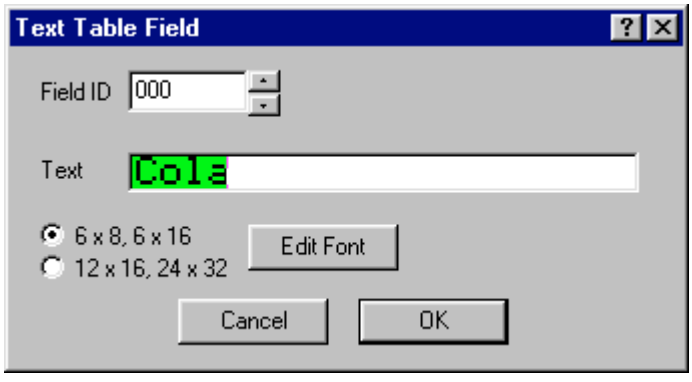


Figure 4.14 – Text Table Field Entry

2. The field ID is automatically the next the available number in the table. This can be changed by typing in the number required or incremented using the up and down buttons to the right of the field.
3. In the text field enter the text corresponding to that field ID.
4. The size of the font that will be used to display the text table can then be set to the character set sizes 6 x 8 or 12 x 16. Note that if custom characters are used in the text table, then using the incorrect font when displaying the text table on the Tiu will prevent the table entries from being displayed as intended
5. The programmer can enter the customised character generator by clicking edit font, see Chapter on Character Generator for further details.

4.10.2 Decimal, binary and hexadecimal Table Modes

Text tables can be called in 3 different modes, **Decimal**, **Binary** and **Hexadecimal**. This refers to the format of the data in the register calling the text table. Also in Binary mode multiple text table entries can be displayed the user can then scroll between these text table entries, or set the Auto Scroll option to let the TIU to automatically scroll between all the selected entries.

4.10.3 Export a Text Table

1. Click the **Export** button.
2. Enter the location of the file.
3. Enter the name the file the text table is to be exported to.

4.10.4 Import a Text Table

1. Click the **Import** button.
2. Click on the file to be imported.

To edit a text table from the TIU:

1. Select the text string field by pressing the **Pause** key.
2. Move up or down the list using the **Up** and **Down** keys.
3. Press the **Enter** key to select the desired text string.

4.10.5 Auto Mask Bit

The Auto Mask function allows the programmer is a function, which allows the programmer to mask off a specified number of bits in a register. When the Auto Mask Bit is selected an extra field appears in the Configure Text Selector Embedded Data window called Bit Offset. This field contains the number of bits to be masked off beginning with the first bit of the register.

4.10.6 Default Text Table Entries

If an undefined value is entered into the text table entry field (i.e., a value that has **not** been assigned in any text table), then one of two different things happen.

a. If the user has assigned a value to the **Default Entry** in the Text Table box, then that entry number is displayed. This value is assigned by first checking the box next to **Default Entry**, then entering a number in the box below.
b. If the box is unchecked and a default entry has not been selected, then a series of asterisks (corresponding to the longest entry in the text table) are displayed.

Example: There are five entries in a text table.

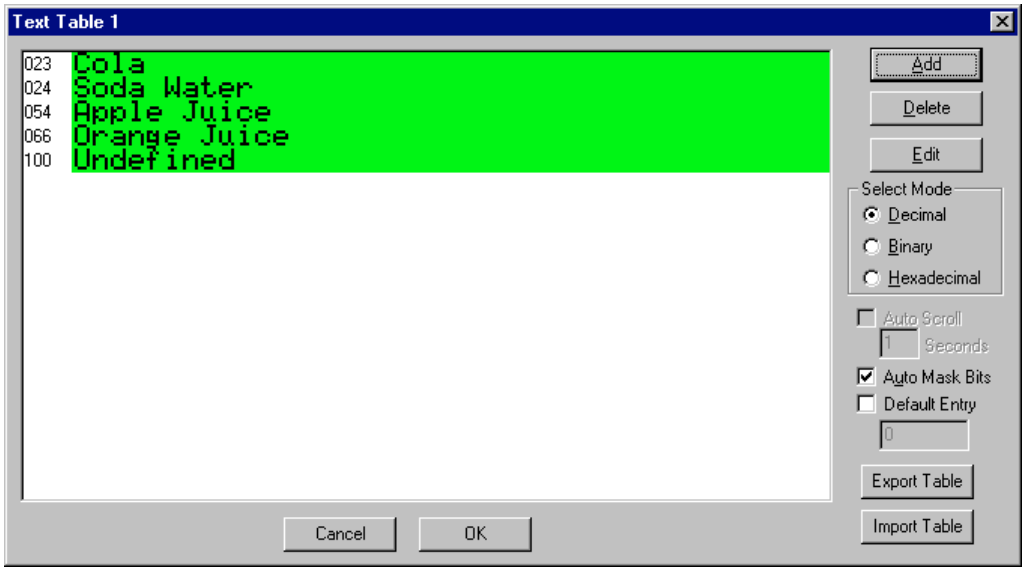


Figure 4.15 Default Text Selector Example

These five entries have numbers of 23, 24, 54, 67 and 100. The text in these entries is as follows:

23 - Cola
24 - Soda Water
54 - Apple Juice
67 - Orange Juice
100 Undefined

If an undefined value is entered (e.g. 97) then "****************" is shown. If a default entry has been selected, i.e., 100 (any number can be used), then the text corresponding to 100, "**Undefined**" is displayed.

4.11 Clock Calendar

This section describes the Clock Calendar function available in the TIU. Use the instructions as follows to embed Clock Calendar.

If the TIU has been fitted with the real-time clock feature, then the time and/or date can be embedded as data. To embed the time and/or date:

1. Select **Clock Calendar** under embedded data list.

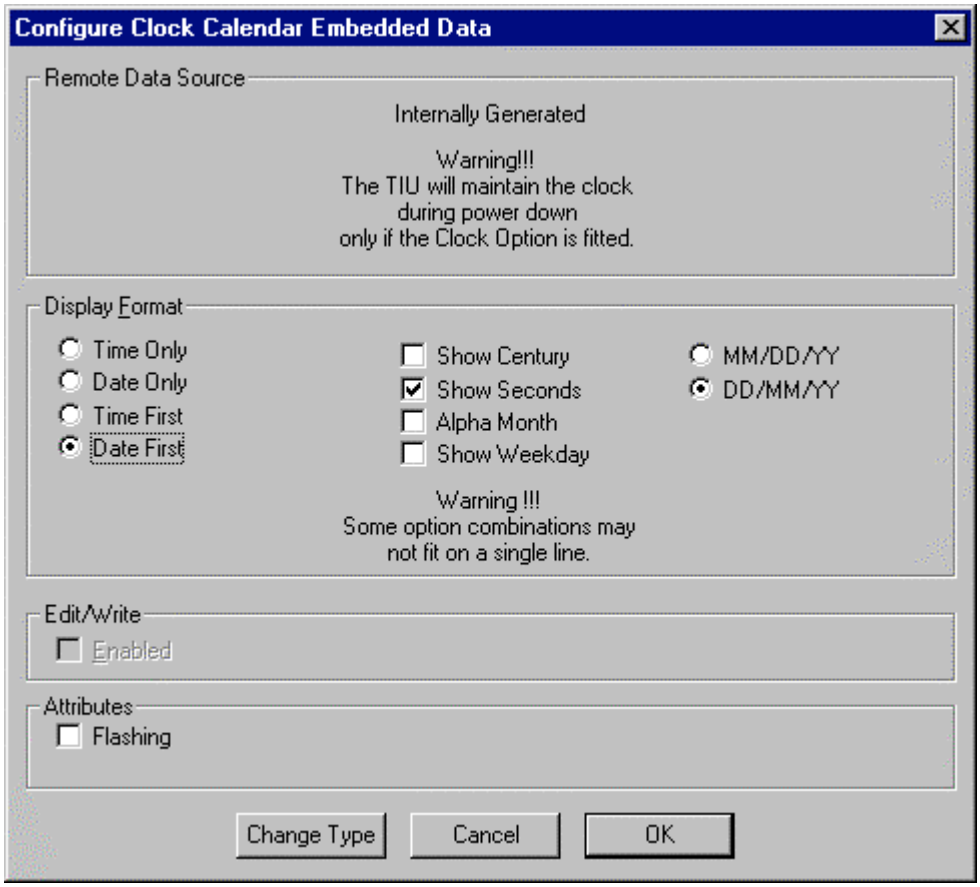


Figure 4.16 – Configure Clock Calendar Data

2. Choose the Format of the time and/or date to be displayed on the TIU. Click **OK**.

4.11.1 Clock Calendar Mapping

It is also possible to map the clock calendar (time and date) information to the automation equipment. To do this:

1. From **Configure**, chose **Clock Calendar Mapping**.
2. Click Enable. Select the **Data Type** (register or other) and first register (or other) for the **Map Start**. Click **OK**.
3. The mapping is displayed in the **Map** field (see Figure 4.14).

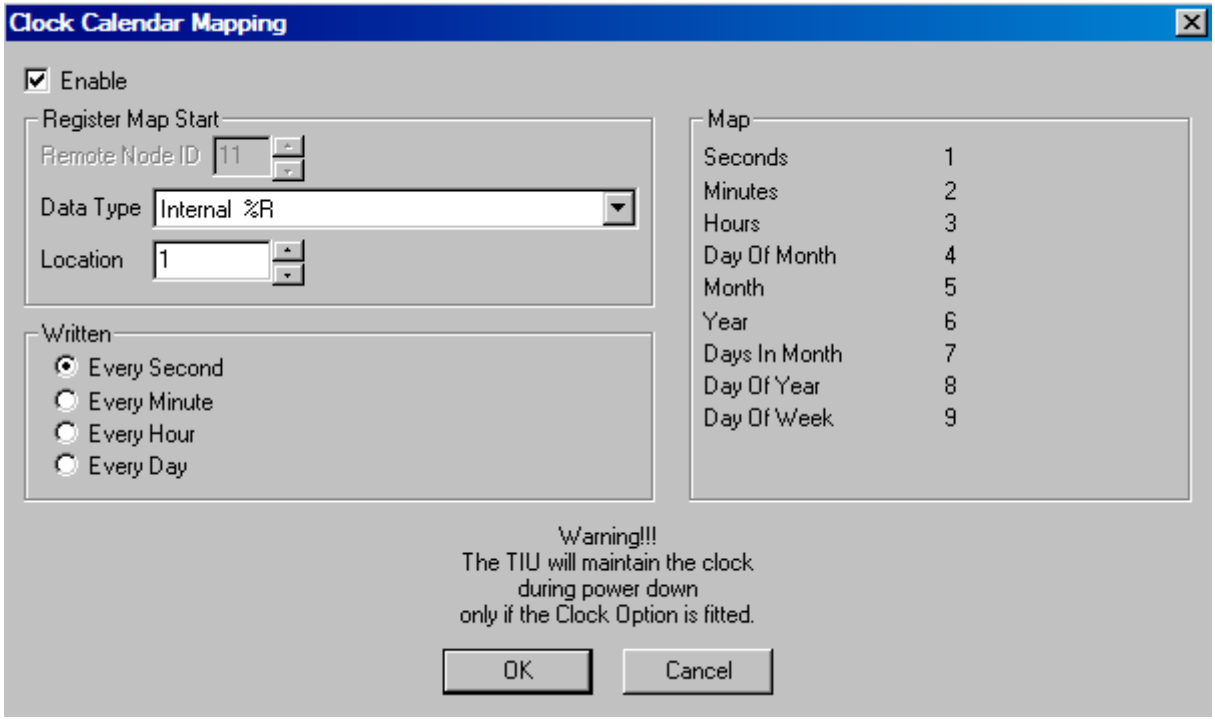


Figure 4.17 – Clock Calendar Mapping

4.12 Graphing (Not available with the HE500TIU050)

This section describes the Graphing function available in the TIU. Use the instructions as follows to embed Graphing.

This features graphs up to two plots of 21 contiguous registers. Plot 1 is the lower byte of the register and plot 2 is the upper byte of the register. The graph is updated continuously. The actual update time depends on the equipment connected to the TIU, and communication speed. The data structure is as follows:

Offset +0	Offset +1	Offset +2	. . .	Offset +21
Points	**Data 1**	**Data 2**	. . .	**Data 21**

Points HIGH Byte = Number of point for plot 2
LOW Byte = Number of points for plot 1
Definitions: 0 = do not plot;
1 = plot first 11 registers on X-axis using 10 pixels per register;
2 = plot 21 registers on X-axis using 5 pixels per register;
>2 = assume 2.

Data HIGH Byte = Data for plot 2, ploted with a dotted line
LOW Byte = Data for plot 1, plotted with a solid line
The scale of the Y-axis is 0 to 29. Values greater than 29 or negative values are plotted full scale.

4.12.1 To Embed a Graph:

1. Select **Embedded Data** from the **Edit** menu
2. Select **Graph** under **Type**.

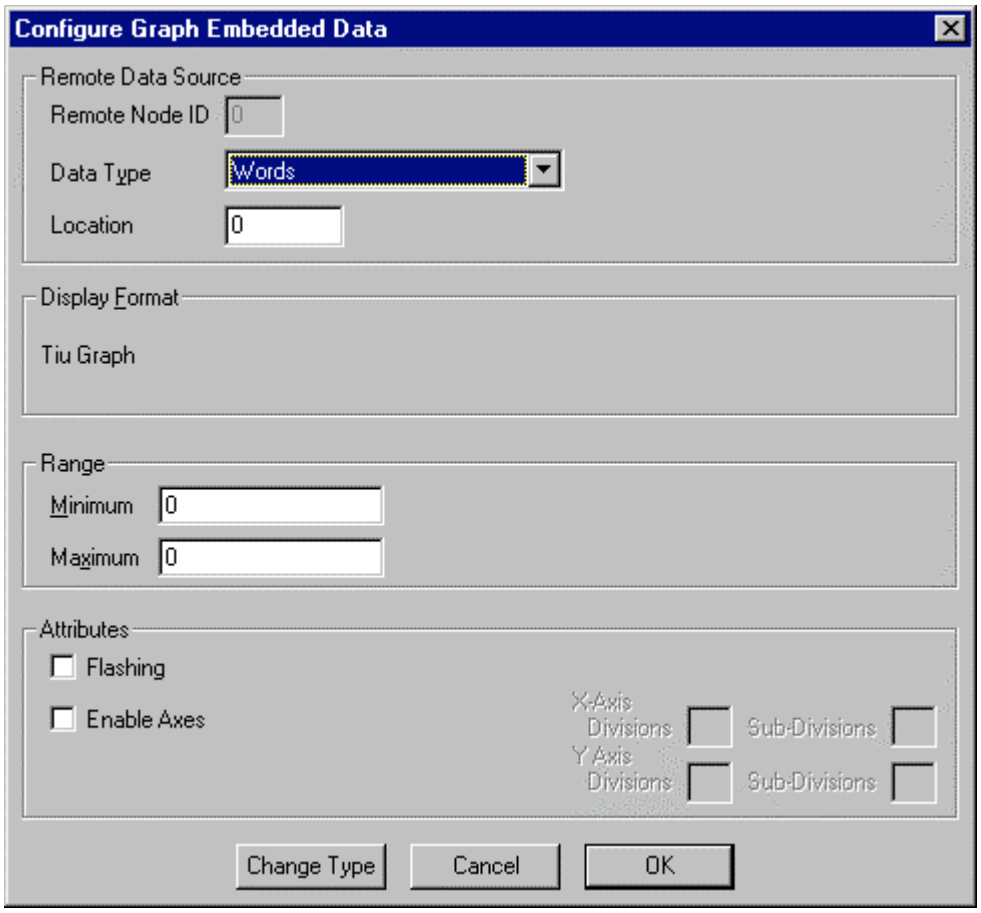


Figure 4.18 – Graph Embedded Data Formatting

4.12.2 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.12.3 Display Format

4.12.4 Range

(Where applicable) Select the values that specify the range over which data will be plotted

4.12.5 Enable Axes

When this option is selected the X and Y-axes of the Graph is displayed on the TIU (except TIU050) when the project is downloaded.

Note: The graph uses up 3/4 of a menu or submenu page and as such overwrites whatever data is on that page.

4.13 Trending (Not available with the HE500TIU050)

This section describes the Trending function available in the TIU. Use the instructions as follows to embed Trending.

This features continuously plots up to two registers (channels) versus time. The maximum update rate depends on the equipment connected to the TIU, and communication speed.

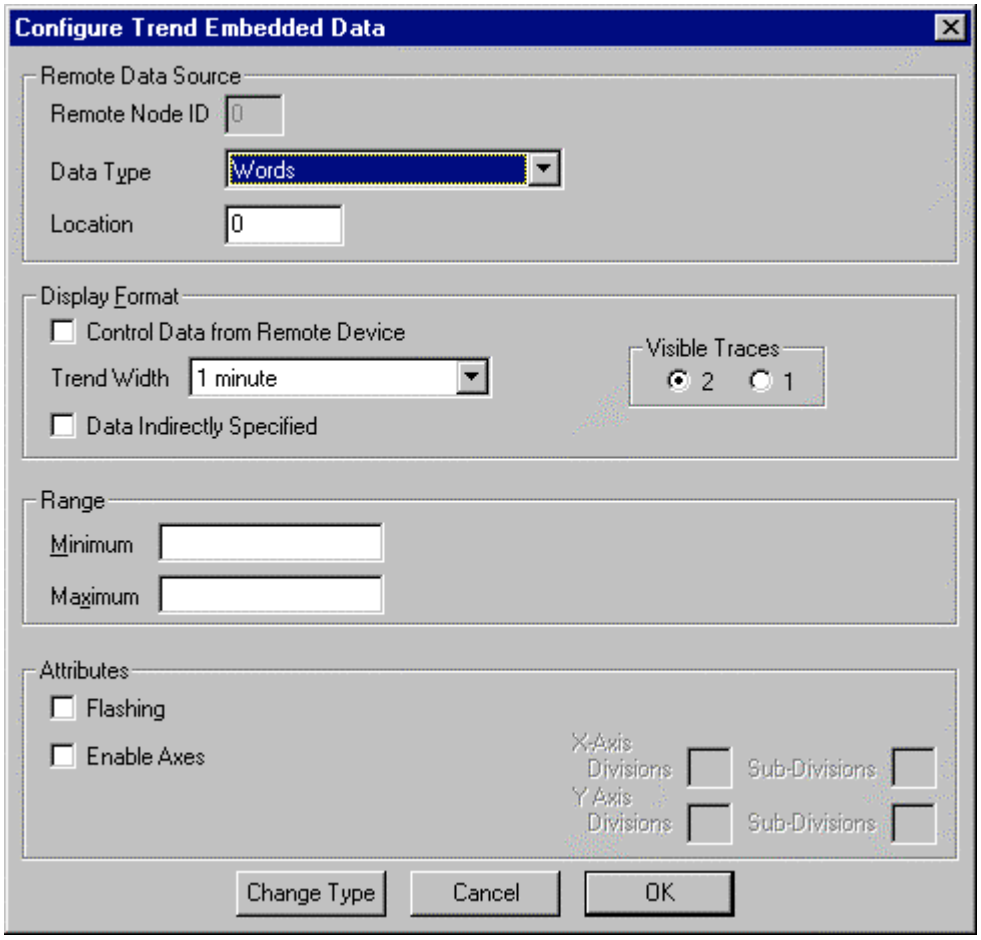


Figure 4.19 Embedding A Trend

4.13.1 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

4.13.2 Data Indirectly Specified.

This option allows the programmer to indirectly specify the register which contains the data for the trend, i.e. the contents of the register, which is specified in the Location section of the Remote Data Source, specifies the register that contains the data for the trend.

4.13.3 Control Data from Remote Device

This option allows the programmer to control the set-up of the trend from registers stored in the automation equipment. The structure for setting up the trend is described further in this paragraph.

The data structure is as follows:

Offset +0	Offset +1	Offset +2	Offset +3	Offset +4	Offset +5
Time Base	**Ch. 1 Scale**	**Ch. 1 Data**	**Ch. 2 Scale**	**Ch. 2 Data**	**Width**

Time Base 0 = maximum update rate;
1 = 1/10s per plot
X = X/10s per plot, up to X=10

Scale Maximum value of Y-axis for that channel; if 0 channel is not plotted.

Data Raw register values. Negative values are plotted at full scale.

Width Number of samples across the display
100 = 1 pixel per plot
50 = 2 pixels per plot
25 = 4 pixels per plot
10 = 10 pixels per plot
Any other value, the nearest to the above 4 is used.

If the Control Data from Remote Device option is not clicked then the trend is set-up as follows.

The Time Base is set by the Trend Width.
The scale is set by the Minimum and Maximum Range
The data for the first trace is taken from the register specified or indirectly specified in the **Location** field
The data for the second trace is taken from the following register specified or indirectly specified in the **Location** field.

Note: When Control Data from Remote Device is selected, the data to set-up the structure of the trend is only read once, when you first go onto a screen where the trend is embedded. The data for the trend is read continuously.

4.13.4 Enable Axes

When this option is selected the X and Y-axes of the Trend are when the project is downloaded.

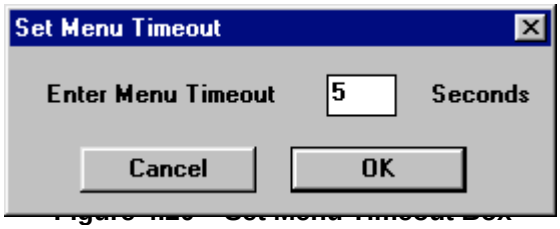
Note: The trend uses up 3/4 of a menu or submenu page and as such overwrites whatever data is on that page.

4.14 Menu Timeout

4.14.1 Scope

This section describes the Menu Timeout function available in the TIU. Use the instructions as follows to embed Menu Timeout.

The Menu Timeout is a useful safety feature. This forces the TIU back to the first (main) menu page after a set time period. For example, the TIU is on an input menu page, after 30 seconds of no activity, the TIU reverts back to the non-input (safety) main menu page. To set the timeout:



From the configuration menu, select **Configure**, then **Menu Timeout**. A timeout is set in **ALL** menu and sub-menu pages. Time-outs in each screen may be inhibited from the **Edit** menu. To disable the Timeout function, set the time to 0 seconds.

4.15 Flashing Characters

4.15.1 Scope

This section describes the Flashing Characters function available in the TIU. Use the instructions as follows to embed Flashing Characters.

The user may have flashing characters on any line and on any type of page in the project. There are two different ways that flashing characters are implemented.

a. In the embedded data screen, under **Attributes** check the box for **Flashing**.
b. The other way to create flashing characters is to use the “TAB” key when you are creating the project. Flashing is toggled by line using the “TAB” key (current line the cursor is on). In this case, the entire line flashes.

Note: Flashing can not be enabled or disabled conditionally.

4.16 Set the Real-time Clock

4.16.1 Scope

This section describes the Set the Real-time Clock function available in the TIU. Use the instructions as follows to embed Set the Real-time Clock.

The Real-time Clock is not a standard feature on all TIU’s. The Real-time Clock is set from the PC’s clock. To automatically set the Real-time Clock from the PC’s clock:
Connect the TIU to the PC.
From File, choose Set Clock. The PC's time is downloaded to the Unit

4.17 Scaling

This section describes the Scaling function available in the TIU. Use the instructions as follows to embed Scaling.

Embedded Fields can be Scaled to convert register values from the AE into real-world numbers.

4.17.1 To enable Scaling:

1. From the Embedded Data screen, click **Enable** in the **Scaling** box.
2. Enter the **TIU Minimum, TIU Maximum, Remote Minimum** and **Remote Maximum**.
3. After configuring any other fields, click OK.

The **TIU Minimum** and **Maximum** refer to the minimum and maximum values to be displayed on the TIU. The **Remote Minimum** and **Maximum** refer to the minimum and maximum values produced by the AE.

Example. Scaling can be used to convert the drive speed in RPM to a conveyor's speed in m/min. This scaling could then be taking the gearbox and all the other mechanical factors into account. The maximum speed of the drive may be 1450, but the actual maximum speed of the conveyor is 100 m/min. Therefore, the Scaling configuration is as follows:

TIU Minimum	0 (m/min)
TIU Maximum	100 (m/min)
Remote Minimum	0 (RPM)
Remote Maximum	1450 (RPM)

4.18 Page Wizard

4.18.1 Scope

This section describes the Page Wizard function available in the TIU. Use the instructions as follows to embed Page Wizard.

The Page Wizard is a short cut for building pages to set or view the internal real-time clock or view communication statistics.
NOTE: Only available on Text type pages.

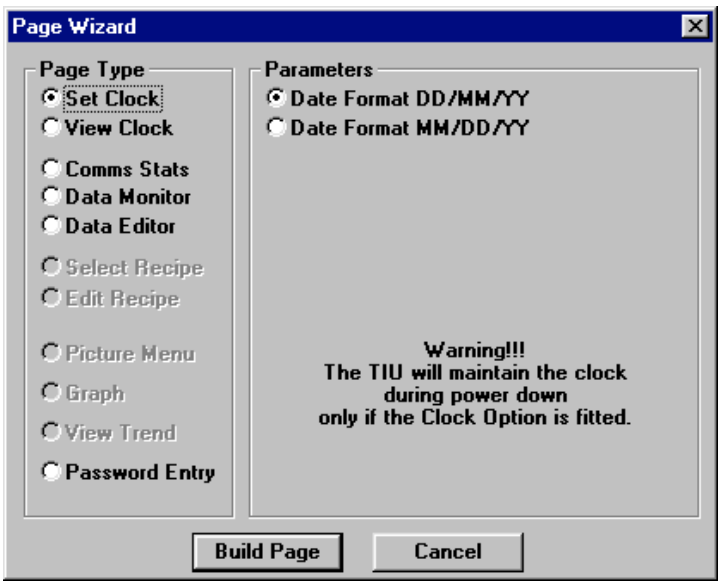


Figure 4.21 – Page Wizard

4.18.2 To use the Page Wizard:

1. Move to or insert a page that is to be built.
2. Click the Page Wizard icon or from **Configure**, choose **Page Wizard**.
3. Click on the **Page Type** to be built and chose the particular **Parameters** to be displayed on the TIU. Click **Build Page**.

NOTES

CHAPTER 5 THE KEYBOARD

5.1 Function Keys

The TIU support function keys to be assigned in the project. The **Up, Down, Pause** and **Enter** (TIU050/10x/11x/20x) keys can be configured as function keys however are defined on a per page basis. Due to the fact that the keys may have other functions allocated to them the following restrictions are placed on the allocation of functions to these keys:

1. The **Pause** key is available for mapping on **status pages, alarm pages, and menu pages** with no editable embedded data, and which are not part of a submenu, and which do not have a submenu.
2. The **Enter** key is available for mapping on **status pages, alarm pages and menu pages**, except the first menu page.
3. The **Down** Key is available for mapping on **status pages** and on the last page of a sub menu.
4. The **Up** Key is available for mapping on **status pages** and on the first page of a sub menu. (It is used for scrolling purposes on menu pages that are not the first in a submenu, and on alarm pages.)

The **Up, Down, Pause and Enter** keys, the alphanumeric keypad on the HE500TIU050/11X/20X and the System to F5 or F7 Keys on the TIU3xx, TIU41x/51x/61x and TIU42x/52x/62x can also be assigned functions in the ***CBREEZE*** software. These function keys can be programmed on all page types and menus.

The Configure Function Key Screen lists the available function keys on each page. See Figure 5.1.

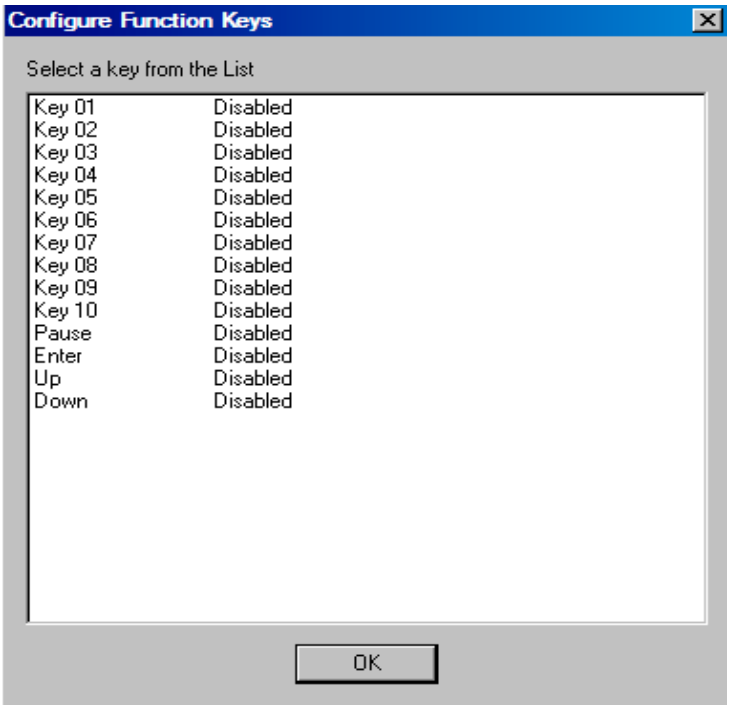


Figure 5.1 Configure Function Keys for the HE500TIU11X

Double Click on the key to be programmed. Each key maybe programmed as a **Global** or **Local** function key. Programmed as a **Local** function, the key will only complete the function in the present page only. Programmed as a **Global** function, the key will perform the function on every page of the project, provided it is not overridden on a particular page with a local function.

Note: The **Up, Down, Pause** and **Enter** keys can only be programmed as **Local** Function Keys.

The **Key Actions** for both **Local** and **Global are:**
1. Disabled
2. Push Button
3. Preset Register
4. Display Page
5. Ramp Register
6. Set Bit
7. Clear Bit
8. Invert Bit
9. Execute Maths
10. Print Report

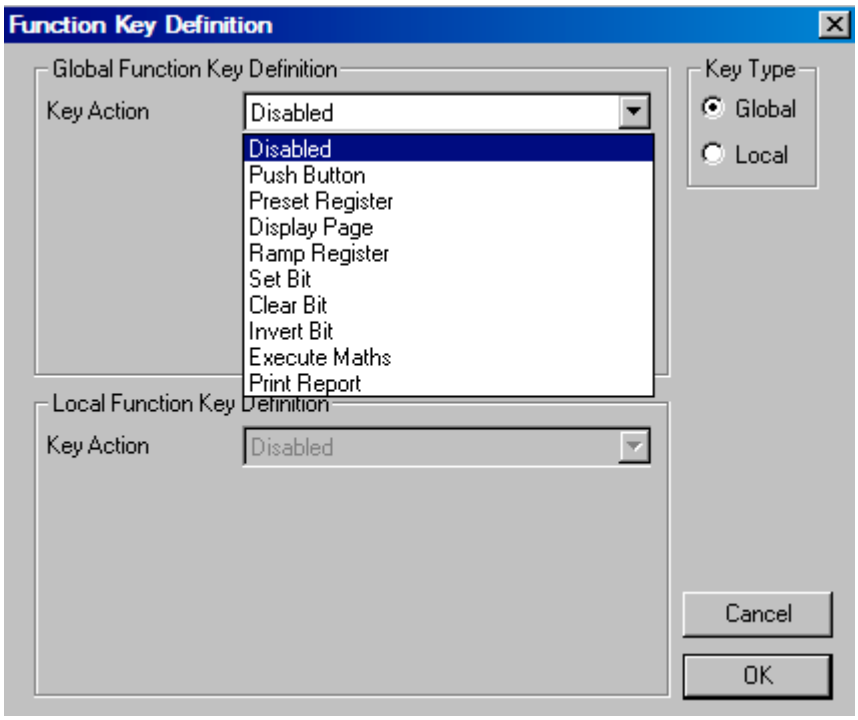


Figure 5.2 Function Key Definition

1. **Disabled**
Default setting, change to any other of the setting to enable function key.

2. **Push Button**
Sets the register chosen in the **Location** and **Set Data type** to the value in the **Value** field while the button is pressed. The register is reset when the button is released.

3. **Preset Register.**
Sets the register chosen in the **Location** and **Set Data type** to the value in the **Value** field.

4. **Display Page**
Displays the specified page in the **Page Number** field.

5. **Ramp Register**
Increases the value of the **Data Type** or register type specified under the **Location** field by the value entered in the **Value** field.

6. **Set Bit**
Sets the bit specified in the **Bit** field of the **Location,** of the **Data Type** or register type to "1".

7. **Clear Bit**
Sets the bit specified in the **Bit** field of the **Location,** of the **Data Type** or register type to "0".

8. **Invert Bit**
Toggles the bit specified in the **Bit** field of the **Location,** of the **Data Type** or register type.

9. **Execute Maths**
Executes mathematic function beginning at the specified line number.

10. **Print Report**
If Reports are configured (see Chapter 12) prints the specified report (1-48)

5.2 Key Mapping

The keyboard can be mapped to PLC automation equipment along with the currently displayed page number. This enables keys to be used in Jog/Instantaneous action modes. Sending the page number allows the automation equipment to qualify the key states sent to ensure that the function only operates on the **correct** page. The page number is written to the specified data register, **Page Mapping**, and the keys are mapped into the next contiguous data register, **Key Mapping**.

5.2.1 To enable key mapping:

1. From the **Configure** menu, select **Keyboard Mapping**.
2. Check the **Enable** box.
3. Choose the **Register Type** and the **Map Page To Register**. Click **OK**.

The **Configure Key Mapping** screen displays the data type, the active page number (from which the keys are active) and the keyboard mapping bits.

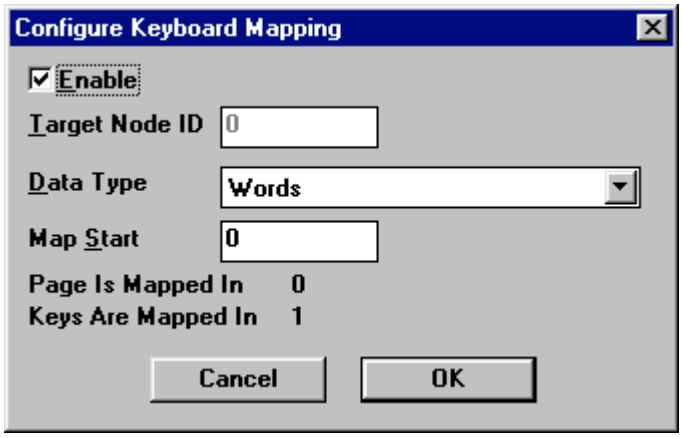


Figure 5.3 - Configure Keyboard Mapping Box

5.3 Function Key LEDs on HE500TIU20X

Function Key F9 – F18 have corresponding LEDs above or below the function key, indicating if the function is programmed or not. These LEDs light up when the corresponding Function Key is programmed to execute a function. When the function key is programmed as a Global Function Key then the LED is lit up constant as the user goes through the programmed menu screens, on the terminal. When the function key is programmed as a Local Function Key then the corresponding LED is only lit when the page in which the local function is programmed is displayed on the terminal.

NOTES

CHAPTER 6 RECIPES

6.1 Scope

Recipes allow the user to send or update multiple registers simultaneously. For example, it may be desired to run a motor at two different settings for two different applications.

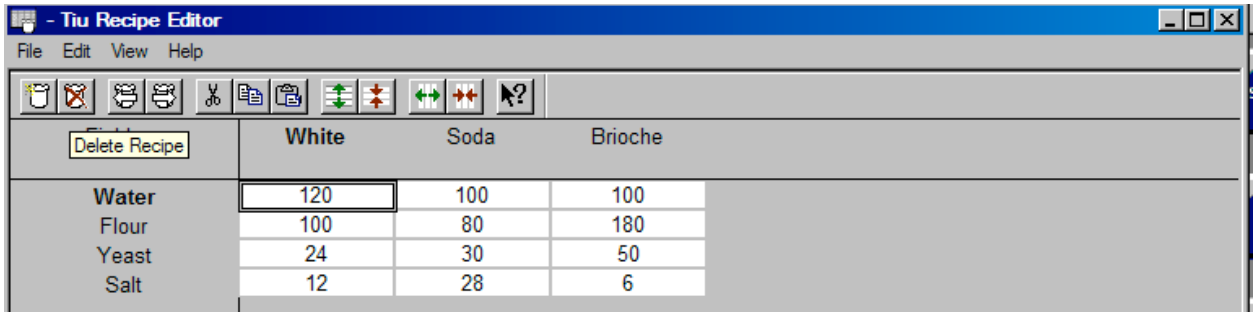
a. Speed of 1000RPM, minimum frequency of 500Hz, acceleration rate of 1000 s/100Hz and deceleration rate of 2000 s/100Hz;
b. Speed of 500RPM minimum frequency of 400Hz, acceleration rate of 500-s/100Hz and deceleration rate of 1500 s/100Hz.

Recipes enable the user to download all the fields (four in this example) at the same time without editing each individual field.

A maximum of 63 fields and 1024 records are supported by the database. The total storage available to the database is 64 kBytes. The number of bytes currently in use can be obtained from the main ***CBREEZE*** help menu under About ***CBREEZE***.

6.2 Using Recipes

1. From **Configure,** select **Recipes.** Enter the **Recipe Name, Number of Records in the Database** and **Number of Fields in Record**. The number of Records and Fields can be changed later. Click **OK.**



2. The **TIU Recipe Editor** appears. Set the number of *Records* (different settings) and *Fields* (parameters).
3. Edit the *Fields* and *Records* as desired.
4. To Add a new recipe database, select File/New Recipe or click on the Add Recipe Icon on the toolbar
5. To Delete a recipe database, select File/Delete Recipe or click on the Delete Recipe Icon on the toolbar
6. If Multiple Recipes are available these can be scrolled through using File/Next Recipe, File Previous Recipe or using the Forward and Back icons on the toolbar
7. From **File,** select **Exit** to leave the Recipe Editor.

6.3 To Edit Recipe Fields and Records

1. Open the Recipe Editor by clicking on the Recipe icon on the Toolbar or from **Configure/Recipes.**
2. Left click on the *Field* to be edited. Enter the **Ingredient Name, Type, Remote Data Source** and **Format** in the same manner as Embedded Data. Enable **Scaling** if desired.
3. Left click on the *Record* to be edited. Enter the value and click **OK** or press <Enter>.
4. From **File,** select **Exit** to leave the Recipe Editor.

6.4 Editing Ingredient Properties

An ingredient, or field, in the database corresponds to a value which will be loaded to a specified location either internal to the TIU or in the connected automation equipment.

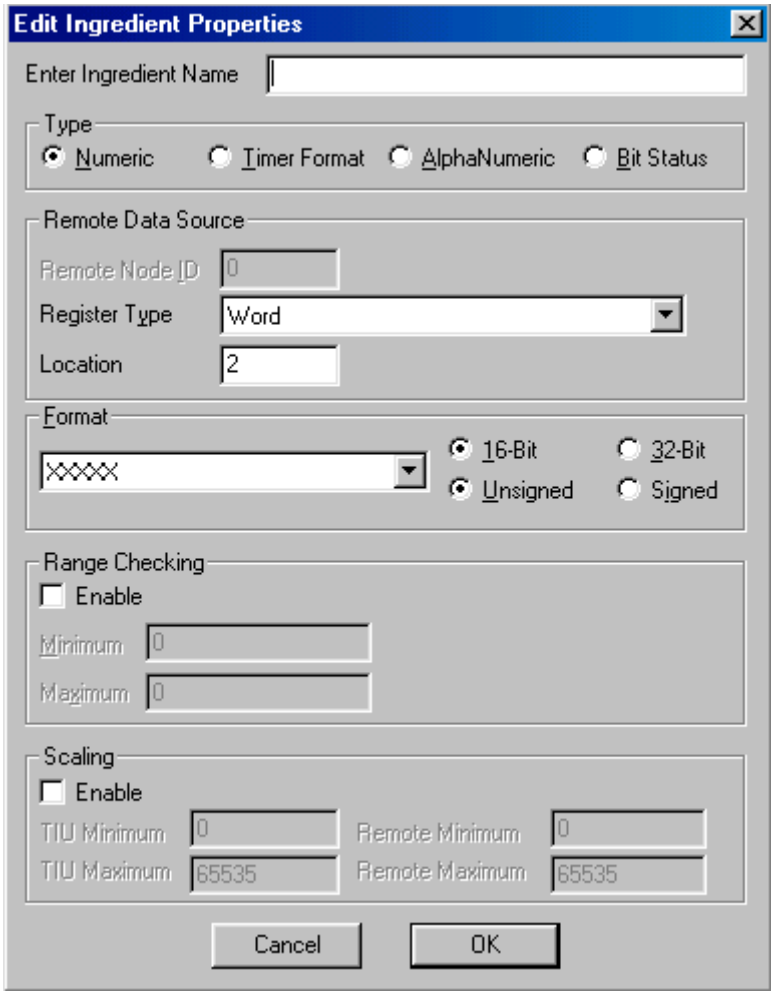


Figure 6.2: - Ingredient Properties

Each field has the following properties: -

6.4.1 Ingredient name

An alphanumeric string that is used to specify which field in a recipe is being edited. The string may be up to 30 characters in length.

6.4.2 Type

Currently recipe data fields may be formatted as numeric, timer, alphanumeric or bit.

6.4.3 Remote Data Source

Select where the source of the date to be used is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

6.4.4 Format

Additional data to specify the format of the data field dependant on its type.

6.4.5 Range Checking

Allows the range of values entered by the operator to be restricted to be within a minimum and maximum value.

6.4.6 Scaling

Use scaling settings where the values read from the PLC need to undergo a conversion prior to being displayed on the PLC. Refer to the Numeric and Timer embedded data editing sections (4.1 and 4.3) for details of scaling usage.

6.5 Editing Recipe Data

Double click on the field to be edited. If the data is a bit status it will toggle, otherwise the Edit Data dialog box will appear. Enter the new data for the field and press enter or click OK.

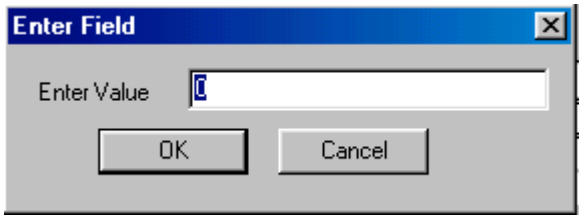


Figure 6.3: - Edit Data

Enter the data required for the field

6.6 Renaming Records

Double click on the record name. When the enter record dialog box is displayed enter the new record name, and click OK or press Enter.

Figure 6.4 – Record Name

NOTE:
While there is no limitation on the number of recipes created, the Recipe Database is limited to 64Kbytes. The Recipe Database size can be viewed from Help/About Cbreeze/ Recipe Bytes Allocated.

6.7 To Embed a Recipe on a Menu Page

When embedding a recipe item on a menu page the following box is displayed.

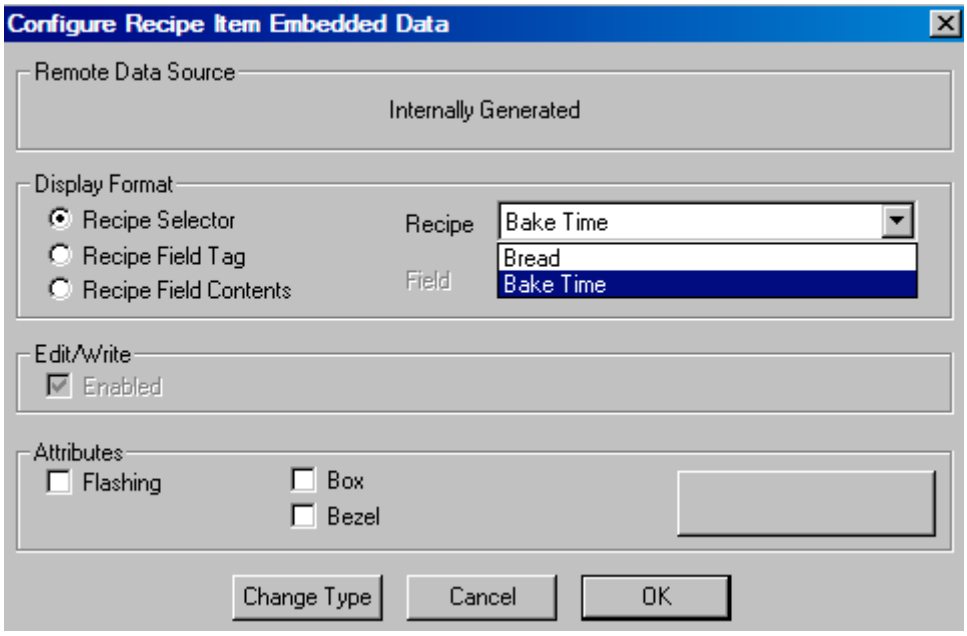


Figure 6.5 – Embedded Recipe Item

The three format types are

6.7.1 Recipe Selector

The Recipe Selector field allows the user to select a recipe database.
The recipe selector requires a field to be selected from the database, typically this will simply be the record name.
The recipe selector initially displays the contents of the specified field within the first record in the database. The operator will be able to scroll through the records in the database to select the record on which he wants to operate. When the required record is found, the Enter key is pressed and the desired record is selected.
The recipe selector is used either on it's own, in which case the page is a recipe selection page and upon selecting the record the contents of that record are transferred to the TIU internal registers and/or the automation equipment. Otherwise the recipe selector is used in conjunction with a recipe field tag and a recipe field contents embedded data field, in which case the page is a recipe editing page used to modify the values loaded by the specified record when selected.

- Recipe Name will allow the user to edit the contents of each Item of the displayed Record; the Record name will be displayed.
- If one of the Items is selected then the user can edit the contents of each Item of the displayed Record; the Record number will be displayed.

6.7.2 Recipe Field Tag

If the Recipe Field Tag is embedded on the menu page then the Item Name of the record selected for that menu page will be displayed. The recipe field embedded data must always be used in conjunction with both a recipe selector and recipe field contents embedded field. If all three recipe embedded data types are on screen the page is used for editing a recipe. Initially when a page is displayed the recipe field tag will be blank. It remains blank until a recipe has been selected using a recipe selector field. At this point the first recipe field is selected for editing and the name of this field is displayed as the recipe field tag. As

the operator enters each recipe item, the recipe field tag moves on to the next field tag until all fields in the recipe have been modified or accepted.

6.7.3 Recipe Field Contents

If the Recipe Field Contents is embedded on the menu page then the contents of the current Item, of the record selected for that menu page, will be displayed. The recipe field contents embedded data must always be used in conjunction with both a recipe selector and recipe field tag embedded field. If all three recipe embedded data types are on screen the page is used for editing a recipe. Initially when a page is displayed the recipe field tag will be blank. It remains blank until a recipe has been selected using a recipe selector field. At this point the first recipe field is selected for editing and the name of this field is displayed as the recipe field contents. Once all the fields in the record have been accepted the modified record is written to flash memory in the terminal. Note that to send the contents of the newly modified record to the automation equipment and/or the TIU internal registers the operator must call up a recipe selection page and select it in the normal manner.
Pressing the pause key at any point during the editing sequence will abort data editing, and cause any changes to the recipe data already made to be ignored. The flash memory is only updated if all fields are accepted with the Enter Key.
Because of the precise nature of the combinations in which the recipe embedded fields must be used in order to achieve a specified function it is recommended that the page wizard is always used to build recipe operation pages!

Note: A recipe item can be manually embedded on a menu page however for best results when embedding a recipe item on a screen see the Page Menu Wizard for Recipe Items. This can always be edited afterwards.

6.8 Importing and Exporting Data from a Recipe

Recipe tables can be imported or exported. Files can be imported or exported as coma delimited (*.csv) or as print files (*.prn). Other file types may be viewed but may not load properly.

Note: Only *Records* are exported and imported, the *Field* names are not.

Note: If the table size that the data has been imported into is smaller then the table it was imported from, then not all of the data is displayed.

Note: Only one Record column can be selected per project at any time.

NOTES

CHAPTER 7 TUTORIAL

7.1 Scope

This chapter contains instructions for using several of the HE500TIU050/100/110 features. The projects in this chapter serve as examples and are not to be taken literally for all applications. After following this tutorial, the user should have a better understanding of how the HE500TIU050/100/110 operates.

7.2 Menus

The HE500TIU050/100/110 supports a total of 300 pages divided between menu and sub-menu, alarm and status pages. The following points are covered in this section:

1. Menus can have sub-menus.
2. Sub-menus can have sub-menus.
3. There may be up to 8 embedded data per page.
4. Embedded data can be displayed-type or entry/editing-type.
5. Sub-menus can be password protected.

Additional menu pages may be created by selecting **Insert Page** from the **Edit** menu or by selecting the "**+**" icon from the icon menu to the right of the Display screen. Selecting **Delete Page** from the **Edit** menu or by selecting the "**-**" icon will delete the displayed page.

The next menu page may be selected by clicking the "**Down**" key or by selecting the **Next Page** from the **Goto** menu. The previous menu page may be selected by clicking the "**Up**" key or by selecting **Previous Page** from the **Goto** menu.

Example: The HE500TIU050/100/110 is used to monitor the temperature of a furnace and indicate the heater or a fan is ON or OFF. This example uses a Hitachi H-252 series PLC, but is applicable to any PLC with modifications.

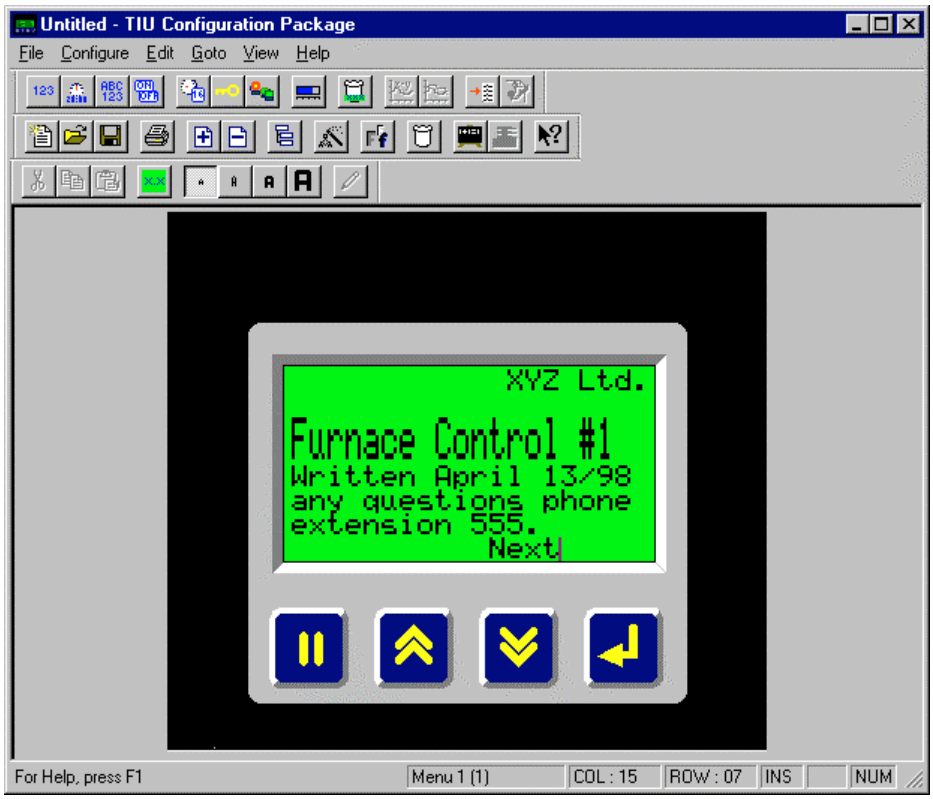


Figure 7.1 – Menu Page 1

1. **Communication Settings** from **Configure**. Select the applicable automation equipment being used, in this example a Hitachi H-series is used. Click **OK**. Update the Protocol if required
2. Menu Page 1 shows some explanatory details about the program and should look like figure 7.1. For “Furnace Control #1” on line 3, click on the font double height icon at the beginning of the line.
3. Click on the Insert Page Icon. Choose **Insert After Current Page**. Click **OK**.

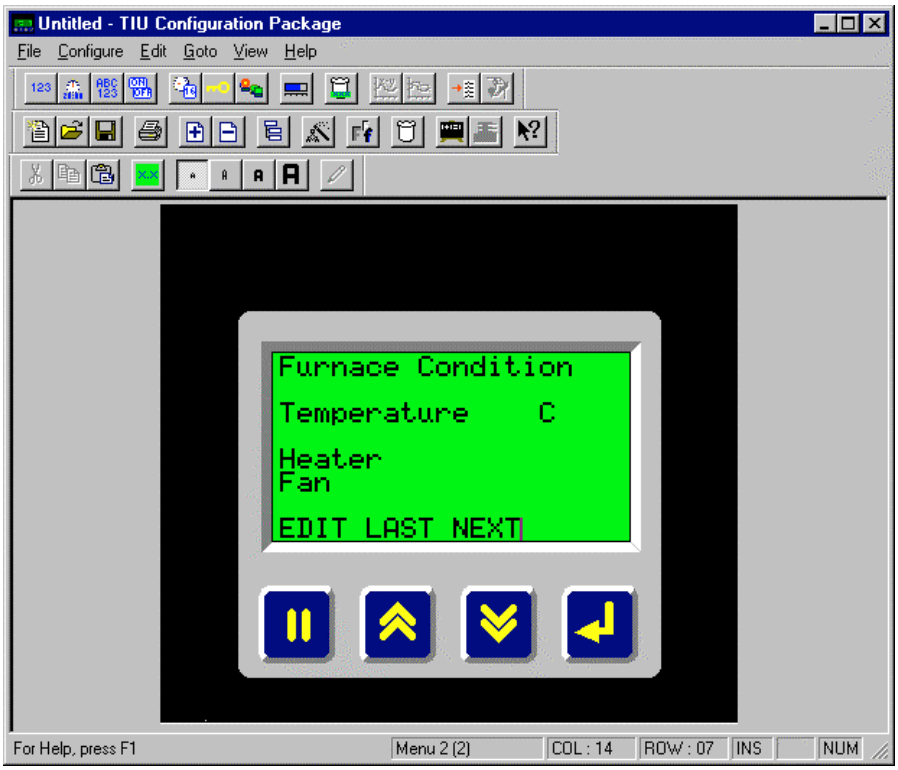


Figure 7.2 – Menu Page 2

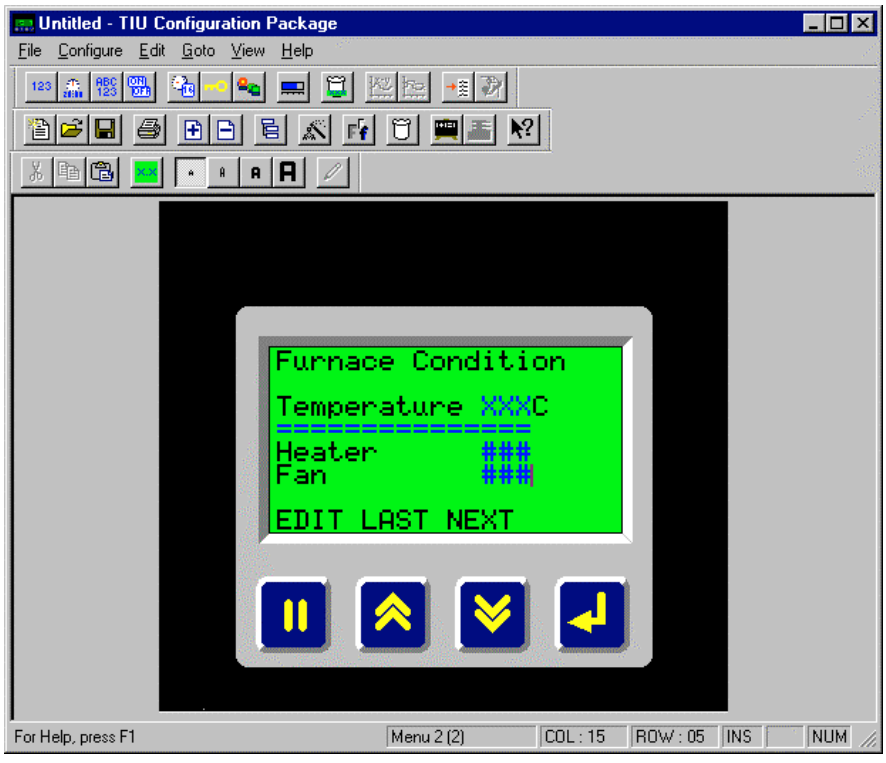


Figure 7.3 – Menu Page 2

1. Enter the text as shown in Figure 7.2.
2. Place the cursor one space to the right of "Temperature" and embed a **Numeric Data** in WR-REGISTERS **Location** 10. Select "**XXX**", **16-Bit**, **Unsigned**. Click **OK**. Correct "C" position.
3. On the first space of the fourth line, click the embed icon. Choose **Analog Meter**, WR-REGISTERS and **Location** 3. Under Format, enter 15 for characters, 760 for **Maximum** and 0 for **Minimum**. Click OK.
4. Place the cursor 6 space to the right of "Heater" and embed a **Bit Status** in Y-REGISTERS, **Location** 100, **Select Token Pair** Format, "OFF"/"ON." Click **OK**.
5. Place the cursor 9 spaces to the right of "Fan" and embed a **Bit Status** in WR-REGISTERS, **Register** 10, **Select Token Pair** Format, "OFF"/"ONFF", **Bit Number** 1. Click **OK**.
6. After embedding the data, the screen looks like Figure 7.3.

Under the **File** menu, click **Download Project**.

The temperature is displayed digitally and as a bar graph by the horizontal fill. Also, it is shown whether the heater and fan are ON or OFF.

Note: For this example to work a thermocouple and relay module must be used to simulate temperature, heater and fan. Otherwise the latent values displayed will be blank or the values in the PLC registers.

7.1 Sub-Menus

Sub-menu pages branch off menu pages analogous to a sub-directory branching off a main directory of a PC. The HE500TIU050/100/110 supports a total of 300 pages divided between menu and sub-menu, alarm and status pages.

Example: Continuing from the example in Figure 7.2, one sub-menu is set up for the heater and one for the fan. Each sub-menu sets the temperature (within the furnace) at which the heater or fan turns ON/OFF.

Note: Ladder code needs to be written if this example is to work as anything more than an example.

1. Go to menu page 2. Under the **Create SubMenu** page, choose **2** for the **Number of Pages**. Be sure that the **Password Protect** box is unchecked. Click **OK**. The bottom middle cell should display Menu Page 2.1 (indicating a sub-menu).

2. After completing this, enter the text as shown on the first sub-menu page (as follows):

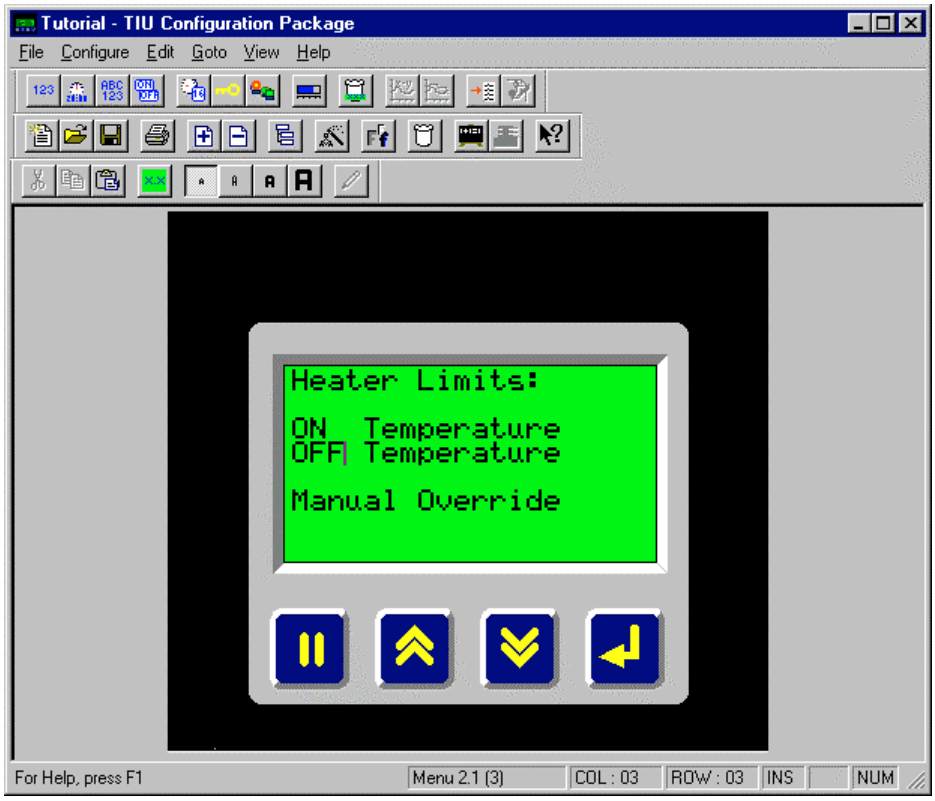


Figure 7.4 – Sub-Menu Page 2.1

3. Embed data one space to the right of “ON Temperature” by selecting **Numeric** for the **Type**, WR-REGISTERS for the **Data Type** and **Location** 10. Under **Format**, select “**XXX**”, **16-Bit Unsigned** and click on **Edit Enable**. Click **OK**.
4. Do the same as in step 3 for “OFF Temperature” but use **Location** 11.
5. On the sixth line, one space to the right of “Manual Override” embed a **Bit Status** in WR-REGISTERS, **Register** 10, **Select Token Pair** Format, “OFF”/”ON”, **Bit Number** 1, Click on **Edit Enable**. Click **OK**.

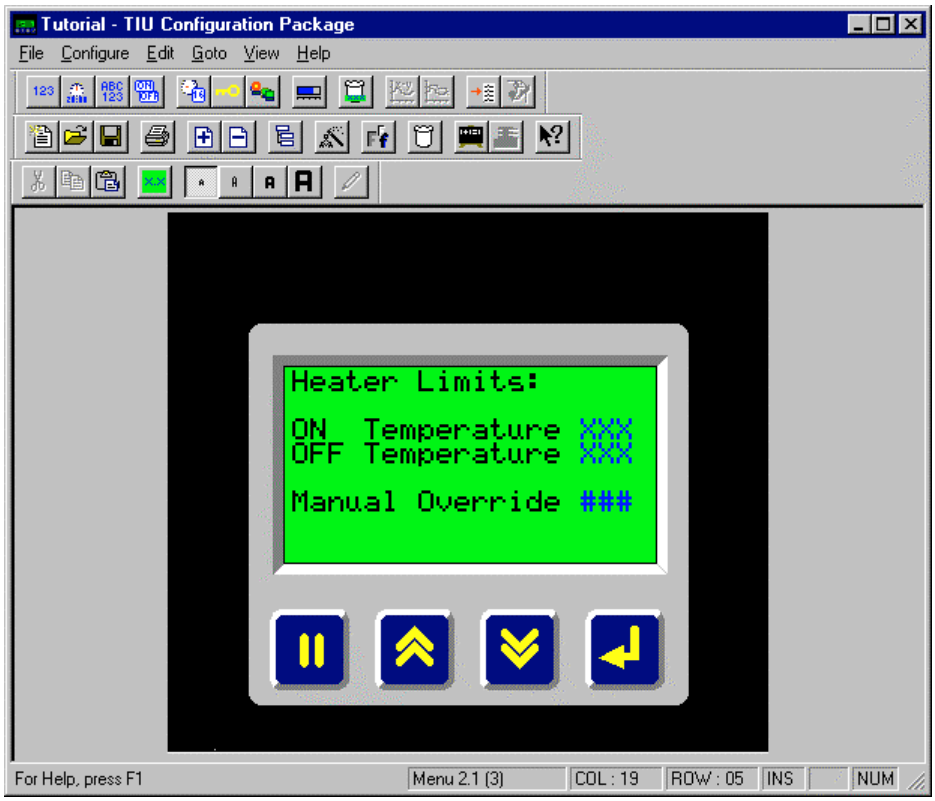


Figure 7.5 - Sub-Menu Page 2.1

6. Highlight the display screen, and select **Copy** from the **Edit** menu. Select **Next Page** from the **Goto** menu. Select **Paste** from the **Edit** Menu. Change the "Heater" to "Fan" and Fan ON and OFF temperature registers to 20 and 21, respectively. Change the **Bit Number** to 1 for the embedded data beside Manual Override.
7. Return to the parent menu by selecting **Parent Menu** from the **Goto** menu.

Under the **File** menu, you can **Save Project**, then **Download Project.**
The Screen appears as in Figure 7.5.

7.1.1 *To Enter A Sub-Menu On the TIU:*

1. To go into a sub-menu from the main menu, press the **Pause** key and the **Down** key at the same time.
2. To edit the data, press the **Pause** key. Press the **Down** key to decrement the data, the **Up** key to increment the data and the **Enter** key to enter the data.
3. Press the **Pause** key and the **Up** key to return to the parent menu or the **Down** key to go to the next sub-menu page.

7.3 Password-Protected Sub-Menus

Scope
This tutorial section of the manual covers how to create password-protected sub-menus.

Example: Continuing from the example in 7.2, one sub-menu is set up for the heater and another for the fan. Each sub-menu sets the temperature (within the furnace) at which the heater or fan turns ON/OFF. This is the same as the example in 7.3 except that the sub-menus are now password protected.

1. Create a new menu page by selecting **Insert Page** from the **Edit** menu.
2. Enter the text, as shown in Figure 7.6.

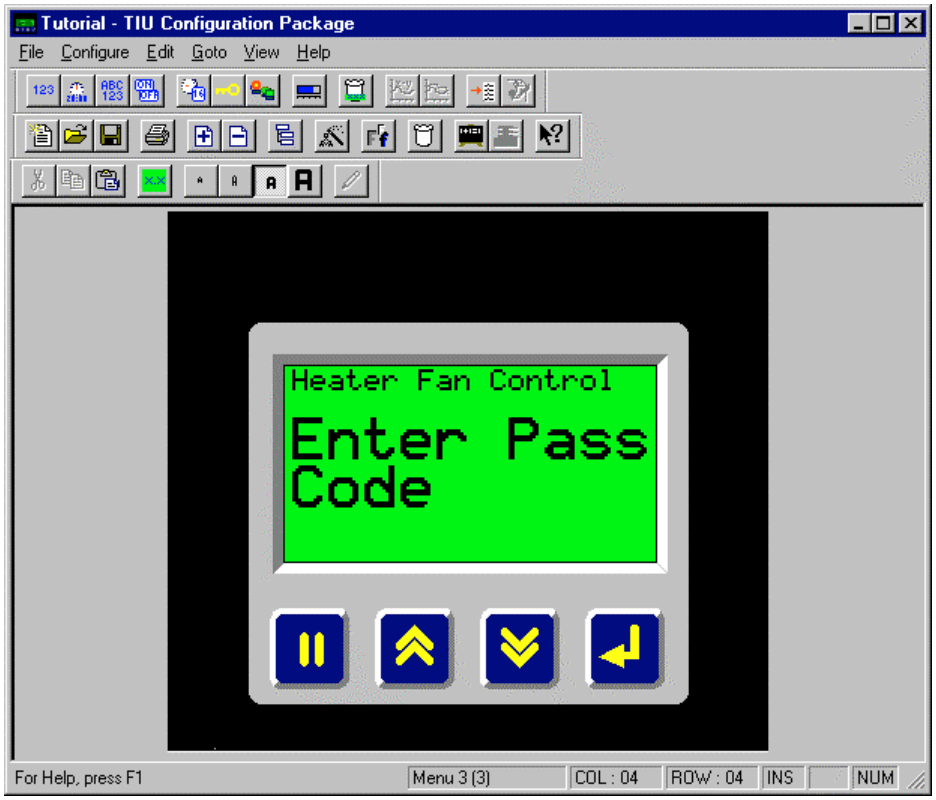


Figure 7.6 - Password Enter Screen

3. Place the cursor one space to the right of "CODE" and select **Embedded Data** from the **Edit** menu. Select **Password** for the **Type**. Click OK. Four question marks should appear beside the word "CODE".
4. Go to menu page 3. Select the **Modify SubMenu Properties**, and choose 2 for the **Number of Pages** Check the **Password Protect** box, and enter a **Password** of "**1234**". Click **OK**. The bottom middle cell should display Menu Page 3.1 (indicating a sub-menu).
5. Follow steps 2 through 8 in 9.3.
6. **Save** and **Download Project** to the HE500TIU050/100/110.

The resulting display screen on the HE500TIU050/100/110 appears as the screen shown in Figure 7.7 (with a code of **0000**).

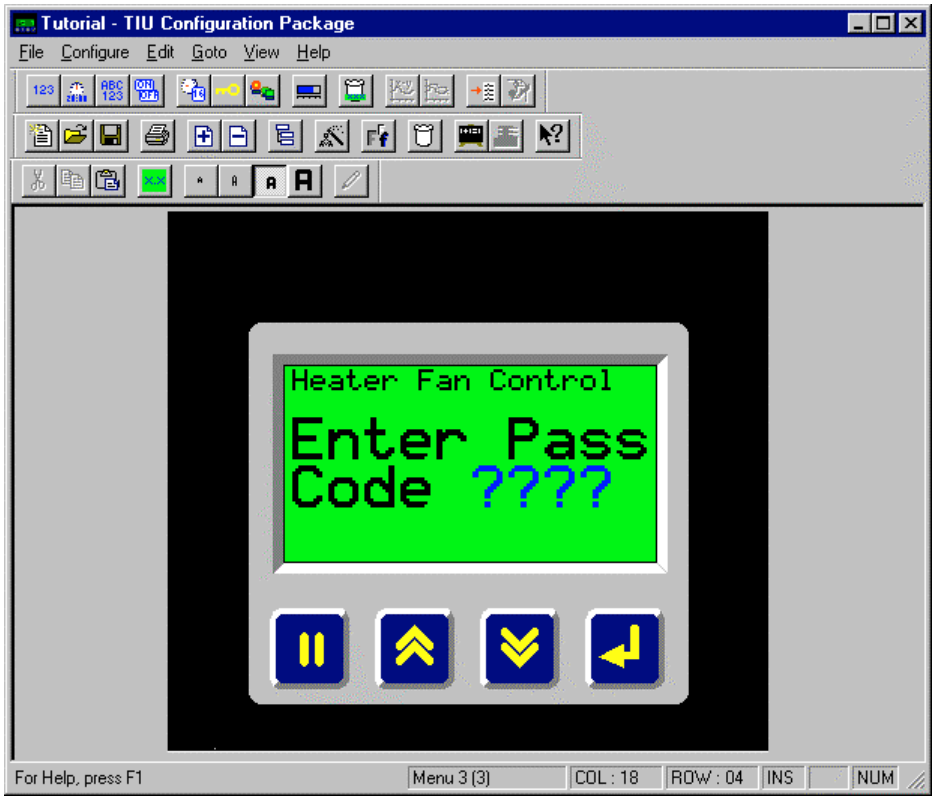


Figure 7.7 - Password Enter Screen

To Enter the Sub-Menu:

1. Press the **Pause** key to edit the Pass Code.
2. Press the **Up** key to increment the code, 1234 in this example (hold the key down for speed incrementing), the **Down** key to decrement the data and the **Enter** key to enter the data.
3. Press the **Pause** key and the **Down** key at the same time to select the sub-menu page. The sub-menu page is only selected if the Pass Code is correct.

To Edit The data On The Sub-Menu Pages:

1. Press the **Pause** key to select the field to edit.
2. Press the **Up** key to toggle or increment the field. Press the **Down** key to toddle or decrement the field. Press the **Enter** key to send the value to the PLC.
3. Press the **Pause** key to select the next field to edit.
4. Press the **Pause** key and the **Up** key at the same time to return to the parent menu.

7.4 Status

Scope
The TIU can display STATUS information. For example, a status page can be displayed as COILS change (in real-time) in your PLC, i.e., the first Coil displays the first Status page, the second coil the second page and so on.

Status messages can have up to eight embedded data values per page. Up to 300 total pages are available split between Status, Alarms and Menu pages.

Two different modes are available for configuring status pages. These modes are the *Bit Mode* and the *Direct Mode*.

- *Direct Mode* reads only one register as a word from the PLC for the status page. If the value in this register is **zero** or **greater than the number of configured status pages in the system**, the main menu screen is displayed. Otherwise, the appropriate status screen is called up.

- *Bit Mode* works essentially the same, except that the screens are controlled by discrete bits instead of the full word register values.

NOTE: Status pages are only displayed when **MENU PAGE 1** is selected.

Example: The following example involves the TIU connected to a GE Fanuc 90-30 PLC. It is applicable to any of the supported automation equipment (see 7.3) with substitutions made for the specific registering nomenclature, i.e., %Q is a discrete bit output. It is assumed the PLC is properly configured, the TIU is properly connected to the PLC, both are powered up, and the ***CBREEZE*** software, HE500TSW232, is running on the PC.

1. Select **Communication Settings** from the **Configure** menu. Select the automation equipment type you are using. For the example here, a "GE Series 90 SNP protocol" is being used. Click **OK**.
2. Insert a menu page after Menu Page 1 (refer to 7.2 for instructions). Place the cursor at the left on the first line. Click the double height icon. Type "Discrete Outputs:"
3. On the third line, type "Q1:". Click on the Embed Icon. Select **Bit Status** from **Type**; discrete output (in this example %Q) from **Data Type**; **Location 1**; leave **Token Pair** as **"OFF"/"ON"** and click **Edit Enable**. Click **OK.** See Figure 7.8.
4. Do the same for Q2, Q3 and Q4 on lines 4, 5 and 6, incrementing the Bit Number by one. These discrete outputs will simulate coils. Menu Page 2(2) should be the same as Figure 7.9.

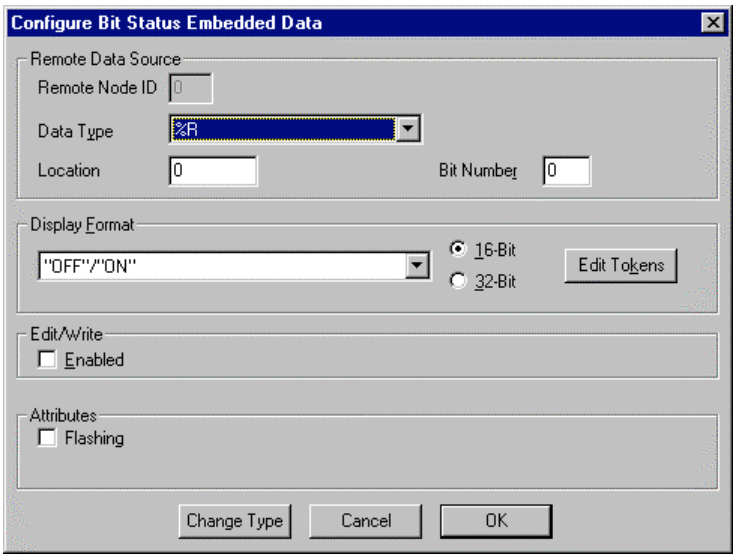


Figure 7.8 – Configure Embedded Data Box

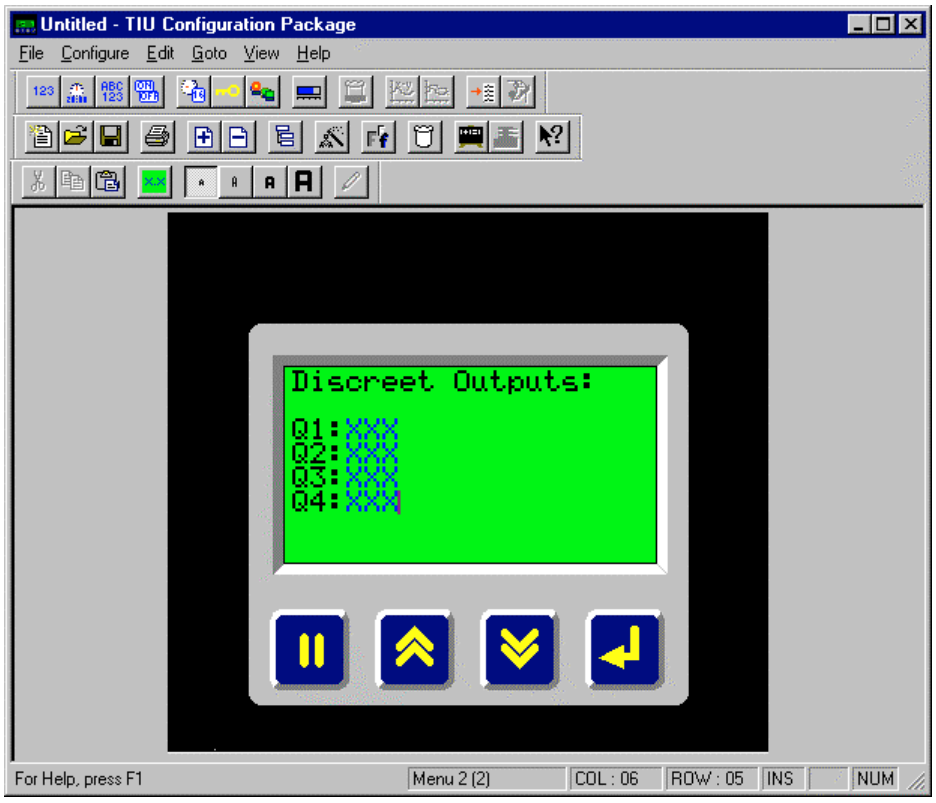


Figure 7.9 – Menu Page 2(2)

From **Configure**, choose **Status**. Click **Direct Mode**. From **Data Type** choose discrete output (%Q in this example); **Block Start** equals1. The **Number of Status Pages** equals 4. Click **OK**.

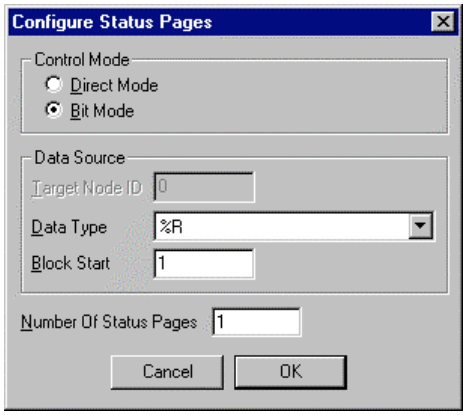


Figure 7.10 – Configure Status Pages

From **View**, choose **Status**. This displays the first of four status pages. On the third line, delete what is there and type "Status Page:" on the fourth line, click on the x4 icon and type "1" in the centre of the line. Status Page 1 appears as the screen in Figure 7.11. Highlight display screen, click **Edit** and **Copy**.

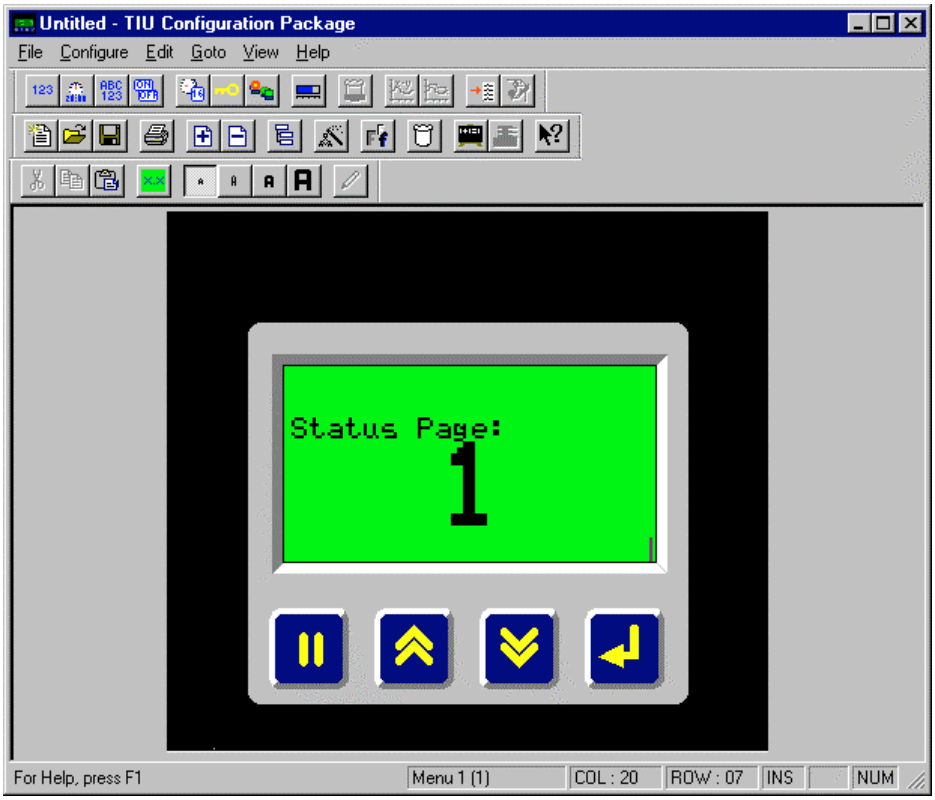


Figure 7.11 – Configure Status Pages

Click the down arrow icon on the project software to get to Status Page 2 of 4. Delete what is on the display screen, then from **Edit**, choose **Paste Page**. Change the "1" on line four to a "2." Do the same for pages 3 and 4.

From **File**, choose **Download Project**

On the TIU, press the DOWN key to get to the Discrete Output page (as in Figure 7.8). Press the PAUSE key the toggle Q0: ON by pressing the UP key and ENTER key. Press the PAUSE key until nothing is highlighted (three times).

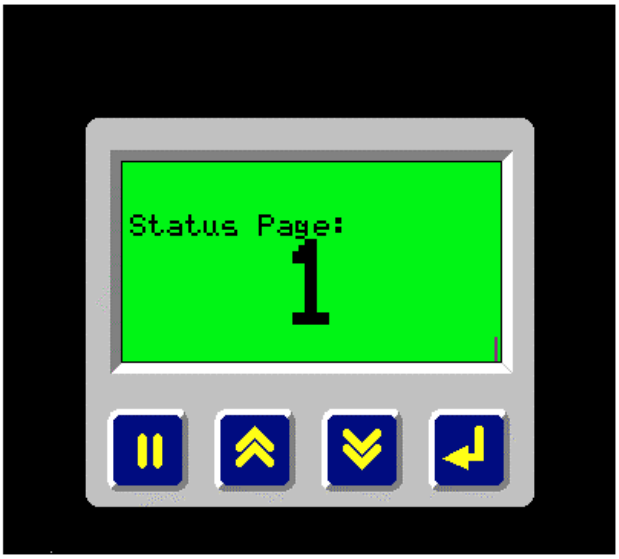


Figure 7.12 – Status Page 0

Press the UP key. The page shown in Figure 7.12 should be displayed.

Note: Status pages are only displayed from Menu Page 1.

5. Press the DOWN key and return to the Discrete Outputs page. Toggle Q1:OFF and Q3:ON. Return to Menu Page 1 by pressing the UP key. Now Status Page 4 is displayed. This is because Direct Mode is selected and the register is being read as a word, i.e., 0100 binary = 4.
6. Toggle Q1: ON, Q2: ON, Q3: OFF and Q4: OFF. Now Status screen 3 is displayed (0110B=3).
7. Toggle Q4: ON and all the other OFF. Now a screen with "Default Menu Screen" written on the second line is displayed. The HE500TIU050/100/110 is looking for Status Page 8 (1000B = 8), which does not exist, so the default screen is displayed.
8. In the ***CBREEZE*** software, choose **Status** from **Configure**. Click on **Bit Mode**. Click **OK.** Download the project to the HE500TIU050/100/110.
9. Now Status Page 4 is displayed. In Bit Mode, the HE500TIU050/100/110 reads the register as discrete bits, not as a word, i.e., 1000 triggers Status Page 4, 0100 triggers Status Page 3, etc.

7.5 Alarms

7.1.2 *Scope*

The HE500TIU050/100/110 can display ALARM information as BITS change in your PLC (real-time). The active alarms can be accepted and then SCROLLED through. Up to 300 total pages are available split between Alarms, Status and Menu pages.

The HE500TIU050/100/110 also has an Alarm Acknowledge Table. This feature allows a set of bits to be written back to the PLC to indicate alarms that have been accepted by the user, but are still "ON" in the PLC table. These bits are in the same format as the "incoming" alarm bits. The acknowledgement bits are set when an alarm has been acknowledged, provided that the corresponding bit is still active in the alarm table. The acknowledgement bit is cleared when the corresponding alarm bit is cleared. Click the **Enable** box to use the Alarm Acknowledge Table.

Example: The HE500TIU100 or 110 is connected to a GE Fanuc 90-30 PLC. Register %R20, bits 1, 2, 3 and 4 are the alarms. Register %R21, bits 1, 2, 3 and 4 is the acknowledgement table. The instructions below are a tutorial of how to use the Alarms on the HE500TIU050/100/110.

1. Select **Alarms** from the **Configure** menu.

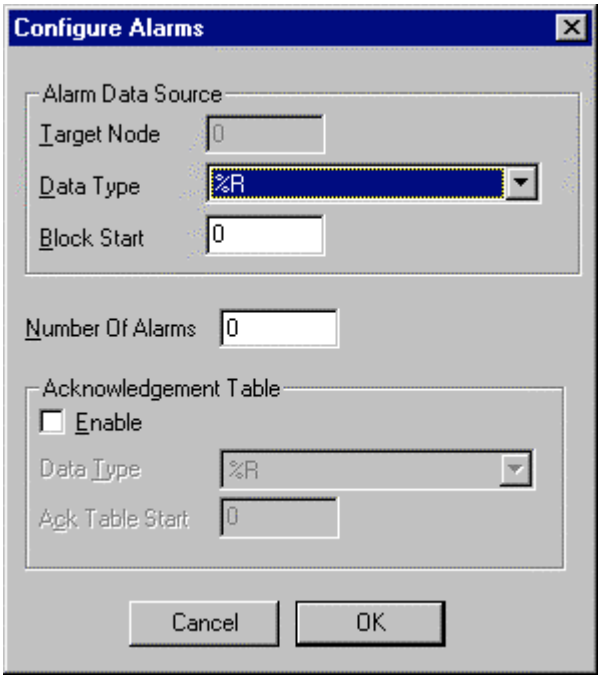


Figure 7.13 – Configure Alarm Box

2. Set the **Data Type** to %R. Enter the location of the **Block Start** as 20.
3. Enter the number of alarm pages in the **Number Of Alarms** box (4 for example). If the number of alarms is greater than 16, then the next PLC register is read.
4. Check the **Acknowledgement Table Enable** box. Set **Data Type** to %R and **Block Start** to 21. Click **OK**.
5. Insert a page (Page 2) after Page 1. Go to page 2. On the second line type "Alarm:" and embed %R20 beside. Make the embedded %R20 field **Numeric**, two digits and **Edit Enabled** with a **Range Maximum** of 15. This field acts as the alarms.
6. On the fourth line, type "Acknwldg Table:" and embed %R21 beside. Make the embedded %R22 field **Numeric** and two digits. This field holds the Acknowledgement table.

7. Select **Alarms** from the **View** menu. The bar at the bottom displays the alarm page selected.

The next alarm page can be selected by clicking the **Down** key or by selecting **Next Page** from the **Goto** menu. The previous alarm page can be selected by clicking the **Up** key or by selecting **Previous Page** from the **Goto** menu.

8. Enter text in Figure 7.14.

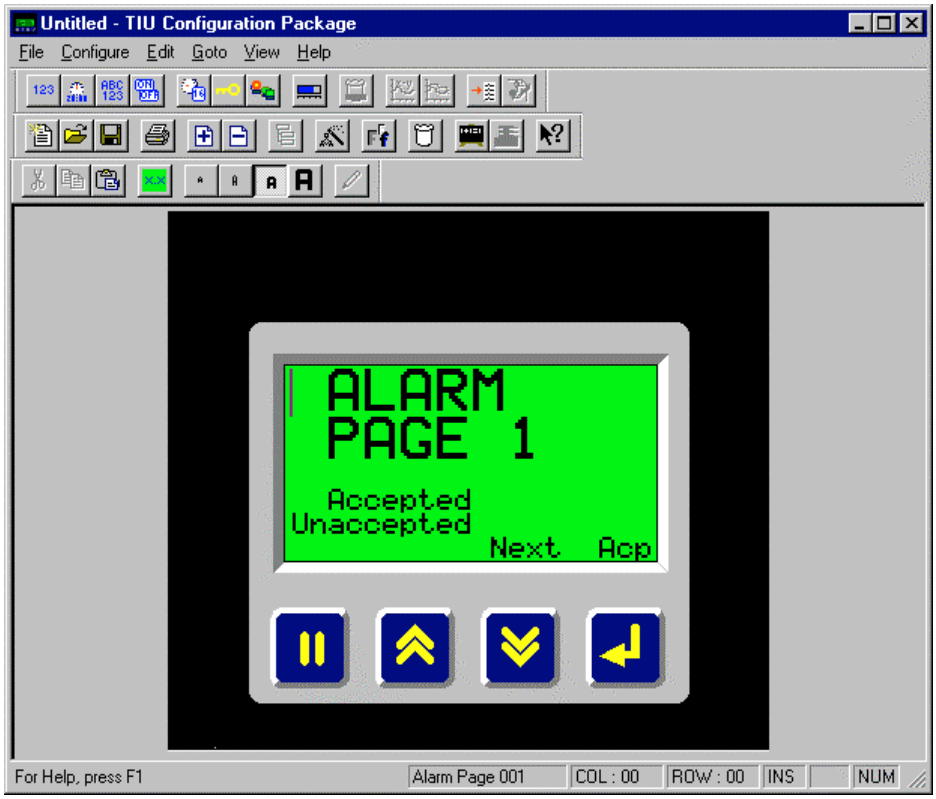


Figure 7.14 - Alarm Page 1 Screen

9. Place the cursor beside either “ACCEPTED” OR “UNACCEPTED” and select **Embedded Data** from the **Edit** menu or click the embedded data icon (**X.X**).
10. Select **System Variable** under **Type** and **XXX Accepted Alarms** or **XXX Unaccepted Alarms** under **Select System Variable** in the **Format** section.
11. Block the entire page. From the **Edit** menu, select **Copy** (or type <Ctrl-C>).
12. Page down to Alarm Page 2 of 4 using **Next Page** from the **Goto** menu. Paste Page 1 to Page 2 using **Paste** from the **Edit** menu (or <Ctrl-V>). Do the same for alarm page 3 and 4.

13. **Download Project** to the HE500TIU050/100/110. Put your PLC in "RUN" mode.

On the HE500TIU050/100/110:

Scenario 1: energise alarm 1. Go to page 2. Select the field beside "Alarm" by pressing the **Pause** key. Change the value to 1 and press the **Enter** key.

Action: Alarm Page 1 is displayed. The user presses **Enter**. The alarm page goes away and "Acknwldg Table:" (%R21) equals 1 indicating alarm 1 has been acknowledged.

Scenario 2: energise alarm 3. One page 2, change the Alarm field to 0, press **Enter**. The "Acknwldg Table:" field returns to 0 as well. Set the "Alarm" field to 4 (the HE500TIU050/100/110 read discrete bits for the alarms, so 0100 binary, i.e., bit 3 high equals 4 decimal).

Action: Alarm Page 3 is displayed. The user presses **Enter**. The alarm page goes away and "Acknwldg Table:" (%R21) equals 4 (i.e., bit 3 is high) indicating alarm 3 has been acknowledged.

Scenario 3: energise alarms 1, 2 and 3. One page 2, change the Alarm field to 0, press **Enter**. The "Acknwldg Table:" field returns to 0 as well. Set the "Alarm" field to 7 (the HE500TIU050/100/110 read discrete bits for the alarms, so 0111 binary equals 7 decimal).

Action:

a. Alarm pages 1, 2 and 3 are active. Alarm page 1 is displayed as the first alarm. Until any alarms are accepted, the **Alarms Accepted** reads **000** and the **Alarms Unaccepted** reads **003**.

b. The next Active alarm page can be selected by pressing the **Down** key on the HE500TIU050/100/110. The last Active alarm can be selected by pressing the **Up** key on the HE500TIU050/100/110.

c. The **Active Unaccepted Alarms** can be accepted by pressing the **Enter** key on the HE500TIU050/100/110. Only one alarm is accepted at a time. Once an alarm is accepted, the next alarm is displayed. Accept all 3 alarms.

Go to page 1. **Accepted Active Alarms** can be recalled by pressing the **Enter** key. **Accepted Active Alarms** are scrolled through with the **Up** key and the **Down** keys on the HE500TIU050/100/110. Pressing the **Enter** key again returns display to page 1.

Note: Active Unaccepted alarms are displayed as a priority on any page.

NOTES

CHAPTER 8 GRAPHIC EDITOR

8.1 Scope

The TIU Graphic editor is designed to be a simple Drawing and Graphic Editor to be used with the HE500TIU20X/HE500TIU3XX/HE500TIU4XX/HE500TIU5XX/HE500TIU6XX. Terminals in these ranges support 2 types of pages, a **Text Page** and a **Graphic Page**. The text page works similarly to the menu pages on the HE500TIU10X/11X. Graphic pages, as well as all the features of the text page, also support many other graphical features, such as; Shapes, vertical text, bit maps and bit map animation.
All features are designed to be intuitive to the experienced user of Windows™ type applications. The following paragraphs describe most of the features available, however hopefully the user will find the software easy to use with some experimentation.

8.2 Draw Mode

Select a drawing mode by clicking on the appropriate button on the **Shapes Toolbar,** by choosing **Setting/Draw Mode** from the main menu. Before drawing the object choose the **Background Fill** (this maybe changed afterwards).

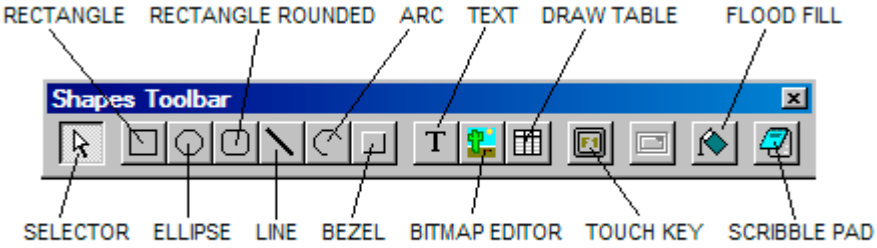


Figure 8.1 – The Shapes Toolbar

8.2.1 Selector

The selector tool may be used to select objects or groups of objects already created. Select an object by clicking on any part of the object. Set the properties of an object by double clicking on the object.
To select all objects click Edit/Select All.

8.2.2 Rectangle

1. Select **Rectangle Draw Mode**.
2. Select the background and pen colour.
3. Move to a corner of the desired rectangle. Click and hold the left mouse button.
4. Drag the mouse to where the bottom right hand corner is to be located.
5. The **Draw Mode** returns to **Selector** as default
6. To edit the size of the rectangle click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the rectangle will change size automatically.
7. Double click on the added rectangle to modify its' colour. The select shape attributes applicable to the terminal type in use will be displayed, which will be similar in format to the figure 8.2

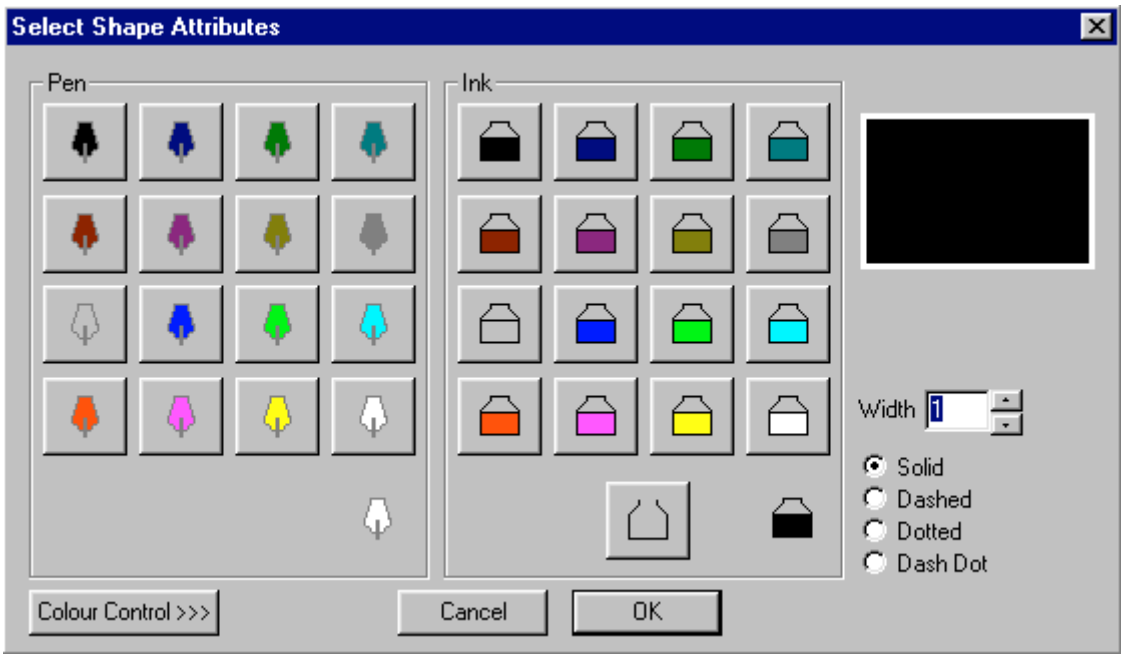


Figure 8.2 – Select Shape Attributes TIU31X/TIU32X

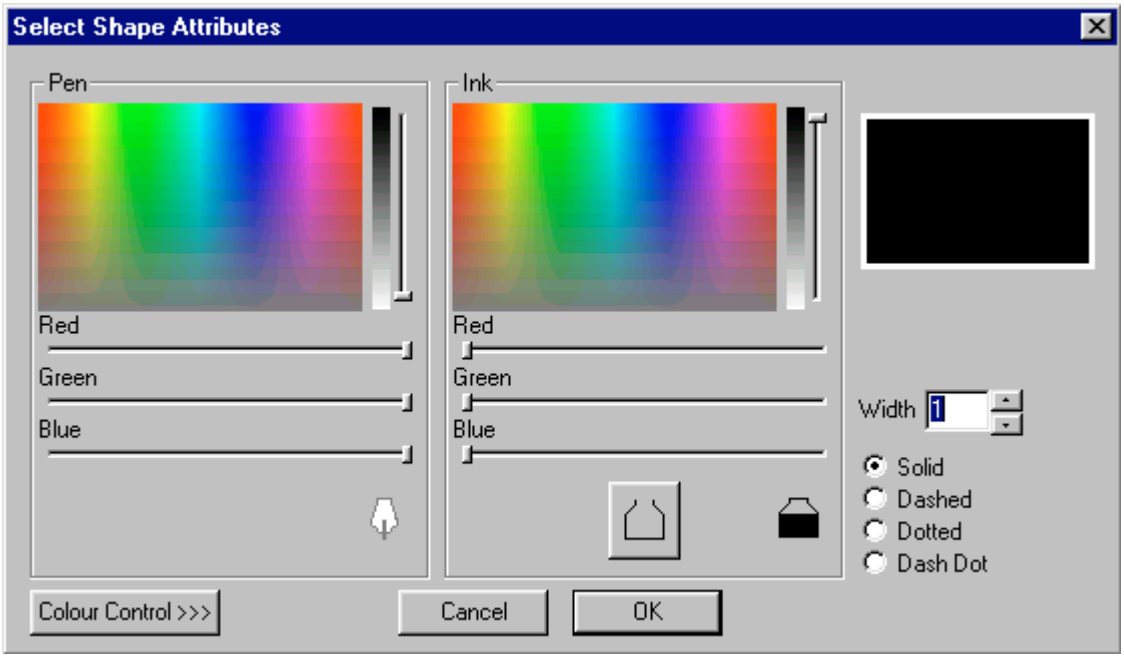


Figure 8.3 Select Shape Attributes TIU4XX/TIU5XX/TIU6XX

8.2.2.1 Pen

Select the colour that is to be used to draw the outline of the rectangle by clicking on one of the pen nib icons. The indicator at the bottom right of the box will be updated as will the sample rectangle to the top right of the dialog box.

8.2.2.2 Ink

Select the colour that is to be used to fill the rectangle by clicking on one of the ink pot. The indicator at the bottom right of the box will be updated as will the sample rectangle to the top right of the dialog box. Click on the empty ink pot icon at the centre bottom of the box to cause the rectangle not to be filled.

8.2.2.3 Line Style

Select the line style (Solid/Dashed/Dotted/Dash Dot) to be used to draw the border of the rectangle. If the selection is solid then the line thinkness (width) may also be selected.

8.2.2.4 Colour control

The Colour Control >>> button is unavailable on the Tiu2XX range. Click on this to allow the shapes colour to be controlled by the system. Once selected the box is expanded to be as in figure 8.3

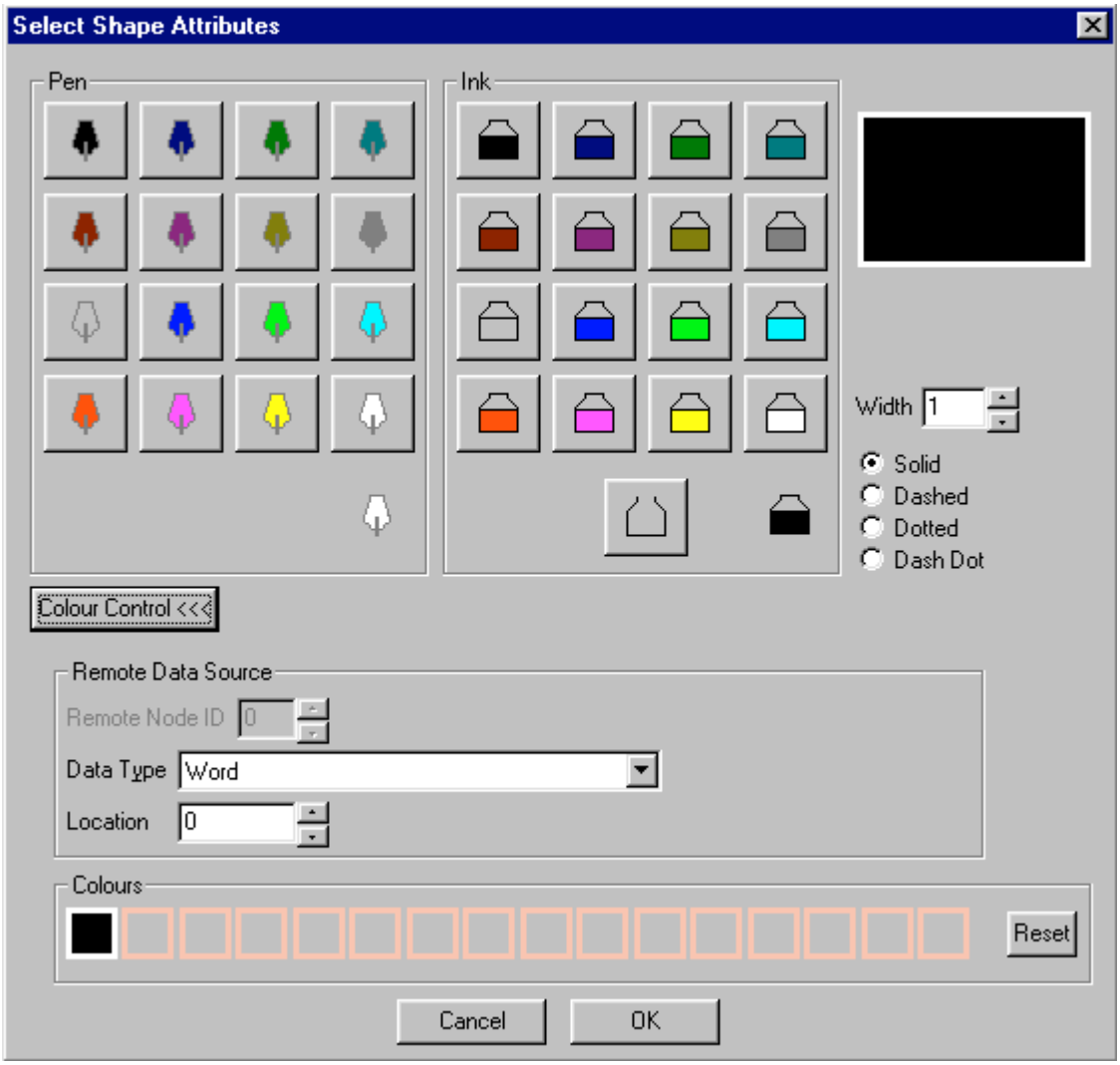


Figure 8.3 – Select Shape Attributes with Colour Control

8.2.2.5 Remote Data Source

Select where the source of the date to be used to control the colour of the shape is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.
If auto mask is selected only the relevant bits within the control word to be used.

8.2.2.6 Colours

Click on entries in the colour palette to modify the colours displayed for a particular index. A cross symbol indicates a transparent shape, hence using the data source register to control visibility of the selected object.

8.2.3 Ellipse

1. Select **Ellipse Draw Mode**.
2. Select the background and pen colour.
3. Move to a corner of the desired ellipse. Click and hold the left mouse button.
4. Drag the mouse to where the bottom right hand corner is to be located.
5. The **Draw Mode** returns to **Selector** as default
6. To edit the size of the ellipse click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the ellipse will change size automatically.

8.2.4 Rectangle Rounded

1. Select **Rectangle with Rounded Corners Draw Mode**.
2. Select the background and pen colour.
3. Move to a corner of the desired rectangle. Click and hold the left mouse button.
4. The **Draw Mode** returns to **Selector** as default
5. To edit the size of the ellipse click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the ellipse will change size automatically.

8.2.5 Lines

1. Select **Line Draw Mode**.
2. Select the background and pen colour.
3. Move to a corner of the desired line. Click and hold the left mouse button.
4. Drag the mouse to where the second point is to be located is to be located.
5. The **Draw Mode** returns to **Selector** as default
6. To edit the size of the line and shape click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the line will change size automatically.

8.2.6 Arcs

1. Select **Arc Draw Mode**.
2. Select the background and pen colour.
3. Move to a corner of the desired arc. Click and hold the left mouse button.
4. Drag the mouse to where the opposite corner is to be located.
5. The **Draw Mode** returns to **Selector** as default.
6. To edit the size of the arc and shape click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the arc will change size automatically.

8.2.7 Bezel Mode

1. Select **Bezel Draw Mode.**
2. Move to a corner of the desired bezel position Click and hold the left mouse button.
3. Drag the mouse to where the opposite corner is to be located and release the mouse button. The **Draw Mode** returns to **Selector** as default.
4. The following dialog box is displayed...

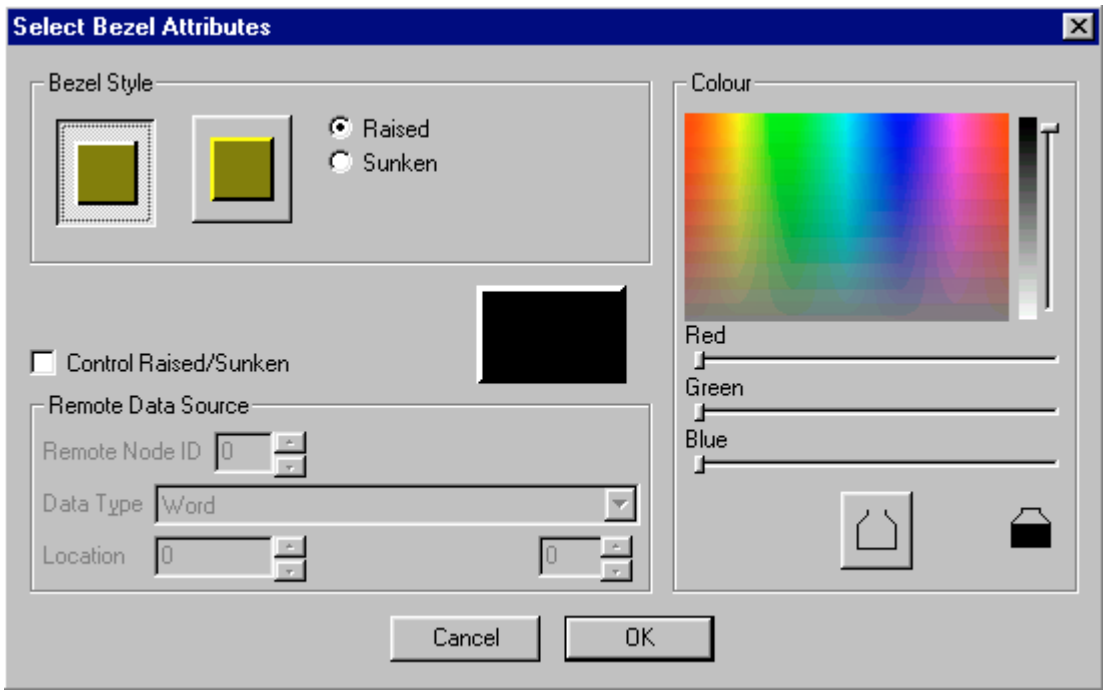


Figure 8.4 – Select Bezel Attributes

8.2.7.1 Bezel Style

Select whether the frame will be thin or thick and whether the bezel should appear sunken or raised.

8.2.7.2 Colour

Specify the colour for the bezel

8.2.7.3 Control Raised/Sunken

If enabled, Remote Data Source can be used to specify a bit which will control whether the bezel appears raised or sunken. This feature is typically used when creating custom touch key areas on the display.

5. To edit the size of a bezel click on the object, then click and hold on one of the black dots around the object. Drag this dot around on the screen and the bezel will change size automatically.

8.2.8 Text Mode

1. Select **Text Mode**.
2. The background on text mode is by default transparent (This can be edited later).
3. Click on the screen, this will become the top left-hand corner of the text box.
4. Drag the mouse to where the bottom right hand corner is to be located.
5. The Set Text window opens Enter the required text and colour information(Fig 8.5)
6. The **Draw Mode** returns to **Selector** as default
7. To edit the size of the font click on the object, then click on one of the black dots around the object. Drag this dot around on the screen and the font will change size automatically.

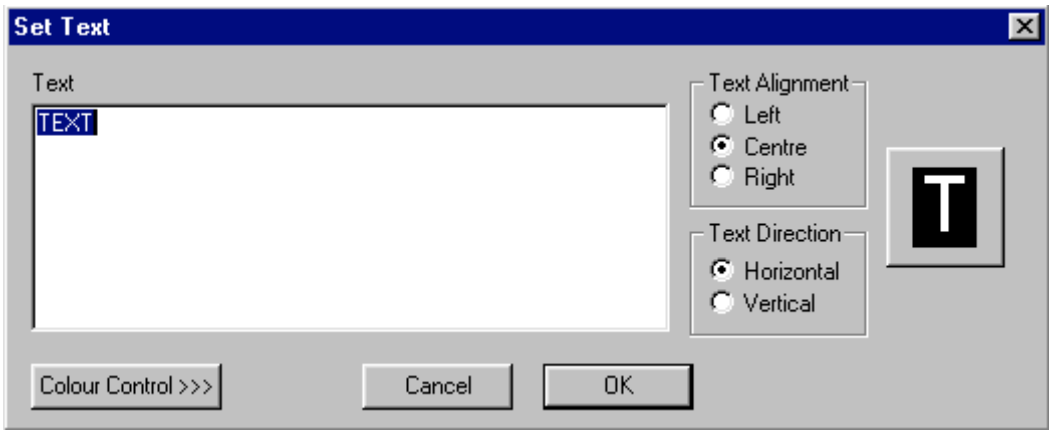


Figure 8.5 – Set Text (Colour Control Disabled)

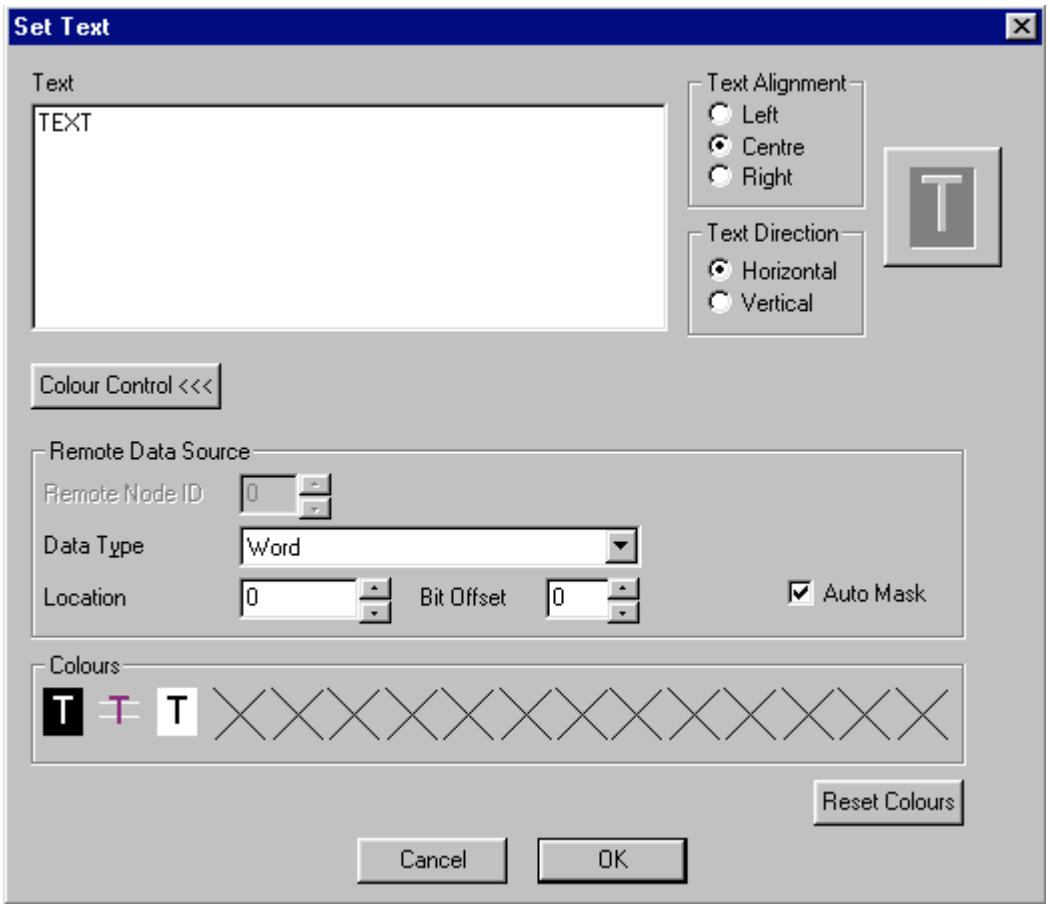


Figure 8.6 - Set Text (Colour Control Enabled)

8.2.8.1 Text

Specifies the text that is to be shown on the screen. The text is displayed in the original text area drawn, in an appropriate size font.

8.2.8.2 Text alignment

Positions the text within the text box.

8.2.8.3 Text direction

Selects whether the text will be displayed horizontally or vertically

8.2.8.4 Colour Indicator button.

Click on the colour indicator to select the colour in which the text will be drawn.

8.2.8.5 Colour Control>>>

On TIU3XX/TIU4XX/TIU5XX/TIU6XX systems a 'Colour Control >>>' button is displayed. Click on this button if it is required to modify the colour of a text field under control of the system. Clicking on this button will toggle the dialog box between the two formats as in Figures 8.5 and 8.6.

8.2.8.6 Remote Data Source

Select where the source of the date to be used to control the text colour is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.
If auto mask is selected only the relevant bits within the control word to be used.

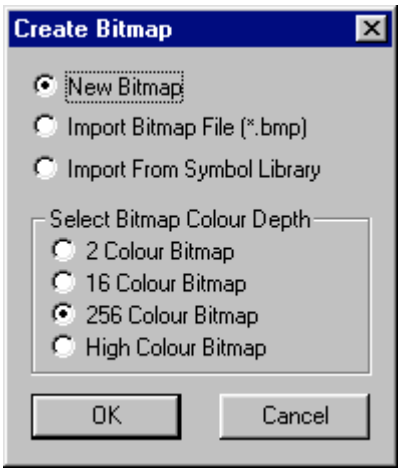
8.2.8.7 Colours

Click on entries in the colour palette to modify the colours displayed for a particular index. Text on a pair of horizontal white background lines indicates a transparent back ground, and a cross symbol indicates transparent text, hence using the plc register to control visibility of the selected object.

8.2.9 Static Bitmap

1. Select **Static Bitmap Mode**.
2. Click on the screen, this will become the top left-hand corner of the bitmap area.
3. Drag the mouse to where the bottom right hand corner is to be located. This will also set the size of the bitmap.

The following Dialog Box will be displayed:



Static Bitmap Selection Dialog

Select the source of the bitmap which is to be added to the screen

New Bitmap
Creates a bitmap of the required size and colour depth, and opens the program currently registered as the bitmap editor for windows (typically paint) so that it may be edited.

Import Bitmap
When selected prompts the user to enter a bitmap file name which is imported in to the current picture and is resized to the appropriate size and specified colour depth.

Import from Symbol Library
Automatically opens the CBreeze symbol Library picker which allows the user to select from a vast database of process oriented symbol bitmaps.

Colour Depth
Allows the user to force the colour depth of the bitmap which is added. Colour depths which are not supported by the currently selected Tiu are automatically precluded from the selections available. The colour depth supported by the currently selected terminal is automatically selected. Note that changing the initial selection will cause the size of the bitmap stored at the terminal to be reduced, but will cause the display draw time to be increased as the Tiu changes the format 'on the fly' when the image is initially drawn.

8.2.10 Table Mode

This tool allows you to easily draw the lines for a table and enter a Table Header. Once the table is created the number of rows and columns can not be edited directly. Boxes or lines may be added manually afterwards.

1. Select **Table Mode**.
2. Click on the screen, this will become the top left hand corner of the Table
3. Drag the mouse to where the bottom right hand corner is to be located. This sets the size of the table only.
4. The Table Creation windows open (Fig 8.8)

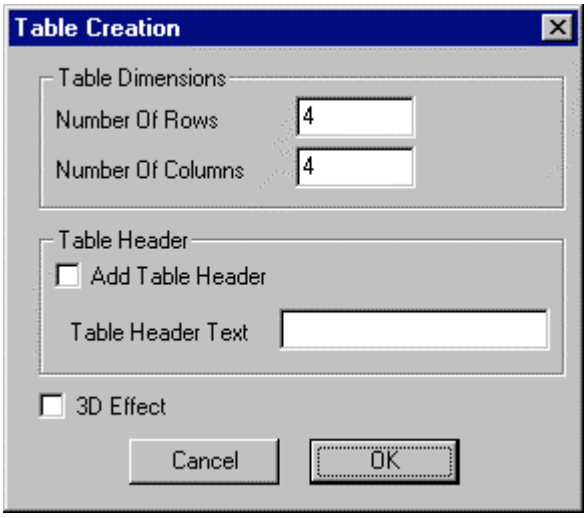


Figure 8.8 – Table Creation

5. Set the number of columns and rows you require.
6. Click on Add Table Header and enter Table Header Text if required.
7. The 3D effect adds an extra line on the right side of the table to give the effect of shadow.
8. Click OK to create table.
9. The table will then be drawn in the area specified at the beginning.

10. The **Draw Mode** returns to **Selector** as default.

8.2.11 Touch Key Mode

1. Select **Touch Key Mode.** (Only available on TIU3XX/TIU4XX/TIU5XX/TIU6XX).
2. Move to a corner of the desired touch key position Click and hold the left mouse button.
3. Drag the mouse to where the opposite corner of the touch key area is to be located and release the left mouse button.
4. The Touch key configuration area dialog box will appear.

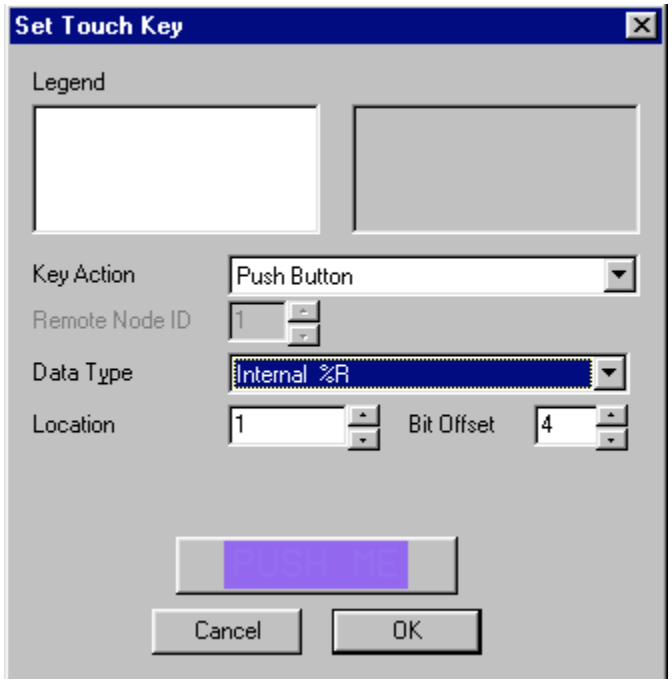


Figure 8.9 Set Touch Key

5. Type in the legend which should appear on the touch key in the legend box.
6. Select the type of action which the touch key should perform in the Key action drop down list box
7. Specify additional action parameters.
8. Click on the 'PUSH ME' button to modify the colour of the touch key area.
9. The **Draw Mode** returns to **Selector** as default.
10. To edit the size of the touch key click on the object, then click and hold on one of the black dots around the object. Drag this dot around on the screen and the touch key will change size automatically.

8.2.12 Flood Fill Mode

1. Select **Flood Fill Mode.** (Only available on TIU3XX/TIU4XX/TIU5XX/TIU6XX).
2. Move to the point of the desired flood fill source. The flood fill will start at the selected point and will occupy all adjoining points that have the same colour as the flood fill source. Click once, or alternatively drag and drop a positional rectangle. In the case of the positional rectangle the flood fill will start from the centre of the rectangle.
3. The Flood fill configuration area dialog box will appear.

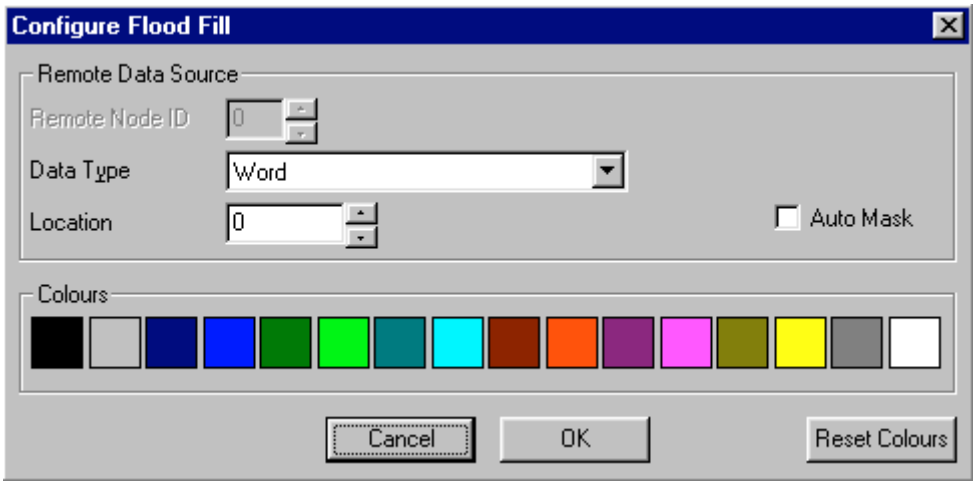


Figure 8.9 Set Flood Fill

8.2.12.1 Remote Data Source

Select where the source of the date to be used to control the flood fill colour is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID. Unused bits in the source register will automatically be ignored.

8.2.12.2 Colours

Click on the boxes within the Colours box to specify the colours that will be displayed for various control values in the Data Source register.

8.2.12.3 Reset Colours

The Reset Colours button causes a standard palette of colours to be loaded.

4. The **Draw Mode** returns to **Selector** as default.

8.2.13 Scribble Pad

The Scribble pad gives the user the means to incorporate an area on the screen that can be drawn into by the operator using his finger. It is intended as a means for an operator to leave a message for a colleague perhaps on a subsequent shift.

1. Choose the Scribble Pad embedded data type.
2. Position the mouse at one corner of the area where the pad is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the pad area and release the left mouse button. The propertes of the Scribble Pad object are non editable – the object is always displayed in the following format.

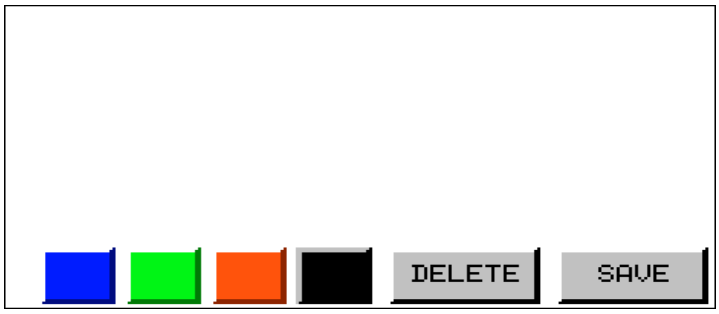


Figure 8.20 – The Scribble Image

4. It is recommended that the notepad is not placed on screen with other animation objects. Doing so will degrade the speed of response of the notepad touch screen response.The Scribble Pad

8.3 Palette Toolbars

The palette toolbar displayed for a particular terminal will be dependant on the screen capabilities of the display fitted to the terminal type.

Note : On TIU30X displays although up to 16 shades of grey are supported the differential between each is quite small and the use of many different 'shades' within a screen, can cause 'fringing effects'. It is recommended that when designing screens for the Tiu30X the number of shades used on each individual screen is kept as low as possible.

Dependant on the terminal type selected a palette toolbar will be available. The toolbar will be one of the following…

Figure 8.10 - Monochrome Palette (TIU2XX)

Figure 8.11 - Grey Scale Palette (TIU30X)

Figure 8.12 - Colour Palette (TIU31X/ TIU32X/TIU4XX/TIU5XX/TIU6XX)

The Palette tool bars are used to select the pen colours, used for the outlining or detail of an object for example the text, depicted on the toolbar by a pen nib, and also the background or fill colour of an object, depicted on the toolbar by an ink pot. To create a transparent object or one with no background the right most icon (empty ink pot) is selected.

8.4 Embedding Data on a Graphic Menu Page

8.4.1 Scope

The Embedded Data types are similar to the data types on text menu pages. Where applicable all data types work the same as they do on a text page see Chapter on Embedded Data. The main difference is how the data type is embedded on the screen.

Figure 8.13 - Animation Tool bar

To Embed Data on the Screen

1. Choose the Embedded Data type you wish to embed.
2. Click on the screen, this will become the top left hand corner of the area the displayed data will take up.
3. The normal embedded data type window will appear. Set-up the embedded dat type as required (See Chapter on Embedded Data).
4. Once the embedded data type is created it is displayed in the area defined earlier, in a font size appropriate to the size of the area.

8.4.2 Analogue Meter

Similar to the horizontal fill is the “Needle Meter” type Analogue Meter. It is embedded on the menu page similar to the Horizontal Meter.

To embed an Analog Meter on a graphics screen:

1. Choose the Analogue Meter Data type.
2. Click on the screen, this will become the top left hand corner of the area the displayed data will take up.
3. The normal horizontal fill embedded data type window will appear. Set-up the embedded data type as required (See Chapter on Embedded Data).
4. Once the embedded data type is created it is displayed in the area defined earlier.

8.4.3 Animated Bitmap Selector

1. Choose the Animated Bitmap selector Embedded Data type.
2. Click on the screen, this will become the top left hand corner of the bitmap area.
3. Drag the mouse to where the bottom right hand corner is to be located.
4. The Animated Bitmap Selector data type window will appear (Fig 8.11).

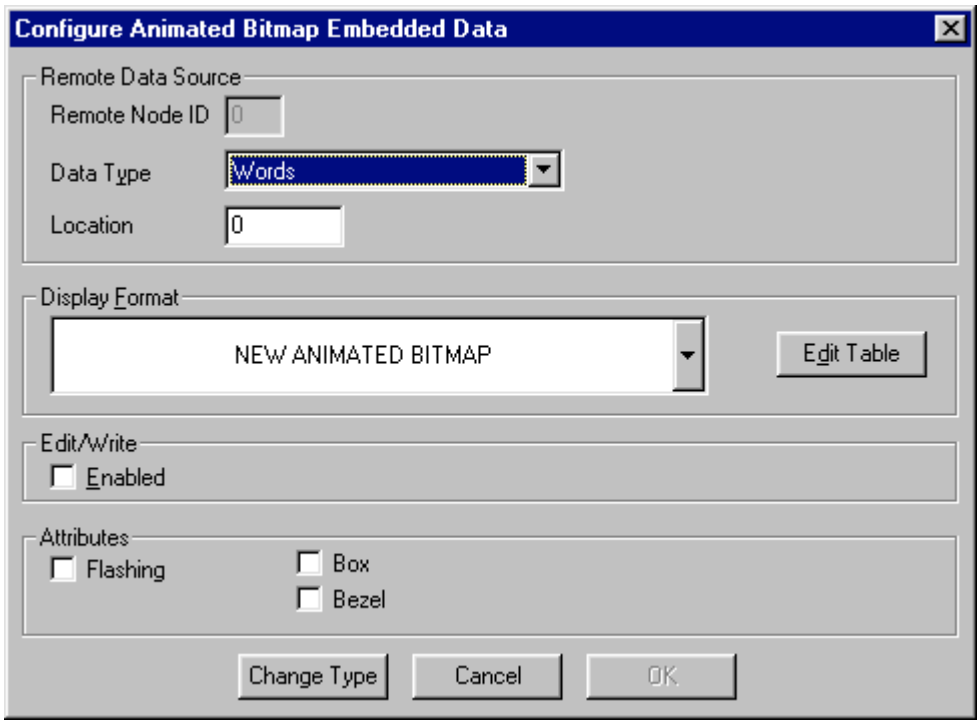


Figure 8.14 – Embedded Animated Bitmap Selector Windows

8.4.3.1 Remote Data Source

Select where the source of the data to be used to control the animated is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

8.4.3.2 Display Format

Select here the animated bitmap which should be used. To reuse an existing animated bitmap select it from the drop down box. To create a new animated bitmap select ‘New Animated Bitmap’ and then click edit table

8.4.3.3 Edit/Write

When checked allows the user to modify the current selection.

8.4.3.4 Attributes

Use attributes to assign any additional attributes to the animated bitmap.

8.4.4 Lamp

To embed a Lamp on a graphics screen:

1. Choose the Lamp embedded data type.
2. Position the mouse at one corner of the area where the lamp is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the lamp area and release the left mouse button. The lamp embedded data type window will appear…

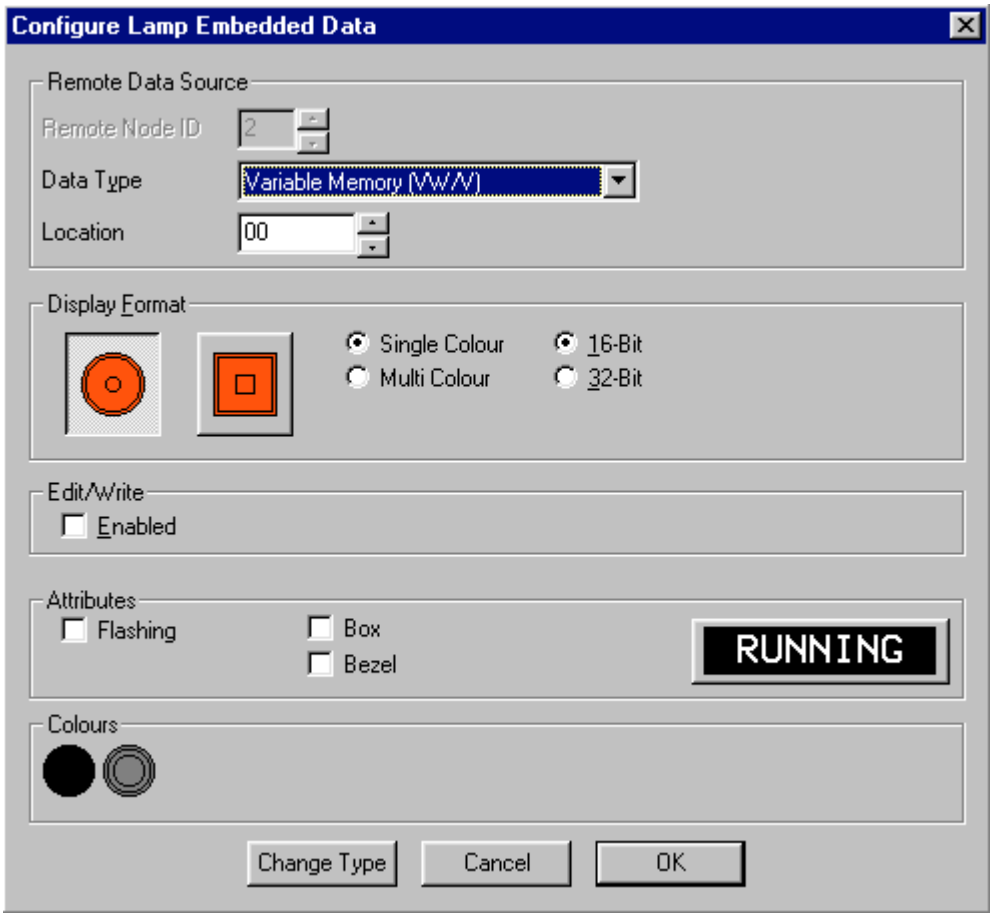


Figure 8.15 - Configure Lamp Embedded Data

8.4.4.1 Remote Data Source

Select where the source of the date to be used to control the shape is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.
This will be a digital point for a single colour lamp or an analog value for a multicolour lamp.

8.4.4.2 Display format

Select whether the lamp is to be displayed as a round or rectangular lamp. Indicate whether the lamp will be a single colour (alternates between half and full luminous versions of the same colour) or multicoloured (select a set of colours which the lamp can show).

8.4.4.3 Edit/Write

If the lamp is set as edit/write enabled then touching the lamp will allow it to move in sequence through colours assigned to it.

8.4.4.4 Attributes

can be assigned to the lamp as required.

8.4.4.5 Colours

When multicoloured mode is selected click on the icons within the Colours section to specify the colours that the lamp will display.

4. Once the embedded data type is created it is displayed in the area defined earlier.

8.4.5 Switch

To embed a switch on a graphics screen:

1. Choose the Switch embedded data type.
2. Position the mouse at one corner of the area where the switch is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the switch area and release the left mouse button. The switch embedded data type window will appear…

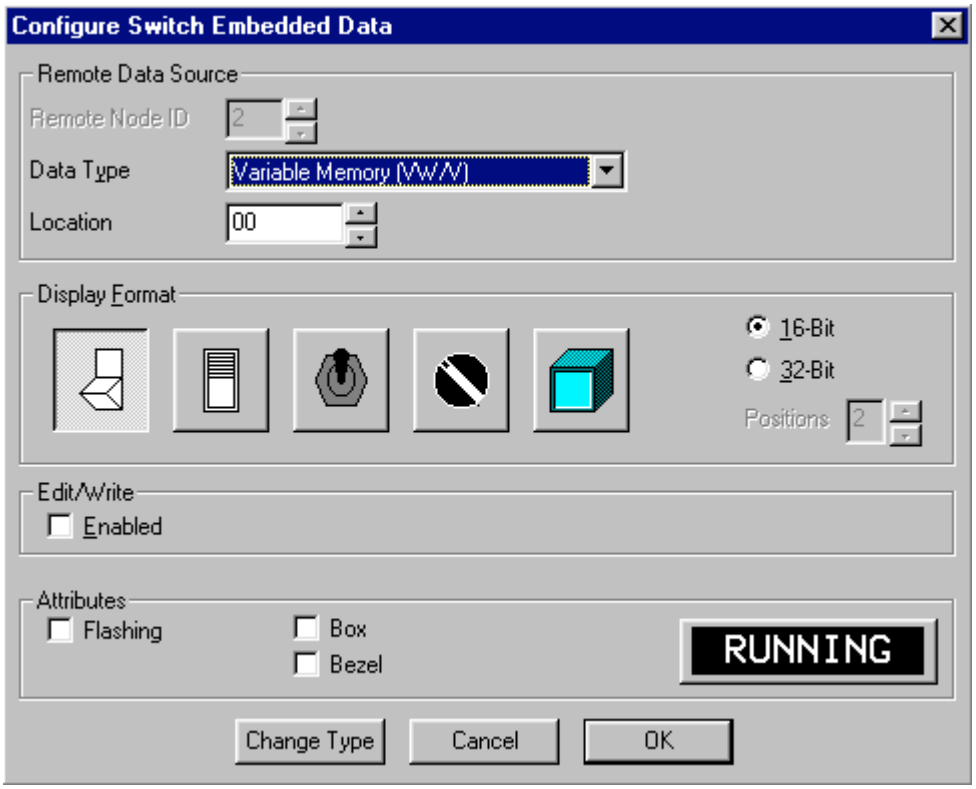


Figure 8.16 - Configure Switch Embedded Data

8.4.5.1 Remote Data Source

Select where the source of the date to be used to control the switch is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

8.4.5.2 Display Format

Select the switch type to be displayed. In addition specify the number of positions for slider (2/3) and rotary (2 – 8) switches.

8.4.5.3 Edit/Write

Enable to allow the user to modify the state of the switch by touching on it.

8.4.5.4 Attributes

specify any additional attributes for the shape.

4. Once the embedded data type is created it is displayed in the area defined earlier in the style specified.

8.4.6 Sliders

Similar to the horizontal fill Horner has added a “Slider” type Analogue Meter. It is embedded on the menu page in a similar manner to the Horizontal Meter. To embed a Slider on a graphics screen:

1. Choose the Slider embedded data type.
2. Position the mouse at one corner of the area where the slider is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the slider area and release the left mouse button.
4. The slider configuration dialog box is displayed

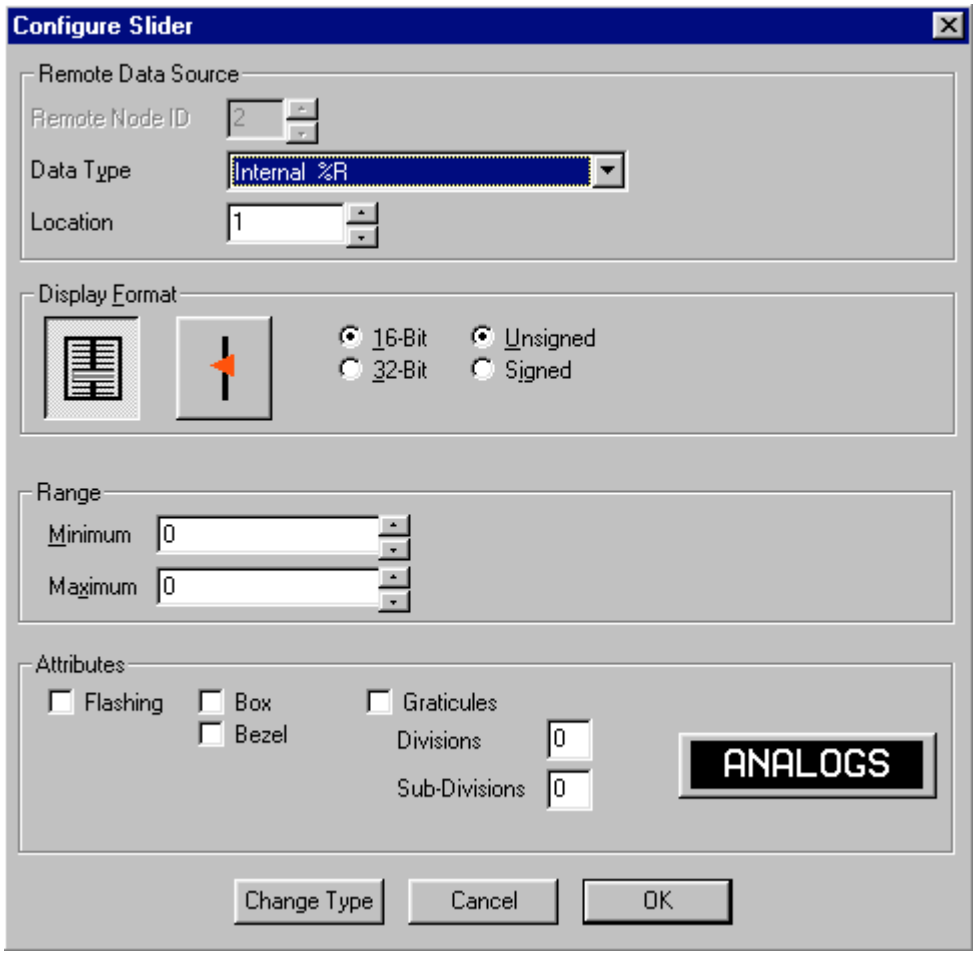


Figure 8.17 - Configure Slider Animation Data Dialog Box

8.4.6.1 Remote Data Source

Select where the source of the date to be used to control the slider is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

8.4.6.2 Display Format

Select whether the slider is to be a knob type slider, or a pointer type slider used to indicate levels.

8.4.6.3 Range

In the range section specify the values to indicate the positions at either end of the slider range

5. Once the embedded data type is created it is displayed in the area defined earlier.

8.4.7 Curved Analogue Fills

To embed a Curved Analogue Fill area on a graphics screen

1. Choose the curved analog embedded data type.
2. Position the mouse at one corner of the area where the curved is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the curved analog area and release the left mouse button.The curved analog embedded data type window will appear…

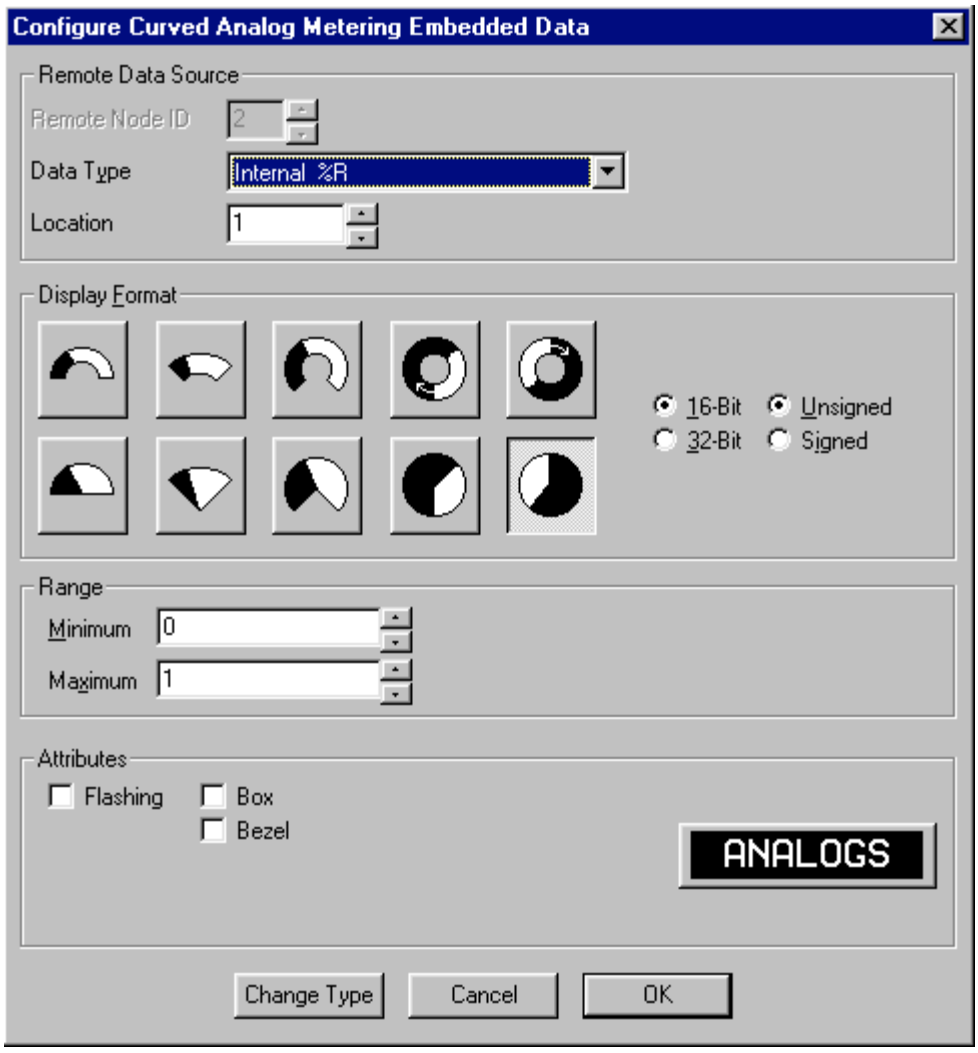


Figure 8.18 - Configure Curved Analog Embedded Data

8.4.7.1 Remote Data Source

Select where the source of the date to be used to control the shape is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.

8.4.7.2 Display Format

Select the style of the fill, along with the format of the register.

8.4.7.3 Range

Select the values which correspond to empty (minimum) and full (maximum) for the area.

8.4.7.4 Attributes

specify any additional attributes for the shape.

4. Once the embedded data type is created it is displayed in the area defined earlier.

8.4.8 Object Groups

Object groups give the means to ‘group’ together a set of object groups to produce a single graphics element. Once grouped together the object is treated as a single element, and can be selected/stretched/moved only as a single entity. Double clicking on the group allows the attributes of a single component part to be edited.

8.4.9 The Part Library

1. The part library enables the means to include standard precomposed objects within graphics pages. Position the cursor at the top left of the screen area to which the library part is to be added.
2. Click here or lick and drag the cursor to the bottom left of the area to which the part is to be added.
3. The standard part library box is displayed on screen.

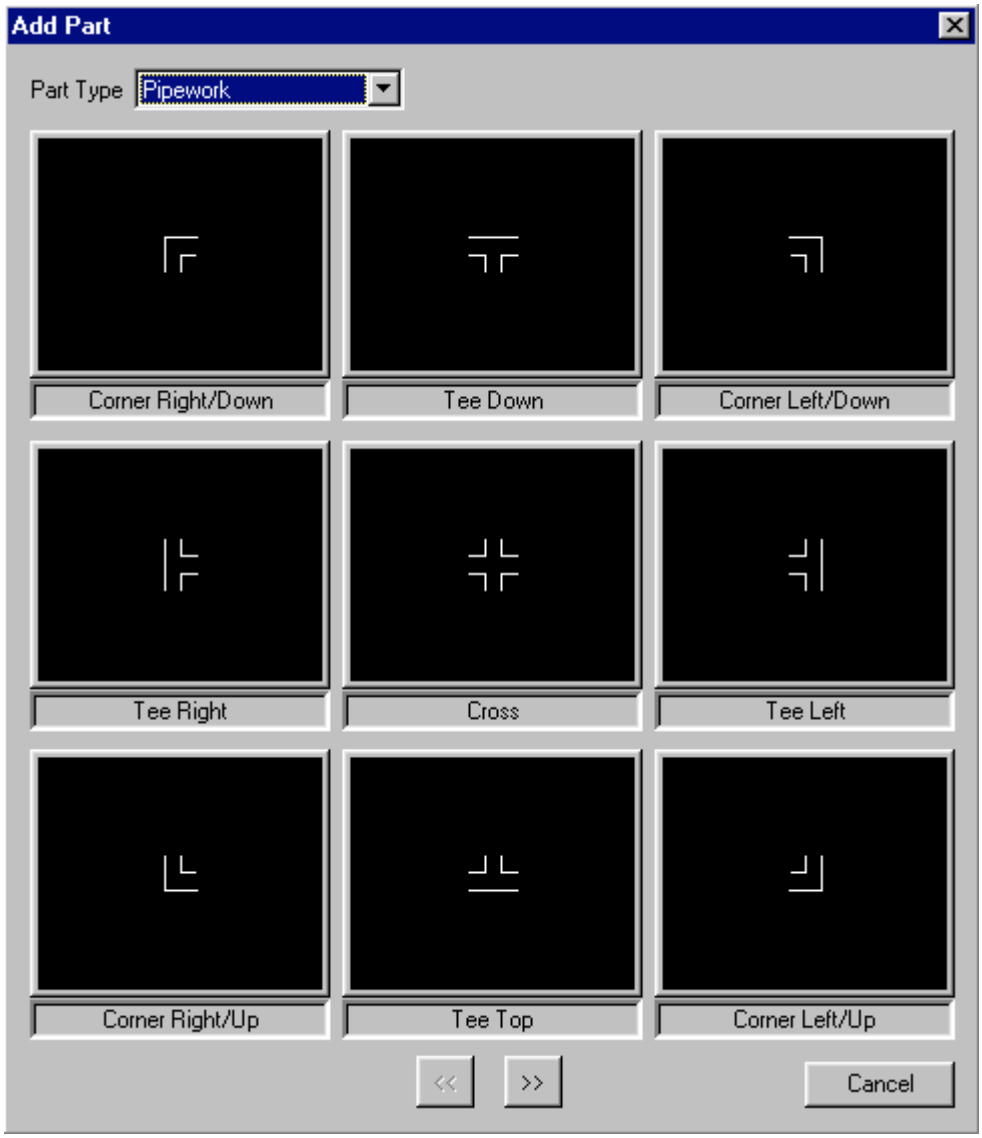


Figure 8.19 - Add Part Embedded Data Dialog Box

Select the part type from the drop down list, (Use the << and >> buttons to step through other variations within the same part type).

8.4.10 Multipen Trends

On the Tiu3xx units trends added are automatically created in multipen format. This allows up to 12 trends to be automatically overlaid on top of each other with up to 12 pens visible.

1. Choose the trend embedded data type.
2. Position the mouse at one corner of the area where the curved is to be drawn. Click and hold the left mouse button.
3. Reposition the mouse to the opposite corner of the curved analog area and release the left mouse button.

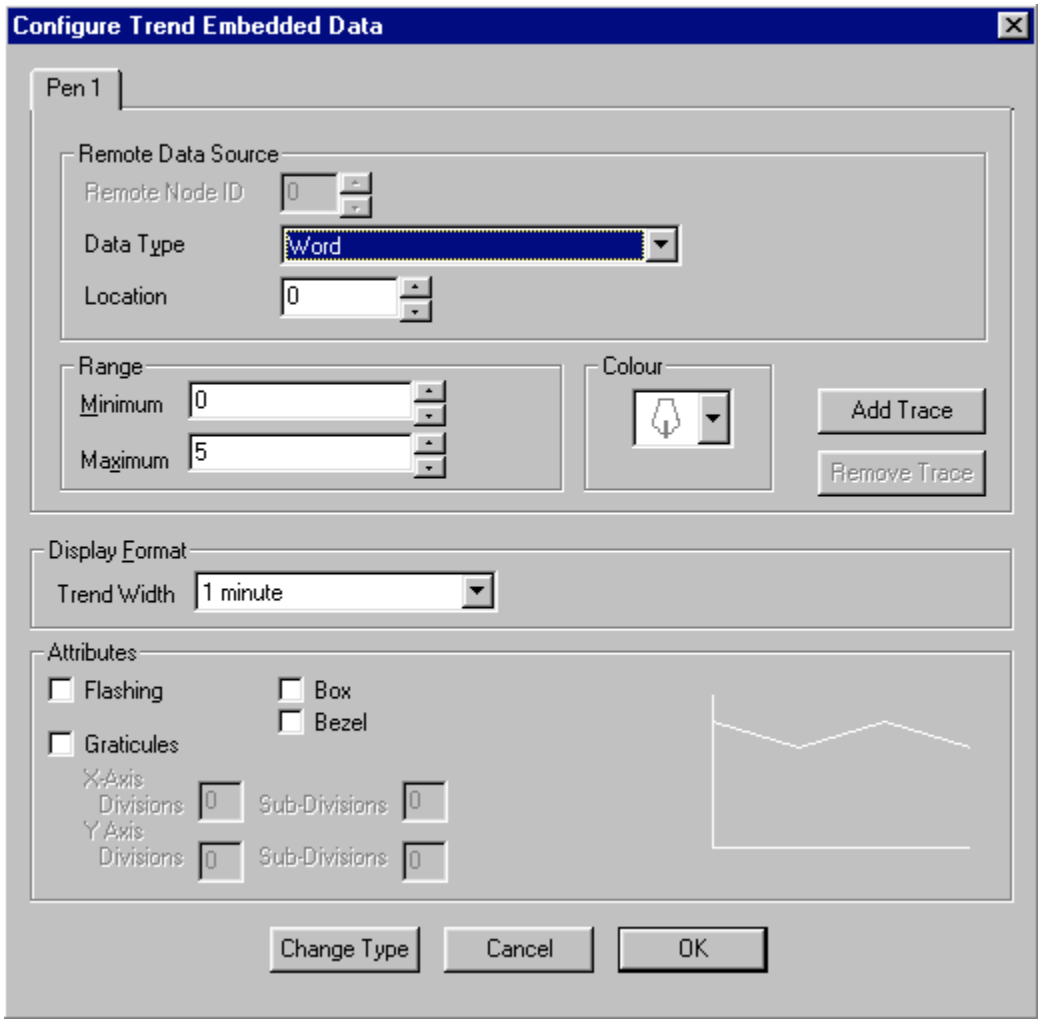


Figure 8.21 – Multipen Trend Dialog Box

4. Use the Add Trace and Remove Trace buttons to define the number of trends to be displayed within the trend window.
5. Click on the appropriate Pen tabs to select between the various traces.
6. Select the data source, Range and pen colour for each trace within the trend.
7. Globally select the Trend width for the entire trend.
8. Globally allocate attributes to the trend.

8.5 Creating Animated Bit Maps

8.5.1 Scope

Graphic terminals allow for the use of the embedded data type Animated Bitmap Selector. The animated bitmap consists of a set of images, which are selected dependent on the value in a register. It is the pictorial equivalent of a text table.

8.5.2 To change the bitmap selected from graphics terminals without a touch screen.

1. Select the text string field by pressing the **Pause** key.
2. Move up or down the list using the **Up** and **Down** keys.
3. Press the **Enter** key to select the desired text string. The Id of the currently selected terminal will be written to the register controlling the animated bitmap.

8.5.3 To change the bitmap selected from graphics terminals with a touch screen.

In addition to the standard Pause/Up/Down/Enter edit mode available on non touch screen keypads, it is possible to select the icon simply by touching te icon area on touch screen terminals.

8.5.4 Creating a new animated bitmap

1. In the animated bitmap assignment dialog box select NEW ANIMATED BITMAP from the pull down box.
2. Click edit table and the size of the bitmap icon is displayed (Fig 8.12). The size of the bitmap icon can be specified now.

Figure 8.22 – Set Bitmap Icon Size

Note: Once created the bitmap size cannot be changed directly. To change the bitmap size, the bitmap image needs to be exported to a file, a new bitmap created the required size and the old bitmap image imported back from the file of the original bitmap image.

3. Click OK to display the animated bitmap edit.See figure 8.13. (Note the icon table will be empty when creating a new animated bitmap)

8.6 The Animated Bitmap Editor

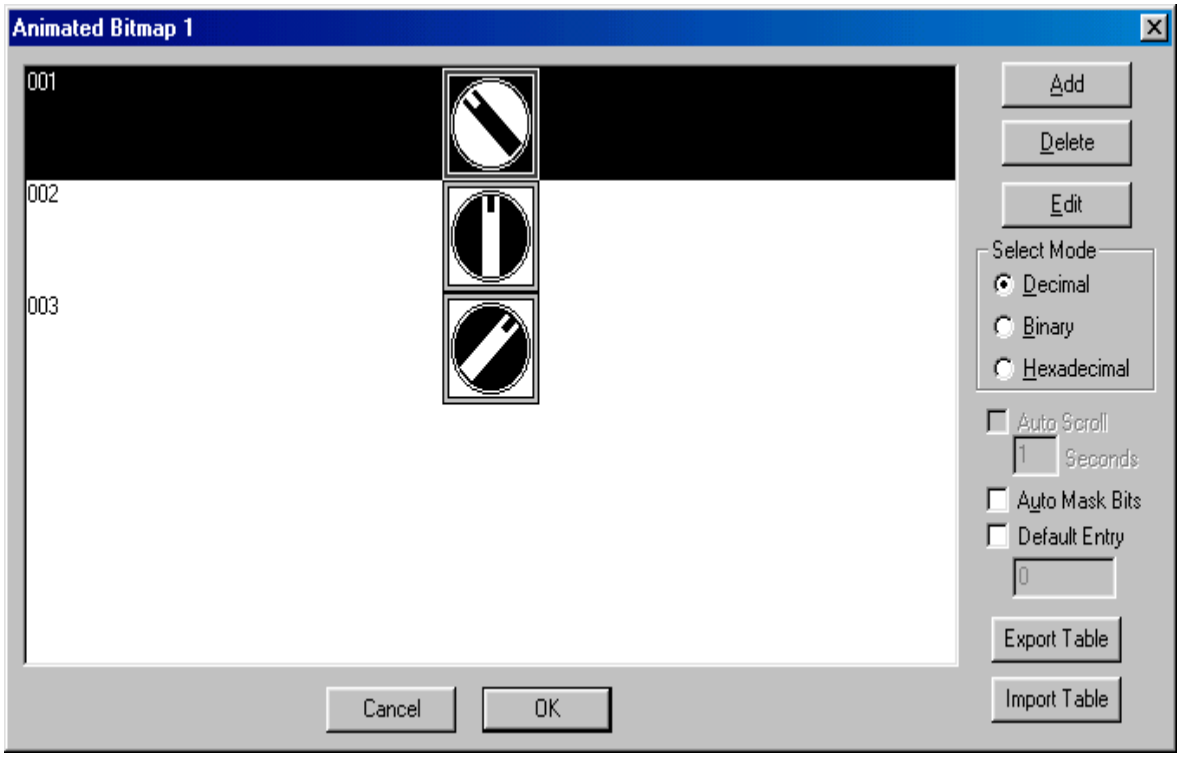


Figure 8.23 –The Animated Bitmap Editor

8.6.1 Add

Click on the Add button to add a new bitmap to the table. The editor will automatically assign an unused ID, but this can be edited if required. The icon editor box is displayed. See 8.5.6 The icon editor.

8.6.2 Edit

Click on the Edit button to modify the currently selected bitmap. The icon editor box is displayed. See 8.5.6 The icon editor.

8.6.3 Delete

Click on the Delete button to remove the currently selected bitmap.

8.6.4 Select Mode.

The tables can be edited in 3 different modes, **Decimal**, **Binary** and **Hexadecimal**. In decimal mode the selecting value is displayed in decimal and can be assigned any value between 0 and 255. In hexadecimal the selecting value is displayed in hexadecimal and can be assigned any value between 0 and FFh. In binary mode the selecting value is displayed in decimal and can be assigned any value between 0/1 and 31/32.

8.6.5 Auto scroll mode.

When AutoScroll mode is selected (only applicable in binary mode) The terminal will automatically scroll through all bitmaps whose corresponding bit is matched in the controlling register.
Auto mask bits
When auto mask bits is selected the terminal will automatically disregard any irrelevant bits when reading the value in the target terminal. When auto mask bits is selected the Data source register for the table becomes a digital point, rather than an analog point.

8.6.6 Default Entry

If an undefined value is entered into the Field ID table entry field (i.e., a value that has not been assigned in any bitmap table), then normally a blank bitmap is displayed. However if the user has assigned a value to the **Default Entry** in the Text Table box, then that entry number is displayed. This value is assigned by first checking the box next to **Default Entry**, then entering a number in the box below.

8.6.7 Export Table

After selecting export table the standard windows save file dialog box is brought up. The filename for saving will actually specify a set of file names containing the bitmap for each frame in the animated sequence. For example Selecting a file name of say Lamp.bmp with a table containing entries for value 0, 1, 2, 4, and 8 will cause the bitmaps in the current table to be exported to a set of bitmaps named lamp000.bmp, lamp001.bmp, lamp002.bmp, lamp004.bmp and lamp008.bmp.

8.6.8 Import Table

Select any icon in the set of bitmaps for the table (refer to Export Table above for the naming convention of an exported animated bitmap) The file set will be imported back into the Animated Bitmap editor.

8.7 The Icon Editor

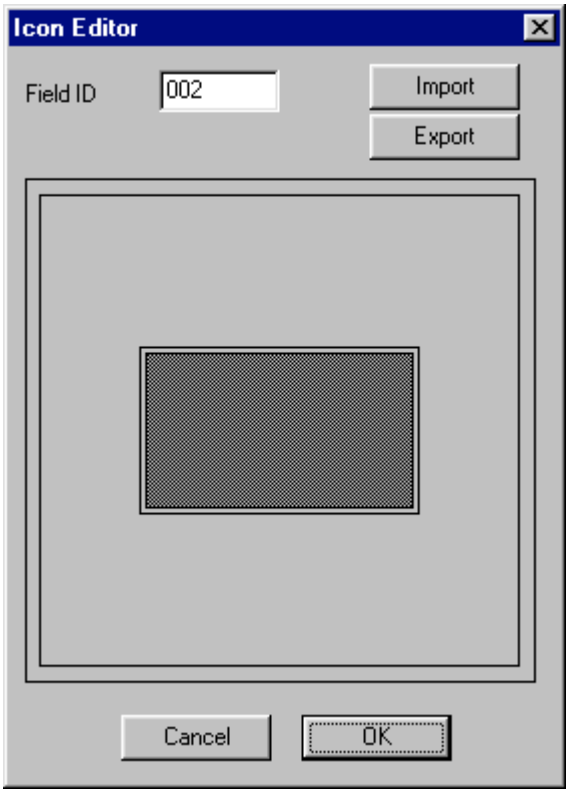


Figure 8.24 – Icon Editor

1. If necessary set the **Field ID** number (1-250).
2. Double click on the icon area in the centre of the screen. The currently registered Windows Bitmap Editor opens the icon as a bitmap to be edited. The Icon is displayed with a checkered design as default. In windows paint select Select All from the edit menu, and then cut.
3. Refer to the documentation for your registered Bitmap Editor for details on how to create graphic images in the bitmap icon.

4. Once the bitmap has been completed close the Bitmap Editor and the bitmap icon will appear in the Icon Editor.

8.8 Draw Attributes

The properties or **Attributes** of a shape can be set before or after the shape is drawn.
Double click on existing shape to modify its' attributes. Alternatively select Draw Attributes from the settings menu to select the colour and pen style in which new objects will be created. The select colour dialog box shown will be dependent on the Terminal type that is being configured.

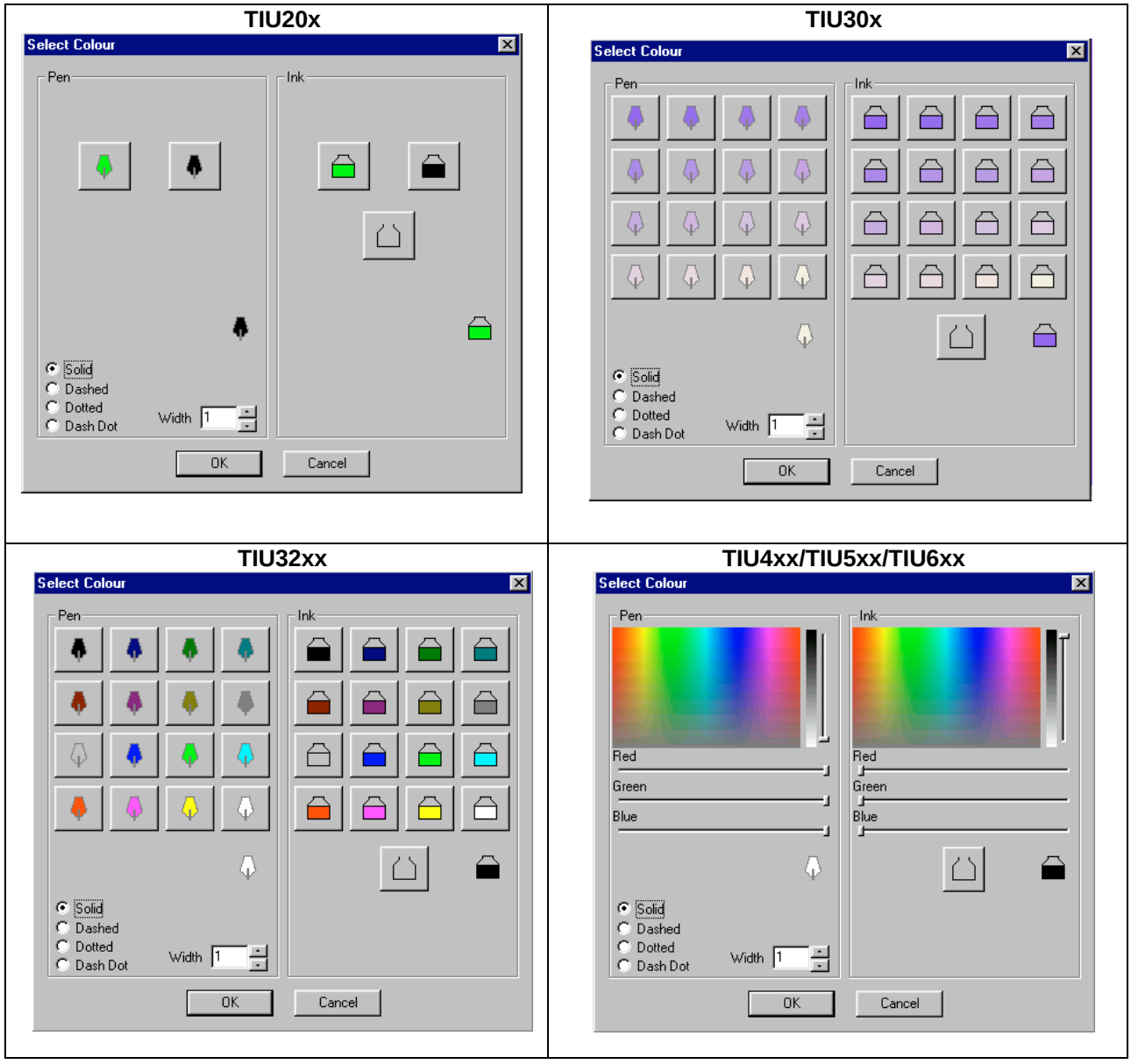


Figure 8.25 Draw Attributes

8.8.1 Selecting colours on Tiu4XX/TIU5XX/TIU6XX panels

On the Units with the smaller palettes selecting colours is as simple as clicking on the ink pot or pen colour buttons to assign a colour to the respective item. On the TIU4XX/TIU5XX/TIU6XX, due to the range of colours available the procedure is a little more complicated, but the recommended method is as follows

i. Click on the palette area to specify a rough match for the colour required.
ii. Use the luminosity slider to the right of the palette to trim how bright/dark the colour is
iii. Trim the colour to the exact requirement using the Red, Green and Blue slider controls beneath the palette.

Note once a colour has been trimmed to requirements it is possible to add it to a working palette by right clicking on the appropriate pen/pot icon within the colour definition area.

8.9 Paste Options

Paste options allow the position of, and in the case of animation points the data source for, pasted objects to be precisely controlled when adding them to a graphic screen. Use of the paste options box allows tables and other repeating objects to be consistently aligned.

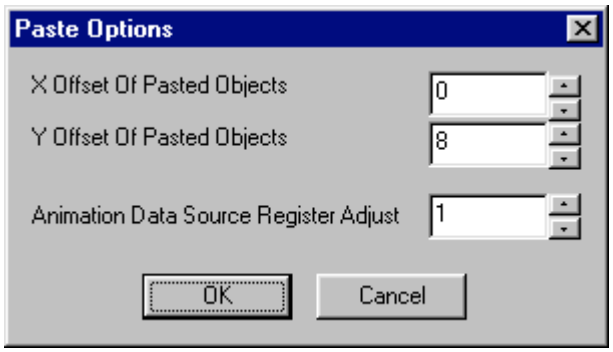


Figure 8.26 Paste Options

8.10 Auto-Adjust Size

The use of the auto adjust size facility allows the size of objects to be fixed to the optimum size required. For example a text object will be resized to the smallest rectangle required to contain it in the current font. Animated bitmaps are resized to be the actual size of the bitmap images.

NOTES

CHAPTER 9 NETWORKING

9.1 Scope

The TIU range supports a variety of industry standard networking options. The terminal type determines the network options available on a TIU. The following networks are available on the various terminal types.

Terminal Type	Network
Tiu050	None
Tiuxx0	Modbus/Serial CsCan
Tiuxx1	CsCan
Tiuxx2	Profibus
Tiuxx3	DeviceNet

9.2 Modbus

Modbus is an industry standard protocol supported by many commercial Scada packages. Use of the modbus protocol on the Tiu range allows connection of the Tius into such a system.

The TIU1X0 and TIU200 terminals support this protocol on their PC programming port, so in order to connect a network of Tius to the host system a 232 to 422 converter must be used. Contact Horner for recommendations of a suitable device. Note that when modbus networking is enabled on the TIU programming port the programming functionality no longer operates other than for a brief three second window immediately after the version numbers are announced on power up, or by shutting the system down which may be done by writing to system register %SR9 using a function key macro.

TIU3X0 units support modbus on their additional communication port, which is capable of running in a two wire RS485 mode for networking purposes.

Available registers are…

Table 9.1 – Modbus Network Registers

Type	Function	Description	Quantity	Retentive
%AIG	Network Analog Input	Analog inputs that can be read or written by the modbus master. These registers are equivalent to holding registers as defined by the modbus specification and are accessed using modbus functions 3 and 16. Data is in words.	32	No
%AQG	Network Analog Output	Analog outputs that can be read by the modbus master. These registers are equivalent to input registers as defined by the modbus specification and are accessed using modbus function 4. Data is in words.	16	No
%IG	Network Digital Input	Digital inputs that can be read or written by the modbus master. These bits are equivalent to coils as defined by the modbus specification and are accessed using modbus functions 1 and 15. Data is accessed in word chunks.	64	No
%QG	Network Digital Output	Digital outputs that are read by the modbus master. These bits are equivalent to input bits as defined by the modbus specification and are accessed using modbus function 2. Data is accessed in word chunks.	64	No

9.3 Serial CsCAN

Serial CsCan is a horner proprietary protocol. Use of the Serial CsCan network protocol on the Tiu range allows connection of the Tiu to a supervisory PC using Horner's own OPC-lite software, which allows the Tiu data to be seamlessly integrated with various OPC supporting packages, including many scada packages as well as, for example, Excel spreadsheets

The TIU1X0 and TIU200 terminals support this protocol on their PC programming port, so in order to connect a network of Tius to the host system a 232 to 422 converter must be used. Contact Horner for recommendations of a suitable device. Note that when serial CsCan networking is enabled on the TIU programming port the programming functionality no longer operates other than for a brief three second window immediately after the version numbers are announced on power up, or by shutting the system down which may be done by writing to system register %SR9 using a function key macro.

TIU3X0 units support serial CsCan on their additional communication port, which is capable of running in a two wire RS485 mode for networking purposes.

Available registers are…

Table 9.2 – Serial CsCan Network Registers

Type	Function	Description	Quantity	Retentive
%AIG	Network Analog Input	Analog inputs that can be read or written by the serial CsCan master. Data is in words.	32	No
%AQG	Network Analog Output	Analog outputs that can be read by the serial CsCan master. Data is in words.	16	No
%IG	Network Digital Input	Digital inputs that can be read or written by the serial CsCan master. Data is in bits.	64	No
%QG	Network Digital Output	Digital outputs that are read by the serial CsCan master. Data is in bits.	64	No
%R	Registers	The Serial CsCan master can access data within the Tiu %R registers	240/1200 with BB	Yes with BB option
%M	Bits	The Serial CsCan master can access data within the Tiu %R registers	2400	Yes with BB option
%SR	System Registers	The Serial CsCan master can access data within the Tiu %SR registers	999	System Specific
%AI	Analog Inputs	Where the TIU has smartstack I/O fitted the Serial CsCan master can access analog input Data directly. Data is in Words	1024	No
%AQ	Analog Outputs	Where the TIU has smartstack I/O fitted the Serial CsCan master can access analog output Data directly. Data is in Words	1024	No
%I	Digital Inputs	Where the TIU has smartstack I/O fitted the Serial CsCan master can access digital input Data directly. Data is in Bits	8192	No
%Q	Digital Outputs	Where the TIU has smartstack I/O fitted the Serial CsCan master can access digital output Data directly. Data is in Bits	8192	No

9.4 CsCAN

The CsCAN network is based on the Bosch Control Area Network (CAN) and implements a protocol designed to take maximum advantage of the global data broadcasting capability of CAN. Using this network protocol, up to 64 Control Stations can be linked without repeaters, and up to 253 Control Stations can be linked by using 3 repeaters.

The available registers are;

Table 9.3 – CsCAN Network Registers

Type	Function	Description	Quantity	Retentive
%AIG	Network Analog Input	Specially defined analog inputs that come from the CsCan network protocol. Data is in words.	32	No
%AQG	Network Analog Output	Specially defined analog outputs that go to the CsCan network protocol. Data is in words.	16	No
%IG	Network Digital Input	Single bit registers that come from the CsCan network protocol.	64	No
%QG	Network Digital Output	Specially defined digital outputs that go to the CsCan network protocol.	64	No

9.4.1 *Sending Data to the CsCAN Network*

The HE500TIU101/111/201 units contain a special set of registers called Global Network I/O, or simply Global I/O. Using the CsCan protocol these bits are automatically sent through the network to all other units on the network. Anyone unit can be made aware of the activities of any other unit on the network, and any one unit can send a signal to any or all other unit on the network.

The global 'I' registers contain an image of global 'Q' registers located in a different units connected to the network. The association between I registers and 'Q' registers is set at the destination unit.
Any 'I' register may be associated to one and only one 'Q' register, but that 'Q' register may be located in any other unit on the network. Any 'Q' register is broadcast on the network for any or all other units to use.

9.5 DeviceNet

9.5.1 *DeviceNet Features Supported Using Operator Station Modules*

It is important to determine the features that the Operator Station Modules support (when used in a DeviceNet network) *before* programming, configuring, and setting up the network.

9.5.2 *Communication Method*

Although the DeviceNet Specification provides for two methods of establishing communication, the Operator Station Modules implement only *one* of the methods, which is referred to as the **Predefined Master/Slave Connection Set.** This method provides communications typically seen in a Master/Slave relationship and uses a **DeviceNet Master/Slave** protocol.

The other method of communication is through the use of the **Unconnected Message Manager (UCMM)**. The Operator Station Modules do not currently support the UCMM method of communication.

9.5.3 *Message Class / Message Priority*

Both Explicit Messaging and I/O Connections are established using a message class known as **Message Group 2 Only.** In this message class, the message priority is determined solely by the network address of the individual nodes. The lower the node's address, the higher its priority.

9.5.4 *Types of Messages / Connections Supported*

The **Explicit Messaging** and **Polled Connection** features are supported. The following terms are defined per the DeviceNet Specification, Release (2.0), Volume I: DeviceNet Communication Model and Protocol.

Explicit Messaging: - Used in typical request/response-oriented networks. Explicit Messages are used to command the performance of a particular task and to report the results of performing the task.

Polled Connection: - Responsible for receiving the Master's Poll Command and returning the associated response.

Explicit Messaging is used for the transfer of small amounts of infrequently accessed data such as configurations or tuning.

The Polled Connection is used for data that is sent automatically between the slave and the DeviceNet Master (Scanner) without intervention. The DeviceNet Master sends a **Polled Command** to a DeviceNet Slave. Attached to the polled command is 32 words of data for the TIU to use. The DeviceNet Slave produces or sends a **Polled Response** back to the DeviceNet Master. (The **Polled Response** consists of 32 words of data.) All Operator Station modules monitor (or eavesdrop on) **Polled Response** messages on the network.

The Operator Station Modules do not currently support **Bit Strobed**, **Cyclic** and **Change-of-State** connections.

9.5.5 *Additional Feature available in Operator Station Modules*

The Horner extension of the DeviceNet protocol known as **Polled Snooping** is also provided. Polled Snooping is totally non-intrusive to DeviceNet traffic. The Operator Station Modules monitor (or eavesdrop on) all **Polled Response** messages on the network. The data in the **Polled Responses** can used by the ***CBREEZE*** project in each of the Operator Station Modules. Their projects can make decisions based on the snooped data.

9.5.6 *DeviceNet Requirements*

The following requirements must be met to integrate Operator Station Modules into a DeviceNet network and to establish communications with a DeviceNet Master.

a. DeviceNet Node Address (MACID)

In order to communicate with a DeviceNet Master, a unique MACID must be assigned to each node on the network. Valid DeviceNet MACIDs are within the range of 0 - 63 inclusive (at least one master and 63 slave and/or master nodes).

b. DeviceNet Baud Rate

Each device connected to a DeviceNet network must be configured to operate at the same baud rate. The baud rate for the Operator Station Modules can be selected to be 125K, 250K or 500Kbaud. All devices on a DeviceNet must be configured to operate at the same baud rate.

The available registers are

Table 9.4 – DeviceNet Registers

Type	Function	Description	Quantity	Retentive
%AIG	Network Analog Input	Specially defined analog inputs that come from the DeviceNet network protocol. Data is in words.	32	No
%AQG	Network Analog Output	Specially defined analog outputs that go to the DeviceNet network protocol. Data is in words.	32	No

9.5.7 *Horner Extension Snooped Slaves*

Most controllers that support DeviceNet slave networking communication allow snooping. Snooping allows the controller to gather data from other slaves on a network as the master polls that slave device. Polled data sent from the slave to the master can be in one of two formats depending on the amount of data the slave needs to send to the master.

9.6 Profibus

Available registers…

Table 9.5 – Profibus Network Registers

Type	Function	Description	Quantity	Retentive
%AIG	Network Analog Input	Analog inputs. Data is in words.	32	No
%AQG	Network Analog Output	Analog outputs. Data is in words.	32	No
%IG	Network Digital Input	Single bit input register.	64	No
%QG	Network Digital Output	Single bit output register	64	No

The Profibus utilise a Master-Slave type of communication with the HE500TIUXX2 functioning as the slave device. Up to 32 devices (Master or Slave) can be connected in one segment without using repeaters or up to 125 devices can be connected using repeaters.

9.7 Configuring the HE500TIU10X/11X/20X for Network Communication

The following procedure configures a TIU to communicate using one of the standard networking options.

1. Select the terminal type from the edit menu.
2. From the main screen of the ***CBREEZE*** software select **Network** from the drop down **Configuration** menu, or click on the network toolbar button
3. The Configure Network Screen will be displayed for the appropriate terminal type chosen in step 1.
4. From the **Configure Network** screen select the node ID and the appropriate network protocol. If CsCAN terminal type HE500TIUXX1 is chosen then network protocol CsCAN is displayed. If Profibus terminal type HE500TIUXX2 is chosen then network protocol Profibus is displayed. If CsCAN terminal type HE500TIUXX3 is chosen then network protocol DeviceNet is displayed
5. Click On Enable Network.
6. Set the Node ID for the Terminal in the specified network.
7. Set the required Network Baud rate. For Profibus this is Auto Sensing.

The available Network Registers are displayed under Register Type Tabs on the Configure Network Screen.

9.8 Programming Network Inputs

9.8.1 *Network Input Registers IG & AIG*

In terms of programming the Operator Station to receive data from the network, all input registers are treated as Internal Registers on the terminal and are none retentive.

9.8.2 *Configure Network Input Registers*

To configure any network-input register, simply specify the source of the data.

Profibus/Modbus/Serial CsCan

Because Profibus, modbus and serial CsCan support Master/Slave type communication only, i.e. no slave can communicate with another slave, the source of the data will always be the master device.

CsCAN

In CsCAN data by any node is available to all other nodes, therefore any other node on the network can be the source of the data.

DeviceNet

In the DeviceNet network the master device decides what data is sent to each slave device. However with the Horner Extension to the DeviceNet protocol, which allows each specified Snooped slave device to

snoop on other specified Snooped slave devices. Therefore in DeviceNet network the master or any slave device that is specified as a Snooped Node can be the source of the data.

9.8.3 C*onfiguring Network Input Registers for all Network Protocols*

1. Choose the register type from the Configure Network window. Only available registers will be displayed
2. Double click the specific register to be configured.
3. The Configure Network Input window appears.
4. In the Data Source Box click the enable tick box.
5. Enter the node ID and register number of the data source.

This procedure will map the output registers from the data source into the input register of the Operator Station. This data can then be sent to registers on a device connected to the serial port of the Operator Station.

1. Click on the enable tick box in the Data Destination box.
2. Select the register type and the register location.
3. Chose the format of the data to be stored as.

If Transmission Timeout is not chosen then the data will be sent to the serial device every time the Input Register is updated. Else the frequency of which the data is sent to the serial device may be specified in 100 msecs.

9.9 Programming Network Outputs

9.9.1 N*etwork Output Registers QG & AQG*

In terms of programming the Operator Station to send data to the network, all output register are treated as Internal Registers on the terminal and are none retentive. The value contained in this Internal Register is sent to the network. The network then reads this value the frequency of which depends on the type of network and how the network is set-up.

9.9.2 D*estination of Output Registers*

Profibus/Modbus/Serial CsCan

Because Profibus, modbus and serial CsCan support Master-Slave type communication only, i.e. no slave can communicate with another slave, the destination of the data will always be the master device.

CsCAN

In CsCAN data is transmitted globally, therefore the destination of the data depends on which node wants the data, and is configured at the receiving node end.

DeviceNet

In the DeviceNet network the master device decides what data is sent/received from each slave device. However with the Horner Extension to the DeviceNet protocol, which allows each specified Snooped slave device to snoop on other specified Snooped slave devices. Therefore in DeviceNet network the master or any device that is specified as a Snooped Node can be the destination of the data.

9.9.3 M*apping Output Registers QG & AQG to a Serial Device.*

All output registers maybe mapped to a device connected to the serial port of the Operator Station. From the Configure Network window chose the output register type to be mapped (QG or AQG). Double click the specific register to be mapped. The Configure Network Output appears.
Click the enable option.
Choose the register type from the list of available registers from the data type pull down menu.
Type in the Location of the specific register.
Choose the format the register is to be stored.
Type in the frequency the data is to be mapped in 100 msecs.

CHAPTER 10 MATHEMATICS

10.1 Scope

The HE500TIU10X/11X/20X now contains a Mathematic Interpreter. Up to 1024 lines of **Mathematic Statements** can be programmed into the terminal, and these can be split into function blocks, which are called by the system as required. The function blocks are called on any of the following basis...

Call Method	Description
Background Tasks	At regularly repeating intervals, definable down to 0.01 seconds
Scheduled Tasks	At a particular time (HH: MM) on specified days of the week
Function Key Presses	As function keys are pressed

Table 10.1 – Call Methods

10.2 Maths Functions

Maths functions may be used for a variety of purposes.

1. Maintaining Internal Variables
2. Controlling Database Operations
3. Generating Alarms

10.3 Internal Registers

The available internal register types are as follows: -

Description	Name	Purpose	Registers Available
Bit Input	SmartStack %I	Digital Input Mapping	As Smartstack Set Up
Bit Output	SmartStack %Q	Digital Output Mapping	As Smartstack Set Up
Word Input	SmartStack %AI	Analog Input Mapping	As Smartstack Set Up
Word Output	SmartStack %AQ	Analog Output Mapping	As Smartstack Set Up
Internal Word Register	Internal %R	Internal Analog Data	240/1200 with BB RAM
Internal System Register	Internal %SR	System Specific Data	999
Internal Bit Register	Internal %M	Internal Digital Data	240
Network Word Output	Network %AQ	Network Analog outputs	Dependant on Network
Network Word Input	Network %AI	Network Analog inputs	Dependant on Network
Network Bit Output	Network %Q	Network Digital outputs	Dependant on Network
Network Bit Input	Network %I	Network Digital inputs	Dependant on Network

Table 10.2 - Internal Register Types

The Internal System Registers available are as follows: -

Name	Read / Write	Description
%SR01	R/W	Current page ID
%SR02	R	State of the up/down/pause/enter keys.
%SR03	R/W	Global PLC Network Address
%SR04	R/W	Contains the most recently entered password
%SR05	R	Current edit variable 0 = none being edited, 1 = first editable variable active, etc.
%SR6	R/W	Keyboard LED AND mask
%SR7	R/W	Keyboard LED OR mask
%SR8	R/W	Base Menu Page
%SR9	R/W	Write zero to shut down system
%SR11	R	RTC seconds
%SR12	R	RTC minutes
%SR13	R	RTC hours
%SR14	R	RTC date
%SR15	R	RTC month
%SR16	R	RTC year
%SR17	R	Number of days in current month
%SR18	R	Number of the day in the year (e.g. 1st February = 32)
%SR19	R	RTC day of week
%SR21	R	Number of accepted alarms
%SR22	R	Number of unaccepted alarms
%SR23	R/W	Total number of communication attempts to the PLC (Writing any value resets all comms counters)
%SR24	R/W	Number of good communication transactions
%SR25	R/W	Number of bad communication transactions
%SR26	R/W	Number of no communication transactions
%SR31	R	Can Status See bit statuses below. Write any value to reset a Can Error
%SR32	R	Can Test Result
%SR33	R	Can Off Count
%SR41	R/W	Recipe Operation Database Selector
%SR42	R/W	Recipe Operation Recipe Selector
%SR43	R/W	Recipe Operation Field Selector
%SR44	R/W	Recipe Operation Error Flag
%SR51	R/W	Touch Screen Beep Enable
%SR52	R/W	Notepad Data Saved Status
%SR53	R/W	Set Backlight State
%SR81..100	R/W	Last Accessed Record Name
%SR101.999	R/W	Last Accessed Record Data Fields

Table 10.3 – System Registers

Bit ID	Name	Indication
0	Receive Buffer Status	Indicates that the can chip has a message available
1	Rx Data Overrun	Indicates a can message has been missed
2	Transmit Buffer Status	Indicates transmission buffer is available
3	Transmit Buffer Completion	Indicates the last message for transmission has gone
4	Receiving Status	Indicates a message is being received by the can chip
5	Transmitting Status	Indicates the chip is currently transmitting a message
6	Error Status	Indicates the can chip has detected an error
7	Can Bus Off	Indicates the can chip has removed itself from the can bus
8	Can Power Fail	24V DC is not applied at the Can connector
9	Buffer Overrun	Indicates can messages are being wasted

Table 10.4 Can Status Word Format

10.4 Maths Editor Window

To view and modify the contents of the Maths Editor, click the mathematics icon from the tool bar  , or choose Maths from Configure in the main menu. After doing so the Maths Editor window appears (Fig 10.1).

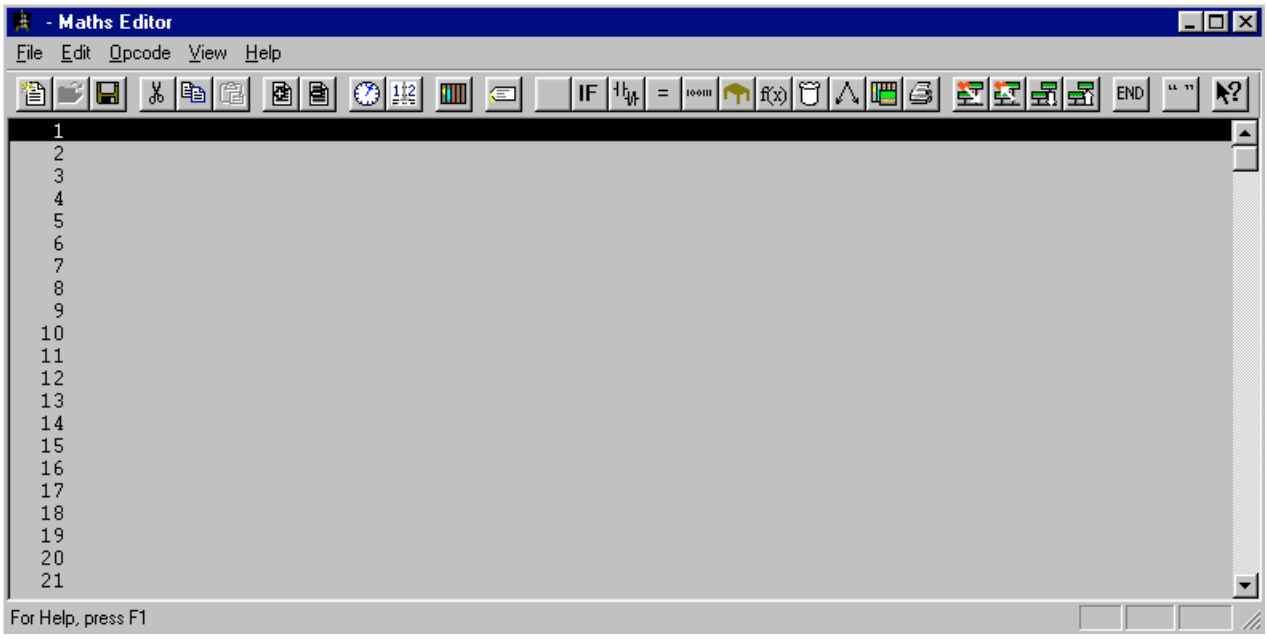


Figure 10.1 – Maths Editor Window

10.5 Execution of Maths Functions

Maths functions are called by starting at a specified line. The lines are processed consecutively beginning at the start line until a line with a *END* marker is processed, or the end of the maths listing is reached. Control may be switched using a GOTO statement in the function block or using any of the conditional statements, which will jump to another line or END marker.

10.6 Opcodes

The available operational statements are

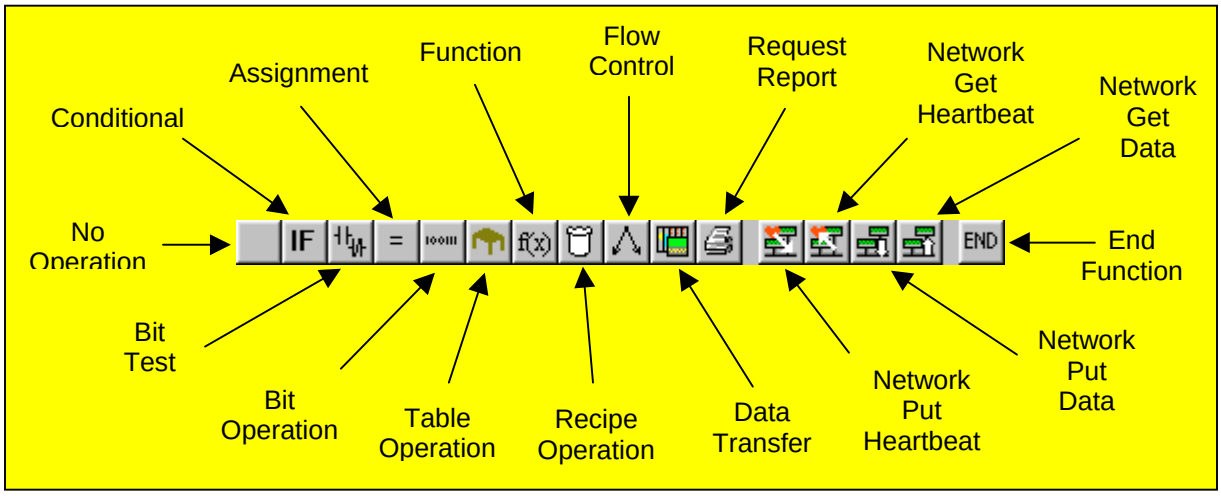


Figure 10.2 – Mathematic Operations

10.6.1 No Operation

This statement causes the line to do nothing. The statement shows as a blank line.

10.6.2 Conditional

This statement compares the contents of a local store register with either the contents of another local store register or a constant. After which an action is completed, depending on the result of the comparison.

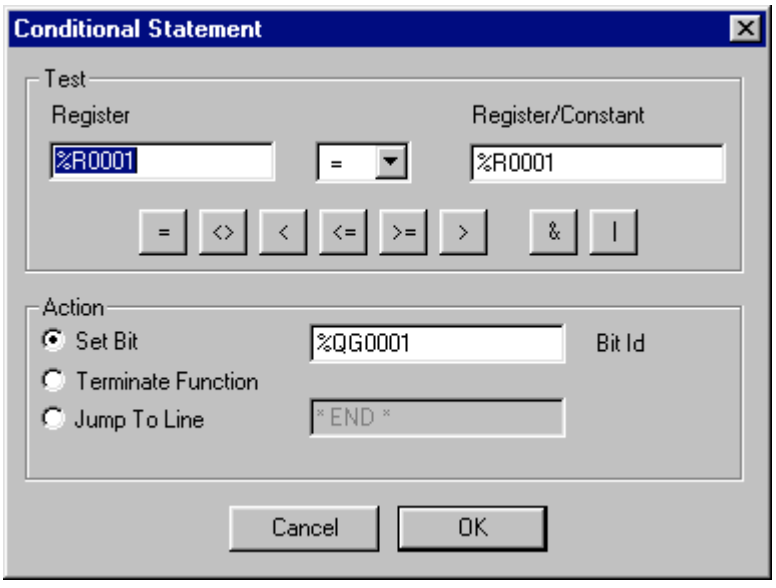


Figure 10.3 – Conditional Statement

The available Comparison Tests are:

10.6.2.1 Equal

Test whether the specified register is equal to the contents of another register or a constant.

10.6.2.2 Not Equal

Test whether the specified register is not equal to the contents of another register or a constant.

10.6.2.3 Less Than

Test whether the specified register is less than the contents of another register or a constant.

10.6.2.4 Less Than or Equal

Test whether the specified register is less than or equal to the contents of another register or a constant.

10.6.2.5 Greater Than or Equal

Test whether the specified register is greater than or equal to the contents of another register or a constant.

10.6.2.6 Greater Than

Test whether the specified register is greater than the contents of another register or a constant.

10.6.2.7 And

Test whether the result of performing a bitwise AND on a register and either another register or a constant value is not zero.

10.6.2.8 Or

Test whether the result of performing a bitwise OR on a register and either another register or a constant value is not zero.

Note:
For the AND and OR conditional statements the two values are combined in a 'bitwise' fashion. The result is considered TRUE if any bits are set and FALSE if no bits are set.

Action
Depending on the result of the test any of three actions may be performed.

10.6.2.9 Set Bit

If the condition tested is TRUE then the specified bit will be set, if the condition tested is FALSE, then the specified bit will be cleared.

10.6.2.10 Terminate Function

If the condition tested is TRUE then the maths function stops executing, if the condition tested is FALSE, then execution continues at the next maths line.

10.6.2.11 Jump To Line.

If the condition tested is TRUE then execution of the maths function continues at the specified line number, if the condition tested is FALSE, then execution continues at the next maths line.

10.6.3 Bit Test

Allows the testing of individual bits and subsequent actions to be taken.

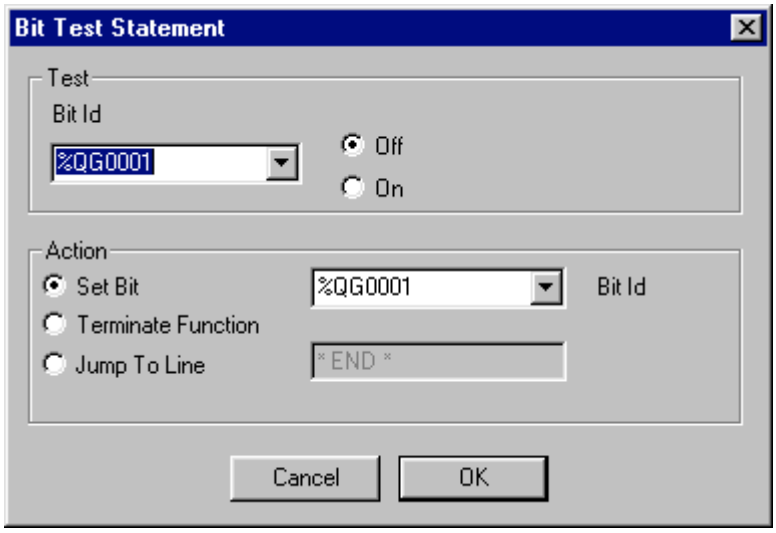


Figure 10.4 – Bit Test Statement

The bit specified is checked against the specified state. If the bit states match then the condition is considered to be TRUE. Refer to the conditional functions section of the manual for an explanation of the actions which may be performed on the result of the bit test.

10.6.4 Assignment

This statement assigns a value to the specified local register. The value of the register can be mathematically manipulated before storing it the local register.

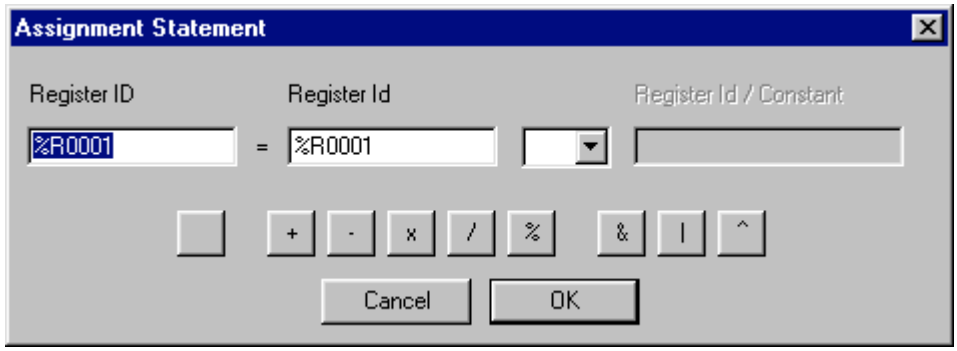


Figure 10.5 – Assignment Statement

The available assignment functions are

10.6.4.1 Equal

This function makes one Register equal to the value in another register or to a constant value.

10.6.4.2 Plus

This function lets the programmer add the contents of a register to the contents of another register or constant and stores the result in the specified register.

10.6.4.3 Minus

This function lets the programmer subtract the contents of a register or constant from the contents of a register and stores in the result in the specified register.

10.6.4.4 Multiply

This function lets the programmer multiply the contents of a register by the contents of another register or constant and stores the result in the specified register. This function has a special case that allows a decimal fraction to be specified as the constant, for example multiply by 0.025.

10.6.4.5 Divide

This function lets the programmer divide the contents of a register by the contents of another register or constant and stores the result in the specified register. This function has a special case that allows a decimal fraction to be specified as the constant, for example divide by 0.3333

10.6.4.6 Modulus

This function divides one integer register by the contents of another register or by a constant, and stores the remainder in the specified register.

e.g. register %R100 contains 18
execute %R101 = %R100 % 7
%R101 is set to the value of Reminder(18 / 7) = 4.

10.6.4.7 And

This function lets the programmer AND the contents of a register with the contents of another register or constant and stores the result in the specified register. The AND operation is performed on a bit basis.
e.g. register %R100 contains value 85 decimal (= b0000000001010101)
execute %R101 = %R100 AND b0000111100001111
%R101 is set to the value b0000000000000101 (=5)

10.6.4.8 Or

This function lets the programmer OR the contents of a register with the contents of another register or constant and stores the result in the specified register. The OR operation is performed on a by bit basis.
e.g. register %R100 contains value 85 decimal (= b0000000001010101)
execute %R101 = %R100 OR b0000111100001111
%R101 is set to the value b0000111101011111 (=3935)

10.6.4.9 Exclusive Or

This function lets the programmer XOR the contents of a register with the contents of another register or constant and stores the result in the specified register. The XOR operation is performed on a by bit basis.
e.g. register %R100 contains value 85 decimal (= b0000000001010101)
execute %R101 = %R100 XOR b0000111100001111
%R101 is set to the value b0000111101011010 (=3930)

10.6.5 Bit Operation

This operational statement can perform 4 different operations on a local bit register.

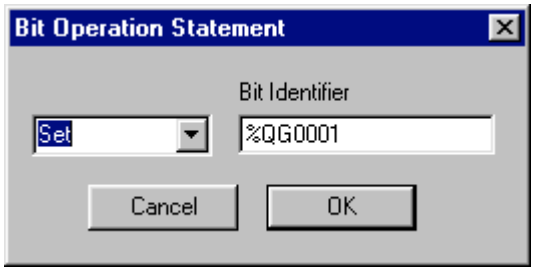


Figure 10.6 – Bit Operation Statement Window

10.6.5.1 Set

Changes the bit value to 1

10.6.5.2 Clear

Changes the bit value to 0

10.6.5.3 Invert

Changes the bit value to 1, if present value is 0, or changes the bit value to 0, if present value is 1.

10.6.5.4 Pulse

Sets the specified bit high for 1 second and clears it to go low.

10.6.6 Table Operation

This operation statement performs a number of operations on a specified table. As per figure 10.5 the table definition is defined as the number of local registers in the table beginning at the specified local register.

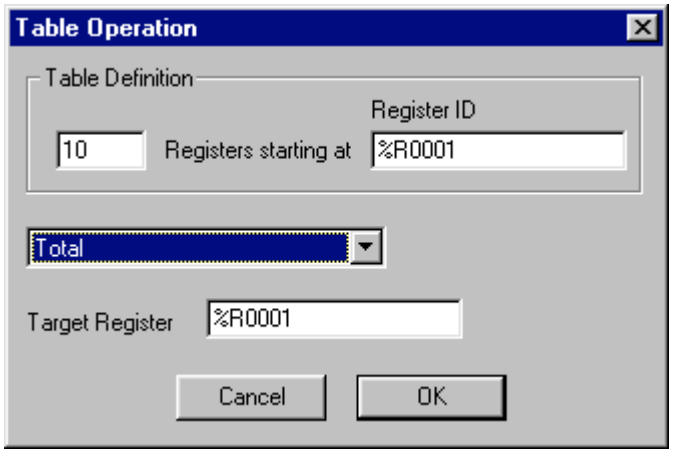


Figure 10.7 – Table Operation Window

The available operations are:

10.6.6.1 Total

This action sums the contents of the registers and stores the result in the target register.

10.6.6.2 Average

This action averages the contents of the registers and stores the result in the target register.

10.6.6.3 Maximum

This action searches the contents of the registers and stores the maximum value in the target register.

10.6.6.4 Minimum

This action searches the contents of the registers and stores the minimum value in the target register.

10.6.6.5 Move To

This action moves the contents of the registers in the table as a memory block, to a memory block beginning at the target register

10.6.6.6 Swap With

This action exchanges the contents of the registers in the table as a memory block, with a memory block beginning at the target register

10.6.6.7 Reset

This action resets the contents of each of the registers in the table to zero.

10.6.7 Function

This action performs a function on the contents of the specified action and stores the result in the same register or another specified register. The available functions are: -

10.6.7.1 Root

This function puts the square root of the contents of the first register in the second specified register.

10.6.7.2 ToBCD

This function converts the contents of the first register to Binary Coded Decimal and stores it in the second specified register.

10.6.7.3 FromBCD

This function converts the contents of the first register from Binary Coded Decimal and stores it in the second specified register.

10.6.8 Recipe Operation

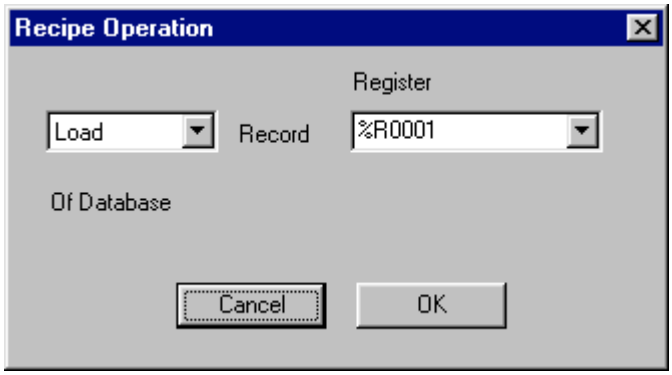


Figure 10.8 – Recipe Operation Window

This function allows the transfer of a record to or from the recipe database. The available functions are: -

10.6.8.1 Load recipe

Loads a recipe whose id is contained within a specified internal register into the recipe data buffer within the system registers.

10.6.8.2 Save recipe

Saves a recipe whose id is contained within a specified internal register from the recipe data buffer within the system registers.
Note that the save operation writes the data to flash memory in the terminal. Whilst this provides optimum data security, it also requires that other terminal operation halts whilst the flash is written to. This includes communication with the AE, network functions and screen update.

10.6.9 Control Flow

This action allows the programmer to perform simple program flow commands within the mathematic function. The available commands are

10.6.9.1 Pause

This command allows the programmer to pause the mathematic function for a specified number of seconds.

10.6.9.2 Goto

This command allows the programmer to jump to a specified line number.

10.6.9.3 Gosub

This command is similar to the **Goto** command however when an **End** command is reached the program flow returns to the line immediately after line where the Gosub command was executed.

10.6.10 Data Transfer

Allows blocks of data to be transferred between local registers and connected devices.

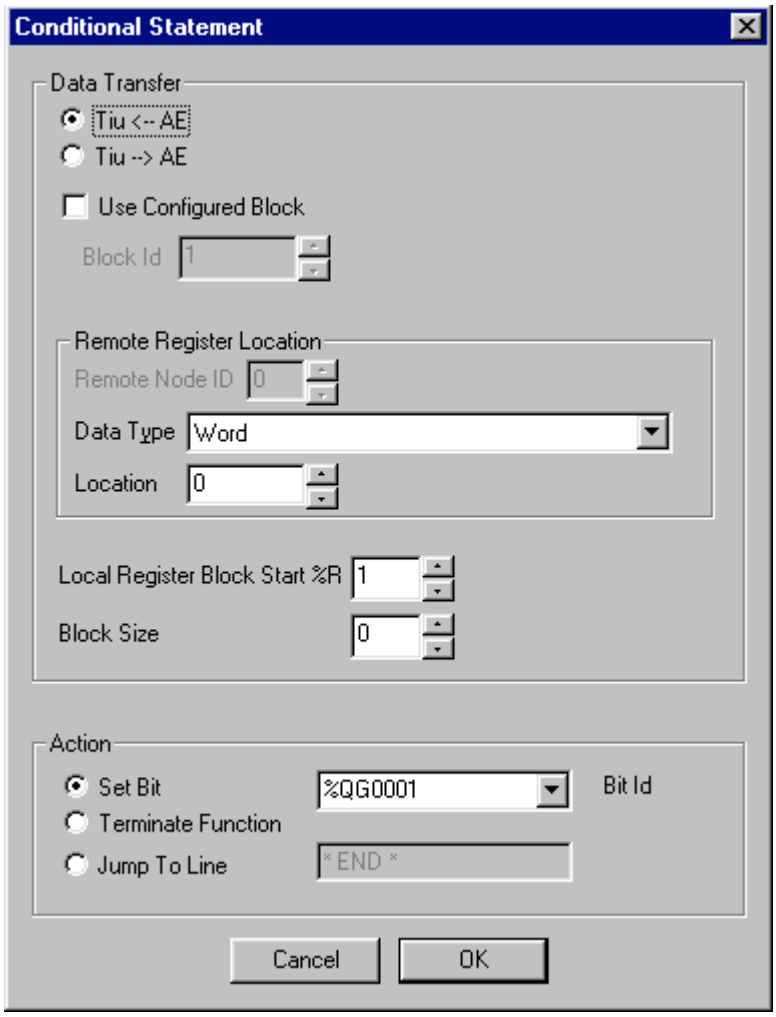


Figure 10.9 – Data Transfer Operation Window

10.6.10.1 Data Transfer

Select the direction in which data will be transferred. Either to or from the AE, or alternately one of the 64 preconfigured communication blocks can be used.

10.6.10.2 Remote Register Location

Specifies the start address of where the data block will be written to or read from the connected equipment.

10.6.10.3 Local Register Block start

Specifies where the data will be read from or written to in the Tiu. Note that only %R registers can be used as for the data store.

10.6.10.4 Block size

Specify the number of registers to be transferred.

10.6.10.5 Action

What to do if the specified block is not transferred correctly.

10.6.11 Network Put Heartbeat Operation

This command allows for a network heartbeat signal to be sent out on the network.

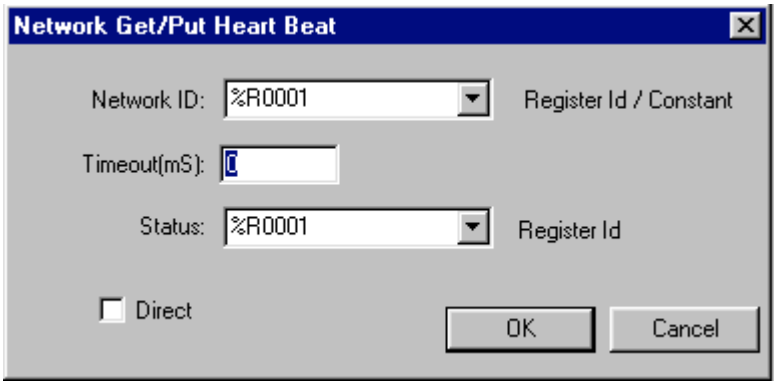


Figure 10.10 – Network Put Heartbeat Operation

Send a heartbeat to the selected network ID, this may be obtained from a local register or be a constant. Status information for the operation will be stored if applicable in the specified Status register after the timeout.

10.6.12 Network Get Heartbeat Operation

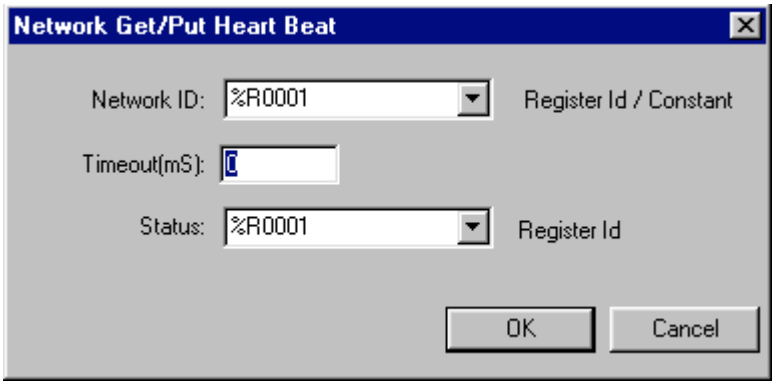


Figure 10.11 – Network Get Heartbeat Operation

Obtains a heartbeat from the specified network node provided it occurs within the specified timeout period. The status of the operation is stored in the status register

10.6.13 Network Put Data Operation

Send Data Out on the network to the as required.

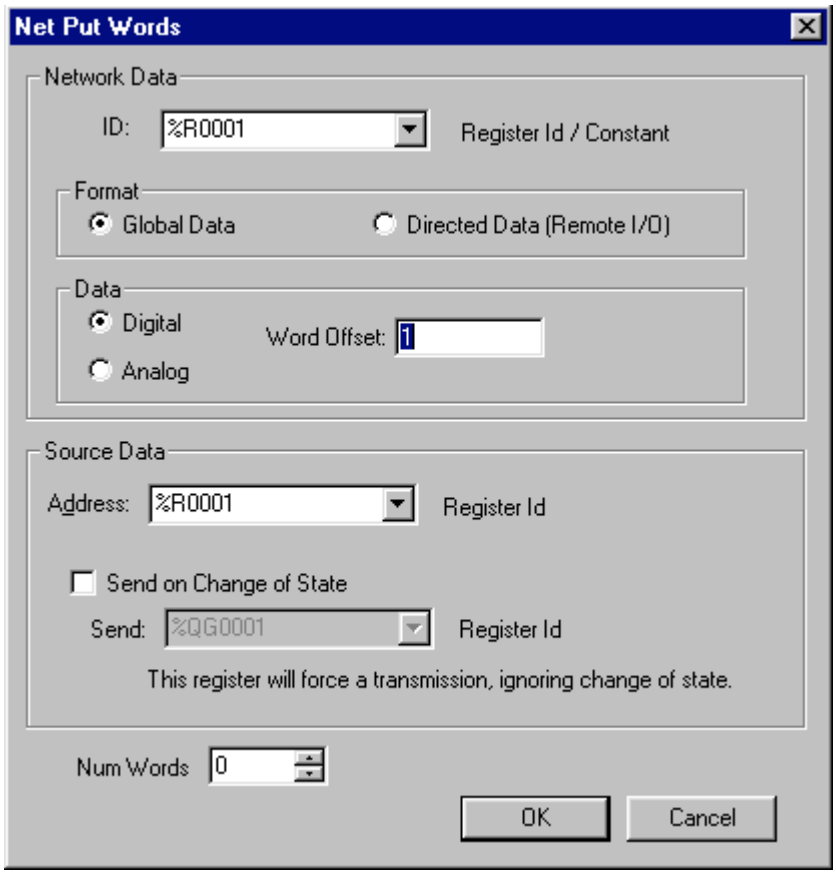


Figure 10.12 – Network Put Data Operation

10.6.13.1 Network Data

ID specifes the node number for which the data is either generated (Global Data) or sent to (Directed Data)..

10.6.13.2 Format

Select whether the data is to be sent as Global data for all nodes to receive or as Directed data (targeted to a specific node)

10.6.13.3 Data

Is the data digital (%QGs), or analog (%AQGs). Also specify the start offset of the first register to be sent.

10.6.13.4 Source Data

Specifies where the data to be sent out is stored internally.

10.6.13.5 Num words

Specifies the size of the global data block to be sent out.

10.6.14 Network Get Data Operation

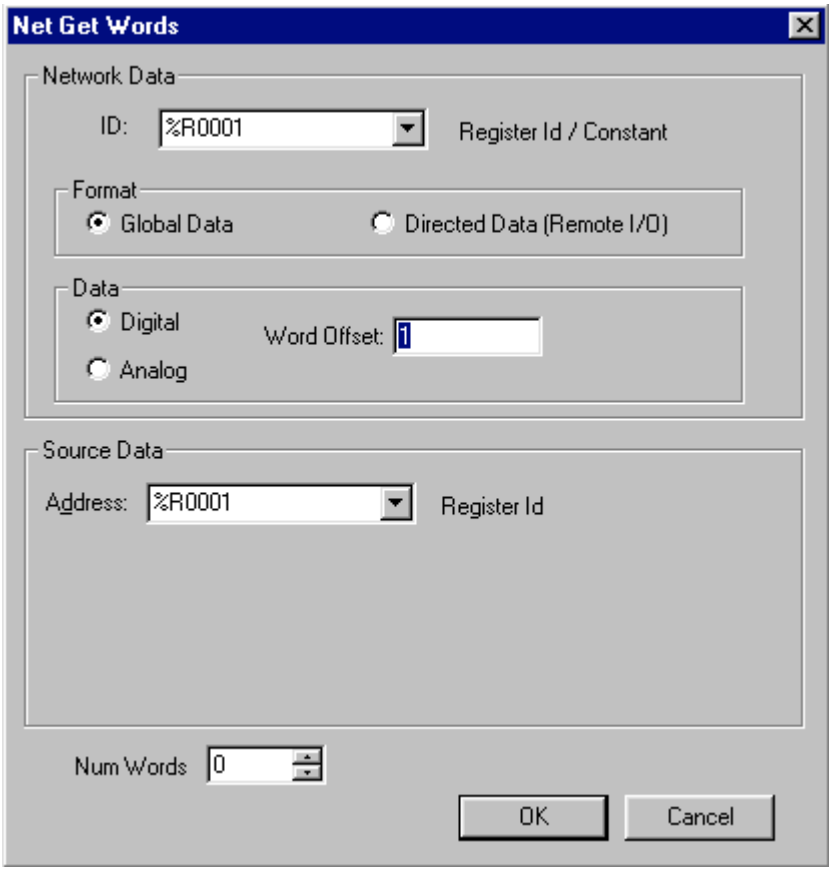


Figure 10.13 – Network Get Data Operation

10.6.14.1 Network Data

ID specifes the node number for which the data is either generated (Global Data) or sent to (Directed Data)..

10.6.14.2 Format

Select whether the data is to be sent as Global data for all nodes to receive or as Directed data (targeted to a specific node)

10.6.14.3 Data

Is the data digital (%QGs), or analog (%AQGs). Also specify the start offset of the first register to be read into local data.

10.6.14.4 Source Data

Specifies where the data is to be stored internally.

10.6.14.5 Num words

Specifies the size of the global data block to be transferred.

10.6.15 Request Report Printout

Causes the terminal to generate the specified report.

10.6.16 Set End

This action denotes the end of a mathematic function.

10.7 Background Functions

The HE500TIU10X/11X/20X terminals background function facility allows the terminal to continually run up to 8 maths functions automatically, without operator intervention. These functions can be programmed to run repeatedly after a specified time interval or be executed once on initialisation of the terminal.
To program a background function, choose **Background Functions** from **Edit** menu, in the **Maths Editor Window.** Figure 10.6 shows the background function set-up window.

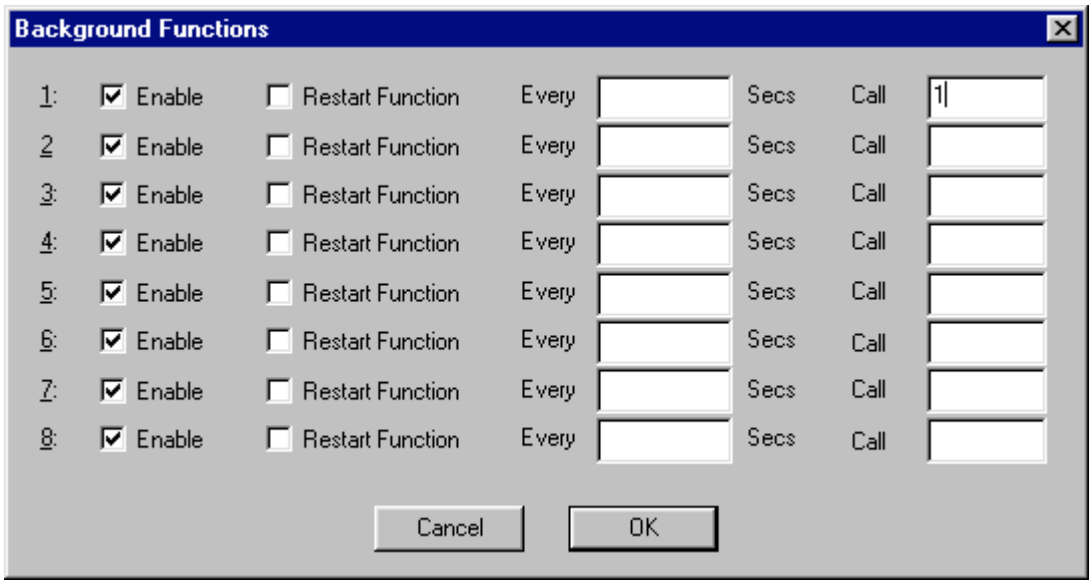


Figure 10.14 – Background Function Set-up Window

10.7.1 To Program a Background Function

Enable one of the 8 background functions by clicking in the tick box next to the number of the background function.

1. Click **Restart Function** if the function is to be executed only on initialisation of the terminal.
2. In the **Seconds** field specify the time interval between executions of the function.
3. In the **Call** field, specify the function to be called, this is the line number where the function begins.

10.8 Scheduled Functions

Scheduled Functions have been provided as a means of initiating functions on a time and day basis. There are 16 schedules available each of which specifies a time of day and day of the week at which a Maths Function is to be called.

To configure the scheduled functions for the TIU terminal select Scheduled Functions from the Edit menu.

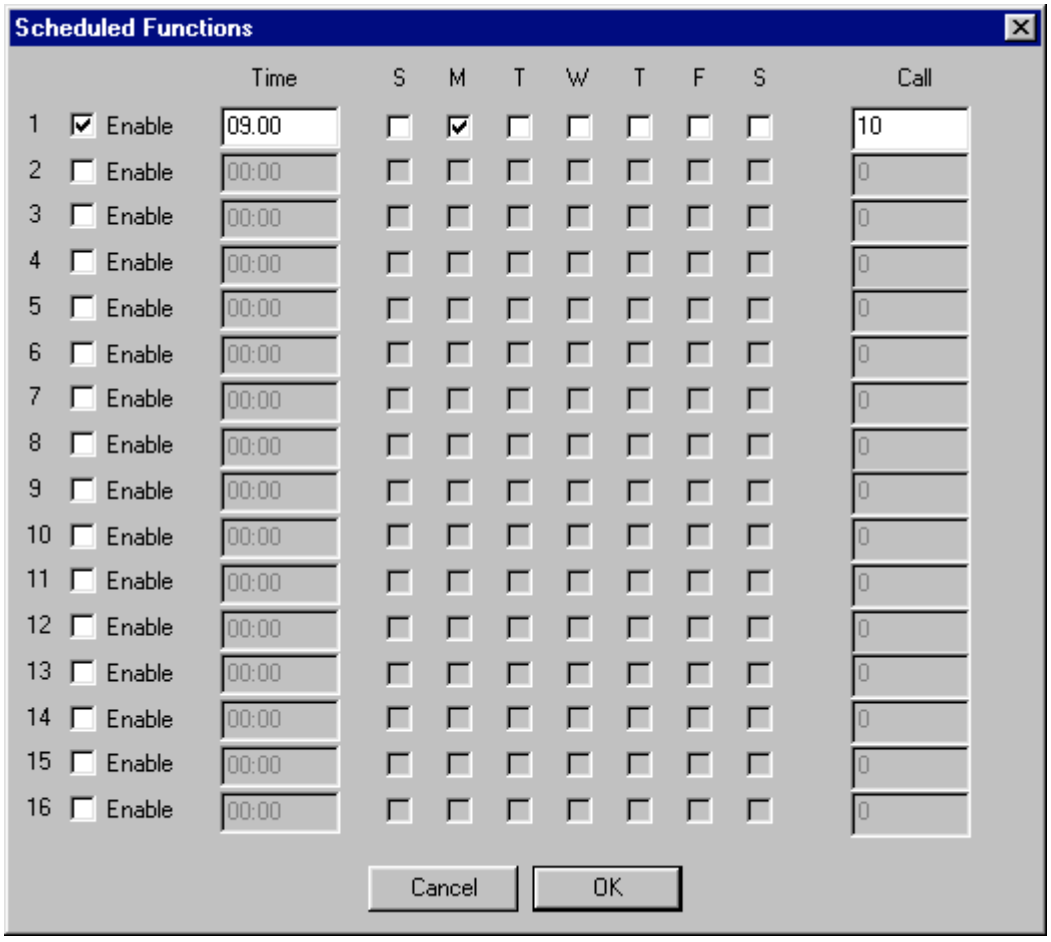


Figure 10.15 - Scheduled Functions Window

10.8.1 To Set-Up a Schedule Function

1. Enable the schedule by clicking on the tick box corresponding to the schedule number.
2. In the **Time** enter the time of day at which the function is to be executed.
3. Click the day or days on which the function is to be executed.
4. In the **Call** field enter the mathematic function to be executed, this is the line number of the mathematic function.

10.9 Internal Register Tagging

Internal register tagging gives two facilities to the maths editor. One is to give names to each %R register to aid in documenting and debugging the mathematics, the other is to allow a pair of registers to be concatenated to form a 32 bit register, allowing maths accuracy to be increased.

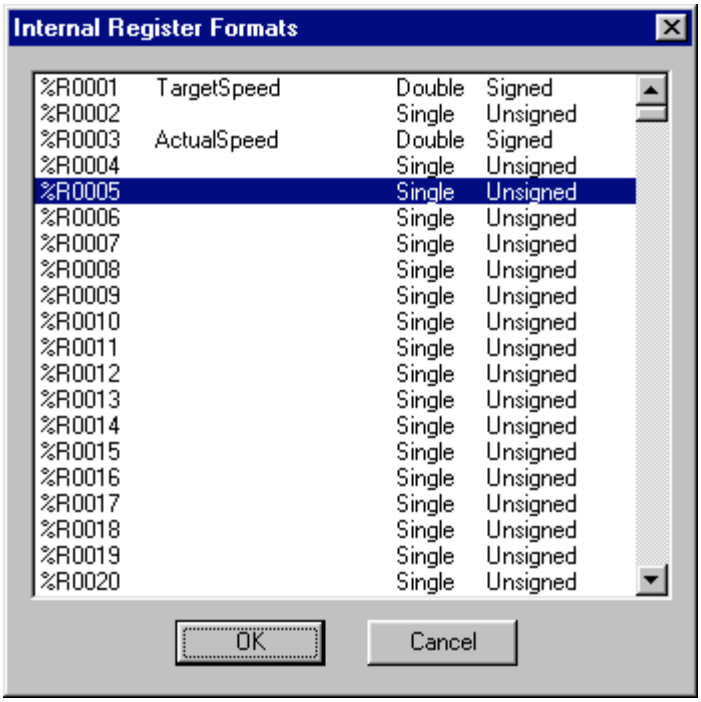


Figure 10.16 – Data Tagging

In order to alter the tag or the size/sign of a number double click on the register or select it and press ENTER. Note that when a register is selected as 32 bit the next consecutive register is used to store the high word of the value. Hence in the displayed example %R0001 and %R0002 are used to store TargetSpeed, while %R0003 and %R0004 are used to store the ActualSpeed. Beware – any modification elsewhere of the high word of a variable will corrupt the value of the variable.

The range of values storable in an internal register is dependant on the size and whether or not it is signed as follows…

Size	Sign	Minimum	Maximum
16 Bit	Unsigned	0	65535
16 Bit	Signed	-32768	32767
32 Bit	Unsigned	0	4294967295
32 Bit	Signed	-2147483648	2147483647

10.10 Data Transfer Block

Local registers in the terminal can be mapped to registers in the automated equipment using the **Data Transfer Block** facility. The maths feature does not allow PLC data to be used directly within the maths

script but relies on input data being preloaded from the attached AE prior to execution and output data being written to the AE following execution. This is because it is not practical to continually fetch data from and send data to the AE as required whilst the maths is executing.
The data transfer facility allows the data to be read from the AE continually either periodically, or on demand within the mathematics, and written back to the AE either when a change is detected or again on demand within the mathematics.

10.10.1 To Add a Block Transfer

From the **Edit** menu choose **Data Transfer Block**.

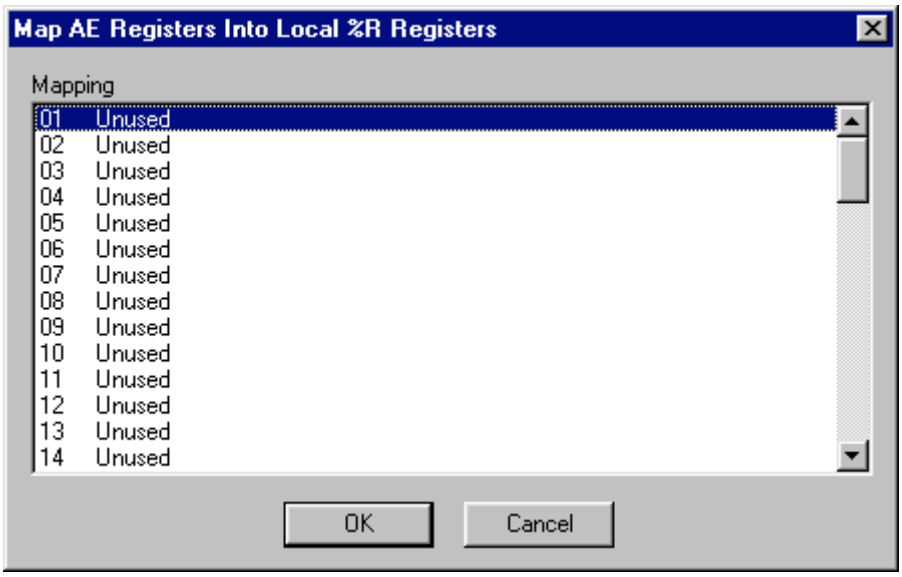


Figure 10.17 – Data Transfer Block

Double click on any mapping to edit it (To add a new mapping edit a currently unused block). The following dialog box is displayed

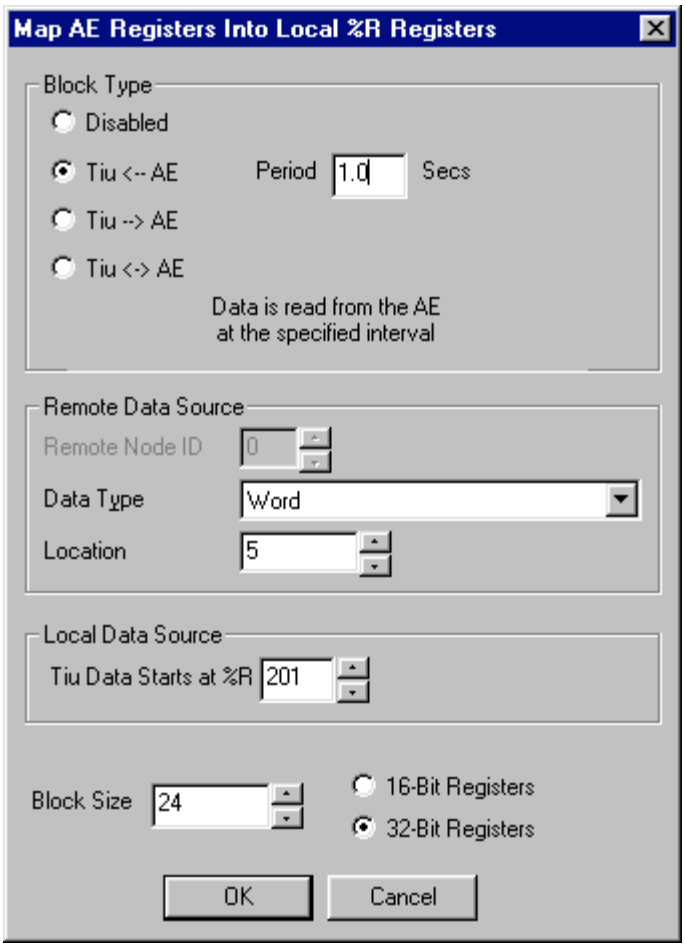


Figure 10.18 – Data Mapping Configuration

10.10.2 Block Type

Selects the direction and control mechanism of the transfer block. The following transfer types are supported.

1 Tiu <- AE

Data is transferred from the AE and placed in Internal registers within the Tiu continually at the specified period. Note that the specified period is only a target and is not guaranteed. Creating many transfer blocks with a short period can reduce communication throughput in other areas, and may cause screen display to become sluggish. It is wise to select the highest acceptable transfer period.

2 TIU -> AE

Data is automatically written to the AE whenever a change is detected within any register in the specified block.

3 Tiu <-> AE

Data may be read from or written to the AE under the control of the Tiu. The Data transfer maths function is used to cause the transfer to occur.

10.10.3 Remote Data Source

Select where the source of the date to be used to control the shape is. This can either be a register within the connected AE or an internal register. Drop down the data type box to select the register type to be

used and specify the register number in Location. Where AE Network mode has been selected the PLC node ID from which this variable should be obtained can be specified in node ID.
If auto mask is selected only the relevant bits within the control word to be used.

10.10.4 Local Data Source

Specifies the target register/bit in the AE target area. Where multiple registers are specified (the block size is not 1) the first register/bit in the AE is specified.
Local Data Source
Specifies the buffer area in the Tiu for the transfer. Currently the data can only be transferred to/from %R Internal registers in the Tiu.

10.10.5 Block Size

Specifies the number of registers to be transferred.

10.10.6 16 Bit/32 Bit registers

Use this selection to set the access size of the data within the Tiu.
In the example shown above 24 registers will be read from the AE starting at Word 5, and stored in the Tiu Internal registers starting at %R201, Hence…
%R201 is loaded with AE Word 5
%R202 is loaded with AE Word 6
%R203 is loaded with AE Word 7 etc.

10.11 Comments

Select comments to add documentation to your mathematics script.

10.12 Using Indirection

Indirection is allowed on the %R local registers, e.g. %R10 = %R(%R40) + %R(%41). If %R40 contain 100 and %R41 contains 11, then %R10 will be sum of the contents of %R100 and %R11.

Indirection Example

To Fill %R100 to %R199 with the values 0 to 99…

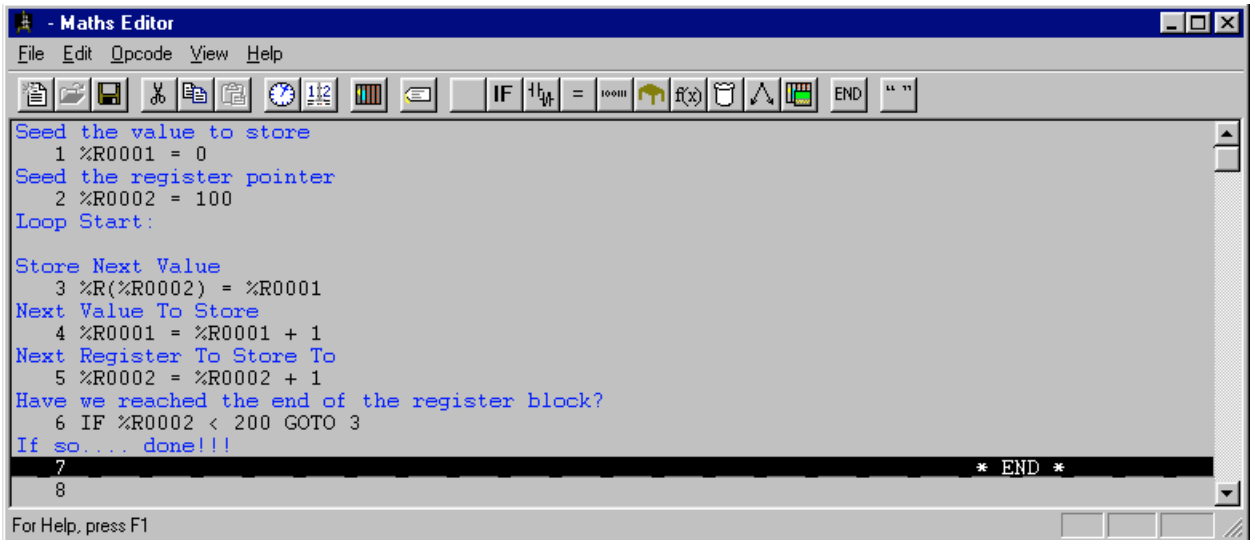


Figure 10.19 - Mathematics Indirection

In this example %R1 counts up from 0 to 99 while %R2 counts from 100 to 199. %R2 is used as the indirection register to store the required value in the appropriate register.

10.13 Constants

CBreeze allows the entry of constants in a variety of formats

Decimal
Enter number as is e.g. 12345, -123, 0

Hexadecimal
Enter number with a leading 'x' e.g. x12344321

Binary
Enter number with a leading 'b' e.g. b1000111100001111

ASCII
Up to four ASCII characters may be entered enclosed in quotes e.g. 'ABCD'.

Scale
Applicable only to multiply and divide assignment operations a scale can be entered as a decimal number, for example 0.0025, 12.75.

CHAPTER 11 SmartStack™

11.1 General

Horner has now added the SmartStack™ modules from the TIU Range to the HE500TIU20X range. The SmartStack system is a method of allowing I/O expansion on an HMI. A wide range of modules is available including Digital and Analogue.

11.2 Installing and Removing a SmartStack Module

The following section describes how to install and remove a SmartStack Module.

Caution: To function properly and avoid possible damage, do not install more than four Smart Stack™ Modules per HE500TIU20X.

a. Installing SmartStack Modules

1. Hook the tabs. Each SmartStack Module has two tabs that fit into slots located on the HE500TIU20X. (The slots on the HE500TIU20X are located on the back cover.)
2. Press the SmartStack Module into the “locked” position, making sure to align the SmartStack Module fasteners with the SmartStack receptacles on the HE500TIU20X.

b. Removing SmartStack Modules

1. Using a Flathead screwdriver, pry up the end of the SmartStack Module (opposite of tabs) and swing the module out.
2. Lift out the tabs of the module.

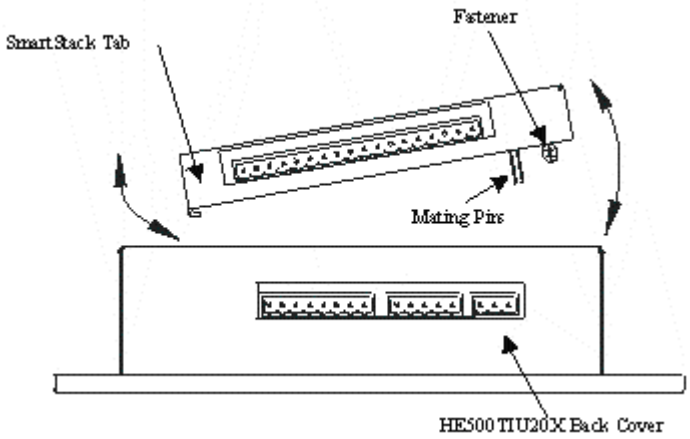


Figure 11.1 – Installing a SmartStack™ Module in a TIU.

11.3 Configuring SmartStack Module

Click on the SmartStack Configuration icon or choose **SmartStack I/O** from the **Configuration** menu.

The following configuration dialog box is displayed: -

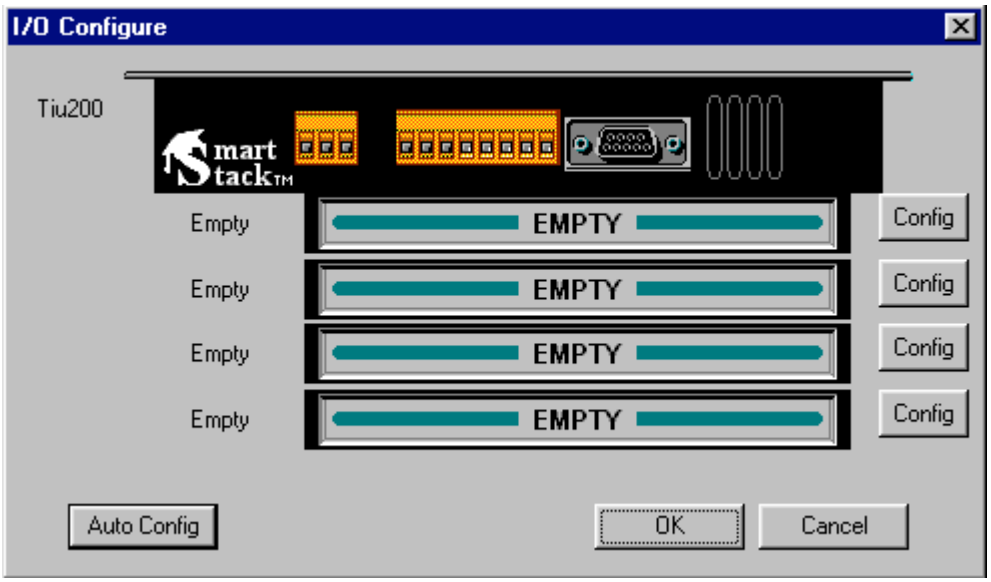


Figure 11.1 – SmartStack Configuration

To configure a specific smartstack module click the config button to the right of the required module or right click on the module itself.

NOTE: - After the project is downloaded to the TIU20X, on power up the TIU checks if the specified SmartStack module is inserted. If the module is not inserted the TIU will display “SmartStack I/O Error”. Power down TIU and insert specified SmartStack module.

11.4 SmartStack I/O

The input and output of the SmartStack is handled within the local registers of the terminal. The local registers and therefore the I/O of the SmartStack is then analysed or manipulated within the Maths scripting function of the **CBREEZE** software. See chapter 10 for more information on the Maths Scripting Facilities within CBreeze.

11.5 Module Addressing

The input and output register names and addresses are as follows: -

Table 11.2 I/O Address	
I/O Type	**Address**
Bit Input	%Innnnn
Bit Output	%Qnnnnn
Word Input	%AInnnnn
Word Output	%AQnnnnn

Refer to the smartstack setup for details of where each individual module is mapped in the I/O Map.

11.6 Displaying Data From SmartStack

Data from SmartStack modules can be embedded into a menu page in exactly the same way as other AE devices. Embed the data type as normal and select the Location from the range of “Smart I/O” register types shown in the pull down register table. The normal function can then be applied to the register value, i.e. Range Checking, Scaling etc.

Note: The numeric default settings for Analogue modules should be set to 16 bit and signed.
Output data can be edited / scaled using the screen editor in the same way as a normal AE.
Data to / from SmartStack can also be scaled or manipulated via the Maths.

Note: The numeric default settings for Analogue modules should be set to 16 bit and signed.
Output data can be edited / scaled using the screen editor in the same way as a normal AE.

It is not possible to read and then modify Output types directly within a TIU system. If it is necessary to do this, it is better to use a System %R register within the Maths facility to manipulate and hold the “master value” then assign the actual value to a %AQ register. See Chapter 10 Mathematics on writing and calling maths functions.
Again, it is good practise to write to an Output type at only 1 point in the configuration.

```
 5 %R0005 = %R0005 x 2
 6 IF %R0005 > 128 GOTO 10
 7 IF %R0005 = 0 GOTO 10
 8 %AQ0001 = %R0005
 9 %AQ10001 = %R0005                                          * END *
10 %R0005 = 1
11 GOTO 8
```

Figure 11.3 – Math Example Word Output

11.7 Considerations for Shutting Down & Restarting a HE500TIU20X with I/O

Shutdow n
During a shutdown for downloading, the smartstack outputs will go to the state defined in the module specific setup. It is important to make sure that all outputs are defined to go to a safe state when the Tiu200 enters shutdown.

Restart

During a restart either from a “Power Up” or from after a download, SmartStack outputs may not always be in the mode required. This situation could be overcome by calling a Restart Maths function to correctly initialise the SmartStack output modules.

Examples are shown below

```
25
26 %AQ00001 = 7
27 %AQ10001 = 0
28 %AQ20001 = -8000
29 %AQ20002 = 8000                                          * END *
30
```

Figure 11.4 – Math Example Initialise Outputs On Power Up

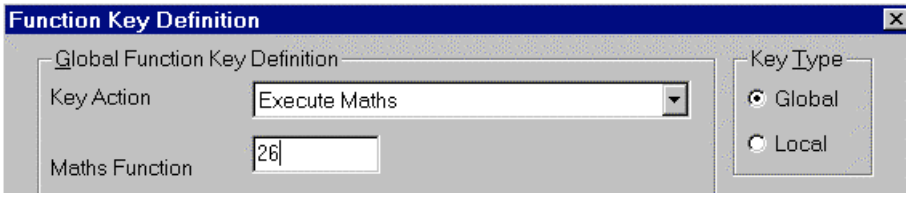


Figure 11.5 – Calling Math Function From Function Key

Figure 11.6 – Calling Math Function from Background Function

CHAPTER 12 THE REPORT GENERATOR

12.1 General

Horner has now added the capability to print reports from the TIU1XX, TIU2XX, TIU3XX, TIU4XX, TIU5XX and TIU6XX series of terminals. Currently only text based reports are supported. The TIU3XX, TIU4XX, TIU5XX and TIU6XX use the onboard Centronics™ port to print reports. Contact Horner for details of a suitable printer cable.

For the TIU1XX and TIU2XX a serial printer is required as the TIU's programming port is used for report printing.
Note that when Report Printing is enabled on the TIU1XX and TIU2XX programming port the programming functionality no longer operates other than for a brief three second window immediately after the version numbers are announced on power up, or by shutting the system down which may be done by writing the value 0 to system register %SR9 using a function key macro.

12.2 Report Editor Window

When the report editor is selected the following window is displayed:

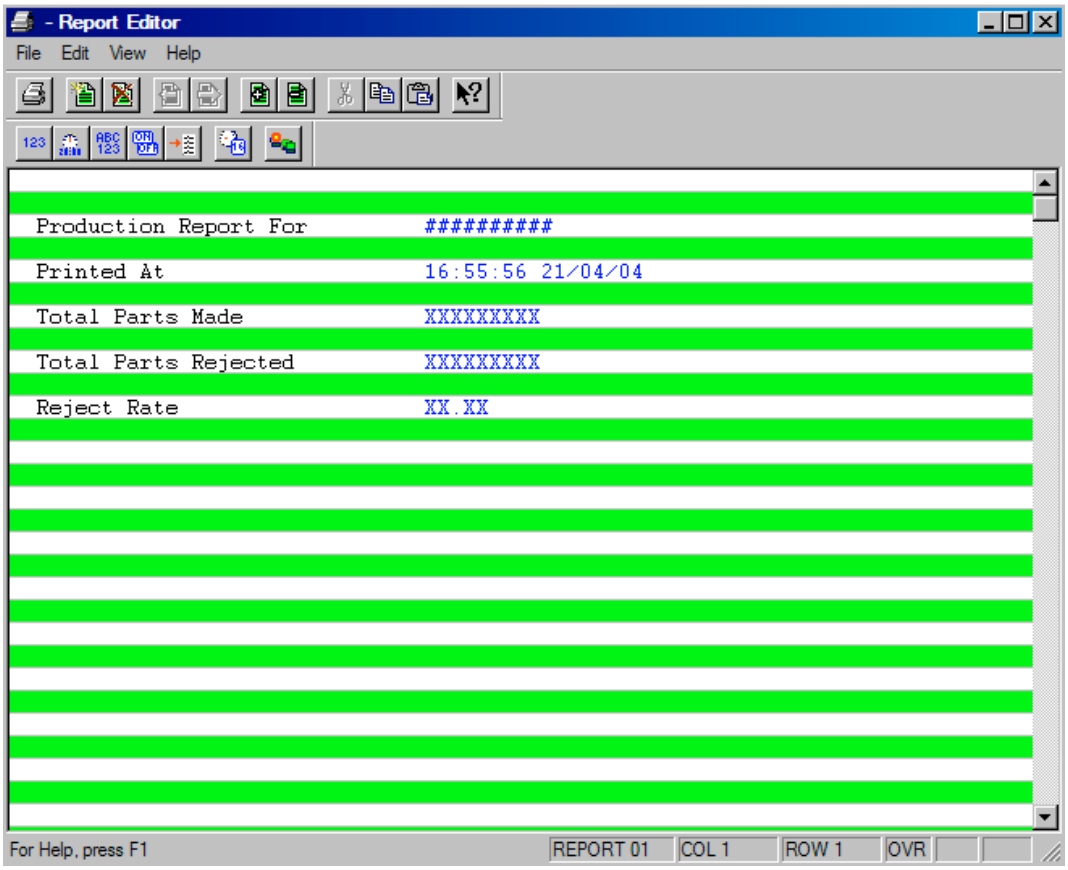


Figure 12.1 Report Editor Main Screen

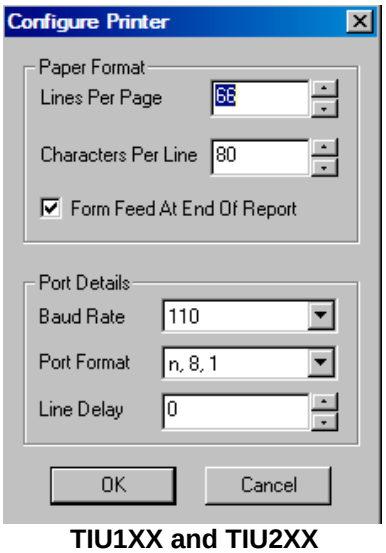
12.3 Configure Printer

In Report Editor Click on Printer Icon.

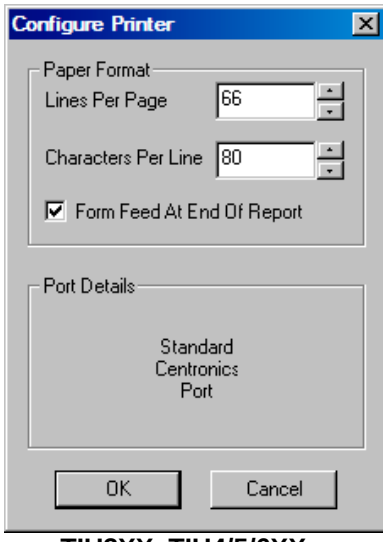
Figure 12.2 Configure Printer Icon

For Paper Format, configure Lines Per Page (10-240) and Characters Per Line (10-132). Form Feed at End Of Report can be unticked to disable form feed after report text. See Figure 12.3.

For the TIU1xx and TIU2xx, Baud Rate, Port Format and Line Feed Delay (0-200s) are configurable from the drop down lists



TIU1XX and TIU2XX



TIU3XX, TIU4/5/6XX

Figure 12.3 Configure Printer Options

NOTES

CHAPTER 13 CHARACTER GENERATOR

13.1 Scope (Not available on the HE500TIU050)

The ***CBREEZE*** software allows the user to edit, create and display on the HE500TIU10X/11X/20X special characters. These characters may be company logos, special symbols or multilingual, non-standard KEYBOARD characters such as Ω, é, °, © or ±.

Note: The character set for the font double height is scaled automatically from the 8x6-character set. The character set for the font x4 is scaled automatically from the 16x12-character set.

Within each character set are up to 256 characters, however, not all these characters are usable and/or editable by the user.

Table 13.1 – Make-up of a Character Set

Characters 0 to 31	System characters – not useable or editable
Characters 32 to 127	Standard keyboard characters – useable and editable although it is not recommended the user edit these characters.
Characters 128 to 160	Editable and useable characters. This is the area of the character set for use.
Characters 161 to 255	Extended keyboard characters – useable and editable although it is not recommended the user edit these characters.

13.2 To Insert a Special Character:

1. Place the pointer on the display where the character is to go.
2. Press <Ctrl> <Enter> or by clicking right mouse button. Click on the character in the Character Map (see Figure 5.2) to be inserted.

13.3 To Create Or Edit a Character:

1. From **Configure** on the menu bar, choose **Fonts**. The screen in Figure 13.1 appears.

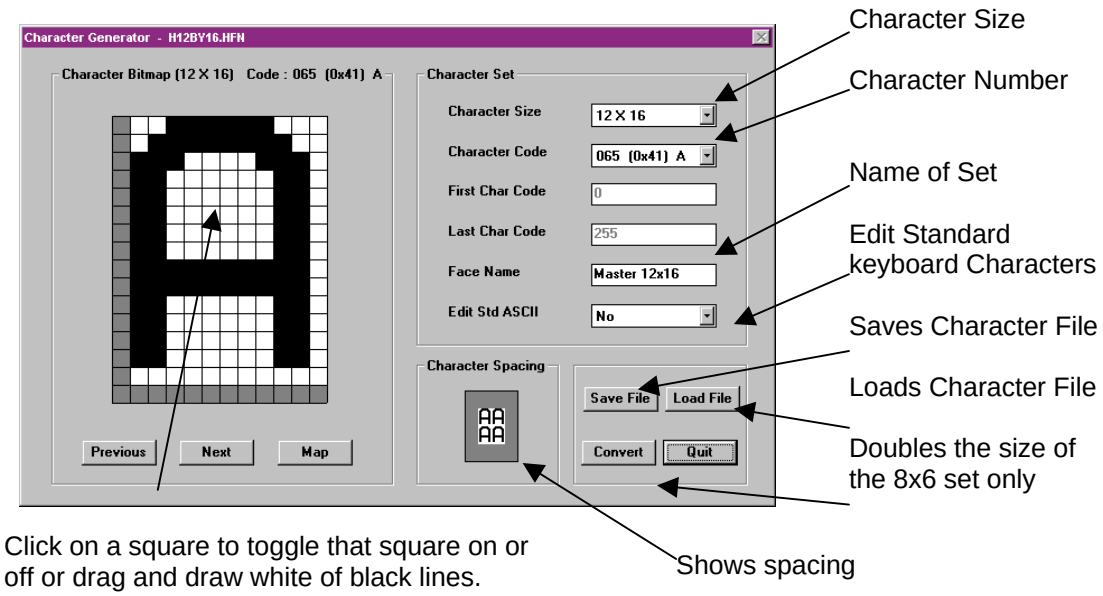


Figure 13.1 - Character Generator Screen

2. Under **Character Set**, choose the **Character Size** to be edited. Beside **Set Name**, enter a name that describes this set.

3. Click on **Map** to show the total character set. The screen in Figure 5.2 appears. The first four rows are the standard keyboard characters, which should not be edited. The fifth row is editable and useable. The lower three rows are the extended keyboard characters, which should not be edited. Click on the character to be edited or blank box to create a character.

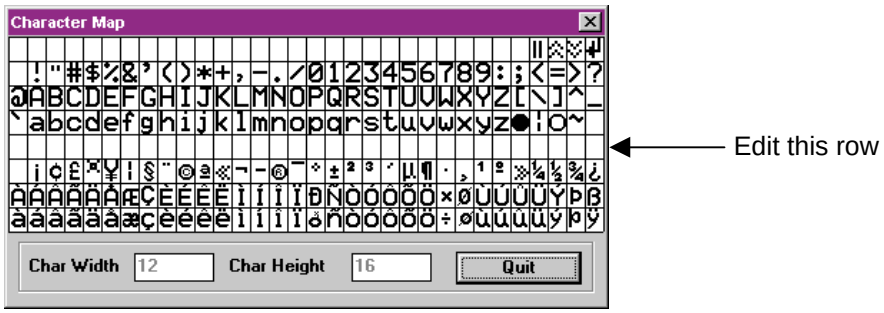


Figure 13.2 – Character Map

NOTE: Standard and Extended keyboard character are editable; however, this must be done with caution as it effects how characters are displayed on the HE500TIU050/100/110, i.e., changing "4" to • causes all 4's from the PLC to be displayed as •. 454 is displayed as •5•.

4. Under the **Character Bitmap** (see Figure 13.1), click on a square (pixel) to toggle that square on or off. The grey area is the space between characters and these squares should not be turned on.

5. Go to step 3 to edit the next character.
6. Once all the characters have been created or edited, click **Save File**. Choosing **Yes** over-writes the current character file. Choosing **No** gives the option to save this character set under a new file name.

Note: It is possible to double the size of an 8x6-character set. To do this click on the **Double** button. It is not possible to half the size of a 12x16-character set. It is recommended that the 8x6-character set be created first and then doubled.

13.4 International Keyboards

The ***CBREEZE*** software supports various international keyboard layouts. However, if the standard or extended keyboard characters are edited or deleted, the pressed key may appear different or not at all. The following keyboard layouts are supported:

Table 5.2 – Supported Keyboard Layouts	
Danish	German (Standard)
Dutch (Belgium)	Italian (Standard)
Dutch (Standard)	Norwegian
English (All)	Spanish (Modern Sort)
Finnish	Swedish
French (Standard)	

NOTES

CHAPTER 14 Graphical Alarm System

14.1 Overview:

The graphics TIU range (TIU3xx/4xx/5xx/6xx) includes a new **Graphical Alarm System** that provides a method of presenting and managing alarms. Alarms are messages that are presented to the operator in response to a specific condition in the control system. On receiving an alarm, the operator is generally expected to take immediate corrective action and record that action by acknowledging or clearing the alarm. In addition, the alarm system also records these events to a history log such that a supervisor can review the number of alarm occurrences or the operator's response to such alarms.

The Graphical Alarm System is actually three separate parts that includes an alarm manager, an alarm object, and an alarm viewer. The alarm manager is a task, which runs invisibly in the background and continuously monitors the configured alarm points for a change to the active state. If an alarm point goes active, the alarm manager records that alarm along with a time/date stamp in both a summary and history alarm log. The alarm object is a graphical object that can be placed on either a user or alarm screen. This object is used to notify the operator that an unacknowledged, active or an alarm entry exists. On detection of an unacknowledged alarm, the operator can touch (select) the alarm object to display the alarm viewer. In the alarm viewer, the operator is presented with the list of current alarm entries along with the controls to select, acknowledge, or clear alarm entries.

14.2 Alarm points

Up to 640 alarm points (ID) can be configured for continuous monitoring by the alarm manager. During configuration, each alarm point requires an identification string and a group number (1-16).
To configure the Alarm points Click on Configure/Alarms. The Alarms Definition Table is displayed:

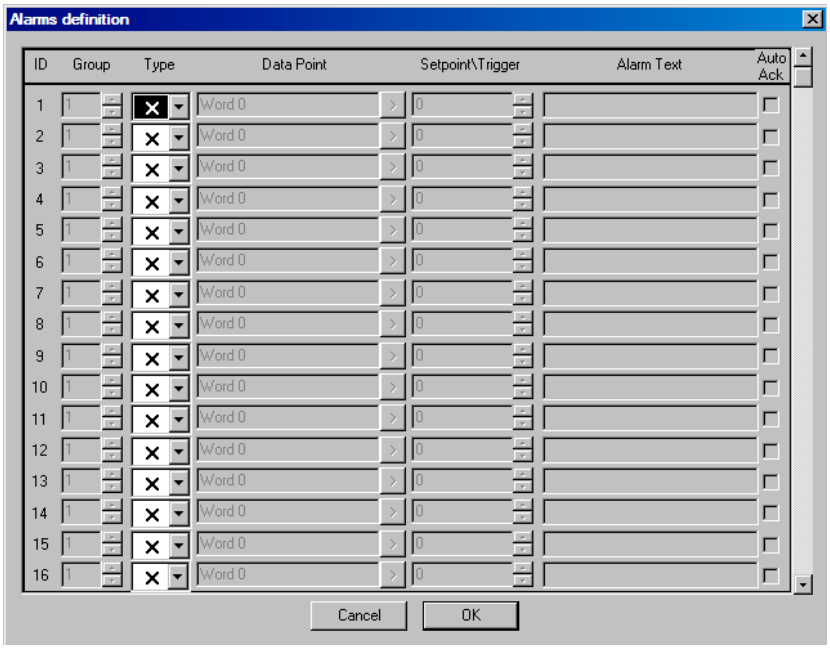


Figure 14.1

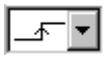
Group:
Value between 1 and 16 to specify which group the alarm belongs to, (See section 14.4)

Type:
Alarm types are selected from the drop down list.

Figure 14.2

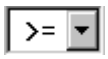
Definitions:

Disabled:
No Action taken.

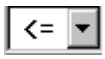


Positive Transition:
If Data Point goes from Off to On, Alarm is Activated.

Negative Transition:
If Data Point goes from On to Off, Alarm is Activated.



Greater Than or Equal To:
If Data Point becomes Greater Than or Equal To Setpoint/ Trigger value, Alarm is activated.



Less Than or Equal To:
If Data Point becomes Equal To or Less Than Setpoint/Trigger value, Alarm is activated.

Data Point:
Can be both External (PLC, Drive, etc) and Internal Register Types.

Setpoint/Trigger:
For Transition Type Alarms a Setpoint/Trigger is not defined. For Greater Than or Equal To and Less than or Equal To, the appropriate value is placed in the Setpoint/Trigger Field, see Figure 14.3 below

Alarm Text: Text strings of up to forty (40) characters are supported in this field. These text strings are visible when the Alarm Viewer Screen or Alarm Logs (History/Summary) are viewed.

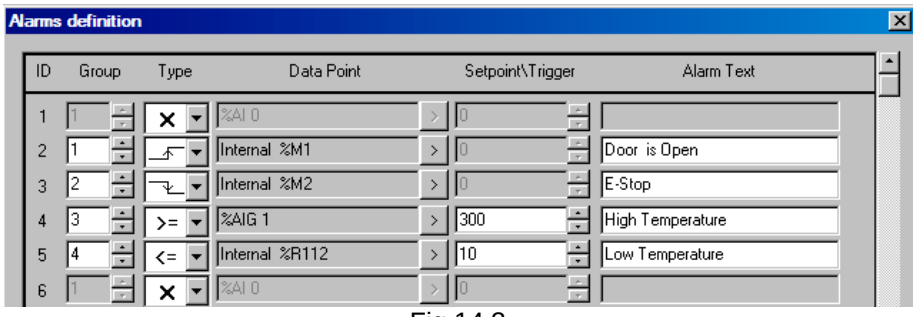


Fig 14.3

Once the program is loaded, the alarm manager begins monitoring each alarm condition. On detection of a transition, the alarm manager changes that alarm point's state and creates an alarm entry in both alarm logs. Each alarm log entry is loaded with the alarm point identification string, group, state and the time and date of the transition.

14.3 Alarm state

The alarm state of an alarm point indicates if it is active and if it has been acknowledged or cleared by the operator. An alarm point is in one of four states:

ALM - Alarm point is active and is pending acknowledgement.
ACK - Alarm point is active and has been acknowledged.
RTN - Alarm point has transitioned from active to inactive (return-to-normal) while still pending acknowledgement.
CLR - Alarm point is inactive and has no pending request for acknowledgement <or> Alarm point is active but has been cleared.

On the first detection of an alarm point going active, the associated state changes from **CLR** to **ALM**. That alarm's state thereafter only changes on one of three events: the operator acknowledges the alarm, the operator clears the alarm, or the alarm point returns to inactive without being acknowledged.

- If acknowledged, the alarm state changes to **ACK** and remains in that state until the alarm goes inactive and changes to CLR.

- If cleared, the alarm state changes to **CLR** and remains in that state until the alarm point makes a transition from inactive to active.

- If the alarm point goes inactive without being acknowledged, the alarm state changes to **RTN**. Generally, the alarm point remains in that state until either it is acknowledged, cleared, or the alarm points go active. However, if the Alarm Configuration parameter **"RTN Implies ACK"** is set, the alarm state thereafter immediately changes CLR.

14.4 Alarm groups

Alarm groups provide a way of categorising alarms based on plant layout, machine group, control zone, or any other grouping of associated alarms. For example, consider a process with several machines and a TIU containing a user screen for each machine. Also assume that the process alarms could also be divided (or grouped) by machine. On each screen, an alarm object could then be configured to only report alarms associated with that corresponding machine.

Alarm points are assigned a group number when configured in the **Alarm | Alarm Configuration** menu. Several alarm points are "grouped" it they are all assigned the same group number. Up to 16 group numbers can be used.

While all alarms are written to a common summary log and history log, alarm objects and the associated alarm viewer that access these logs are configurable to selectively filter entries. Filtering is accomplished by specifying the alarm group or groups that each alarm object can access.

14.5 Alarm logs

A log is a portion of internal TIU memory that contains alarm information. The alarm manager maintains two alarm logs that are referred to as the summary and history log. While the differences between the two logs are detailed below, generally the summary log contains the **current** active and unacknowledged alarms while the history log contains a **history** of alarm state changes. Each alarm log entry contains the alarm point identifier, time, date, state, and group number of the alarm. The time and date indicates the moment the alarm transitioned to the current state. Alarm log entries can be viewed (through group filters) and optionally modified by the operator through the alarm viewer.

The **summary** log provides a single entry for each alarm point whose current state is NOT equal to CLR. Since only one entry per alarm point is logged, the number of entices is limited to the number of alarm points configured. Entries are cleared on a power-cycle or program download. Entries contained in the summary log contain an alarm in one of the following states:

ALM – Active alarm not yet acknowledged or cleared by operator.
ACK – Active alarm was acknowledged by operator
RTN – Alarm returned to inactive without being acknowledged (optional).

If the system configuration **RTN-implies-ACK** in the **Alarm | Alarm Configuration Menu** is set, the RTN state immediately changes to CLR. The action prevents RTN from being shown in the summary log.

The **history** log provides an entry for each transition of an alarm state (history of changes). The history log length is limited to 128 entries and is stored in non-volatile memory. Entries are only cleared at program download or through operator intervention. Once the log becomes filled, the least current entry is deleted when a new alarm event occurs. Noted that re-occurring alarms can quickly fill the history log. Entries contained in the history log show alarm transitions to the following alarm states:

ALM – Alarm went active
ACK – Active alarm was acknowledged by operator
CLR – Active alarm was cleared by operator
RTN – Alarm returned to inactive without being acknowledged.

Note that transitions from either ACK or RTN to CLR are not logged.

14.6 Alarm Object

Figure 14.4 Alarm Object

The alarm object is a graphical object, which provides two mechanisms. The first is to visually indicate that alarms are unacknowledged, active, or recorded in the associated ALARM LOG. The second is to respond to touch (selection) and display the ALARM VIEWER, which allows the user to view and optionally modify any of the alarms in the associated alarm log.

The alarm object must be configured for attachment to either the alarm summary log or the alarm history log. Selecting the summary log allows the alarm object to monitor for active and unacknowledged alarms. Selecting the history log allows the alarm object to monitor for recorded alarm entries. In addition to the alarm log, the alarm object must also be configured for which ALARM GROUP or groups to monitor. This provides a method of limiting a specific alarm object to only respond to a group (or subset) of alarms. Additionally, the group information is also passed to the alarm viewer such that it only displays entries from the selected group(s).

The alarm object also supports GENERAL OBJECT PROPERTY's attributes of Visible, Flash, and Enable input. This allows creative use of the object, for example: The Visible attribute can be tied indirectly (through ladder logic) to the alarm ladder indicators to allow an alarm object to become visible when alarms are present. The Flash attribute can be tied to ladder logic, which causes the legend to flash after alarms have not been acknowledged for some period of time. And the Enable input attribute can be tied to ladder logic that only allows operators with certain privileges can access the alarm viewer.

14.6.1 Default Display (partial list):

By default, the alarm object is configured to display the latest entries of the associated alarm log in list form on the surface of the object. Background colour around the list, and a legend with a selectable font is also configurable. The list background is always white.

Figure 14.5 Alarm Summary/History Partial List

Only the topmost (newest) entries from the associated alarm log that fit in the alarm object's list area are displayed. Each entries text colour is based on its associated alarm point's ALARM STATE. These list text colours are globally defined in the Alarms | Alarm Configuration Menu in the graphics editor. For example, when a new alarm occurs, its entries text is displayed in the ACT colour at the top of the partial list to alert the operator. The operator can then display the alarm viewer and acknowledge that alarm. On return to the alarm object's screen, that entries text colour is changed to the ACK colour. Should the operator fail to acknowledge the alarm before the alarm point returned to inactive, that entries text colour is changed to the RTN colour (if RTN Implies ACK is NOT active).

The display format of the list entries is configurable through the Alarm Object Properties dialog box. The displayed fields of time, date and state can be individually enabled (order of the fields in the message cannot be altered). Additionally, the specific time and date formats are selectable. The font of the entries is also selectable; however, since entries are limited to single line and clipped at the right edge of the alarm object, fonts sizes should be kept minimal.
Note also that the associated alarm viewer uses same field, format and font selections of the calling alarm object.

14.6.2 Unacked Only:

When using the partial list to display the summary log, a configuration option **Unacked ONLY** is available. Selecting this configuration option results in the alarm object only listing the latest un-acknowledged alarm entries. This filtering of entices is used to lesson operator distraction caused by acknowledged entries. The associated alarm viewer is NOT affected by this option and DOES display acknowledged entries.

14.6.3 Display alarm button/icon only:

An option is provided to not show the partial list on the surface of the alarm object. Alternately, only the legend and an optional ICON are displayed. In addition, the background colour of the alarm object is dynamically modified to reflect the state of entries in the associated alarm log.
These state colours are defined in the **Alarms/Alarm Configuration Menu** in the graphics editor and depend on which alarm log type is selected.

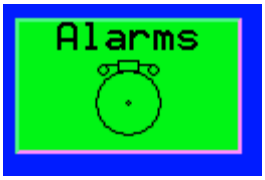


Figure 14.6 Alarm Icon

When a **button/icon only** alarm object is attached to the **summary** log and a new alarm occurs, the alarm object is displayed in the UNACK colour to alert the operator than an unacknowledged alarm exists. The operator can then display the alarm viewer to acknowledge that alarm. On return, the alarm object is then displayed in the ACK colour (if the alarm is still active). Once all alarms in the selected group(s) are acknowledged and inactive, the alarm object is displayed in the EMPTY colour.

When a **button/icon only** alarm object is attached to the **history** log and a new alarm occurs, the alarm object is displayed in the Not-Empty-Colour to alert the operator that entries now exist in the log. The operator can then display the alarm viewer to view and optionally clear the entry. If the alarm history log is full, the alarm object is displayed in the Full-colour to alert the operator that entries are being deleted on new alarm state changes. Once all alarms in the selected group(s) are cleared (and the history log is NOT full) the alarm object is displayed in the EMPTY colour.

Note that the alarm object's list format parameters (font, fields and format) are STILL required for an alarm object configured for **button/icon only** since that information is required for the associated alarm viewer.

14.7 Alarm viewer

The alarm viewer allows an operator to view and optionally modify entries in an alarm log. To access the alarm viewer, the operator must select a visible and enabled alarm object. When selected, the alarm viewer is displayed, consuming the full page and displaying as many alarm entries that are present and that fit in the display area. If more entries exist than can be displayed, a scroll bar appears to the side of the screen to illustrate the currently displayed group of entries relative position from the beginning of the log. Additionally, the length of the scroll bar gives a relative indication of the number entries. Since the scroll bar does not respond to touch commands, control buttons (UP/DOWN) are provided to scroll through the list and select a particular entry.

The alarm viewer only displays log entries belonging to the specified group(s) contained in the specified alarm log. The specified group(s) and alarm log are the same as that defined for the calling alarm object. The alarm viewer also displays the entries in the font and format as that defined for the "calling" alarm object. As with the alarm object's partial list display, each entries text is displayed in the colour determined by its alarm state. These list text colours are globally defined in the **Picture | Configure Alarms Monitoring** in the Picture editor. The background colour of the list is always white.

If any of the time, date or alarm state fields are enabled in calling alarm's object format, the alarm entries are displayed on two lines. The first line contains the time, date or alarm state, and the second line contains the alarm identifier (indented). If none of the time, data or alarm state fields are enabled, each

alarm entry only consumes a single line containing just the alarm identifier (not indented). Alarm identifiers that do not fit on a single line are clipped to the right edge of the display. This needs to be considered when selecting a font.

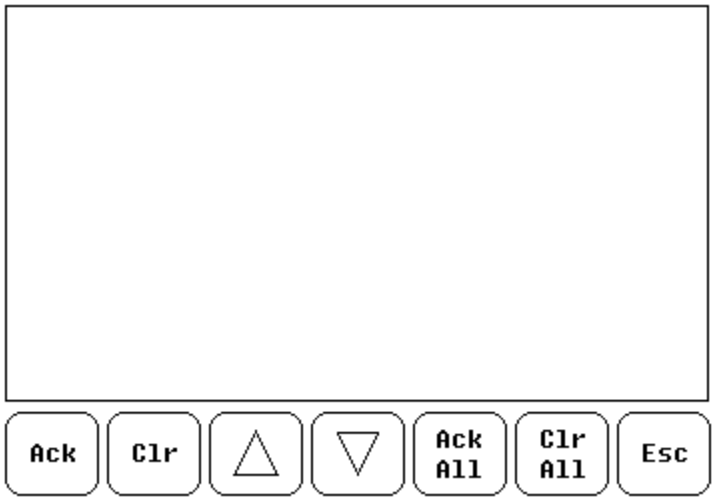


Figure 14.7 Alarm Viewer

The control buttons at the bottom of the alarm viewer allow the operator to modify the contents of the specified alarm log. Some of the control buttons can be disabled depending upon the log displayed and the **Allow Operator to Clear** selection of the calling alarm object.

ACK	Acknowledge selected alarm entry (summary log only)
CLR	Clear selected alarm entry (if clear enabled)
ACK ALL	Acknowledges all alarm entries (summary log only)
CLR ALL	Clear all alarm entries (if clear enabled)
UP	Select the entry above the currently selected. If at the top of screen, scroll the screen down one by one entry.
DOWN	Select the entry below the currently selected. If at the bottom of the screen, scroll the screen up by one entry.
ESC	Return to page containing calling alarm object.

For locating entries in large logs, the UP/DOWN keys can be held down for an extended period to enable auto repeat.

The entry list is dynamic in that it is updated continuously while the alarm viewer is active. Upon entry to the list, the first alarm entry is selected (indicated by hi-lighting that entry). The viewer attempts to maintain the selected entry at its current position as new alarms are added or deleted. However, in some situations such as the selected entry being located near the beginning or end of the log, a position change of the selected entry is required to show its relative position from the beginning or end of the log.

Should the selected entry be deleted (i.e. acknowledged alarm goes inactive), the alarm viewer attempts to select the next entry displayed last below the deleted entry. If unable to locate an entry displayed below, the alarm viewer attempts to select an entry displayed above the deleted entry. In the extreme case that all displayed entries are deleted simultaneously, the alarm viewer selects the first entry in the list. Any control selected while the alarm viewer is searching for a selected entry is discarded.

14.8 Configure Alarms Monitoring

14.8.1 Alarms Monitoring

In Cbreeze, Picture Editor, select Picture and then Configure Alarms Monitoring to select the colours associated with various alarm log entries.

The following applies to the alarm viewer and alarm objects whose indicator mode is not set to **alarm button/icon only**.

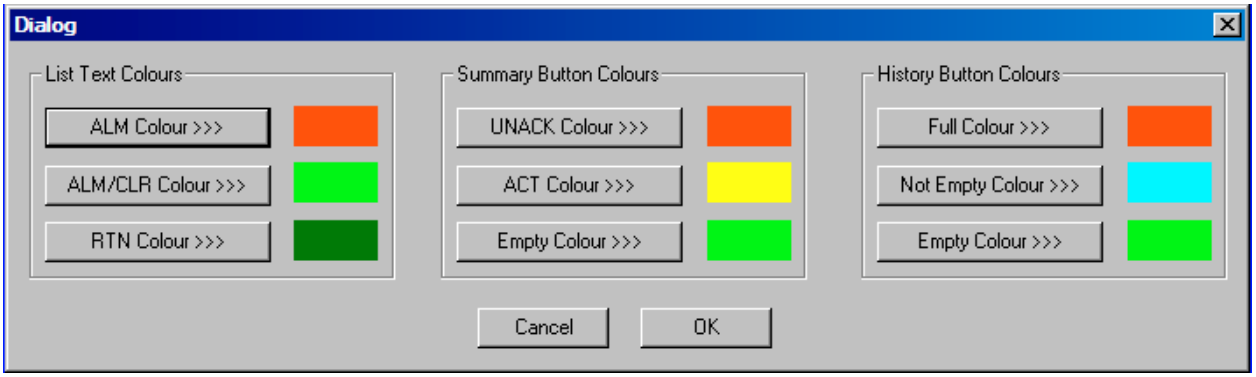


Figure 14.8 Configure Alarm Monitoring

14.8.2 List Text Colours

- **ALM Colour**

Specifies the colour to paint alarm log entries that are in the **ALM** state.

- **ACK/CLR Colour**

Specifies the colour to paint alarm log entries that are in the **ACK** or **CLR** state.

- **RTN Colour**

Specifies the colour to paint alarm log entries that are in the **RTN** state.

14.8.3 Summary Button Colours

The following only applies to alarm objects whose indicator mode is set to **alarm button/icon only**.

- **UNACK Colour**

Specifies the colour to paint the background of alarm objects when their associated summary log has entries at an unacknowledged alarm state.

- **ACK Colour**

Specifies the colour to paint the background of alarm objects when their associated summary log has entries at an active alarm state but NO entries at an unacknowledged alarm state.

- **Empty Colour**

Specifies the colour to paint the background of alarm objects when their associated summary log has NO entries at an active or unacknowledged alarm state.

14.8.4 History Button Colours

The following only applies to alarm objects whose indicator mode is set to **alarm button/icon only**.

- **Full Colour**

Specifies the colour to paint the background of alarm objects when their associated history log is full.

- **Not Empty Colour**

Specifies the colour to paint the background of alarm objects when their associated history log has entries.

- **Empty Colour**

Specifies the colour to paint the background of alarm objects when their associated history log has NO entries.

14.9 Alarm Object Properties

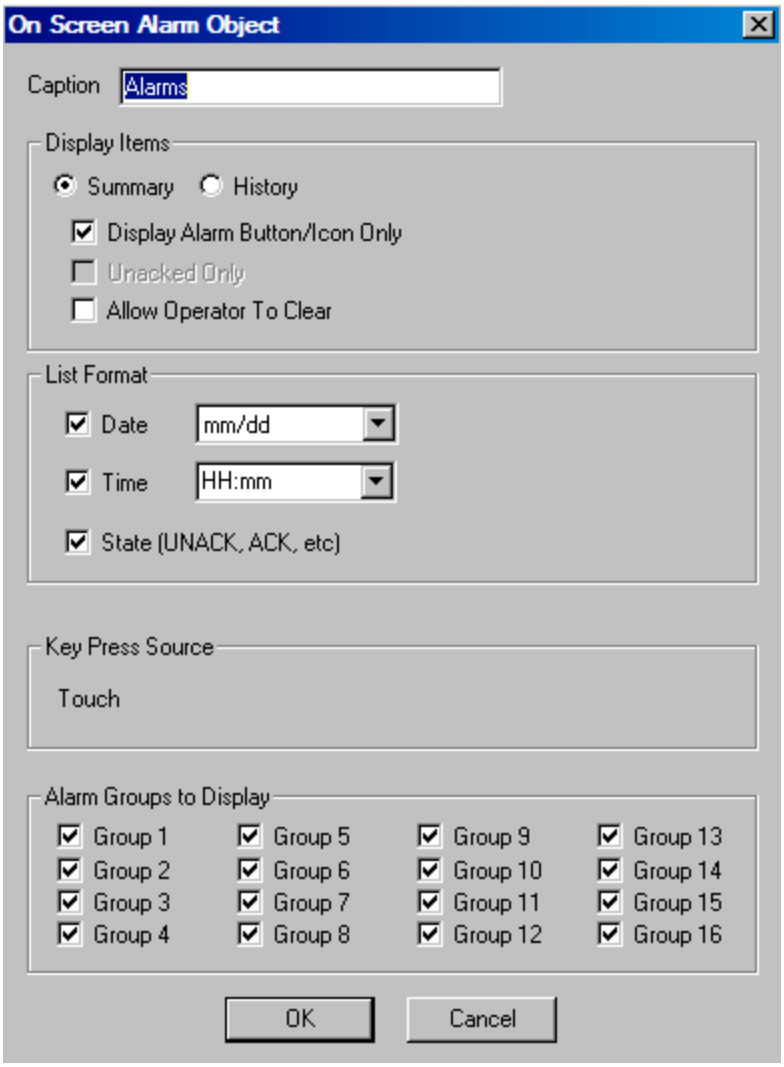


Figure 14.9 Alarm Object Properties

14.9.1 Object Specific Properties:

- **Summary/History**
  Specify which log to access. Summary contains the current alarm states while the History log maintains a history of each alarm change.

- **Display alarm button/icon only**
  Specifies which indicator to present: a partial list or just a button (w/optional icon) is displayed.

- **Unacked Only (available on partial list attachment to summary log only)**
  Only unacknowledged alarms are displayed on the partial list. This allows the user to ignore acknowledged active alarms. This option does NOT affect the alarm viewer, which displays all active and/or unacknowledged alarms.

- **Allow Operator to Clear**
  Enables the Clear/Clear All buttons when displaying the alarm viewer. When enabled, the operator is allowed to clear (remove) entries from either the summary or history logs.

- **Date**
  This checkbox enables the display of the date of occurrence for each alarm in both the partial list and the alarm viewer. The corresponding list box allows selection of the specific date format.

- **Time**
  This checkbox enables the display of the time of occurrence for each alarm in both the partial list and the alarm viewer. The corresponding list box allows selection of the specific time format.

- **State**
  The checkbox enables the display of the state of each alarm in both the partial list and the alarm viewer.

- **Alarm Groups to Display**
  Selects which group(s) of alarms to be display by both the partial list and the alarm viewer.

CHAPTER 15 CompactFlash®

15.1 Overview

With the addition of the SVGA TIUs (TIU4XX, TIU5XX and TIU6XX) to the TIU line-up, a CompactFlash® port is now available for use in several different capacities.

Comma-separated text files can be read from or written to the CompactFlash® card making it possible to datalog or otherwise store and retrieve enormous amounts of data. These files can be read or created using a spreadsheet program for data processing. The ability to Delete and Rename files, as well as moving around in a directory structure, is also available.

Many additional new features were added to the CompactFlash® functionality. With the arrival of the new 4-channel video card option, it is possible to freeze-frame an image from a video channel to a 15-bit colour bitmap or JPEG file on the CompactFlash® card. Also possible is a full screen capture to bitmap or JPEG. Along with these new image options comes the ability to view those images directly on the TIU screen by selecting one in the CompactFlash® directory.

In addition to image capture and viewing to and from CompactFlash®, it is possible to use Cbreeze to save a program to a CompactFlash card in a special format using a card reader/writer connected to the computer running Cbreeze. This program can then be loaded to the TIU from the CompactFlash® card at a rate of speed far beyond the capabilities of a serial port connection. This increase in speed is especially noticeable on programs with large amounts of bitmap data in the graphics section of the program. To load a Project from CF to the TIU the TIU must already have a project with an embedded CF button (to allow loading of the Project)

15.2 Compact Flash® on screen

To embed a CompactFlash® (CF) object onscreen, open the Picture editor in Cbreeze and select the CF button (figure 15.1)

Figure 15.1 CompactFlash® button

Click and drag an area onscreen for the object. The following is displayed

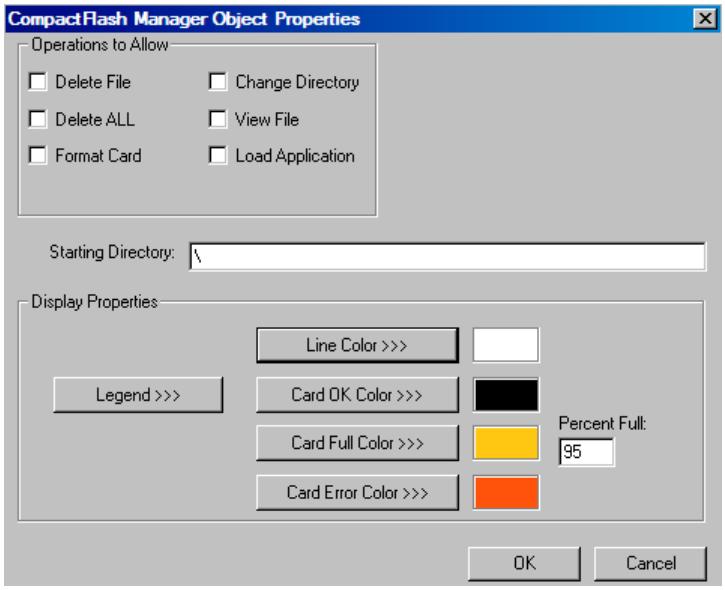


Figure 15.2 Compact Flash Manager Object Properties

Description:

The Compact Flash Object provides both visual information about the status of the attached flash card and provides an entry point to the CompactFlash directory. The status information is shown as one of three background colors which signify if the CompactFlash card is accessible, if the card is close to being full, or if the card is not accessible (remove, invalid format, invalid card type). If the object is touched and is enabled, the CompactFlash directory will be displayed. When the directory is displayed, certain 'permissions' are passed from the CompactFlash object such as which controls are enabled and the Current Working Directory (CWD) to open the directory in. The CompactFlash object also has the typical Attribute functions.

Operations to allow:

Specifies which directory controls are enabled when zooming to CompactFlash directory. This allows limited control by operators.

Delete File - If checked, allows option of deleting a single file or folder when CompactFlash is accessed using this particular object.

Delete ALL - If checked, allows option of deleting all files and folders on the card when CompactFlash is accessed using this particular object.

Format Card - If checked, allows option of formatting the CompactFlash card when CompactFlash is accessed using this particular object.

Change Directory - If checked, allows option of navigating through directories that are below (subdirectories of) the Starting Directory when CompactFlash is accessed using this particular object. Never is the user allowed to navigate to a directory above the Starting Directory.

View File - If checked, allows option of viewing Bitmap and JPEG files in certain formats when CompactFlash is accessed using this particular object. can be viewed or .pgm files saved to the card by Cscape can be loaded into the unit, overwriting the existing program.

Load Application - If checked, allows option of loading a .pgm file saved to the card by Cbreeze, overwriting the existing program.

Starting Directory

Specifies the virtual current working directory displayed in the CompactFlash directory. The operator is not allowed to transverse to directories above this path. If path is non-existent, an error message is displayed (see CompactFlash directory).

Legend

Text to be displayed on the onscreen icon.

Line Colour

Colour used for drawing borders and icon.

Card OK Colour

Colour used to paint background of object is CompactFlash card status is OK.

Card Full Colour

Colour used to paint background of object if CompactFlash is filled at or above the limit specified with the Percent Full specification (0 to 100 equals 0% to 100% respectively)

Card Error Colour

Colour used to paint background of object if CompactFlash card is not accessible. The specific error type is displayed on the CompactFlash directory or through SR176.

15.3 CompactFlash® functions

Compact Flash Functions are carried out in the Maths editor

15.3.1 Read CompactFlash csv

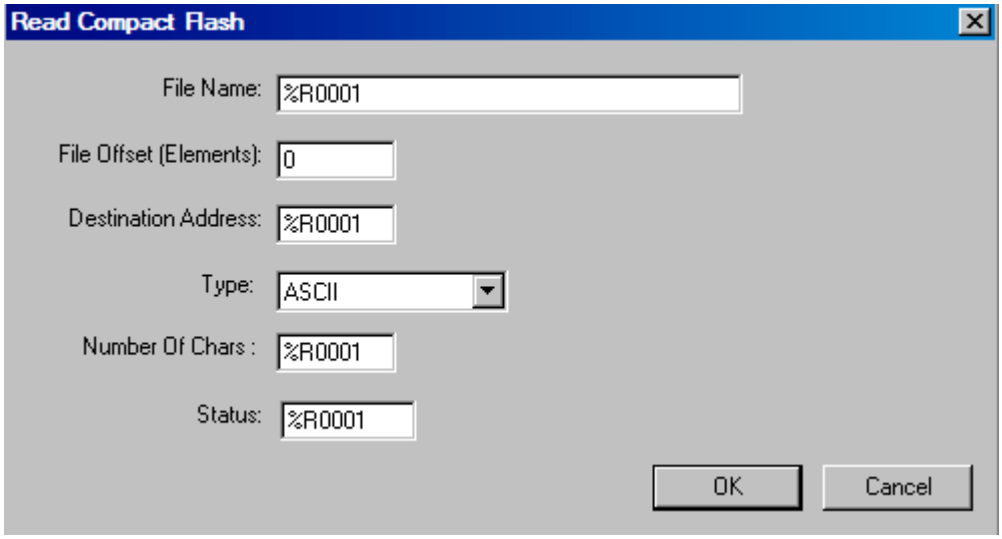


Figure 15.3 Read CompactFlash

This function allows reading a comma separated value file from the CompactFlash interface into TIU register space.

15.3.1.1 Description of Function Parameters:

File Name – This is the filename to read the values from and enter into the TIU. This can be a constant or a TIU registers. If this is a constant it can be up to 147 characters long that includes sub directories (i.e. “my_data\test.csv”). If the filename is stored in registers it still has a limit of 147 characters and must be terminated with a NULL (byte containing zero). To indicate the file is in a register, place the percent (%) symbol before the register name. This is used to differentiate between “R1234” which is a valid file name and “%R1234” which is a register reference. File and directory names are limited to the 8.3

convention. This is 8 characters for the name and 3 characters for an extension with a period (.) separating them. See the filename descriptions in the section below.

File Offset – This parameters defines where in the file to start reading data. This can be a constant value or a 32-bit TIU register. For example, a csv file contains the following data “123, 456, 789”. The value “123” is element offset zero, the “456” is element offset one, and “789” is element offset two.

Destination Address – This is a TIU register where the read data is placed. Because each element can require more than one 16-bit registers (DINT, UDINT, ASCII types) and more than one element can be read at a time this can fill a large number of registers from this starting point.

Type – This is the type of data that is read. There is no type or size information encoded in a csv file and it is the programmer’s responsibility to read data from a file using the correct type.

BOOL allows storing a single TIU bit as a one (1) or zero(0) in the csv file.

Binary allows storing 16-bits of data as a string of ones and zeros for example the number 123 is represented as 0000 0000 0111 1011 in binary. When writing this to the csv file it will write “000000001111011,”. This format is designed for advanced user, typical office products like Excel do not handle this as a native format.

Number of Elements – This determines the number of element to read it can be a constant or 16-bit TIU register.

For ASCII types this becomes “Max Number of Characters” and sets the maximum number of characters that can be read from the file and stored in TIU registers.

For BOOL types this is always set to one.

Status – This is a 32-bit register used to show the status of the function block. The first 16-bit register is a status code, see the possible status codes in the status section below. The second 16-bit register shows the number of elements successfully read.

15.3.2 Write CompactFlash csv

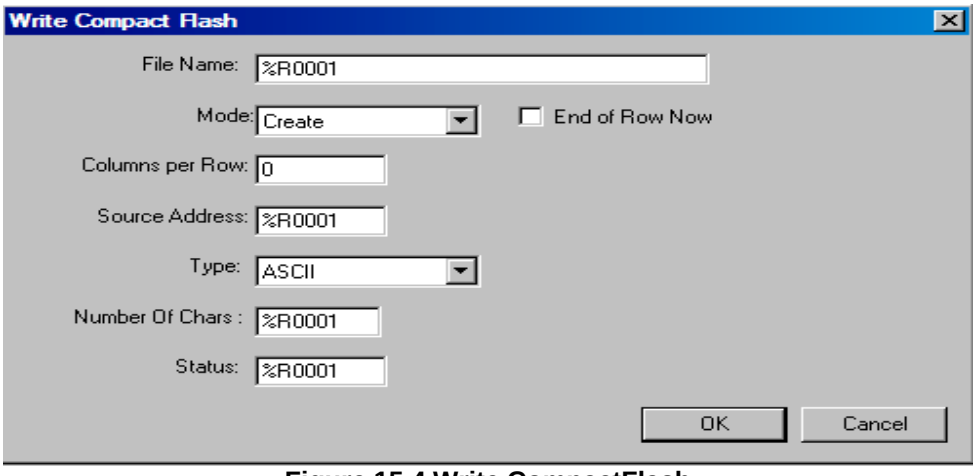


Figure 15.4 Write CompactFlash

This function allows writing a comma separated value file to the CompactFlash interface from TIU register space.

15.3.2.1 Description of Function Parameters:

File Name – This is the filename to write the values from the TIU. This can be a constant or a TIU register. If this is a constant it can be up to 147 characters long that includes sub directories (i.e. "my_data\test.csv"). If the filename is stored in registers it still has a limit of 147 characters and must be terminated with a NULL (byte containing zero). To indicate the file is in a register, place the percent (%) symbol before the register name. This is used to differentiate between "R1234" which is a valid file name and "%R1234" which is a register reference. File and directory names are limited to the 8.3 convention. This is 8 characters for the name and 3 characters for an extension with a period (.) separating them. See the filename descriptions in the section below.

Mode – This is the writing mode for the function.
Create – create a new file, error if file DOES exist
Append – add data to end of existing file, error if file does NOT exist
Create / Append – create the file if it doesn't exist, append if the file does exist
Overwrite – if the file exists overwrite with a new file

Columns per Row – This defines the format for writing data to the csv file. This can be a constant or 16-bit TIU registers. When a csv file is written to a table format it can be viewed is a column / row format like a spreadsheet. Setting this parameter determines how many elements to write in a row before a new row is started.

Setting this value to zero will disable the generation of new rows and will generate all data as a single row.

Examples:

3 columns per row

1	2	3
4	5	6
7	8	9

5 columns per row

1	2	3	4	5
6	7	8	9	10

End of Row Now – Setting this option will cause the row to end at the end of this write function. See Columns per Row above.

Source Address – This is a TIU register where the data to write is located. Because each element can require more than one 16-bit registers (DINT, UDINT, ASCII types) and more than one element can be written at a time this can require a large number of registers from this starting point.

Type – This is the type of data that is written. There is no type or size information encoded in a csv file and it is the programmer's responsibility to write data to a file using the correct type.

Number of Element – This determines the number of element to write it can be a constant or 16-bit TIU register.

For ASCII types this becomes “Number of Characters” and sets the number of characters that are written to the file as ASCII characters.

For BOOL types this is always set to one.

Status – This is a 32-bit TIU register used to show the status of the function block. The first 16-bit register is a status code, see the possible status codes in the status section below. The second 16-bit register shows the number of elements successfully read.

15.3.3 Rename CompactFlash csv

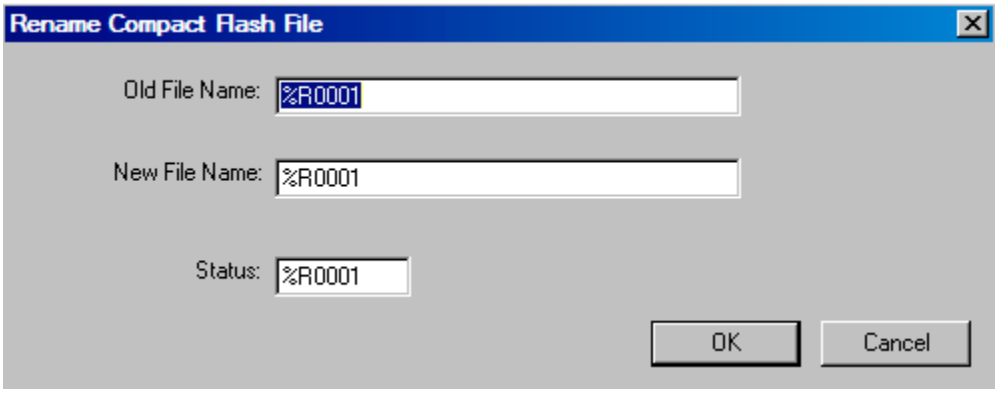


Figure 15.5 Rename Compact Flash

This function allows renaming a file on the CompactFlash card. The data in the file is not changed.

15.3.3.1 Description of Function Parameters:

Old File Name – This is the original filename to rename. This can be a constant or a TIU register. If this is a constant it can be up to 147 characters long that includes sub directories (i.e. “my_data\test.csv”). If the filename is stored in registers it still has a limit of 147 characters and must be terminated with a NULL (byte containing zero). To indicate the file is in a register, place the percent (%) symbol before the register name. This is used to differentiate between “R1234” which is a valid file name and “%R1234” which is a register reference. File and directory names are limited to the 8.3 convention. This is 8 characters for the name and 3 characters for an extension with a period (.) separating them. See the filename descriptions in the section below.

New File Name – This is the new filename. This can be a constant or a TIU register and has the same requirements as the old filename.

Status – This is a 16-bit TIU registers used to show the status of the function block. See the possible status codes in the status section below.

15.3.4 Delete CompactFlash csv

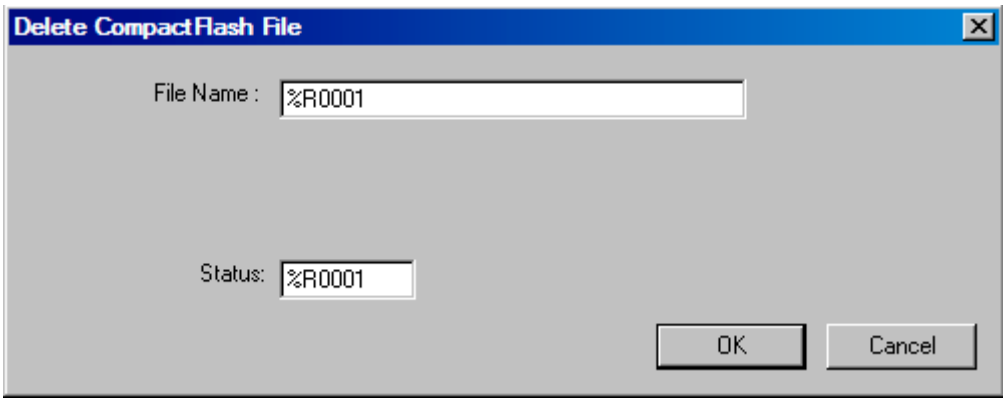


Figure 15.6 Delete Compact Flash csv

This function allows deleting a file on the CompactFlash card.

15.3.4.1 Description of Function Parameters:

File Name – This is the filename to delete. This can be a constant or a TIU register. If this is a constant it can be up to 147 characters long that includes sub directories (i.e. "my_data\test.csv"). If the filename is stored in registers it still has a limit of 147 characters and must be terminated with a NULL (byte containing zero). To indicate the file is in a register, place the percent (%) symbol before the register name. This is used to differentiate between "R1234" which is a valid file name and "%R1234" which is a register reference. File and directory names are limited to the 8.3 convention. This is 8 characters for the name and 3 characters for an extension with a period (.) separating them. See the filename descriptions in the section below.

Status – This is a 16-bit TIU register used to show the status of the function block. See the possible status codes in the status section below.

15.3.5 Status Values Returned by CompactFlash Function Blocks

Value	Description
0	Operation completed successfully
-1	End of file was reached before completing
-2	Function is active, waiting for operation to complete
-3	Function is waiting on another CF function to complete
-4	Function block is inactive (usually no power flow)
1	Card present but unknown format
2	No card in slot
3	Card present, but not supported
4	Card swapped before operation was complete
5	Unknown error
66	File / Path specified does not exist
73	Bad file descriptor (corrupt file)
77	Attempt to open / rename file that is open
81	Specified file already exist
86	Function block contains illegal parameter
88	Too many open files*
92	Attempt to write failed
94	Sharing violation*
95	No disk present*
96	Directory structure corrupt
98	Incorrect data format

15.3.6 Filenames Used with the CompactFlash Function Blocks

The TIU CompactFlash functions support the flash with a DOS/Windows standard fat-16 file system. All names must be limited to the "eight dot three" format where the filename contains eight characters a period then a three-character extension.

The entire filename including any path must be less than or equal to 147 characters.

When creating filenames and directories it is sometimes desirable to include parts of the current date or time. There are six special symbols that can be entered into a filename that are replaced by the TIU with current time and date information.

Symbol	Description	Example
$Y	Substitutes the current 2 digit year	2004 = 04
$M	Substitutes the current month with a 2 digit code	March = 03
$D	Substitutes the current day	22nd = 22
$h	Substitutes the current hour in 24 hour format	4 pm = 16
$m	Substitutes the current minute	
$s	Substitutes the current minute	

Note that all the symbols start with the dollar sign ($) character. Date symbols are in upper case, time symbols are in lower case.

The following are examples of the substituted time/date filenames:

Current date and time: March 1, 2004 3:45:34 PM

Filename: Data$M$D.csv = Data0301.csv

Filename: Year$Y\Month$M\aa$D_$h.csv = Year04\Month03\aa01_15.csv

Filename: Month_$M\Day_$D\$h_$m_$s.csv = Month_03\Day_01\15_45_34.csv

15.3.7 System Registers used with CompactFlash

%SR55 Status – This shows the current status of the CompactFlash interface.

Possible status values:

0	CompactFlash interface OK
1	Card present but unknown format
2	No card in slot
3	Card present, but not supported
4	Card swapped before operation was complete
5	Unknown error

%SR56 Free Space – This 32-bit register shows the free space on the CompactFlash card in bytes.

%SR57 Card Capacity – This 32-bit register shows the total card capacity in bytes.

CHAPTER 16 Video objects

16.1 Overview

The SVGA colour touch TIU models (TIU420, TIU520…) provide the capability of displaying and capturing video with the optional HE500VIM400 video module. Installation of this module allows the TIU to display or capture up to four channels of NTSC or PAL video. Display of live or captured video is accomplished by the placement of a video object on a display screen. Capture of a video frame is accomplished either through the optional pop-up menu associated with the video object, or through the optional video control register, which allows scripting logic control of captures. Once captured, the video frame may be displayed, saved to Compact Flash, or both.

16.1.1 Video Captures

Each video channel has an associated capture buffer that is used to store a single video frame. When the **freeze** operation is selected from either the pop-up menu (touch) or by setting the freeze bit in the video control register, a video frame is captured and stored to the associated channel's capture buffer. When a channel is frozen, any video object associated with that channel displays the captured video. To differentiate between observing live video or a captured frame, the video object **displays a red band** around the captured video display. When the freeze operation is released from the pop-up menu, the image in the capture buffer is lost and the associated video object's display returns to live video.

When the **save** operation is selected from either the pop-up menu, or by setting the save bit in the video control register, the TIU first determines if that channel is already frozen and contains a valid image in its capture buffer. If the channel is frozen, the previously captured frame is saved to Compact Flash. If the channel is not frozen, a capture immediate occurs to fill the capture buffer and that image is then saved to Compact Flash. Once the save is complete and if the channel was NOT previously in freeze mode, the image in the capture buffer is lost and the associated video object continues to display live video.

Freeze and save operations are provided separately to give the user the ability to *freeze* a frame, optionally zoom to inspect the captured frame and then determine whether or not to save the captured frame to Compact Flash. Alternately, events may trigger save operations without freezing and disrupting the associated video objects live video display.

Warning: Commanding a freeze operation from either the pop-up menu or the control register while a save operation for the same channel is in progress corrupts the capture buffer being saved to Compact flash.

Saved frame captures are stored in either Windows™ 15-bit colour bitmap or JPEG format. The save format and path\filename for each video channel are specified in the Video Configuration. Note that the specified path\filename may use substitution characters that allow each capture to have a unique filename or path.
The minimum amount of time between consecutive captures (saved to CompactFlash) on a particular channel is the sum of: start capture latency, capture completion time, and save capture to CompactFlash completion time. Capturing multiple channels increases the minimal amount of time by that taken for each channel.

Start time latency exists between setting the freeze or start bit in the video control register and the TIU starting the frame capture. This value varies and is the sum of the following dependencies (latency for interrupting active video objects is only required if a video object(s) is currently displaying on the screen):

One Scripting function schedule time	(application defined)
Interrupting active video objects	180mS (max)
Initialise video channel	30mS (typical)
Sync to video input	30mS (typical)

Once the capture is started, an additionally 100mS is required to complete the capture and save it to the associated channel capture buffer. If multiple channels are commanded to freeze or save simultaneously, the captures are serviced in ascending order by channel number. Furthermore, the latency for the higher channel numbers must account for the start capture latency and the capture completion time of the lower channel numbers.

The time required to save the current capture to Compact Flash is dependent on the file format, the speed of the Compact Flash and if any other flash operations are currently queued. While exact write times are not possible to predict, typical capture storage times have been under 4 seconds. When using the optional video control register, the TIU clears the save bit when the write operation has been completed. The user may use this functionality to more accurately determine write times and when the next save capture operation can be started.

Video frames are always captured and saved at the full 640 x 480 resolution. Because frames are captured at full resolution, zooming full screen from a smaller sized video object to view a frozen frame results in **no** loss of quality.

16.1.2 Video Display

Up to four channels of video may be simultaneously displayed on any screen at one time. This video is displayed through graphical video objects that may be placed anywhere on the screen and coexist with other graphical objects. The video object generally provides two mechanisms. The first is to provide a display of video from the associated video input channel. The second is to respond to touch (optional) and provide either a temporary zoom-to-full-screen display or a pop-up menu (described below). Display and touch options for the video object is specified in the Video Object configuration.

The video object supports four resolutions or sizes (full screen, 640x480, 320x240 and 160x120). With the exception of full screen resolution, video objects are normally displayed in a *windowed* mode. In *windowed* mode, other graphical or video objects may also be simultaneously displayed. However, since this mode allows the display of other objects, the update rate of live video display is reduced. When a video object is alternately sized at full screen resolution, the video object consumes the entire screen and no other graphical objects are displayed. Thus, full screen resolution allows video to be viewed at its full frame rate.

When a video object is configured to a *windowed* size and if touch is enabled, the user may at run-time temporally zoom-to-full-screen and view the video at full resolution and full frame rate. To return to the original screen, the user can touch anywhere on the screen. Note that this touch action is different than a video object configured for full screen resolution. With an object configured (sized) for full screen resolution, objects may be placed on top of the video object and while not visible they still process touch signals.

Each video object is tied to one of the four input channels available on the optional video module. The input channel may be specified by a configuration constant or at run-time with a 16-bit register. The displayed video may be live or still (captured video frame) depending on the freeze state of that channel.

Up to four video objects can appear on one screen; however, avoid overlapping video objects with other video objects to prevent display artefacts. Since, multiple video objects on a screen can further slow the update rate of the live video, a priority option is available when 3 or more video objects are on the same screen. This priority option allows one of the video objects to be updated more often than the others thus giving it a faster update rate. This priority option may be assigned at initialisation or at run-time through the pop-up menu.

The video object also supports General Object Property attributes of Visible and Enable input. This provides the ability to only display the object or allow touch functions under certain conditions.

16.1.3 Video Object Pop-up Menu

When the video object is configured to *Show Menu* for the touch option, the following pop-up menu is displayed when the video object is touched. The pop-up menu option is not functional for video objects sized at full screen resolution. Note that some selections may be greyed out when disabled in the object's configuration.

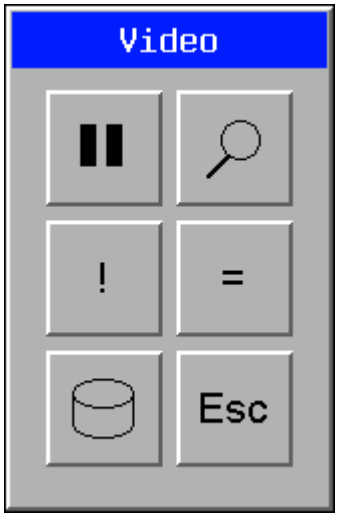


Figure 16.1 Video Object Pop-up

Note that invoking the pop-up menu when the current video display is live causes the object to immediately capture a video frame in the associated channel's capture buffer. Thereafter, if either the freeze or save button is selected from the menu, that captured frame is thereafter displayed as frozen or stored to Compact Flash (respectively). Otherwise stated, the frame used for frozen display or saved to Compact Flash is captured when the menu is invoked, not when the actual freeze or save button is pressed. Each of the buttons is described below:

- **Freeze / Resume**

This button allows the user to select whether to freeze the current display or resume to live video. When freezing the display, the image in the capture buffer is displayed instead of live video and made available to the save operation. On selecting resume, live video is resumed and the image in the capture buffer is no longer available to the save operation. The button's symbol changes to represent the state of the next press.

- **Zoom**

This button allows the operator to zoom-to-full-screen to view live video or the frozen image at full screen resolution. When live video is shown at full screen resolution, it is displayed at its full frame rate (30 or 25 frames per second). To return from the full screen resolution display, touch anywhere on the screen.

- **Set this object to priority**

When three or four video objects are shown on one page, the priority option allows displaying one of the objects with a higher frame rate. Enabling this menu option allows the operator to select which video object to give the highest update priority.

- **Set all equal priority**

The button works in cooperation with *Set this object to priority* button. When three or four video objects are shown on one page, enabling this menu option allows the operator to set each video object at an **equal** update rate.

- **Save**

This button causes the captured video to be saved to Compact Flash. When the operator presses the save button, the frame is saved using the file name assigned in the global Video Configuration (see below). Note that the save button remains depressed until the save operation is complete.

- **Escape**

This button removes the pop-up menu from the display.

- **Freeze Bit (read/write)**

When this control bit is set high, a video frame is captured in the associated channel's capture buffer. In addition, all video objects associated with that channel display the frozen frame. Once this bit is reset, all video objects associated with that channel return a live video display. This bit also reflects the Freeze State if controlled from a pop-menu associated with this channel.

- **Save Bit (read/write)**

When the control bit is set high, that channel's capture buffer is saved to Compact Flash. If the associated channel is not currently in freeze mode, a video frame capture is made prior to the save. Once the save is complete, **the TIU resets the save control bit**. Since, the TIU resets the bit, scripts should only set this bit on a write request. Once set, scripts may monitor this bit to determine when the save operation is complete. This bit also reflects the save state if controlled from a pop-menu associated with this channel.

- **Video Err (read only)**

If the video card fails or is not present, these bits are set.

- **Save Err (read / write)**

If a save to Compact Flash fails (i.e. Compact Flash card full or missing), this bit is set for the appropriate channel.

16.2 Video Object Properties

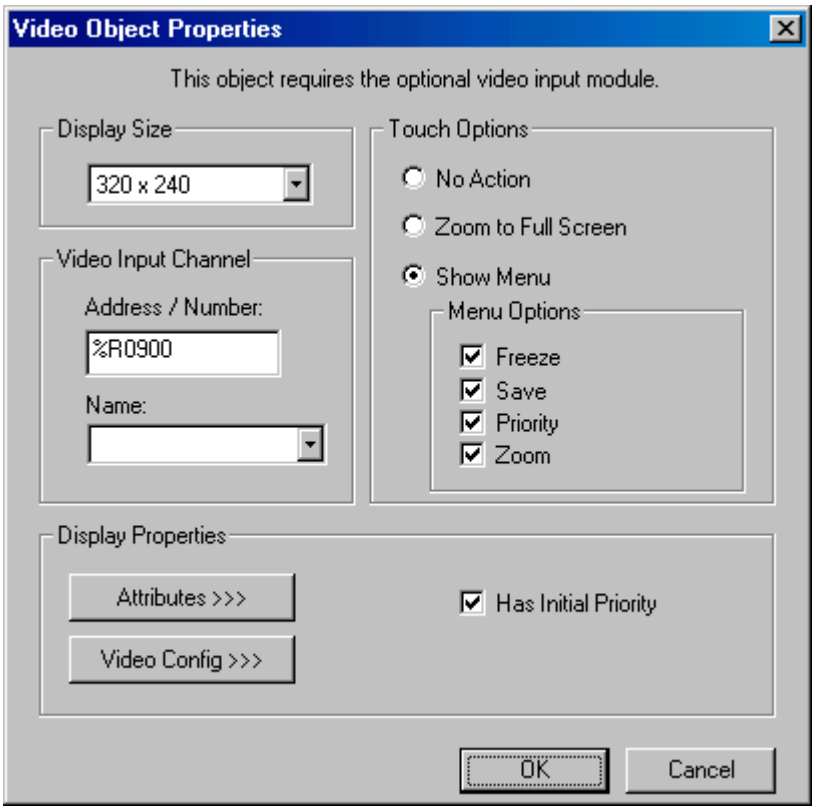


Figure 16.2 Video Object Properties

16.2.1 Object Placement

This object can be placed anywhere on the screen and initially set to any size but is automatically re-sized to fit the nearest supported resolution after releasing the mouse button.

16.2.2 Object Specific Properties

- **Display Size**

This option modifies the size of the video window and thus the size of the object. Four pre-set display sizes of Full screen, 640x480, 320x240 and 160x120 are available (pre-set sizes allow for maximum video update performance). On exiting this dialog, the object re-sizes itself to match this resolution setting.

By selecting “Full Screen”, the video object is the only object that is displayed (when visible attribute set) regardless of other objects present on the screen. This provides the advantage of displaying the video at its full frame rate 30 (NTSC) or 25 (PAL) frames a second. If the video object is configured with one of the other display sizes, other objects are also displayed, but the video is displayed at a reduced frame rate. Full screen video is displayed with a small black band around the video since NTSC / PAL video is approximately 640 x 480 and the TIU screen resolution is 800 x 600 (video is not stretched to prevent distortions).

- **Video Input Channel**

This option specifies which of the four physical video input channels are displayed on this video object. This can be either a constant from 0 to 3 or a 16-bit register address. When using a register to control channel selection, only the lower two bits are used (upper bits are ignored).

- **Video Config**

This button invokes the global video configuration dialog. The settings in global video configuration dialog are not directly tied to the video object but provide access to the global parameters associated with video. This dialog is also accessible from the main menu under Config | Video.

- **Touch Options**

This selects the action to performed when the video object is touched. These options are not available if the display size is set to full screen.

- **No Action**

Pressing the video object has no action.

- **Zoom to Full Screen**

Touching the video object switches the display to show the video full screen and at its full frame rate. Pressing anywhere on the full screen page returns the display to normal.

- **Show Menu**

Touching the video object brings up a small menu that, depending on the options enabled, allows the user to: freeze / resume the video, save the video, zoom to full screen, or adjust the video frame rate priority. Each menu item must be specifically enabled which determines what buttons are enabled when presented to the user. Note that the priority buttons are automatically disabled when less than 3 video objects appear on a screen.

- **Has Initial Priority**

This option allows this video object to have the priority frame rate (updated more often then other video objects) when the screen is initially shown. Only one video object per screen should have this option selected. This option only has an effect when three or four video objects are shown on a single page. The video object with priority frame rate can be modified at run-time with the pop-up menu.

*16.2.3 **Object** Behaviour*

- **Functionality**

This object continuously samples the specified TIU register (if not a constant) for a video channel change. The object then displays on the screen the video from that video channel. If the selected video channel is frozen, the display shows the image in the associated capture buffer. Else, the display shows the selected channel's live video.

If enabled, this object also samples touch and provides the configured action. If configured to provide a pop-up menu, that menu is display and sampled for the appropriate button press.

16.3 Video Configuration

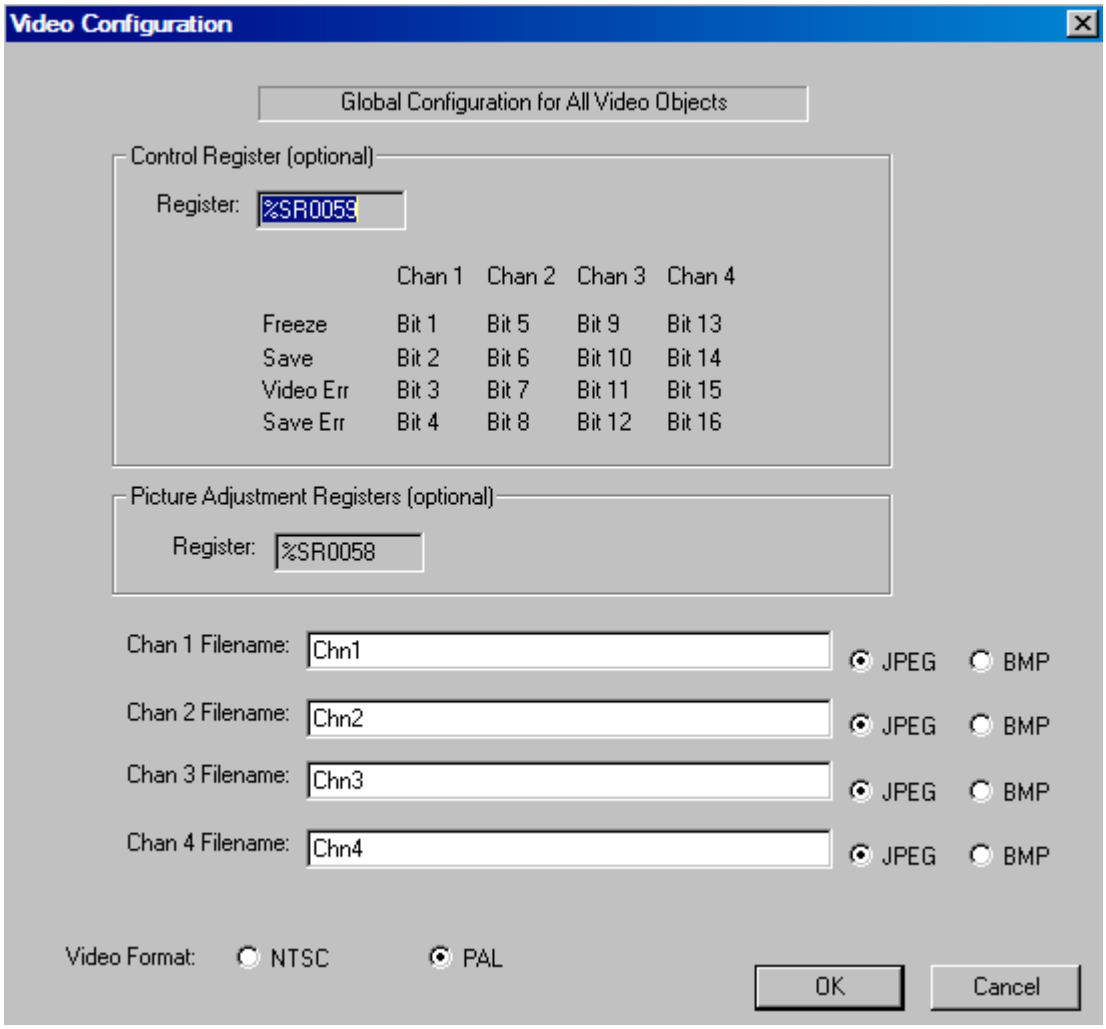


Figure 16.3 Video Configuration

- ***Video Control Register (Internal %SR0058)***

The video control register may optionally be allocated in the global Video Configuration. This register may be used by control captures and obtain status on the capture success. Four bits are allocated per channel out of the 16-bit register. These bits are listed on the Video Configuration Screen in Cbreeze.

- **Picture Adjustment Register (Internal %SR0059 & %SR0060)**

This address field allocates two consecutive 16-bit registers for controlling individual channel brightness, contrast and colour intensity. The first register specifies the parameter and the second specifies the value. Once a parameter is selected with the first register, the current value is available at the second register. Writing to the second register changes the parameters value. Note that changes are volatile on a power-cycle.

- **Parameter Number:**

	Chan 1	Chan 2	Chan 3	Chan 4
Brightness	0	4	8	12
Contrast	1	5	9	13
Colour	2	6	10	14
Reserved	3	7	11	15

- **Value Ranges:**

Brightness	0-31
Contrast	0-31
Colour	0-31

* 31 is maximum value, values greater than 31 are ignored.

- **Chan ‘n’ Filename**

These name entries specify the path\filename used for each video channel’s save function. The filenames must follow the general Compact Flash filename rules. Specified path\filenames may also specify substitution characters that are converted to run-time values such as date and time information when the path or filename is create. See filenames for more information.

- **Chan ‘n’ Save Format**

This entry specifies if the video channel’s capture image is saved as bitmap (16 colour) or JPEG file.

- **Video Format**

This specifies if the video inputs are NTSC or PAL.

Notes

CHAPTER 17 Ethernet

17.1 Overview – Modes of Operation

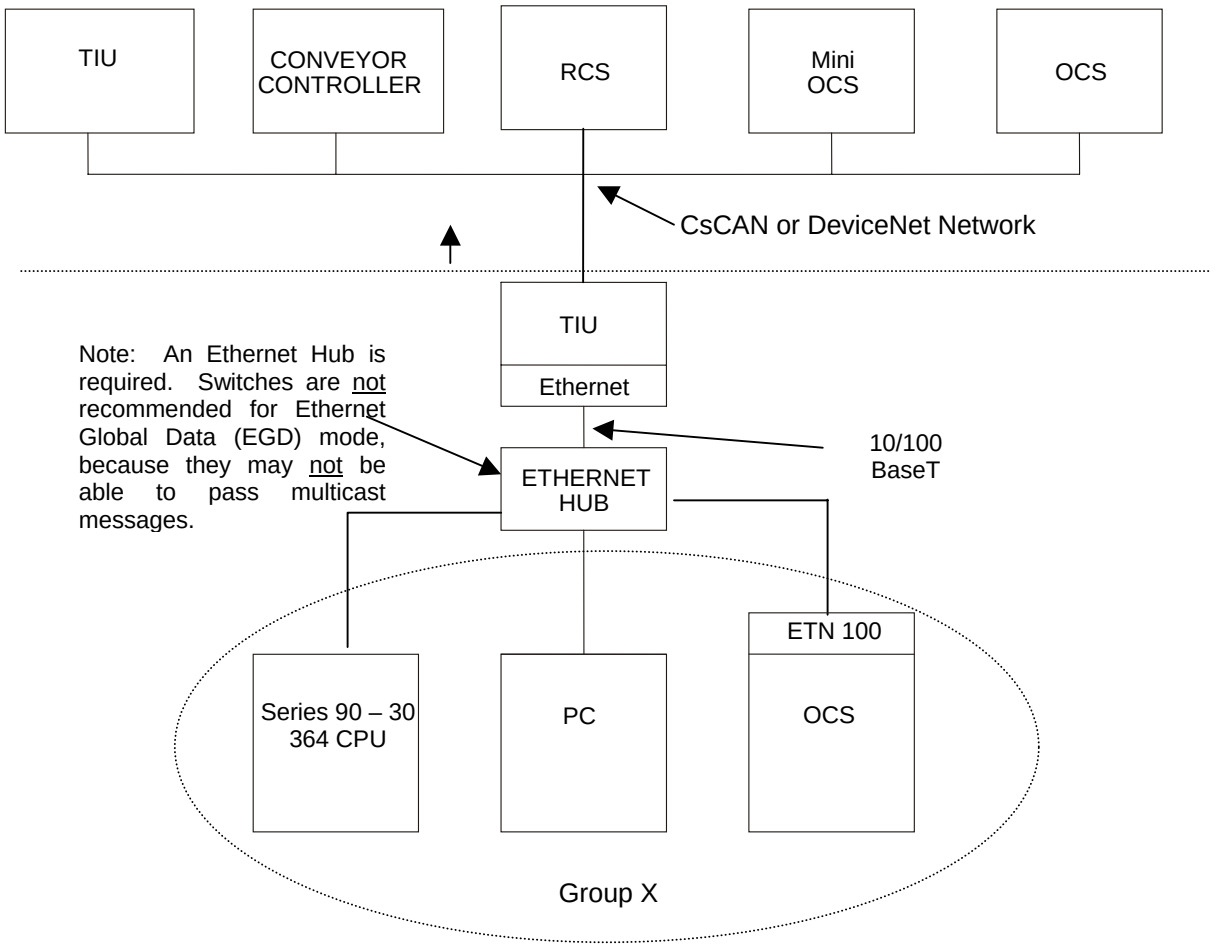


Figure 17.1 Example of an Ethernet network

Figure 17.1 depicts an overview of an Ethernet network. The Ethernet port has Four modes of configuration; EGD (Ethernet Global Data), SRTP (Service Request Transport Protocol), Modbus TCP/IP (Slave) and ICMP (Ping).

a. IP Address

Each node in the network is assigned a unique **IP Address**, which is represented by 4 dotted-decimal numbers. In existing networks, Network Administrators assign IP Addresses. For users who need to "build" a network, the recommended IP Address is 192.168.0.**x** (where **x** = 01 – 254 addressable nodes). These are IP Addresses that are set aside for private, internal IP Addresses per InterNIC.

b. Group ID

In some instances, a group of 2 or more devices are configured to *consume* (or receive) an exchange from a producer. A **group** consists of any node that produces or transfers exchanges to 2 or more nodes *or* is a node that is configured to consume those particular exchanges. Up to 32 separate groups are supported. Each group is assigned a unique Group ID between 1 and 32. A Group ID is considered an IP

Address. Note, however, that each node in a group is assigned a unique IP Address. When setting parameters for *Consumed* Exchanges, the value 0 is entered into the Group ID block when there is no group.

17.2 Configuration

17.2.1 Terms and Parameters

It is essential that the user understand the following key terms and parameters in order to configure the TIU's Ethernet module

Ethernet Global Data (EGD)	Allows a device (producer) to transfer (exchange) data to one or more consuming devices at a regularly scheduled transfer rate.
Service Request Transport Protocol (SRTP)	Allows a remote client to request services from a TIU containing the Ethernet module. SRTP is a Client/Server, Request/Reply Protocol and the TIU provides the Server side of the protocol.
IP Address	This is the unique id for a device on a network and is represented by 4 dotted-decimal numbers.
Recommended IP Address to Build a Network	When a user intends to "build" a network, the recommended IP Address is 192.168.0.**x.** (**x** = 01 – 254 addressable nodes.) This is an IP Address that is set aside for private, internal IP Addresses per InterNIC.
Group ID	When an Exchange Number is produced, it can be transferred to a *consuming* device or a *group of consuming* devices. Up to 32 separate groups are supported. Each group is assigned a unique group number between 1 and 32. When setting parameters for *Consumed* Exchanges, the value 0 is entered into the Group ID block when there is no group.
Subnet Mask	A Subnet is a portion of a network which shares a network address with other portions of a network. Subnets are distinguished from one another by a Subnet Number. The subnet defines the size of the subnet. The default Subnet Mask is 255.255.255.0.
ICMP Ping	Used for diagnostics only. A ping signal is produced and consumed to test an Ethernet module

17.2.2 Suggested Order of Configuration

Prior to configuration, it is recommended that a programmer use a spreadsheet and/or a drawing package to organise the required information. It is also recommended that the physical layout of the network be determined to include devices on the network and their locations.

1. Assign all IP addresses. There is one IP address per node. All devices require a unique IP Address even if the device is part of a group.
2. Assign Group IDs if a producing device is going to produce (send) an exchange to more than one consuming (receiving) device. A group includes all producing and consuming devices.
3. Determine the type of data that is going to be sent by each device.
4. Assign Exchange Numbers for each produced exchange (block of data) in Cbreeze Configuration by pressing the *Produced Exchanges Tab*. Also, set the memory range for each produced exchange.
5. Assign Exchange Numbers for each consumed exchange (block of data) in Cbreeze Configuration by pressing the *Consumed Exchanges Tab*. Also, set the memory range for each consumed exchange.

17.2.3 Configuration Procedures

The following procedures are used to configure the Ethernet module using Cbreeze Software.

1. Go to the Main Screen of Cbreeze and press Communications. Select Ethernet.
2. The Ethernet Configuration Screen appears.

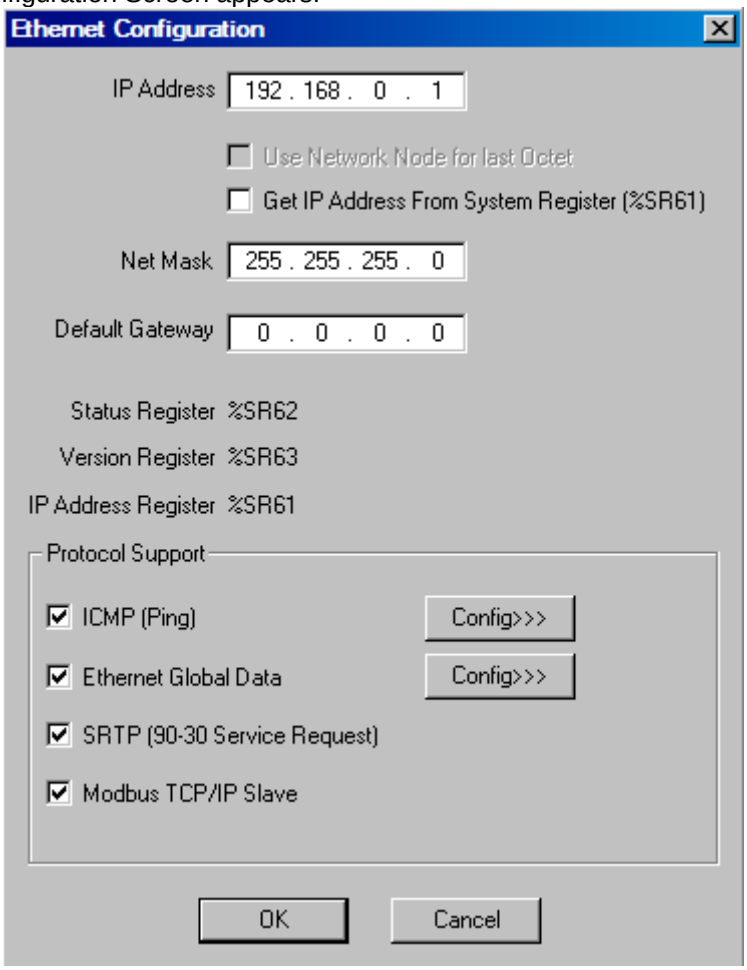


Figure 17.3 Ethernet configuration screen

3. Use the mouse to select the required Ethernet Protocol by clicking the desired box.

   The **ICMP (Ping)** is used for diagnostic purposes. A ping signal is sent to another device and then the ping is sent back to the originating device.

   The **EGD** (**Ethernet Global Data)** allows peer-to-peer or peer-to-group data sharing.

   The **SRTP** (Service Request Transport Protocol**)** allows a remote client to request services from an TIU containing an Ethernet module. If this mode is desired, select the SRTP box. ***No further selection is required.***

   The **Modbus TCP/IP Slave** allows a remote client to request services from a TIU. ***No further selection is required.***

4. Set the **IP Address, Net Mask, and default Gateway**

The **IP Address** is the address of the Ethernet module that is being configured. In this example the IP Address is 192.168.0.1. The **Subnet Mask** is 255.255.255.0 and allows up to 254 devices on the subnet.

The **Status Register** (%SR62) is a 16-bit register written by the module to indicate operational status. The **Version Register** (%SR63) is a 16-bit register written by the module to indicate the module firmware version.

5. Use the mouse to select either **ICMP (Ping)** or **EGD (Ethernet Global Data)** by clicking the desired box. When appropriate, both items can be selected

   The **ICMP (Ping)** is used for diagnostic purposes. A ping signal is sent to another device and then the ping is sent back to the originating device.

   The **EGD** (**Ethernet Global Data)** allows peer-to-peer or peer-to-group data sharing.

17.2.4 Configure ICMP

The ICMP (Ping) mode is used for diagnostic purposes only. Aan internally generated ping signal is produced and consumed. The user can then check the response time.

If the **ICMP (Ping)** box is selected, press the Config button next to it. The following screen appears. The **Ping Timeout** indicates how often a ping signal is sent out in milliseconds. The range available for selection is 100 – 100,000 milliseconds. (Figure 17.4)

The **IP Address** register, Internal %SR0064, is a 32-bit register read by the module to determine the IP Address to pins. The **Ping Time** register Internal %SR0065, is a 32-bit register written by the module indicating the time millisecond the last ping took.

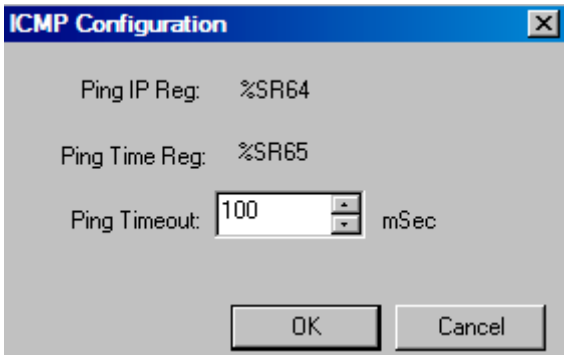


Figure 17.4 ICMP Configuration

After setting the ping timeout, it is necessary to go to the script program and write the ping address to the registers. To view the ping response time, go to the Script Program or a TIU screen, and view the ping time register.

17.2.5 Configure EGD

a) If the EGD box (Ethernet Global Data) is selected, the screen in figure 17.5 appears. Two tabs are available for selection: **Produced Exchanges** and **Consumed Exchanges**.

Parameters required to configure Produced Exchanges					
Exchange #	Type	Address	Produced Period	Reply Rate *Reserved for Future Use*	Ranges for Selected Exchange
Parameters required to configure Consumed Exchanges					
Exchange #	Producer ID		Group ID	Update Timeout	Ranges for Selected Exchange

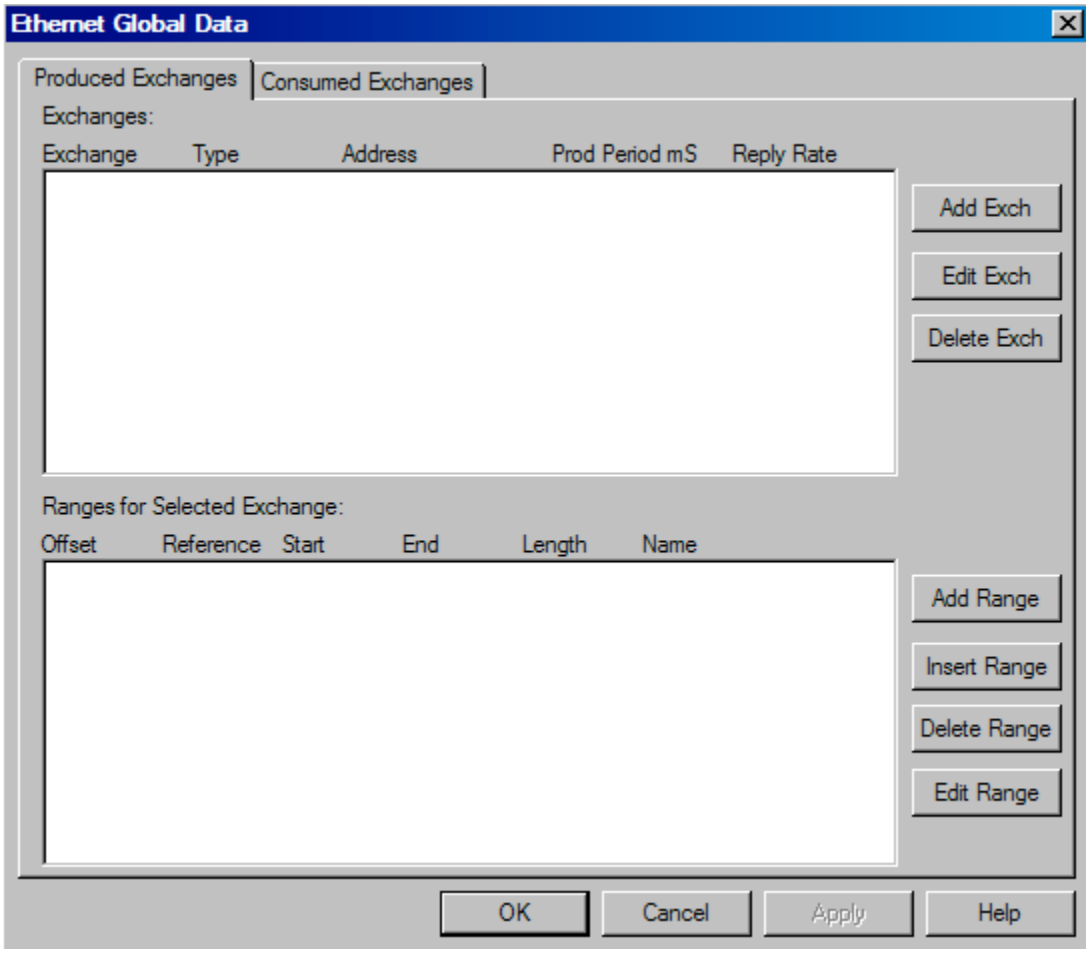


Figure 17.5 Ethernet Global Data exchange screen

17.2.6 Ethernet Global Data (EGD) Mode

a. EGD Functions

Ethernet Global Data (EGD) exchanges are designed for simple, efficient communication of sampled data between devices. EGD is not intended for event notification where the possible loss of a sample of data would be significant.

In the EGD mode, a device can be configured to function as:

1. A producing device, which sends or transfers an exchange (a block of data) to one consuming device or a group of consuming devices;
2. A consuming device, which receives exchanges from a producing device;
3. Both a producing and consuming device.

Note: An **Exchange** is a block of data that is assigned a numerical value by the user.

b. Exchange Configuration and Interaction

Producing and consuming devices operate asynchronously to each other. *For each device, both the data that it produces and the data that it consumes must be separately configured.* During configuration, the user needs to select *the Produced Exchanges Tab* to configure the produced exchanges and then select the *Consumed Exchanges Tab* to configure the consumed exchanges.

Example of Producing and Consuming Exchanges

Figure 17.6 depicts an example where Node 1 is configured to produce or transfer a block of data (Exchange 1) to Node 2 at a regularly scheduled transfer rate. Node 2 consumes the block of data (a consumed exchange. In addition to being configured to consume Exchange 1, Node 2 is also configured to produce (transfer) a different block of data (Exchange 2) on the network to Node 1. Node 1 is configured to consume Exchange 2.

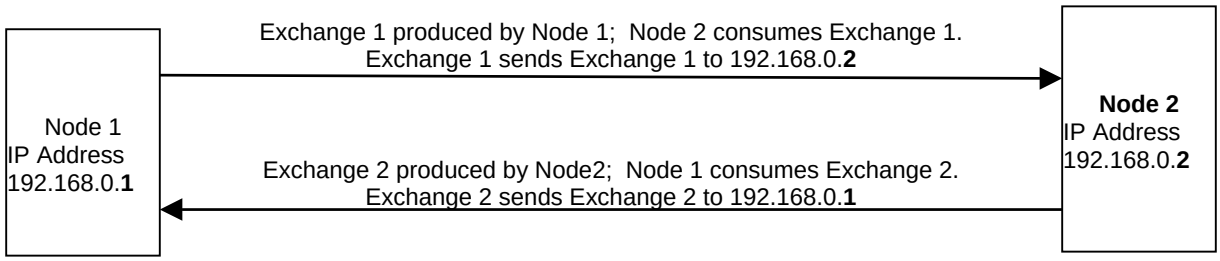


Figure 17.6 Example of Exchange Interaction

c. PLC Timing (Using Timestamp Feature)

The PLC scan time and the exchange time settings are asynchronous. The exchange time settings are the Produced Period for produced exchanges and the Update Timeout for consumed exchanges. Producing a data sample occurs as specified by the Produced Period. However, the update of the data sample to the CPU is not necessarily guaranteed to occur at that interval due to the PLC sweep time. To verify whether the data is new, the user can select to use the Timestamp feature.

Data consistency is handled on a per exchange basis.

d. Obtaining a Status (Status Feature)

To obtain a status, the user can select the status feature. The following tables provide status descriptions.

State	Value	Description
INVALID	0	Specified exchange is not defined on consuming node.
HEALTHY	1	Exchange is defined; Valid data was recently received.
UNHEALTHY	2	Exchange is defined but the last data sample received was invalid or A sample was not received within a specific time period.

Table 17.1 Produced Exchange Status

Condition	Description
INVALID_ERROR *	Producer indicates that data in the produced exchange is invalid. **
SHORT_ERROR *	Produced exchange was received but its length was less than expected.
REFRESH_ERROR *	Consumer did not successfully receive the exchange within a pre-configured time period.
PROTOCOL_ERROR *	Consumer received the exchange, but the protocol version was incompatible with version implemented on the consuming node.
SIGNATURE_ERROR *	The format of the user data in the produced exchange did not match the expected configuration on the consuming node.
LONG_EXCHANGE	The exchange was received successfully but was larger than expected.
NOT_TIMESYNCED	The producer has indicated that the data is valid, but the timestamp included in the exchange may not be accurate. **
* This condition forces a transition to the UNHEALTHY State	
** These values are set by the producer node and are included in the produced data exchange.	

Table 17.2 Consumed Exchange Status

17.2.7 SRTP (Service Request Transport Protocol

SRTP is a GE Fanuc proprietary protocol. This allows a remote client to request services from a TIU equipped with an Ethernet port. SRTP (Service Request Transport Protocol) is a Client/Server, Request/Reply Protocol and the TIU provides the Server side of the protocol. As the SRTP was designed to provide the services available on the GE Series 90 PLC, not all services are available from the TIU. This implementation of SRTP is mainly limited to those services required in the transport of PLC register data. The following are Service Requests processed by the TIU:

Req. Code	Service Name
0	PLC_SSTAT
1	PLC_LSTAT
4	READ_SMEM
7	WRITE_SMEM
33	CHG_PRIV_LEVEL
67	RET_CONTROL_INFO
79	SESSION_CONTROL
97	PLC_FEATURES_SUPP

The READ_SMEM and WRITE_SMEM requests are used for that Register Data Transfers and Following Register Types are valid:

Sel.	Register	Type
8	%R	16 bit
10	%AI	16 bit
12	%AQ	16 bit
16	%I	8 bit
18	%Q	8 bit
20	%T	8 bit
22	%M	8 bit
30	%S	8 bit
70	%I	1 bit
72	%Q	1 bit
74	%T	1 bit
76	%M	1 bit
84	%S	1 bit

There is No configuration of the TIU required to use SRTP, other than the IP Address, Net Mask and the check box enabling the protocol. The TIU acts a Server and responds to Requests from all Clients. SRTP can be used simultaneously with all other protocols available on the Ethernet port.