FLUKE®

Fluke Metrology
Software
Version 7

MET/CAL

5500/CAL

MET/TRACK

Users Manual

Table of Contents

Appendices

Index

xi

List of Tables

List of Figures

Chapter 1
Theory of Operation

Contents **Page**

Safety Information

Calibration systems may generate or measure dangerous voltages as required by the instrument calibration process. Both the operator and the procedure writer must be aware of possible hazards. To avoid electrical shock and fire hazards, follow the instructions below.

⚠⚠**Warning**

To avoid hiding the high voltage safety symbol:

Never use a screen saver when using the Run Time or Procedure Editor applications. These programs control the test instruments and can cause them to output dangerous voltage levels. The high voltage symbol indicates when dangerous voltage is present.

⚠⚠**Warning**

To avoid electric shock:

- **Use interconnect wiring and adapters rated for the highest voltage and current levels carried.**

- **Never touch exposed conductive portions of signal interconnect wiring, even after instruments have been turned off.**

- **Only touch the insulated portion of a connector. First disconnect the interconnect wiring at the source, then at the measurement side.**

- **Always use insulated adjustment tools.**

- **If the calibration program is abnormally terminated verify that the front panels of source instruments indicate standby mode.**

- **When writing procedures, make sure that procedures minimize the time during which dangerous voltages are applied.**

Introduction

This chapter is necessary reading for those new to Fluke Metrology Software as well as those currently using Fluke Metrology Software.

The upgrade will be more efficient for current users who understand the reasoning behind certain changes made. Taking time to understand product philosophy will improve implementation by new users. This chapter explains how the software operates, what tasks it is designed to accomplish and what problems it is designed to solve.

Beginning with Version 5.0, Fluke Metrology Software fully incorporated all previous products into a cohesive set of applications. After installing the MET/BASE package, licenses are applied to enable necessary programs.

About This Manual

This is the *Fluke Metrology Software Users Manual*; its purpose is to assist users who have already installed the base package and one or more licenses. There is no installation information in this manual. It provides specific information about the calibration of instruments and management of metrology assets.

The users manual was developed for two types of users: those who set up, administer, and maintain the system and those who use the software to perform calibrations or tracking.

Chapter 1 provides a look into the design considerations and ideas behind the software. Fluke's long-standing experience with calibration and metrology management software has proven that a solid conceptual model of the product gives users many advantages. Those who develop a clear picture of how the product works are better equipped to answer many of their own questions once they begin working with it.

Installation should be completed according to the *Installation and Upgrade Guide* prior to using this manual. The *MET/CAL Getting Started Guide* is used as a quick introduction to operation.

Terminology Clarification

- The 5500/CAL product is a subset of MET/CAL. Occasionally, the term MET/CAL is used when the text is applicable to both. When the term MET/CAL is used it is assumed that 5500/CAL operates identically. When there are differences between MET/CAL and 5500/CAL operation, the difference is clearly stated.

- This manual was not designed for cover-to-cover reading, but for random access use. Some unfamiliar terms may be used in early chapters. Further use of the software will increase terminology familiarity. It is recommended that terms or concepts be researched through use of help files or other sources to supplement information found in this manual.

  Several resources are available: the Glossary, the online help files, the Sybase online manuals and the README file

This Manual Describes Only Database Mode

Some older versions of MET/CAL and 5500/CAL could be operated in one of two modes, either Legacy Mode or Database Mode. Legacy mode is no longer available or supported. All upgraded installations will operate only in Database mode.

Intended Product Usage

The software application was designed to provide time-saving functions and features to the calibration laboratory environment. The traceability documentation requirements defined by current quality standards are making software solutions necessary for daily operation, regardless of the lab size.

Documentation may include:

- Lists of instruments due for calibration.
- Traceability reports for instruments used to calibrate other instruments.
- Calibration certificates for use in an ISO-9000 compliant organization.
- Calibration results reports and calibration summary reports as defined by ISO/IEC 17025.

Traceability

Proof of traceability of calibration may be required, for example, to maintain ISO-9000 certification. For a metrology lab, this means that the calibration documentation must be able to demonstrate an unbroken chain of comparisons. These comparisons must be traceable between a given asset and a certified standard, such as one maintained by a national standards body.

When a calibration event is entered into the database, information about one link in the traceability chain is recorded. When a traceability report is printed, the entire chain of comparisons is documented in one of two specified directions.

A *forward traceability* report provides information about a particular asset and a particular calibration event. It is a listing of all the standards in the chain used to calibrate that asset relative to a specific cal event. The standards used in the current calibration are called the **first tier**. The standards used to calibrate *those* standards are the **second tier**. Those standards used to calibrate the second tier are in the **third tier**, and so on. The depth of the chain is selected when the report is run.

A reverse traceability report documents all the assets calibrated directly or indirectly by a specified standard asset during a specified period. Again, the standard asset is the first tier. Instruments that the standard asset calibrated are the second tier. Instruments that the second tier calibrated are in the third tier, and so on. Traceability reports are discussed in more detail later in this manual.

Software Components

Two major components make up the Fluke Metrology Software product offering:

1. MET/BASE is the core product. However, MET/BASE is not functional until a second component is in place.

2. The User License is the second component. A License enables particular applications. The licenses available are called MET/CAL, 5500/CAL, and MET/TRACK. Which license or licenses applied determines which applications can be accessed. Client software can be installed on an unlimited number of workstations. However, the database keeps track of how many applications that can be started at any given time, depending upon the number of applied licenses. This type of license is called a "floating license."

Applications Available to the Licenses

The following table lists the names of the applications enabled by each different license.

Application Name	Licenses		
	MET/CAL	**5500/CAL**	**MET/TRACK**
MET/CAL Run Time	✓		
5500/CAL Run Time		✓	
MET/CAL Procedure Editor	✓		
5500/CAL Procedure Editor		✓	
MET/TRACK	✓	✓	✓

This chapter introduces these applications (and others that are not subject to license management). Details are provided later in this manual.

The Fluke Metrology Software Applications

The software is designed to assist users in conforming with ISO/IEC 17025, ISO-9000, ISO/IECEN 17025, ANSI/NCSL Z540-1 and other requirements. ISO and other standards bodies have defined a structured process flow for metrology. Adhering to that flow is the only way to ensure calibration traceability.

This software is designed to integrate into the traceable environment. It is important that managers, administrators and technicians read this chapter. All Metrology/Calibration personnel benefit from an understanding of these processes and requirements. Later, this chapter illustrates process flow.

MET/CAL *Plus* Software is a set of Windows-based applications that automate the asset calibration and management process. This includes procedure execution, instrument control, results storage, report generation, and asset management.

Software automation improves test consistency, reduces error and cuts the amount of time required to calibrate an instrument. MET/CAL *Plus* software also provides information storage and retrieval.

The Run Time and Procedure Editor applications allow a user to control calibration equipment on the IEEE-488 bus or RS-232 serial port. This provides a way to verify and adjust a Unit Under Test (UUT) either through IEEE-488 or serial interfaces. The Run Time and Procedure Editor applications can also be used in manual applications to ensure consistency of testing from technician to technician.

The following table shows the icons for all applications available for installation. Note that the icons are in two groups: those representing Fluke programs, and those provided as third-party software. Applications that are subject to license management include a large check mark beside the description.

With the exception of *Crystal Reports*, all of these programs are members of the Fluke Metrology Software program group that the installation program creates on the administrator's workstation.

Table 1-1. The Fluke Metrology Software Tool Set: Fluke-Developed Applications

	MET/CAL and 5500/CAL Run Time As the primary MET/CAL and 5500/CAL application, the Run Time executes calibration procedures and saves the results. Procedure Writers and Operators can access this application.	✓
	MET/CAL and 5500/CAL Editor The Editor helps create, edit, and compile MET/CAL or 5500/CAL procedures. Procedures are the programs that control the automated calibration of instruments.	✓
	MET/TRACK II This application provides access to the database for configuration, customization and data entry. This is the interface used by administrators to configure the system, manage users and security levels, customize data entry forms and field entries. In addition, it is used by data entry personnel to add assets to inventory, and record events like calibration, location changes and repair information. It Provides the mechanism for viewing and browsing data and has utilities for adding, editing, and running reports.	✓

✓ *Check mark indicates applications that are subject to license management.*

Table 1-2. The Fluke Metrology Software Tool Set: Third Party Software

	Database server The server is part of the Sybase SQL Anywhere product. The server must be running before any client (application program) is started. The icon is seen only in a standalone installation, or in network installation, on the administrator's workstation.
	Network requester client. The network requester client is part of the Sybase SQL Anywhere package. The data engine must be running on the server before the network requester on the client machine is started. Once the requester is running, several applications can use it to connect to a database servers.
	ODBC Administrator The ODBC Administrator is part of Windows. This tool configures the data sources.
	ISQL Interactive SQL is a part of the Sybase SQL Anywhere package. ISQL is an interactive tool for issuing commands in the Structured Query Language.
	Crystal Reports Crystal Reports is the report writer program used for generating reports. All Sample Reports were created with this application. For compatibility reasons, Fluke recommends using Crystal Reports to create any additional reports that may be required.

MET/CAL License

When applied, a MET/CAL license grants access to the entire suite of applicable software programs available with MET/CAL Plus. These programs allow a metrology lab to calibrate, maintain and track equipment in conformance with various standards requirements, such as ISO-9000. 5500/CAL Run Time and Editor Programs, a subset of MET/CAL Runtime and Editor are not accessible with a MET/CAL license.

5500/CAL License

The 5500/CAL License limits the automated calibration programs to serial instrument interface only. 5500/Cal has its own Editor and Run Time programs and IEEE-488 cannot be used. However, the remaining suite of programs is accessible with this license.

MET/TRACK License

A MET/TRACK License also provides limited access to programs. The data entry, database customization and system configuration applications are the same as those enabled by MET/CAL or 5500/CAL licenses, however there is no access to automated calibration applications with a MET/TRACK license.

Calibration Process Flow

As shipped, Fluke Metrology software is an effective tool for automation. Alternatively, it can be customized to better meet specific corporate guidelines for process flow and documentation.

The application design is based on the typical path of an instrument as it arrives, undergoes repair, maintenance or calibration, and finally is sent back out to the use location. Since this process may vary from company to company, customization tools are provided.

New Asset

Each piece of equipment or *asset* receives a unique identification number when first entered into the system. This *asset number* is used to create links between each section of the database relative to that specific instrument.
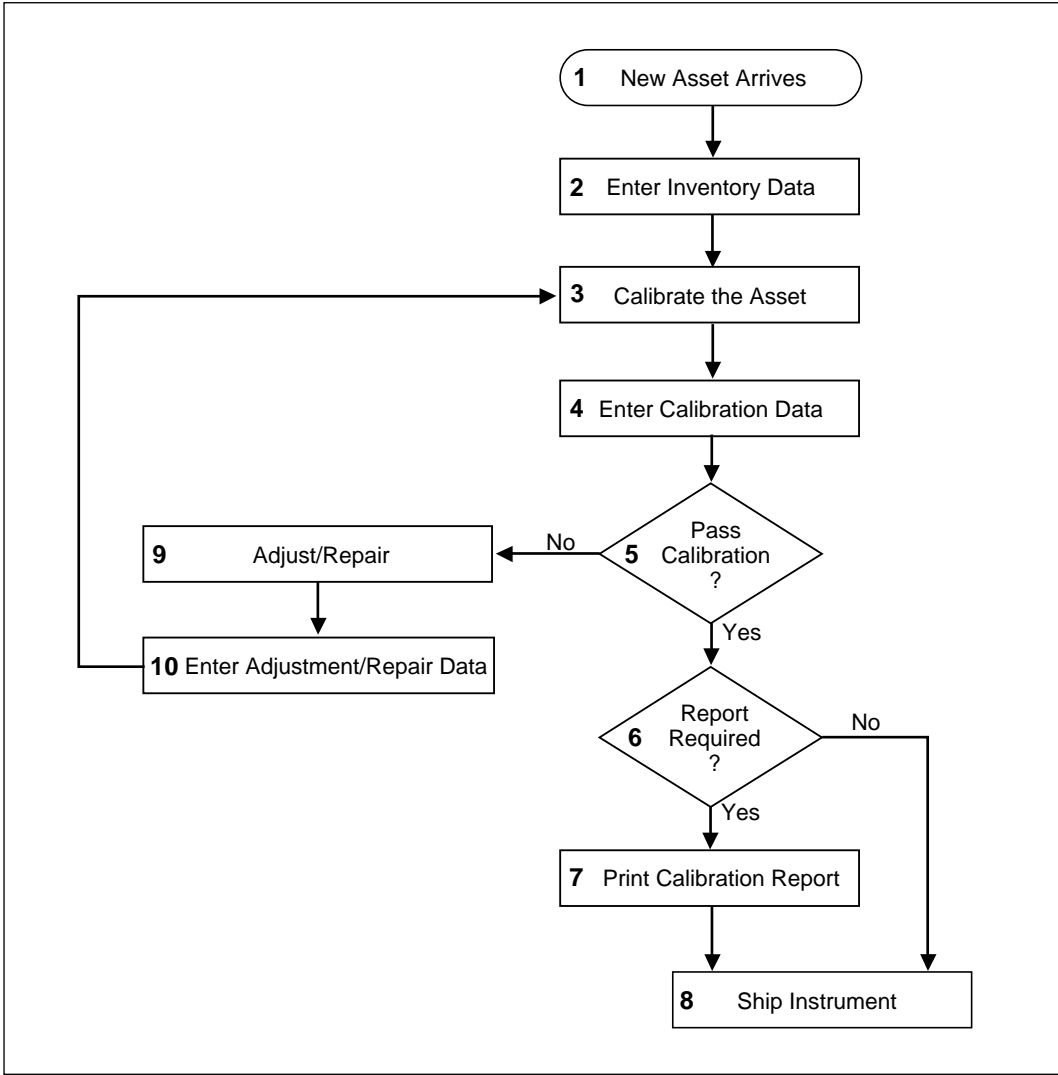
il102f.eps

Figure 1-1. Process Flow 1: New Asset

The following numbered paragraphs discuss the path an asset follows through the calibration process. The process is charted in Figure 1-1.

1 The new asset arrives on site.

2 Vital information, like the unique asset number, is recorded on an inventory form by using MET/TRACK or MET/CAL Run Time.

 MET/TRACK is used to manually record data on the inventory form. In addition to identification details, this data will include arrival status, (or condition of instrument) and the desired *calibration interval*. Additional asset information can be recorded at this time, including database *segregate*, required calibration procedure, purchase date and cost. The amount of information entered depends on the amount of database customization done.

 MET/CAL Run Time is used to calibrate an instrument. However, if the instrument has not been entered into the database by the time it is calibrated, required information is entered from Run Time. During the customization process, certain data fields may be designated as *required fields*. A dialog box will prompt the operator to enter this *required* information before the procedure runs. This process will create an inventory record for the asset being calibrated. Again, the amount of information entered depends on the amount of database customization done

3 If necessary, the new asset is calibrated. This is done manually or by using Run Time.

4 Calibration data is recorded in the database. This is done automatically with Run Time or manually, using the MET/TRACK application. At the end of the automated calibration procedure, the operator may be prompted to either save or discard calibration data. Selecting "save" will record the calibration event in the database.

 If the asset is calibrated manually, or by an outside source, a calibration record can be added manually to the database. The MET/TRACK application will allow a user to add a calibration event and record applicable results data.

5 If the asset does not pass calibration, it might be necessary to adjust or repair it. (see step 9). If the asset does pass calibration, it continues through the process.

6 Most instrument calibrations must be documented. The easiest way to document a calibration event is to print a calibration report. If a calibration report is not required the unit can proceed to shipping.

7 If a report is required, the desired report is selected and printed. Again, this can be done from Run Time or MET/TRACK.

If reports are printed from Run Time, they are selected at the end of the procedure. At the conclusion of the calibration, a *Post Run Results* window will appear. It is from this window that reports are selected and printed.

If reports are printed from MET/TRACK, they are selected from a toolbar menu on the calibration record pertinent to the specific calibration incident.

8 Whether documentation is printed or not the asset is now ready to leave the calibration lab for its final destination.

9 At Step 5, if the asset did not pass calibration, it leaves the normal flow so it can be adjusted or repaired.

10 Repair or calibration adjustment results are recorded in the database as described previously, using either MET/TRACK or Run Time. Another attempt is made at calibration (back to Step 3). The asset will either proceed to the next step or continue in a loop until it passes or is removed from inventory.

Asset Recalled: Due for Calibration

The following chart follows the path of an instrument called out of inventory to be calibrated. While the process is similar to what a new instrument undergoes, the results are more critical. It is crucial that an instrument used as a standard to calibrate other instruments be found *in tolerance* when it is called up for calibration. If it is found *out of tolerance* then all calibrations that it has performed since the prior calibration date are suspect. In this situation all those suspect instruments may have to be recalled for calibration.
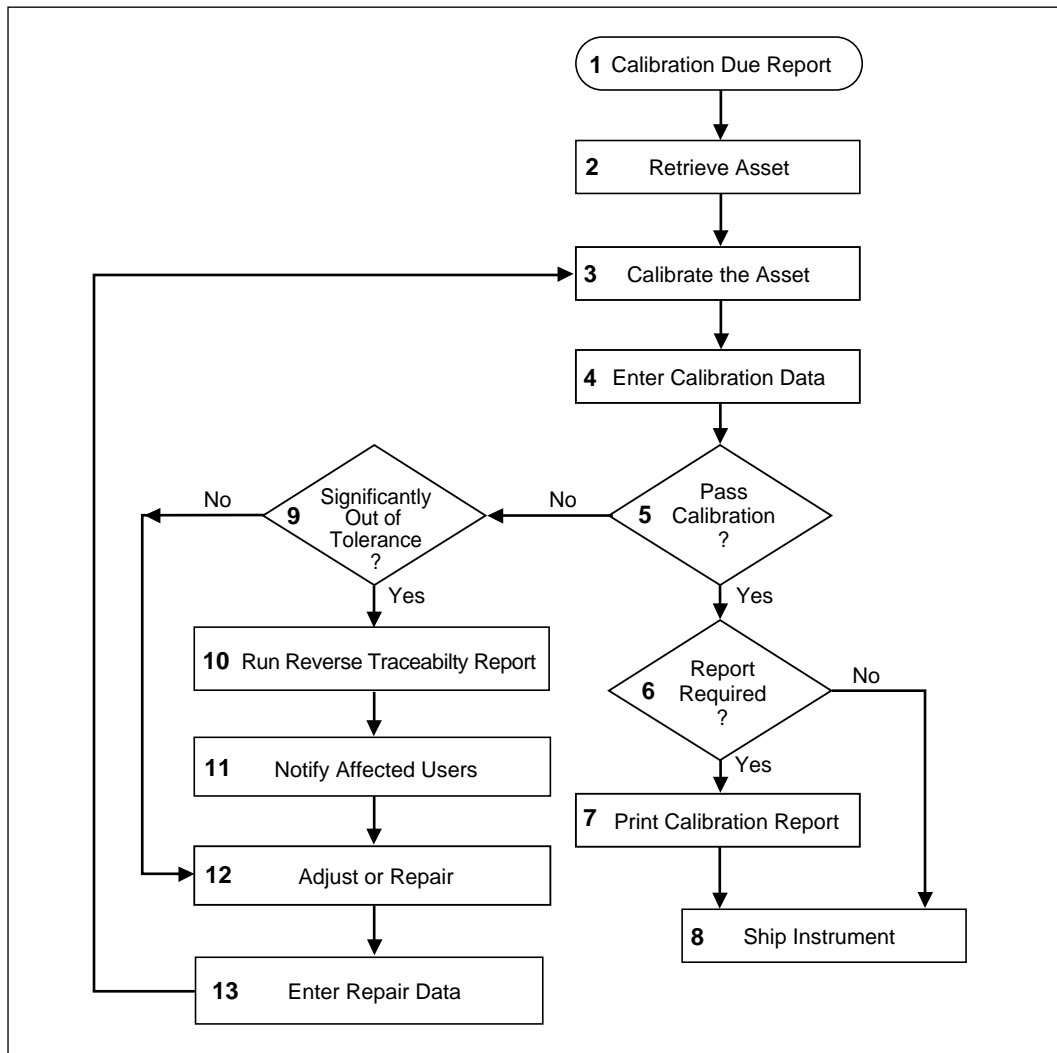
IL103F.EPS

Figure 1-2. Process Flow 2: Asset Recalled, Due For Calibration

1   Assets are assigned a calibration interval when they are entered into inventory. A *Due for Calibration Report* looks at this data to identify when an asset needs to be calibrated.

2   The assets identified in the report are retrieved and brought to the lab.

3   The asset is calibrated, either automatically using MET/CAL Run Time, or manually.

4 Calibration data is recorded in the database. This is done automatically with Run Time or manually. At the end of an automated calibration procedure, the operator may be prompted either to save or to discard calibration data. If the save option is selected the calibration event is recorded in the database.

   If the asset is calibrated manually, a calibration record can be added to the database. The MET/TRACK application allows a user to add a calibration event and record applicable results data.

5 If the asset passes calibration, it continues through the process as described in steps 6 through 8.

   If the asset does not pass calibration additional data must be collected before it continues through the process loop. A unit under test that is not used as a standard to calibrate other instruments can go through the repair and recalibrate loop represented by steps 12, 13 and 3. If the unit under test is used as a standard to calibrate other instruments a recall may be necessary. A traceability report can be run to determine if a UUT has calibrated other instruments.

6 If an instrument used as a standard is found to be significantly out of tolerance a decision to recall or not must be made. Since the only data available is the last calibration record, it is assumed that the subject instrument has been out of tolerance since it was last calibrated.

   Note, however, that the definition of "significantly out of tolerance" varies from site to site. Tolerance is based on quality definitions and practices employed by different companies. Reports generated by Fluke Metrology Software cannot be used alone to make asset recall decisions.

7 A reverse traceability report is run to determine which other assets may have been affected by the subject asset as shown in step 10.

8 The owners of affected instruments are notified of the results so a recall decision can be made as shown in step 11.

9 The subject instrument is adjusted or repaired as shown in step 12.

10 Adjustment or repair data is entered into the database as shown in step 13 and calibration is again attempted.

11 Once the instrument can be successfully calibrated a report is generated and the instrument is shipped back to the user.

Asset Recalled: Due for Maintenance

Some asset recall systems schedule periodic maintenance, A Due For Maintenance Report is used to locate all the assets due for maintenance. As assets reach their Maintenance Due dates, Fluke Metrology software helps manage their flow through the lab. The process is charted in Figure 1-3.
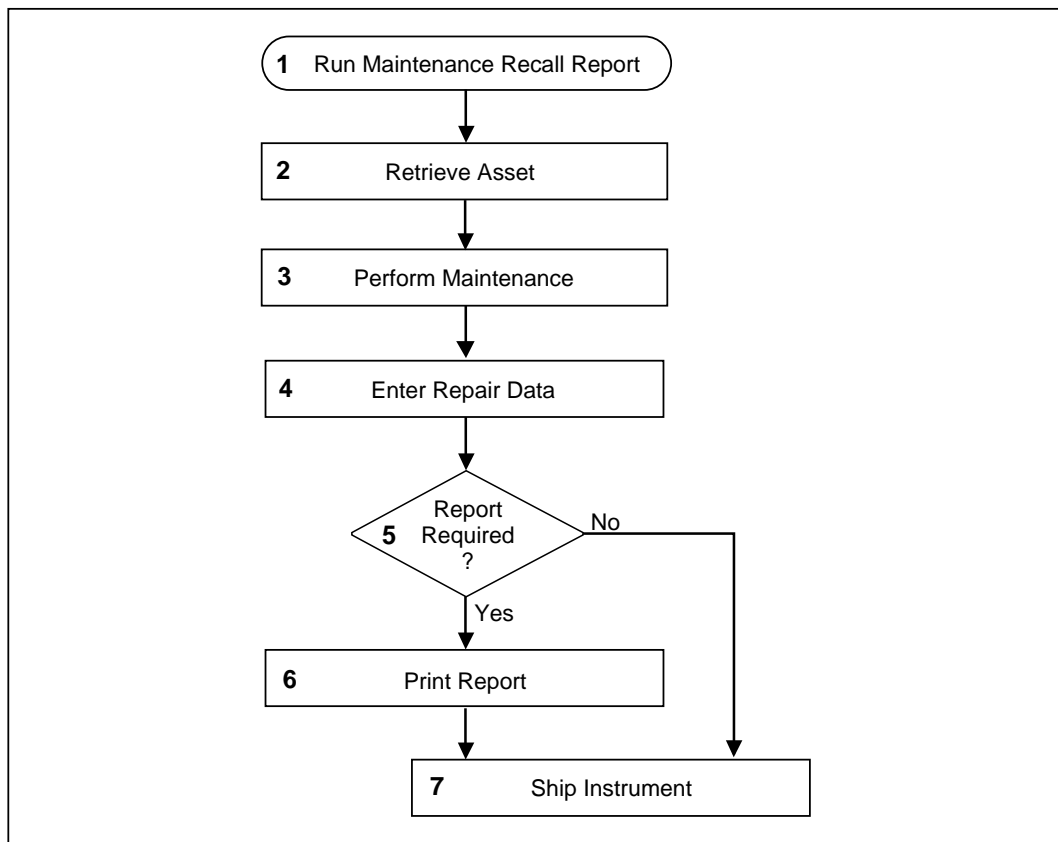
IL104F.EPS

Figure 1-3. Process Flow 3: Asset Recalled, Due For Maintenance

The following paragraphs describe the activities that normally take place in the calibration laboratory when an asset is due for maintenance.

1 Periodically, the laboratory runs a report designed to locate all assets due for maintenance. This may be a part of a formal preventive maintenance program, or a routine cleaning and inspection process.

2 Based on the results of the Due for Maintenance Report, assets are recalled for maintenance. As assets reach their maintenance due dates, Fluke software helps manage their flow through the lab. Reports create work schedules

        while the MET/TRACK or Run Time applications create or update associated asset records.

3   The required repair or scheduled maintenance is performed on the subject asset.

4   Details of all work done is entered into the database. Maintenance records keep a complete history of every repair or maintenance that has been performed. The first record is created after the asset is entered into the database and a new record is added with each subsequent repair or maintenance event. The maintenance record is created from a form that can be used to track repair work, including parts used and related part and labor costs. The same form is used to track routine preventive maintenance requirements, such as cleaning a filter or changing fluids

5   After the records are updated, need for a documenting report is assessed.

6   The necessary documentation is printed.

7   The asset is returned (shipped) to the required location

Software Operation

When MET/BASE is installed according to the client/server (network)or stand-alone model, the installation program creates two key directories, Metcal and Metdata.

The Metcal directory must be sharable by all clients. In a network installation, the directory is on a designated drive on the server. All of the client workstations on the network use the executable programs and other files stored in this shared directory. Which files are accessed depends on the applications chosen during the client installation. However, all users must have the ability to read from and write to the Metcal directory to ensure access to applications. In a stand-alone installation the Metcal directory is installed on a designated hard drive. The directory is usually not shared because the stand-alone system probably has a single user.

The Metdata directory is not shared. The *database file*, called **mtrack.db** and the *log file*, called **mtrack.log** reside in the Metdata directory. Only the database engine can read and write to this file. No other programs access the database file in any way when the database is in use. The data engine must run on the machine that has access to the database file. In a network installation, this machine is usually the server. Due to the importance of the database file to correct operation of the software, it is recommended that only administrative tasks are performed on the machine running the data engine. In a stand-alone installation, the data engine resides locally, on the designated hard drive and directory sharing is not an issue.

Database Communication

In network installations, database requests come from client computers that send and receive information to and from the data engine, via the *data requester*. The messages for the data requester come from the client applications. Client applications include MET/TRACK, Run Time, Procedure Editor, Crystal Reports, ISQL, and other programs.

The data engine and the data requester communicate using the Open Database Connectivity standard (ODBC). The data requester icon is visible to the user from the client machine. The data engine in turn sends and receives that same information to and from the actual database file. Any changes made to the database file are tracked as key strokes in the log file.

A similar process is followed in a standalone installation, but the data requester functionality and the data requester icon are not visible to the user. The data engine still communicates with the database file through ODBC and the log file still tracks database changes.

Example

If the MET/TRACK application is being used to search for all assets where the manufacturer is FLUKE, **Search** is selected then FLUKE is entered in the manufacturer field and the **Enter** key is pressed. The MET/TRACK application sends a message to ODBC, which in turn sends it on to the requester, to find all assets where the manufacturer is FLUKE. The requester then sends this message to the data engine according to the network protocol. The data engine receives the message, searches the database file, and sends the answer back to the requester, again using the network protocol. The requester receives the answer, sends it to the MET/TRACK application using ODBC, and MET/TRACK displays the results on the screen for the operator.

Software Operation Summary

Every transaction between a Fluke Metrology application and the database involves the interaction of many programs. This is true for either stand-alone or client-server installations. Data is stored in the database file called mtrack.db. Keystrokes used to enter and edit data are recorded in a log file called mtrack.log. Both of these files are in the unshared Metdata directory. Program executables and other necessary files like procedures and reports are in the shared Metcal directory.

As discussed previously, all communication for data travels from the client applications to the data requester and between the requester and the data engine via ODBC. The data engine is the only application that writes directly to the database files.

User Profiles

Fluke Metrology Software is designed for several different types of users:

- System Administrator
- Sr. Technician/Metrologist
- Operator/Technician
- Operator / Data Entry
- Manager

At some sites, one person may perform all the functions. At other sites tasks may be divided among separate individuals or groups.

The following paragraphs give general descriptions of tasks the various user types perform and to which applications they should have access,.

System Administrator

The System Administrator is the person who. understands the processes and documentation required for lab operation. In addition, this person should be very familiar with computer operation and database functions. It is the responsibility of the System Administrator to make any customization necessary to ensure integration of the software into existing lab practices. Once the integration process is complete, the System Administrator must maintain system operation. The System Administrator must be aware of every aspect of the system, from adding users to editing forms and fields to database backup. Some common Administrative tasks are listed below:

- Install Software and upgrade releases as required.
- Install computer interface hardware as needed (IEEE interface cards).
- Add and configure users, assign passwords, security access levels and segregate designations. Customize user desktops.
- Customize database fields, forms and reports to integrate software into established lab practices.
- Create and implement a backup plan for the database and crucial shared directories.

The System Administrator understands lab practices, defines data flow through the calibration process, maintains user access, and customizes data fields and forms. He also installs software and software upgrades, installs IEEE interface hardware and performs data backup to maintain data integrity.

Fluke software ships with a format designed for out-of-the-box use, with little or no customization required. This enables the System Administrator to concentrate

on installation, data importation and training, before implementing desired customization.

The System Administrator is assigned the highest user security level.

Sr. Technician/Metrologist

The Sr. Technician who also may be a metrologist creates and modifies procedures. A Sr. Technician has an understanding of basic metrology principals and is familiar with calibration procedure structure. Responsibilities of this user may include::

- Writing and testing calibration procedures

- Maintaining procedure library, adding, editing or deleting procedures as necessary

- Generating Test Uncertainty Ratio reports

- Adding and editing calibration standards

- Configuring the Run Time application including Measurement Uncertainty

The Sr. Technician will use the Editor, and Run Time applications as well as some MET/TRACK functions.

For specific information on the tasks of the Sr. Technician, see Chapters, 4, 6, 7 and 8 of this manual (*Running Calibration Procedures*, *Procedure Editor, and Customizing the Run Time Application, Configuring the System.)*

Operator/Technician

Operator/Technicians run procedures to perform verification and/or adjustment of a Unit Under Test (UUT). The operator has the following responsibilities:

- Calibrating UUTs using the Run Time application.

- Saving, viewing and printing results.

The operator uses the Run Time and MET/TRACK applications. For specific information, refer to Chapter, 4 of this manual.

Operator/Data Entry

Some sites have a workload heavy enough to support a separate individual just to input data. Typically, a data entry person enters new asset, maintenance or location information. If all the assets in a system are labeled with barcodes, a data entry workstation may include a bar code reader to assist with automated data entry.

If manual calibrations are performed, the data entry operator might transcribe hard copy calibration results into the database. This user may also print cal certificates and calibration data reports.

Manager

The Manager is mainly interested in looking at data and uses the MET/TRACK tool to review data and run reports. Reports run by the manager may include calibration due, calibrations overdue, workload by technician and anything else that will help schedule the lab employees time. Some managers may want to develop custom reports as well. They should have a good understanding of the database and report writing programs.

The User Interface

Fluke Metrology Software is implemented as a group of Windows applications. MET/TRACK uses the same standards and conventions as other Windows applications and MET/CAL uses a similar menu structure. Experience with Windows will help a user become comfortable with the user interface. Pull-down menus, *Hotkeys* and fill-in dialog boxes are standard elements of this interface, and they operate in much the same manner from one application to the next.

Getting Data into the Database

When entering or updating information in the database, the user enters data into fields on the applicable form. The exception to this is the process used by the Run Time application to automatically create calibration and results records at the end of the calibration process. In this instance, the user does not create records manually.

A field is the smallest piece of data within the database. An example of a field is the Asset Number field. The Asset Number field is a part of the Inventory Table. Other fields in the Inventory Table can be assembled together to make the Inventory Form. Users will enter data on to the form. When that data is saved it creates a record that is now a part of the database.

The Database Tables

The software records asset information and calibration results in tables within the database. A form displays only one record of a table. For example, each asset has a unique entry in the Inventory table. The information saved on the Inventory Form for an asset is just one of the many records contained in the Inventory table.

The main tables and their forms are listed below.

Inventory	Contains information about an asset, including asset number, model, manufacturer, and serial number.
Calibration	Each record contains information about a single calibration event, such as the calibration due date, the date calibration was performed, the environmental conditions at the time of calibration, what standards were used, and additional information about the calibration event.
Calibration Results	Contains information about the results of a calibration. When a MET/CAL or 5500/CAL Calibration Procedure is running, Function Selection Codes (FSCs) that generate results automatically store the results in the database. Refer to the *MET/CAL Reference Manual* for detailed information on FSCs.
Location	Location information includes the department and station where the instrument is being used and the name of the current user. It can be used also to assign the instrument to another department or user.
Maintenance/ Repair	Records contain information about a single repair or maintenance procedure performed on an asset. It may also include the parts used in the repair or maintenance, part and labor costs and failure description.
Customers	Contains information about customers such as name, address, shipping, tax and contract status.
User Created	The User Tables are created by the user (usually the system administrator). They can contain any information in table form. They are an optional-use table.

Chapter 2
Backing Up Data

Contents   **Page**

Vitally Important Information!

Backing up data is of vital importance, and this chapter describes a minimum recommended plan.

Performing a backup of the database is not complicated, nor difficult. Provided tools make the process fairly simple. However, backing up data is of paramount importance. Here's why:

Calibration data recorded to a database provides proof of the traceability of a labs calibrations. If data becomes lost or damaged that proof may be gone and a lab may have difficulty reconstructing important traceability information.

A database can be corrupted either by media failure or system failure. Both types of failure can make data irretrievable. Since the risk is unknown, it is best to be prepared for the worst-case scenario.

Backup and Recovery Plan

Most companies will have a plan and schedule for backing up crucial data. The backup of the data base file (mtrack.db) and the data log file (mtrack.log) as well as any custom report files (found in the METCAL directory) and any custom procedures (found in the PROC sub directory of METCAL) should be included in the corporate backup process.

If no corporate standard exists it is highly recommended that a plan be implemented. Backup media that can be used includes writeable CDs and zip disks used with a zip drive. The frequency of backups depends on the maximum amount of data recoverable without a backup. For example: If a company can safely recover a weeks worth of data, the backup frequency could be weekly. The Administrator should be actively involved in backup plan decisions.

The following schedule can be used as a guide to establishing a backup plan.

Daily   Every day, make a backup of the log files. (The database automatically creates files describing its activity. See the Glossary for a more detailed description).

        The transaction log file does not contain the entire database, but a record of the transactions that have occurred since the last time a new log file was started.

Weekly   One day of the week can be designated for a weekly backup. A weekly backup includes backing up the entire METDATA directory, including the log files and the database files, and also report and procedure files contained in the METCAL directory. At the same time, restart the transaction log file. This is the file that records, on a daily basis, the full set of transactions that have occurred since the last backup was done.

Monthly On a designated day every month, do a monthly backup. This is a backup of the entire METDATA directory plus the METCAL directory on the server.

Annually On a designated day each year, remove the newest monthly backup disk, or CD. Archive it permanently, and replace it with a new disk or CD.

Each piece of backup media should be labeled correctly to assist with data recovery in case of a catastrophic event.

This basic system can be modified to suit the workload at a specific site. For example, if the workload is heavy, it may be appropriate to do full backups daily, in which case the transaction log file is reset each day. In a very light workload situation, full backups may be performed only once per month, with transaction log files being backed up weekly.

Preliminary Checks

Before backing up data its integrity should be verified. From the Sybase folder browse to Sybase Central and run scjview.exe to bring up the program. Under Adaptive Server Anywhere, open up the Utilities folder. Select the Tools menu and select Connect to log in to the database. After database has started, Select the Validate Database utility by double clicking with the mouse. Follow the instructions generated by the Validate Database wizard.

At this point, the database can be backed up manually by selecting the Backup Database utility. Instructions for a more automated backup routine are provided later in this chapter.

Copying the Backup Files to Archive Media

Regardless of the operating system, once you have created the backup files, the final step is to copy them to the archival media. In a very strictly controlled environment, two copies may be necessary, one for storage off-site.

The nightly backup is called incremental because it contains only a record of the day's transactions, and it grows incrementally as the week goes on. If the plan described in this chapter is followed, each morning after a backup is done a fresh log file is started. That evening, the backup contains the day's transactions, then the next day another day's transactions are added and so on. This will allow recovery's to be done from any necessary starting point. One of the utilities provided by Sybase Central allows the transaction log file to be translated to SQL. Log file changes can be applied to the most recent full backup taken, eliminating data losses. Full backups are defined as a backup of everything in the METCAL and METDATA directories.

After backups are done, backup files should be copied onto archive media as soon as possible and the archive media should be properly labeled and stored.

Some important points to execution of a good backup plan are:

- If magnetic media like floppy disks are being used, continuous overwriting can damage the disk. A limited number of overwrites should be chosen, and a tally maintained either on the label or in a backup log. When the media has been used the planned number of times it should be replaced.

- Backups should be stored safely. A good plan is to store all the backup media off-site.

- If time and space permit, duplicate copies of the monthly and annual backups. can be made to store on site. This allows quicker access to backup media in case of crashes.

- There are many commercial backup software packages available. Make sure your backup software works! Several times a year you should restore from your backup system to verify its operation.

- Be sure to explore the Adaptive Server Utilities included in Sybase Central. It provides features that can aid both the backup and recovery operations that may be necessary.

The database engine makes both backup and recovery as minimally stressful as possible. It automatically recovers from many failures. If other types of failures occur, recovery can be done quickly, *but only if backups are done on a regular basis.*

The Sybase SQL Anywhere online manual has detailed information about built-in features of the database engine. These features assist with backup and recovery processes.

Backing up MET/TRACK Data from an Icon

An icon can be created easily to perform backup of the database. Backup is accomplished using the DBBACKUP.EXE program. The first step is to create a shortcut on your desktop for the file DBBACKUP.EXE. This backup utility is found in the SQLANY50/WIN32 directory. Update the required target line information by right-clicking the newly created icon, then choose **Properties** from the menu and enter the following information on the target line:

- Path to the backup program, `c:\Sybase\SQL Anywhere 8\win32\dbbackup.exe`, for example, if this is a stand alone system.

- -x, the flag to reset the log file

- −y, the flag to proceed without confirmation (this can be safely omitted if a confirming user prompt is desired)

- −c, the flag denoting that commands follow

- uid=mt, the required user login

- `pwd=mt`, the required administrator password or user defined mt level password.

- `dbf`=the path to the data base, for example,
  `dbf=c:\metdata\mtrack.db`

- `c:\` the path to the back up directory, for example, `c:\backup`

The finished target line will look something like this:

```
Target: C:\sqlany80\win32\dbbackup.exe -x -y "-cuid=mt;
pwd=mt; dbf=c:\metdata\mtrack.db" c:\backup
```


2-6
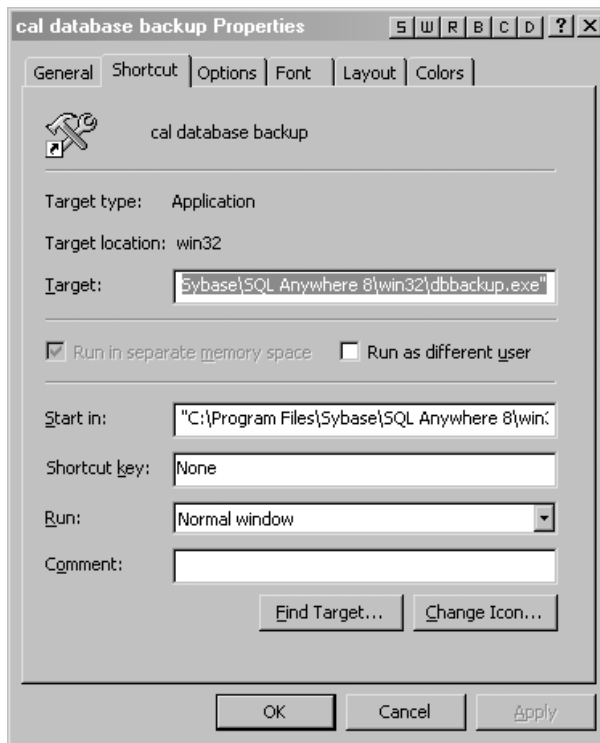
Scheduling Backups Using a Service

For Windows NT Users

The first step in setting up a system to make automatic backups is to make sure that the scheduling services of Windows NT are running. At the server, press **Start**, **Settings** and **Control Panel** then double click the **Services Icon** and scroll through the list of available services to determine server status. If it is not running, double-click on **Schedule Services** to bring up a service edit window. Set the **Startup Type** to **Automatic**, and make sure that under the **Log On As** section the **System Account** radio button and the **Allow Service To Interact with Desktop** box is checked. Click **OK** to close the window and select **Start** to start the service.

For Windows 2000 Users

The first step in setting up a system to make automatic backups is to make sure that the scheduling services of Windows 2000 are running. At the server, press **Start**, **Settings** and **Control Panel** then double-click the **Administrative Tools Icon**. Next, double-click the **Services Icon** and scroll through the list of available services. Status will show as **Started** if it is running. If it is not running, double-click on **Schedule Services** to bring up a service edit window. Set the **Startup Type** to **Automatic**, make sure that under the **Log On As** section the **System Account** radio button and the **Allow Service To Interact with Desktop** box is checked. Click **OK** to close the window and select **Start** to start the service.

Setting up the Backup

Now an event is entered into the **Administrative Tools** scheduling service. The **DOS** Prompt must be accessed for this process. Click **Start**, **Run** then type **CMD.EXE** and press the **Enter** key. At the **DOS** prompt, type the **AT** command:

The AT command displays a list of scheduled activities that the server is currently using and is used to create a new event. You can modify the command line syntax shown below to meet individual system requirements.

```
AT 01:00 /interactive/every:m,t,w,th,f,s,su
c:sqlany80\win32\dbbackup.exe -x -y -
cuid=mt;pwd=mt;dbf=database-name d:\backup
```

where:

01:00	Time of the day, in 24-hour format to perform the event.
/interactive	Allow display to show on the desktop (recommended).
/every:m,t,w,th,f,s,su	Days of the week to perform the event, every day in this example.
c:\sqlany80\win32\dbbackup.exe	The Sybase utility that does the backup. This should be modified to show the correct path according to the server setup.
-x	Truncate the transaction log.
-y	Allow overwrites and answer "yes" to prompts.
-cuid =mt;pwd=mt	Login user id (uid) is mt (system administrator) and the password (pwd) is mt, or the user defined mt level password. The dbbackup utility must have Database Administrator Authority (DBA or MT level) to work correctly. The -c portion of the line means commands are to follow.
d:\backup	Drive and path where the backup files are going.

If you change anything in the statement, delete the event and add a new one with any necessary changes.

At the DOS prompt, type AT to list the event and the Job ID. AT ^xx^/del xx is replaced with the job ID. This will delete the old event. A new event is added as shown in the example above.

Scheduling the Time

Some labs set up a separate event for each day of the week and have the data copied to a different directory each day. A lab needs to evaluate their needs and worst-case recovery scenario to determine a back up plan. Time should be set to coincide with the least amount of server traffic. The Sybase system does not require all users to log off while the backup occurs and the backup process is invisible to the users.

Important Notes

- The program, DBBACKUP.EXE creates a mirror image of the database and puts it into the designated backup directory. This mirror image can be used to recover the database files in case of a corruption by replacing the corrupted mtrack.db file with the backup file.

- The date/time stamp on the mtrack.db file may be confusing. It is only updated when Sybase allocates drive space. The true date/time stamp can be read off of the mtrack.log file in the backup directory.

- The purpose of making backup files is to have a good copy with which to make an archiveable print onto a CD or other media. Due to the Sybase properties, you must use the Sybase backup program to make the initial backup of the actual database. Other backup software can then be used to transfer the data from files created by DBBACKUP.EXE onto selected archive media.

- Backup systems should always be tested at regular intervals. This is done by restoring the database files with a backup and testing software operation.

- METCAL directory files should be backed up on a regular basis to ensure that custom written procedures and reports are protected. This may not be done as often, but should be included in the backup schedule.

The following is an example of a METCAL directory backup using the xcopy command:

```
AT 20:00/interactive/every:m,t,w,th,f,s,su
c:\winnt\system32\xcopy /E /V /I D:\METCAL\*.* f:\METCAL
```

This command backs up the METCAL directory and subdirectories at 10:00 P.M. and copies them to the METCAL directory on the F: drive. This might be a ZIP or JAZZ drive. For NT systems, this must be a local drive if the console is logged out. See the Sybase Help File for more details on the DBBACKUP.EXE and other database tools.

Contents   **Page**

Introduction

This chapter describes the asset management functions included in Fluke Metrology software. All the other applications that make up the software are dependant of the inventory and event records about each asset stored in the database

When an automated calibration is done, the Run Time application automatically records the event in the database. However, MET/TRACK can be used to record calibration or maintenance events manually. Many companies send instruments out to third party calibration service providers, but still need to track their calibration, repair and location status. MET/TRACK is designed to accommodate this type of customer as well as the customer that calibrates all instruments in house.

Basic Database Operations

Data entry tasks are usually performed by operators, but the administrator should be familiar with these applications, too. Becoming expert in all of the applications and utilities can help administrators perform any needed customization more efficiently, and better prepare them to provide training and guidance to data entry and managerial users.

This chapter covers tasks related to entering all data. Note that any interaction with the database requires the database engine to be running.

Starting an Application

To connect to the database, proceed as follows:

1. Make certain that the Calibration Data Engine is running. On networked systems, the Data Engine runs on the server.

2. On a single workstation system (not networked), the data engine icon should be minimized on the task bar. It is not necessary to start a Requester on a standalone workstation.

    If the Data Engine is not running, start it. Go to the Start menu, open Fluke Metrology Software, and select Calibration Data Engine.

3. On a network Workstation, or Client, start the Calibration Data Requester, then start up the **MET/TRACK** application. A dialog box appears and prompts you for a **user ID** and **password**. If no user names or passwords have been assigned, use the default user name **fluke** and the password **fluke** and press **ENTER**. If a user name and password have been assigned use those.

4. As shipped, the database has three valid user names, **FLUKE, FLUKE3** and **MT**. The FLUKE user name has a password "FLUKE", FLUKE3 has a

password of "FLUKE3" these are USER passwords. The MT password is
"MT", it is the SYSTEM ADMINISTRATOR Password. The only default
passwords allowed for data entry are USER passwords. See chapter 8 of this
manual for instructions and additional information on password changes and
management.

Setting User Preferences

Prior to adding any records, the User Preferences need to be addressed.

1. From the **Tools** menu, select **Preferences** .

2. Set user **Preferences** or place/remove a checkmark next to the screens that
   will be needed to enter complete records. You can set the following
   Preferences:

   - Position of the **Toolbar**

   - Viewing or Hiding the **Status Bar** which details the User Name, Desktop
     selection, Data Source Name, Date and Time as well as the program
     status.

   - **Regional Settings**, allows you to change PC settings like Time, Date,
     Language, Number and Currency settings.

   - Enable **Search Browse** toolbar.

   - Enable **Customer Menus.** The customer screens may not be used by all
     companies and are therefore hidden by default. Enabling will make
     Customer screens accessible and will allow the user to assign customers to
     inventory items.

   - Enable **Maintenance** Menus. Maintenance menus are also hidden by
     default. Enabling will make the Maintenance screens accessible by the
     end user.

Entry Tools and Screen Navigation

Toolbar Definitions

zv300s.bmp

Add Record Toolbar

Use these tools to:

- Add Inventory Records
- Add Calibration Records
- Add Location Records
- Add Maintenance/Repair Records
- Add Customer Records

zv301s.bmp

Edit Record Toolbar

Use these tools to:

- Edit Inventory Records
- Edit Add Calibration Records
- Edit Add Location Records
- Edit Add Maintenance/Repair Records
- Edit Add Customer Records

zv302s.bmp

Search Toolbar

Use the Search Toolbar to find an asset using a single search field.

Navigating Browse Screens

A Browse screen is displayed when a search is done. The browse screens contain basic information about an asset and its related history. Browse screens act as paths to the entry screens as well.
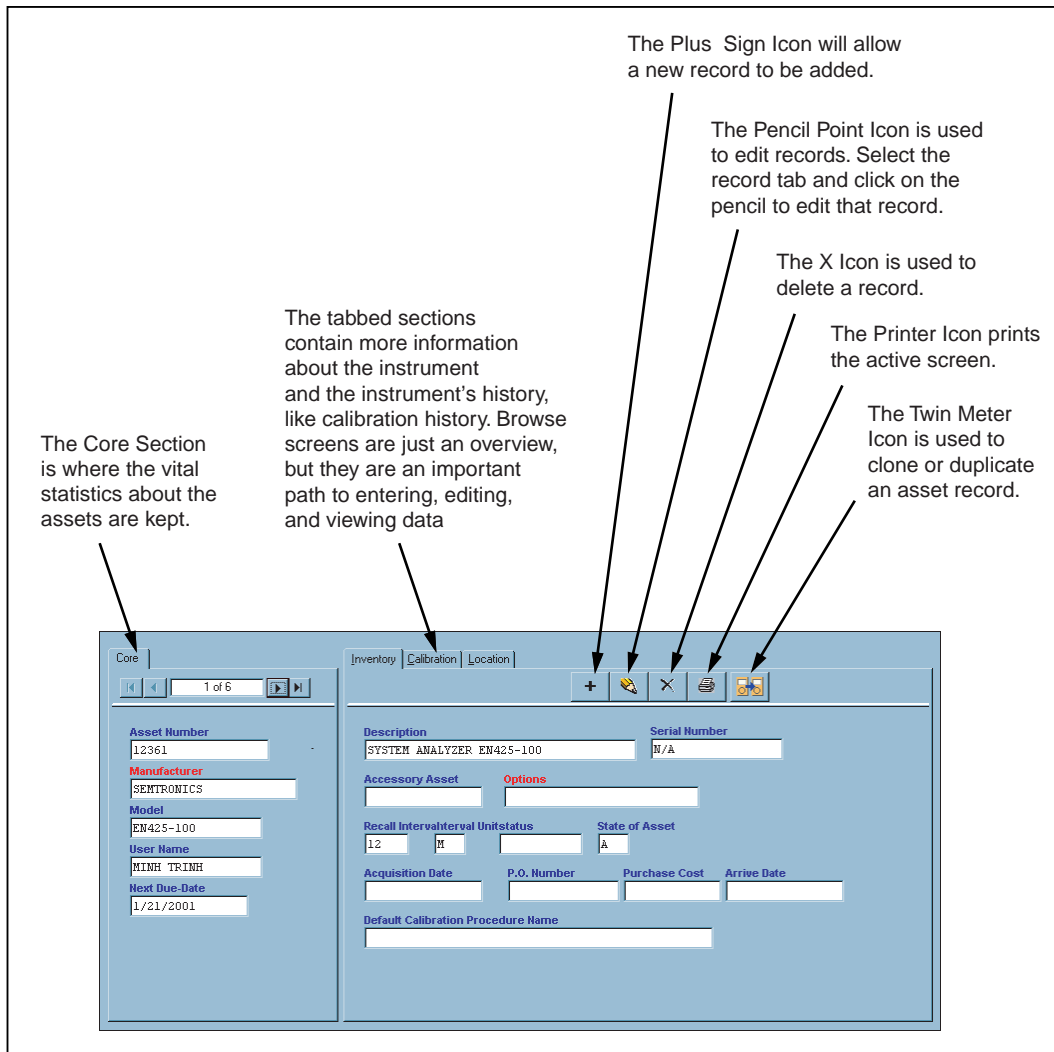
il300f.eps

Figure 3-1. Parts of a Browse Screen

Navigating Entry/Edit Screens
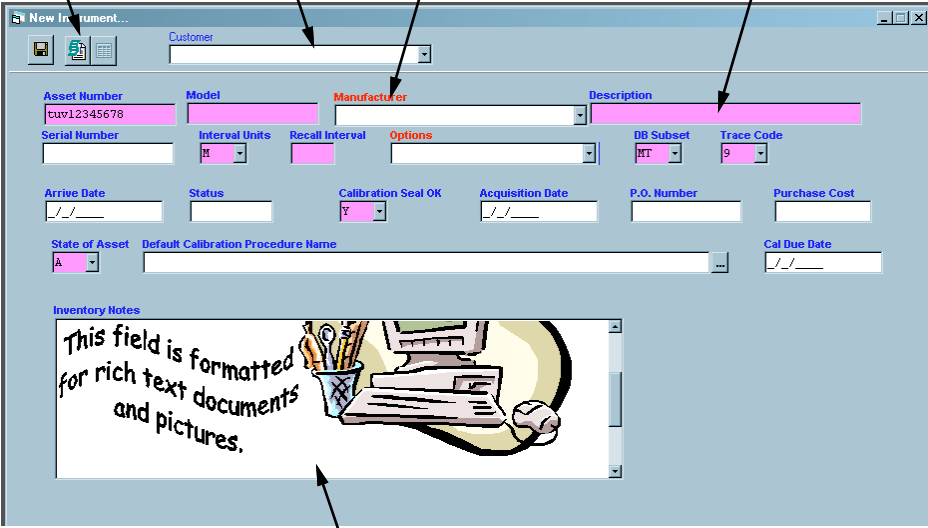
Entry and Edit Screens can be customized by the System Administrator so the appearance will vary from installation to installation. There are many types of special fields in MET/TRACK. Most special fields are designated by a color either in the field background, or the title or in an adjacent line. This is an over view of a typical Inventory add/edit screen. The remainder of the chapter will explain fields and records in more detail.

il301f.eps

Figure 3-2. Parts of an Entry/Edit Screen

Adding a New Asset to the Database

Creating the Inventory Record

1. Log into the **MET/TRACK** application using the instructions found earlier in this chapter.

2. From the menu, select **Add,** then **Inventory Record** or use the toolbar. There are two main toolbar sections, **Add** and **Edit.** The **Add** tools are preceded by a plus sign. The tool tip or function of each tool will be displayed if the cursor is passed over it.

3. The next dialog box asks for a new asset number. Type in a unique number or alpha-numeric combination that is not already in use as an asset number. The systems will not take a number that is already in use. To search for asset numbers there are some different methods to use.

   - Select the down arrow to browse through the list.

   - Type **?** to bring up the whole list.

   - Select the **Last+** to find the last asset added.

   - Select the **Max+** button to find the highest number, or alpha-numeric value added. Then select the **Increment+** button to go to the next, unused number.

   - Once the value is entered, select the green check box to save the number and continue adding the record.

zv303s.bmp

Assigning a New Asset to a Customer

4. If the asset belongs to a customer it can be assigned to that customer from the entry screen. The **Customer** selection box will be visible on the toolbar if the customer screen view has been enabled. If not, it can be enabled now. If this step is not applicable, proceed to step 7.

5. Select the **Tools** menu. Select the **Preferences** menu item and put a check mark next to **Enable Customer Menus.** The entry form must be closed and re-opened to enable changes.

6. When the **Customer selection** box is visible, click the scroll arrow and select the appropriate customer from the list.

7. Select the **Save** button when all of the required fields are populated, or at least those with a different colored background. The **Save** button looks like a floppy disk.

8. Once the asset has been saved the **Clone** button ![clone icon] appears.

Using the Clone Feature

9. If the asset just entered is one of two or more of the exact same type, click the **Clone** button. The **Clone** button is easily identifiable by its twin meter icon.

10. Assign a new asset number in the dialog box and click the green checkmark**.**
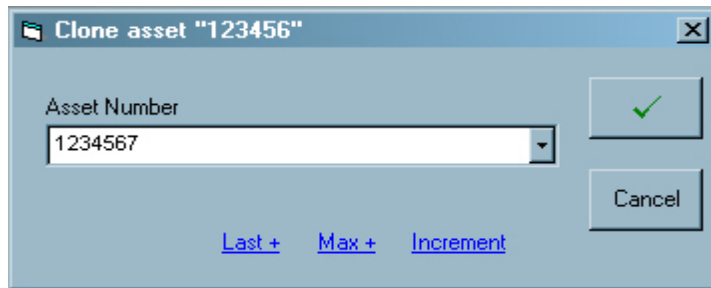
zv304s.bmp

11. The **New Instrument** screen will reappear with the same information that was entered for the previous instrument, with two exceptions:

- The **Asset Number** will be the new one entered in the **Clone Asset Number** dialog box.

- The serial number field is blank and ready to accept a new value.

12. Type in a new serial number and Select the **Save** button again. The clone feature allows you to duplicate like inventory records easily and quickly.

Understanding Entry Fields

By default some of the fields in the **Inventory Screen**, and the various **History Screens,** are **Required**. A **Required** field must contain an entry. These fields will be a different color from the non-required fields. Fields with **Defaul**t values are designated also by a different color. A field with a **Default** is often, but not always a required field as well. The **Default Value** is one set by the System Administrator and is usually the most logical entry for the field. The field colors and default values are set when the System Administrator creates or customizes the user **Desktops**. For more information, see Chapter 8 under **Set-Up Menu** section.

There can be other specially designated fields on forms. These fields usually require the user to choose an entry from a prefabricated list. These lists can be simple **Pick Lists**, which have a list of suggested, but not required values or **Required** simple **Validation** or **Linked Validation** lists. A **Pick List** is marked with a solid blue line and scroll arrow. A user can make an entry in this field that is not on the **Pick List or** choose a value from the list. Those fields that require a value from a **Required Validation** List have a red field title and a scroll bar. An example of a Required Validation Field is shown in the next figure. These fields must contain a value that is on the **Required Validation List**.

zv305s.bmp

If the field is the **Root field** of a **Linked Validation** it too will look like the previous figure. The **Root Field** is the main field which determines the value of all other fields in the Link. It also requires an entry that is on the list. If marked by a dashed red line to the far right of the field, it is a **Secondary Field** in a **Linked Validation** whose value relies entirely on that of the **Root** field to which it is linked. No data can be entered directly into this field from the MET/TRACK user entry screens. A **Merge** field is also designated by a red title.(see Chapter 8 for linked validation configuration and User Table configuration).

This sounds like a lot of information to remember. But the use of special types of entry fields actually automates the entry process by providing lists of preselected values or default values. Their use also ensures Consistent Data which is much easier to manage and maintain

Recording Events

Each time an asset is calibrated, repaired, or relocated, information is gathered and entered into the database by way of the Calibration, Maintenance, and Location forms. For calibration and repair events, the Results form may also need to be updated.

Every event must be unique. Because the event's date and time are *core fields* their function cannot be customized. The system assigns unique ID tags based on the date, time and event type. To ensure the uniqueness of these ID tags, the system will not allow their duplication. See the Glossary or Chapter 8 for more information about Core fields.

Recording Location Events

1. Log into the MET/TRACK application using the instructions found earlier in this chapter. Select **Add** then **Location Record** or use the toolbar. The Toolbar definitions are provided earlier in this Chapter.

2. By default, the **Asset Number** dialog box will display the number of the asset currently being entered. Accept the default by selecting the Okay button, or type in a new value.

3. The **New Location Record** screen will appear. As in the Inventory Screen, there are some required fields. Enter data into the fields, paying close attention to those that require values and save the record.

Recording Maintenance and Repair Events

1. Follow the steps above to add a Maintenance or Repair event. Note that the maintenance date automatically defaults to the current date and that the **Interval** and **Interval Units** fields default to the same values as those set-up in the Inventory Record. The **Interval** and **Interval Units** can be changed in this screen to calculate the desired **Due Date**. The **Due-Date** and **Due Time** fields are calculated and cannot be changed by directly typing a new date into the field.

2. Use the **Tab** key to jump from field to field.

3. The **Maintenance Type** field is a validated field. The valid entries are configured in the System Configuration Menu by the System Administrator as described in Chapter 8.

4. Enter or select a value for all required fields that do not have a default value and save the record.

Recording a Calibration Event

Each time an asset is calibrated, information can be gathered and entered into the database either automatically (as a direct consequence of running a MET/CAL procedure), or manually. See Chapter 4, "Running Calibration Procedures," for information on the automatic recording of events.

1. Log into the MET/TRACK application using the instructions found earlier in this chapter. Select Add then Calibration Record or use the toolbar.

2. Use the default asset number in the **Asset Number** dialog box or type in a new one or select the scroll arrow to search for the correct asset number.

3. Click the **Okay** button and the **New Calibration Record** screen appears. Note that some of the fields are already populated, the **Cal-date** field displays the current date and the **Pass** field has a default value of Y for "Yes". The **Temp** and **Humidity** fields and the **Cal-Time** field may also be populated. Again, this varies by installation since default values are set by the Administrator.

4. There are some tool buttons to the right of the **Calibration Procedure Used** field. The button with three horizontal dots will take the user to the **Met/Cal Procedure List** so an appropriate **Procedure Name** can be selected. The second button has a lightening bolt. This selection will take the user to the **Run-Time Application** to run the calibration procedure for this instrument. (see Chapter 4, **Running Calibration Procedures**) If this selection is made the remainder of the **Calibration Record** will be completed by the Run-Time application.
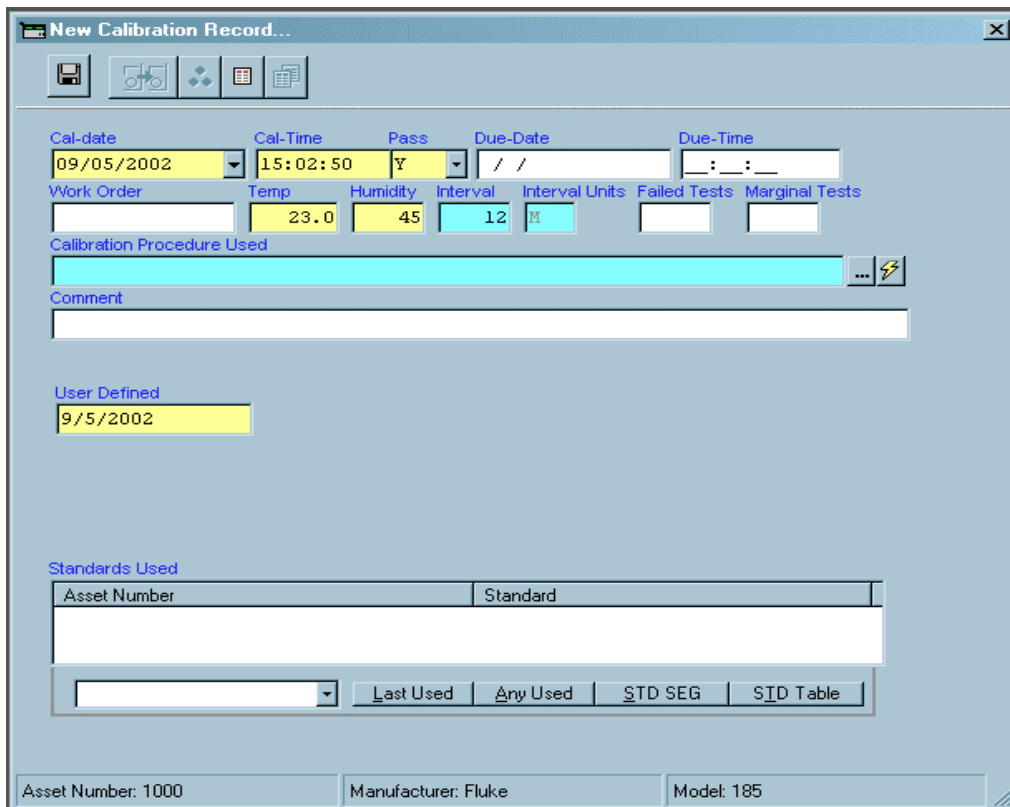
zv306s.bmp

5. To complete the entry of the **Calibration Record** the **Standards Used** information needs to be provided. Tab or click in to the field below the Standards Used description box. This field is marked by a scroll arrow. Select the arrow to bring up a list of all instruments in the system. Select the appropriate one, or choose one of the following.

6. The choices for Standards Used are: **Selection** (from step 5), **Last Used, Any Used,** Choices only from the **Standards (STD) Segregate** or anything from the **Standards Table**. The **Standards Table** is a compilation of all the instruments that have ever been used as a **Standard** in a procedure, or any that have been listed in a manually-entered **Calibration Record**.
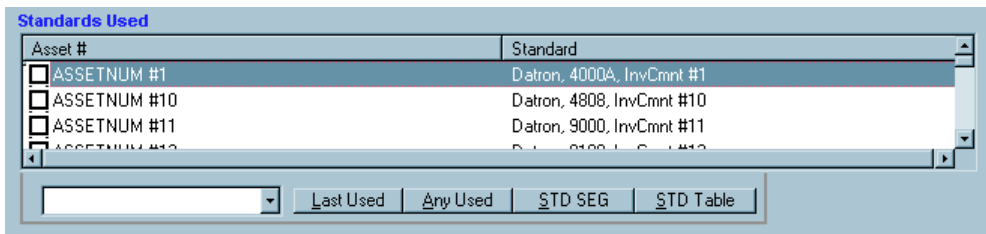
zv307s.bmp

The **Standards Used**, must be in the database and must have a current **Calibration Record**. Note also that an Asset by the name of **Fluke Corporation** was added to the database shipped with the software. This, no-cal-required asset can be used as the designated standard if instruments are being sent back to a **Fluke** service center for calibration. Any Calibration Service Provider can be added in this manner to use as a standard. This leaves a somewhat better audit trail than a field left blank.
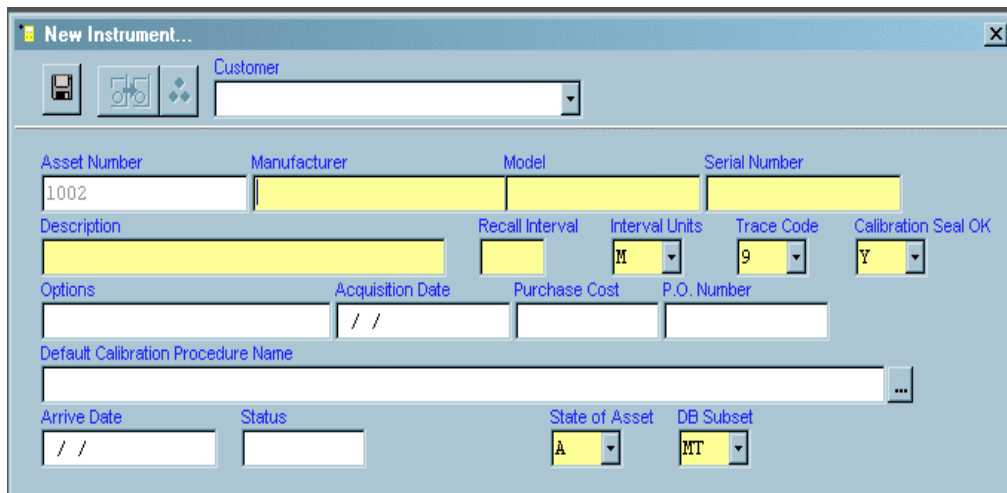
zv308s.bmp

7. Note that the **Due-Date**, calculated with the **Cal-Date, Interval** and **Interval Type** (12 M for 12 Months, for example) is filled in, automatically. Note that the **Cal-Date defaults to today's date**. The Cal Date can be changed in most cases. The system administrator can set the maximum age a cal record can have to be added by certain user levels. In other words, a calibration that was done 3 months ago cannot be entered into the system by a level 3 user if the maximum age of the record is 30 days and the only user that has override permissions is a level 5 user. The **Cal-Due Date** is calculated and cannot be changed by directly typing into the field.

8. When the **Calibration Record** is complete, select the **Save** button.

Additional Notes on Validating Standards

The application validates a standard for the event only if that standard's calibration due date has not yet arrived. In the case of assets that require calibration according to number of uses, a calibration due date is not assigned until that number of uses has elapsed. Then, that date becomes its due date. In other words, it becomes immediately due for calibration on the date that it exceeds its <u>number of uses</u> setting.

If calibration time has been suppressed as a core field, it means that a given asset would not be able to be re-calibrated on the same day. Doing so would violate the rule that each calibration event must be uniquely identified, since the database uses Asset Number, Cal Date, and Cal Time as the unique identifier for each cal event.

This may be completely appropriate in some situations, or it may be a hindrance. Only the individual administrator can make that determination, because conditions and requirements vary. For additional information on this topic, see Chapter 8, "Configuring the System."

Entering Calibration Results Into the Database

There are two methods that can be used to enter calibration results data into the database.

- The Text Editor method will store the results data in a single field, C2501. Text can be copied and pasted into the results field from any text editor or text document.

- New with version 7, MET/CAL software has the ability to store each piece of data in a separate field. This method of recording results, called Full Results, provides a grid entry format with pre-set column headings for each type of results data.

Entering Results Using a Text Editor

The **Results Form** is tied to each unique Calibration event. The form can only be edited when the corresponding calibration record is open for editing. The Results Form is used as a plain text editor like Notepad. All test results and other applicable data are typed free form into the record.

Using the Results form in this way will store all results in a single database field, **C2501**. Since this is a text field, text documents can be pasted in from other applications. The standard Windows **Copy** (**Ctrl**+ **C**) and **Paste** (**Ctrl**+ **V**) commands will work in this application.

To enter calibration results from the **New Calibration Record** entry screen, select the **Enter Calibration Results** button from the toolbar on the record being entered. Enter the information by typing or using Copy and Paste functions. When the cal record to which the results information is being added is saved, the results will be saved as well.

To enter calibration results on a Calibration Record that has already been created, access the Calibration Results editor from a Browse Screen, Menu or Toolbar. Select the Enter Calibration Results button from the toolbar and follow the same procedure as shown above. Again, saving the main Calibration Record will save the results.

When a MET/CAL or 5500/CAL Runtime Procedure stores calibration results, it can generate a line of results data for each test. The file named RSLT_DB.FRM formats these lines and stores them into the database field C2501 as well.

To understand more about how RSLT_DB.FRM is formatted, look in the MET/CAL help files in the MET/CAL help directory, under **"**Overview of Tolerance Computations**"**.

Entering Results using the Full Results Grid.

The Full Results Grid is a series of fields that contain detailed test information. Unlike the data stored in C2501, data stored using the Full Results Editor stores each critical piece of data in a separate field. The specific details make up the columns and the individual tests make up the rows of the grid.

To access the Full Results editor from a **New Calibration Record**, a **Browse Screen** or an **Edit Screen**, select the **Full Results** button from the toolbar on the record.

For information on the field headings, their intended use and acceptable values, refer to Results Table documentation in the Manuals Folder under the METCAL directory.

When the editing or adding is complete, select OK.
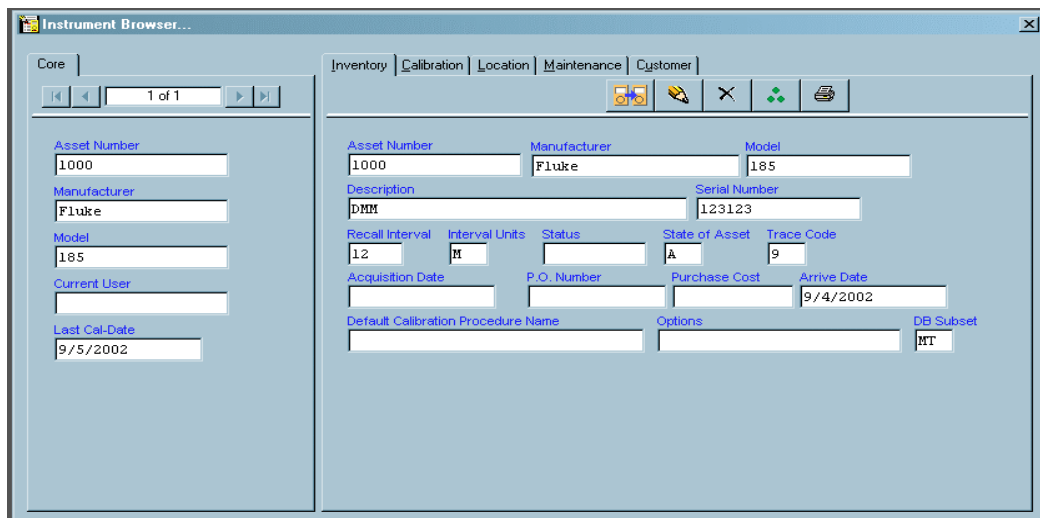
zv309s.bmp

Editing Records

Records can also be edited from the **Edit** tools on the **Toolbar**. Note that the **Edit** tools are nearly identical to the **Add** tools. Where the **Add** tools have a plus sign, the **Edit** tools have a pencil point. See the beginning of this chapter for a definition of all the **Edit Tools**.

1. Select the tool for the type of record to be edited. The **Edit Inventory, Calibration** or **Location** screen will display, depending upon selection.

2. Select the default asset number in the **Asset Number Selection** box or browse with the scroll arrow, or simply type in the asset number to be edited.

3. Make any desired changes, by selecting the field to change and typing in the changes. If the field is grayed out, it cannot be edited by the user. The Entry and Edit (or update) permissions for each field are set by the Administrator when configuring field properties.

4. If the field being edited is specially designated by a solid or dashed line, scroll arrow or red title, it is a specially configured field that may have to be edited in another way. A field with a Required Validation List, or the Root Field in a Linked Validation has a red field title and a scroll arrow. A suggested Pick List is marked with a solid blue line and scroll arrow. If a field is marked by a dashed red line to the far right of the field, it is a member of a Linked validation that cannot be edited by typing in the field from this edit screen. A Merge field is also designated by a red title, but no scroll bar.

Editing Validated Fields or Merge Data in Records

5. With the record open, select the **Tools** menu. The additional editing choices are Edit User Validation List and Edit Merge Data. User Tables can also be edited from the Tools menu.

6. The **Validation Editor** appears if you have sufficient editing permissions set by the System Administrator. If you do not have sufficient permission, the Edit choices will not be available from the Tools menu.

7. Select the **Validation** field or the **Merge** field. Note that the only field the edit function can be accessed from is the Root field. The Selected Validation list, Linked Validation grid, or Merge Table will be displayed.

8. Make any necessary changes and close the Validation editor. Save the record. Saving the record will save any changes made to Validation or Merge data. Only an Administrator can choose to drop Linked Validation Tables, Merge Tables or simple Validation lists from the database.

Browsing the Data

Using the Search Screen

The MET/TRACK application allows users to view information in the database and reports.

1. Log in to the MET/TRACK application.

2. Select **Search** and then select the Search Engine. The **Search Engine Screen** will be displayed. Note the scroll arrows next to each field.
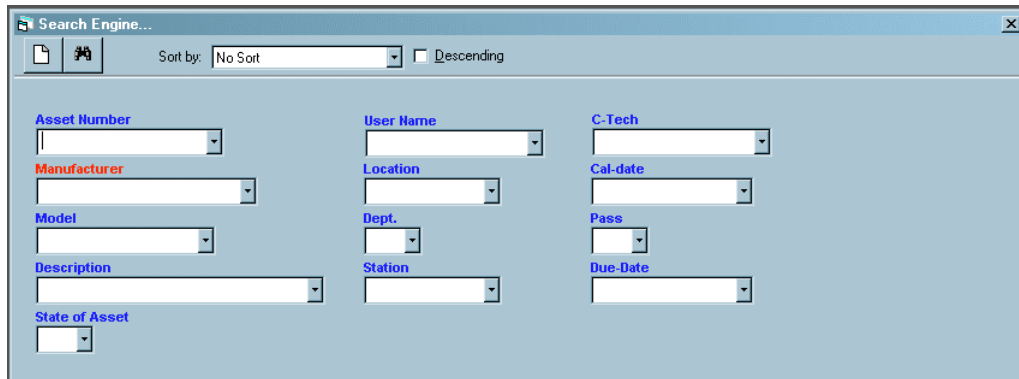
zv334s.bmp

3. Choose the **Asset Number** field to browse and click the scroll arrow. Select an asset number to look for. Any field or combination of fields can be searched. The search can be very general or very specific.

4. When an asset number has been selected click the **Search** button, represented by the pair of binoculars.

5. If an asset meets the selected criteria, the **Browse Screen** will display the basic information about the asset.

The Browse Screens

Note when the **Browse Screen** is displayed it is divided into sections. The **Core** section displays the vital statistics of the asset. The tabbed sections will display **Inventory** data, **Calibration** data and **Location** data when selected. All of the sections of the **Browse Screen** can be individually customized by the System Administrator. Fields can be added or suppressed. Field Headings, Font type and field lengths can be changed. Screens should be customized to meet the requirements of each different company.

The **Inventory** data is unique for each asset. The **Calibration** and **Location** data is historic and since it changes with each event, a new record is created each time. For this reason the Calibration and Location Screens have back and forward arrows to make finding a specific record easier. The following figure is the **Calibration Browse Screen.** Play close attention to the tool bar. The tool bar functions allow records to be added and edited from the **Browse Screen.**

zv311s.bmp

Using the Browse Toolbar.

The browse toolbar can be used to do a very simple search on a single **Field** and **Value.** A user may want to find an asset from a group of assets just entered. Maybe that group of assets all had the same **Manufacturer**.

1. From the **Browse** toolbar select I4202, Manufacturer.

2. Locate and select a **Value** from the pull-down list by selecting the scroll arrow and highlighting a specific Manufacturer or by typing the name of a Manufacturer to locate. Note that the system will search based on the first few characters typed. For instance, Typing F followed by L will bring up the name Fluke.

3. When the Field and Value browse fields are populated, select the Search tool, (the pair of binoculars).

zv312s.bmp

4. The system will bring up all assets in the database that meet the selected criteria. If more than one item meets the criteria there will be search arrow keys in the **Core Browse Screen.** When in the data browser screen, the left & right arrow keys move one record at a time. But, if the CTRL is held down, each click moves 10% of the number of records per click.

5. Scroll through until the right record is found.
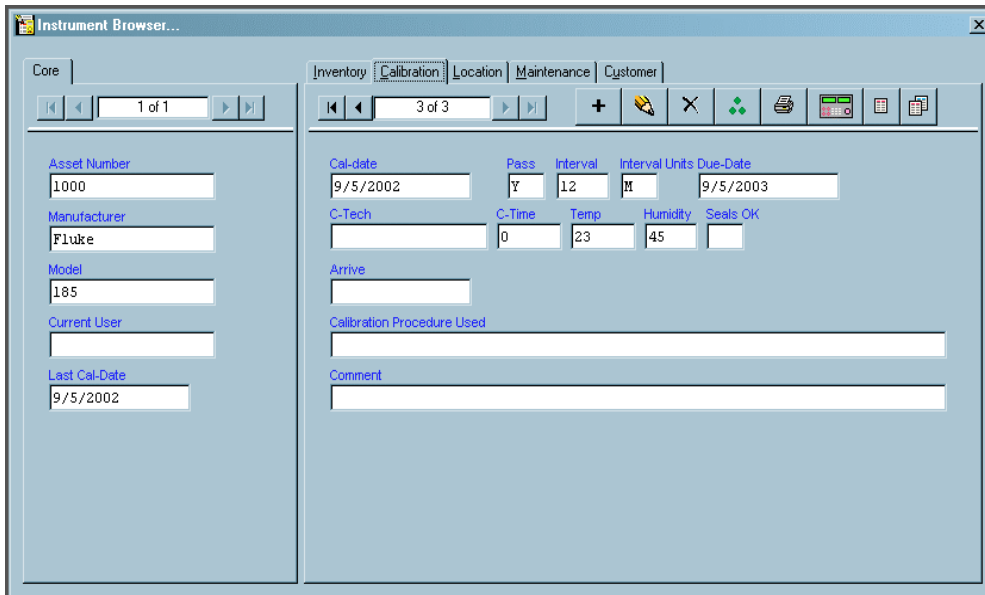
zv313s.bmp

1. Click the **Search** menu to access the **Search Engine.**

2. Choose the **manufacturer** field to browse and click the scroll arrow. Select a manufacturer from the list. Any field or combination of fields can be searched. The search can be very general or very specific.

3. When the Manufacturer has been selected, click the Search button, represented by a pair of binoculars.

4. If an asset meets the selected criteria, the **Browse Screen** will display the basic information about the asset.

5. If more than one asset meets the specified criteria, scroll through the records using the right and left arrow keys, or scroll 10 records at a time by holding down the **Ctrl** key and using the right and left arrows.

6. For this exercise, assume that none of the assets found under the search manufacturer meets the criteria.and a new asset record must be created.

7. Select the **Inventory** record tab.

8. Click the **Plus** sign to add a record.

9. The system will prompt for a new asset number. Enter a new number and click the save button.

10. The **Add Inventory** screen will now be displayed and a record can be added.

11. Complete the Inventory form and save the record as described earlier in the chapter.

Editing a Record from the Browse Screen

1. Locate an asset using the **Search** engine. As mentioned earlier, the types of screens available for editing with the **Instrument Browser** are seen as tabs on the **Browse Screen**.

2. Select the tab that corresponds with the record to be edited.

3. Select the **Edit** tool from the toolbar, the button that looks like a pencil. The **Edit Inventory** or **Calibration**, **Location, Maintenance** or **Customer** screen will display, depending on the record type selected and the record types enabled in the **Preferences** settings. Make any desired changes, by selecting the field to change and typing in the changes.

4. When the changes are complete, Save the record.

Deleting a Calibration Record

⚠CAUTION
Deleting a calibration irretrievably removes information from the database.

Only level 4 and 5 operators can delete records from the database.

• To delete a calibration event, view it on the **Calibration Form** and click the **Delete** button.

Purging an Asset

⚠CAUTION
Purging an asset irretrievably removes information from the database.

Only level 4 and 5 operators can purge records from the database. It is not possible to purge an asset that is used as a standard.

- To purge an asset, view it on the **Inventory** form and click the **Delete** button

  ✕ . If the asset you want to remove from the system has been used as a standard for the calibration of another instrument, then the application will not permit purging the asset.

Special Functions of the MET/TRACK Tools Menu

Additional special functions are accessed within the Tools menu. These special functions allow the user to **Edit User Tables**, **Combine Calibrations**, **Change Asset Number**, **Change Password** and access additional **Fluke Metrology Software** applications.

Editing User Tables

Even if one of the forms is not being edited, the function that allows **User Tables** to be edited can be accessed from the **Tools** menu.

1. Select the **Tools** menu. The Edit User Tables is the only editing choice a user has when no record is open for editing. The user tables are not tied to a record in the database, but are stand-alone tables. For this reason no record needs to be open for editing.

2. If the user has sufficient editing permissions set by the System Administrator the User Table list will be displayed. If the user does not have sufficient permission, the Edit choices will not be available from the Tools menu.

3. Select the **User Table** to be edited. An example is shown below.

Part ID	Part Name	Part Description	Part #	Cost	Current Qnt	Min Level	Order Date	Receive
497400	Screw	Screw	4115	0.05	34	5	10/31/1997	9/28
101648	Washer	Washer	6006	0.02	45	5	7/14/2003	6/19
183301	Nut	Nut	5816	0.02	5	5	11/7/2001	1/20
72079	Chassis	Chassis	7227	1.23	65	5	11/20/2000	4/29
524168	Top Cover	Top Cover	7078	2.44	654	5	6/11/2003	9/9
258355	Bottom Cover	Bottom Cover	575	1.75	345	5	3/4/2002	3/27
648411	Front Panel	Front Panel	1877	9.44	45	5	4/6/1999	12/1
677063	Trim Kit	Trim Kit	4551	0.9	4345	5	5/14/1999	8/6
963391	Power Cord	Power Cord	7739	4.55	4	5	5/6/1997	8/13
200361	Fan	Fan	9432	4	45	5	3/9/2003	12/27
347315	Filter	Filter	4351	2	4	5	1/1/2001	2/9
822537	CD kit	CD kit	5679	32	45	5	11/27/1996	5/25
573221	Floppy Kit	Floppy Kit	6977	2	45	5	11/9/2002	1/14
546722	Monitor	Monitor	6316	245	45	5	3/19/1999	6/6
854224	Keyboard	Keyboard	3629	18	87	5	2/19/1999	7/23
93334	Mouse	Mouse	8576	9.55	67	5	10/3/2000	4/16
762333	Mouse Pad	Mouse Pad	7283	0.55	5	5	2/13/1996	7/28
50763	Planner	Scanner	8958	92.77	78	5	1/23/1996	6/5
152819	Printer	Printer	7080	189.33	978	5	11/2/1996	2/15
830968	Paper	Paper	3449	1.25	90	5	12/27/1998	8/10
371206	Foam padding	Foam padding	5043	0.22	5	5	9/27/2001	10/13
869479	Setup guide	Setup guide	4724	0.25	678	5	3/31/2001	8/21
822284	Manual	Manual	4262	95	67	5	11/19/1996	11/7

zv315s.bmp

4. Make any necessary changes and close the **User Table** editor. Changes are saved automatically.

Combining Calibration Events

MET/CAL offers and advanced feature to combine calibration events. This feature is useful when a calibration event is split into several parts or over more than one day.

1. From the **Tools** Menu in the **MET/TRACK** application, select **Combine Calibrations.**

2. Enter the Asset Number of the calibration events being combined and how many days old the calibration events can be. Click the **Update List** button. Decide which record is the first in the series, second, etc. Number them in the boxes provided by clicking into the box, in order, or highlighting the entire record and typing in the correct number. To change the order click the **Clear Order** button and start over.
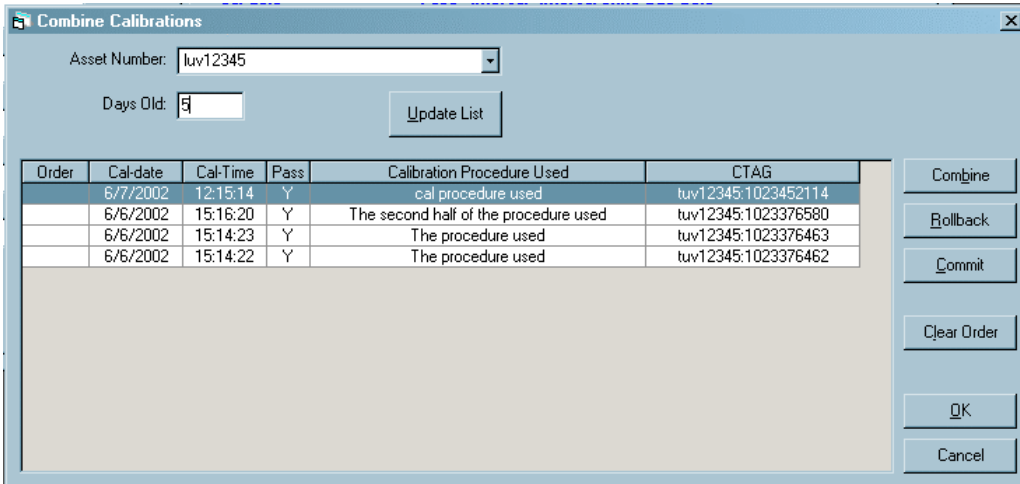
zv316s.bmp

3. Click the **Combine** button. Tell the system to Re-Assign the Pass Field or not to do so. Follow the on-screen prompts.

4. Click the **Commit** button to make the changes in the Database or the **Rollback** button to undo the changes

5. If the changes have been committed and the combination is finished click **OK** to exit the program.

6. There will now be another record in the database that is a combination of the selected records. One Calibration Certificate and one Calibration Report can now be printed reflecting data from all the combined records.

   • The asset's most recent calibration even is used as the root summary for creating the new event, even if it was not selected in the order. The feature assumes it will be selected.

   • If any one of the calibration events is a FAIL, the new combined record is a FAIL.

   • In general, all of the values from the most recent calibration are used as the values in the new summary.

- The following fields are summed up from all the selected calibration events: 2350, 2351, 2352, 2353, 2324 and 2328.

- Standards are combined from all events.

- All standards must be in cal on the date of the most recent calibration event.

- The results are combined in the order specified.

- The operator has the option of deleting the original individual calibrations from the database.

Changing an Asset Number

From time to time an asset is created with a non-conforming, or simply incorrect number. Possibly the asset numbering system within a company is changed. The Asset Number entered when initial record is created follows the instrument always, through each event. Changing the Asset Number on the Inventory record will affect all other records.

For this reason a tool was created to simplify the process. The Change Asset Number tool ensures that all history reflects the Asset Number change.

1. From the **Tools** menu select **Change Asset Number**. Type in the asset number being changed, or select it from the list by clicking on the scroll arrow with the mouse. The asset list also shows the Manufacturer and Model number for confirmation that the right asset is being selected.

2. Type in the new asset number and click **OK**.

3. A confirmation dialog box will appear. Click **OK** to make changes or Cancel to stop the process.

Changing a User Password.

⚠ Caution

Once a user password is changed by the user it cannot be recovered if lost.

In the Initial User Setup, the Administrator can give a user permission to change his or her own user password at will. If this permission is granted the Change Password tool can be accessed from the **Tools** menu. If the choice is grayed-out on the **Tools** menu, no such permission was granted.

1. Select the **Change Password** item from the Tools menu.

2. Type in the password being changed.

3. Type in the new password, slowly, to avoid errors.

4. Type in the new password again and click the **Change** button.

Accessing Other Applications from the Tools Menu

To go to another application directly from MET/TRACK use the Tools menu. Select the application with a single click of the mouse or use the directional arrows to select the application and press the **Enter** key.

What applications are available from the **Tools** menu will vary. This feature is configurable from the MET/CAL initialization file (metcal.ini, by default) in the windows directory. It can be configured differently at each station. See Chapter 7 for more details.

Database Reports

Running Reports

Any report can be run from the MET/TRACK application once it has been added into the metcal directory and added to the report list. From the **Reports** Menu **Run Reports** will bring up a list of available reports. Select a report from the list by clicking on it with the mouse. Select the print preview button or printer icon from the toolbar and enter any prompts the dialog box asks for. The report will either preview on the screen or print to a printer. It is that simple.

Fluke Metrology Software comes loaded with many of the standard reports generally used by a cal lab. Reports can be custom written or modified from Crystal Reports, (see Chapter 5) or quickly created using **Quick Reports**.

Quick Reports

Creating a New Report

The quickest way learn to use Quick Reports is to build a report. Select **Quick Reports** from the Reports menu.

1. Click on the **Report Title** and type a new Title for the report.

2. Click on the **Report Caption** to add a caption.

3. Select the **Columns** tab.

4. Choose fields to add to the report by clicking on the plus sign next to the table and then double clicking the desired field. Watch as the report starts to materialize. By default, the outline only lists columns that are visible on MET/CAL forms. This means that fields that have been suppressed are not listed. To show all columns, suppressed or not, click the All Fields check box. This will reset the report and list all MET/CAL columns in the outline.

5. Continue adding columns until all the necessary fields are displayed on the report.

6. Select the Limits tab to choose the type of data to print. Select data that falls within a certain date or a certain department or calibrated by a certain technician. Up to three sets of limits can be set. For example, only print those records where the manufacturer's name is equal to Fluke, or print all records except those in a particular department. Set limits to provide just necessary information.

7. Choose the field, (column), then the limit type, then the limit value. There are lots of possibilities. Here are the limit types and their corresponding symbols, as well as some examples of limiting record selection.

Symbol	Definition
=	Equal to
<>	Is not equal to
>	Is greater than
>=	Is greater than or equal to
<	Is less than
<=	Is less than or equal to
Begins with	Begins with the criteria entered
Ends with	Ends with criteria entered
Is Nothing	The field is blank
Is Something	The field contains a value, any value

Setting Multiple Conditions

In this example, two manufacturers are included in the limiting criteria. With these settings, the report will print a record if the manufacturer's name is equal to Fluke or if the manufacturer is equal to Hewlett Packard. The limit value is not case sensitive. FLUKE, fluke or Fluke will all return the same report information.

zv317s.bmp

Selecting the Limit Value From a List

Quick Reports generates a list of database information automatically that may be used to set a limit. This is helpful if the exact spelling or value is unknown. Selecting from a list is easy and keeps errors to a minimum. There is a down arrow to the right of the **Limit Value** list box. When it is clicked, Visual Reports generates a list of values for that column and adds them to the list. Scroll through the list to find the value to use to limit the report. Then press **Enter**. In the example to the right, a list of manufacturer's names from the database has added to the list.
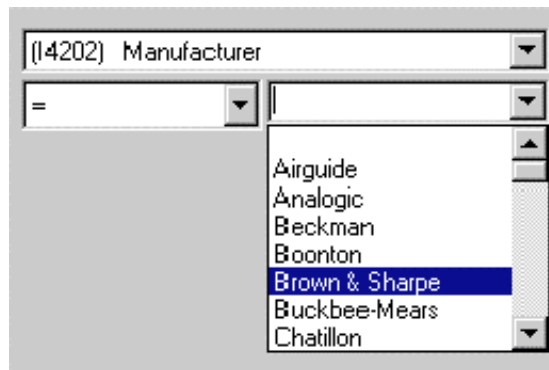
zv318s.bmp

The date control feature makes date selection easy. Use the arrow keys to select a date or click the down arrow to display a calendar. Select a date from the calendar by clicking it with the mouse.
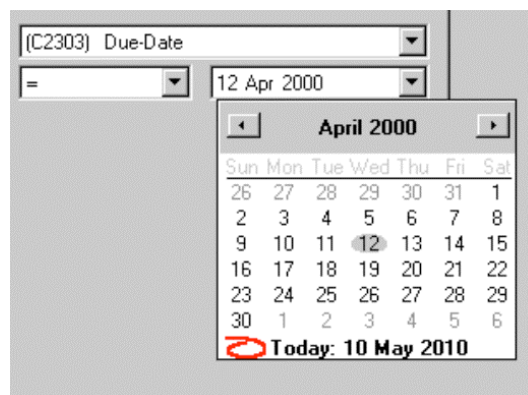
zv319s.bmp

In the next example, the report prints if the due-date is between two dates. The report includes assets due for calibration during the month of May in the year 2000. This is how the dates for a recall report are set.

zv320s.bmp

8. Continue selecting **Limit** criteria until it is as narrow or broad a selection as desired.

9. Check the **Most Recent Records** Only check box for the last Calibration done and the current Location, or leave it unchecked for all records.

10. Check the Active **Assets Only** check box to select only active assets, or leave it unchecked for all records.

11. Select the **Sorting** tab. A large report would be hard to understand if it lacked organization. To make reports more meaningful and easier to read, the report may be sorted. As columns are added to the report, each column name is added to the list of columns available for sorting. In this example, the report will be sorted first by the manufacturer's name and then by the model name.

zv321s.bmp

12. Choose the field to sort the report by and how to sort it. To sort, highlight a column in the top box. Then click the **A-Z** for an ascending sort or the **Z-A** button for a descending sort.

13. Double click to add fields to sort by. Click one of the up **arrow keys** [▲▲▲] [▲] to remove a field from the sorting criteria. The single arrow button un-selects a column name in the sort. The triple arrow button clears all column names from the selected list.

14. Select the **Options** tab to print, preview and export a report. The check boxes determine the appearance of the report.
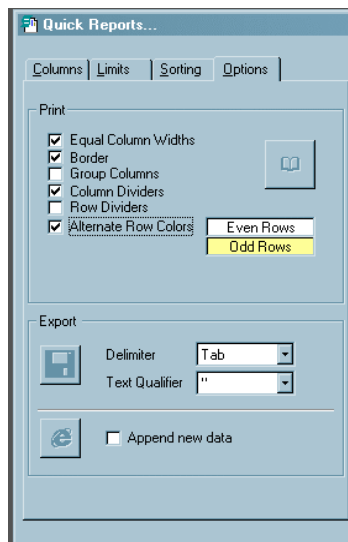
zv323s.bmp

Choices are:

Equal Column Widths – Sets widths equal so they fit on a single page

Border – Adds a border around the report.

Group Columns – Groups like fields together as one.

Column Dividers – Places a dividing line between report columns.

Row Dividers - Places a dividing line between report rows.

Alternate Row Colors – If checked, the odd and even rows are a different color. The foreground and background colors of the rows can be set. Left-mouse click for foreground colors. Right-mouse click for background colors.

The **page setup** button 📖 displays the setup window. Set the printer, margins and orientation.

15. Click the **preview** icon ⃞ to see what the finished report will look like.

16. Print the report by choosing the **printer** icon 🖨 to print the report.

Exporting A Report

Quick Reports can export a report to a computer file. This powerful capability then makes MET/CAL data available to other computer programs.

Export to a Data File

1. To export to a data file select a delimiter character from the list box.

2. Select an optional text qualifier to surround the data (if necessary).

3. Click on the **Save** button. A report saved with comma delimiters and double quote qualifiers would look like this:
   "1000","Fluke","5520A","Multi-Product Calibrator"
   This standard format is easily imported into database or spreadsheet programs.
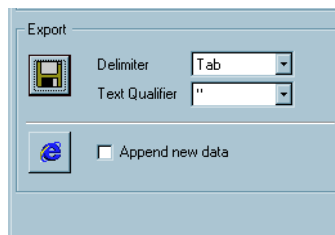
zv327s.bmp

Export to HTML

Click HTML export icon 🅔 to export to an HTML file. This allows viewing in Netscape, Internet Explorer or other Web browsers or for enhancement Web page editors. This feature greatly expands the ability to get meaningful reports to others easily and quickly. A report exported in this manner can be posted on an intranet site for public viewing or quickly e-mailed.
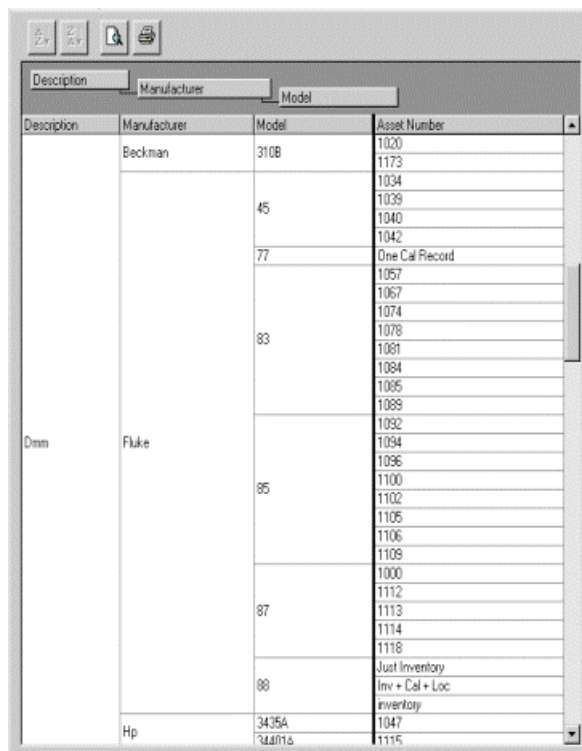
Additional Viewing Capability

This section explains the **grid** icon on the Report Builder screen. The grid icon displays the report in a data grid. It is similar to the Print Preview feature, but permits columns to be moved and rows grouped, sorted and organized.

1. Each column has a header at the top of the column. To reorganize the display, select the column header and then with the left-mouse button pressed, drag the header into the dark gray area above the column header.

2. When this is done the grid groups like information into a single cell.

In this example, a report containing Asset number, Manufacturer, Model and Description was constructed and displayed in the grid. The "Description" column was clicked, and dragged onto the gray area. Next, the "Manufacturer" and "Model" columns were also dragged in.
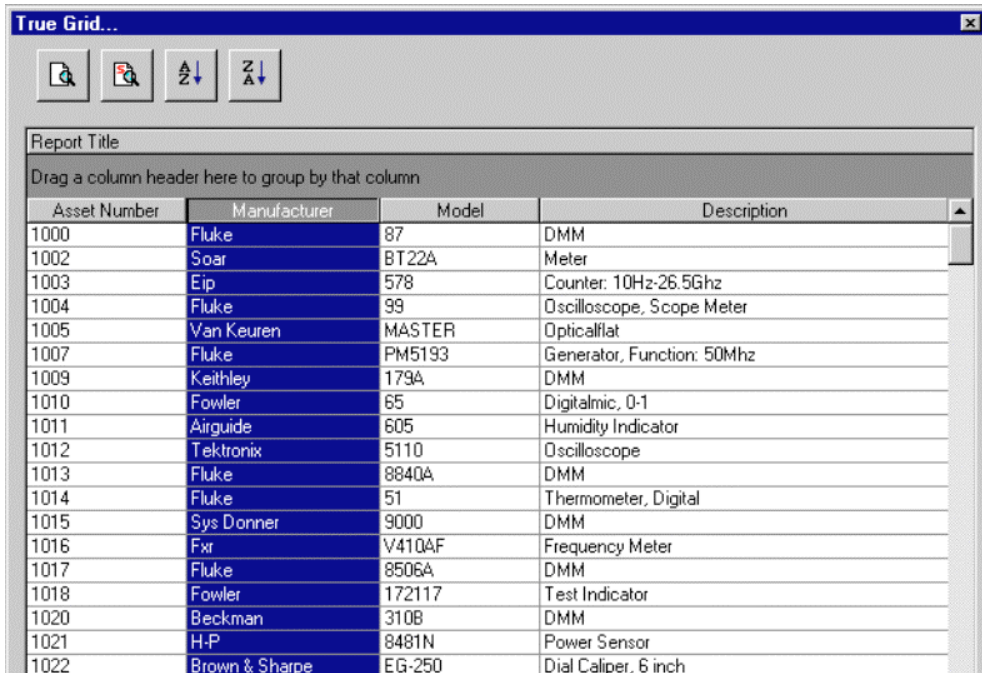
The grid is reorganized to display the data. This new view of the data can be printed or viewed by clicking the icons at the top of the screen.

zv330s.bmp

1. If the grid is not grouped the columns can be sorted. Select a column by clicking its name at the top of a column.

2. Click the **A to Z** button [image] to sort the highlighted column in ascending order.

3. Click the **Z to A** button [image] to sort the highlighted column in descending order.

Asset Number	Manufacturer	Model	Description
1000	Fluke	87	DMM
1002	Soar	BT22A	Meter
1003	Eip	578	Counter: 10Hz-26.5Ghz
1004	Fluke	99	Oscilloscope, Scope Meter
1005	Van Keuren	MASTER	Opticalflat
1007	Fluke	PM5193	Generator, Function: 50Mhz
1009	Keithley	179A	DMM
1010	Fowler	65	Digitalmic, 0-1
1011	Airguide	605	Humidity Indicator
1012	Tektronix	5110	Oscilloscope
1013	Fluke	8840A	DMM
1014	Fluke	51	Thermometer, Digital
1015	Sys Donner	9000	DMM
1016	Fxr	V410AF	Frequency Meter
1017	Fluke	8506A	DMM
1018	Fowler	172117	Test Indicator
1020	Beckman	310B	DMM
1021	H-P	8481N	Power Sensor
1022	Brown & Sharpe	EG-250	Dial Caliper, 6 inch

zv336s.bmp

4. Adjust the view using the **Pivot**, **Group** and **Filter** radio buttons, if desired.

5. Preview or Print the report.

Table of Hot Keys

MET/TRACK

F1   Help
Ctrl+S Save

Adding Records

F2   Add Inventory
F3   Add Calibration
F4   Add Location
F5   Add Maintenance
F6   Add Customer

Editing Records

Shift+F2 Edit Inventory
Shift+F3 Edit Calibration
Shift+F4 Edit Location
Shift+F5 Edit Maintenance/ Repair
Shift+F6 Edit Customer
Ctrl+V   Edit Validation
Ctrl+M Edit Merge

General Functions

Ctrl+A   Assign Asset to a customer
Ctrl+L   Log-on as a new user
Ctrl+O   Log-off
Ctrl+D   Select a new desktop
Ctrl+F   Search

Accessing other Applications

Ctrl+R   MET/CAL Runtime
Ctrl+E   MET/CAL Editor
Ctrl+Q   Quick Reports

MET/CAL Editor

F1   Help

File Commands

Ctrl+N New
Ctrl+O Open Procedure
Ctrl+S Save Procedure
Alt+S   Save to Default Directory
Ctrl+D Change Default Directory
Ctrl+F Open Text File
Ctrl+J Save Text File
Ctrl+F4 Close
Ctrl+P Print
Alt+F4 Exit

Edit Commands

Ctrl+X Cut
Ctrl+C Copy
Ctrl+W Copy to
Ctrl+V Paste
Ctrl+G Insert File
Del   Delete
Alt+F3 Find
F3   Find Next
Ctrl+F3 Replace
Ctrl+A Adjust
Ctrl+Enter Break

Compile Commands

F8   Check Line
F9   Next Error
Shift+F9 Previous Error
Ctrl+F9 Re-warn
Ctrl+T TUR Report

Test Run Commands

F2 Restart
Alt+F2 Go
Ctrl+F2 Show

Configure

Ctrl+M Text Mode Toggle
F12 Instruments

Chapter 4
Running Calibration Procedures

Contents   Page

Safety Considerations

Calibration systems may generate or measure dangerous voltages. Both the operator and procedure editor must be aware of possible hazards.

To avoid electrical shock and fire hazards, follow the instructions listed below.

⚠⚠**Warning**

Never use a screen saver with MET/CAL or 5500/CAL Run Time Applications. The Fluke software has been designed to promote safety by displaying a high-voltage safety symbol when dangerous voltage is present.

A screen saver program hides this symbol, so should never be used on workstations where calibrations are performed.

⚠⚠**Warning**

Avoid electric shock by always following these rules:

- **Use interconnect wiring and adapters rated for the highest voltage and current levels carried.**

- **Never touch exposed conductive portions of signal interconnect wiring (even after instruments have been turned off.)**

- **Only touch the insulated portion of a connector. First disconnect the interconnect wiring at the source, then at the measurement side.**

- **Always use insulated adjustment tools.**

- **If the calibration program terminates abnormally, verify that front panels of the source instrument indicate standby mode.**

Introduction

This chapter describes how to use the Run Time application.

You can skip this chapter if you have only MET/TRACK licenses.

The Run Time application is the central tool provided by the MET/CAL and 5500/CAL licenses, because this application executes procedures to actually calibrate instruments.

Each time a calibration begins, the procedure can present prompts for the operator to provide needed information, such as the asset number of the instrument being calibrated, or the temperature or other environmental factors. During the calibration, the screen might display illustrations showing test points, or forms providing an opportunity to enter a value, such as a UUT reading.

At the conclusion of a Calibration Procedure, you may see other prompts or displays, and you may be able to direct the system regarding how to deal with the output of the tests. You may be able to generate a Calibration Certificate or other report, or you may even be given the opportunity to discard the results if the test failed. All these possibilities depend on the particular way your system administrator has configured and customized the Fluke Metrology applications for your site. If you are not the administrator, be sure to speak with that individual before beginning any calibrations, so you know what to expect and how to respond appropriately.

This chapter can be helpful whether this is your first experience with the Run Time, or whether you have previously worked with Fluke Calibration software.

You need a basic knowledge of the Windows graphical interface; for example, how to operate pull-down menus and dialog boxes, how to make selections from list boxes, and so on. This chapter does not provide any instruction in these topics.

This chapter assumes that your system is completely configured, and that you have installed some Calibration Procedures.

It is helpful if at least one person at your site has gone through all the exercises in the *Getting Started Guide*. If you are not the same individual who did the Getting Started exercises, consult with that individual or with your system administrator to find out any configuration details you may need, and to learn which Calibration Procedures and reports are available to you.

The remainder of this chapter discusses the following major topics:

• Overview of the Run Time Application

• Selecting a Calibration Procedure

• Executing a Calibration Procedure

• Post Run Results

Overview of the Run Time Application

The Run Time application allows you to select a procedure and run a calibration on a Unit Under Test (UUT). Figure 4-1 gives a high-level overview of how the Run Time application works when you run a procedure.
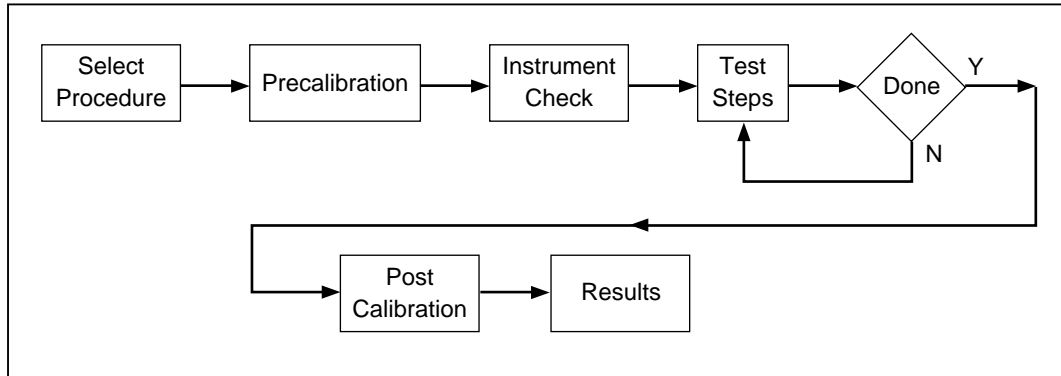
il401f.eps

Figure 4-1. High-Level Overview of Run Time

The purpose of the Run Time application is to execute Calibration Procedures and save calibration results. Some of the information in this chapter requires an understanding of the Fluke procedure language. Therefore, this chapter includes some information about the MET/CAL procedure language.

Note that, while it is not necessary to understand the procedure language in order to use the Run Time application, an understanding of the basics of the language helps you understand how the Run Time application functions and, in particular, how its operation may vary depending on the procedure being executed. Refer to the *MET/CAL Reference Manual* for additional information about the MET/CAL procedure language.

Sequence of Events

This section presents a sequential outline of the major steps performed by the Run Time. Most of these steps are described in more detail later in the chapter.

To execute the sequence of steps outlined below, start the Run Time and choose **Calibrate** in the top-level menu. It may be helpful to actually run a procedure while reading this information to obtain a full understanding of the process.

Note

The first step in the process, selecting a procedure, is initiated by the operator. All the remaining steps are done by the Run Time application, although some of the steps require operator involvement.

Step 1 - Select Procedure

There are two ways to select the procedure: by name, by asset. The procedure selection method is configurable (by going to the Run Time menu and selecting **Configure**, then **Procedure Selection Method**).

For more information refer to the heading later in this chapter titled, "Run Time Menu."

Step 2 - Check User Permissions for Required Database Fields

The Run Time verifies that the user has permission to write to all required fields in the Calibration and Inventory database tables.

Step 3 - Load Procedure

The selected procedure and all required subprocedures, if any, are loaded into memory. No operator interaction is required in this step, but the Run Time displays a sequence of one or more pop-ups that trace the loading of the procedure.

Step 4 - Load Pictures

If there are any picture (.bmp) files required, the Run Time verifies that the specified files exist.

Step 5 - Check Instrument Configuration

Next, the Run Time verifies that the system instruments required by the selected procedure are configured.

If a required instrument isn't configured, it can be added to the configuration by choosing **Instruments** in the **Configure** menu. Verifying that required instruments are configured does not involve any communication with the actual instruments.

Step 6 - Check Traceability

For each required system instrument, user-configured system instrument, or manual standard, a traceability check is done to make sure the instrument is in cal.

ALL the instruments used in a calibration are considered to be "standards", and therefore all of them must meet the following rules:

1. The standard must be in calibration before the instrument that is the current UUT. For each standard, only the most recent record meeting this criteria is used.

2. Every standard must have passed its most recent calibration. (Field C2323 = Y.)

3. The standard's due date + due time must be in the future, beyond the due date and time of the current UUT. If the standard's due date + due time is blank, then due date + due time is assumed to be infinity; it is never due for calibration.

Step 7 - Prompt for UUT Asset Number

Now the Run Time prompts for the asset number of the UUT.

For more information refer to the heading later in this chapter titled, "Asset Number Prompt."

Step 8 - Check User Permissions for Database Asset Information

The Run Time verifies that the currently logged-in user has permission to write to those database fields that the Run Time automatically updates for the specified asset. This verification is needed because MET/CAL automatically writes to the database at the conclusion of the calibration.

Step 9 - Pre-Prompt Dialog

A dialog prompts the user for associated information before procedure execution starts. This dialog is often used to prompt for temperature, humidity, and work order number. The dialog is configurable, however, and can be customized for each site.

If you do not want to use the pre-prompt dialog, it can be turned off.

For more information, refer to the heading later in this chapter titled, "Prompt Dialog."

Step 10 - Create Test Results Window

The Test Results window is a separate window that shows a one-line, color-coded result line for each test step in the Calibration Procedure.

For more information refer to the heading later in this chapter titled, "Test Results Window."

Step 11 - Reset Internal Data

This step prepares the system to execute the selected procedure. No interaction with the user is involved.

Step 12 - Initialize IEEE-488 Boards

This step is skipped for 5500/CAL, since it does not support IEEE-488 interfaces.

Step 13 - Open Required Serial Ports

The Run Time next opens all serial ports referenced by the selected procedure.

Step 14 - Test Required System Instruments

The Run Time performs an instrument-specific test for each required system instrument.

If a system instrument fails its test, it is probably because it isn't turned on or is not set to the configured address. In some cases, however, a system instrument may be broken, or the PC's IEEE-488 bus or serial ports may be locked up or otherwise malfunctioning. If the instrument is turned on and set to the correct address, you may wish to reboot the PC before concluding that the instrument is malfunctioning.

For system instruments configured on serial ports, the port configuration (specified using the Windows Control Panel) must agree with the instrument settings, and the cable must be of the correct type and pinout.

No test is done for the UUT, for user-configured instruments, or for manual standards.

Note

A user-configured instrument is an instrument used as a calibration standard, and remotely controlled by MET/CAL, but for which there is no built-in driver.

Step 15 - Clear Required System Instruments

This step returns all required system instruments to a known, reset state prior to procedure execution.

Step 16 - Execute Procedure

After performing the foregoing preliminary steps, the Run Time now executes the selected Calibration Procedure.

A Calibration Procedure is a sequence of calibration test steps. Each test step involves setup steps followed by an evaluation. In many cases the setup steps involve prompts to the operator, and the evaluation may also involve an operator prompt.

The sequence of steps executed and the types of prompts displayed to the operator are controlled by the MET/CAL procedure.

To execute a procedure, MET/CAL starts at the first procedure statement and executes statements in the order they occur, except when one of the following two things occurs:

- the procedure jumps to a different step, or

- the operator uses the Post Test dialog to alter the execution sequence.

The operator's ability to alter the execution sequence of the procedure can be disabled by the procedure writer.

Each test step generates a test result. By default, the results of each test step are shown to the operator in the Post Test dialog. However, it is common for procedures to be written so that the Post Test dialog appears only after a test step fails.

More information on procedure execution, including descriptions of the different types of tests and operator prompts, is provided later in this chapter. Refer to the heading titled, "Procedure Execution."

Step 17 - Clear Required System Instruments

This step returns all required system instruments to a known, reset state following procedure execution.

Step 18 - Close Required Serial Ports

All serial ports referenced by the selected procedure are closed.

Step 19 - Automatic Prompt to Operator: Remove All Connections

An operator prompt display reminds the operator to remove all connections. You cannot configure or inhibit this prompt. It is a built-in feature of the Run Time application.

Step 20 - Post-Prompt Dialog

A dialog display prompts the user for associated information after procedure

execution ends. This dialog is often used for displaying status information (such as the number of marginal PASS results, elapsed time, and so on), as well as to prompt for a remark that will be stored with the calibration results.

You can configure the post-prompt dialog, and customize it for each site. It can be configured independently, based on whether the overall result of the calibration is PASS or FAIL.

If you do not want to use the post-prompt dialog, it can be turned off.

For more information, refer to the heading later in this chapter titled, "Prompt Dialogs."

Step 21 - Post Run Results

The Post Run Results dialog allows the operator to view or print the test results.

Test results are normally saved automatically, and no operator intervention is required. The dialog includes three buttons which offer the following choices:

- **Save Calibration Data**

- **Discard Calibration Data**

- **Discard All Data for UUT**

The following aspects of the Post Run dialog can be configured using the MET/CAL Run Time application:

- The dialog can be turned off.

- A macro can be set up to view and/or print specified reports.

  Up to 8 different calibration reports can be set up for viewing or printing. By default, the following reports are provided:

  1. Certificate of Calibration

  2. Calibration Results

  3. Calibration Summary

- Users can add new reports or modify existing reports as needed.

- Users can selectively disable the software's ability to save test results, discard test results and discard all information for the UUT.

After the operator chooses **Close** to exit from the Post Run Results dialog, the Run Time returns to its top-level menu and waits for further input from the user.

At this point, the Run Time has completed the sequence for running one procedure, and the user can execute a different procedure, re-execute the same procedure, or exit from the application.

Run Time Menu

This section provides information about the Run Time application's menu items. When investigating the menu, it may be useful to open the Run Time and actually view the various items available.

File

Choosing **File** in the top-level menu causes a drop-down submenu to display. The menu has only one item, **Exit**. Choosing **Exit** closes the MET/CAL Run Time application.

There are three other, equivalent ways to close the application:

1. Choose Close in the system menu. The system menu drop-down can be seen by clicking in the upper-left hand corner of the window.

2. Type **Alt** + **F4**.

3. Click on the **X** in the upper, right-hand corner of the window.

The Run Time application cannot be closed during procedure execution.

Calibrate

Choosing calibrate initiates the sequence of steps described under the heading above titled, "Run Time Overview."

The first thing the user sees after choosing **Calibrate** is a dialog that allows the procedure to be selected.

Actually, one of two different dialogs will be seen, depending on the procedure selection method. The Options menu item allows you to select procedures. A description of the Options menu appears a few paragraphs forward.

Selection By Procedure Name

If the procedure selection method is *By Procedure Name*, choosing **Calibrate** causes the Run Time to display the Procedure Selection dialog. This dialog presents a directory of available MET/CAL procedures, listed by name.

You can add, delete, or modify procedures using the Editor. Open the **Tools** menu and select **Administrator**. The Run Time application does not provide a way to add, delete or modify procedures. It only allows the operator to select a procedure to be executed.

The Procedure Selection dialog includes OK, Cancel and Search buttons.

- **OK** selects the highlighted procedure. If no procedure is highlighted, an error message displays, and you can try again.

- **Cancel** returns to the top-level menu without doing anything.

- **Search** allows searching for any substring contained in a procedure name.

The Procedure Selection dialog does not list hidden or non-executable procedures. Hidden procedures are usually subprocedures that are not selected directly. Use the Editor to work on hidden or non-executable procedures.

Selection By Asset Number

If the procedure selection method is *By Asset Number*, choosing **Calibrate** causes a prompt for the UUT asset number to appear. The number you type into the dialog box must be a valid asset number.

After the user enters the asset number of the UUT, the Run Time queries the database to find the procedure associated with the specified asset.

Options

Choosing **Options** causes a drop-down submenu to display. The submenu contains the following items:

Demo Mode

The Run Time can operate in two modes: *demo* mode and *real* mode.

If the *Demo Mode* menu item is checked, the Run Time is in demo mode; otherwise, the application is in real mode.

In demo mode, the Run Time application does not communicate with instruments. Also, in demo mode, the application doesn't open or close serial ports, doesn't initialize the IEEE-488 bus, and doesn't read from or write to serial or IEEE-488 instruments.

In all other respects demo mode is the same as real mode, including the saving of results. In general, results generated when running in demo mode should be discarded, since demo mode is provided for testing and debugging only, and is not intended for use in calibrating real UUTs. Note that you can debug procedures by using the Editor's Test Run capability. The Run Time's demo mode may be useful, however, in testing prompt screens, Run Time reports, and so on.

When the Run Time is in demo mode, it appends " - Demo Mode " to the application name in the window title.

It is not possible to change modes during procedure execution.

Procedure Selection Method

Highlighting *Procedure Selection Method* in the Options menu causes an associated menu containing the following choices to be displayed:

- By Procedure Name

- By Asset Number

At any given time, one and only one of these items will be checked. You can click on a different item to change the selection method. The Run Time remembers the selected method until you change it. Choosing a different procedure selection method has no effect until you choose **Calibrate**, in the top-level Run Time menu.

Refer to the heading above titled, "Calibrate" for a description of how the procedure selection method affects the Run Time operation.

Instruments

This selection lists the current configured instruments in your system and allows you to add new instruments as the need arises. It also provides a means for editing or deleting instruments.

IEEE-488 Boards

This selection allows you to configure the number of IEEE-488 boards that are in the computer and lists their manufacturer model name.

Default Serial Port

This selection allows you to configure a default serial port for serial controlled UUTs.

Default Font

This selection allows you to determine the font used in the Editor application, and the Run Time application's Post Test - List option. To maintain column alignment when procedure listings are viewed, the default font must be a fixed-point font (one in which every character consumes the same amount of space on the line).

Display Font

You may configure the font in some of the prompts and messages Run Time operators see during procedure execution. The Display font may or may not be a fixed point font. Verify that the fonts you select display correctly with the monitor used on the calibration system.

Post Run Reports

Configuration of Post Run Reports permits choosing those reports in MET/CAL's RPT directory that you wish to make available to the Post Run or Autosave Macros which run at the conclusion of a calibration.

Post Run Dialog

The Configure Post Run Dialog selection allows the restriction of an operator's options after the procedure is complete. For example, if you want an operator to have only the option of viewing a report, select View and click OK. After the UUT is tested, an operator can only view the report, not print it. If none of the options are enabled, the Post Run dialog box does not display at the end of each procedure.

The Post Run dialog can be set up so the results of a calibration are NOT stored automatically, and even to initially select "Discard Data on Close." These may be useful features during development or testing of new calibration procedures, or when you are first getting MET/CAL set up.

Autosave Pass / Autosave Fail Macros

The Autosave pass and Autosave Fail macros let you determine which reports are displayed or printed automatically when the procedure completes. The list is the same one as for the Post Run Macro, created from those reports you select using Configure Post Run Reports.

Post Run Macro

Configuring the Post Run Macro lets you set up a macro for the operator to use at the end of each calibration procedure. The operator executes the post Run Macro by choosing the MACRO button on the Run Time Post Run dialog box. For example, if you want the operator to be able to both view and print the reports, select both **Print** and **View** for each of the listed reports. The list is the same one as for the Autosave Pass and Autosave Fail macros, created from the reports you select using Configure Post Run Reports.

Break

Break has only one purpose: it aborts the operation of a closed-loop procedure. A closed-loop procedure runs without operator intervention. *Break* is normally disabled (grayed out) except during procedure execution.

Tools

You can configure the Tools menu to contain any other applications you want to start from the Run Time. By default, the menu includes other MET/CAL applications.

When you select an application in the Tools menu, the Run Time attempts to start that application. If the selection is another MET/CAL application that requires logging into the database, you do not need to re-enter the login information (database, name, and password). The other application starts using the same database, login name and password as the user who is currently logged in to the Run Time.

There is no automated way to modify the contents of the Tools menu using the MET/CAL applications. To add, change, or delete items in the Tools menu you must edit the MET/CAL initialization file, `metcal.ini`. The Run Time Tools menu items are in the [Run Time Tools] section. Use Notepad or a similar text editor to modify the initialization file.

Security

Choosing **Security** in the top-level Run Time menu causes a drop-down submenu to appear. The submenu has only one item, *Password*.

Password

Choosing **Password** causes the Change Password dialog to be displayed.

This dialog allows the currently logged-in user to change his or her password.

About

Choosing **About** causes a dialog to display that shows:

a) Company Name

b) Copyright Message

c) Application Name

d) Product Name and Version

e) Current User
    This is the full name (not the login name) of the currently logged in user.

Run Time Window

The top-level window of the Run Time application consists of a title, a menu (described above), and information displayed in the window below the menu. The information displayed in the window usually changes as the procedure runs.

The information described in this section is not the only information presented to the operator during procedure execution. Other information, however, is not written directly on the Run Time's main window. Rather, it appears in various pop-up dialogs and windows that appear and disappear as the procedure runs. Most, but not all, of these pop-ups require a response from the operator.

Refer to Figure 4-2 as you review the following information about the Run Time display.
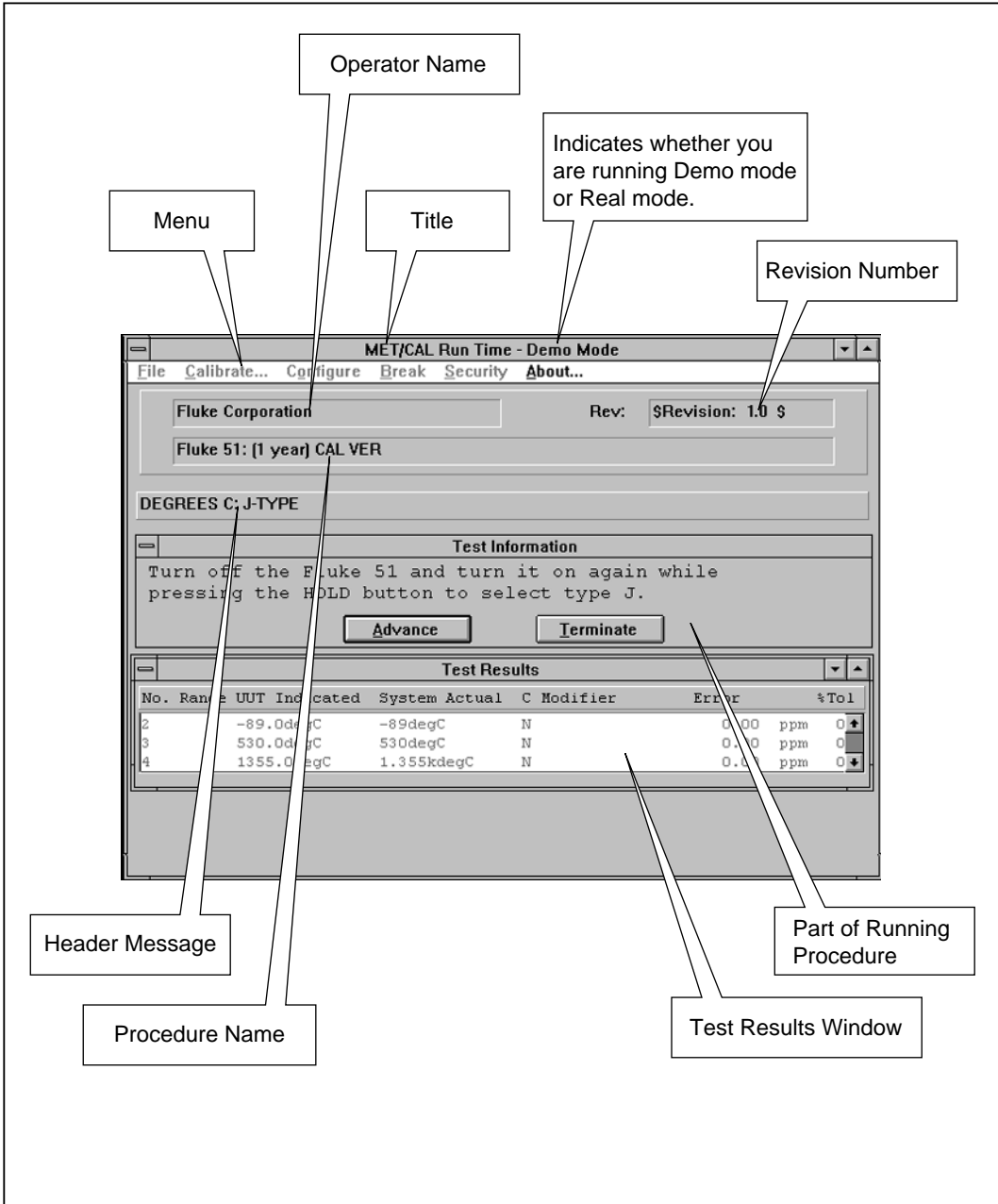
Figure 4-2. Run Time Window

il402c.eps

Title

The window title shows the name of the application (MET/CAL Run Time). If the Run Time is in demo mode, "- Demo Mode" is appended to the application name in the title.

Menu

See preceding discussion, under the heading, "Run Time Menu" above.

Run Time Window Information

In the upper portion of the window, below the menu, the Run Time shows the operator's name, the procedure revision, and the procedure name.

Operator Name

The name shown is the full name of the currently logged in user.

Procedure Name and Revision Number

The procedure name and revision are not shown unless a procedure is running.

If the main procedure calls a subprocedure, the name and revision of the subprocedure are shown while the subprocedure is executing. After the subprocedure returns to the main procedure, the main procedure's name and revision are displayed again.

Header Message

Below the procedure name, space is reserved for a header message. This message is generated whenever a HEAD statement in a procedure is executed. A HEAD message remains on the screen until a subsequent HEAD statement changes it, or the procedure terminates.

An empty HEAD statement in the procedure can be used to clear the message.

The header message can be used to provide a descriptive header that groups the individual test steps of a procedure into functional groups. For example, a procedure to calibrate a handheld DMM might divide its test steps into AC voltage tests, DC voltage tests, AC current tests, DC current tests, and resistance tests. The procedure could include a corresponding HEAD statement for each group of tests. The operator will then see, for example, "AC Voltage Tests" displayed in the header message area during the ACV tests, "DC Voltage Tests" during the DCV tests, and so on.

System Stimulus/Measurement Information

Below the area reserved for the header message, a line is reserved for information about the current output stimulus or current measurement. This area is not seen on the illustration, since it is hidden at the moment by the Test Information dialog.

For example, if you write and execute a procedure containing the lines:

```
5700 1V S
DISP Pause
```

you will see the text: **Stimulus: 1V** appear in the Run Time screen when the 1V stimulus is present. The stimulus is present from the time the setup statement executes until the 5700A is reset.

If you write and execute a procedure containing the line:

```
8508 1V S
```

you will see text similar to **Measurement: 1.001V**. This text is shown until the operator responds to the prompt that instructs him to adjust the UUT for a reading of 1V. The *1.001V* here is just an example. If you actually do this and run the procedure in real mode you would see the actual Fluke 8508A measurement here.

Asset Number Prompt

Each MET/CAL Calibration Procedure verifies or adjusts a particular Unit Under Test (UUT). The asset number of the UUT is required by the Run Time because calibration results generated during procedure execution are stored in a database in which all information is organized by asset number.

If the asset number does not exist in the database, a separate dialog prompts for all required fields in the Inventory Table. The Run Time application then writes the new asset and all required inventory table data to the database.

If the procedure selection method is *By Asset,* then, when the operator enters an asset number, MET/CAL retrieves the name of the associated procedure from the database.

If the specified asset is new to the database, no information exists for the asset in the database, so the associated procedure name cannot be retrieved. In this case, MET/CAL displays the procedure selection dialog to allow the procedure to be selected by name. If the procedure name field in the inventory table is configured as a required field, the specified procedure name is pre-loaded into the subsequent prompt for required inventory data. This mechanism allows the association between asset number and procedure name to be initially set up using the Run Time application when the asset is first added to the database. The other way to do this is to use the manual Entry application to add the asset, including the associated procedure name, before using the Run Time application to run a procedure to calibrate the asset.

If the specified asset is not new to the database, inventory table information for the asset already exists in the database. In this case, as stated above, MET/CAL attempts to retrieve the name of the associated procedure from the database. If there is no associated procedure name, MET/CAL displays the procedure selection dialog to allow you to select the procedure by name. The Run Time application cannot, however, modify an existing inventory table entry, so the selected procedure is executed by the Run Time, but the name is not saved in the inventory table for the specified asset. The only way to permanently associate a specified procedure name with an existing asset is to use the Manual Entry application.

Prompt Dialogs

There are two configurable dialogs that normally are presented to the operator each time a procedure is executed. These dialogs are referred to as the pre-prompt dialog and the post-prompt dialog. The pre-prompt dialog displays after you select a procedure, but before procedure execution begins. The post-prompt dialog displays after procedure execution terminates.

Pre-Prompt Dialog

You can configure the pre-prompt dialog that appears after a procedure has been selected, but before the start of procedure execution.

Used the pre-prompt dialog to display read-only information, or to prompt the operator for information that will be written to the results or, in some cases, used during procedure execution.

The pre-prompt dialog is controlled by the parameter named *prompt* in the [startup] section of the MET/CAL initialization file, metcal.ini. The *prompt* parameter specifies the name of the file that controls the pre-prompt dialog.

The default initialization file contains the line:

```
prompt = promptdb.txt
```

This indicates that the name of the file that controls the pre-prompt dialog is promptdb.txt.

To turn off the pre-prompt dialog, the system administrator can change the initialization file to read, "prompt = none."

An equivalent way to turn off the pre-prompt dialog is to edit the prompt file (default name `promptdb.txt`) and change it so that it contains no lines other than comments and blank lines. Any line that begins with a pound sign (#) or a semicolon (;) is a comment line.

The default pre-prompt dialog prompts the operator for the temperature, the humidity, the work order number, and asks whether the calibration seal on the UUT is intact. By modifying the pre-prompt file the administrator of the system can prompt for any desired information.

If the value entered by the operator for a data item is to be written to the database, the value must be written to one of the fields of the calibration table, and it must not be a field that is automatically updated by the MET/CAL Run Time.

Normally all fields in the pre-prompt dialog are displayed in a single dialog. However, if the system is set up to prompt for a large number of items, a sequence of separate dialogs will appear until all necessary prompts have been shown.

Refer to the heading "Customizing Prompts for the Operator" in Chapter 7 for additional information, including a detailed description of the format of the pre-prompt file, and other information about customizing the pre-prompt file.

Post-Prompt Dialogs

There are two post-prompt dialogs: the pass-prompt dialog and the fail-prompt dialog. After each procedure execution one or the other, but not both, of these dialogs is displayed.

If the overall result of the procedure is PASS, the pass-prompt dialog is displayed. If the overall result is FAIL, the fail-prompt dialog is displayed. The condition that determines an overall result of FAIL is that one or more of the individual tests has failed because the UUT is out of tolerance at that test point.

The pass-prompt and fail-prompt dialogs are separately configurable.

Use the post-prompt dialogs to display read-only information, or to prompt the operator for information that will be written to the results.

The pass-prompt dialog is controlled by the parameter named *pass_prompt* in the [startup] section of the MET/CAL initialization file, `metcal.ini`. The *pass_prompt* parameter specifies the name of the file that controls the pass-prompt dialog.

Similarly, the fail-prompt dialog is controlled by the parameter named *fail_prompt* in the [startup] section of the MET/CAL initialization file, `metcal.ini`. The *fail_prompt* parameter specifies the name of the file that controls the fail-prompt dialog.

The default initialization file contains the following two lines:

```
pass_prompt = pass_db.txt
fail_prompt = fail_db.txt
```

These indicate that the names of the files that control the pass-prompt and fail-prompt dialogs are `pass_db.txt` and `fail_db.txt`, respectively.

To turn off the pass- or fail-prompt dialogs, you can change the initialization file to read, "pass_prompt = none", or "fail_prompt = none." Since the two dialogs are independently configurable, it's possible (for example) to set up the system so that a post-prompt dialog appears when the overall result is FAIL, but not when the overall result is PASS.

As with the pre-prompt dialog, an equivalent way to turn off the post-prompt dialog is to edit the appropriate prompt file (default names are `pass_db.txt` and `fail_db.txt`), and change it so that it contains no lines other than comments and blank lines. Any line that begins with a pound sign (#) or a semicolon (;) is a comment line.

The default pass-prompt dialog shows the operator the number of marginal tests, the time it took to calibrate the UUT, the overall test result (PASS, FAIL, etc.), and asks the operator to indicate that the results are either "As Found" or "As Left", and to enter an optional comment.

Note that a "marginal test" is one where the test passed, but the error expressed as a percentage of the test tolerance is greater than the adjustment threshold. The adjustment threshold is a configurable parameter set in the procedure. It is typically set to 70%.

The default fail-prompt dialog is the same as the pass-prompt dialog, except that it also shows the total number of tests that failed.

However, as with the pre-prompt dialog, the post-prompt dialogs can be configured by the person who sets up the system. When you run a procedure, you may or may not see the information and prompts described for the default prompt dialogs.

If the value entered by the operator for a data item is to be written to the database, the value must be written to one of the fields of the calibration table, and it must not be a field that is automatically updated by the MET/CAL Run Time.

Normally all fields in the post-prompt dialog are displayed in a single dialog. However, if the system is set up to prompt for a large number of items, a sequence of separate dialogs will appear until all the prompts have been shown.

Refer to the section "Customizing Prompts for the Operator" in Chapter 7 for additional information. There, you will find a detailed description of the format of pass-prompt and fail-prompt files, and other information about customizing them.

Procedure Execution

This section describes how the Run Time application executes a MET/CAL procedure. The information following is mainly intended for the person who will be writing those procedures, or modifying a supplied procedure.

Some of the information in this section is repeated in the *MET/CAL Reference Manual*. In fact, as you prepare procedures for your site, refer to that manual for complete reference information about the FSCs that make up the MET/CAL procedure language. The descriptions that follow are provided to assist in giving an overview of the Run Time's procedure execution process.

Procedure Statements

Each MET/CAL procedure consists of a header followed by a sequence of procedure statements.

An individual procedure statement begins with a step number, followed by a Function Select Code (FSC). The FSC is a keyword that identifies the type of procedure statement.

Example:

```
1.001  5500   40   35.00V      0.72U     5kH      SI     2W
```

In this statement the FSC is **5500**, which identifies the statement as one that controls a Fluke 5500A calibrator.

Example:

```
1.001  DISP         Set the Capacitance Decade to 4.70nF.
```

In this statement the FSC is **DISP**, which identifies the statement as one that issues a prompt to the operator.

For a detailed description of the procedure header, see the *MET/CAL Reference Manual* under the heading, "MET/CAL Procedure Header."

Step Numbers

As mentioned above, each procedure statement begins with a step number. The step number has two parts, as follows:

- The major step number is the test number.

- The minor step number defines the sequential position of the statement within that test.

You can see step numbers in a procedure by using the Editor application, or looking at the currently executing procedure using the Post Test List option.

Example:

```
3.020  5500        3.513V                50H       SI    S   2W
```

The above example is the 20th statement in test number 3.

Tests

Statements in a procedure are grouped by major step number into blocks that comprise individual tests.

A typical test has three parts:

1. Connections

2. Setups

3. Evaluation

In a simple case, a single procedure statement performs all three parts of the test. For example:

```
STEP  FSC  RANGE NOMINAL    TOLERANCE    MOD1    MOD2   3   4 CON
1.001 5700 400   350.0mV    2.9U         60H                 2W
```

This single statement (assuming the default state of the ASK flags), performs the following operations:

1. **Connection** - An automatic connection message displays that prompts the operator to connect the UUT to the 5700A Output Terminals.

2. **Setup** - An automatic range message displays that prompts the operator to set the UUT to the 400mV AC Range.

3. **Setup** - The 5700A is programmed to output 350mV, 60Hz with internal sense.

4. **Setup** - The *Slew* dialog displays that prompts the operator to *Adjust stimulus for a UUT reading of 350mV at 60Hz*. When slewing is complete, System Actual is set to the final 5700A output voltage, and UUT Indicated is set to the value in the Nominal field.

5. **Evaluation** - UUT Indicated is compared to System Actual, according to the specification in the Tolerance field, and test results are generated.

In many cases, however, a test is made up of multiple procedure statements. More information about the three parts of a test (connections, setups, and evaluation) is given below.

Connections

The operator performs connections under the direction of prompts that the procedure generates. Connection message prompts can be automatically generated by an instrument FSC or the connection (CON) FSC, or the person who writes the procedure can create the message prompts using the display (DISP) or picture (PIC) FSC.

Connection messages instruct the operator, or, in the case of the PIC FSC, show the operator graphically how to interconnect the UUT and the calibration standards. See *Automatic Connections*, *Operator Information Prompt*, and *Pictorial Information Prompt* in the section on run time prompts later in this chapter.

For a complete descriptions of the **DISP**, **PIC**, and **CON** FSCs see the FSC Reference chapter of the *MET/CAL Reference Manual*.

Setup

Once the connections are made, a test typically requires one or more setups to be performed. Setups fall into one of three categories:

1.   Setting up the UUT.

2.   Setting up the standards required for the test.

3.   Setting up the memory registers containing UUT Indicated and System Actual, which are used to perform the test evaluation.

Setting up the UUT

The UUT is set up either manually by the operator or automatically by MET/CAL if it has remote control capability. Prompts to the operator to set up the UUT can be automatically generated by an instrument FSC or RNG FSC or by using the DISP, MESS, PIC, or SET FSCs. For example, the following statements would all generate the operator prompt *Set UUT to the 10 MOhm range*.

```
1.001  RNG         10MZ
1.001  5700   10   10.00000MZ      0.00410U              2W
1.001  DISP        Set UUT to the 10 MOhm range.
```

See the headings, *Automatic Range Message, Automatic Test Setup Prompts, Automatic UUT Setup Prompts,* and *Operator Information Prompt* in the section on run time prompts later on in this chapter. For a complete description of instrument FSCs, **RNG**, **DISP**, **MESS**, **PIC**, and **SET** see the FSC Reference chapter of the *MET/CAL Reference Manual*.

The IEEE FSC is used to set up UUTs with an IEEE-488 interface and the PORT FSC is used to set up UUTs with an RS-232 interface. The statement below uses the SCPI remote protocol to program a UUT with an IEEE-488 interface.

The UUT is a DMM. The SCPI commands select 2-wire Ohms and the 10 MOhm range. The IEEE-488.2 ***OPC?** (Operation Complete query) command is also sent to determine when the setup is complete.

When the setup is complete, the DMM returns a "**1**" which MET/CAL subsequently reads using the **[I]** special construction. The programming string is automatically terminated by MET/CAL using the IEEE-488 EOI (End or Identify) line.

```
1.025  IEEE           FUNC "RES";:RES:RANG 10e+6;*OPC?[I]
```

If the UUT has a RS-232 interface, the same command could be sent using the PORT FSC. For serial UUTs the terminator must be specified. The terminator can be included at the end of the output string or declared globally using the [OTERM] special construction (see Port FSC in FSC references). In this case a carriage return is specified at the end of the output string using the **[13]** special construction.

```
1.025  PORT           FUNC "RES";:RES:RANG 10e+6;*OPC?[13][I]
```

For a complete description of **IEEE** and **PORT** see the FSC Reference chapter of the MET/CAL Reference Manual.

Setting up Standards

MET/CAL can set up remotely programmable and manual standards. An instrument FSC is used to set up a standard for which there is a built-in MET/CAL driver. A device for which MET/CAL has a built-in driver is referred to as a *System Instrument*.

Example, Setting up a System Instrument:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	5700	400	350.0mV	2.9U	60H				2W
2.001	5700		350.0mV		60H			S	2W

The above statements set up the 5700A to output 350mV at 60Hz with internal sense (2-wire). Statement 1.001 will also set up the UUT range and perform an evaluation. Statement 2.001 only sets up the standard (**MOD4** = **S**). Both statements will generate an automatic connection message unless otherwise inhibited using the **ASK-** FSC.

Remotely programmable standards for which there is no built-in driver are referred to as *User-configured Instruments.*

The IEEE and PORT FSCs are used to set up IEEE-488 and RS-232 controlled user-configured instruments, respectively. The IEEE and PORT FSCs must contain the correct protocol for controlling the standard, as described in the remote programming section of the instrument's operating manual.

Example, Setting up a User-configured Instrument:

```
1.001  IEEE        [@2812]:INST:NSEL 1;;VOLT 2;;CURR 1
```

The above statement sets up the PM 2812 DCV power supply channel 1 to 2V
with a current limit of 1A.

Manual standards are set up by the operator under the direction of prompts
generated by the DISP, MESS, and PIC FSCs.

Example, Setting up a manual standard:

```
1.001  DISP        Set the 792A to the 220mV range.
```

Setting up Memory Registers

The correct memory registers must be set up with the values of UUT Indicated and
System Actual for the test evaluation to be properly performed. These registers are
automatically set up by instrument FSCs that perform an evaluation (**MOD4** =
blank) as shown in the simple 5700A example earlier in this section. However,
there are many tests where an instrument FSC evaluation cannot be used. For
these tests, one or more additional FSCs must be used to set up the UUT Indicated
and System Actual values in the correct memory registers. This is the case for
closed-loop tests and tests where the UUT units are not the same as the units of
the applied standard.

Example, closed-loop test:

```
STEP   FSC    RANGE NOMINAL    TOLERANCE    MOD1    MOD2  3  4 CON
1.001  5700         10.0000V                                 S  2W
1.002  IEEE         ?[I]
1.003  MEMCX 20     10.000V    0.0005U
```

The action of each test step in the above example is detailed below:

1. **Setup** - The 5700A is programmed to output 10V DC and a value of 10 is
   stored in memory register MEM1.

2. **Setup** - The UUT reading is read via the IEEE-488 bus and stored in memory
   register MEM.

3. **Setup** - Swap the contents of registers MEM and MEM1. This is necessary so
   System Actual, the 5700 output, and UUT indicated, the UUT reading, are in
   the correct registers for the MEMC (memory compare) evaluation FSC.

4. **Evaluation** - Compare the UUT Indicated to System Actual against the UUT
   specification in the Tolerance field.

Example, units of UUT parameter and applied parameter differ:

```
STEP    FSC    RANGE NOMINAL   TOLERANCE    MOD1  MOD2  3  4 CON
1.001   5700         2V                     60H            S 2W
# Get the 5700 accuracy at 2Vrms
1.002   MATH         M[1] = ACCV2("Fluke 5700A", "Volts", 2.0, 60.0)
# Convert to Vp
1.003   MATH         M[1] = M[1] * 2 * SQRT(2)
1.004   ACC          2.828Vp   M1U
1.005   IEEE         ?[I]
1.006   MEMCX 2.0    2.828Vp   0.045U
```

The action of each test step in the above example is detailed below:

1. **Setup** - The 5700A is programmed to output 2Vrms at 60Hz and store a value of 2 in memory register MEM1.

2. **Setup** - Retrieve the voltage accuracy of the 5700A at 2Vrms, 60Hz from the 5700A accuracy file.

3. **Setup** – Convert the accuracy in Vrms to Vp.

4. **Setup** – Establish the system accuracy in volts peak for the 5700A output. 2.828 is stored in memory register MEM1, overwriting the value of 2 stored there in Step 1.

5. **Setup** - Obtain the UUT reading and store it in memory register MEM.

6. **Evaluation** - Compare the UUT Indicated (MEM) to the System Actual (MEMCX Nominal Value) against the UUT specification in the Tolerance field.

A number of FSCs can be used to set up memory registers. For a complete description of these FSCs, see **ACC**, **MATH**, **MEM2**, **MEME**, **MEMI**, and **OPBR** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

The IEEE and PORT FSCs can be used to set up memory registers MEM and MEM2 by using the **[I]** and **[I$]** special constructions respectively. Also see "Use of Standard Memory Registers" in the chapter covering General Rules for FSCs in the *MET/CAL Reference Manual*.

Evaluation

Each test ends with a test evaluation. The basic result of an evaluation is that the test passed or failed. Evaluations can be either numeric or Go-NoGo. Numeric evaluations save numeric data in the results for the test. Go-NoGo evaluations only save a pass or fail indication for the test.

Numeric Evaluation

A numeric evaluation is performed by the following FSCs:

- An instrument FSC evaluation test where the standard is sourcing an output to the UUT and slew or keyboard entry mode is specified.

- An instrument FSC evaluation test where the standard is measuring an output of the UUT.

- The **MEMC** FSC.

- The **DOSE** FSC when the user-written program appends the percent error for the test to *dosdose.dat*.

A numeric evaluation may have additional qualifiers that can be added to the evaluation result. For example, a *marginal pass* is an evaluation in which the error, expressed as a percentage of the test tolerance, is less than or equal to 100% (a configurable value), but greater than the threshold value (also configurable, but usually 70%).

Instrument FSC Evaluation Test

Instrument FSCs are FSCs that refer directly to system standards for which MET/CAL provides a built in driver. An evaluation test is specified for an instrument FSC when the MOD4 field is blank. An Instrument FSC Evaluation Test compares the System Actual to the UUT Indicated value for the test against the UUT specification in the Tolerance field.

Example, standard sourcing an output to the UUT:

```
STEP  FSC   RANGE NOMINAL   TOLERANCE  MOD1   MOD2  3  4 CON
1.001 5700  400   350.0mV   3.9U       60H                 2W
```

The above statement will use the slew mode to obtain the UUT reading unless otherwise specified. When slew mode is used, the UUT Indicated value is taken from the Nominal field and the System Actual is the final slew value. See "Slew Dialog" under *Run Time Prompts* later in this chapter.

The keyboard entry mode is used if the K-flag is set when the statement is executed or the B-flag is set and the operator chooses *keyboard* when the *Test Evaluation* dialog is displayed. The K-flag and B-flag are set using the ASK+ FSC. For keyboard entry mode, the System Actual is the Nominal field value and the UUT Indicated is the value entered from the keyboard. See *Keyboard Entry Operator Prompt* also under *Run Time Prompts.*

For a complete description of enabling and disabling keyboard entry and slew modes, refer to **ASK+** and **ASK-** in the FSC Reference chapter of the MET/CAL Reference Manual.

Example, standard measuring an output of the UUT:

```
STEP  FSC    RANGE NOMINAL   TOLERANCE   MOD1   MOD2  3  4 CON
1.001 34401  400   350.0mV   3.9U        60H                  2W
```

In this example, where the standard is measuring an output of the UUT, the Nominal field is taken as the UUT Indicated output. The value measured by the standard is used as the System Actual.

MEMC/MEMCX FSCs

The MEMC and MEMCX FSCs perform a numeric evaluation similar to an instrument FSC evaluation test. However, unlike an instrument FSC, MEMC and MEMCX cannot measure the UUT output or obtain the UUT reading via slew or keyboard entry mode. The UUT data must be obtained prior to execution of the MEMC statement. The MEMC and MEMCX FSCs are typically used in *closed-loop* tests and tests where the UUT units are not the same as the units of the applied standard. They are also used for to perform the evaluation when the reference is a user-configured instrument or manual standard.

Example, closed-loop test:

```
STEP  FSC    RANGE NOMINAL    TOLERANCE  MOD1    MOD2  3   4 CON
1.001 5700          10.0000V                                S 2W
1.002 IEEE          ?[I]
1.004 MEMCX 20      10.0000V   0.0005U
```

The action of each test step in the above example is detailed below:

1. **Setup** - The 5700A is programmed to output 10V DC and a value of 10 is stored in memory register MEM1.

2. **Setup** - The UUT reading is read via the IEEE-488 bus and stored in memory register MEM.

3. **Evaluation** - Uses the UUT Indicated, the System Actual, and the UUT specification in the Tolerance field to determine whether the test passed or failed.

Example, units of UUT parameter and applied parameter differ:

```
STEP  FSC    RANGE NOMINAL     TOLERANCE    MOD1    MOD2   3   4 CON

1.001 5700         2V                       60H                S 2W
# Get the 5700 accuracy at 2Vrms
1.002 MATH         M[1] = ACCV2("Fluke 5700A", "Volts", 2.0, 60.0)
# Convert to Vp
1.003 MATH         M[1] = M[1] * 2 * SQRT(2)
1.004 ACC          2.828Vp  M1U
1.005 IEEE         ?[I]
1.006 MEMCX 2.0  2.828Vp  0.045U
```

The action of each test step in the above example is detailed below:

1. **Setup** - The 5700A is programmed to output 2Vrms at 60Hz and store a value of 2 in memory register MEM1.

2. **Setup** - Retrieve the voltage accuracy of the 5700A at 2Vrms, 60Hz from the 5700A accuracy file.

3. **Setup** – Convert the accuracy in Vrms to Vp.

4. **Setup** – Establish the system accuracy in volts peak for the 5700A output. 2.828 is stored in memory register MEM1, overwriting the value of 2 stored there in Step 1.

5. **Setup** - Obtain the UUT reading and store it in memory register MEM.

6. **Evaluation** - Compare the UUT Indicated (MEM) to the System Actual (MEMCX Nominal Value) against the UUT specification in the Tolerance field.

Example, User-configured Measurement Instrument

```
STEP   FSC  RANGE NOMINAL   TOLERANCE   MOD1   MOD2  3  4 CON
1.001 IEEE        [@3458]DCV 10;ARANGE ON;TRIG HOLD
1.002 IEEE        OUT 10V;OPER;*OPC?[I!]
1.003 IEEE        [@3458]TRIG SGL[I]
1.004 ACC         V         2.6P% 2e-6U
1.005 MEMC 22     10.00V    0.01U
```

1. **Setup** – The User-configured DMM (in this case a 3458A) to DCV, autorange, and trigger hold.

2. **Setup** – The UUT is set to 10V DC and operate.

3. **Setup** – Obtain the reading from the User-configured DMM and store it in memory register MEM.

4. **Setup** – Establish the system accuracy as 2.6ppm of reading plus 2uV. The ACC statement takes the Nominal value from MEM when the ACC Nominal field does not contain a value. In this case MEM is the User-configured DMM reading from step 3.

5. **Evaluation** - Compare the UUT Indicated (MEMCX Nominal Value) to the System Actual (MEM) against the UUT specification in the Tolerance field.

DOSE FSC (Numeric Evaluation)

The DOSE FSC runs a user-provided program or batch file. The DOSE FSC behaves like a numeric evaluation when the user-written program or batch file appends the percent error for the test to ***dosdose.dat***.

For a complete description of this FSC, see **DOSE** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

Go-NoGo Evaluation

A Go-NoGo evaluation is performed by the following FSCs:

- An instrument FSC evaluation test where the standard is sourcing an output to the UUT and Go-NoGo mode is specified.

- The **EVAL** FSC.

- The **PICE** FSC.

- The **DOSE** FSC when the user-written program *does not* append the percent error for the test to *dosdose.dat*.

Instrument FSC Evaluation Test

Instrument FSCs are FSCs that refer directly to system standards for which MET/CAL provides a built in driver. An evaluation test is specified for an instrument FSC when the MOD4 field is blank. An Instrument FSC Evaluation Test uses the System Actual, the UUT Indicated value for the test, and the UUT specification in the Tolerance field to determine whether the test passed or failed.

Example, Go-NoGo Instrument Evaluation Test.

```
STEP   FSC   RANGE NOMINAL    TOLERANCE    MOD1    MOD2   3   4 CON
1.001 ASK+        G
1.002 5700 400    350.0mV    3.9U         60H                   2W
```

The above statement will use the Go-NoGo evaluation if the G-flag is set when the statement is executed or the B-flag is set and the operator *does not* choose *keyboard* or *slew* when the *Test Evaluation* dialog is displayed. The G-flag and B-flag are set using the ASK+ FSC. When Go-NoGo mode is used, no numeric data for the test is stored in the results.

For a complete description of enabling and disabling Go-NoGo mode, refer to **ASK+** and **ASK-** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

EVAL FSC

The EVAL FSC presents a message to the operator and typically waits for a YES or NO response. The operator's response determines the result of the test (PASS or FAIL). See *Test Evaluation Prompt* under *Run Time Prompts* later in this section.

Example

```
1.009  EVAL   Did the UUT display test pass?
```

For a complete description of this FSC, see **EVAL** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

PICE FSC

The PICE FSC displays a picture to the operator and waits for a YES or NO response. The operator's response determines the result of the test (PASS or FAIL). See *Pictorial Information Prompt* under *Run Time Prompts* later in this section.

For a complete description of this FSC, see **PICE** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

DOSE FSC (Go-NoGo Evaluation)

The DOSE FSC runs a user-provided program or batch file. The DOSE FSC behaves like a Go-NoGo evaluation when the user-written program or batch file appends *PASS* or *FAIL* for the test to dosdose.dat.

If neither PASS nor FAIL is appended, a pass condition is assumed.

For a complete description of this FSC, see **DOSE** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

Procedure Flow Control

When MET/CAL executes a procedure, it starts on the first line after the header and executes the lines in order until one of the following occur:

1. The end of the procedure is reached.

2. An **END** statement is executed.

3. A **JMP**, **JMPF**, **JMPT**, **JMPL**, or **JMPZ** statement transfers control to a different procedure statement.

4. A repeat statement (**RPT**) transfers control to Step 1 of the test.

5. A **CALL** statement transfers control to a subprocedure.

6. The operator alters the normal procedure execution sequence using the Post Test **List**, **Repeat**, **Cancel**, or **Terminate** options.

The **OPBR** (Operator Branch) FSC can be used with the JMPF, JMPT, or JMPL FSCs to perform a jump based on the operator's response to a Yes/No prompt. See *Test Decision Prompt* under *Run Time Prompts* later in this section.

For a complete description of these FSCs, see the FSC Reference chapter of the MET/CAL Reference Manual.

Run Time Prompts

Automatic Connection and Disconnection Message Prompts

Automatic connection and disconnection message prompts are generated by instrument FSCs and the CON (connection) FSC. Automatic connection messages generally have limited utility, because MET/CAL builds them with only the information contained in the CON (UUT connection) field of an instrument FSC. For example, the following statements would generate the subsequent automatic connection and disconnection messages:

```
1.001   5500    4    3.500V      0.034U      60H     SI      2W
2.001   5500         100.0mA     1.2U                        2W
```

■ Connect:	⊠
UUT to 5500A NORMAL Output Terminals	
Advance **T**erminate	
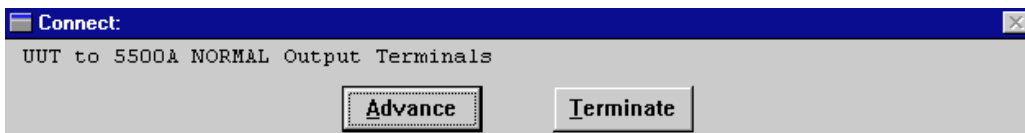
The automatic disconnection message prompt is displayed when the UUT connection changes. In this case, the 5500A NORMAL outputs are used for voltage, however, the AUX outputs are used for current.

■ Disconnect:	⊠
UUT to 5500A NORMAL Output Terminals	
Advance **T**erminate	
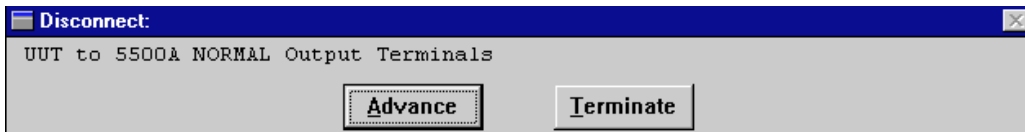
Statement 1.001 specifies an AC voltage with a 2-wire connection to the UUT. This is enough information for MET/CAL to determine that the 5500A NORMAL output terminals must be used. However, this is not enough information to determine exactly which UUT terminals must be connected to the 5500A NORMAL output terminals. Typically, a procedure writer inhibits automatic connection and disconnection messages using the ASK- FSC, and instead uses a more descriptive prompt using the DISP or PIC FSCs. See the headings titled, "Operator Information Prompt" and "Pictorial Information Prompt" later in this chapter.

Example:
```
1.003   DISP        Connect the 5500A to the UUT as follows:
1.003   DISP        5500A NORMAL Output Hi to UUT V-Ohm-Diode
1.003   DISP        5500A NORMAL Output Lo to UUT Common
```

For a complete description of enabling and disabling automatic connection and disconnection messages, refer to **ASK+** and **ASK-** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

Automatic Range Message Prompt

Automatic range message prompts are generated by instrument FSCs and the RNG
(range) FSCs. Automatic range messages are built by MET/CAL using the
information contained in the RANGE field of the instrument FSC and the
NOMINAL and MOD1 fields of the RNG FSC. For example, the following 5500
and RNG statements would generate the same automatic range message (shown
immediately after the fragment):

```
13.001  5500   4     3.500V      0.056U      1kH    SI    2W
2.001   RNG          4V                      AC
```

```
UUT Range                                                         ☒
Set UUT to the 4 V AC range.

                    Advance            Terminate
```
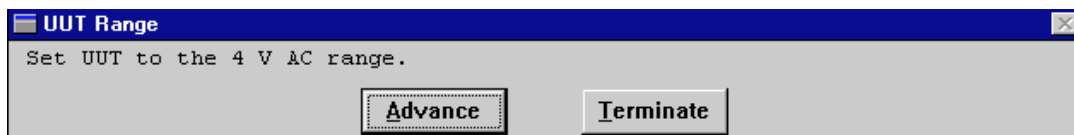
For more information on UUT range messages, see the following sections in the
MET/CAL Reference Manual:

- RANGE Field under "Instrument FSCs" in General Rules for FSCs

- UUT Range Message under "Automatic Messages", also in General Rules for
  FSCs

- **RNG** in the FSC Reference.

For a complete description of enabling and disabling automatic range messages
refer to **ASK+** and **ASK-** in the FSC Reference chapter of the *MET/CAL
Reference Manual*.

Automatic Test Setup Prompts

Automatic test setup prompts are generated by an instrument FSC evaluation test,
nominal setup test, or comparison test that is measuring an output of the UUT. For
example the following 34401 statement would generate the subsequent automatic
test setup prompts:

```
1.002  34401        1.00V                                      N   2W
```

```
Test Setup                                                         ☒
Set UUT to source 1 V.

Then set UUT to OPERATE.

                    Advance            Terminate
```

After the 34401A takes the measurement, the following automatic test setup prompt is generated:

```
Test Setup                                                              ☒
Set UUT to STANDBY.
                        Advance              Terminate
```

For a complete description of enabling and disabling automatic test setup prompts refer to **ASK+** and **ASK-** in the *MET/CAL Reference Manual*.

Automatic UUT Setup Prompt

An automatic UUT setup prompt is generated by an instrument FSC setup test that is monitoring an output of the UUT. For example the following 34401 statement would generate the following automatic UUT setup prompt:

```
1.002  34401        1.00V                                       S  2W
```

```
UUT Setup                                                               ☒
Adjust UUT for a reading of 1 V.
                        Advance            Terminate
```

For a complete description of enabling and disabling the automatic test setup prompt, refer to **ASK+** and **ASK-** in the FSC Reference chapter of the MET/CAL Reference Manual. For an explanation of how to create a message to annotate or replace the automatic UUT setup message, see **MESS** in the same chapter.

Slew Dialog

The slew dialog is a popup screen that is created by an instrument FSC evaluation test, nominal setup test, or comparison test when the calibration instrument is applying an output to the UUT. The slew dialog is the default mode for evaluation tests and comparison tests. The slew dialog is always displayed for nominal setup tests. When the slew dialog is displayed, it is used to perform one of the two functions enumerated below:

1.   Slewing the Calibrator Output

If the calibration instrument allows incremental changes of its output around the nominal value, then, as the operator changes the displayed value of the slew screen, the number shown reflects the actual calibrator output. The operator slews (adjusts) the display until the UUT is reading the nominal value as closely as possible. If the statement is an evaluation test or comparison test, MET/CAL can then calculate the deviation from the nominal required to make the UUT read the desired value and report the error of the UUT.

Example:

```
1.002  5700      1.00V          0.01U                          2W
```
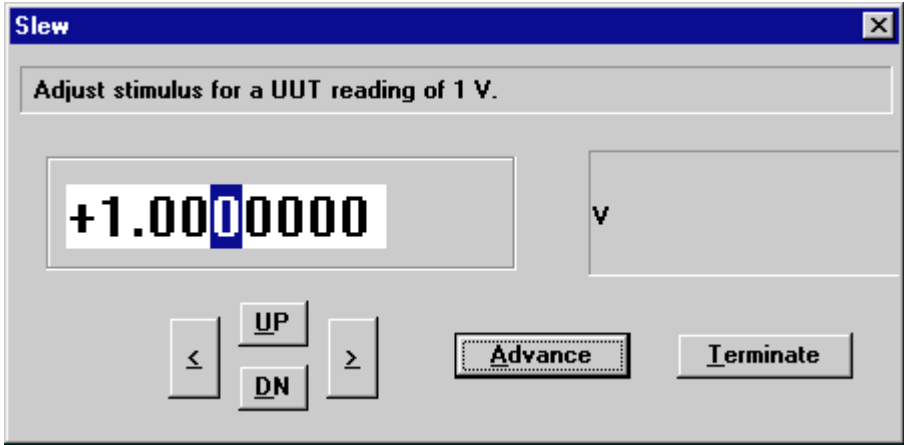

2. Matching the UUT Display

If the calibration instrument cannot incrementally change its value, like 5700A resistance, slew acts differently. The operator adjusts the displayed value in the slew screen to match the reading shown on the UUT's display. MET/CAL uses this information to calculate the UUT error.

Example:

```
1.002  5700      1.00kZ         0.01U                          4W
```
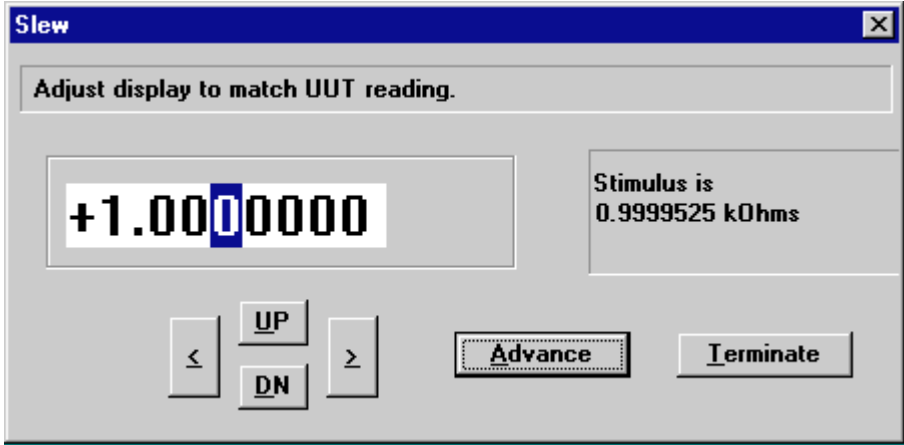

For more information on the slew dialog, see the following sections in the *MET/CAL Reference Manual*:

- Stimulus Function under "Evaluation Test"

- Stimulus Function under "Nominal Setup Test"

For information on configuring the slew message, see the following sections in the *MET/CAL Reference Manual*:

- Slew Message under "Automatic Messages" in General Rules for FSCs

- **MESS** in the FSC Reference.

Keyboard entry or Go-NoGo mode can be selected in lieu of slew mode using the appropriate ASK flags (see Keyboard Entry Operator Prompt and Test Evaluation Prompt in this section).

For a complete description of enabling and disabling slew mode refer to the **ASK+** and **ASK-** FSCs in the *MET/CAL Reference Manual*.

Keyboard Entry Operator Prompt

The keyboard entry operator prompt is a popup screen that is created by an instrument FSC evaluation test, nominal setup test, or comparison test to enter the UUT reading. The operator prompt is used when the keyboard entry evaluation mode is selected. The following is an example instrument evaluation test with keyboard entry mode selected:

```
1.002  ASK+         K
1.003  5700         1.00V            0.01U                      2W
```

The ASK+ K statement specifies keyboard entry mode for the 5700 evaluation test. This causes the following dialog to be displayed, prompting the operator for the UUT reading:
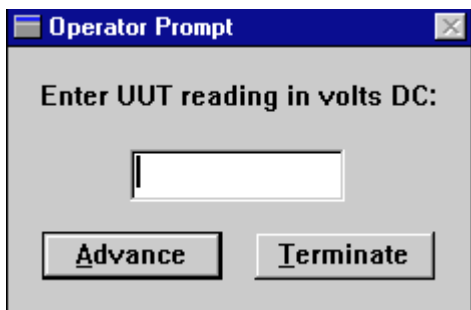
For more information about the Keyboard Entry Operator prompt, see *Instrument FSCs* in the chapter "General Rules for FSCs" of the *MET/CAL Reference Manual*.

Memory Register Operator Prompts

Memory register prompts are popup screens that prompt the operator to enter data for the MEM and MEM2 registers. The MEMI FSC is used to display a prompt for the value of MEM. The MEM2 FSC is used to display a prompt for the value of the MEM2 register.

The MEMI FSC can be used to prompt for the UUT reading, like the keyboard entry prompt does for instrument FSC. Specifically, the MEMI FSC must be used to obtain the UUT reading when its units are not the same as those of the standard. This situation is illustrated in the following procedure fragment:

```
1.001    5700    2V                          60H              S   2W
1.002    DISP    Press the MIN MAX button.
1.002    DISP    Press BEEPER button to display maximum values.
1.003    MATH    MEM = ACCV2("Fluke 5700A", "Volts", 2.0, 60.0)
1.004    MATH    M[1] = 2 * SQRT(2) * MEM
1.005    ACC     2.828Vp        M1U
1.006    MEMI    Enter UUT reading in volts peak:
1.007    MEMCX   2.828Vp        0.045U
```

Note that the UUT reading is in volts peak even though the setup of the standard is specified in volts RMS. If a 5700 evaluation test had been used instead of a 5700 setup test, the UUT reading would have been incorrectly entered in volts RMS. The following shows the MEMI prompt that would be generated by the above procedure fragment:
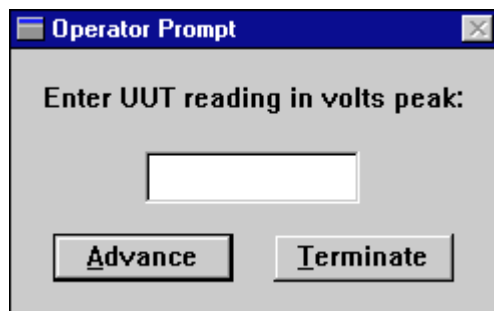
For a complete description of creating memory register prompts, see **MEMI** and **MEM2** in the FSC Reference chapter of the *MET/CAL Reference Manual*. Descriptions of the other FSCs used in the above example can also be found in the FSC Reference.

Test Decision Prompt

The test decision prompt is a popup screen that is created by the OPBR FSC. The test decision prompt is used for yes/no conditional prompts. The OPBR FSC does not perform an evaluation. The following example OPBR statements create the example dialog immediately following:

```
1.001  OPBR     Have any components been replaced?
1.001  OPBR     (Note: the hardware adjustments may be skipped
1.001  OPBR     unless the ScopeMeter test tool has been repaired.
1.001  OPBR     If adjustments S6, S7, S8 or S9 fail, also
1.001  OPBR     restart the MET/CAL procedure and perform H1..H4.)
1.002  JMPT     1.003
```


For a complete description of creating the test decision prompt, see **OPBR** in the
FSC Reference chapter of the *MET/CAL Reference Manual*. A Description of the
JMPT FSC can also be found in the FSC Reference.

Test Evaluation Prompt

The test evaluation prompt is a popup screen that is created by an instrument FSC
evaluation test or the EVAL FSC. In the case of an instrument FSC, the test
evaluation prompt is generated only when the Go-NoGo evaluation of the UUT
reading is selected. The following is an example instrument evaluation test with
Go-NoGo mode selected:

```
1.002  ASK+      G
1.003  5700      1.00V          0.01U                            2W
```

The ASK+ G statement specifies Go-NoGo mode for the 5700 evaluation Test.
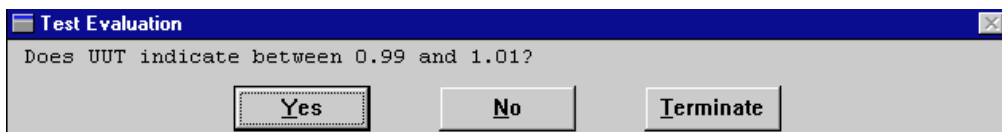
Following is another example instrument evaluation test with Go-NoGo mode
selected:

```
1.002  ASK+       B
1.003  5700       1.00V          0.01U                           2W
```

The ASK+ B statement also specifies Go-NoGo evaluation of the UUT reading,
but allows the operator to optionally select either keyboard entry or slew
evaluation mode.

```
┌─ Test Evaluation ──────────────────────────────────────────────── ☒ ┐
│ Does UUT indicate between 0.99 and 1.01?                             │
│   ┌─────────┐   ┌─────────┐   ┌──────────┐   ┌─────────┐   ┌────────────┐ │
│   │  Yes   │   │  No    │   │ Keyboard │   │  Slew  │   │ Terminate │ │
│   └─────────┘   └─────────┘   └──────────┘   └─────────┘   └────────────┘ │
└─────────────────────────────────────────────────────────────────────┘
```
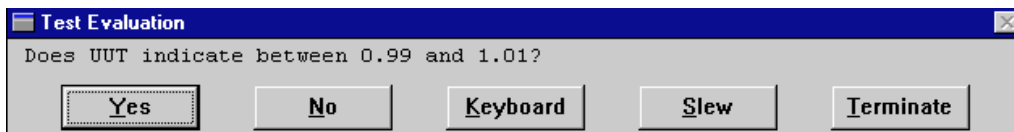
The EVAL FSC is used for Go-NoGo evaluations that cannot otherwise be performed using an instrument FSC Go-NoGo evaluation.

Example EVAL FSC:

```
1.002   DISP   Plug a test lead into the V Ohm Diode terminal,
1.002   DISP   and touch the probe to the 10A terminal.
1.003   EVAL   Does UUT indicate between 0.1 and 0.5?
```

```
┌─ Test Evaluation ──────────────────────────────────────────────── ☒ ┐
│ Does UUT indicate between 0.1 and 0.5?                              │
│        ┌─────────┐        ┌─────────┐        ┌─────────────┐        │
│        │  Yes   │        │  No    │        │ Terminate  │        │
│        └─────────┘        └─────────┘        └─────────────┘        │
└─────────────────────────────────────────────────────────────────────┘
```
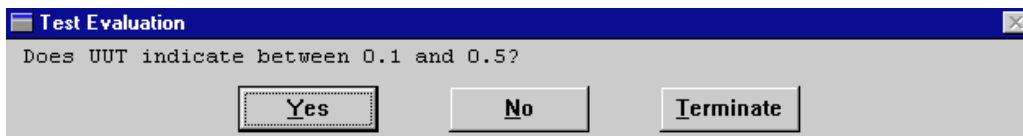
For more information about the test evaluation prompt, see *Instrument FSCs* in *General Rules for FSCs* and **EVAL** and **MESS** in the FSC Reference chapter of the *MET/CAL Reference Manual*. A Description of the DISP FSC can also be found in the FSC Reference.

Test Information Prompt

The test information prompt is a popup screen created by the DISP FSC. The test information prompt is used to present the operator with textual information that does not require a Yes or No response.

```
43.004   DISP   Press the MIN MAX button.
43.004   DISP   Press the BEEPER button to display maximum values.
```

```
┌─ Test Information ──────────────────────────────────────────────── ☒ ┐
│ Press the MIN MAX button.                                          │
│ Press the BEEPER button to display maximum values.                 │
│            ┌─────────┐           ┌─────────────┐                    │
│            │ Advance │           │ Terminate  │                    │
│            └─────────┘           └─────────────┘                    │
└─────────────────────────────────────────────────────────────────────┘
```
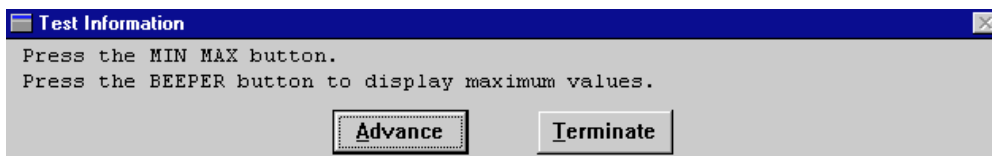
For a complete description of creating the test information prompt, see **DISP** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

Pictorial Information Prompt

The pictorial information prompt is a popup screen that contains a picture and is created by the PIC and PICE FSCs. Pictorial information is used instead of text. The pictorial-style prompt is normally only used in those cases when instructions to the operator would require a detailed description of a required calibration step that would be difficult to present in text-only form.

The PIC FSC is used for connections and setups, whereas the PICE FSC also performs a test evaluation.

Example PIC FSC:

```
2.003  PIC          55_s3_cw
```
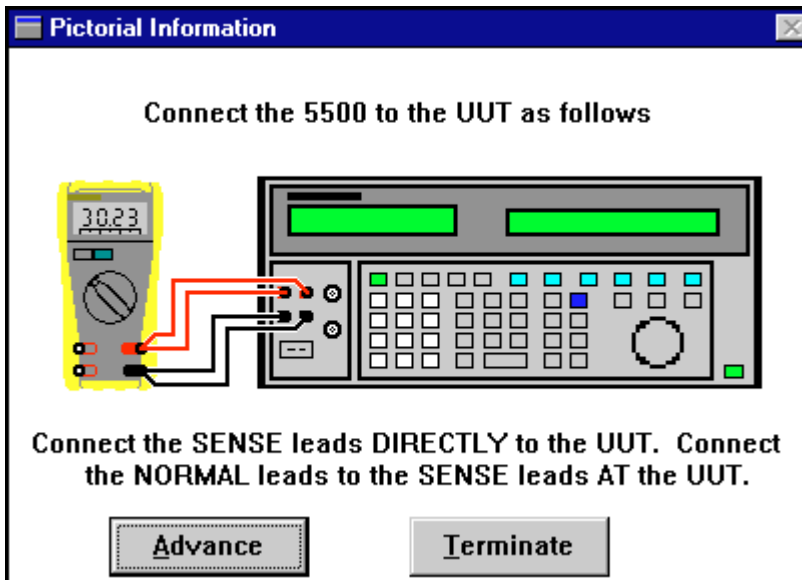

Example PICE FSC:

```
1.007  PICE         7x-3_dsp
```
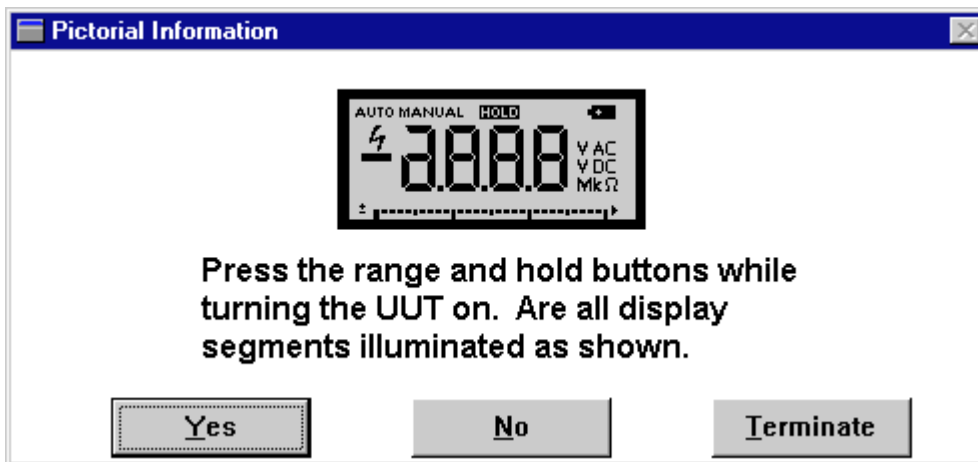

zv405s.bmp

For a complete description of creating the pictorial information prompt, see **PIC** and **PICE** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

UUT Setting Prompt

The UUT setting prompt is a popup screen that contains a list of UUT setups. The prompt is generated by the SET FSC and is typically used in procedures for oscilloscopes when a large number of setups is required, or the steps are unusually complex.

Example:

```
1.001  SET          VOLTS/DIV CH 1 : 1V
1.001  SET          VOLTS/DIV CH 2 : 1V
1.001  SET          TIME/DIV : 10us
1.001  SET          Input Coupling CH 1 : 1 MOhm GND
1.001  SET          Input Coupling CH 2 : 1 MOhm GND
1.001  SET          ADD : Off
1.001  SET          INVERT : Off
1.001  SET          ALT/CHOP : ALT
```
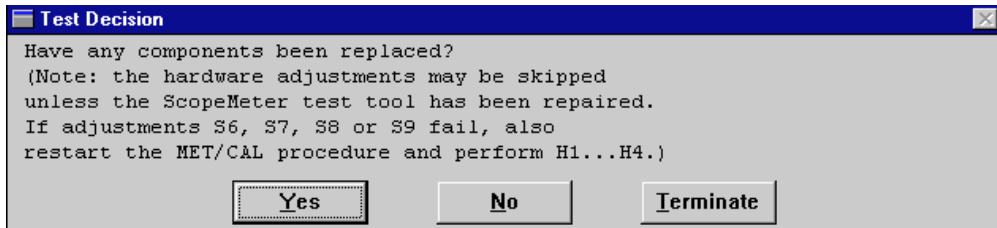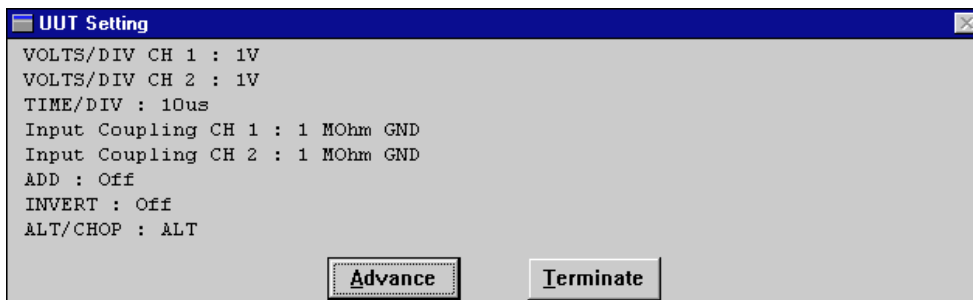

For a complete description of creating the UUT setting prompt, see **SET** in the FSC Reference chapter of the *MET/CAL Reference Manual*.

Post Test Module

When a MET/CAL procedure executes, a series of calibration tests is performed. As described earlier, each calibration test is made up of connection messages, setup steps, and an evaluation step. The evaluation step is always the last part of a test.

The Run Time application calls the Post Test module after each evaluation step. It also calls the Post Test Module after a system error, whether or not the error occurred in an evaluation step.

The Post Test module has three main functions:

1. It resets the system instruments.

2. It generates results for the test that has just completed.

3. It displays the Post Test dialog.

System Instrument Reset

Whenever the Post Test module is called, whether because an error occurred, or because an evaluation step has been completed, one of the first things it does is reset the system instruments that are in use.

A system instrument is in use if the main procedure that is being executed, or any subprocedure it has called or may call, contains a reference to that system instrument. A reference is a use of an FSC that invokes the built-in driver for that instrument. For example, the Fluke 5700A is used by procedures that contain "5700" FSC statements. The statement need not have been executed in order for the instrument to be "in use."

It is possible to inhibit the normal resetting of the system instruments. To do this, clear the ASK 'Q' flag. Certain other ASK flags must be also clear (not set) in order to inhibit resetting of system instruments. Refer to the Reference Manual sections on the **ASK+** and **ASK-** FSCs for details.

Post Test Dialog

This section describes the Post Test Dialog as shown in the following figure.
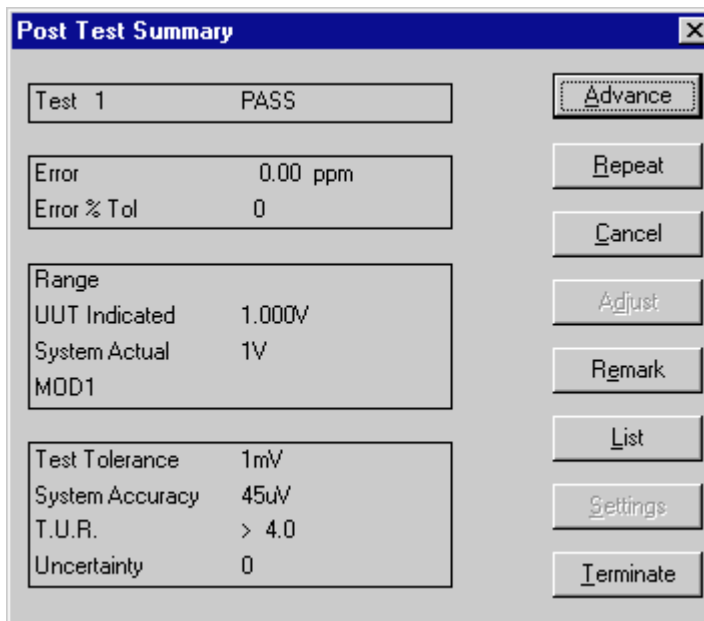
zv401s.tif

On the left-hand side, the Post-Test Summary dialog shows the following information:

Test Field

The test field shows the test number and the test result. The test number is the major step number of the test. For example, test number 7 might look like the following:

```
7.001 DISP  Connect...
7.002 5700  1V     1%
```

The test result is shown on the right-hand side of the Test field, and will be one of the following values:

- **PASS**

  A test result value of PASS indicates that the UUT is within the test tolerance at this test point, and is also within the adjustment threshold.

  The adjustment threshold is specified in the header of the main procedure being executed. The default value is 70%. If the error, expressed as a percentage of the tolerance, is less than the adjustment threshold the test result will be PASS.

- **MARGINAL PASS**
  MARGINAL PASS indicates that the UUT is within the test tolerance at this test point, but not within the adjustment threshold.

  At some sites, the standard policy is to run the calibration adjustment procedure for a UUT if the UUT passes the verification procedure, but one or more test points generate a MARGINAL PASS result.

- **FAIL**
  FAIL indicates that the UUT is not within the test tolerance at the current test point, but is within the "significantly out of tolerance limit." See the description of this limit in the FAIL NOTIFY USER section below.

  The [startup] section of the MET/CAL initialization file metcal.ini contains a parameter named *pass100* that allows the system to be configured with respect to whether or not a test is a PASS or a FAIL when the error is exactly equal to 100% of the test tolerance.

  If pass100 = *yes* in metcal.ini, then the test result is MARGINAL PASS if the error is exactly equal to the test tolerance.

  If pass100 = *no* in metcal.ini, then the test result is FAIL if the error is exactly equal to the test tolerance.

  The default value of *pass100* (as distributed) is *yes*.

- **FAIL NOTIFY USER**
  FAIL NOTIFY USER indicates that the UUT is not within the test tolerance at the current test point, and also not within the "significantly out of tolerance limit."

  This limit is specified using the *oot_lim* parameter in the [startup] section of the MET/CAL initialization file metcal.ini. Legal values for the *oot_lim* parameter are between 99.9 and 500.0.

  The purpose of the *oot_lim* (out of tolerance limit) parameter is to allow a site to specify a limit above which a failing UUT is considered to be significantly out of tolerance, potentially requiring the recall of instruments recently calibrated or adjusted using the UUT in question.

  The default value of *oot_lim* (as MET/CAL is distributed) is 100.0. This is a conservative setting, indicating that any UUT that fails at any test point will generate the FAIL NOTIFY USER test result.

Error Field

The error is calculated as:

error = UUT Indicated – System Actual

If the NOMINAL units are dBm, the Nominal value is zero, the UUT Indicated value is zero, or the System Actual value is zero, the error is formatted as an absolute number.

Otherwise, the error is formatted as a percentage of either the UUT Indicated or the NOMINAL value, depending on the value of the *tol_ref_nominal* parameter in the MET/CAL initialization file.

For a Go/NoGo test the Error field is blank.

Error % Tol Field
For a numeric evaluation, this field shows the error expressed as a percentage of the test tolerance.

For a Go/NoGo evaluation the *Error % Tol* field is blank. This applies to instrument evaluations with ASK+ 'G' set, to EVAL statements, PICE statements, and to some DOSE statements.

Range Field
The Range field shows the UUT range, as indicated in the RANGE field of the procedure statement just executed. The Range field shows "A" to indicate auto-range.

UUT Indicated Field
The UUT Indicated field shows the UUT Indicated value for the test. For a test in which the calibration standard is a stimulus device (like a Fluke 5700A), and the UUT is a measurement device (such as a Fluke 77), the UUT Indicated value is the reading taken by the UUT. If the test is a Go/NoGo test, the UUT Indicated field is blank on the Post Test dialog.

For a test in which the calibration standard is a measurement device (such as an HP 3458A), and the UUT is a stimulus device, the UUT Indicated value is the expected reading, as indicated in the NOMINAL field of the procedure statement that performed the evaluation step.

System Actual Field
The System Actual field shows the System Actual value for the test.

If the UUT is a measurement device, the System Actual is the true value applied to the UUT by the calibrator being used as a calibration standard.

If the UUT is a stimulus device, the System Actual is the measurement taken by the measurement device being used as the calibration standard.

MOD1 Field

The Post Test MOD1 field shows the information in the MOD1 field of the procedure evaluation step just executed. If you execute an evaluation step such as the following:

```
STEP NOMINAL MOD1 TOLERANCE
5700 10kH    1V    1%
```

the evaluation is based on frequency (NOMINAL field), so you will see that MOD1 shows the voltage (1V in this example).

Test Tolerance Field

The Test Tolerance field shows the test tolerance in units of the NOMINAL field.

For example, suppose you execute the procedure evaluation step:

```
5700 100V         1%
```

The test tolerance displayed in the Post Test dialog will be 1V, because 1V is 1% of 100V.

System Accuracy Field

The System Accuracy field shows the accuracy of the system instrument (calibration standard) used for the test.

For example, suppose you execute the following procedure evaluation step:

```
5700 200V          1%
```

If the 90-day accuracy file for the 5700A is used, the system accuracy will be shown as 1.3mV.

This is because in the accuracy file, for the 220V range, the tolerance is given as 6e-4 and the floor is 100e-6V. Note that the tolerance value in the accuracy file is a percentage.

The calculation is therefore:

*system accuracy = 6e-4 * .01 * 200V + 100e-6V*

... which is equal to 1.3mV, as shown in the Post Test dialog.

If the test in the procedure is a MEMC test in which the system accuracy is specified using an **ACC** statement, MET/CAL uses the value from the ACC statement and does not look up the system accuracy in one of the FSC-specific system accuracy files.

T.U.R. Field

The T.U.R. field shows the test uncertainty ratio for the test.

The test uncertainty ratio is the ratio of the test tolerance to the system accuracy.

If the test tolerance or the system accuracy are specified in decibels (dBm), the quantity is converted to volts before it is used to calculate the T.U.R.

If the T.U.R. exceeds the T.U.R. limit specified in the MET/CAL initialization file, the Post Test dialog does not show the T.U.R. Rather, the dialog indicates that that the T.U.R. is greater than the limit, and shows the limit.

The T.U.R. limit is specified by the *tur_lim* parameter in the [startup] section of the MET/CAL initialization file, `metcal.ini`. The default value for the limit is 4.0. Any value between 0 and 10 can be specified. It is also legal to set *tur_lim* to *none*, which disables the calculation of the T.U.R. by the Run Time and Editor applications. If *tur_lim* is *none,* the Post Test dialog does not show values in the Test Tolerance, System Accuracy, or T.U.R. fields.

Post Test Summary Dialog Buttons

On the right-hand side of the Post-Test Summary dialog are 8 buttons. These have the following functions:

Advance
Choosing **Advance** causes procedure execution to resume at the next step.

Repeat
The basic function of **Repeat** is to repeat the current step. The precise operation of Repeat depends on the current setting of the ASK 'P' flag in the procedure.

If the 'P' flag is set, the procedure is re-started at the current procedure line when the operator selects the Post Test Repeat option.

If the 'P' flag is *not* set, the procedure is re-started at the first statement of the current test. The step number of the first statement of the test has the form XX.001.

Note that when a test is repeated more than once (that is, executed more than twice), MET/CAL saves only the first and last results for that test step.

Cancel
Selecting **Cancel** is the same as Repeat (see above) except that when the operator chooses Cancel, the result of the canceled test is not saved.

As with Repeat, the procedure step on which execution resumes is controlled by the current setting of the ASK 'P' flag.

The Post Test Cancel button can be disabled (grayed out) by not setting the ASK 'X' flag in the procedure.

A parameter *ask_x_default* in the [startup] section of the MET/CAL initialization file `metcal.ini` controls the default state of the ASK 'X' flag.

- If *ask_x_default* is set to *yes* (or +), then the ASK 'X' flag will be set by default in a procedure that does not specify otherwise. This means that the Post Test Cancel button is enabled by default.

- If *ask_x_default* is set to *no* (or –), then the ASK 'X' flag will not be set by default in a procedure that does not specify otherwise. This means that the Post Test Cancel button is disabled by default.

  As distributed, *ask_x_default* is set to *yes* in `metcal.ini`.

Adjust
The **Adjust** button is enabled only if the error for the test just completed exceeds the adjustment threshold, and the procedure being executed contains an adjustment block for the current test step, and the ASK 'J' flag is set.

There is some interaction between the ASK 'J', 'A', and 'F' flags. Refer to the description of the "ASK+" and "ASK-" FSCs in the MET/CAL *Reference Manual* for details.

Procedures distributed by Fluke do not make use of in-line adjustment blocks. Separate verification and adjustment procedures are provided. When these procedures are used, the Adjust button will never be enabled.

Remark
Choosing **Remark** allows a remark of up to 32-characters to be entered. The entered remark is written to the results. Multiple remarks can be entered for one test step.

List
Choosing **List** causes a read-only listing of the current procedure to be displayed. When the listing is displayed, the current line (that is, the line just executed) is highlighted.

The highlighted line can be changed using the Up Arrow, Down Arrow, Page Up, and Page Down keys, or by using the mouse to click on the desired line.

Note that when the Run Time first displays the listing, the input focus is on the Advance button. The Up Arrow, Down Arrow, Page Up, and Page Down keys will not work as expected until the focus has been moved to the list box that shows the procedure. This can be done using the Tab key, or by clicking on the list box.

The Procedure Listing window includes Advance and Terminate buttons. These are not the same as the Advance and Terminate buttons in the Post-Test Summary dialog. Choosing **Advance** in the Procedure Listing causes procedure execution to resume by executing the highlighted line.

It is important to realize that if you choose the Post Test **List** button, and then immediately choose **Advance** in the Procedure Listing window, you will re-execute the step that just completed. If you really just wanted to look at the procedure, and would like to resume execution as if you hadn't chosen List at all, you can choose **Terminate** in the Procedure Listing window, followed by **Advance** in the Post-Test Summary dialog, or you can move the highlighted line down one line in the Procedure Listing window, and then choose **Advance** there.

The ASK 'L' flag can be used to enable or disable the List option in the Post-Test Summary dialog.

Settings
Choosing the **Settings** button causes the Run Time to display the last 18 settings created by the **SET** FSC. This allows the operator to verify that the UUT is set up correctly for the current test. This capability is used primarily in conjunction with calibration oscilloscopes. Refer to the SET FSC section in the *MET/CAL Reference Manua*l for details.

The Settings button is disabled unless one or more stored settings are available to be viewed.

Terminate
Choosing **Terminate** stops the execution of the procedure. Results generated before the procedure is terminated are not discarded, unless the operator subsequently chooses to discard them.

The Terminate button can be enabled or disabled by setting or clearing, respectively, the ASK 'T' flag. By disabling the Terminate and List options, a procedure writer can write a procedure that, barring errors, forces the operator to execute all of the tests in the procedure. Such a procedure should be carefully tested, however, because it can be difficult to terminate.

Test Results Window

As mentioned in the Run Time outline at the beginning of this chapter, the Test Results window is a separate window that shows a one-line, color-coded result for each test step in the Calibration Procedure.

The Test Result window initially appears in minimized form. It can be opened, moved, re-sized, or minimized at any time during procedure execution.

The contents of the Test Results window are not cleared until a subsequent Calibration Procedure is started. That is, after you finish a Calibration Procedure and return to the top-level Run Time menu, you can still look at the results of the procedure in the Test Results window. However, as soon as you start another procedure, or start to re-execute the same procedure, the Test Results window is cleared.

The lines in the Test Results window are color coded as follows:

- GREEN   indicates the test result is PASS.
- YELLOW   indicates the test result is MARGINAL PASS.
- RED   indicates the test result is FAIL.

A **PASS** is a test in which the error, expressed as a percentage of the test tolerance, is less than or equal to the adjustment threshold.

A **MARGINAL PASS** is normally a test where the error, expressed as a percentage of the tolerance, is greater than the adjustment threshold, and less than or equal to 100%. The adjustment threshold is set in the header of the main procedure and is, by default, 70%.

A **FAIL** is normally a test in which the error, expressed as a percentage of the test tolerance, is greater than 100%.

The reason the above descriptions of MARGINAL PASS and FAIL say "normally" is that MET/CAL is configurable with respect to whether a test at exactly 100% of tolerance is considered a MARGINAL PASS or a FAIL.

If the parameter *pass100* in the [startup] section of the MET/CAL initialization file metcal.ini is set to *yes*, then exactly 100% of tolerance is regarded as a MARGINAL PASS, and the error must be strictly greater than 100% in order for the test to be a FAIL. If pass100 is set to *no*, then exactly 100% of tolerance is a FAIL, and the error must be strictly less than 100% in order for the test to be considered a PASS or MARGINAL PASS.

However, note that there may be cases when the value displayed in the %Tol field does not appear to agree with the PASS/FAIL result of the test. This happens when the actual error, expressed as a percentage of the tolerance, is rounded up or down and displayed as 100%. For example, if the error as a percentage of the tolerance is 99.9999%, it will be displayed as 100%, but the test will be a PASS (actually a MARGINAL PASS), even if pass100 is set to *no*. This consideration is not specific to the Test Results window. It also applies to the Post Test dialog (discussed elsewhere in this chapter), and to the formatted results that MET/CAL writes to the database.

If the operator terminates a test manually, the Test Results window displays a one-line message in red indicating that the statement was terminated by the operator.

The Test Result window can display a maximum of about 900 result lines from a single procedure run. If this limit is exceeded, the display functions as a first-in/first-out queue, always showing approximately the last 900 result lines.

The content and format of the lines displayed in the Test Results window are fixed and cannot be customized by the user.

For a normal instrument evaluation test, the Test Results window shows:

No.........................test step number

Range...................UUT range (if specified)

UUT Indicated....value indicated by UUT for test

System Actual.....actual stimulus or measured value for test

C...........................Y if System Actual correct using a correction file, otherwise N

Modifier..............MOD1 value from test, if any, -- often shows frequency

Error ....absolute error (UUT Indicated - System Actual)

%Tol ....error as a percentage of test tolerance

For evaluation steps based on EVAL, PICE, DOSE statements, or instrument Go/No Go evaluation steps, some of the information is not available, and the field will be blank in the Test Results window.

For example, in a Go / No Go test the operator is simply asked if the UUT Indicated value is between a specified set of bounds. The answer is Yes or No, and does not indicate a numerical error. Because of this you will see OPER-EVAL in the UUT Indicated column of the Test Results window, and the Error and %Tol fields will be blank.

Safety Window

The safety window is an always-on-top popup display that the Run Time creates whenever a potentially dangerous voltage is being generated during procedure execution by one of the configured system instruments the procedure is using.

The word **Danger** is shown in the window title, and the standard lightning bolt danger symbol ⚡ is shown below the title.

The safety window does not appear when a dangerous voltage is generated by a user-configured instrument, or by any instrument being controlled by the IEEE or PORT FSCs.

A dangerous voltage is any DC voltage greater than 60V, or any AC voltage greater than 42.4V (peak).

Operators are cautioned not to rely only on MET/CAL's safety window as an indication of a dangerous voltage. There are two reasons for this:

• First, instruments not under control by a built-in MET/CAL instrument driver do not cause the safety window to appear when a dangerous voltage is present.

• Second, it is possible to manually override the setting of a calibrator so that it is generating an unsafe voltage without the Run Time's knowledge.

Always verify that instruments are in standby before touching the output terminals.
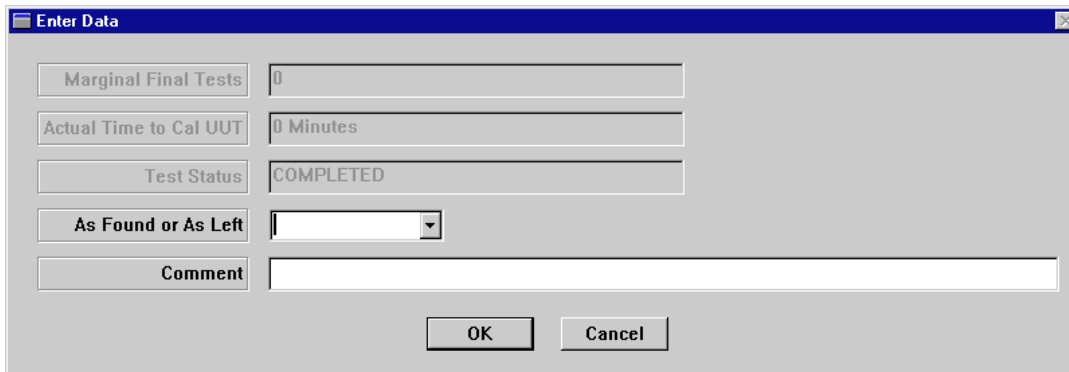
The Run Time application attempts to disable the operation of screen savers during procedure execution in order to prevent the safety window from being covered up by the screen saver display. However, some screen savers do not conform to the guidelines for screen savers, so it can happen that the safety window will be covered up by a screen saver.

Users are advised to disable screen savers when using the MET/CAL Run Time application to calibrate instruments.

Post Prompt Dialog

When a calibration is complete or the procedure is terminated, the Run Time displays the Post Prompt Dialog.

You can use the Post Prompt dialog to add administrative information necessary for the results. After adding the information, click **OK**. The following figure indicates typical information you can add to the results. Information entered on the Post Prompt Dialog can be included in the final calibration report.

zv403s.bmp

Figure 4-3. Sample Post Prompt Dialog

Note

The fields in the form may or may not be filled automatically, depending on how you have configured the PASS_DB.TXT and FAIL_DB.TXT files.

Post Run Results

After you close the Post Prompt dialog, the Run Time displays the Post Run Results dialog, as shown in the following figure.

Note

The following section describes all possible items in the Post Run Results dialog. However, using the Fluke Metrology Software Configure menu under the Run Time application, you can configure the dialog to exclude use of some of the items or to inhibit the dialog box from opening. Also, you can customize which reports are available.
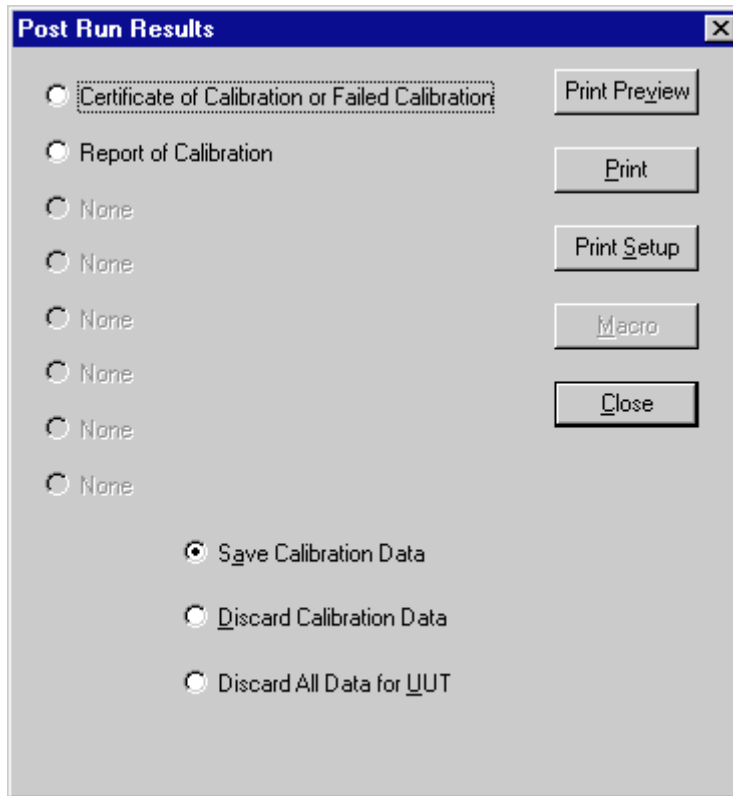
zv402s.tif

Figure 4-4. Post Run Results Dialog

Post Run Reports

The dialog can be configured to permit selection of up to eight different reports. The configuration of the software as shipped has three of the possible eight reports already selected. These reports are as follows:

- **Certificate of Calibration #1**: a calibration certificate that lists the standards used to calibrate the UUT, the environmental conditions during calibration, who signed it, and when they signed it.

- **Calibration Results Report #1:** a test results report with detailed test results for each step.

- **Calibration Summary Report #1**: a summary report that summarizes the full results report.

Print Preview

> With one of the choices selected, click **Print Preview** to view the certificate or report without actually printing it. Use this selection to identify the report you want and to verify the information it contains.

Print

> The Print selection allows you to print calibration results, summaries, and certificates. To print, proceed as follows:

> 1. Select one of the reports.

>   Click **Print**. The print dialog box opens. If the settings are not correct, make the desired changes in the settings.

> 2. Click **OK** when you are satisfied with the settings (otherwise **Cancel**).

>   The Run Time sends the certificate or report to the printer and returns you to the Post Run Results dialog.

Print Setup

> Use Print Setup to select the printer, printing orientation, and other options.

Macro

> Macros provide an automated method of storing a series of actions for later replay. This lets you minimize the number of selections you make after each Calibration Procedure. You need to select only the **Macro** button on the Post Run Results dialog to execute all of the actions previously set up in the Run Time application. (**Configure** | **PostRun Macro** selection).

> For example, you can use the Run Time to set up the macro to preview or print several types of reports automatically. Clicking **Macro** initiates the action.

Calibration Data on Close

> You have several options for how you choose to handle calibration data when you close the application. The options are represented the following buttons:

> **Save Calibration Data**
> Test results are saved in the database when you close the dialog box.

> **Discard Calibration Data**
> Test results are not saved in the database when you close the dialog box.

Discard All Data for UUT
Test results are not saved in the database when you close the dialog box. In addition, all date for the asset (UUT) is discarded from the database when you close the dialog box. This option will fail if the asset in question has prior calibration history in the database. If this is the case, an error message is generated and the user must select one of the other two choices.

These buttons are mutually exclusive and the resulting action is permanent. The **Configure PostRun** menu in the Run Time application allows you to control availability of these options by selectively enabling or disabling them.

Contents   Page

Note

Fluke Metrology Software is supplied with a series of Sample Reports that support the general usage philosophy of the product. It is impossible for Fluke to provide reports that will satisfy every situation. Therefore, the sample reports are provided as examples that you can modify as your requirements dictate. If these reports are used unmodified, as supplied by Fluke, it is your responsibility to verify that they provide the output that your circumstances require. They were created and can be modified with Crystal Reports Professional, which is supplied with the base software package.

Introduction

A fundamental reason for collecting information in a database is so you can retrieve it later and view trends and patterns within the data. Fluke MET/BASE applications give you a number of ways to see your data, from viewing it on the display to printing out multi-page reports.

Fluke Metrology Software comes with several calibration reports. These reports are designed to satisfy the needs of a typical calibration laboratory. You can easily accomplish minor changes by editing one of the supplied reports.

This chapter introduces the report process, and then demonstrates how to modify one of the supplied reports. Later sections show how to create a new report from scratch.

Types of Reports

MET/BASE uses reports that are written using Crystal Reports. You can run reports using stored procedures (explained later) or access data tables directly. Once you've written a report, it is installed into the system. This allows users to select them from a list and execute them. The way you install reports determines how they can be used in MET/BASE.

General Reports   Many reports fit into this category. The supplied reports that print database customization and calibration recall lists are examples of general reports. General reports typically provide information about more than one asset or history record (i.e. the recall report). They may or may not have user prompts. If general reports have user prompts, then Crystal Report prompt should be used. You can run General reports from the MET/TRACK Application or from Crystal Reports.

Run Time Reports   Run Time or Calibration reports are designed to print results of a specific calibration event. You can run them at any time from the MET/TRACK or the Run Time Applications. Run Time reports are written around a CTAG value. In the MET/TRACK application, the system will automatically prompt the user for the asset number, then for a calibration event. From this information, a specific CTAG value can be passed to the report. These reports show up in the run report window along with other reports. However, on the calibration screen, selecting Print will bring up a list of only Run Time reports. In the Run Time, since you just completed a calibration, the specific CTAG is known. Run Time reports typically are written to report off the stored procedure MCCALRESULT or MCCALRESLOC.

Location Reports   Location reports are designed to print information about a specific location event. You can run these reports at any time from the MET/TRACK application. These reports are written around a specific LTAG value. In the MET/TRACK application, the system will prompt the user for the asset number, then for a location event. From this information, a specific LTAG value can be passed to the report. These reports show up in the Run Report dialog, along with other reports. However, on the location screen, selecting Print will bring up a list of only location reports. Location reports are typically written to report off the stored procedure MCLTAG or MCLTAGINVENTORY. In addition, any report may be added as a Location Report.

Maintenance Reports   Maintenance reports are designed to print information about a specific maintenance event. You can run these reports at any time from the MET/TRACK application. These reports are written around a specific RTAG value. In the MET/TRACK tool, the system will automatically prompt the user for the asset number, and then for a Maintenance event. From this information a specific RTAG value can be passed to the report. These reports show up in the "run report" window along with other reports. However, on the location screen, selecting print will bring up a list of only Maintenance reports. Location reports are typically written to report off of the stored procedure MCRTAG or MCRTAGINVENTORY.

In addition, any report may be added as a Maintenance Report.

Inventory Reports Inventory reports are designed to print information about a specific Inventory item. You can run these reports at any time from the MET/TRACK application. These reports are written around a specific MTAG value. In the MET/TRACK tool, the system will automatically prompt the user for the asset number. From this information a specific MTAG value can be passed to the report. These reports show up in the "run report" window along with other reports. However, on the Inventory screen, selecting print will bring up a list of only Inventory reports. Inventory reports are typically written to report off of the stored procedure MCMTAG or MCMTAGINVENTORY. In addition, any report may be added as an Inventory Report.

Customer Reports Customer reports are designed to print information about a specific Customer. You can run these reports at any time from the MET/TRACK application. These reports are written around a specific KTAG value. In the MET/TRACK tool, the system will automatically prompt the user for customer ID. From this information a specific KTAG value can be passed to the report. These reports show up in the "run report" window along with other reports. However, on the Customer screen, selecting print will bring up a list of only customer reports. Customer reports are typically written to report off of the stored procedure MCKTAG or MCKTAGINVENTORY.

In addition, any report may be added as a Customer Report.

All report types use the standard RPT extension.

Elements of a Report

Every report must contain the following elements:

- The *source location* of the desired information. Specify the location by naming the data source, the table of interest, and the field name. In the Fluke Metrology system, field names are actually their field numbers, with a single alphabetic prefix identifying the table. For example, the Inventory table stores the Asset Number in field 4201, so this field is identified by I4201.

- *Selection criteria - Crystal Reports* lets you specify selection criteria using the Select Records Expert. It is not necessary to know SQL (Structured Query Language), but it is possible to edit SQL commands directly for record selection in complex situations. If you use *Crystal*, you have all the power of that language for specifying the precise information you want included in the report. If you are reporting using a stored procedure, no selection criteria are necessary as it is embedded in the stored procedure.

- The *appearance* of the report. Again, *Crystal* has a friendly interface that lets you produce practically any appearance, from the very formal look of a Certificate of Calibration, complete with corporate logo and detailed laboratory specifications, through informal lists for your own use.

Running Reports

Once you have defined a report, you can preview and print it from within *Crystal*. You can also include the new report in the system and start running the report from the MET/TRACK Application.

Adding a Crystal Report to the System

The Fluke Metrology software provides a way to run reports directly from the MET/TRACK application. You must use reports created with *Crystal Reports* Professional.

1. Copy the report file to your shared MET/CAL directory, and log in as the MT level user. This will open the Administrator Mode.

2. Select **Setup, Install Reports** and the report selection screen appears.

Report Name	Size	Date
☐ Calibration Test Report.rpt	248,649	4 Dec 2001
☐ Calibration workload history crosstab.rpt	39,681	8 Jan 2002
☑ Cals due by week.rpt	35,572	15 Aug 2001
☐ caltest.rpt	248,223	13 Mar 2002
☐ Certcal.rpt	65,669	26 Feb 2002
☐ chckcust.rpt	95,770	11 Jul 2001
☐ company.rpt	13,312	27 Sep 2001
☐ DTSUBLNK.RPT	33,280	18 Sep 1997
☐ failed_cals.rpt	62,976	14 Feb 2002
☐ Failedcal.rpt	47,926	26 Jul 2001
☐ Formulas.rpt	361,984	8 Jun 2001
☐ Group By Intervals.rpt	320,512	26 Nov 1999
☐ label7.rpt	27,915	21 Sep 2001

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3. All available **.RPT** files in the will appear for selection. Click the check box of the report you wish to add and click the + button. You will be prompted for a title of your report.

4. Once the report has been installed it must be configured. To configure a report, click **SETUP**, **CONFIGURE REPORTS**.

5. Select the report you wish to configure and select where you would like your report to run. If you choose Reports, the report will be available in the Run Report section of MET/TRACK. If you choose Run Time, the report will be available at the end of the Run Time application. If you want to run from any of the forms, select each one for which you would like to have the report available. You may select one or more of the check boxes.

Description	Comments	Author	Prompts	filename	Reports	Run Time	Inv	Cal	Loc	Maint	Cust
rtktag1.rpt			Y	rtktag1.rpt	☑	☐	☐	☐	☐	☐	☐
Calibration Label 7	Cal Sticker using stored procedure		Y	label7.rpt	☑	☑	☐	☑	☐	☐	☐
rtmtag1.rpt			Y	rtmtag1.rpt	☑	☐	☐	☐	☐	☐	☐
rtrtag1.rpt			Y	rtrtag1.rpt	☑	☐	☐	☐	☐	☐	☐
rtrtag2.rpt	Report written using stored Procedure		Y	rtrtag2.rpt	☑	☐	☐	☐	☐	☐	☐
MET/BASE Table Definitions	This report was used to produce text	R. McKelvy	N	tbldefs.rpt	☑	☐	☐	☐	☐	☐	☐
Forward and Reverse Traceability Report			N	trace.rpt	☑	☐	☐	☐	☐	☐	☐
Field Properties	What you need to know about a data	Steve Griffin	N	V7 - Field Properties.rpt	☑	☐	☐	☐	☐	☐	☐
V7.0 Customizing		S Griffin	N	V7.0 Customizing.rpt	☑	☐	☐	☐	☐	☐	☐
# Cals per DOW.rpt			Y	# Cals per DOW.rpt	☑	☐	☐	☐	☐	☐	☐
12 Month Cal Projection.rpt			N	12 Month Cal Projection.rpt	☑	☐	☐	☐	☐	☐	☐
12 Month Workload Projection.rpt			N	12 Month Workload Projection.rpt	☑	☐	☐	☐	☐	☐	☐
Manufacturer Asset Count	Displays ther number of asset from ea	Steve Griffin	Y	Asset Count by Manufacturer.rpt	☑	☐	☐	☐	☐	☐	☐
Asset Number Change.rpt			N	Asset Number Change.rpt	☑	☐	☐	☐	☐	☐	☐

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Report Creation Strategies

To create your own customized reports, you can use a number of different approaches. *Crystal Reports* is a very capable report writing program, and it is the program that was used for developing the reports supplied with the Fluke Metrology software.

Using and Modifying Sample Reports

- The simplest strategy for generating a report is to use one of the supplied reports without modification. For the most part, these samples will cover the needs you most frequently encounter.

- The next way to approach the process is to modify an existing report. Starting with a fully developed report can significantly reduce the time you need to spend to get the reports you need. With only minor modifications, you can quickly personalize one of the supplied sample reports.

Note

Even if you eventually decide to create a report that is not based on a supplied report, you should spend a little time in modifying one of the supplied reports to familiarize yourself with Crystal Reports, and to investigate the features of the sample reports. This is especially critical if you have little prior experience with report writing.

Creating Reports from Scratch

- The next developmental level is to create a report from scratch, making use of one of the "stored procedures." In this method, you use pre-defined database requests that are stored in the database itself. As part of the Metrology Software package, Fluke provides stored procedures that you can use to quickly develop custom reports. A list of these stored procedures and information about using them appears later in this chapter.

- Finally, you can create an entirely new report by accessing the database tables directly. Creating a report from the base tables requires you to be knowledgeable about the underlying database structure and may require further study. This may be the best option if you have complex reporting requirements, as long as you are aware that this approach requires more fundamental understanding of the database and may require more effort, depending on your experience level.

Other Sources of Information

One critical element in your report creation strategy ought to be to familiarize yourself with the available sample reports and the report creation process. Besides this manual, other sources for more information include the *Crystal Reports* and *Sybase* manuals, both printed and online.

Before you spend too much time creating your first report, you should take a few moments to become familiar with the process by reading the remainder of this chapter, and then look through the other documentation to gain an idea of the process and capabilities available.

What is in the Rest of This Chapter?

The remainder of this chapter discusses how to modify one of the supplied reports. It ends with some background information you will need if you must create a report entirely from scratch.

Modifying Sample Reports

The reports that most users create are based on the reports that have been provided as part of the base package. Often, you can use these reports just as they come or with only slight changes. In either case, the supplied reports can serve as valuable templates and examples. Creating a new report is fairly simple if you base it on one of the provided reports.

After you identify the changes you wish to make to a supplied report, open a copy of it in *Crystal* to modify it as needed. *Crystal Reports* provides a <u>Design</u> mode and a <u>Preview</u> mode. This allows you to check the affects of any changes without needing to run the report from one of the Fluke Metrology applications.

The remainder of this section is a tutorial exercise that guides you through the steps for modifying one of the reports that has been supplied with the Fluke Metrology software.

The tutorial exercise addresses the major issues faced by users when they want to modify one of the supplied reports:

* Selecting an existing report and opening it in *Crystal*'s Design Mode.

* Adding a database table.

* Adding a text object to print out boilerplate material, such as a legal declaration.

* Creating the report data select criteria.

* Generating a formula field to mark specific data in the report.

Modifying the Basic Inventory Report

1. Make sure that the database engine is running. Then, start up *Crystal Reports*. The first time you start up *Crystal*, it displays an opening screen called the Welcome Dialog. This screen provides you the option to create a new blank report, open an existing one, or use the report expert.

   At the bottom of the Welcome Dialog, a selection lets you decide whether to continue to start *Crystal* with this dialog or go immediately to the menus. If you turn this option OFF, each time you start Crystal subsequently, you must use the File menu to select either **New** or **Open**. "New" means that you will be creating a report from the ground up, while "Open" means that you want to start by modifying an existing report.

2. Whether you leave the Welcome Dialog active or not, you must first choose between creating a new report or opening an existing one. If you select **Open Report**, *Crystal* presents a standard directory and file-selection dialog for you to browse to the RPT file you wish to work on. Note: in order to see the reports in the MET/CAL directory, you must first go to File, Options, New Report and change the path to the new reports to direct it to the shared MET/CAL directory.

If you have de-activated the Welcome Dialog, go to the File menu and select **Open**.

3. Browse to C:\METCAL\BASIC INVENTORY V7.RPT. (This is the default path and filename. Adjust as needed to conform to your local installation.) This report is a very basic report, showing inventory table fields only. You will modify this report to provide a basic calibration due report.

The following illustration shows the calibration due report **BASIC INVENTORY V7.RPT**, as it appears when opened in *Crystal Reports* Design mode.
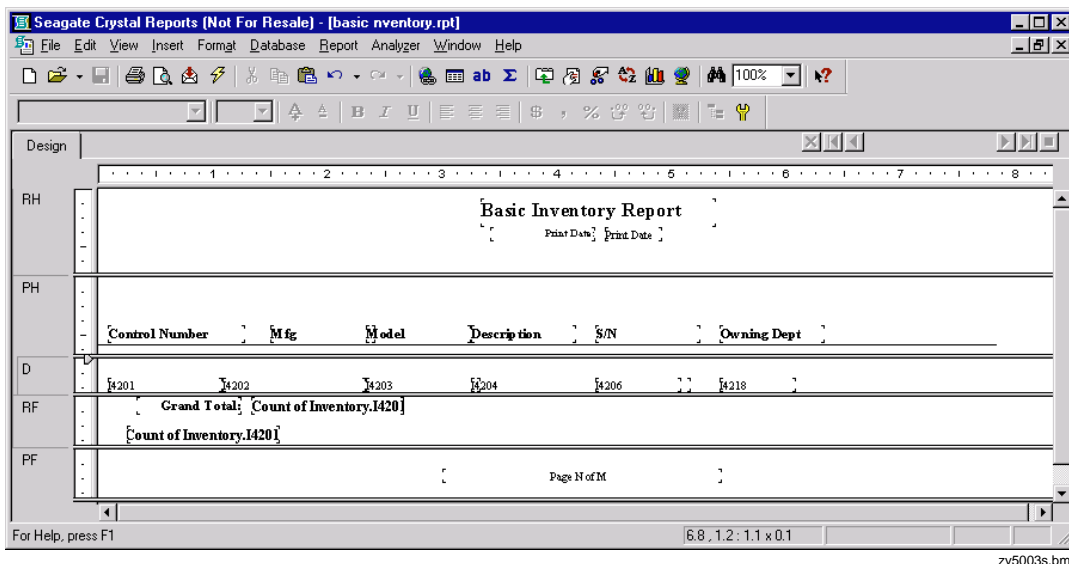
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Make note of the following:

- This display may differ from that on your computer. Instead of the field names, you may see lines of xxxxx's. Proceed as follows: open the File menu, and select **Options**. A dialog box appears. In the lower right hand corner, under "Field Options", add a check mark to the box labeled "Show Field Names."

- The supplied reports use strict naming conventions. You may see some reports with a letter "J" (RTRSLTJ1.RPT for example). These are Japanese versions. Open these reports only if you have a Japanese system.

As you view the display, do not be too concerned just yet with the appearance of the viewing area (*Crystal* calls this the "Design Window"). The next section describes the process of creating a completely new report. There, you will find an illustration of the Design Window that identifies all the parts and describes their use. In this first tutorial, the idea is to leave the basic parts as they are, and just get practice with changing some of the details.

Both selections can be useful, because, at times you may want to work only with the layout of the report. By de-activating Field Names, you can avoid being distracted by all the text. At other times, you must work with the individual fields, so you want to see the field names.

Adding a Table to the Report

Using the **Basic Inventory V7.rpt** report as a starting point, you will learn how to add a table to the report to make this report a simple Calibration Due for Next 30 Days Report. This report uses a table called MT.INVENTORY. Since the calibration information is contained in the calibration table, you must also add the calibration table to the report.

1. Click **DATABASE**, **ADD DATABASE TO REPORT**. You will be asked to log on to the server. Use the default Log In User ID: FLUKE, and the default password: FLUKE.

2. When the Data Explorer window opens, expand the ODBC folder and select Calibration Data 8 and expand it. You now have access to the tables in the database.

3. Select **MT.CALIBRATION** and click **Add** then click Close. This added the table called mt.calibration to the report.
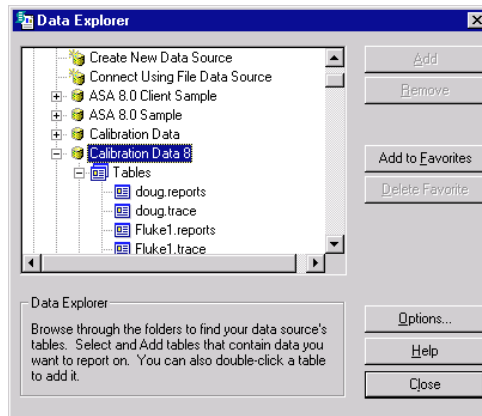
zv5004s.bmp

The Linking Expert

Crystal Reports requires that multiple tables be linked so that data in one table can match data in another table. This will be discussed in more detail later. Crystal Reports has a feature called Smart Linking. When this feature is turned on in the Options, it will link the MTAGs located in each of the tables. The MTAG is a unique identifier assigned to an asset when the asset is added to the database. This same MTAG is copied into the calibration table when a calibration record is created and saved. This is how MET/CAL keeps track of the assets and their calibration records. Linking will be covered in more detail later. Click **OK** to accept the default links.
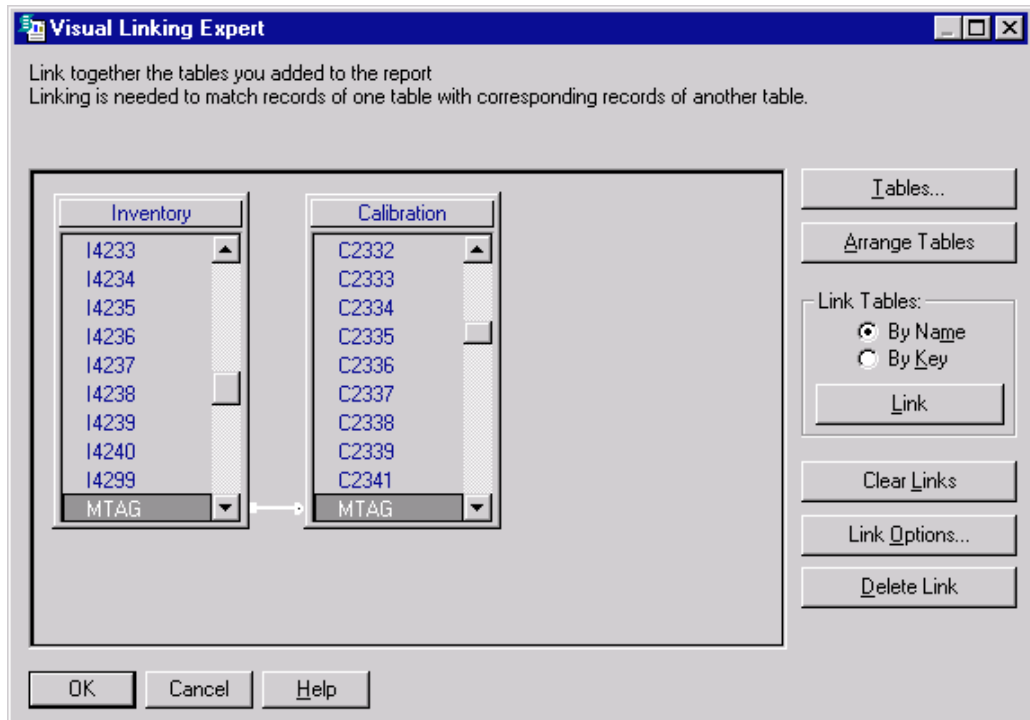
zv5005s.bmp

Adding Fields to the Report

Modify this report to create a simple calibration due for next 30 days report. To create the report, you need to add a new field to the report from the newly added calibration table.

1. To do this, click **INSERT**, **DATABASE FIELD**.

2. Select **C2303** (Calibration Due Date) and double-click it.

3. Your mouse cursor now has a box attached, representing the field we just selected.

4. Drag this field to the details section (D) of the report and drop it next to the field I4218 (Owning Department).

5. At this point, you can format the field or change the font, by clicking on the field with your right mouse button and select the appropriate function.

Adding Text Fields to the Report

Now you need to add a text header to the column that was just added. Crystal Reports has a very nice text object function that allows you to have formatted text and/or embedded database fields.

1. To add a text object for your header, click **INSERT**, **TEXT OBJECT**.

2. Your cursor now has a box attached representing the text object. Drag the text object to the Page Header (PH) and drop it over the column you just added.

3. Type **"Due Date"** in the text object box without the quotes.

4. The text object may be resized by clicking once on the object. The text object will now have resizing handles

5. If you want to edit the text within the object, double-click inside the text object. You will now see the cursor flashing inside the text object and a ruler now shows at the top of the page. You can now change the font, or otherwise format the text.

   The title of the report also needs to be changed. To do this, edit the title text object as shown above. Change the title to read, **"Basic Calibration Due for Next 30 Days Report"**. Preview the report by pressing the **F5** key. The report should look similar to the following:

zv5006s.bmp
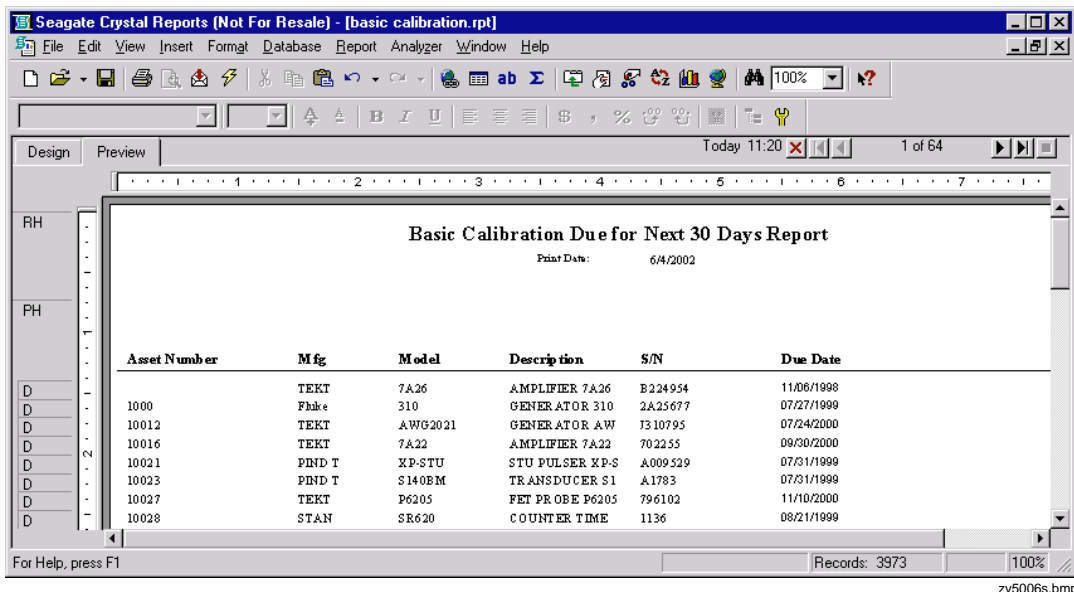
6. Note that all calibration dates are showing on the report. You need to limit the dates to just the due dates less than 30 days from today's date. This is done using the Record Selection Expert.

Changing the Record Selection Criteria

Crystal Reports allows you to limit or restrict the records that are to be included in the report. In our example, you need to limit the calibration due dates to all dates less than 30 days from today's date. You also need to be certain that only the current records are shown.

1. Open the Select Expert by clicking Report, Select Expert.

2. The Choose Field box opens.

3. Select field C2303 from the Calibration Table.
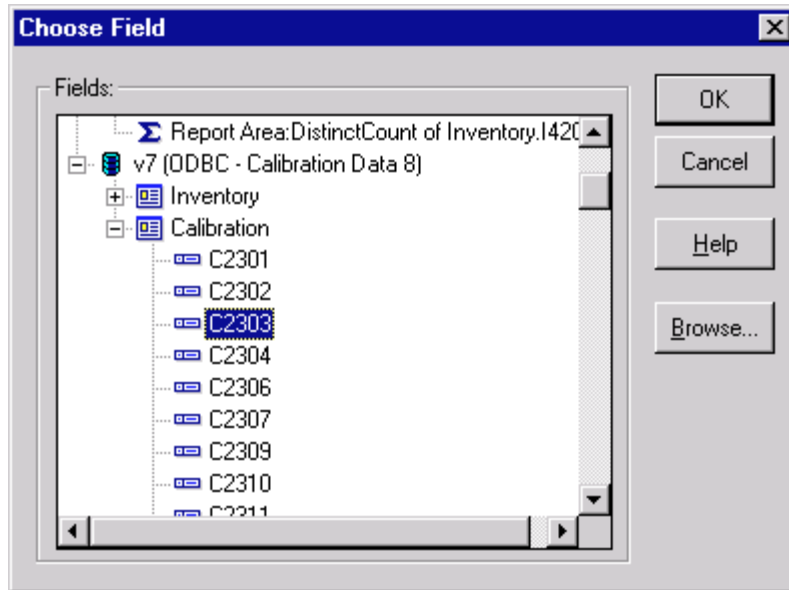
zv5007s.bmp

4.   The Select Expert opens.
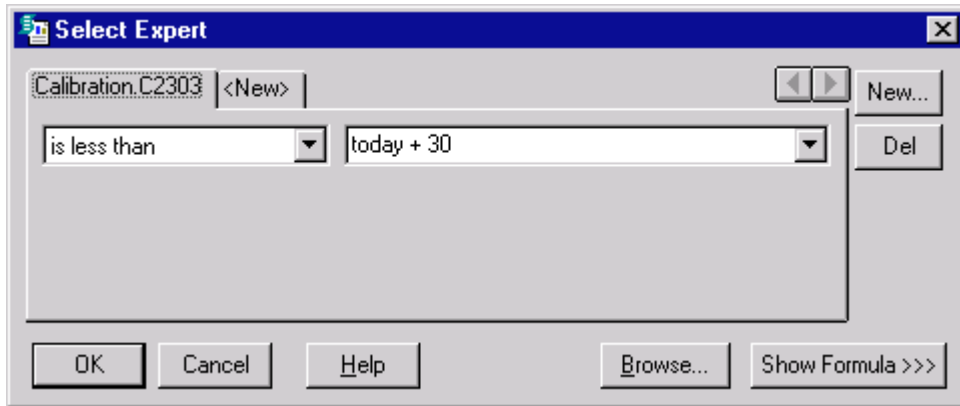
zv5008s.bmp

5.   In the pull down box to the left, select **IS LESS THAN**. In the pull down box to the right, type **TODAY + 30**.

6.   The only records selected will now be due dates less than 30 days from today's date. You also need to set up the record selection to only show the current calibration records. This is done using a field called **C2339** (Archive Flag) that MET/CAL uses to determine if the record is the current record. If a "1" is contained in this field, the data for the asset is the current data. Archive Flags are discussed later in this chapter in much more detail.

7.   Click **New**. Then select field **C2339**.

8.   In the pull down box to the left, select **EQUAL TO**. In the pull down box to the right, type "**1**" and click OK.

9.   The report will now ask if you want to refresh the data. Click **YES**. The preview data now only shows the current calibration data.

Creating a Formula Field

In this exercise, you will create a formula to add to the report that will check the due date of the asset and print an "*" if the due date is less than today's date.

1. To insert a formula field, click **INSERT**, **FORMULA FIELD**.
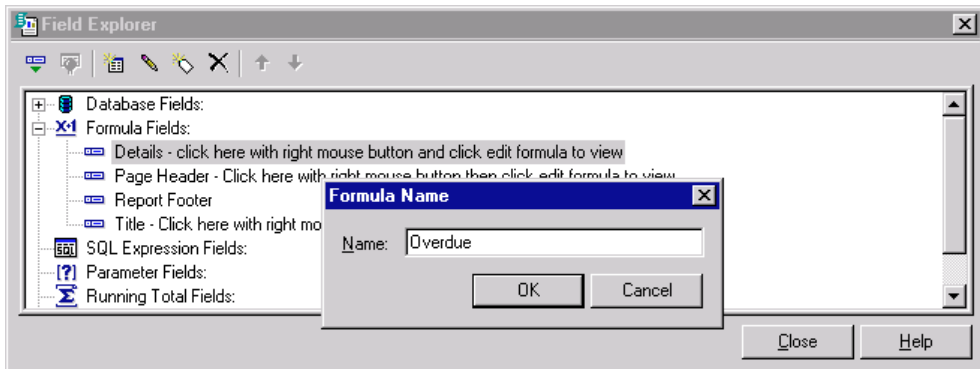
zv5009s.bmp

2. The Field Explorer window opens. Click the NEW button in the menu bar.

3. The Formula Name box opens. Type "**Overdue**" as the formula name and click OK.

4. Type "**IF**" in the box at the bottom of the Formula Editor, then find field Calibration.C2303 in the left box at the top and double-click it. This brings the field down to the formula editor and formats it.
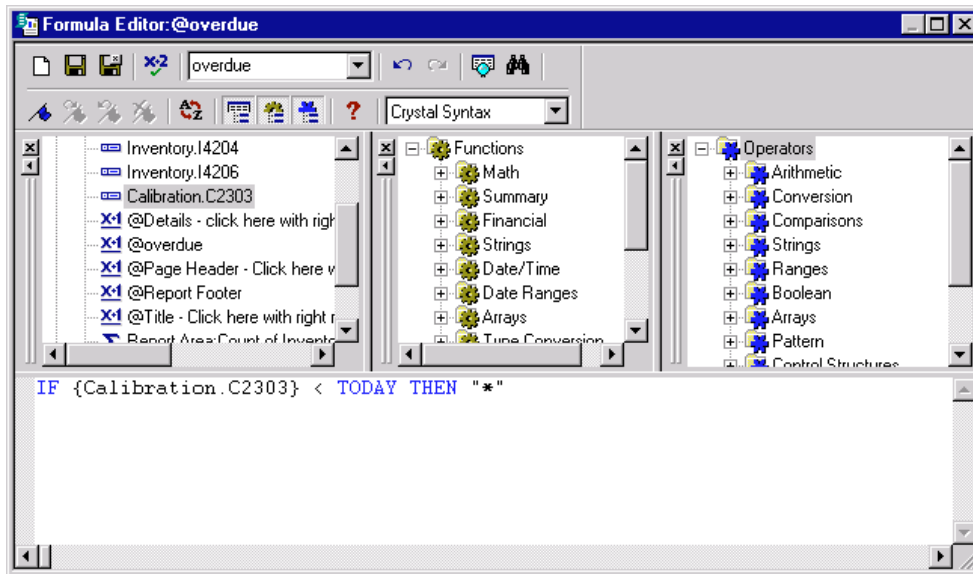
zv5010s.bmp

5. Now type "**< TODAY THEN "*"** ".

6. Click the **X-2** button to check the formula syntax. If it shows no errors, click the **Save and Close** button to the left of the X-2 button.

7. The Field Explorer window opens again. Click on **OVERDUE** with the right mouse button and click **INSERT INTO REPORT**.

8. Drag the formula to the details (D) section of the report and place it to the right of the Due Date field and drop it. After refreshing the data, you now have an asterisk showing all overdue items.
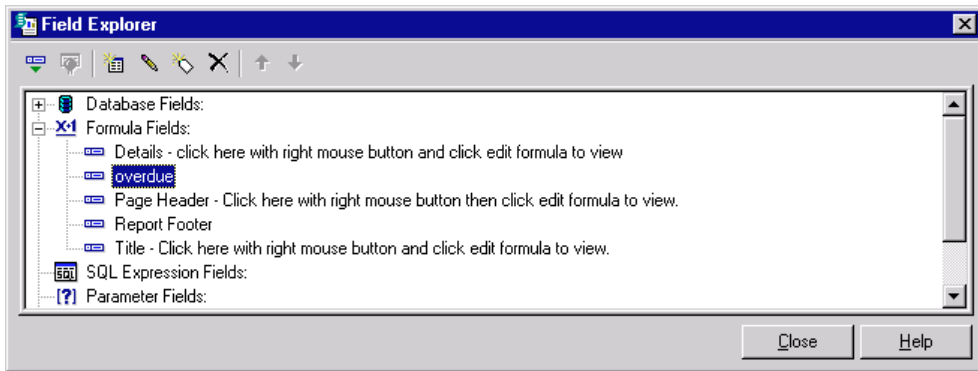
zv5011s.bmp

Adding a Graphic

Personalizing a report for your organization or for a particular customer can result in a very attractive presentation by the simple addition of a graphic, such as a logo.

You can add graphics to reports in several different formats, including bitmaps, (BMP), graphics interchange format (GIF), PC Paintbrush (PCX), tagged image format (TIF), and Targa (TGA). These five formats cover the most commonly used graphics formats, and many applications can be used for generating them.

1. First, be sure that the database engine is running. Then, start up *Crystal Reports*.

2. If the Welcome Dialog is active, choose **Open Report**. If it is not, under the **File** menu, select **Open**.

3. Browse to the location of the report you wish to change.

4. When the report opens, go to the **Insert** menu and select **Picture**.

   A dialog box opens for you to select or browse to the location of the graphics file.

5. Select the desired graphics file. When you click **OK** to dismiss the dialog box, a rectangle appears in the report that follows the movement of the mouse.

6. Position the rectangle where you want the graphic to appear, and click the mouse button once. The image from the file appears at that location in the report.

   You can crop, size or scale the image, or reposition it by dragging it to a different location. If you need more powerful graphics capabilities (such as rotating an image, or changing some of its colors), perform those operations in your graphics editor before bringing the illustration into your report.

7. To delete an image, select it and press the **DEL**ete or backspace key. If you do this, note that *Crystal Reports* has added space to accommodate the image, so you may need to remove that space if you remove the image. Similarly, if you insert a very large graphic and size it to be smaller, you may have to delete the added space.

    To do that, position the cursor in the middle of the line separating the report elements. When the cursor changes to up-and-down arrows, drag and drop the horizontal bar to re-size the element.

As is true of any element you add to a report, if an image is added to the TITLE area, it only prints on the first page of any multiple-page reports. If you want the image to repeat on every page, you must include it in the page header or page footer area.

Adding Boilerplate Text

Text objects provide a convenient way to add arbitrary text to the reports you create. A common use of a text object is to insert the same text repeatedly. This is called *boilerplate* text.

For example, you can add a text object to every page of a report to describe what type of report it is, or to make some sort of legal declaration, such as a claim regarding liability limits, or to explain the traceability of instruments in your lab.

1. First make sure the database engine is running, then start up *Crystal Reports*. Under the **File** menu, select **Open**, and browse to the location of the report you wish to change.

2. When the report opens, go to the **Insert** menu and select **Text Object**.

    A rectangle appears in the report that follows the movement of the mouse.

3. Move the rectangle to the area where you want the text to appear: *Title area* for first page only, *Page Header* for the top of every page, and so on. When the rectangle is in the desired location, click the left mouse button once. This sets the location of the text object.

    When you establish the location of the text object, the cursor moves into the selected text area, and the text object editor starts up. A ruler line should display above the selected text area.

4. In the text box, type in the text that you want to appear in the text object. When you have finished typing in the text, let the text object stay selected.

5. Click once on the right mouse button and a floating menu appears.

    From this menu, you can elect to change the formatting in many different ways. Most of the available selections are self-explanatory and lead to familiar dialog boxes.

For example, if you select **Change Font**, you can change the font type, size, and various attributes such as bolding, italic, and the displayed color. Explore the dialog box selections. You have a high degree of control over the appearance of text that appears in the report.

In addition, when you are editing a Text Object, you ought to explore the options available under the Format menu. The *Format Text* selection provides a large variety of options for various needs. For example, under the "Common" tab, the *Can Grow* selection lets text objects grow to fit the size required by the incoming information. *Crystal Reports* provides many such features. You can even do conditional formatting. For example, you can print the results of failed tests in red and passed tests in blue.

Adding a Page Number with Total Page Count

You can easily add page numbering to multi-page reports. The following steps result in a simple serial page number added to each page in the report.

1. First, make sure the database engine is running. Then, start up *Crystal Reports*. If the Welcome Dialog is active, select Open Report. If you have de-activated the Welcome Dialog, go to the **File** menu and select **Open**. Browse to the location of the report you wish to change.

2. From the Insert menu, select **Special Field**, Then, continue dragging across to the submenu and select **Page N of M**.

   When you click **OK** to dismiss the dialog box, a rectangle appears in the report that follows the movement of the mouse.

3. Move the rectangle to the area where you want the page number to appear (normally the Page Footer area).

4. When the rectangle is in the desired location, click the left mouse button once. The rectangle changes into a box containing the words "Page N of M." If you have disabled the Show Field Names option, you will see a representative number, such as 5,555,555.

5. With the Page N of M selected, click once on the right mouse button.

   A floating menu appears with formatting options similar to those available for text objects.

   • To format page numbers, proceed just as you do for a text object: highlight the field and click the right mouse button to access the floating menu that makes the formatting options available. Make sure that the *Decimals* selection is set to "1".

   • You can also use the toolbar at the bottom of the window to change fonts, paragraph alignment, and so on.

Considerations Specific to Run Time Reports

The following topics apply only to Run Time reports.

When run immediately following a Calibration Procedure, Run Time reports return information about one and only one calibration event, the one just completed. When run from the MET/TRACK application, a dialog box asks the user for an asset number and then for a calibration event. After you enter the asset number, the entire list of calibration events for that asset appears. The list identifies date and time of the calibration. Except for this one case in the MET/TRACK application, Run Time Reports do not support operator prompts.

Configuring Post Run Reports

Up to eight Run Time reports can be set up for selection by the operator to run after a calibration. PostRun reports are configured in the Run Time application. Proceed as follows:

1. With the database engine running, start the Run Time application.

2. When the Run Time application starts, pull down the **Configure** menu, and select **PostRun Reports**.

    The Run Time presents a dialog box listing all available reports on the left. The report you wish to add must exist in the METCAL directory and must already be added using the MET/TRACK application.

3. Select the report from the list on the left, and press the **─>** button to add it to the list of reports available. All the reports that appear in the list on the right will be available for operator selection at the conclusion of the calibration.

Run Time Report Rules

- Must be based on **ctag** as the only record selection criteria.

- Can read database tables directly, or use a stored procedure.

- Formula @mt *company* substitutes the company field from the **Configure Company** dialog box in DB Setup.

- Formulas @*mt_ user1* through @mt_user5 cause the Run Time application to substitute user1 through user5 from the **Configure | Company** dialog box in Administrator Mode.

Creating Reports from Scratch

This final section of the chapter about reports provides important background material about the overall reporting process. This information is most useful if you are creating reports entirely from scratch, although it may be of interest even if you are simply modifying supplied reports.

Report Creation Process Overview

Creating your own reports can be very simple, or it can be quite complex, depending on your needs and the effort you are able to expend. The following are the major steps you must take, no matter how you approach the process:

- Design the report.

  The first step is to design the report. What information is it to contain? Is it to be run only one time, or according to some schedule? Is it a general report (one that can run any time), or a Run Time report (one that automatically runs at the end of a calibration procedure)?

  Before considering the method you will employ to create the report, first have a purpose firmly in mind, asking yourself, "What exactly is this report supposed to accomplish?" By designing the report first, you begin to identify which database fields contain the information of interest. You also make a start in deciding on a plan of attack: whether to duplicate the report from an existing one, or to build it entirely from scratch.

- Create the report.

  Once you know what you want to do, decide upon a plan of attack for creating the report. More than likely, you can modify one of those supplied with the Fluke Metrology software.

  In *Crystal Reports*, this is very straightforward. Open the sample report in *Crystal*, and make any necessary changes as described in the prior section of this chapter and resave the report back to the shared MET/CAL directory.

  If you are creating a new report, first open *Crystal*, and then select **File Options**. Open the **SQL** tab, and toggle the selection ON that allows reporting

on stored procedures. Now, as you begin creating the report, the stored procedures are listed and available to the report, just as the database tables are.

• Add the report to the system.

After saving the report from *Crystal*, the final part of making the report is to add it to the system. Note that ONLY *Crystal Reports* can be added. If you are using some other report package, you will not be able to run the reports from within any of the applications.

Reports are added to the system using the Administrator Mode. Use the Run Time application to configure Run Time reports for Post Run use if you want it to be available to operators upon completion of a Calibration Procedure.

How Information Gets Into the Database

The database gets its information from three sources:

MET/TRACK   Information can be explicitly entered into the database by manually keying it in or wanding it in with a bar code reader.

Importation   Information that pre-exists in a data source can be imported into the database.

Procedure Results   Data goes into the database automatically any time you run a calibration procedure using the Run Time application. For example, the date and time might be retrieved from the current system date and time. This method is of interest only if you are using MET/CAL or 5500/CAL for automating your calibrations.

Database Table Structures

Fluke Metrology software uses a relational database consisting of many tables interrelated by key fields. The software uses some of the tables internally, and you should rarely, if ever, need to access them. The primary tables for producing reports on assets are as follows:

mt.customers	Information about your customers.
mt.inventory	Information about your assets.
mt.calibration	Latest and historical information about all Calibration events.
mt.calresults	Step by step test results for Calibration events.
mt.standards	All of the standards used to perform calibrations.
mt.location	The place where the asset is currently located
mt.repair	Historical information about an asset's Maintenance events.

How to Interpret the Table Structures

One of the sample reports included in the shared MET/CAL directory is called **TBLDEFS.RPT**. This report gives a complete definition of all of the tables used in MET/CAL. Print this report and have it handy when creating a report from scratch as it has the field descriptions for all of the tables you will be using. If you perform any customization, this report will show the customization you have done.

The report does not describe all the tables in the database. The database engine uses system tables, and the software itself creates and maintains a number of tables for its own internal uses. Even of the tables shown, only some fields will be of interest to you. However, for effective report writing, you need some basic information about the position of fields, their contents, and some customization information.

For example, assume that you wanted to produce the report that you just printed, showing the current system customization. By looking at the table structure, you can see the Customization table contains the kind of information that such a report might contain. By knowing such things as the maximum possible length the field, you can format your report to present the data clearly.

The Customization table contains information about field-level customization. The column names represent a particular field attribute (not a number.) Attributes define each field; the Customization table stores the present settings. Actually, the database uses some preset field attributes (e.g., FLDNUM for field number and DATALEN for data length). You can only make changes to the attributes via the customization interface.

The center column of each table has a short description of the intended use for the field. The description may be an actual field title or a few words to relay the idea behind including the field on the form. The last column gives the data type and byte size of the field. The data types are Character, Date, DOUBle, INTeger, and TimeStamp. Date fields contain only month, day, and year, while the TS field adds hour, minute, and second.

The arrows show the internal linkages within the relational database. Two fields (CTAG and MTAG) carry linking information. The links are not customizable, and you cannot affect their action externally. The software maintains the links automatically.

Stored Procedures

A number of stored procedures are provided as a part of the Fluke Metrology Software package. You can find the input and output parameters of these stored procedures by running the report **PROCPARM.RPT**. This will generate the tables as they exist when the product is shipped. Not all of the reports supplied with Fluke Metrology software access the base tables directly. Instead, a technique has been developed to run a "stored procedure." Stored procedures run within the database. They scan the base tables for information, and return this information to the report writer program for formatting and printing.

A stored procedure is a series of SQL commands stored in the database. There are several reasons for storing such a series of commands in the database. Following are the most important benefits from using this approach:

- First, the stored procedure runs in the database itself, so network traffic is significantly reduced. After it executes, the stored procedure returns only the requested data to the client. This makes the stored procedure run much faster than the equivalent request coming from a report searching the base tables. It also uses the network bandwidth much more efficiently.

- Secondly, the stored procedure pre-processes the information, so the amount of data returned is only a subset of the entire body of information contained in the Calibration database. As a consequence, the sorting and grouping done by the report is minimized, resulting in speedier, more efficient operation.

- Finally, *Crystal Reports* does not perform multiple SELECT statements, so if you need multiple records from more than one tables in the database, the best solution is to use a stored procedure.

Fluke provides the following stored procedures with the software.

mc_assets	Provides information for a specific asset.
mc_cal_due	Provides a list of instruments due for calibration.
mc_cal_loc_due	Provides a list of instruments due for calibration with location included.
mc_cal_loc_due_range	Provides a list of instruments due for calibration with location included based on a start and end date.
mcctagresult	Used primarily for run time calibration reports. Uses ctag to identify a particular cal event.
mcresult	Prompts for asset number, start date, end date. Returns information about one or more cal events.
mccalresult	Gets inventory, cal summary, stds, and results for a CTAG.
mcctagresloc	Used primarily for run time calibration reports with location information. Uses ctag to identify a particular cal event.
mccalresloc	Gets inv, cal summary, stds, results and loc for a CTAG.
mcltag	Gets location info for an ltag.
mcmtag	Gets inventory for an mtag.
mcktag	Gets customer info for a ktag.
mcrtag	Gets maintenance info for an rtag.
mcltaginventory	Gets location and inventory info for an ltag.
mcrtaginventory	Gets maintenance and inventory info for an rtag.
mcmtagcustomer	Gets inventory and customer for an mtag.
rep_tech	Returns information about repair events based on repair tech and start and end date.
rep_asset	Returns information about repair events based on asset number based on start and end date.
mcktaginventory	Gets inventory and customer info for a ktag. (multiple rows)

How to Interpret the Results Structures

The supplied report PROCPARM.RPT illustrates the structures of the results information returned by the stored procedures. You will need this information if you wish to use a stored procedure to filter and supply needed information.

Note

After customization, it might be appropriate for you to run
PROCPARM.RPT to generate a corrected version of the information.

Run Time reports can be set up to run automatically upon completion of a
Calibration Procedure. Those reports that are based on the MCCALRESULT
stored procedure automatically supply the *ctag* value, since the Run Time has just
assigned it.

When a report is designed for use only as a Run Time report, it takes one argument
(the *ctag* that the Calibration Procedure has just assigned). If you wish to run a
Run Time report later (as if it were a General report), it will ask for an asset
number and a calibration event. This is the only time a Run Time report prompts
for information, and prompting for the *asset number and calibration event* is an
automatic function in this case.

Another Fluke-supplied stored procedure, MCResult, takes three arguments: the
asset number of interest, and a beginning and ending date. This procedure is
intended to be used for General Reports, because only through the report
prompting mechanism can the dates be supplied to the procedure.

Crystal Setup

The following directions set a number of options in Crystal Reports that some report developers have found to be helpful. None of the settings discussed here make any permanent alteration of the system, so, if you find you prefer some other behavior, it is an easy enough to undo the change.

1. After you start up Crystal, select File | Options. Open the DATABASE tab and select the option report on Tables, Views and Stored Procedures. The tables in the Metrology database are SQL tables, so when you create a new report, the tables and stored procedures will be available as soon as you specify the database.
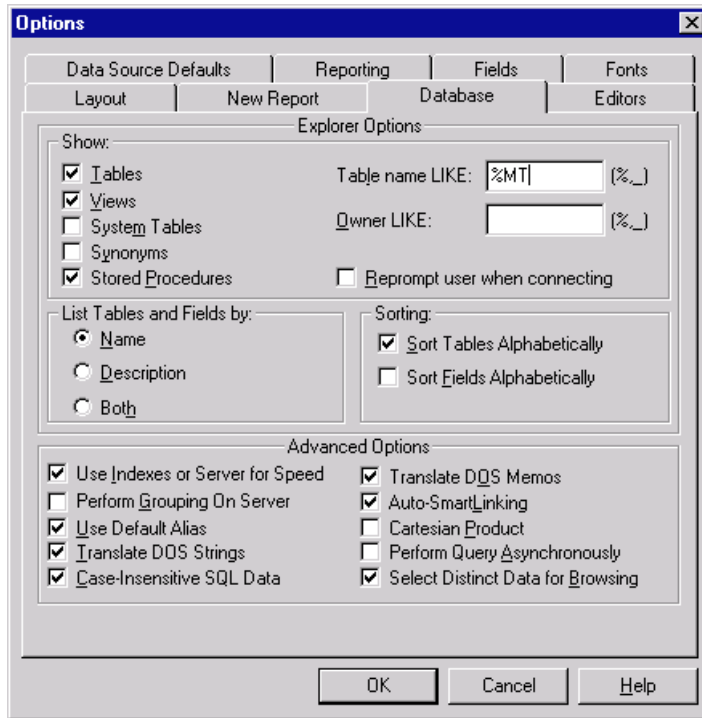
zv5012s.bmp

2. Open the Reporting tab, and make sure the option Convert NULL field value to default is de-selected. If selected, this option prevents searching for NULL values in the database, which can make generating some reports more difficult.
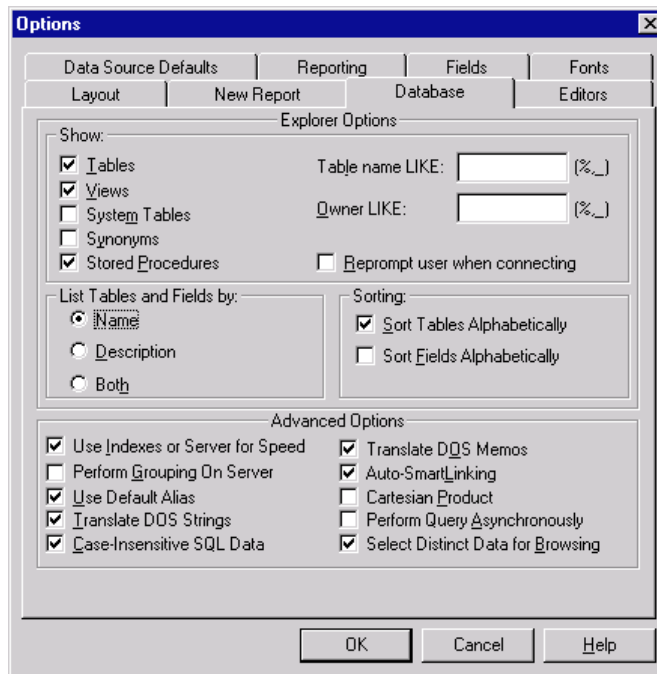
zv5013s.bmp

3. Open the New Report tab, and type the path to your shared METCAL directory in the Report Directory box. When opening a report with Crystal, the reports in the METCAL directory will now show.
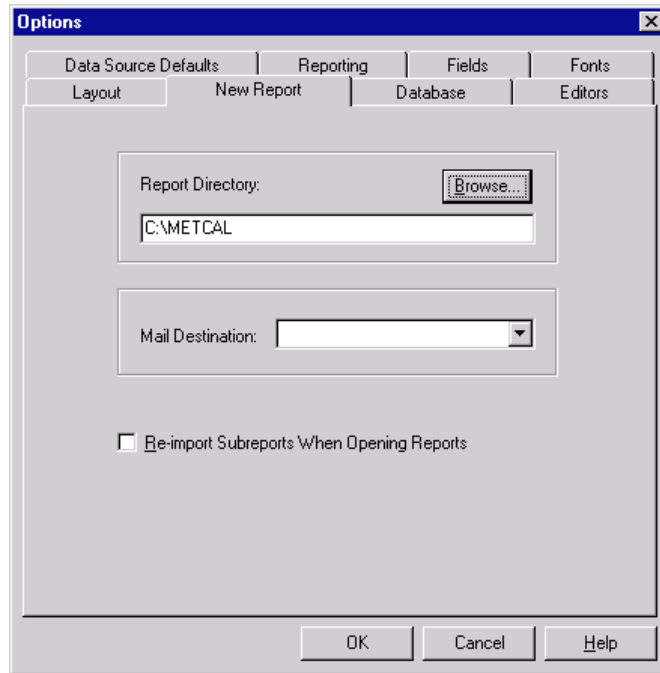
zv5014s.bmp

1. While the File Options dialog box is opened, another selection can simplify your later work with Crystal.

2. Under the Layout Tab, place a select mark in the option "Show Field Names."

   With this selection checked, the Design Window shows the names of the fields and formulas at the location where they are places, rather than just indicating their location by a string of xxxxxx's. Also, under the **Layout** Tab, check the box for "Show Short Section Names in Design". This will give you more room on the page for your report.

Configuring a Report From Scratch

The first step to creating a new report is to Click ▢ (the New Report button) on the Button Bar. The dialog box that appears is known as the Report Gallery.
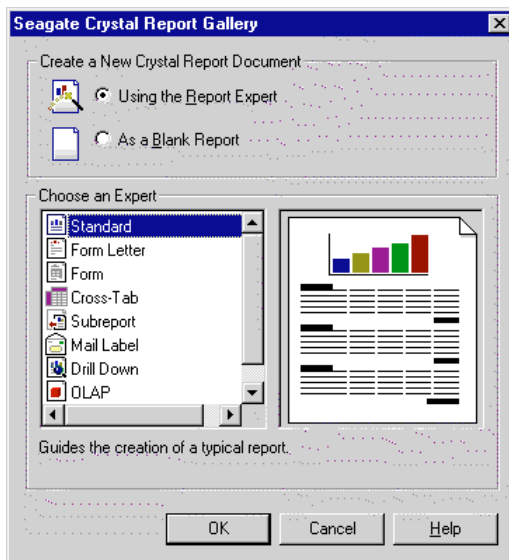
zv5015s.bmp

The Report Gallery offers a number of options when building a new report. You can choose from various Experts that will help you design your report. To design our report you will click on **As a Blank Report**. Expand the ODBC folder and select Calibration Data.
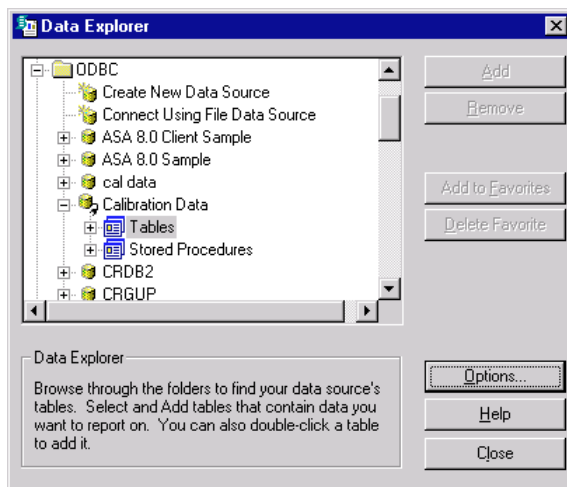
zv5016s.bmp

The Log on Server window appears. Log on the Server with ODBC - MET/CAL Calibration Database and with the User ID **FLUKE** and Password **FLUKE.**

Double-click on **Tables**. This allows the report writer to access the MET/CAL SQL database tables.
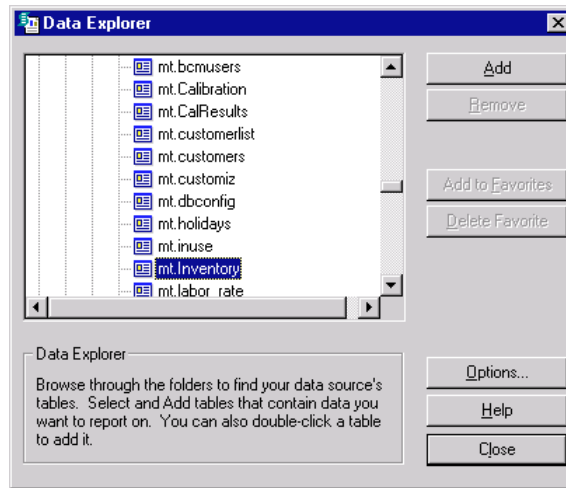
zv5017s.bmp

Our Report will be a simple **ASSETS DUE FOR CALIBRATION** Report. In order to select the data used in the report it is necessary to understand which MET/CAL Tables you will be using for the data. For our report you will need fields:

I4201	Asset Number	mt.Inventory Table
I4202	Mfg	"
I4203	Model	"
I4204	Description	"
L2801	User Name	mt.Location Table
C2303	Cal-Due Date	mt.Calibration Table

Select SQL Table: **mt.Inventory** and click **Add.** Then select SQL Table **mt.calibration** and click **Add.** Finally, select **mt.location** and click **Add.** Click **Close.** A **Visual Linking Expert** window appears.
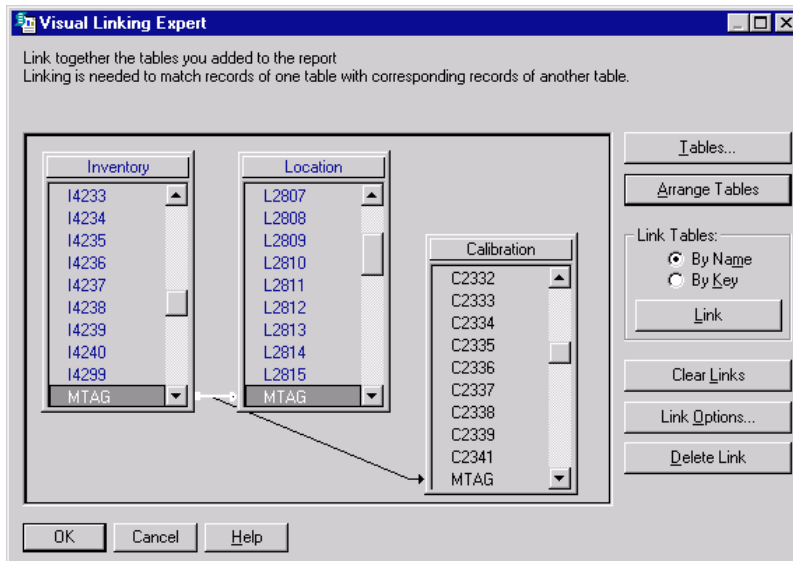
zv5018s.bmp

Table Linking

If the report contains data from two or more database tables, they need to be linked at this point when creating reports. If the check box for Smart Linking is checked in the Options, the MTAG's will be automatically linked. Database tables are linked so records from one database match related records from another. For example, if you activate An Inventory table and a Calibration table, the databases are linked so that each MTAG (from the Inventory table) can be matched up with the calibration records (from the Calibration table). The majority of reports will probably require data from two or more tables, so linking will be necessary. The process of linking is made easy with the Visual Linking Expert and the Smart Linking option.

Join Types

Highlight the link between the Inventory Table and the Location Table. The Link Options button becomes active. The Link Options sets the table join types. The only types normally used in calibration type reports will be Equal Join and Left Outer Join.

Equal Join

The result set from an Equal Join includes all the records where the linked field value in both tables is an exact match. This is the default join type. For most reports, it will not be necessary to change from EqualJjoin.

Left Outer Join

The result set from a Left Outer Join includes all the records in which the linked field value in both tables is an exact match. It also includes a row for every record in the primary (left) table for which the linked field value has no match in the lookup table. This join type is useful for reports where you need to show the asset number of assets without calibration or location records where an MTAG would not exist.

Click **OK** to accept the linking.

Inserting Data Fields
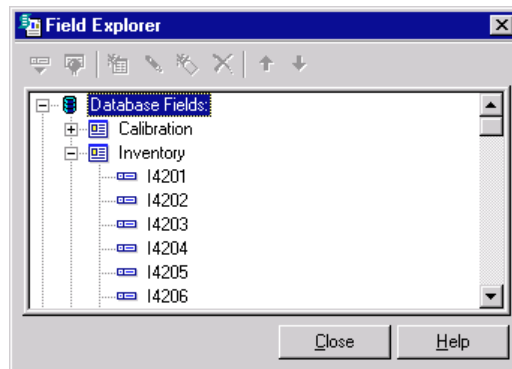
zv5019s.bmp

A Field Explorer window opens, showing all of the tables you just added. Expand the Inventory table. The first data field you want to insert into your report is **I4201**. Double-click field I4201.

A box will appear on your cursor when moved out of the Field Explorer window. Move your cursor to the **Details Section** of your report and place it where you want the data to show and drop it. We will show you how to add a report page heading later. Now do the same with the other data
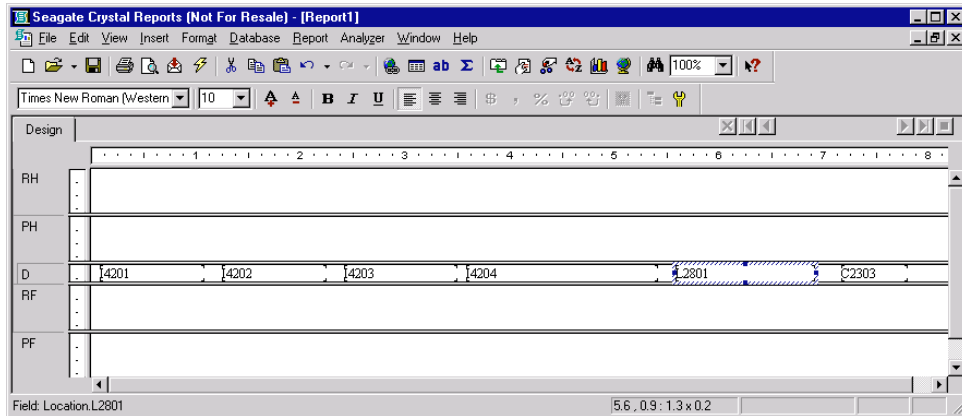
zv5020s.bmp

Changing the Field Formats

It may be necessary to change the size of the data fields. Do this by moving your cursor to the data field and click once with the left mouse button. This will highlight the box. Then with your mouse cursor, move the cursor to the small resizing handle on one of the ends of the highlighted box. The mouse cursor will change into a double arrow. Hold down the left mouse button and drag to change the size of the field.

Previewing the Report

You should now preview what the report will look like at this point. Do this by pressing the F5 key to preview the report. The report will appear just the way it would be if printed at this point. In the Preview mode, you may also move the data around by highlighting the data field and holding down the left mouse button, drag the data field to where you wish it and drop it.

Inserting Text Fields

Now add the correct titles to each of the fields. Click **Insert | Text Object** in the menu bar. Drag the cursor, which now becomes a box, to the top of the I4201 column and type **Asset Number.** Do the same with each of the other Headers. Also note that you may also change color, etc. in the same way. Make each of the headers Bold by clicking on the text object and click with your right mouse button, selecting **Change Font** then select **Bold**.

Now add a title to the report. Text can be changed in two ways:

Type the text directly onto the report.

Insert a text object. For this example, you will insert a text object.

To insert a text object, Click **Insert** on the Menu bar and choose **Text Object**. Move the cursor to position the text object in the Report Header section then click.

Type in **ASSETS DUE FOR CALIBRATION.** When finished, Click anywhere off the edit text object box. It is easier to do this in the Design Window Mode.

Formatting Fields

Now you have a basic ASSETS DUE FOR CALIBRATION report. You can now format the fields so that they are presentation quality. Begin by formatting the report title. The title size needs to be expanded to the width of the report.

Increase the font size of the title to 14 point by clicking on the font size down arrow.

Click the **Report Title** field to select it.

Position your cursor on the right edge of the field box until you get a double-arrow resizing cursor.

Drag the right edge of the field box until it is even with the right edge of the data in the right column in the **Preview Window**. You may need to release the field box, scroll the window to the right, then continue expanding the field box until it is even with the right edge of the column.

Scroll to the left edge of the Preview Window when finished. What you have done now is created a large field that extends from the left edge to the right edge of your report. Now you're going to center align the title in that field so it will automatically be centered above your report date.

At the bottom of the window is the Format Bar. Click ▤ (the center alignment button) to center the report title inside the text field.

To format a field, Click on the field to select it and then click the right mouse button and a pop-up menu will appear. Use Font to change the font, font size, style, effects and/or color for selected elements on your report. Select Change Border and Colors to change the color of the text, to place a border etc.

Your Report should look something like this: (Note: your report will differ in content)

zv5021s.bmp

Selecting Records

The report you just created shows all of the data in the selected fields including
Cal-Due Dates in the future as well as the past. Generally on a report, you wish to
limit the information you see, and in order to do that, you need to select the
records you would like to see on the report.

Crystal Reports provides two options for selecting records:

- Select Records Expert, which you are going to use here, and

- Edit Record Selection Formula, which is covered later.

Record Selection Using the Select Records Expert

The Select Records Expert is a straightforward way to create a record selection
expression. It will guide us through the creation process. There are three ways to
access the Select Records option:

- Select a field and Click the right mouse button to reveal a pop-up menu.
  Choose **Select Expert** from the menu and the Select Records Expert dialog
  box will appear.

- Choose **Report** then **Select Expert** from the Menu bar. The Select Records
  Expert dialog box will appear.

- Click ▣ (the Select Records button) on the button bar. If you have not first
  selected a field, the Choose Field dialog box will become visible and you will
  have to select a field. Select **C2303** and click **OK**.
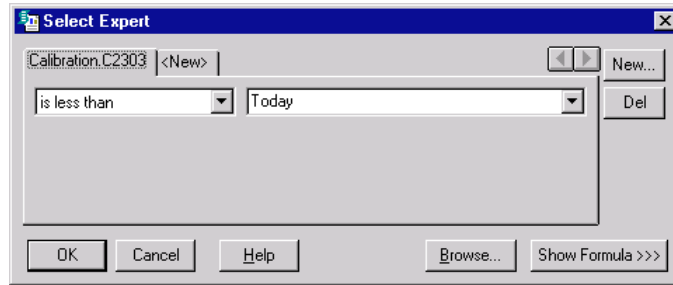
zv5022s.bmp

At this point, you need to tell Crystal Reports our criteria for selection. In this case, you only want cal-due dates less than or equal to today's date. The Select Records Expert will have tabs indicating the fields available for selection criteria. Click on the Calibration C2303 Tab. Use the down arrows in each box, select **IS LESS THAN** and type **Today.** You must also set the archive flags in the Record Selection Expert.

The Archive Flags

The MET/CAL database contains archive flags that are set to denote the most recent calibration record and the most recent location record. The fields for these flags are C2339 and L2815 respectively. If these fields are set to 1, the record is the last entry. They are set to 0 for calibration and location history. Notice that our report contains all of the past history. The asset number is repeated with all of the past calibration dates. In order to obtain the most recent record only, you must set up our record selection criteria to only ask for data with C2339=1 and L2815=1.

To set up the selection you need to click the New tab. Select C2339 and click OK. Click on the C2339 tab and use the down arrows in each box, select IS EQUAL TO and type "1" in the next box. Repeat this process for L2815. This will set the record selection to only select the current calibration and location records.
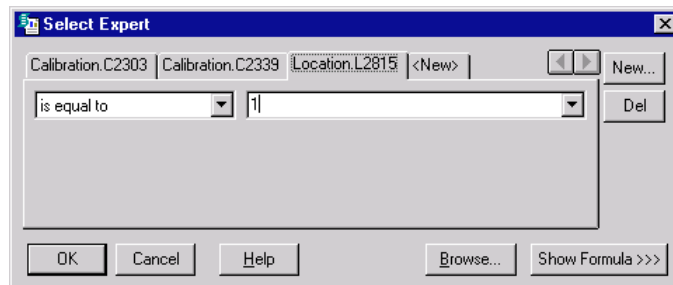
zv5023s.bmp

Inserting Groups

So far you have selected specific information for our report using record selection, but it is presented to us in the order which it is stored in the database. You can group information by report fields or even by fields that are not on the report. You would like to group information in this report such as assets owned by a given using-department and by due-date.

To insert a group

Select the field you want to group on and Click **Insert | Group Section.**

The Insert Group dialog box appears.
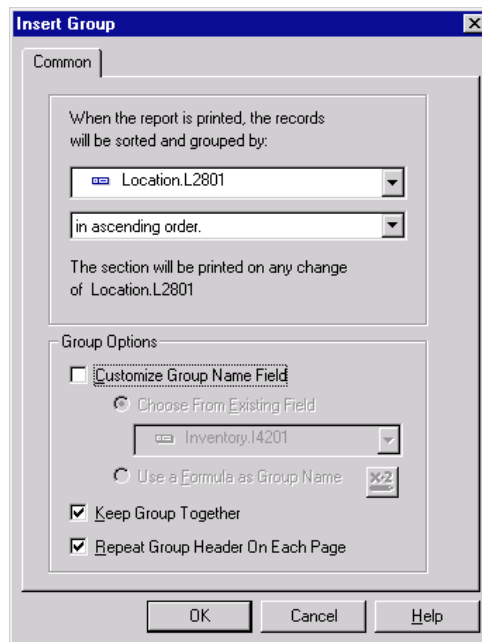
zv5024s.bmp

Choose the Location L2801 field and the order in which the groups should be displayed. In this case, choose **IN ASCENDING ORDER.** Click **OK**. If you are in the Design Window, you will see two new sections: the Group Header and the Group Footer. These will be identified by a number on the left side of the Report Window, and by the field that is controlling the group.

Now you have the User-name above the group, but it is not pretty. So click on the User-name field, using the right mouse button, and change the font to underline and bold. You should also add a line between the User-name and the Header titles. To do this, move the cursor to the far left gray area in the Header Section and click on the right mouse button. Select **ADD LINE**

Record Sort Order

So far you have selected specific information for your report and grouped like information together. The records in each group are not sorted however; they appear in the same order as they appear in the database. Sort the report by Model and Due-Date. This can be done in two ways:

- Click ⊞ (Set record sort order button) on the Button Bar, or

- Choose **Report | Sort Records** from the Menu Bar.

The Record Sort Order dialog box appears.
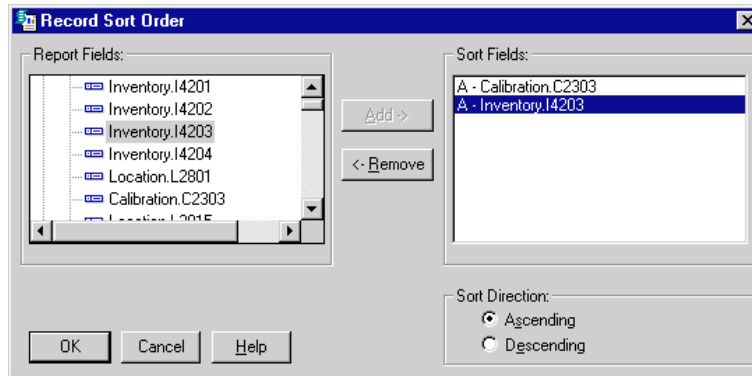
zv5025s.bmp

First select the Calibration C2303 field and then the Inventory I4203 field and add them to the Sort Fields box. The report is already grouped by Location L2801. If you click on OK, the sort will be ascending.

Your report should now look similar to:

zv5026s.bmp

Inserting Summaries

Now you have a report where you have selected specific information and grouped and ordered that information logically. Let us assume that you would like to add some summary information (for example a count of assets due for calibration for a given user-name). You add summary information into the Grouped Footer, where Summaries and Subtotals can be inserted.

Note

Crystal Reports allows you to group and summarize in a single step. You are using multiple steps to familiarize you with the fundamentals.

First you highlight the field you want to summarize. If the field is a string field, like Asset Number, then you are going to be inserting a summary such as a count of Asset Number for each user. If you had a numeric field, you would insert a subtotal. Having highlighted the Asset Number field, Click the right mouse button. Select Insert Summary. The Insert Summary dialog box appears. Select Count by clicking on the pull down arrow and highlighting Count.

The dialog box will look like this:
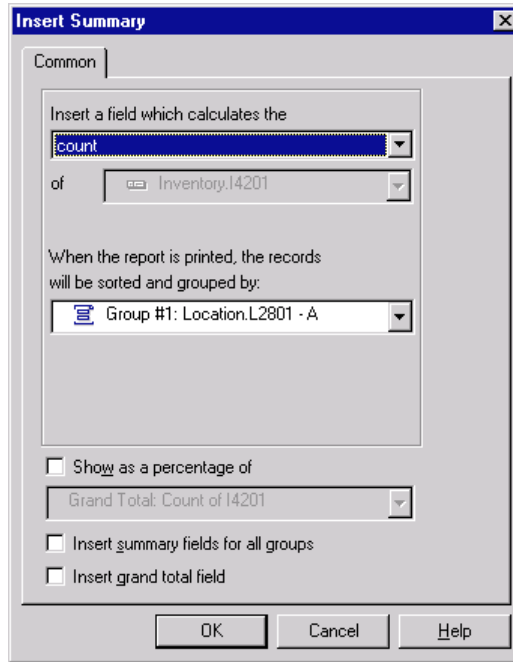
zv5027s.bmp

Select Count from the pull down. Click OK and a number will appear below each
User-Name group. Now put a text field to tell what this number means by clicking
on **Insert | Text Object** and type **Subtotal for User:** and position it in front of the
number.

Your report will now look something like this:

zv5028s.bmp

You now have a summary for each group, but you also would like to have a summary for the whole report. This is the Grand Total and will appear at the end of the report. When you insert a Grand Total, the grand total is placed in the report footer. As with subtotals and summaries, a String field can be summarized (counted) and a numeric field can be totaled at the end of the report. To create a Grand Total, highlight the Asset Number field again and Click on **Insert | Grand Total** or click the right mouse button and select Insert Grand Total.

The Insert Grand Total dialog box appears.
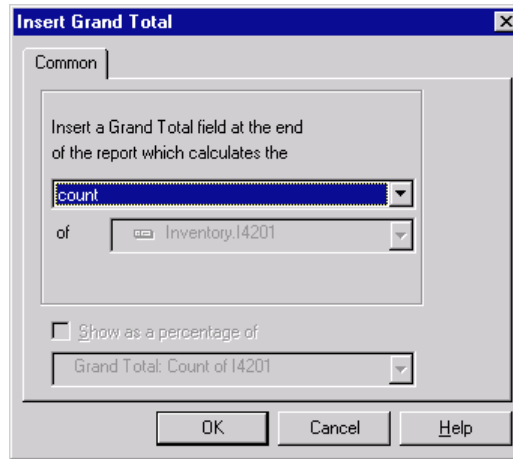
zv5029s.bmp

Choose **Count** and Click **OK**. Again, add a text object in front of the number that appears in the Report Footer (Last Page) that says **Grand Total:**.

Formatting the Sections

You now have the information you want presented to us on the report. You have selected specific records, grouped records and sorted both records and groups. You have also placed some summary information on the report. You will now look at the formatting options available for entire sections. For example, you may want to insert a page break before each section or hide a section so it doesn't print.

You can place the cursor over one of the sections on the left of the Design Window and click the right mouse button. Select the Format Section option.

The Format section dialog box appears.
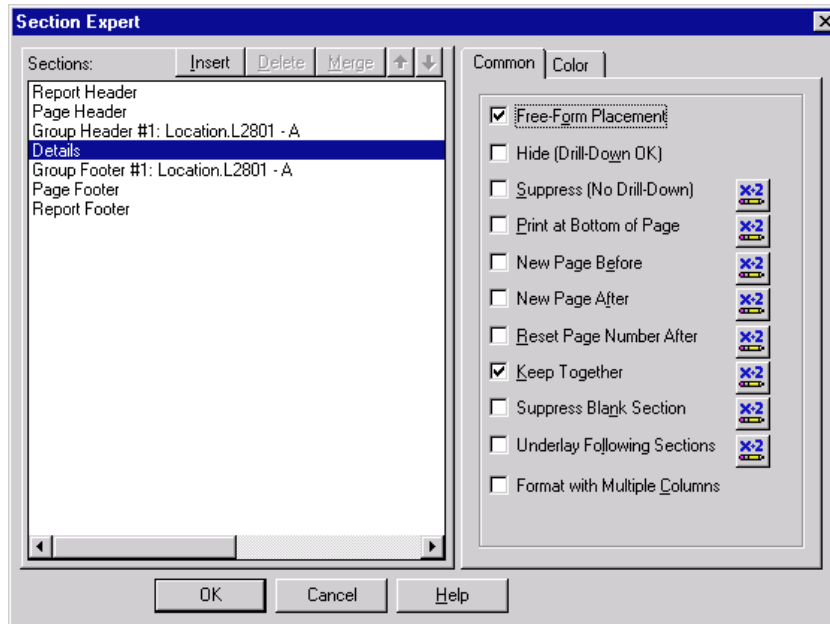
zv5030s.bmp

This is useful if you want to change the report to show one End User on each page.
To do this, highlight Group Footer #1 Location.L2801 and select the New Page
After box. Now check the Reset Page Number After box. This will restart the page
numbers for each User.

Inserting Special Fields

There is some information that is not in a database but is useful report information
such as Report Date and Page Number. Click on **Insert | Special Field** to insert
one of these fields. A menu appears listing the different options. The page number
field is self explanatory. It puts the page number on the page. The Total Page
Count Field will put the total number of pages on the report. The Print Date field
puts the date on the report. The default format is MDY, but by selecting the field
and clicking with the right mouse button you can change the format. The Group
Number field will number the groups. If you place it in the Page Footer section
you will see the number of groups on the page. The Record Number field numbers
the records. If you put it in the Page Footer you shall see the number of records on
the page.

Put a page number on your report by Clicking on **Insert | Special Field** and click
on the Special Fields expansion box and select **Page N of M** and drag the special
field to the Page Footer.

Inserting Lines and Boxes

If you want to make some data stand out or just improve the presentation quality of our report you may wish to highlight it with lines and boxes.

Use one of the following methods to draw a line:

- Click ▤ (Draw a line button), or

- Choose **Insert | Line** from the Menu bar.

Once you have selected one of the above, you will see a pencil cursor on the screen. Click the left mouse button where you would like the line to be and holding down the mouse button, move to where the line should end and release the mouse button.

Use one of the following methods to draw a box:

- Click ▣ (Draw a box button), or

- Choose **Insert | Box** from the menu bar.

Once you have selected one of the above, you will see a pencil cursor on the screen. Click the left mouse button where you would the upper left corner of the box to be. Hold the mouse button and drag the pencil cursor to where the lower right corner should be placed on the report.

Using the above method draw a line under your headers and draw a box around your report title.

Modifying your Existing Reports to Run in Crystal Version 8

If you have reports created with an earlier version of Crystal Reports, these reports will need to be modified to work with the Crystal Reports Version 8. To do this, open each report in turn in Crystal and:

1. After logging into the Version 8 Sybase Data Engine, select **DATABASE**.

2. Then select **Set Location**.
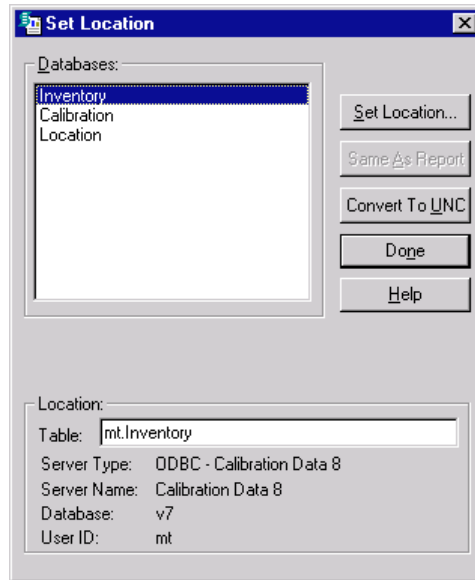
zv5031.bmp

3. Select **Inventory** and click **Set Location**.
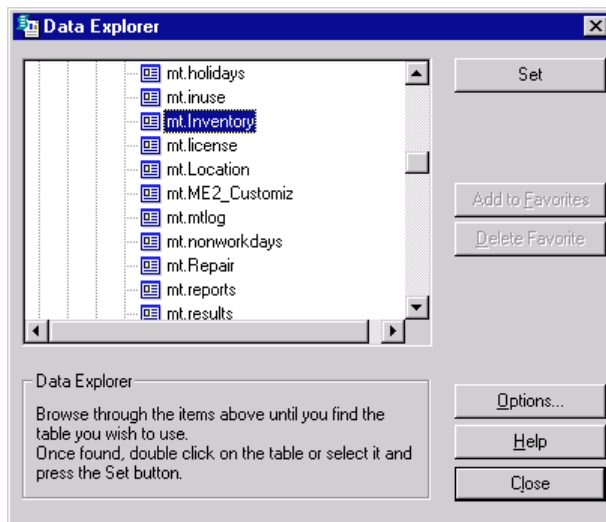
zv5032s.bmp

4. Open the ODBC folder in the Data Explorer window and double-click on Calibration Data 8.

5. Double-click **Tables**

6. Select the **mt.inventory** table and click **Set**.

7. You will see the following message:
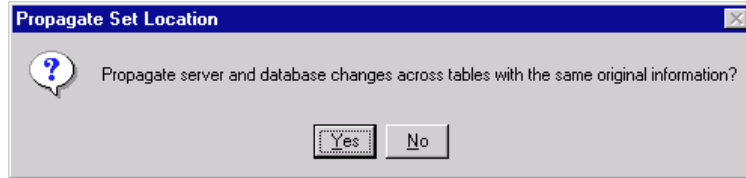
zv5033s.bmp

8. Click **Yes**. This will change all of the other tables to use the Crystal Version 8 drivers.

9. Click **Done.**

10. You will see a dialog box that asks if you want to fix up the report. Click Yes for each prompt and save your report back to your shared METCAL directory.

Chapter 6
Procedure Editor

Contents	**Page**

Introduction

The Procedure Editor application is designed for writing MET/CAL or 5500/CAL calibration procedures, but it also has a text mode, so you can use it for modifying any ASCII files, such as the control files that are discussed in Chapter 7.

The Editor lets you create new procedures or modify existing procedures. You can also compile, debug and test run calibration procedures.

In addition, the Editor allows you to configure the system instruments: add them to the system, assign their IEEE-488 addresses, and so on. The Tools menu provides a convenient way to start up other Fluke Metrology applications.

Logging Into the Editor

Note

You must log in at a level sufficient to use the Editor. The required level is configurable and is stored in the database. Refer to the Database Setup in Chapter 8 for detailed information.

To log into the Editor, first make sure that the database engine is running, then proceed as follows:

1. In the Fluke Metrology Software program group, double-click the **Editor** icon. (Windows NT and Windows 95: Start Menu, Fluke Metrology Software.)

2. The editor login dialog box appears.

    In the User Name field, type in your user name, tab to the Password field, and type in your password. Click **OK**.

    If you do not have a password, see the administrator of the system.

You now have access to the Editor. Figure 6-1 is an example of the Editor window with a Calibration Procedure opened.

Refer to the following list for descriptions of the items labeled in Figure 6-1.

Title Bar	Shows the name of the application.
Menu Bar	Lists the available options in the Editor.
	Click the menu items to see the selections available.
Error Window	Shows you the error number and describes what the error is in the procedure you tried to compile.
Status Line	Describes what is taking place within the Editor.
	In Figure 6-1, the status line indicates that the 43 lines in the selected procedure have been loaded into the Editor.

Ovr This annunciator indicates the current status of the overwrite/insert mode.

When you press the Insert key, you can write over text in your procedure. If Ovr is not on, you can insert text into your procedure.

Cap This annunciator indicates whether the Caps Lock function is on.

When you press the Caps Lock key, you can type in all capital letters in the procedure.

Num This annunciator indicates whether the Num Lock function is on.

When you press the Num Lock key, you can enter numbers from the numeric keypad on the keyboard.

Horizontal A position indicator that shows the cursor's horizontal position in the procedure.

The numbers indicate the cursor position as the number of character positions from the left within the procedure.

Vertical A position indicator that shows the cursor's vertical position in the procedure.

The numbers indicate the cursor position as the number of lines from the top of the procedure.
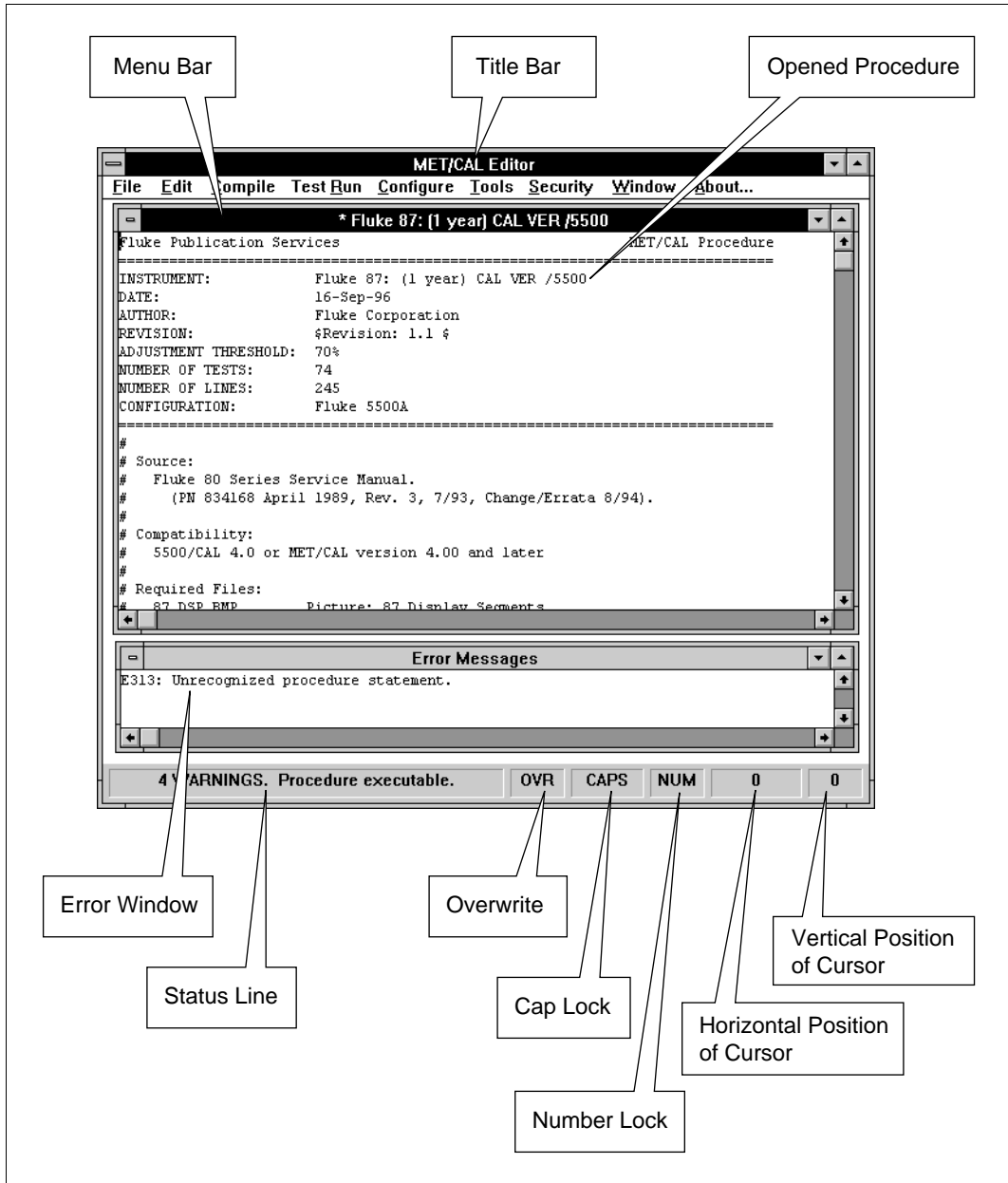
Figure 6-1. Editor Window with a Procedure Opened

il601c.eps

Checking the User Level

After logging in, you can easily check your user access level.

To check your access level, click **About** in the Menu Bar. The **About** box show the current user name and user level.

If the user level is too low to allow access to Editor functions, see the administrator of the system.

Security

The Security menu provides a way to change your password.

To change your password, click **Security** in the menu bar, then **Password**.

The Change Password dialog box displays. Enter your old password, tab down to the New Password field and enter your new password.

Tab down to the Confirm New Password field and enter your new password again, then click **OK**.

Exiting the Editor

To exit the Editor, select **File**, then **Exit**.

If you have any open files that have been modified, you are asked if you want to save them before the Editor closes.

Synopsis of Editor Functions

The following table lists all the Editor commands in a quick-reference format.

Table 6-1. Overview of Editor Functions

Action	Keystrokes	Menu
Navigating		
Move left	⬅	
Move right	➡	
Move up	⬆	
Move down	⬇	
Move to the beginning of the line	`Home`	
Move to the end of line	`End`	
Move to the beginning of the file	`Ctrl` `Home`	
Move to the end of file	`Ctrl` `End`	
Page up	`Page Up`	
Page down	`Page Down`	
Editing		
Cut selected text to clipboard	`Ctrl` X	Edit, Cut
Copy selected text to clipboard	`Ctrl` C	Edit, Copy
Copy to file	`Ctrl` W	Edit, Copy to
Paste text after cutting or copying from one source to another	`Ctrl` V	Edit, Paste.
Insert file	`Ctrl` G	Edit, Insert File
Delete selected text.	`Delete`	Edit, Delete
Searching		
Find strings in a file	`Alt` `F3`	Edit, Find
Find the next string	`F3`	Edit, Find Next
Replace strings in a file	`Ctrl` `F3`	Edit, Replace
Formatting a procedure file		
Create an adjustment step	`Ctrl` A	Edit, Adjust
Break a line at the cursor position	`Ctrl` `↵ Enter`	Edit, Break
Continue a message on two or more lines	`F6`	Edit, Continue

Table 6-1. Overview of Editor Functions (cont.)

Action	Keystrokes	Menu
Testing a procedure		
Test run from current line	`Alt` `F2`	Test Run, Go
Test run from top of procedure	`F2`	Test Run, Restart
Make test run top window	`Ctrl` `F2`	Test Run, Show
File Handling		
Open a new procedure	`Ctrl` N	File, New
Open a previously written procedure	`Ctrl` O	File, Open Procedure
Save a procedure to directory from which it was opened	`Ctrl` S	File, Save Procedure
Save a procedure to the default directory		File, Save to Default Directory
Open a text file	`Ctrl` F	File, Open Text File
Save a text file	`Ctrl` J	File, Save Text File
Save a compiled procedure in a specified directory		File, Save As, Save As Compiled Procedure
Save a text file with a new file name		File, Save As, Save As Text Procedure
Close a file	`Ctrl` `F4`	File, Close
Print a file	`Ctrl` P	File, Print
Hide a procedure		File, Hide Procedures
Delete a procedure		File, Delete Procedures
Copy a procedure		File, Copy Procedures
Change default directory		File, Change Default Directory
Exit from the Editor	`F4` I	File, Exit
Compiling a Procedure		
Compile the current procedure line	`F8`	Compile, Check Line
Compile an entire procedure forwards	`F9`	Compile, Next Error
Compile an entire procedure backwards	`⇧Shift` `F9`	Compile, Previous Error
Re-enable all warning messages	`Ctrl` `F9`	Compile, Re-warn

Table 6-1. Overview of Editor Functions (cont.)

Action	Keystrokes	Menu
Configure		
Disable the compiler	`Ctrl` M	Configure, Text Mode
Select fonts		Configure, Font Configure, Default Font Configure, Display Font
Add and edit instrument configuration	`F12`	Configure, Instruments
Add and edit IEEE-488 boards		Configure, IEEE-488Boards
Select a default Serial Port		Configure, Default Serial Port
Tools		
Copy procedures, Run Time		Tools, MET/CAL Run Time
Asset Management		Tools, MET/TRACK
Security		
Change your password without closing the application		Security, Password

Opening, Creating, and Saving Procedures

The File menu lets you open procedures and text files, save procedures and text files, print files, configure the print setup and layout, and exit.

Creating a New Procedure

New lets you create a new procedure.

- To create a new procedure, from the Editor menu bar, click **File**, then **New**. You should see a window titled <No Name>.1 at the top.
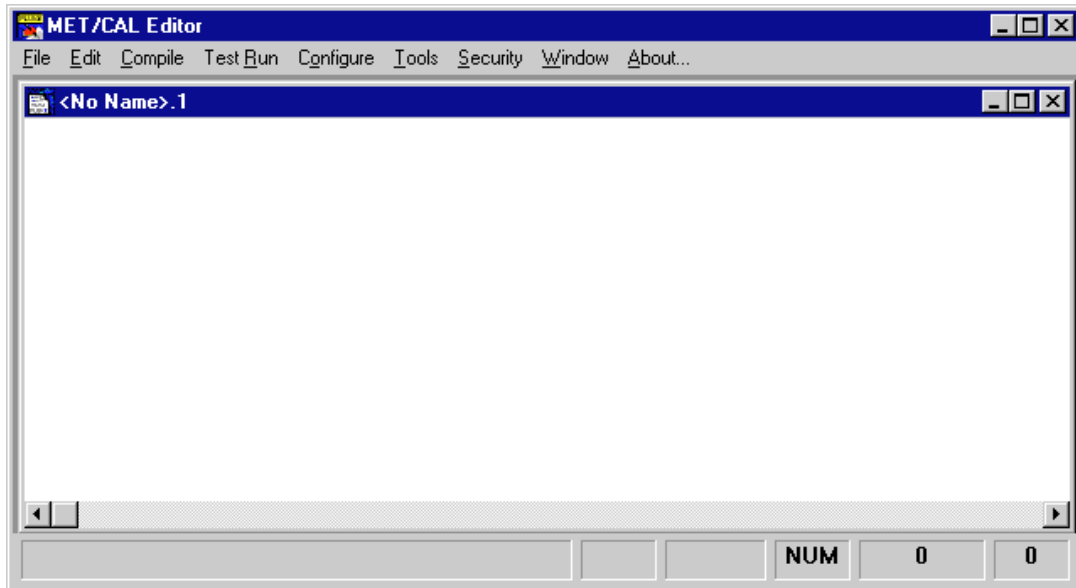
zv602s.tif

Selecting a Procedure

Selecting **Open Procedure** on the menu opens a Select Procedure dialog box. This box lists the procedures that exist in the MET/CAL procedure directory.

- To open a procedure, click **File**, then **Open Procedure**. Select the procedure you want.
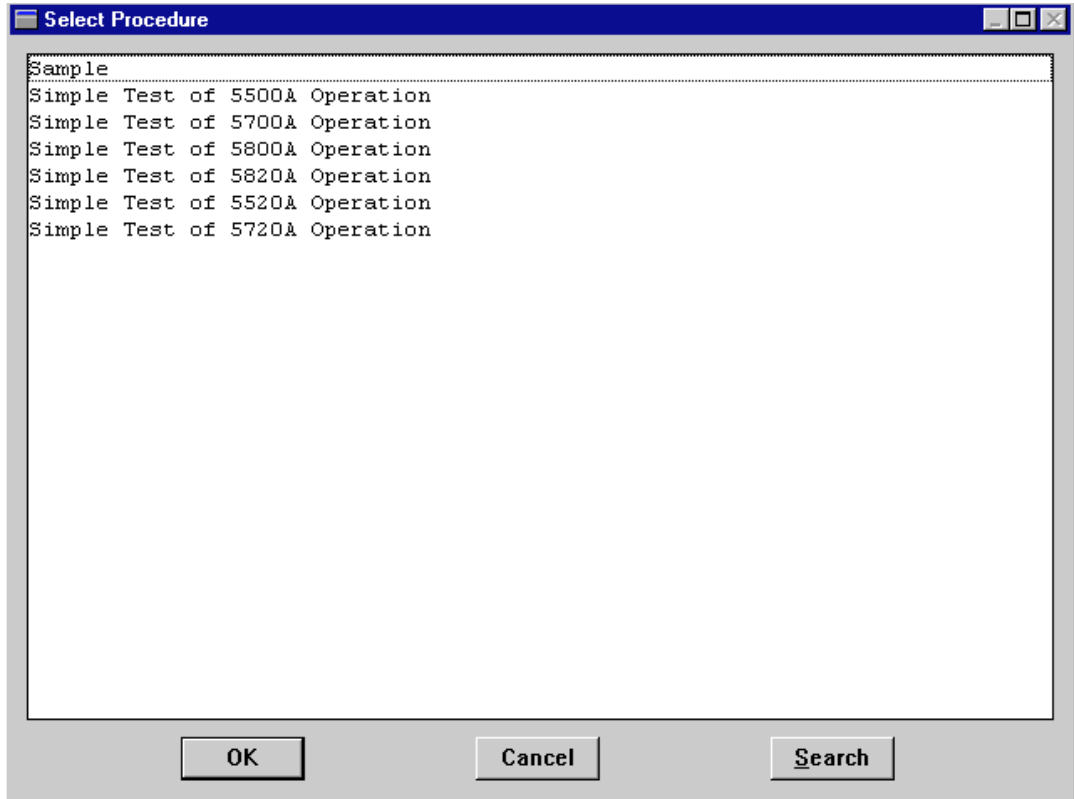
zv603s.tif

Click **OK**. A message tells you that the selected procedure is being loaded, then the procedure listing appears in the Editor window.

Note

*The Select Procedure dialog box displays the names of ALL procedures, whether they have been compiled or not, including those that are marked **hidden**.*

Saving a Procedure

Save Procedure either saves a new Calibration Procedure or saves changes you made to the current one. The Save Procedure selection saves a Calibration Procedure to the Procedure Directory from which it was opened. If the procedure is new or was loaded with **Open Text File**, it is saved to the default directory. You can save compiled or uncompiled procedures. If you save an uncompiled procedure, the procedure does not appear in the Procedure Selection dialog box in the Run Time application.

To save a procedure, first make sure the file you want to save is in the active window. Select **File**, then **Save Procedure**. This selection uses the procedure instrument name to save a procedure. In the status line of the Editor, a message appears indicating whether you saved an executable or non-executable procedure.

If a naming conflict arises, you are given the option of either overwriting the current name or giving the procedure a new name.

Saving a Procedure to the Default Directory

This operation is identical to **Save Procedure** with the exception that the procedure is saved to the default directory unconditionally.

Opening a Text File

Open Text File lets you open any text file and view it.

Note

If you do not perform Step 1 below, MET/CAL will attempt to compile the text file you load, because it assumes the text file is a procedure. Step 1 must be performed if you want to use the Editor to view or modify non-procedural text files.

To open a text file, proceed as follows:

1. From the menu, select **Configure**, then **Text Mode**.

2. From the menu, select **File**, then **Open Text File**.

The Open dialog box appears.
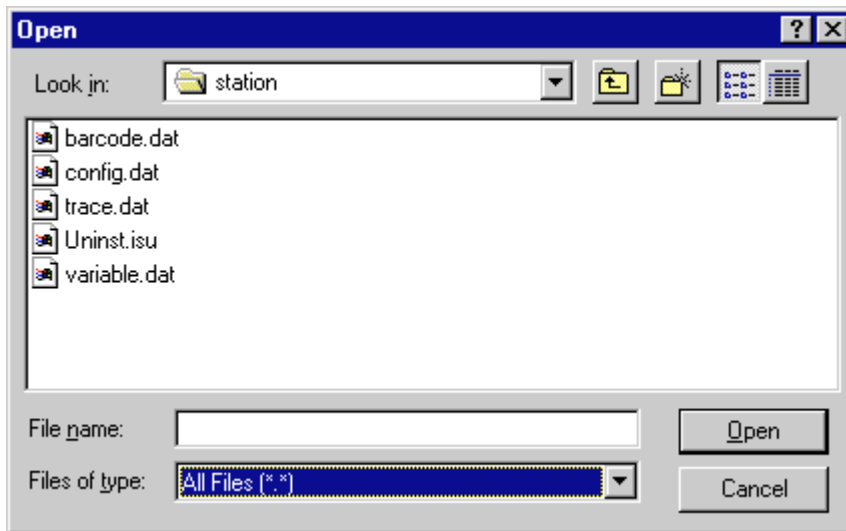
zv604s.tif

3. Highlight the file name and select **Open**.

   The text of the file appears in the Editor window.

Saving a Text File

Save Text File lets you save the contents of the active window as a text file. Text files are free format and do not have special protection. Except where noted, case is not significant.

To save a text file, open the file and select **Save Text File**. A prompt appears if you have not yet specified a text file name for the procedure.

In the status line of the Editor, a message appears indicating the file is saved. The message indicates the name and location of the procedure.

Save As

Save As has two submenus: **Save As Compiled Procedure** and **Save As Text Procedure**. **Save As Compiled Procedure** is functionally the same as **Save Procedure** except that you can select the directory to which the compiled procedure will be saved. **Save As Text Procedure** opens a dialog box that lets you save a new or changed procedure as a text file under a new name, directory, and /or drive.

To save a procedure, proceed as follows:

1. Select the procedure you want to save.

2. From the File menu, click **Save As.**

   A dialog box opens.

3. Type in the new file name in the File Name field.

4. Select a directory to store the file and click **OK**.

   In the status line of the Editor, you get a message indicating the full pathname of the saved file.

Printing a Procedure

Print opens a dialog box that lets you print the current procedure. To print a procedure, proceed as follows:

1. Open the procedure you want to print.

2. From the File menu, select **Print**.

   A Print dialog box appears.

3. Choose the options you want and select **OK** to print the active procedure.

Print to File

Print to File lets you save the contents of the active window to a file with all format and printer codes. To print to a file, proceed as follows:

1. Open the procedure you want to print.

2. From the File menu, select **Print**.

3. Select Print to File, then **OK**.

   A Print to File dialog box appears.

4. Type in a name for the file to which you want to print. Enter a name different from the original to avoid overwriting the original file.

5. Select **OK**.

Print Setup Options

Print Setup lets you change the type of printer used, the page orientation, and the paper size. Depending on the printer available in your system, this selection has additional options that let you send the file as an encapsulated postscript file, remove margins, and create and send a header. Advanced options allow you to send particular true type fonts and manipulate graphics in your document.

Hiding a Procedure

Hide Procedure allows you to hide procedures in the default procedure directory. Hidden procedures are not visible in the Run Time application.

Deleting a Procedure

Delete Procedures allows you to delete procedures from any valid compiled procedure directory.

Copying a Procedure

Copy Procedures allows you to copy a compiled procedure from one directory to another.

Change the Default Directory for Compiled Procedures

Change Default Directory sets the directory used by **Save Procedure**, **Save to Default Directory**, and **Hide Procedure**.

Modifying Procedures

The Edit menu lets you modify procedures by selecting text within a procedure and choosing a command to make the desired changes. This section describes how to select and edit text within a procedure.

Using the Basic Edit Functions

The following paragraphs describe how to manipulate text within a procedure. These functions all start from the Edit menu.

Cut

Cut lets you cut selected text out of a procedure. Place your cursor at the beginning of the text you want to cut. Hold down the left mouse button and drag the cursor to highlight the text. Select **Cut**. The text is removed from the procedure and placed into the Windows clipboard, ready to be pasted.

Copy

Copy lets you copy selected text from one part of a written procedure to either another part of a procedure or a different procedure. To copy text, highlight the text you want to copy and select **Copy**. The text is copied into the Windows clipboard, ready to be pasted.

Copy to

Copy To lets you copy selected text to a file. Be sure this is what you want to do. If you have any data in the file you are copying to, it is overwritten.

Paste

> **Paste** lets you insert the contents of the Windows clipboard at the current cursor position. The cursor may be positioned within any document window. To paste text after you copied or cut it, place the cursor where you want the text placed. From the Edit menu, click **Paste**. The text is positioned after the cursor.

Delete

> **Delete** lets you delete selected data from a document. This selection is different than the Cut selection because once you delete information from a document, it cannot be recovered. To delete text, highlight the text you want removed and press **Delete**. Pressing **Delete** when the cursor is on a blank line deletes the line.

Break

> **Break** lets you split a line in a procedure at the point the cursor is positioned and to start a new line. To break a line, place the cursor where you want the line to break and press Ctrl **+** Enter, or click **Break**.

Inserting a File

> **Insert File** lets you insert the text of an external text file at the cursor position in the opened procedure. This is different from cut and paste or copy and paste. When you select a file that you want to insert into the new procedure, **Insert File** copies and pastes everything in the source file. To insert a file, proceed as follows:

1. From the Edit menu, select **Insert File**.

    The Insert dialog box opens.

2. Select the file you want inserted into the active procedure, the select **OK**. The file is inserted into the active procedure and the dialog box closes.

Finding Text in a Procedure

> **Find** lets you search for a text string. The editor searches forward or backward until the first occurrence of the text is found.

To find text, proceed as follows:

1. From the menu, select **Edit**, then **Find**.

    The Find dialog box appears.

2. In the **Find What** field, type in the text you are looking for.

3. Choose the options you want to use to control the search. You can specify the case sensitivity and direction (up or down in the procedure) of the search.

4. To start the search, click **Find Next**.

If you find the selection you want to change, click **Cancel** and make your changes.

To continue with the search, from the Edit menu, click **Find**. The Find dialog box remains available until you click **Cancel**.

If the text for which you are searching occurs once in the procedure, the following message appears on the status line at the bottom of the screen:

```
Search string found at current position.
```

Find Next

Find Next provides an alternate way to continue searching for text that you have specified in the Find dialog box. Use Find Next when you want to use the Find command without displaying the Find dialog box. You must have previously specified text under the Find option for this to work.

1. From the Edit menu, select **Find Next**.

The found text is highlighted in the procedure, but a Find dialog box does not appear.

2. Select Find Next or F3 to continue searching.

Replacing Text in a Procedure

Replace lets you search for a specified text string and replaces each occurrence with different text. Replace lets you change text without performing cut and paste. To replace text, proceed as follows:

1. From the Edit menu, select **Replace**.

The Replace dialog box appears.

2. In the **Find What** field, type in the text you want to find.

If you used the Find or Replace options in the current session, the text from the previous search is already there. Type over the text to search for a different string.

3. Tab to the Replace With field and type in the replacement text.

4. Choose whether or not you want to match the case and select **Find Next** to start the search and replace operation.

When a string is found, the following options become available:

- **Find Next** goes on to the next occurrence of the string and does not perform a replacement.

- **Replace** confirms a replacement.

- **Replace All** replaces all strings without confirmation.

- **Cancel** quits replace. The cursor remains where it was prior to quitting.

Adjustment Statement

Adjust indents a procedure line so the FSC is in the RANGE field. It is used only if the result of evaluation of the previous regular procedure step resulted in a MARGINAL or FAIL condition. For more information about Adjust, refer to the section titled "Adjustment Statement" in Chapter 1 of the Reference Manual.

Continue Statement

Continue lets you mark the current line as a continuation of the previous line. This is useful for certain FSCs that allow multi-line statements. For more information about Continue, refer to the section "Continuation" in Chapter 1 of the *Reference Manual*.

Naming a Procedure

Name Procedure specifies a procedure name. A procedure can have up to six names. The Editor keeps track of all names (instrument lines) and knows that all six names belong to one procedure.

To name a procedure, from the menu bar, select **Edit**, then **Name Procedure**. The Instrument: line appears. Type in the name you want for the procedure and press `↵ Enter`. The name appears in the title bar of the active window.

For more information about naming a procedure, refer to "Naming a Procedure", in Chapter 1 of the Reference Manual.

Name Conflicts

A name conflict exists if any of the possible six names of one procedure is the same as a name in another procedure. These problems may occur when you modify or create new procedures with names already in the Procedure Directory.

Compiling Procedures

The Procedure Compiler is integrated with the Procedure Editor. The compiler checks the correctness of each procedure statement. Once the FSC is recognized, the compiler checks the correctness of individual fields within the line, and then the interdependencies of the lines.

The Compile menu displays selections that compile procedures forward and backwards, and individual lines of procedures. The Compile menu options are the following:

- Check line
- Next Error
- Previous Error
- Rewarn
- TUR Report

Checking a Procedure Line

Check Line checks the contents of the current line for errors, and reports errors in the error window. Errors must be corrected before you can run the procedure. If no errors are present, the line is formatted and fields are lined up under the correct columns. If the line contains an instrument evaluation FSC, the Test Uncertainty Ratio (T.U.R.) is calculated in most cases. If the T.U.R. is less than the "tur_lim" parameter specified in "metcal.ini," a warning message is generated and presented in the Error window. T.U.R. warnings are not considered errors, and so do not prevent a procedure from being executable. The procedure writer must verify that the new procedure is adequate, and that the standards used are satisfactory for the calibration to be performed.

Automatic Line Check is operating as long as the Editor is not operating in Text Mode. The same checking as described above is performed on every procedure line as you enter it. When you press $\boxed{\leftarrow \text{Enter}}$, the line check is triggered. If no errors are found, the line is formatted, and the cursor is placed on the next line ready for the next procedure statement.

Checking for the Next Error

Next Error lets you compile a procedure from the current line forward until an error is reached or until the entire procedure is compiled. If the last line is reached with no errors found, the compiler jumps to the top of the file and continues checking the procedure until the original line is reached or an error is found.

If the procedure contains no errors, the compiler checks for interline dependencies. For example, it checks for missing jump destinations, duplicate jump destinations, and incorrect indentation. If no compilation errors are found, the following message displays at the bottom of the screen:

No Errors. Procedure Executable.

If the procedure contains an error, an error window appears and indicates what the error is.

The cursor is positioned on the line containing the error in the procedure window. If the procedure window is not active, click the title bar to activate it.

Note

It is best to position the error window so that it does not overlap the procedure window. This allows the procedure window to remain active when the error window indicates an error.

Checking for a Previous Error

Previous Error is exactly the same as **Next Error**, except the procedure is scanned from the current line backward, rather than forward.

Rewarn

Normally, a Test Uncertainty Ratio (T.U.R.) warning is displayed only once. Subsequent compilation does not redisplay a warning unless you have modified the corresponding procedure statement. To override this, use Rewarn to enable all prior warnings in the active procedure.

T.U.R Report

T.U.R Report lets you create procedures with special comments that show the T.U.R. following each evaluation. A T.U.R. report helps you identify and address those tests where the application did not have enough information and either made an estimate or did not compute the T.U.R. These comments may indicate that the T.U.R. cannot be computed or was estimated based on range information. To generate a T.U.R. report, proceed as follows:

1. Open a procedure or use the one you are creating.

2. If the procedure is not compiled, compile the procedure. A T.U.R. report cannot be generated for a non-executable procedure.

3. From the Compile menu, select **T.U.R. Report**.

   A message indicates that the report is being generated. Then, a new window shows the procedure with the T.U.R. information embedded in it as comment lines.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ═ │                      MET/CAL Editor                      │ ▼ │ ▲ │
├─────────────────────────────────────────────────────────────────────┤
│ File   Edit   Compile   Test Run   Options   Security   Window   About... │
├─────────────────────────────────────────────────────────────────────┤
│ ┌───┬──────────────────────────────────────────────────────────────┐ │
│ │ ═ │              * Fluke 51: (1 year) CAL VER                      │ │
│ ├───┴──────────────────────────────────────────────────────────────┤ │
│ │ Fluke Corporation                             MET/CAL Procedure   │ │
│ ├═════┬─────────────────────────────────────────────────────┬──────┤ │
│ │ │ ═ │                  T.U.R. Report                  │ ▼ │ ▲ │ │
│ ├─────┼─────────────────────────────────────────────────┼──────┤ │
│ │INST │  1.012  DISP       If the Fluke [MEM2] is not setup for a type K │ ▲ │ │
│ │INST │  1.012  DISP       thermocouple, turn it off and then on again.  │   │ │
│ │DATE │  1.013  DISP       Setup the Fluke [MEM2] to display degrees C if not │ │
│ │AUTH │  1.013  DISP       already doing so.                           │   │ │
│ │REVI │  1.014  5500       -182.0degC       0.9U                  _K TC │   │ │
│ │ADJU │#! WARNING:  Test Tol 0.9, Sys Tol 0.25, TUR 3.6000 (<  4.00).  │   │ │
│ │NUMB │  2.001  5500       -89.0degC        0.8U                  _K TC │   │ │
│ │NUMB │#!          Test Tol 0.8, Sys Tol 0.14, TUR 5.7143 (>= 4.00).   │   │ │
│ │CONF │  3.001  5500       530.0degC        1.2U                  _K TC │   │ │
│ ├═════┤#!          Test Tol 1.2, Sys Tol 0.19, TUR 6.3158 (>= 4.00).   │   │ │
│ │ STE │  4.001  5500       1355.0degC       2.1U                  _K TC │   │ │
│ │# So │#!          Test Tol 2.1, Sys Tol 0.3, TUR 7.0000 (>= 4.00).    │   │ │
│ │# Th │  5.001  JMPT       9.002           Fluke 51: (1 year) CAL VER  │   │ │
│ │ 1.  │  5.002  HEAD       DEGREES C, INPUT 2: {K-TYPE}               │   │ │
│ │ 1.  │  5.003  PIC        55_52_K2                                    │   │ │
│ │ 1.  │  5.004  DISP       Select Input 2.                            │   │ │
│ │ 1.  │  5.005  5500       -182.0degC       0.9U                  _K TC │ ▼ │ │
│ │ 1.  ├◄──┬────────────────────────────────────────────────────┬►─┤ │
│ │ 1.  │                                                          │   │ │
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└─────────────────────────────────────────────────────────────────────┘
```

il605s.tif

4. If you want to save the procedure with TUR information embedded, click Save Procedure.

   A message indicating that you have a name conflict appears. Click **OK**.

5. Another message appears asking if you want to overwrite the procedure that does not have TUR information embedded in it with the procedure that does. To overwrite, select **Yes**.

Note

When a new T.U.R.. report is generated, previously generated T.U.R. comments are stripped out.

Test Run Menu

Test Run lets you execute a procedure and to see how the procedure performs while it is being created or modified. You do not need to store a procedure in the Procedure Directory to test run it.

The procedure must be executable before you can perform a Test Run; if not, a warning message is shown asking you to check for errors. Check for errors using Next Error (F9).

When you test run, you are not asked for pre- and post-calibration information, and no results are written to the database. To test run a procedure, proceed as follows:

1. Select **Test Run** from the menu bar.

The following options are available:

*   **Go**. Runs procedure from the line where the cursor is currently positioned Does not reset global procedure data.

When the procedure is completed or terminated, the values of certain parameters are remembered, so that the next time you execute the procedure, it is not necessary to repeat the test steps that establish those values.

For example, the ASK flags are typically defined close to the top of most procedures. You want to keep those settings even if you do not restart execution with the first line in the procedure. Remembering values provides the advantage of rerunning procedure segments with the test environment in the same condition each time. The first time you test run a procedure, start with those lines that assign values to those parameters.

The system remembers the following parameters:

*   ASK flags, created using the ASK- and ASK+ FSCs.

*   Memory variables MEM, MEM1, MEM2, and M1 through M255.

*   Values created with Instrument Setup FSCs (For example, MMFC, MCAL, and M606 FSCs).

*   MESS message buffers, created with the MESS FSC.

*   DRAW parameters, created with the DRAW FSC.

*   SET settings table, created with SET FSCs.

*   **Restart**. Runs a procedure from the top even if the cursor is not positioned at the beginning of the procedure. **Restart** also re-initializes global procedure data before the procedure runs.

*   **Show**. Brings the Test Run window to the top to resume testing the procedure. While operating Test Run, you may need to switch to the Procedure window. This action covers the Test Run window.

1. Select one of the options.

The Test Run menu appears.

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The following describes the function of the buttons and check boxes:

- **Run** executes a procedure. As the procedure runs, it halts only to prompt the user for information.

- **Step** executes the current statement and then pauses, waiting for the user to choose **Step**, **Run**, or **Quit**.

- **Stop** lets you stop execution when running a closed-loop procedure.

- **Quit** lets you exit Test Run and returns you to the Editor.

- **Demo** lets you run procedures without having instruments connected. Ordinarily, if a procedure attempts to communicate with an instrument, and no instrument is connected, the Editor generates a warning and the instrument will time out waiting for a response. Demo mode runs the procedure as if instruments actually are connected, but does not do a real I/O.

- **ASK** displays how the ASK flags are set in the procedure. ASK flags are control flags that affect automatic operation and/or messages. If you want brief description of what function each ASK flag performs, click the desired flag. The information about the selected ASK flag appears in the status line of the Editor. For more information about the ASK flags, refer to *ASK+* and *ASK-* in Chapter 2 of the Reference Manual.

- **N-Reg** shows the numeric registers and displays the values for MEM, MEM1, and M1-255 registers. For more information about MEM, MEM1, and M1-255, refer to the *MEME* and *MATH* FSCs in Chapter 2 of the Reference Manual.

- **S-Reg** shows the MEM2 string registers. For more information about MEM2, refer to *MEM2* in Chapter 2 of the Reference Manual.

2. After selecting a Test Run option, follow the instructions.

3. After you quit Test Run, you return to the Editor.

Configure Menu

Selections on the Configure menu let you:

- switch between Text mode and Procedure mode

- choose the font used in displaying and printing the active Edit window

- configure the instruments that make up the workstation

- inform MET/CAL of number and type of IEEE-488 boards installed in the PC

- configure the defaults serial port for control of serial UUTs

- configure humidity and temperature sensor

Text Mode

Text Mode lets you make changes to a text file other than a Calibration Procedure. In the Text mode, procedure syntax checking and compiling features are disabled. You can load, edit, and save text files. When you remove the check mark from the Text Mode menu item, full procedure checking is again available.

Font opens a Font dialog box and lets you make changes to the font, font style, and font size in the procedure that you are working on. To change a font, proceed as follows:

1. From the Configure menu, click **Font**. The Font dialog box opens. Refer to the following figure.
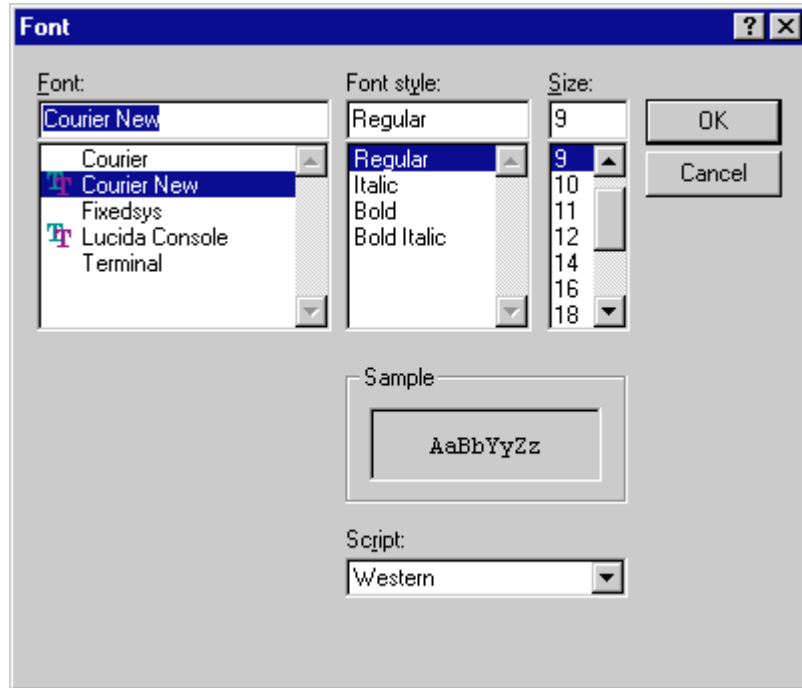
zv607s.bmp

2. Select the font, font style, and size, and click **OK**. The font is changed only for the active edit window.

Instruments

The **Configure** menu provides a way to change the system instrument configuration. When you select **Instruments**, a small dialog box appears that contains a listing of all the currently configured instruments.

The following describes the function of the buttons:

Add   Opens a second dialog box listing all the instrument FSCs available. From this, select the instrument you wish to add to the configuration. After you select one, you are immediately placed into the Edit Instrument dialog box, described next.

Edit   Only available when one of the currently configured instruments is selected, (or opens automatically as a result of selecting an instrument to add). Opens a dialog box permitting port selection, alias assignment if desired, and specification of any options.

Delete   Deletes an instrument from the configured instrument list.

MET/CAL maintains the list of configured instruments. Associated traceability information for configured instruments is stored in the database.

Before you can use calibration instruments, you must identify which instruments are configured in the system.

A configured instrument is a traceable calibration standard. There are three types of configured instruments:

System Instruments
A system instrument is an instrument for which the Fluke Metrology software provides a built-in instrument driver. For each system instrument there is a corresponding FSC in the procedure language. For example, the "5700" FSC is used to control the Fluke 5700A.

Fluke Metrology software supports over 30 different system instruments.

User-Configured Instruments
A user-configured instrument is one that is remotely controlled, but has no built-in driver. A procedure writer uses the PORT and IEEE FSCs to control user-configured instruments.

The PORT FSC is used for instruments with a serial interface (RS-232) and the IEEE FSC is used for instruments with an IEEE-488 interface.

You do not need to make an instrument user-configured in order to communicate with the instrument using a Calibration Procedure. There are two advantages in using a user-configured instrument:

- A user-configured instrument can have an address and an alias. The alias is a symbolic name by which a procedure can refer to the instrument. Using an alias improves procedure readability and portability.

- A user-configured instrument is traceable and can be used in reports. Before starting a procedure that uses a user-configured instrument, the software first checks to make sure the instrument is in cal.

Also note that user-configured instrument specifications are subject to the same format and syntax rules as system devices, with the following additional restrictions:

- A user-configured device cannot have attached secondary devices.

- A user-configured device cannot have optional attribute specifiers.

Manual Instruments
A manual instrument is one that is not remotely controlled by the system, but is used as a calibration standard, so it must be traceable. Manual instruments can encompass a wide range of device types. Examples include the Fluke 792A AC/DC Transfer Standard, the Fluke A40 Current Shunts, or a manual device such as a micrometer. The STD (Standard) FSC is used in a Calibration Procedure to require that an instrument be configured as a manual instrument standard. The DISP (Display) FSC is then used to inform the operator of setting or connection changes required when using the standard during execution of the calibration procedure.

Note

When configuring a new instrument, remember to also add traceability information to the database.

Modifying the Instrument Configuration

To add, delete, or change an instrument, the following steps are required:

1. Physically replace the instrument.

2. Edit the Configuration.

   To edit the Configuration, use the Editor application. Under the Configure Menu, select **Instruments**.

3. Update the configuration information.

4. Use the Manual Entry application to add or modify traceability information in the database.

IEEE-488 Boards

A dialog displays that allows you to specify the number (0, 1, or 2) and model of the IEEE-488 boards installed in your PC.

Default Serial Port

A dialog displays that allows you to specify the default port that the PORT FSC uses to control UUTs that have a serial interface.

Humidity and Temperature Sensor

This menu item allows you to configure a Fluke 5000A-RH/T Precision Humidity and Temperature Data Logger for use with MET/CAL. For further information concerning the 5000A-RH/T, refer to the document **rht.pdf** on the MET/CAL CD.

Chapter 7
Customizing the Run Time Application

Contents   **Page**

Introduction

This chapter describes how to customize an individual Calibration Workstation.

A number of editable files affect the Run Time environment. Changing them provides the ability to customize the operation of the MET/CAL and 5500/CAL Run Time applications. Table 7-1 lists the files that control the way the software operates.

Table 7-1. Overview of the MET/CAL Control Files

DEFAULT FILENAME	FUNCTION	SEE PAGE
METCAL.INI	MET/CAL Initialization File	7-5
PROMPTDB.TXT PASS_DB.TXT FAIL_DB.TXT	Contain prompts to the user. The first set of prompts displays after selecting but before executing a calibration procedure. The PASS and FAIL prompt files display prompts upon completion of a procedure; which one the software uses depends on the result of the procedure.	7-24

Note

The actual names of the prompt file are set in the initialization file, METCAL.INI. Except for the initialization file itself, these filenames can be changed by editing METCAL.INI.

MET/CAL Initialization File Parameters

4xxx Selected Device Clear (Optional)

```
4xxx_clr_sdc = yes │ no
```

4xxx_clr_sdc controls whether the Datron 4000(A)/4200(A)/47xx/4800(A) driver clear function sends a Selected Device Clear (SDC) to the instrument. If **4xxx_clr_sdc** is not specified in the initialization file, the default is **4xxx_clr_sdc = yes**.

525A IEEE-488 Interface (Optional)

```
525A_488 = yes │ no
```

525A_488 controls whether to allow the configuration of the Fluke 525A on an IEEE-488 interface. If **525A_488** is not specified in the initialization file, the default is **525A_488 = yes**.

525A IEEE-488 Input Terminator (Optional)

525A_488_iterm = LF | CR | EOI

525A_488_iterm specifies the input terminator for the 525A driver when the 525A is configured as an IEEE-488 device. If **525A_488_iterm** is not specified in the initialization file, the default is **525A_488_iterm = EOI**. If a 525A is controlled by an IEEE-488 to RS-232 converter, **525A_488_iterm** must be set to **CR**.

9100 Manufacturer (Optional)

9100_mfg = *string*

In the event that the manufacturer names accepted by the 9100 driver do not conform to firmware in the actual 9100 used, the manufacturer names may be overridden on a per-workstation basis by specifying **9100_mfg**. For example, specifying **9100_mfg = Yokogawa-Datron** in the **[startup]** section of the MET/CAL initialization file will cause the 9100 driver to accept *Yokogawa-Datron* as a valid manufacturer name returned in response to the *IDN? query.

9500 Manufacturer (Optional)

9500_mfg = *string*

In the event that the manufacturer names accepted by the 9500 driver do not conform to firmware in the actual 9500 used, the manufacturer names may be overridden on a per-workstation basis by specifying **9500_mfg.**

Accuracy Check (Optional)

acc_check = yes | no

acc_check controls whether or not accuracy file headers are read and cross-checked against the database.

When **acc_check = yes** the following steps are performed:

1. Determine the instrument name associated with the FSC (example FSC: 5700, instrument name: Fluke 5700A).

2. Retrieve the asset number associated with the instrument name from the instrument configuration.

3. Retrieve the calibration interval for the asset from the database.

4. Search the MET/CAL accuracy file directory for an accuracy file with a header which contains the same instrument name and interval.

When **acc_check = no**, *fsc*.acc in the MET/CAL accuracy file directory is unconditionally used for accuracy information for the FSC specified. If **acc_check** is not specified in the initialization file, the default is **acc_check = yes**.

ACCF FSC Relative Path (Optional)

```
accf_acc_rel = yes | no
```

accf_acc_rel which controls whether or not partial path specifications in ACCF statements are interpreted as relative to the MET/CAL accuracy directory and cross-checked against the database.

If the initialization file does not contain an **accf_acc_rel** specification, then, by default, a partial path specification in an ACCF statement is taken to be relative to the MET/CAL accuracy directory. I.e., omitting the **accf_acc_rel** specification is equivalent to **accf_acc_rel** = **yes**.

Prior to V6.0 prior path specifications in ACCF statements were always taken to be relative to the Current Working Directory (CWD). That is, the accuracy file was simply opened using the name exactly as specified in the ACCF statement. In V6.0, in order to run a system compatible with V5.11 and previous (in this respect), it is necessary to explicitly add **accf_acc_rel** = **no** to the initialization file (**[startup]** section).

ASK C-Flag Default (Optional)

```
ask_c_default = yes | no
```

ask_c_default allows the default state of the ASK C-flag to be set. For MET/CAL V4.2 and previous, this initialization file parameter did not exist, and the default was **ASK+ C**. Therefore, for compatibility with previous versions of MET/CAL, if **ask_c_default** is not specified in the initialization file, the default is **yes** (**ASK+ C**). To change the default to **ASK- C**, it is necessary to add the line **ask_c_default** = **no** to the initialization file.

ASK X-Flag Default

```
ask_x_default = yes | no
```

This parameter determines the default state of the ASK X-flag.

- **yes** (default is **ASK+ X**)
- **no** (default is **ASK- X**)

Auto Author (Optional)

```
auto_author = yes | no
```

auto_author controls whether or not the Editor automatically inserts the full name of the current user in procedure **Author:** lines which are automatically generated. If **auto_author** is not specified in the initialization file, the default is **auto_author** = **yes**.

Accuracy File Directory

accdir = *accuracy_file_directory*

This is directory where MET/CAL looks for accuracy files.

Beep

b**eep** = *beep_delay***[**,*beep_count***]** | **none** | **off**

beep enables or disables one or more beeps when an operator message or prompt is displayed. **beep** specifies the count and the inter-beep delay (in seconds). If **none** or **on** is specified, the run time beep is disabled. There is no difference between **none** and **off**. Otherwise, the delay must be a valid floating-point format number between 0.0 and 3600.0. The beep count is optional. If specified, it must be a valid integer between 0 and 100. If beep count is not specified, it is set to 1. Note that setting the beep count to zero has the same affect as specifying **beep** = **off** or **beep** = **none**.

CaretWidth (Optional)

CaretWidth = 1, 2, 3,… 300

Specifies the caret width.

Confidence (Optional)

confidence = 0.0 to **4.0**

confidence specifies the value of the confidence parameter used in the measurement uncertainty calculation. The setting of **confidence** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Configuration File

config = *instrument_configuration_file*

File where MET/CAL stores configured instrument information.

Correct Exact Match (Optional)

cor_exact = yes | **no**

cor_exact determines what is printed in the *corrected* column (**C**) in the test results window, when an exact match is obtained for the system actual value in a correction file. When **cor_exact** = **yes**, **X** is printed in the *corrected* column when an exact match is obtained. When **cor_exact** = **no**, **Y** is printed in the *corrected* column when an exact match is obtained. If **cor_exact** is not specified in the initialization file, the default is **cor_exact** = **no**.

Correction File Directory

correctdir = *correction_file_directory* | **none**

Directory where MET/CAL looks for correction files.

Coverage Factor (Optional)

coverage_factor = 0.0 to **4.0**

coverage_factor specifies the value of the coverage factor parameter used in the measurement uncertainty calculation. The setting of **coverage_factor** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Database Procedure (Optional)

db_proc = yes | **no**

db_proc controls where MET/CAL gets the name of the associated procedure when a procedure is selected by asset or by workload. When **db_proc** = **yes**, if a procedure is selected by asset or by workload, the name of the associated procedure is fetched from the database. When **db_proc** = **no**, the name of the associated procedure is looked up in the barcode file (also know as the asset map file). If **db_proc** is not specified in the initialization file, the default is **db_proc** = **yes**.

DOS Special Construction Evaluation (Optional)

dos_sc_eval = yes | **no**

dos_sc_eval controls whether or not MET/CAL special constructions should be evaluated when they appear in arguments to user programs in DOS/DOSE procedure statements. If **dos_sc_eval** is not specified in the initialization file, the default is **dos_sc_eval** = **yes**. **dos_sc_eval**.

DTR Disable (Optional)

dtr_disable = yes | **no**

dtr_disable controls whether the DTR line is raised or not when DTR handshaking has not been selected.

- **dtr_disable** = **yes,** force DTR low

- **dtr_disable** = **no,** force DTR high

If **dtr_disable** is not specified in the initialization file, the default is **dtr_disable** = **no**.

F (Optional)

F = 0.0 to **4.0**

F specifies the value of the F parameter used in the measurement uncertainty calculation. The setting of **F** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Fail Prompt File

fail_prompt = *fail_prompt_file*

fail_prompt specifies the name of the post-run prompt file used when the overall result is a fail.

Force Uppercase in Database Fields (Optional)

forcecase = 1 | 0

forcecase controls whether or not data written to the SQL database are forced to upper case.

- **forcecase = 1**, string data forced to uppercase.

- **forcecase = 0**, string data not forced to uppercase.

If **forcecase** is not specified in the initialization file, the default is **forcecase = 1**.

Head FSC Font (Optional)

head_font = system | display

head_font specifies whether HEAD statements use the *System* or *Display* font. If **head_font** is not specified in the initialization file, the default is **head_font = display**.

Help File Directory

helpdir = *help_file_directory*

Directory where MET/CAL looks for help files.

HP 8903 Type (Optional)

```
hp8903 = A │ B │ E
```

hp8903 specifies the particular model of the user's HP 8903 (if any). The default is HP 8903B. The fact that the default is HP 8903B has no significance when there's no HP 8903 at all in the system. The reason it is necessary to have the **hp8903** parameter is that no method has been determined by which MET/CAL can query an HP 8903 to determine it's type (**A**, **B**, or **E**).The real need is simply to determine: Is it or is it not an HP 8903A? I.e., the code will not behave differently if **hp8903** is set to **B** rather than **E**. (In the future, this could change, however.)

IEEE-488 Boards: I/O Address

```
ib_ioaddr = i/o_address
```

ib_ioaddr specifies the addresses of both the primary and secondary IEEE-488 boards within the address space of the PC. This parameter is updated by the **Configure**=> **IEEE-488 Boards** menu selection in the Editor and Run Time applications.

IEEE-488 Boards: Number of Ports

```
ib_nport = 0, 1, or 2
```

ib_nport specifies the number of IEEE-488 boards configured in the system. This parameter is updated by the **Configure**=>**IEEE-488 Boards** menu selection in the Editor and Run Time applications.

IEEE-488 Boards: Type

```
ib_type = board_type
```

ib_type specifies the type of IEEE-488 boards configured in the system. Where *board_type* is:

- **PC2B(T)**   National Instruments GPIB PCII/IIA
- **PC2A**   National Instruments PC2A
- **PCMCIA-GPIB**   National Instruments PCMCIA-GPIB
- **AT-GPIB/TNT**   National Instruments AT-GPIB/TNT
- **AT-GPIB/TNT(PNP)** National Instruments AT-GPIB/TNT(PNP)
- **PCI-GPIB**   National Instruments PCI-GPIB
- **GPIB-USB-A**   National Instruments GPIB-USB-A
- **none**   only allowed when **ib_nport = 0**

This parameter is updated by the **Configure**=> **IEEE-488 Boards** menu selection in the Editor and Run Time applications.

IEEE-488 Demo Mode Prompt (Optional)

```
ieee_demo_prompt = yes │ no
```

ieee_demo_prompt determines whether the IEEE FSC should prompt the operator (when necessary) for the IEEE-488 address in demo mode. For MET/CAL V4.2 and previous, this initialization file parameter did not exist. For compatibility with previous versions of MET/CAL, If **ieee_demo_prompt** is not specified in the initialization file, the default is **ieee_demo_prompt** = **yes**.

In Calibration is Required (Optional)

```
in_cal_req = yes │ no
```

in_cal_req determines whether MET/CAL displays a prompt which asks the user if he wishes to continue when a required instrument is out-of-cal. If **in_cal_req** is not specified in the initialization file or **in_cal_req** = **no**, a prompt is displayed which asks the user if he wishes to continue with the out of cal instrument. If **in_cal_req** = **yes**, an out-of-cal instrument causes no warning or prompt.

Logo, Editor and Run Time Startup (Optional)

```
logo = 0, 1, 2,… 20000
```

logo specifies the length time in milliseconds, to display the Editor and Run Time startup logo. If **logo** = **0**, the startup logo is not displayed. If **logo** is not specified in the initialization file, the default is **logo** = **2500** (i.e. the startup logo is displayed for 2.5s).

Measure Only (Optional)

```
measure_only = yes │ no
```

measure_only affects meter drivers in measurement uncertainty mode. If **measure_only** = **yes**, then on the second and subsequent of a series of measurements comprising a test the meter driver will omit the steps required to set up the meter. I.e., the driver presumes the meter remains in the correct setup state and only triggers the measurement and reads the reading. The setting of **measure_only** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Measurement Uncertainty Output File (Optional)

```
mfile = measurement_uncertainty_output_file │ none
```

mfile specifies the name of the measurement uncertainty output file. The setting of **mfile** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Measurement Uncertainty Output File Format (Optional)

```
mfile_format = delim │ delim-q │ delim-std │ verbose
```

mfile_format specifies the format of the measurement uncertainty output file. The setting of **mfile_format** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

MEMC Instrument Repeat (Optional)

```
memc_irpt = yes │ no
```

memc_irpt determines whether or not instrument SETUP and NOMSET statements are by default repeated on the second and subsequent passes through a MEMC or MEMCX test for the measurement uncertainty calculation. For MET/CAL V6.0 and previous, this initialization file parameter did not exist. If **memc_irpt** is not specified in the initialization file, the default is **memc_irpt = yes**, and instrument SETUP and NOMSET statements in MEMC and MEMCX tests will be repeated. This means that, by default, MET/CAL will work differently from V6.00. (Prior to V6.00 there was no measurement uncertainty calculation, so the issue did not arise.) In order to cause MET/CAL to skip instrument SETUP and NOMSET statements in MEMC and MEMCX tests, unless overridden by a procedure level VSET specification of **MEMC_IRPT** or by the addition of a **TARGET** or **TARGET -m** statement to the test, it is necessary to add **memc_irpt = no** to the **[startup]** section of the MET/CAL initialization file.

Number of Measurements to Average (Optional)

```
nmeas = 0, 1, 2,… 1000
```

nmeas specifies the number of measurements to take for the measurement uncertainty calculation. The setting of **nmeas** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Number of Significant Digits (Optional)

```
nsd = 2, 3, 4,… 14
```

nsd is used to specify the number of significant digits in the reported values of the expanded uncertainty (**EXP_UNC**), the standard uncertainty (**STD_UNC**), and the coverage factor (**COV_FAC**). The setting of **nsd** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Number of Measurements to Throw Away (Optional)

nthrow = 1, 2, 3,… 100

nthrow specifies the number of measurements to be discarded before the sequence of measurements to be saved for the measurement uncertainty calculation. The setting of **nthrow** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Out-of-Tolerance Limit

oot_lim = 99.9 to **500**

oot_lim specifies the Significantly Out-of-Tolerance limit. This limit sets the threshold above which a significantly Out-of-Tolerance (OOT) warning is generated to notify the user of the UUT about this condition. The most conservative value, and the one that Fluke recommends, is 100 (%), to that every Out-of-Tolerance condition causes a Notify User warning.

Pass 100%

pass100 = yes | no

pass100 specifies whether a test passes at 100% of tolerance or not.

Pass Prompt File

pass_prompt = *pass_prompt_file*

pass_prompt specifies the name of the post-run prompt file used when the overall result is a pass.

Picture Directory

pidir = *picture_directory*

Directory where MET/CAL looks for picture files.

Port, Default Serial

port = *serial_port*

port specifies the default serial port to be used for RS-232 controlled UUTs. Where *serial_port* is:

COM1	PC COM1
COM2	PC COM2
COM3	PC COM3
COM4	PC COM4
COM5500	Fluke 5500A SERIAL 2 TO UUT
COM5520	Fluke 5520A SERIAL 2 TO UUT
COM5800	Fluke 5800A SERIAL 2 TO UUT
COM5820	Fluke 5820A SERIAL 2 TO UUT

This parameter is updated by the **Configure**=>**Default Serial Port** menu selection in the Editor and Run Time applications.

Power On SRQ GPIB Port 0 (Optional)

power_on_srq0 = error | **prompt** | **clear**

power_on_srq0 controls how MET/CAL handles the situation in which a device on IEEE-488 port 0 is requesting service just prior to the start of procedure execution.

When **power_on_srq0 = error**, MET/CAL does nothing. This means that Post Test will report that the first statement in the procedure was terminated by an SRQ. This is not very satisfactory when a user-configured system instrument always asserts a power-on SRQ and can't be configured otherwise. This option is provided for compatibility with previous versions of MET/CAL. It will turn off the whole check.

When **power_on_srq0 = prompt**, just prior to starting to execute a procedure MET/CAL will check to see if there's an SRQ on IEEE-488 board 0. If there is, the addresses of all configured instruments listening on port 0 are serial polled until a device which acknowledges the SRQ is found. If such a device is found, and the SRQ condition was successfully cleared by the serial poll, the operator is prompted to see if he wishes to continue or to abort the procedure.

When **power_on_srq0 = clear**, MET/CAL does the same thing it does when **power_on_srq0 = prompt**, except there's no prompt to the operator. That is, if the serial poll successfully clears the condition, MET/CAL goes forward as if it hadn't happened.

If **power_on_srq0** is not specified in the initialization file, the default is **power_on_srq0 = prompt**.

Power On SRQ GPIB Port 1 (Optional)

power_on_srq1 = error | prompt | clear

power_on_srq1 controls how MET/CAL handles the situation in which a device on IEEE-488 port 1 is requesting service just prior to the start of procedure execution.

When **power_on_srq1 = error**, MET/CAL does nothing. This means that Post Test will report that the first statement in the procedure was terminated by an SRQ. This is not very satisfactory when the UUT is always assets a power-on SRQ and can't be configured otherwise. Some Tek scopes are this way. This option is provided for compatibility with previous versions of MET/CAL. It will turn off the whole check.

When **power_on_srq1 = prompt**, just prior to starting to execute a procedure MET/CAL will check to see if there's an SRQ on board 1. If there is, the address of the **UUT** is searched for. When the first listener is found, assuming there is one, the search stops. The device is serial polled to see if it acknowledges the SRQ. If it does, and the SRQ condition was successful cleared by the serial poll, the operator is prompted to see if he wishes to continue or to abort the procedure.

When **power_on_srq1 = clear**, MET/CAL does the same thing it does when **power_on_srq1 = prompt**, except there's no prompt to the operator. That is, if the serial poll successfully clears the condition, MET/CAL can go forward as if it hadn't happened.

If **power_on_srq1** is not specified in the initialization file, the default is **power_on_srq1 = prompt**.

Procedure Date Format (Optional)

proc_date_format = *string*

proc_date_format specifies the format for the date string in the procedure header.

Example:

proc_date_format = MM/DD/YYYY

If anything goes wrong in attempting to format the date using the format string specified by **proc_date_format**, silently revert to the default (YYYY-MM-DD).

Format descriptors:

DD	day number
MM	month number
MON	3-letter month name
MONTH	full month name
YY	2-digit year number (for window 1970 - 2069)
YYYY	4-digit year number

Rules:

1. No format code may occur twice.

2. At most one of { MM, MON, MONTH } may occur.

3. At most one of { YY, YYYY } may occur.

4. Other characters are copied unchanged.

Procedure Directory

`pocdir` = *picture_directory*

Default compiled procedure directory.

Procedure Directory Window Minimize (Optional)

`pd_min = yes` | `no`

pd_min enables or disables **Minimize** on Procedure Directory window.

Procedure Title (Left)

`ptitle_l =` *string*

string becomes the left portion of the first line in the header of a procedure.

Procedure Title (Right)

`ptitle_r` = *string*

string becomes the right portion of the first line in the header of a procedure.

Prompt File

`prompt` = *prompt_file* | `none`

prompt specifies file used for pre-run prompts.

Prompt Font (Optional)

`prompt_font = system` | `prompt` | `display`

prompt_font specifies the font to be used for prompts.

Readonly Database Write (Optional)

`readonly_db_write = yes | no`

readonly_db_write determines whether the Run Time allows readonly prompt screen parameter values to be written to the database. For MET/CAL V6.01 and previous, this initialization file parameter did not exist. If **readonly_db_write** is not specified in the initialization file, the default is **readonly_db_write = yes**. This means that if the initialization file does not include the **readonly_db_write** parameter, the Run Time will allow readonly prompt screen parameters to be written to the database.

Readonly Variable (Optional)

`readonly_var = yes | no`

readonly_var determines whether the Run Time writes readonly prompt screen parameter values to the variable file. For MET/CAL V6.11A and previous, this initialization file parameter did not exist. If **readonly_var** is not specified in the initialization file, the default is **readonly_var = yes**. This means that if the initialization file does not include the **readonly_var** parameter, the Run Time will write readonly prompt screen parameters to the variable file. V6.11l and later, are different from previous versions in this regard. A user will have to explicitly add **readonly_var = no** to the MET/CAL initialization file in order to retain the behavior of V6.11A (actually V6.11k) and earlier.

Remove All Connections Prompt (Optional)

`remcon = yes | no`

remcon controls whether or not to display the *Please Remove All Connections..* message at procedure termination. If **remcon** is not specified in the initialization file, the default is **remcon = yes**.

Required Standard Prompt (Optional)

`req_std_prompt = yes | no`

req_std_prompt indicates whether or not the Run Time should prompt for the asset numbers of required instruments whose asset numbers are not specified in the System Configuration File. **req_std_prompt = no** disables this prompt. If **req_std_prompt** is not specified in the initialization file, the default is **req_std_prompt = yes**.

Result Column Template File (Optional)

`rslt_col_template = result_column_template | none`

This parameter specifies the format file that determines the data written to legacy database mode field 2501.

Results Save Mode (Optional)

```
ResultSaveMode = All │ FirstLast │ Last
```

ResultSaveMode specifies the mode for saving repeated test results**:**

- **All**, save all executions

- **FirstLast**, save first and last execution only

- **Last**, save last execution only

If **ResultSaveMode** is not specified in the initialization file, the default is **ResultSaveMode = FirstLast**. The setting of **ResultsSaveMode** in the initialization file may be overriden using the VSET FSC. See VSET FSC in the MET/CAL FSC Reference Manual for a full definition of this parameter.

Run Time Demo Prompt (Optional)

```
rt_demo_prompt = yes │ no
```

rt_demo_prompt determines whether the Run Time should display an informative prompt when a procedure is executed in demo mode. For MET/CAL V5.0 and previous, this initialization file parameter did not exist. If **rt_demo_prompt** is not specified in the initialization file, the default is **rt_demo_prompt = yes**.

Self Calibration

```
self_cal = yes │ warn │ no
```

self_cal specifies the action MET/CAL takes it is determined that UUT asset number is the same as that of a required configured instrument.

If **self_cal = yes**, the workstation is configured to unconditionally allow self-calibration.

If **self_cal = no**, the workstation is configured to unconditionally disallow self-calibration. If the UUT asset number is the same as the asset number of a required instrument, an error message is generated.

If **self_cal = warn,** the workstation is configured to conditionally allow self-calibration. If the UUT asset number is the same as the asset number of a required instrument, the operator is prompted to see if procedure execution should be continued or aborted.

Serial Poll Slow (Optional)

```
serial_poll_slow = 0, 1, 2,… 1000
```

serial_poll_slow enables a special slowed down serial poll routine for HP 890x instruments. The value of **serial_poll_slow** specifies the delay, in milliseconds, to be inserted into the middle of the serial poll. Legal values are 0 to 1000 ms. The default is 500 ms. This means that omitting **serial_poll_slow** from the initialization file is equivalent to specifying **serial_poll_slow = 500**. Setting **serial_poll_slow = 0** disables the feature altogether, causing the normal serial poll routine to be used. Note that the special slow serial poll routine is in any case applied only to HP 890x instruments, and then only if two or more of them are configured.

Show Required Instruments (Optional)

```
show_req_instr = yes │ no
```

show_req_instr determines whether the list of required instruments is shown to the operator prior to procedure execution. For MET/CAL V6.0 and previous, this initialization file parameter did not exist. If **show_req_instr** is not specified in the initialization file, the default is **show_req_instr = yes**. To disable the display, it is necessary to add the line **show_req_instr = no** to the initialization file.

System Type

```
systype = meter │ oscilloscope
```

systype sets a system flag which is used to determine whether automatic range messages are generated with the **/div** (per division) suffix. **systype** also affects the slew message generated by some instrument FSCs.

Test Run Search IEEE-488 Port 0 (Optional)

```
tr_search0 = yes │ no
```

tr_search determines whether or not IEEE-488 port 0 is always searched prior to procedure execution in Test Run. For MET/CAL V6.0 and previous, this initialization file parameter did not exist. If **tr_search** is not specified in the initialization file, the default is **tr_search = yes**. In order to cause Test Run to skip the bus search, except the first time and after a change to the instrument configuration, it is necessary to add **tr_search0 = no** to the **[startup]** section of the MET/CAL initialization file.

Tolerance Reference

```
tol_ref = uut_indicated | nominal
```

tol_ref specifies the reference value for the calculation of the test tolerance. The default is **tol_ref = uut_indicated**. **tol_ref** has no effect unless the TOLERANCE field specifies the test tolerance as a percentage or PPM value. The following calculated quantities are affected by the **tol_ref** setting:

1. Test Tolerance If **tol_ref = nominal**, the test tolerance is calculated with respect to the Nominal value. If **tol_ref = uut_indicated**, the test tolerance is calculated with respect to the UUT Indicated value. Example:

   Suppose you have a MET/CAL test like:

   ```
   ASK+ K
   5500 10V 1%
   ```
   Suppose also that the UUT (a meter) reads 10.1V. If **tol_ref = nominal** the test tolerance is ±0.1V, because 0.1V is 1% of 10V. If **tol_ref = uut_indicated** the test tolerance is ±0.101, because 0.101 is 1% of 10.1V.

2. Test Uncertainty Ratio (T.U.R.)

   The test tolerance is the numerator of the T.U.R., so changing the test tolerance calculation changes the T.U.R.

3. Error

   Except in some special cases (like dBm in the NOMINAL field), MET/CAL displays the error for a particular test as a percentage. If **tol_ref = uut_indicated**, the error is displayed as a percentage of the UUT Indicated value. If **tol_ref = nominal**, the error is displayed as a percentage of the Nominal value.

4. Error % Tol

   MET/CAL calculates the error for a test as the difference between the System Actual and the UUT Indicated. It then displays the error as a percentage of the test tolerance. Since the test tolerance is affected by the **tol_ref** setting as described above, the error expressed as a percentage of the test tolerance is also affected by **tol_ref**.

   It is important to remember that **tol_ref** makes a difference only for tests where the UUT Indicated and Nominal values are different.

   If the system instrument is a source instrument (like a 5700A or 5500A), and the UUT is a meter, **tol_ref** makes a difference for keyboard-entry (ASK+ K) and closed-loop tests, but does not make a difference for tests where the actual output of the calibrator is slewed until the meter reading matches the Nominal value.

TUR Limit

```
tur_lim = 0, 1, 2,… 10 | none
```

tur_lim specifies the Test Uncertainty Ratio (TUR) limit. If a TUR in a procedure is below the limit set, a warning is displayed when the statement is compiled. If this parameter is 0, no TUR warnings are generated.

Use Student's T (Optional)

```
use_st = yes | 1 | no | 0
```

use_st controls whether or not to make use of the Student's T distribution in the measurement uncertainty calculation. (Actually, **use_st** can be set at 3 levels: procedure, initialization file, or database, and the precedence is in the order listed (highest to lowest).)

Setting **use_st = yes** (or, equivalently, **use_st = 1**) in the initialization file indicates that the Student's T distribution should be used in the measurement uncertainty calculation, unless an overriding VSET specification exists in the procedure.

Similarly, setting **use_st = no** (or, equivalently, **use_st = 0**) in the initialization file indicates that the Student's T distribution should not be used in the measurement uncertainty calculation, unless an overriding VSET specification exists in the procedure.

Notice that not specifying **use_st** at all in the initialization file is equivalent to neither **use_st = yes** nor **use_st = no**. In this respect **use_st** is unlike most other optional initialization file parameters. Thus, in order to have the database **use_st** specification take effect, it is essential that **use_st** not be specified in the initialization file.

User Current Working Directory (Optional)

```
user_cwd = user_current_working_directory | none
```

user_cwd specifies the working directory for user programs. That is, it becomes the current directory for an executing user program. Unless otherwise specified (see **user_prog_dir** below), it also becomes the directory where MET/CAL looks for user programs (unless a full path or partial path specification is given in the procedure), and becomes the directory where the DOS/DOSE data file is created and accessed (see **user_data_dir** below).

User Data Directory (Optional)

```
user_data_dir = user_data_directory | none
```

user_data_dir specifies the location of the DOS/DOSE data file. If specified, it takes precedence over any **user_cwd** specification.

User Program Directory (Optional)

user_prog_dir = *user_program_directory* | **none**

user_prog_dir specifies the directory where user programs reside. If specified, it takes precedence over any **user_cwd** specification.

A **user_prog_dir** specification has no effect on a DOS or DOSE procedure statement which gives a full path specification for the user program.

For example,

DOS c:\metcal\myprog.exe

This DOS statement executes the **myprog.exe** in **c:\metcal** regardless of what **user_prog_dir** specifies in the initialization file.

If the DOS or DOSE statement provides a partial path specification, the partial path specification is relative to the **user_prog_dir** specification (if any).

For example,

If the initialization file specifies:

user_prog_dir = c:\metcal

and a DOS statement in a procedure specifies:

DOS exe\myprog.exe

then MET/CAL executes the program **c:\metcal\exe\myprog**.

User Program Exit Code (Optional)

uexit_code = yes | **no**

uexit_code specifies whether MET/CAL should pay attention to the exit code of a user program invoked by the DOS or DOSE FSC.

- **yes**, pay attention to exit code
- **no**, ignore exit code

An individual DOS or DOSE statement may override the setting of **uexit_code** by specifying either **–x** (pay attention to exit code) or **-i** (ignore exit code) as an argument on the DOS or DOSE procedure line. If **uexit_code** is not specified in the initialization file, the default is **uexit_code = no**.

Variable File

varfile = *variable_file*

Variable file.

Workstation Directory

workdir = *workstation_directory*

This is the directory where all workstation specific files and temporary files are stored. For example the workstation instrument configuration file is typically stored in this directory.

Test Results in the Database

To appreciate the reporting capability of Fluke Metrology software, you need an understanding of how results are stored in the database. With this information, you can select a report creation method to best fit your needs and available resources.

When a calibration procedure is run, the Run Time application stores results directly into the database tables. The saved calibration data contains three general types of information.

1. Test Summary
   Examples of summary data include UUT Identification, Cal Date, and Pass/Fail. This information is usually printed at the beginning of the report. Sometimes, relevant summary data is also included in page headers or footers.

2. Standards Used
   A list of all the standards used to perform the calibration.

3. Test Results
   The step-by-step test results of the calibration.

Each evaluation (test step) in a MET/CAL of 5500/CAL Calibration Procedure generates a result. The Run Time application automatically writes the results to the database. When you run a report, the test results for the calibration of interest are returned. For a detailed description of the database results table see ResultsTable.pdb on distribution CD.

Customizing Prompts for the Operator (PROMPTDB.TXT, PASS_DB.TXT, FAIL_DB.TXT)

You must edit the **PROMPTDB.TXT, PASS_DB.TXT,** and **FAIL_DB.TXT** files to collect customized information that you want to have included in any type of results printout. You can edit the prompt files using the Procedure Editor's "Open Text File" selection (File Menu) or using an external text editor.

The Run Time application prompts the operator of the calibration system every time a calibration procedure is executed, if the system has been so configured. Prompts occur in the following instances:

- Pre-run prompt (PROMPTDB.TXT): After selecting a procedure to be executed, but before a procedure actually starts up.

- Post-run, Pass (PASS_DB.TXT): After completion of a procedure, and the UUT passes.

- Post-run, Fail (FAIL_DB.TXT): After completion of a procedure, and the UUT fails.

The presence of appropriate prompt files determines if one or more of these prompts occurs, and their content determines the type of information for which the operator is prompted.

When the operator enters a response, the text entered is assigned to the name of a variable. The variable and the assigned string value are stored in a temporary variable file. The values can be recalled when results output is created. The temporary file is not erased after a procedure terminates; values can be "recalled" automatically when starting up another procedure, using special constructs in the prompt files.

The prompt at the beginning of execution of a calibration procedure is determined by the prompt file with default name **PROMPTDB.TXT**. The default content of the **PROMPTDB.TXT** file is shown below:

```
Temperature in deg C      ::   TEMP$  2311
Relative Humidity in %    ::   RH$    2312
Calibration Seals Intact? :B: SEALS$ 2322
Work Order Number         :B: WO$    2314
```

Prompt File Description

Each line in a prompt file specifies a prompt to the user that appears on a Run Time prompt screen. Except for blank lines and comment lines, both of which are ignored, each line in a prompt file has 3 or 4 components as follows:

Prompt String   The prompt string is the text that the user sees when the prompt screen appears. The prompt string is everything on the line up to the first colon (:). The colon is not included in the prompt string, but it must appear in the prompt file, otherwise there is an error.

Attribute String

The attribute string includes everything between the first and second colons. If there is no second colon, the attribute string is just the colon.

The attribute string can contain the following specifiers:

R   Indicates that the field is read-only

N   Indicates the field must contain a numeric value only

B   Indicates the response buffer is to be initially blank. An attribute specifier of **:B:** is equivalent to just a colon - **:**

However, **B** can be useful in conjunction with other specifiers. For example, **:BN:** specifies an initially blank, but numeric-only field. Note that this is not the same as **:N:**, which specifies a numeric-only field initialized with the value from the variable file.

n   An integer between 1 and 128 restricts the maximum number of characters that can be entered in the response field.

D   Indicates that the response buffer is to be initialized with the *default* database value (NOT the current value of the field). Permitted fields: In Version 6.0, Inventory Table fields are allowed if they are read-only, calibration table fields, and those that are not updated automatically. Specifically, the following Calibration table fields cannot be prompted for:

2301	2319	2333	2339	2346	2351
2305	2320	2335	2342	2347	2352
2315	2321	2336	2343	2348	2353
2317	2323	2337	2344	2349	2363
2318	2325	2338	2345	2350	

Variable Name String

The variable name string is the name of the variable that will be associated with the user's response.

The variable name string is everything after the attribute string up to the terminating dollar sign (**$**). The dollar sign is required. Leading white space is not included in the variable name string.

Database Field Name String

The database field name string is optional. If it is included, it specifies the field in the Calibration table of the database to which the user's response will be written.

The database field name string is anything after the dollar sign. It does not include any leading or trailing white space. It may be empty (since the string is optional). The name can be a field number, or it can include a leading **C** to designate Calibration table fields.

Prompt File Rules

The following rules apply to the Prompt File:

- Every line in the prompt file represents one prompt.

- The *prompt* can be any character except colon (**:**), and is used to provide the prompt for the operator.

- A *variable-name* must start with an alpha character (**a-z**, **A-Z**) or underscore (**_**), and is optionally followed by more alphanumeric characters or the underscore (**_**) character.

- A *variable-name* must end with a dollar (**$**) sign.

- Upper case and lower case is not significant in variable names.

- If the colon is replaced by two colons, the entry is preloaded with the currently assigned value stored in the **VARIABLE.DAT** file.

  For example, suppose the temperature and relative humidity in your calibration laboratory are closely controlled. The temperature and %RH are not expected to change significantly. Also, the name of your calibration facility is not changing. The previously entered value is not preloaded if the entry in the prompt file has a single colon:

  ```
  Temperature        : TEMP$
  ```

  The operator can override the preloaded entry, speeding up the operation by not requiring new entries for values that seldom change.

  The variable name and its value is stored in the **VARIABLE.DAT** file. The variable name and value can be accessed by programs run through the DOS and DOSE FSCs, and can be inserted into the results via the **RSLT.FRM** file.

Parsing and Validation of Attribute Strings

The following rules control the parsing and validation of the attribute string:

1. White space is ignored, except that white space cannot be embedded within the maximum response length specifier (*n*).

2. No specifier can be used more than once.

3. Specifiers can occur in any order.

4. The read-only specifier (**R**) is mutually exclusive with all other specifiers, except the "use database" specifier (**D**).

5. Whenever the attribute string contains two colons, the prompt response buffer will be initialized, unless the Blank specifier (**B**) appears.

    The initialization value is taken either from the variable file or from the database default value for the field. The database default is used only if (a) the prompt file line specifies a database destination field, and (b) the attribute specification includes the **D** specifier.

6. If the attribute string is simply a colon (**:**), no attribute specifiers are present. In this case, the attribute is really just separating the prompt string from the variable name. The response buffer displayed to the user will initially be blank.

Prompt Fonts

You can select the font to use for prompt screens through the initialization files, METCAL.INI. There are three possible selections: SYSTEM, DISPLAY, and PROMPT. For details, refer to the heading earlier in this section that describes initialization file entries.

Post-Run Prompts and the As Found / As Left Feature

The purpose of field 2308, Found/Left, is to permit you to mark each calibration event with a tag specifying the point in your process that the event occurred. The tags specify whether the calibration results indicate the condition of the instrument at the time it arrived, at the time it left, or both.

The As Found / As Left feature makes use of prompts contained in both the FAIL_DB.TXT and PASS_DB.TXT files. The prompts create a validated field on the Pass and Fail Post Run prompt screens (assuming that the validation entries for 2308 have not been modified).

Refer to Chapter 8, "Configuring the System" for complete information about how to use the As Found / As Left feature. There, you will find a discussion that explains how to use the feature in conjunction with the Pass/Fail field to create a reliability profile for your assets.

Description of Accuracy Files (*.ACC)

Unless TUR checking is turned off, there must be one Accuracy File associated with each Instrument FSC. Accuracy files contain information on the specified accuracy of the instrument associated with the FSC.

Accuracy files may be empty. In this case, the Test Uncertainty Ratio checking must be disabled by the following entry in the **metcal.ini** file:

        tur_lim = none

The Procedure Compiler verifies that the requested value of parameters as stated in the FSC is possible. It also attempts to compute calibration accuracy ratios and issue a warning if the ratio of specified UUT tolerance to tolerance of the calibration system at the Nominal value drops below a constant value. This constant value is the one assigned to the variable tur_lim in the **metcal.ini** file. The default value is 4.

The person who is writing your procedures should ensure that TUR warnings are not generated by verification steps.

However, during adjustment steps, warnings are commonplace and generally can be ignored. The reason is that calibration adjustments are typically made close to the resolution of the UUT, which can be well within the stated accuracy of the UUT. In the limit case, the reading is set right on, meaning zero tolerance. Given that any calibration instrument has at least some tolerance, a warning of insufficient Test Uncertainty Ratio is generated that can be ignored in such a case.

The TUR is defined as (Test Tolerance / System Accuracy).

The compile time and run time TUR calculations may not be identical. At compile time the Test Tolerance is determined as the distance from the specified Nominal to the closest tolerance limit, unless one of the limits is zero. For example, a +3U in the tolerance field (implying -0U tolerance) causes the Test Tolerance to be 3U.

At run time, the Test Tolerance is calculated as the distance from the UUT Indicated value to the tolerance limit that falls on the SAME side of the UUT Indicated value as the System Actual.

All accuracy files are located in the directory specified by the "accdir" parameter in the **metcal.ini** file. Accuracy files are named as follows:

        {FSC}.ACC

Example:

        5100.ACC

Every Fluke calibration software package includes default accuracy files for all instruments in the system. These accuracy files reflect the performance of those calibration instruments in a systems environment over a period of 90 days. In most cases, no changes are needed.

Certain calibration instruments may have special calibrations, making it possible to achieve tighter specifications. By modifying the accuracy files, it is possible to inform the calibration system of these tighter specifications.

Note that the ACCF FSC modifies how the software handles accuracy files. For details, refer to the description of the ACCF FSC in the Procedure Reference manual supplement.

Accuracy File Formats

- Accuracy files are ASCII files that can be modified using any text editor.

- Each accuracy file must begin with a file header.

- Text is case insensitive.

- The file format is as follows. Each file is a sequence of sections. Each section consists of a MODE line, followed by one or more lines containing numeric data.

  A MODE line has the format:

  ```
  MODE: <unit specifier> [ <flag> <flag> ....]
  ```

- The list of valid unit specifiers depends on the instrument. For example, valid unit specifiers for the 5100 FSC are volts, decibels, and amps.

- Flags are also specific to each instrument. For the same 5100 FSC, valid flags are E (for accuracy enhancement) and O (for Divider Override).

- A mode line may not have extraneous characters.

- Mode lines are not user-configurable.

- Numeric data lines containing the accuracy information for the stated MODE have the following format:

  ```
  <nlb> <nub> <mlb> <mub> <tol> <floor> <res>
  ```

where:

<nlb>	is the nominal lower bound
<nub>	is the nominal upper bound
<mlb>	is the MOD1 lower bound
<mub>	is the MOD1 upper bound
<tol>	is the tolerance as a percentage of the nominal value (%)
<flr>	is the tolerance in absolute units (floor specification)
<res>	is the resolution of the instrument in absolute units or percent of nominal

- The string "NA" may be used to indicate that a particular value is not applicable (i.e., not used).

- The nominal bounds must always be specified.

- The lower and upper bounds for Nominal and MOD1 are the legal lowest and highest values at which the instrument can be programmed. The lower and upper bounds themselves are legal values.

- The tolerance and floor may both contain "NA" to indicate that a range is valid, but no accuracy is specified for that range.

- If either tolerance or floor is "NA", both must be "NA."

- The resolution is expressed either in absolute units or percent of the Nominal value. If expressed in percent, the resolution is terminated with the percent (%) sign. Resolution may be "NA."

- The file may contain any number of blank lines or comment lines.

- Comment lines have a pound sign (#) as the first non-white space character.

- White space before the beginning of text or after the text of a line is not significant.

A section of the accuracy file for the 5100 FSC may appear as follows:

```
Mode: Volts

0    .0199999  NA   NA   0.0038  0.0000052 0.1e-6
.02  .199999   NA   NA   0.0038  0.0000066 1e-6
.2   1.99999   NA   NA   0.0038  0.000021  .00001
2    19.9999   NA   NA   0.0038  0.000165  .0001
20   199.999   NA   NA   0.0038  0.0016    .001
200  1100      NA   NA   0.0038  0.016     .01


# Base 5100B accuracy AC Volts with divider for
# low values < 20 milliVolts.

1e-6 .0199999  50    10e3   0.1   0.00001   0.1e-6
1e-6 .0199999  20e3  50e3   0.12  0.00001   0.1e-6
.02  .199999   50    10e3   0.05  0.00006   1e-6
.02  .199999   20e3  50e3   0.08  0.000066  1e-6
.2   1.99999   50    0.9e3  0.05  0.00015   .00001
.2   1.99999   1e3   10e3   0.05  0.00013   .00001
.2   1.99999   20e3  50e3   0.08  0.00021   .00001
2    19.9999   50    10e3   0.05  0.001     .0001
2    19.9999   20e3  50e3   0.08  0.00165   .0001
20   110       50    10e3   0.05  0.01      .001
20   110       20e3  20e3   0.08  0.016     .001
110  199.999   50    1e3    0.05  0.01      .001
200  1100      50    1e3    0.05  0.055     .01


Mode: Volts E
# Enhanced accuracy specification for 7404B
# type system
# The accuracy enhancement is done with the 8506A from
# the output directly.

0    .0199999  NA   NA   0.0022  0.0000016  0.1e-6
.02  .199999   NA   NA   0.0022  0.0000016  1e-6
.2   1.99999   NA   NA   0.0014  0.0000062  .00001
2    19.9999   NA   NA   0.0010  0.000160   .0001
20   127.999   NA   NA   0.0017  0.0006     .001
128  199.999   NA   NA   0.0017  0.006      .001
200  1100      NA   NA   0.0017  0.006      .01
```

Accuracy File Headers

Beginning with Version 6, each MET/CAL accuracy file must have a header. All accuracy files that are shipped with Version 6 will include valid headers. If you have created your own accuracy files you will have to add headers to these files.

Accuracy file headers allow MET/CAL to automatically associate the correct accuracy specifications with an instrument that is used as a calibration standard.

As in previous versions of MET/CAL, accuracy files are used only with supported system instruments. These are remotely-controlled calibration standards for which MET/CAL includes a built-in driver.

Examples of supported system instruments are the Fluke 5700A, Fluke 5500A, and the HP 3458A. Accuracy files are not used with user-configured instruments or with manual standards.

The accuracy file header should appear at the beginning of the accuracy file. Comments may precede the header.

The accuracy file header is used to specify the instrument name, calibration interval, confidence and asset.

Instrument Name

This is the system instrument name that is associated with the accuracy file. The name must agree exactly with the name of a supported system instrument. For example, Fluke 5700A is valid, but Fluke 5700 is not.

The syntax for this parameter is:

```
instrument = <name>
```

Name recognition is case-insensitive.

The accuracy file header must include an instrument specification.

Calibration Interval

This is the calibration interval associated with the accuracy file. For example, if the file contains accuracies based on 90-day specs for a 5700A, the interval should be 90 days.

The syntax for this parameter is:

```
interval = <interval number><interval units>
```

The `<interval number>` may be any number. Units may be specified in days, weeks, or months. For days, `<interval units>` may be:

"d", "da", "day", or "days"

For weeks, <interval units> may be:

"w", "wk", "week", or "weeks"

For months, <interval units> may be:

"m", "mo", "mon", "month", or "months"

Calibration interval recognition is case-insensitive.

The accuracy file header must include a calibration interval specification.

When MET/CAL compares the calibration interval that is specified in an accuracy file header to the calibration interval associated with an asset in the database, it considers the two intervals to be the same if they are within approximately 10% of one another. This method allows, for example, 365 days to be recognized as 12 months.

Confidence

The confidence parameter specifies a sigma value for use in the measurement uncertainty calculation. The syntax for this parameter is:

confidence = <confidence value> [sigma]

The confidence must be specified as a sigma value. It cannot be specified as a percentage. The word sigma is optional in the specification. If specified, recognition is case-insensitive.

The accuracy file header must include a confidence specification.

Asset

The asset parameter specifies an asset number that is associated with the accuracy file. The asset specification is optional. If specified, it indicates that the file should be used only with the specified asset.

The syntax for this parameter is:

asset = <asset number>

If specified, the <asset number> should be the same one entered in the database for the calibration asset.

Sample Accuracy File Headers

Each accuracy file header is delimited by the lines:

```
Begin Header
End Header
```

Header delimiter line recognition is **not** case sensitive.

An example of a complete accuracy file header is:

```
Begin Header
instrument = Fluke 5700A
interval   = 90 days
confidence = 2.58 sigma
End Header
```

An example of a the same header with an asset number specification is:

```
Begin Header
instrument = Fluke 5700A
interval   = 90 days
confidence = 2.58 sigma
asset      = 23-495A
End Header
```

Adding the asset specification in the example indicates that this accuracy file can be used only with asset 23-495A.

Avoid Accuracy File Header Conflicts

It is important to avoid accuracy file header conflicts. Two accuracy files in the MET/CAL accuracy directory may not specify the same instrument name and same calibration interval, unless you have included unique asset number specifications in one or both headers. In addition, if the procedure contains ACCF statements that refer to accuracy files not in the MET/CAL accuracy directory, the headers of those files must not conflict with the headers of any file in the MET/CAL accuracy directory, nor with the header of any other ACCF-specified file in the same procedure, or any called subprocedure.

The confidence specification in the accuracy file header cannot be used to distinguish two accuracy files which otherwise have the same header. This is because, although the confidence value is used in the measurement uncertainty calculation, it is not one of the selection criteria used to automatically associate an accuracy file to a configured calibration asset.

Creating Correction Files (*.COR)

One Correction File may be associated with any Instrument FSC. These files are optional. If used, they are located in the directory specified by the "correctdir=" parameter in the **metcal.ini** file. Correction files must have file names ending with **.COR** . Correction files contain information on special calibration points of the instrument associated with the instrument FSC. An electronic instrument is far more stable during a limited period of time than its stated accuracy indicates. By providing specific calibration points and reducing the calibration interval, the uncertainty of the calibration instrument under those conditions can be significantly reduced. This is the case in particular with AC voltage functions.

The presence of correction factors is indicated by the value of the Correction File Directory parameter "correctdir" in the **metcal.ini** file being set to something other than "none." The default is "none." If the Correction File Directory is identified, a search for correction factors is done. If no correction factors are known, the files can be blank.

If there is a directory named **CORRECT**, the Run Time application attempts to find the corrected value for the calibration instrument, and report this corrected value in the results.

Note

If Correction files are used, the Accuracy file and Calibration Interval should also be changed to reflect the improved accuracy specifications.

To indicate that a correction has been applied, the software displays the corrected System Actual value in the Post Test Summary dialog, followed by the word **(corrected)** to the right of the System Actual value.

The Test Results window also indicates corrections. The corrected System Actual is shown in the *System Actual* column, and a **Y** appears in the *C* column.

You can access the correction indication in the formatted results using the C$ variable.

How Correction Files are Found and Named

The **correctdir** directory contains all correction files. Correction files are named as follows:

        <FSC>.COR
Example:

        5100.COR.

The Fluke Metrology software package includes no default correction files. An example correction file for the 5200A is illustrated later in this chapter.

Interpolation Methods to Determine Corrections

The Correction file first identifies the modes for which corrections are available. For example, the corrections apply to the volts mode:

```
Mode: Volts
```

Any qualifiers, such as "O", are included. This is also the case with the mode information in the accuracy files:

```
Mode: Volts O
```

Within each mode, a number of ranges can be defined over which interpolations can be made. This includes the following:

- A lower bound for NOMINAL (e.g., voltage)

- An upper bound for NOMINAL (e.g., voltage)

- A lower bound for MOD1 (e.g., frequency)

- An upper bound for MOD1 (e.g., frequency)

This reflects calibration instruments containing ranges of voltage and frequency. Interpolations are generally not valid between different ranges of voltage and possibly frequency. Interpolations and extrapolations are generally valid as long as ranges do not change.

Each range lists a number of data points that can be used for interpolation. Data points are sorted by MOD1 value. After each MOD1 value, one or more Nominal values and their corrections follow. For example:

```
RANGE: 3 19.9999  100  10e3
 MOD1: 100
       3  3.0002, 10 9.99998 , 19 18.9997
 MOD1: 1e3
       3  3.0002, 10 10.0001 , 19 18.9999
```

You may have a single Nominal data point for a given MOD1 value and there may not be an identical Nominal data point for another MOD1 value. In that case, the NOMINAL and MOD1 values in the correction file must exactly match the values in the calibration procedure to determine the corrected value.

You may have a single Nominal data point for a given MOD1 value, and there may be an identical Nominal data point for another MOD1 value. In that case the Nominal data point value must exactly match the Nominal value in the calibration procedure in order to determine the corrected value.

You may only have data points for a single value of MOD1. In that case the MOD1 value in the correction file must exactly match the MOD1 value in the calibration procedure to determine the corrected value.

In all other cases, data points must be on a rectangular grid as a function of Nominal (voltage) and MOD1 (frequency) value. The data points must also be in sorted order: increasing values of nominal with increasing values of MOD1 values. (Refer to the example later in this chapter.)

The process of determining corrected values is as follows:

- Check to see if there is a range available over which interpolations can be done; if not, try the next range. Ranges may be overlapping. If all ranges fail, no correction is possible.

   The accuracy file should reflect standard instrument accuracy for ranges not covered by the correction file. There may be overlapping ranges of correction. The most desirable range to be used for interpolation should be shown first in the correction file.

- Check to see if there is a data point that exactly matches both the Nominal value (e.g., voltage) and MOD1 value (e.g., frequency). If found, return the correction; if not, continue the interpolation process.

- Check to see if there are at least two data points with the same Nominal value but different MOD1 values (e.g., frequency) in the list of corrected values in the range selected.

   1. Find the MOD1 values that are closest to the desired MOD1 value above and below the desired value of MOD1. See Figure 7-1.
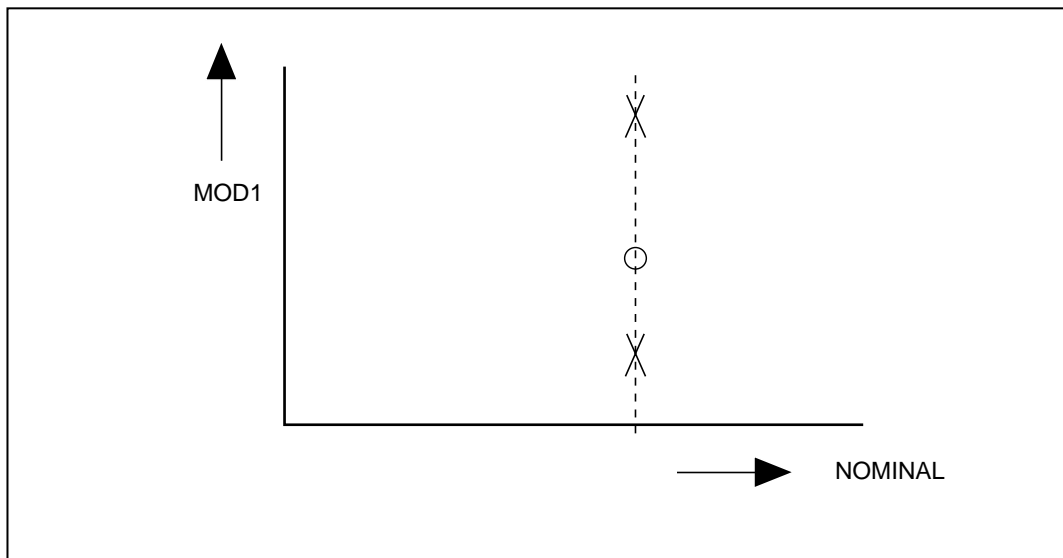
IL701F.EPS

Figure 7-1. Selection of Data Points in a Range of the Correction File

If no MOD1 value below or above can be found, find the next MOD1 value above or below the desired value to be able to extrapolate. See the following figure.
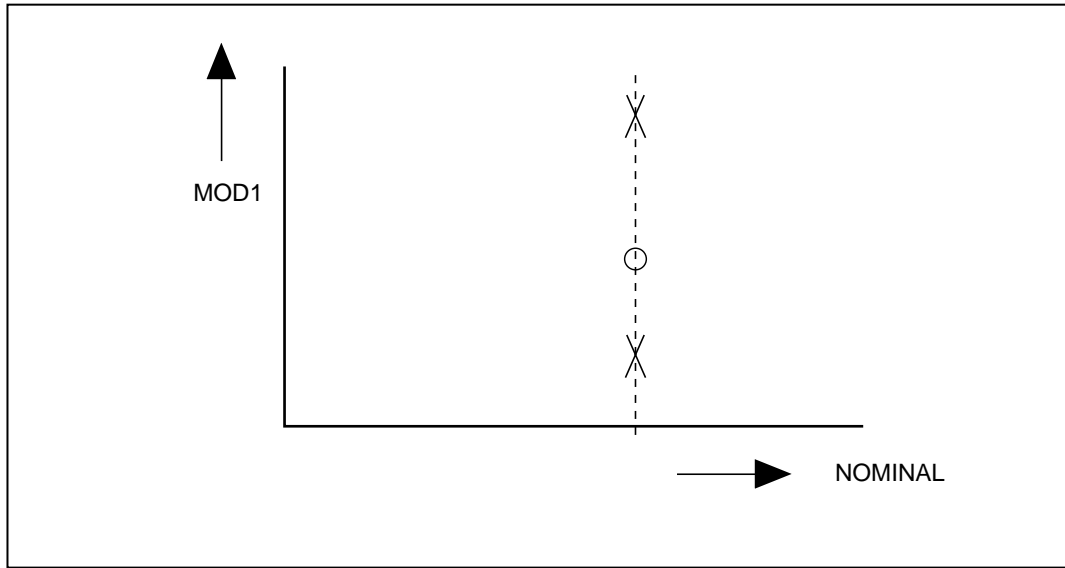
il702f.eps

Figure 7-2. Data Points and Desired Value Requiring Extrapolation

If extrapolating, find the difference between the closest Nominal value and the desired Nominal value, and the difference between the two reference Nominal values. If the ratio is more that 0.2, extrapolation is disallowed, and the correction within the range is not successful.

2. When suitable data points are found, compute by linear interpolation the corrected value of the nominal at the MOD1 value desired. If conditions are not satisfied, continue the interpolation process.

- Check to see if there are at least two data points with the same MOD1 value but different Nominal values (e.g., voltage), in the list of corrected values in the range selected. Find the Nominal values that are closest to the desired Nominal value. The data point selection is similar to the previous case where the Nominal value was fixed and where two values of MOD1 existed. If conditions are not satisfied, continue the interpolation process.

- Data points must be on a rectangular grid when the data points are plotted out as a function of Nominal (e.g., voltage) and MOD1 (e.g., frequency), unless the range contains just one or two data points. First, you search for two values of the MOD1 closest to the desired MOD1 value above and below the desired MOD1 value. Next, you search for the Nominal values above and below closest to the desired Nominal value. See the following figure.
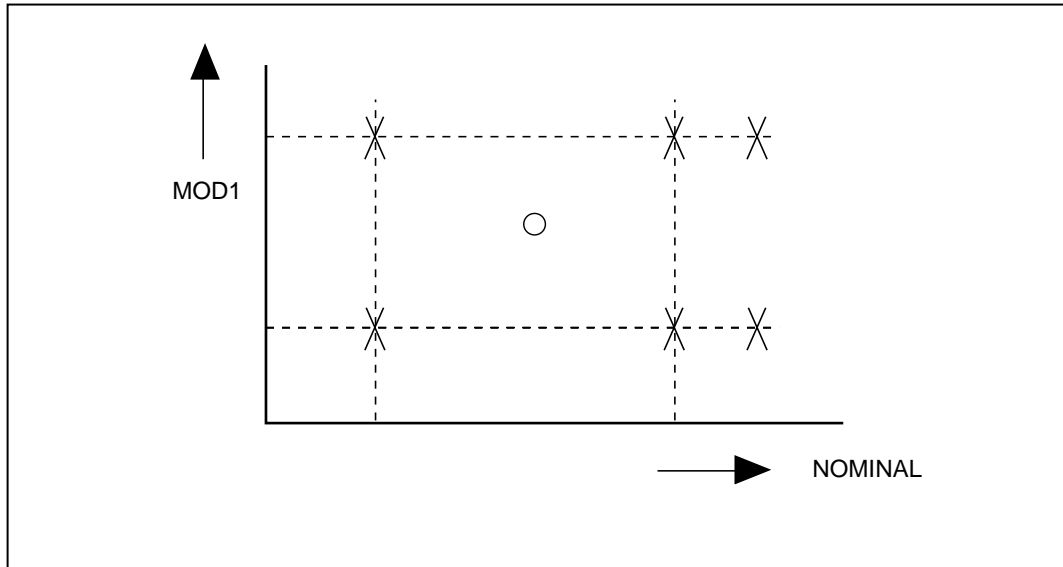
il703f.eps

Figure 7-3. Data Point Selection

If you cannot find two values of Nominal and/or two values of MOD1 above or below, find the closest values of Nominal and/or MOD1 both above or below, and try to extrapolate. See the following figure.
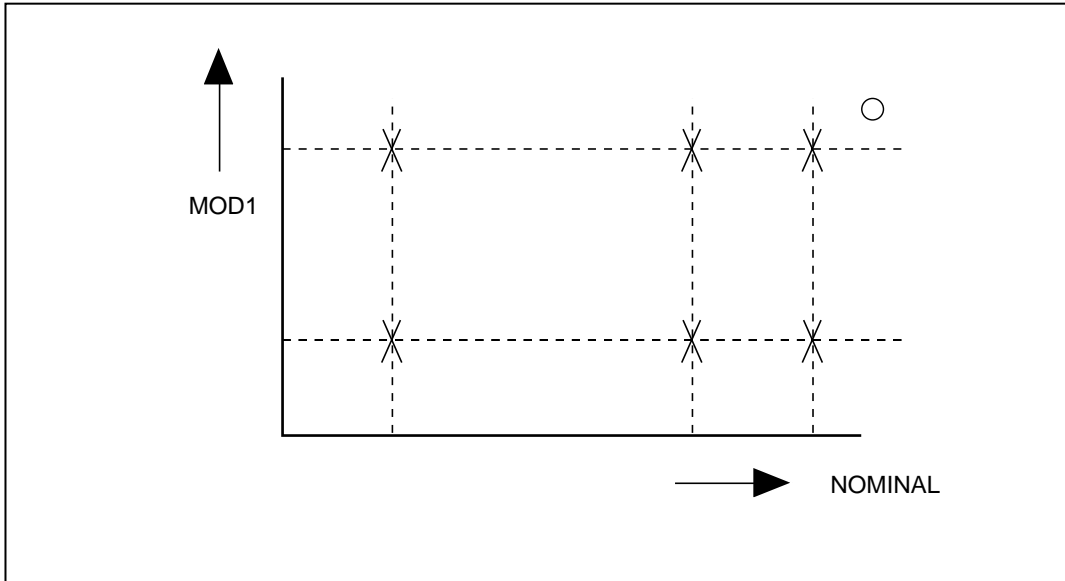
il704f.eps

Figure 7-4. Data Point Selection and Extrapolation

The range of extrapolation is limited to 20% of the difference of Nominal or MOD1. If the desired value is not within that range, the extrapolation scheme fails, and no correction is applied. The interpolated correction value is computed as follows. See the following figure.
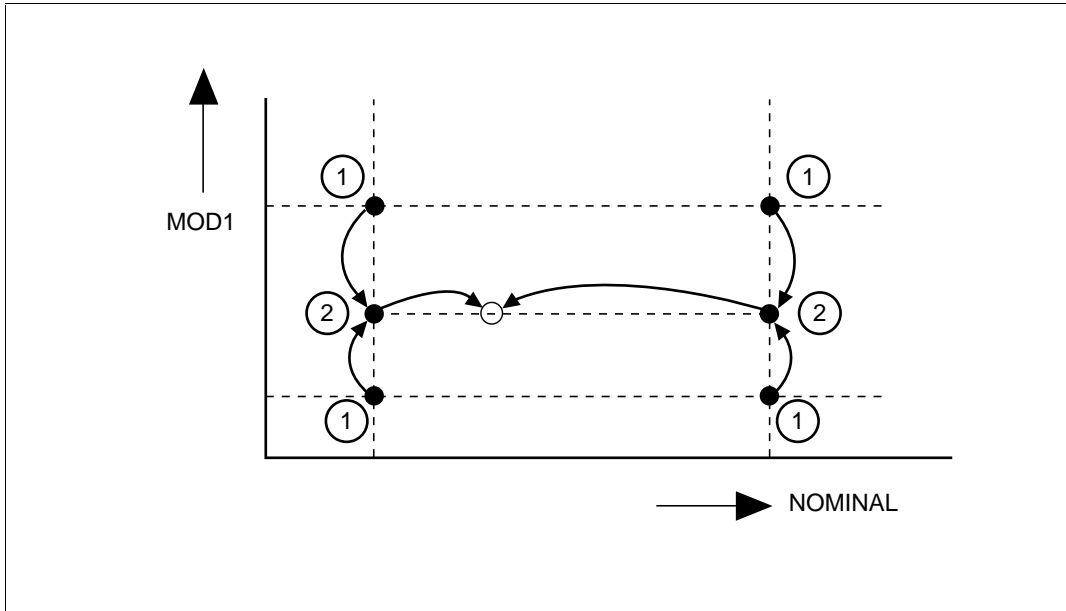
il705f.eps

Figure 7-5. Correction Computation Method

1. Find the correction factors for the desired Nominal values at the lower and higher value of MOD1 (four correction factors).

2. Compute the two interpolated correction values for the desired Nominal value at the lower and higher value of MOD1 (result is two new correction factors).

3. Compute the correction at the desired combination of Nominal and MOD1 is found by linear interpolation from the new correction factors.

Using Correction Files

Correction values are used in the results reporting and loading MEM or MEM1, depending on the type of test (Evaluation, Setup, Nominal Set, Compare) and mode (Slew, Keyboard Entry, Go/No-Go).

The effect on memory locations MEM and MEM1 and the UUT Indicated and System Actual values is as follows.

```
Evaluation Test:  MEM : no change
(MOD4 = blank)    MEM1: Slew    : last slewed value
                                   (CORRECTED)
                        Keyboard: entered value
                        Go/No-Go: Nominal value
                                   (CORRECTED)
                                  Test limits are adjusted

         UUT Indicated: Slew    : Nominal value or MEM
                                   (Not Ohms)
                        Slew    : last slew value (Ohms)
                        Keyboard: entered value
                        Go/No-Go: OPER-EVAL

         System Actual: Slew    : last slewed value (Not Ohms)
                                   (CORRECTED)
                        Slew    : Nominal value or MEM value
                                   (Ohms) (CORRECTED)
                        Keyboard: Nominal value
                                   (CORRECTED)
                        Go/No-Go: Nominal value
                                   (CORRECTED)

Setup Test:       MEM : no change
(MOD4 = S)        MEM1: Nominal value or MEM
                        (CORRECTED)
                        Calibrator output is not adjusted.

Nominal Set Test: MEM : Slew    : last slewed value
(MOD4 = N)                         (CORRECTED)
                  MEM1: no change

Comparison Test:  MEM : no change
(MOD4 = C)        MEM1: Slew    : last slewed value
                                   (CORRECTED)
         UUT Indicated: Slew    : MEM

         System Actual: Slew    : last slewed value
                                   (CORRECTED)
```

Rules for Correction Files

The following are the rules for correction files:

- Correction Files are ASCII files that can be modified using any text editor.

- Text is not case-sensitive.

- The correction file may contain any number of blank lines or comment lines.

- Comment lines have a pound sign ("#") as the first non-white space character.

- White space before the beginning of text or after the text of a line is not significant.

- Each file is a sequence of sections. Each section consists of a MODE line, followed by one or more ranges.

- The MODE line has the following format:

  - `MODE: <unit specifier> [ <flag> <flag> .....]`

- The list of valid unit specifiers depends on the instrument. For example, the valid unit specifiers for the 5100 FSC are Volts and Amps.

- Flags are also specific to each instrument. For the same 5100 FSC, valid flags are E (for accuracy enhancement) and O (for Divider Override).

- A MODE line may not have extraneous characters.

- A range of values is defined by the following format:

      Range: <nlb> <nub> <mub> <mub>

where:

  nlb   is the Nominal lower bound

  nub   is the Nominal upper bound

  mlb   is the modifier lower bound

  mub   is the modifier upper bound

Example:

      Range: 2 19.99999 40 20

The string "NA" may be used to indicate that a particular value for the modifier is not applicable and is not used.

- The lower and upper bounds for Nominal and MOD1 must always be specified. They typically coincide with a range of a calibration instrument.

- Data points associated with a range follow the Range definition starting with a new line. Data points are listed by increasing MOD1 (frequency) value. The MOD1 value for which data points are valid is shown by:

```
MOD1: <mvalue1>
```

Starting on the next line, Nominal data points and their corrections are shown. A comma "," separates each group of Nominal value and corrected value:

```
<nvalue1> <cvalue1> , <nvalue2> <nvalue2> , ...
```

A range and data points may be shown as:

```
Range: 2 19.9999 40 2e3
 Mod1: 100
  3 3.0002 , 10 9.9998 , 19 18.9997
 Mod2: 1e3
  3  3.0002, 10 9.9999 , 19 19.00003
```

Example Correction File for 5200A

```
# Example Fluke 5200A Correction File (partial)
# 5200.COR
#

MODE: VOLTS

Range: 50e-3 119.9999e-3 50 100e3
 MOD1: 50
    50e-3 49.9998e-3, 100e-3 99.9976e-3
 MOD1: 100
    50e-3 50.0000e-3, 100e-3 100.0013e-3
 MOD1: 200
    50e-3 50.0002e-3, 100e-3 100.0023e-3
 MOD1: 1e3
    50e-3 50.0022e-3, 100e-3 100.0023e-3
 MOD1: 2e3
    50e-3 50.0023e-3, 100e-3 100.0030e-3
 MOD1: 10e3
    50e-3 50.0026e-3, 100e-3 100.0057e-3
 MOD1: 20e3
    50e-3 50.0033e-3, 100e-3 100.0033e-3
 MOD1: 50e3
    50e-3 50.0040e-3, 100e-3 100.0112e-3
 MOD1: 100e3
    50e-3 50.0020e-3, 100e-3 100.0263e-3

Range: 500e-3 1.99999 50 100e3
 MOD1: 50
    0.5 0.499998,  1.0 0.999976

Range: 3 11.99999 50 100e3
 MOD1: 50
    3.0 2.99989,  10 9.99970

Range: 30 119.9999 50 100e3
 MOD1: 50
    30 29.9997,   100 99.9992

Range: 300 1199.999 50 50e3
 MOD1: 50
    300 299.995,  1000 999.980
```

Contents   **Page**

Introduction

MET/CAL Plus software can be configured to meet companies specific requirements. This chapter covers what can be customized and provides information on how customization is accomplished.

The key responsibility for system configuration falls on the System Administrator. The MET/TRACK screen used for entering data also serves as the Configuration Editor. The difference is the login and password used to open the program. MET/TRACK user screens are activity based and will change based on the user login. Logging in to MET/TRACK, using the MT password will display the necessary menus required for configuration. These menus will allow the System Administrator to add users, configure data forms and data fields, set up uncertainty, set-up and assign database segregates and add merge tables and other user-defined tables.
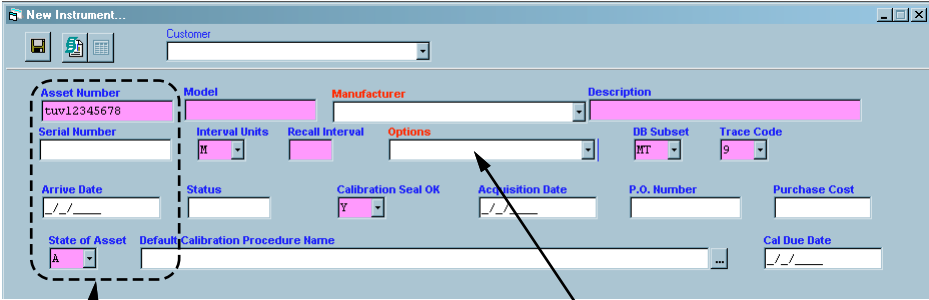
Basic Customization Techniques

All of this customization is discussed later in the chapter. This is a quick overview of the mechanics behind customizing the appearance and content of the user screens. The user screens include the search screen, any of the browse screens and the data entry screens.

This overview section will cover how to:

- Select a Field or Group of Fields.

- Reposition Fields.

- Edit Basic Fields Properties.

- Edit Field Content using Validation.

- Customize Fonts and Field Colors on the Desktop.

Field Selection

il303f.eps

Field Selection

Positioning Selected Fields

Once the fields are selected, the toolbar can be used to move, hide, align, add or format the fields. Shown next is a reference chart of all the tools and their functions. All forms are customized using these tools.

Select a field with the mouse. A selected field will turn *pink*. Move the field title from the side to the top or the top to the side.

Top Align all the selected fields Horizontally to keep the rows even.

Move the fields closer together from side to side. Repeat until the fields are correctly spaced.

Align the selected fields to the left to keep the margins even.

Move the fields closer together from top to bottom. Repeat until the fields are correctly spaced.

Align the selected fields to the right margin to keep The margins even.

These tools can be used on groups of selected fields. To select fields click and hold the left mouse button. A dashed line will appear, as illustrated, to capture all the desired fields. When selected, the fields will turn *red*.

To add or restore fields to a form a click on this button will bring up the list of fields that can be added. Select a field to add by double clicking on it with the left mouse button.

To remove a field from a form, select the field to remove and click the trash can button.

To change the field properties, select a field and push the field properties button. Or just double click the desired field.

See and change the tab order of all the fields on the form by clicking this button and following the instructions in this chapter

Formatting Tools

Editing Field Properties

Field headings and field lengths are set in the Field Properties of each field. Double click in the field to bring up its properties. All fields on all forms are edited this way. Field properties for Browse Screens and Entry Screens are discussed in more detail later in the chapter, but a map of the Field Properties editor is shown in the next two figures.

Change field title here. Highlight the current title and type the new one right over it. Then type a new description in the tool tip box so the entry person will know what the field is used for.

Choose another field to edit from this pull-down list.

Check this box to make the field *Required*. This means the field must contain a value before a record can be saved.

Move the lever to the left or right to change the data and display length

Set the level of user That will be allowed To add or edit data from the entry or edit screens. Careful, a *Blank* defaults to level 4 and 5.

Specify an automatic or *Default* value for the field. Just type it in. Or select an automatic value from the pull-down list.

Select a field to *copy from* or a field to *copy to* from one of these pull-down lists.

Field Properties Editor

The Validation Editor

Validation will be discussed later in the chapter, but validations are added and created from the field properties editor. The next figure shows the Field Properties editor with the Validation/Merge tab selected.

Select the *Adding* or *Editing* tab to set
field properties applicable to a new or
existing entry. (see previous figure.)

Click here to
exit the Field
Properties
Editor

Select the
Validation/ Merge
tab access the
validation editing
tools.

Create a list of *Required Valid* entries, *Picklists*,
Linked Validations, and *Merge Tables* from the
Field Properties Editor

Edit Validations
or Merger Tables
by selecting the
Edit button.

il800f.eps

Editing Validation

Setting Fonts and Field Colors on the MET/TRACK Desktop

Required Fields and fields containing a Default Value will have a different
background from the other fields on a form. These colors are selected when a user
Desktop is customized. Desktop settings can be created and edited under the
Setup menu.

The following example screen illustrates the customization possibilities.
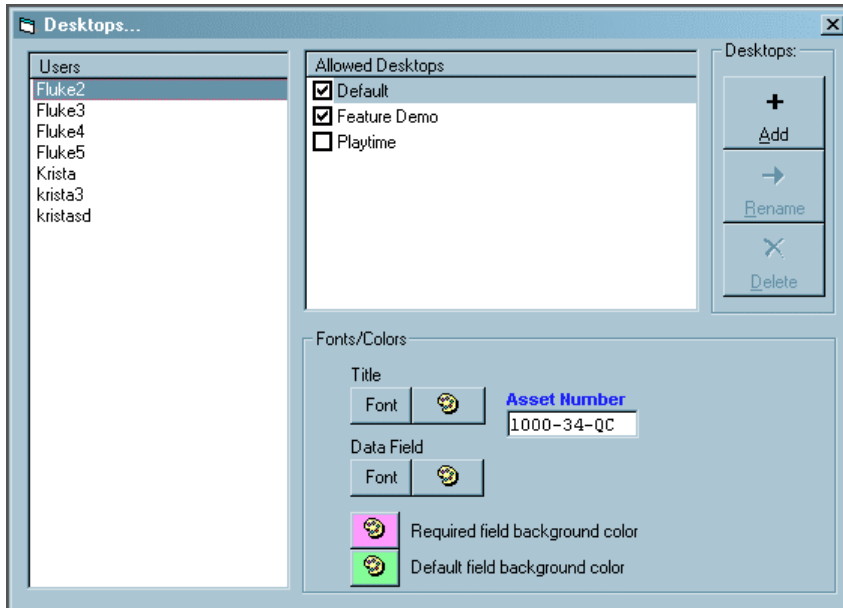
zv834s.bmp

Selecting one of the Font selection buttons will bring up a list of fonts installed in the PC. The style selection will be displayed.
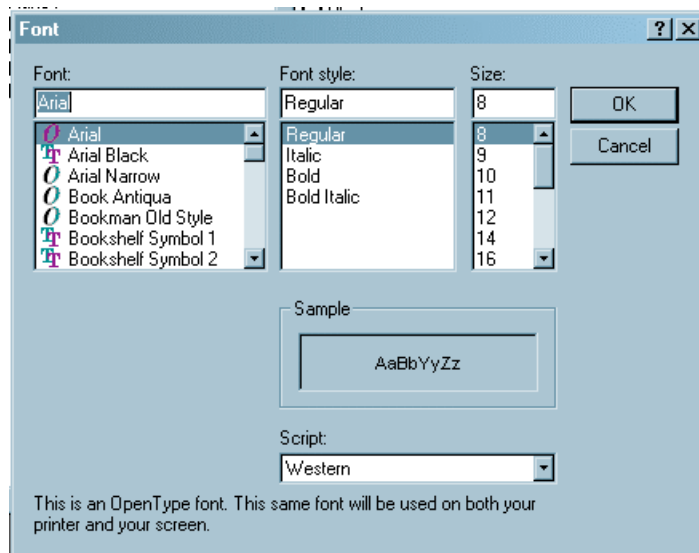
zv835s.bmp

Selecting a color pallet will bring up the color chart. Choose a color for **Required** fields and for **Default** fields. Make sure that selected colors are not too dark, or the text will not be legible.
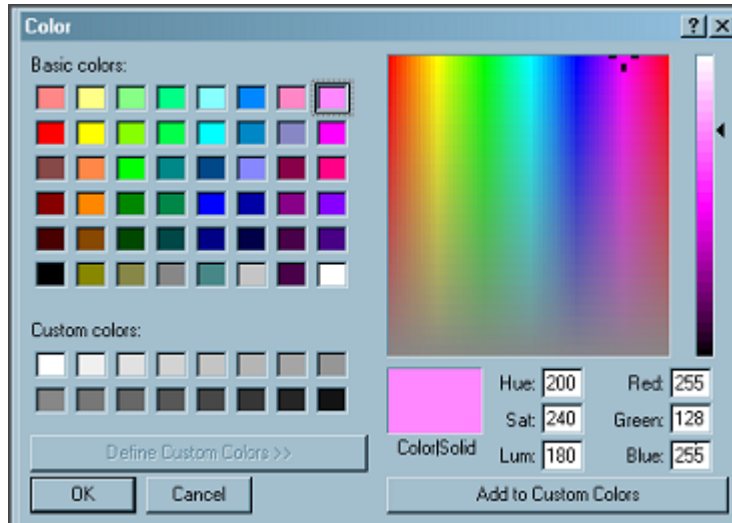
zv836s.bmp

For more information on **Desktop** customization see "Configuring User Desktops" later in this Chapter.

Starting an Application

If MET/CAL is set up as a Client/Server installation make sure the Calibration Data Engine is running on the server and start the Data Requestor on the client machine being accessed by the System Administrator.

If MET/CAL is set up on a standalone computer, start the Calibration Data Engine by double-clicking on the Calibration Data Icon with the mouse.

Start the MET/TRACK application by clicking on the MET/TRACK icon. Log in using user ID **MT** and Password **MT.** See the section later in the chapter on changing passwords.

Note

This is the Administrator password and should be changed as soon as possible by the designated Administrator.

From the File menu, select the desktop to be customized. The name of the active desktop will be displayed at the bottom of the screen, on the status bar. If no desktop is selected, all changes will be reflected on the **Default Desktop**.

The Customization Process

Configuration menus

The menus that appear on the MET/TRACK screen when the MT login is used are:

- File
- Layout
- Database
- Set-Up
- Help

Using the File Menu

Use the **File** menu to **Login** again using a different user name and password. The File item also gives you the option to **Log off.**

Use the **Select Desktop** item to choose a different desktop. The Desktop you select will be the one under which customization will reside. Desktop customization will be discussed in more detail later in this Chapter.

Exit closes the program.

Using the Layout Menu

The **Layout** menu allows the System Administrator to change the appearance of three main types of user screens: **Search Engine**, **Browse** and **Entry** screens. This is where data screens and database fields are accessed for customization. Why customize an entry screen? Companies may have a pre-existing form that they want to emulate in MET/TRACK. The System Administrator can move fields, change field headings and field requirements, add a list of valid entries and change the color scheme. Fields are added using the left-arching arrow and suppressed using the trash can icon. Moves can be made by dragging and dropping fields to the desired location or by drawing a line around a group of fields to be moved and using the various position icons on the left side of the toolbar. Format changes within a field are made by accessing the Field Properties box. This is accomplished with a double-click within the field you want to change

An example of a Field Properties box accessed within a Browse Screen is shown below.
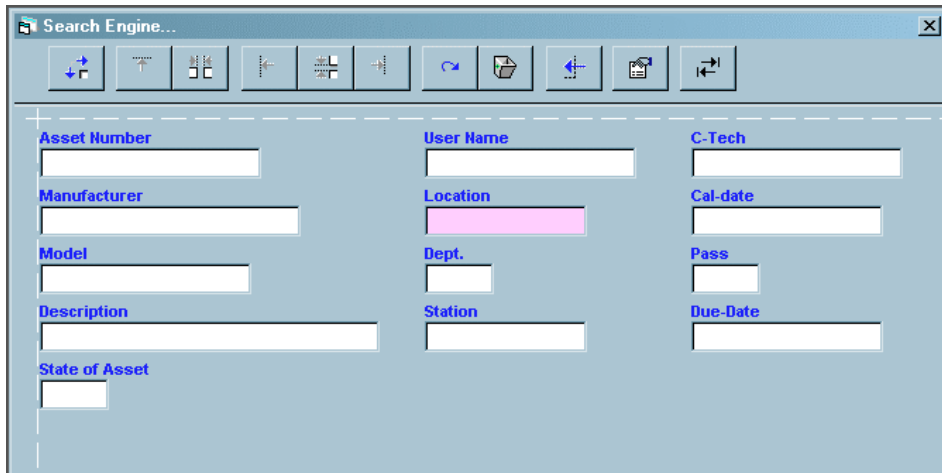
zv837s.bmp

The Search Engine

The **Search Engine** form is used to find a record in the database. Any field can be added to the search screen with the exception of **Memo** fields. Any field that is on the Search Screen can be used in a search. The default form is shown below.
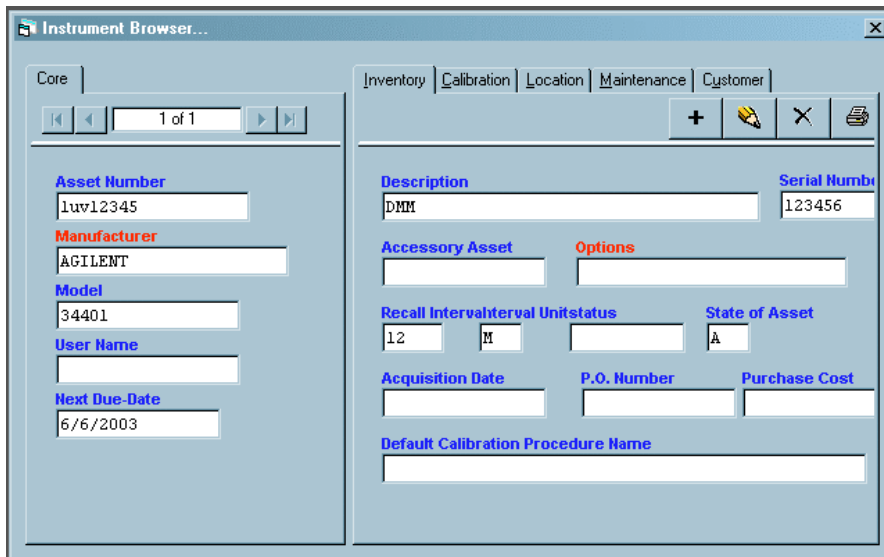
zv838s.bmp

Fields can be added or suppressed (hidden). Fields that are used on the screen should be those that contain information most readily available to the user and that will give the most unique identifying information about an instrument.

The administrator can move and rearrange fields or groups of fields, using the editing buttons on the top of the screen, or by dragging and dropping individual fields to another location on the screen..

Customizing the Search Engine

1. Suppress any fields not needed on the **Search** screen by clicking once in the field with the mouse and then clicking on the trashcan tool.

2. Add any fields by first clicking on the **Restore a Field** tool then selecting the field from the pull-down list. Select the field by double-clicking with the mouse.

3. Relocate the field on the screen by dragging them to the new location while holding down the left mouse button and then dropping by releasing the left mouse button. The field can also be highlighted and the up, down, right and left arrow keys used to reposition them.

4. Reposition several fields at once by using the mouse to capture all fields to re-position. Once fields are selected, (remember, selected fields will turn color), use one of the Toolbar items to change the position.

5. Change **Field Title** or **Tool Tip Text**, if desired, by highlighting the text to select it and typing the new title text to replace the old text.

6. Adjust the **Display Length** by sliding the bar to the right or left to increase or decrease length. Then close the Field Properties editor.

7. These customization tools are used the same way to customize all forms.

Browse Screens Defined

Browse Screens are used to edit data already in the database. The screens available from the browse screens sub-menu are the Core, Inventory, Calibration, Location, Maintenance and Customer screens. Fields can be added to browse screens, but field customization is limited to Field Title text, Tool Tip text and Display Length. A more thorough discussion on field property customization will come later in this chapter. A sample Browse screen is shown below.
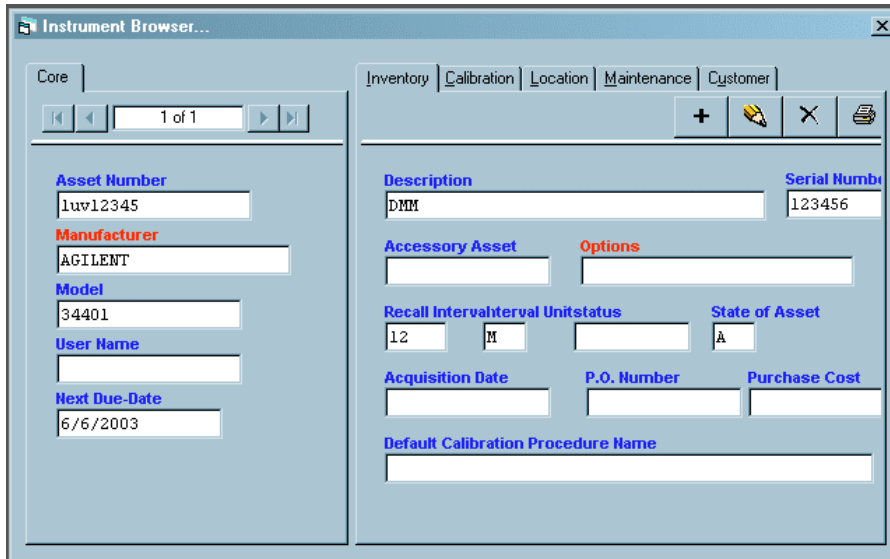
zv838s.bmp

- Core Browse Screen: The Core screen is a section of all of the browse screens. The Core fields chosen remain visible, whether a user is editing the Inventory, Calibration or Location records of a particular asset using the Instrument Browser. These fields are chosen by the System Administrator as the most crucial information that should be shown at a glance. The fields can come from any table in the database.

- Inventory Browse Screen: This screen contains basic inventory information about an asset. These vital statistics include the unique Asset Number, Model name, Serial Number, Description, Options, Calibration interval information, Status and Acquisition information. It can include any field from the Inventory table.

- Calibration Browse Screen: The Calibration browse screen contains key information about a specific calibration event. This may include cal time, whether the unit passed the calibration, the cal technician performing the work and the environmental conditions in the lab. It also may contain engineering notes and comments or any field from the Calibration Table.

- Location Browse Screen: This screen will give detailed information of the current location of the instrument in question. At a glance this screen should tell the inquirer the User Name, the user's Shop and Location information and when the instrument was loaned to the current user. It can contain any field from the Location Table.

- Maintenance Browse Screen: If instruments require regular maintenance or if an instrument has ever been repaired a Maintenance Record is created. This data is located on the Maintenance Browse Screen. This screen can give Maintenance Dates, including Maintenance Due, a Description of the work done, Parts Used and Part and Labor Costs. Like the other Browse screens, any field from the Maintenance Table can be added to this screen.

- Customer Browse Screen: Companies that have external and internal customers will use the Customer screen to see and update basic customer information. Basic information will include the Customer ID number, Name, Address, Contact Names and Phone Numbers. It can also contain Contract and Billing information.

Customizing Browse Screens

The browse screens are customized in exactly the same way as the Search engine.

1. Select the Layout menu.
2. Select the screen to customize.
3. Follow the steps described earlier to make the necessary changes.

Entry Screens Defined

The **Entry Screens** are built from the same tables as the Browse Screens and can display all of the same fields, however the Entry Screens allow more detailed customization. All entry screens can be accessed from this menu and they include the:

- Inventory Screen
- Calibration Screen
- Location Screen
- Maintenance Screen
- Customer Screen

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The Entry Screens can be customized to show any fields from their corresponding tables. The System Administrator can move fields, change field headings and edit field properties to include a list of valid entries, pick lists, linked or merged data. Fields can be set so entry into them is required they are added, suppressed and moved as described earlier.

Like with the Browse Screen, the **Inventory Entry/Edit Screen,** shown above**,** is the Entry Screen that corresponds with data found in the Inventory Table. The Inventory record is the first created for a new asset. If an instrument is not in inventory no other information can be entered. The inventory form will be one of the most used forms and should be made as efficient and easy to use as possible. Data entry can be automated through the use of pick lists, linked validation, customized tab order, and screen layout. Using custom colors to designate required fields will tell the user what fields must contain data before the record can be saved. Unused fields can be suppressed to help simplify and shorten the entry time.

The **Calibration Screen** is where calibration events are recorded. This form is used to manually enter calibration information into the database or is created automatically when a calibration is done with the **Run Time** application. Fields on this screen are customized and rearranged the same way. Any field that resides in the Calibration Table can be displayed on the **Calibration Screen**. This is the second most used entry screen and should also be kept very simple and user-friendly.

The **Location Screen** is used to track the whereabouts of a company's equipment. It records details like the User Name, Station and Department, when the instrument was loaned out and anything else that may be used to keep track of valuable instrumentation. Any field that is part of the Location Table can be added to the Location screen.

In many cases equipment must have regular maintenance to maintain maximum performance. The **Maintenance Screen** will track maintenance requirements and maintenance and repair events. Complete details of what is done to an instrument

or what needs to be done, the parts involved and the costs associated are tracked with the Maintenance and Repair screen. Fields that make up the Maintenance and Repair screen are in the Maintenance Table. Like with the previous forms, anything from this table can be displayed on the screen.

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The **Customer Screen** keeps information on customers whose instruments are being calibrated, repaired, etc. This is a very useful screen for those users that do service external customers. It can also be useful for those in large companies who service many other departments or internal customers. This screen can contain any information stored in the Customer Table. Like the other entry screens, this screen is used to record information about a specific inventory item, or asset. This form will allow the user to assign or tie specific asset numbers to a specific customer. Data on this screen is usually a Customer ID number, Name, Address, Shipping Address, Contact names and accounting information like Tax Status and Billing Terms.

Customizing Entry Screens

Defining Database Field Types

Every field can be customized. However, before doing ANY field customization it is important to understand the types of fields located in the various tables. Each field is classified as **Core, Calculated** or **Auxiliary**

Core Fields contain certain types of values which are required for the underlying database to work properly. Examples are fields like I4201, Asset Number and C2301, Calibration Date. Many of these fields can be set up to have default values. The operator may not see them, but they exist and are used by the system.

Calculated Fields are those that have some sort of mathematical relationship to other fields. For example, C2303, Due Date, is computed using values from C2301, C2302, and C2333, Calibration Date, Calibration Interval, and Calibration Pass/Fail, respectively. There is no way to change the way these fields interact. Customization allowed for this field type is usually limited to making changes in the name of the field heading.

Auxiliary Fields are all those other fields that are neither core fields nor part of a calculated field group. Auxiliary Fields are strictly data fields. They just contain information. Reports supplied with the software may expect certain types of information in some of these fields but users can change these fields without interfering with the basic operation of the software. Reports using some of these fields may need to be changed to match the user customizations. Auxiliary fields are less sensitive to customization, but changes can still result in confusing reports or screens if intended use of the fields is not taken into consideration.

Memo Fields Memo Fields can take large amounts of text, but differ from a comment field because they are formatted to accept **Rich Text Format.** Word document can be copied and pasted into the memo field by the user. Picture files, like .bmp files, jpg files and any other type of graphics file can be pasted in using the standard Windows CTRLC and CTRLV copy and paste commands. This field can be used to store photos of the inventory item, copies of cal certs or scanned copies of Manufacturer's Warranty cards. Store a shortcut to a .pdf file or any type of file in the memo field. This field does not require customization. Just add the memo field to the Inventory, Calibration, Location and Maintenance Screens.

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Core Fields: **The Minimum Requirements** As previously stated, Fluke
Metrology applications can be used just as they are shipped, without any special
customization at all. Initial values and defaults have already been established for
all of the core fields. These fields represent the absolute minimum requirements to
enable the various programs to interact with the database. Following is an
illustration of the Calibration Form as seen in the Entry Screen Lay-out function
of MET/TRACK.

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The fields necessary for the calibration form to work properly are those labeled **Cal-Date, Cal-Time, Pass**, **Interva**l. These fields represent the minimum amount of information that the database needs, and ensures that the date and time the calibration was performed, whether the asset passed or failed, and the calibration interval will always be recorded.

Core fields are required only for the proper functioning of the Fluke Metrology application programs. During customization of any of the forms, special consideration must be made of the core fields.

A form can be customized as radically as desired; even to the point of having none of the core fields visible. As long as the fields are receiving data from somewhere, everything will sail along smoothly.

One customizable field attribute is Source (copy from) This attribute allows another field to receive a copy of the data from the field designated as the Source field. In order to suppress the core field Cal-Date, you would have to ensure that some other field is supplying the data. Otherwise, the system will complain.

The underlying design supports efforts to keep every piece of important data for every calibration event, whether the information is recorded automatically as a result of running a Calibration Procedure, or manually, using MET/TRACK. A System Administrator must be aware of the underlying design in order to change it without creating costly errors.

The following table shows the minimal fields on the entry forms:

Table 8-1. Minimum Field Set

Calibration Form Core Fields		Inventory Form Core Fields	
C2301	Calibration Date	4201	Asset Number
C2333	Calibration Time	4209	Trace
C2323	Pass/Fail	4299	State
C2302	Interval (from 4229)	4240	Segregate Value
C2331	Interval Type (from 4228)	4228	Interval Type
C2316	Arrive Date (from 4224)	4229	Interval

Calculated Fields

In the database, a calculated field is one that depends on the value in another field or one that supplies a value to another field. This value can be a direct copy, as in the case of C2302, C2316 and C2331 on the Calibration form, Interval, Interval Type and Arrival Date, respectively all of which receive their values from the Inventory form. The inter-relationships among the fields also can be more complicated, as in the case of Calibration Labor Rate calculation.

Using the Calibration Labor Rate as an example, the value in field C2309, Calibration Labor Cost, is calculated from the values in several other fields, namely C2307 ,Cal-Tech, C2313, Calibration Shop, C2310 Shop Rate, C2324, Calibration Time,C2327, Second Cal-Technician, and C2328 Second Cal-Tech Time. The relationships between these fields are best illustrated by the formulas used in deriving the values:

Table 8-2. Calculated Field Formula

Tech1cost = 2324/caltime1 X Labor rate for 2307/caltech

Tech2cost = 2328/caltime2 X Labor rate for 2327/caltech2

ShopCost = 2310/caltime X Rate for 2313/calshop

2309 (CalLaborCost) = Tech1cost + Tech2cost + ShopCost

It is imperative that any customization of calculated fields take into account the underlying connections between fields that interact. For example, if field number C2324 is customized to record some information other than a period of time used by the primary calibration technician to calibrate the asset, the result of multiplying this time by a labor rate would have to be disregarded which would nullify the C2309 total cost. As a general rule, **the basic functions of calculated fields or those fields that contribute to the data in a calculated field should not be changed**.

Following is a list of Calculated fields and the fields in their Calculation Group.

Due Date Calculation

2301	Cal Date	2323	Pass/Fail
2302	Cal Interval	4228	Interval Type
2303	Cal Due Date	4229	Master Interval

Calculation Labor Rate

2307	CalTech1	2327	CalTech2
2313	CalShop	2328	CalTime2
2324	CalTime1	2310	CalTime

Total Calibration Time

2310	Total Cal Time	2324	Cal Time
2307	Cal Tech 1	2327	Cal Tech 2
2313	Cal Shop	2328	Cal Time 2

Repair Labor Rate

3233	Rep Tech 1	3237	Rep Tech 2
3236	Rep Shop	3738	Rep Time 2
3239	Rep Time 1	3229	Rep Time
3235	Labor Cost		

Total Repair Time

3229	Total Repair Time	3239	Repair Time
3233	Repair Tech	3237	Repair Tech 2
3236	Repair Shop	3238	Repair Time 2

Repair Due Date

3230	Repair Date	3249	Repair Interval
3247	Repair Due Date	3250	Repair Interval Type

Total Parts Cost

3209	Cost of Part 1	3218	Cost of Part 4
3212	Cost of Part 2	3221	Cost of Part 5
3215	Cost of Part 3	3224	Cost of Part 6

> *Note*
>
> *Some fields are considered to be **Calculated Fields** if they are subject to rules enforced by the database. For example, As Found/As Left can influence the values recorded in the Reliability field, C2304.*

For additional information about how the fields interact and the formulas used in the calculations, refer to the online help files.

Auxiliary Fields

Fluke Metrology software has the potential to be molded to fit just about any metrology lab's needs. Therefore, many of the fields are neither core nor calculated, they're just there to record data. These include the many user-defined fields in the database that are designed to be customized for unique application.

Auxiliary fields can be customized in almost any way, consistent with maximum character length and data type. Like Core and Calculated fields, Auxiliary field customization can have an affect on pre-existing reports. If a field title is changed on a form, a corresponding change should be made on any report that uses data in that field.

There are many examples of auxiliary fields most of the Inventory Form is made up of them. It is not necessary, for example, to use I4202 for the name of an asset's manufacturer. If a 20 character field is required for something else and 12 characters are sufficient for the list of manufacturers, I4210 can be used for manufacturers, and the 20 characters in I4202 for some other purpose. A user-defined field that meets the required length criteria can also be used.

When the usage and title of a field is changed simultaneously, customization should be documented. It is not strictly necessary, though, since running the report, MTCUST7.RPT generates a report that shows current customization

Memo Fields

A memo field behaves like any other auxiliary field. It really doesn't require much customization beyond setting display and data length. It is either added to or suppressed from the various data forms. The memo field is designed to accept rich text format documents, picture files and shortcut links to other programs.

Editing Basic Field Properties

Format changes within a field are made by accessing the **Field Properties** dialog box with a double mouse click within the field to be changed. Editing a field from the Entry Screens Layout menu will allow additional customization. The System Administrator can determine the user access level allowed to add and make changes to fields. Refer the Field Properties dialog later in this Chapter to see the choices.

Note

The selection of a blank value will default the required user level to Manager, or level 5.

For many fields, user levels can be set differently for initial records (Adding) and existing records that are being changed (Updating). A user may be able to add a serial number on an initial record, but not allowed to change it after the record has been saved.
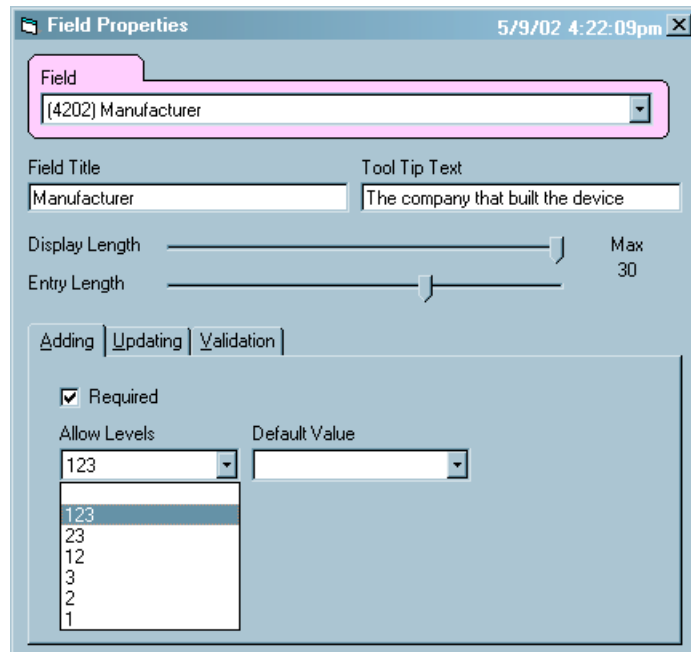
zv843s.bmp

Creating and Editing Validated Fields

Required Validation lists, lists of allowed entries for a specific field and **Pick Lists**, lists of frequently used entries for that field, can be created. **Linked Validation** lists, automated entry links to other fields, are also created here. **Required Validation** lists differ from **Pick Lists**. A record with a field containing a **Required Validation** cannot be saved unless the field contains an entry that is on the list. A **Pick List** contains frequently-used values but these choices are suggested, not required. **Linked Validations** will enter data into multiple fields depending on the entry the user selects in the main field, or Root Field.

An example of a Field Properties dialog box accessed within the entry screen is shown below. This is what the System Administrator will see when customizing a Pick List, within the Manufacturer Field in the Inventory Entry Screen Editor.
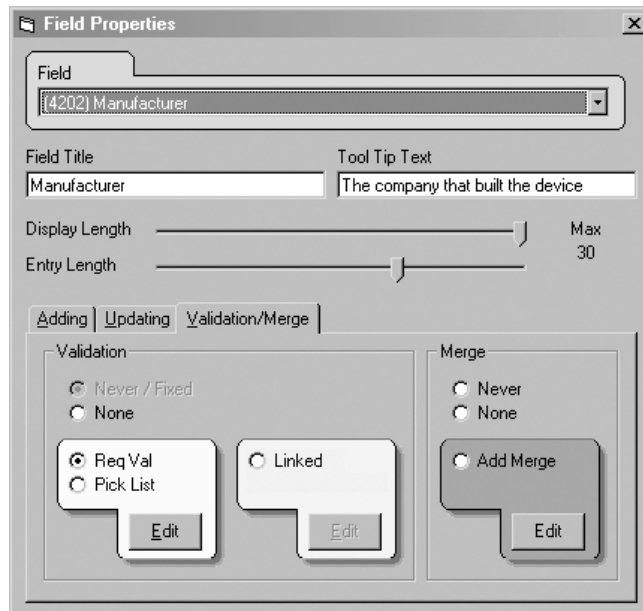
zv844s.bmp

Validation provides a way to restrict the data allowed in a field to a set of authorized, or valid, values. Validated lists of entries are created and edited within the field by editing the field properties and selecting the Validation tab.

There are three types of field validations from which to choose, **Required Validations**, **Pick Lists** and **Linked Validations**.

A **Required Validation** is a single list of entries consisting of approved values for a specific field. The operator is required to select from the list or the record can not be created. During normal operation, an invalid entry cannot be entered. If the user starts to type information into a required validated field the system will find the word that starts with the same letters the user is typing. If no match is found the only other option for the user is the leave the field blank. However, if the field is set-up to be **Required,** if the field is left blank an error message will be displayed saying that the field is required and must contain data before the record can be saved. A **Required Validation** is created by selecting the **Req Val** radio button under the **Validation** tab and then selecting the edit button.

To add a new list select the **New** button and type the list. To save the list select the **Save** button. To exit, select the **Close** button.

To edit an existing list click on any row in the list and press **Enter** a new blank line will appear in which a new item can be typed. To save the changes select the **Save** button. To exit, select the **Close** button.

A **Pick List** is configured in exactly the same way as a **Required Validation** list, except that the **Pick List** radio button is initially selected. A **Pick List** is created and edited the same way also. The only difference between a **Required Validation** and a **Pick List** is the Required part. A Pick List contains a list of values thought to be appropriate for a particular field. It gives the user frequently used choices to help speed up the entry process. However, if the user enters an item that is not on the list it is perfectly acceptable to the system and the record can be saved with any value in that field.

A **Linked Validation** is used to enter data into the database in several fields from a single entry. It is used to enter data into Model, Manufacturer and Description, for instance by just selecting a Model number. It saves data-entry time. Like a **Required Validation** the field is required to contain a value that is on the validation list. A field whose selected value will determine what values the other linked fields will get is the **Root** field. The **Root field** comes first when creating the **Linked Validation** table.

Following is an example of a **Linked Validation**

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To create a **Linked Validation**, select the **Linked** radio button and then select the **Edit** button. The first field title will show the **Root** field. Click the **Add Link** button and then select a field to be linked with the Root field using the down arrow. Once a field is selected press the **Enter** key. To enter values for each field, select the right-facing arrow until the first field is highlighted. Type in the desired values and tab to the next field in the link. When all entries are completed, move the cursor to the last row, denoted by the **＊**symbol and exit the **Linked Validation** editor.

Note

In any large database, valid data entry is very important. The entries typed in the Form Layout Application are used for validating the field data. Careless editing can result in the applications accepting incorrect data or rejecting correct data.

Try to keep the number of validated fields manageable in size, and do not set up a field with too large number of valid entries. Validated fields with too many possible entries may take the user a longer time to scroll through than it would take to type manually.

Copying Data Between Fields

Source Copy/Destination Copy

Fields can be populated with information from another field. Inventory data contains no history, but the Source (copy from) selection can be used to copy the value from one of the history forms into the inventory form.

If there is a company requirement to have the current Due Date appear on the inventory window it can be added using a Source copy on the Inventory form.

1. Use the **Restore Field** tool to add field I4212, Note Date, to the Inventory form. Double-click to access the Field Properties Editor.

2. Select the **Updating tab** then click on the arrow in the Source (copy from) Field. Locate C2303, Cal Due Date as the Source field from which to copy data into the Note-date field.

3. Click once with the left mouse button to select it.

Now every time a new calibration record is saved the due date will be copied from the calibration record to the Note-date field on the Inventory form. If **Destination** (copy to) has been enabled in any of the History forms, the selected field in the Inventory record is updated when the History Record is changed.

Copying Data Between Records

When creating a new Cal, Loc, or Maintenance record, all considered **History Records**, and if **Copy Forward** was enabled for a field, the previous value in that field is inserted into the record being created. Any field can have its value copied forward to the next record (of the same type) created.

Copy Forward takes precedence over Default data. If a field has both default data and copy data, the copy data will appear in the field, not the default data. For fields that contain historical data, legal values for Copy Forward are ON and OFF. MET/TRACK restricts the choice to one of these two values or to use the Source (copy from) instead.

If copy forwarding is set to ON, then the entry from the previous record is brought forward when a new record is added to the system. If the lab has only one cal tech the C-Tech field can be copied to every new calibration record. By setting the copy value to ON, the C-Tech from the previous calibration record will be copied to a new calibration record. This value can be changed if the user has sufficient authorization to update or add-to the C-Tech field.

Setting the initial default value to blank and making the field required ensures that the field is filled the first time it appears in a record.

Setting Default Values in Fields

Default data is that which appears automatically in a field on a data entry window or during importation. Default data can be specified for both Insert and Update data entry. It is another way to populate fields without the data-entry process.

Default data may overwrite any data that is currently in the field with the exception of data caused by the Copy attribute being active or if. the user has authorization to enter or update data in the field.

Special Default Data Selections

There are some Specially Configured Selections for Default Data.

Table 8-3. Special Default Values

Current Date	Enters the current computer calendar date.
Current Time	Enters the current computer clock time.
User's Login Name	Enters the name of the user currently logged in.
User's Full Name	Enters the real name of the user currently logged in (from the user configuration.
User's Segregate	Enters the user's assigned segregate.
User's Workstation	Enters the user's workstation designation.
Desktop Name	Enters the name of the desktop used.

These selections are already in the Default Value list

1. Select the desired entry by using the scroll arrow to the right of the **Default Value** entry field and choosing from the list.

2. If the desired Default Value is not in the list, select the blank entry in the drop-down. This will blank the value. The required value can now be typed into the empty box.

Special Rules for Customization

As Found/As Left

As Found/As Left represents a calibration philosophy about how calibration is performed. MET/BASE supports three basic philosophies. The philosophy you choose determines how the Found/Left field, C2308, is configured.

Philosophies of As Found/As Left

Philosophy 1

When an instrument comes in for calibration, the verification procedure is run. If it passes, the data is recorded and the instrument returned. If it fails, failed data may or may not be recorded, the instrument is re-calibrated or fixed and the verification procedure is run again. (It passes this time – it was fixed).

Following this approach, Field C2308 is left blank (or suppressed), and the user is not concerned with As Found/As Left.

Philosophy 2

As Found/As Left data is always recorded. When an instrument comes in for calibration, the verification procedure is run. Whether it passes or fails, the data for the instrument is recorded and C2308 set to AS-FOUND, since this is how the instrument came into the lab. If it failed, the instrument is recalibrated or fixed.

Now, if it passes, the verification procedure is run again. This time, however, the data that gets recorded is AS-LEFT, since the instrument is being sent back to the user.

Philosophy 3

As Found/As Left data is recorded, but the verification procedure is only run once if the AS-FOUND passes. The procedure is followed as in #2 if the instrument fails on the AS-FOUND. If the instrument passes on the AS-FOUND, then C2308 is set to FOUND-LEFT, to indicate that the instrument was FOUND in this condition, and it LEFT the lab in the same condition.

The difference between #2 and #3 may not seem very large, but it becomes important when reporting on the data, and if trying to match up As-Found and As-Left data in Crystal Reports.

The purpose of field C2308, Found/Left, is to permit tagging of each calibration event with information about when the event occurred in the process. The tags specify whether the results indicate the condition of the instrument at the time it arrived, when it left, or both. The feature can also be disabled so that no such tagging takes place.

However, note that by not using the Found/Left feature, a reliability coefficient for each instrument cannot be generated. The Reliability Coefficient is a figure of merit that indicates each instrument's reliability. The coefficient is stored in field C2304. Fields C2308 and C2304 make up a **Calculation Field Group.** Because of this relationship, the system enforces the interaction between these two fields in the database.

Constructing a Reliability Coefficient

The Found/Left field,C2308, stores a single value for each calibration event, and the feature works the same way whether the data comes from the Run Time or the Manual Entry application.

The Found/Left field is 10 characters, and it must contain one of the values **AS FOUND**, **AS LEFT**, **FOUND_LEFT**, or it must be empty (contain a null value).

The purpose of field C2308, Found/Left, is to mark a calibration event with a tag that specifies the point in the process where the event occurred. These tags specify whether the calibration results indicate the condition of the instrument at the time it arrived, at the time it left, or both.

The As Found / As Left feature makes use of prompts that the operator will see upon completion of a calibration procedure. The formatting of these prompts is contained in two files, Pass_DB.TXT and FAIL_DB.TXT, located in the METCAL directory, by default. The prompt is formatted as follows:

```
As Found / As Left  :: FOUND_LEFT$ 2308
```

The effect of these prompts is to create a validated field on the Pass and Fail Post-Run prompt screens (assuming that the validation entries for C2308 have not been modified). The choices presented are the legal values, including the null value. If the validation of C2308 is modified, the automatic loading of the Reliability field will not operate.

A pound sign (#) at the beginning of the line illustrated above causes the Run Time application to ignore the entire line. This removes the prompt from the post-run screen and disables the feature. Open each file in an editor such as Notepad to make the changes in both the FAIL_DB.TXT and PASS_DB.TXT files. If the feature is disabled the prompts must be removed (or commented out using the # sign) from both the FAIL_and PASS_DB.TXT files. If the feature is disabled the validation entries for field C2308 can also be edited.

If the Found / Left feature is used, the contents of the Reliability field, C2362, can be affected. The reliability field is a calculated field that receives information from two sources: Found/Left, C2308 and Pass/Fail, C2323.

Providing As Found reports may be a requirement for some customers, but even if it is not required, gathering reliability information may be a convenient way to determine calibration cycles for certain instruments. If an instrument with a 30-day calibration interval is always in cal upon arrival, it may be appropriate to extend the interval. Conversely, if a critical instrument usually arrives out of calibration a shortened interval may be in order.

The following table shows the effect of As Found/As Left on the reliability field.

Table 8-4. Effect of As Found/As Left on Reliability Field

Pass / Fail (C2323)	Found / Left (C2308)	Reliability (C2362)
Pass *or* Fail	Don't Care	No Change
Pass	Found_Left *or* As Found	If rel < 0, set to *1* otherwise set *rel=rel +1*
Fail	Found_Left *or* As Found	If rel > 0, set to *-1* otherwise set *rel = rel -1*
Pass	As Left	No Change
Fail	Don't Care	No Change

Interval Types

As assets are entered an interval type is assigned for each one. The interval type is recorded on the inventory form and is copied forward to the calibration form when calibration data is saved for that asset. The interval type can be changed at any time without affecting calibration history. The interval type must be one of the following:

Table 8-5. Interval Types

Type	Units	Interval
d	Days	24 hours
w	Weeks	7 days
m	Months	Calendar months
u	Uses	Number of uses
n	None	Never needs calibration

The interval type allows the system to calculate a due date. This method is preferred over manually entering a due date.

How Time Intervals are Calculated

For TIME interval types (Days, Weeks, Months), the system computes the due date using the cal date and the cal interval, calculating in the Non-working Days and Non-working dates configured by the System Administrator. If zero is entered, no due date is calculated.

How Use Intervals are Calculated

For USE interval types, the system computes the due date when the number of uses (Field 4230) exceeds or equals the interval. The date this occurs becomes the due date.

How No Cal Instruments are Handled

For NEVER interval types, the interval is always zero. Use N for assets that never need calibration. A due date may still be entered manually, but, if the interval type is N, the software ignores the due date in the traceability reports. For purposes of forward traceability, an N interval type represents the termination of the traceability tree.

Understanding Abeyance

Abeyance is the condition of being temporarily set aside or in suspension.

MET/CAL provides a way to put a mechanical asset into abeyance when the asset is calibrated, but not used right away. Instead, it is placed in a special location where it stays until it is used. While it is in this location, it is in a state of suspension or abeyance. When it is removed from the abeyance location, the due-date is then calculated.

Fields Used in the Abeyance Process

There are six fields for abeyance, four for data retention. These fields are:

4258 : Abeyance state.

4259: Abeyance interval.

Located in the Inventory Table

and

2380: Abeyance date.

2381: Abeyance time.

2382: Abeyance state.

2383: Abeyance interval.

Located in the Calibration Table

Field 4258, Abeyance state, can be either Y or N. This flag determines how the due-date is calculated during calibration. If the flag is set to Y, then the asset will be placed in abeyance after it is calibrated.

Field 4259 is the abeyance interval. This is an interval to be used to set a due-date in case the asset never comes out of abeyance. Fields 2382 and 2383 are copies of 4258 and 4259 and are stored for historical purposes when the calibration record is saved. Fields 2382 and 2383 record the date the item was taken out of Abeyance.

An Example of the Abeyance Feature

Assume there is a device X. Its calibration interval is three months, and the abeyance interval (4259) is set to 24 months. Also assume field 4259 is set to Y.

Asset X is calibrated on 1999-06-01. Field 2382 will be set to Y, and field 2383 will be set to 24. The due-date will be computed as 2001-06-01 (24 months out).

Now, on 1999-08-01 the item is taken out of abeyance.

To take the item out of abeyance, field 4258 on the inventory form is set to N. When the inventory record is saved, the due-date for asset X will be recomputed to 1999-11-01. Field 2380 will be set to 1999-08-01 and field 2381 will be set to the current time.

Using the Database Menu

Global Changes

At times it is necessary to update more than one database record at a time. In the Manufacturer field for example, users are all entering the same Manufacturer name in different ways. Some are entering it ABC Incorporated, some A.B.C. Inc., some ABCInc. Maybe several assets have recently change ownership from one department to another. These examples represent a large number of records that should be corrected. The easiest way these changes are made is using the **Global Change** menu item. Global changes are made when more than one record has to be updated with the same information. Hand typing the new information would be time consuming, depending on the number of records to be changed. The figure shown below is the Global Change screen. In this example the user is updating Manufacturer field on the Inventory Table. The incorrect company name Brown & Sha is being replaced with the correct name, Browne and Sharpe.
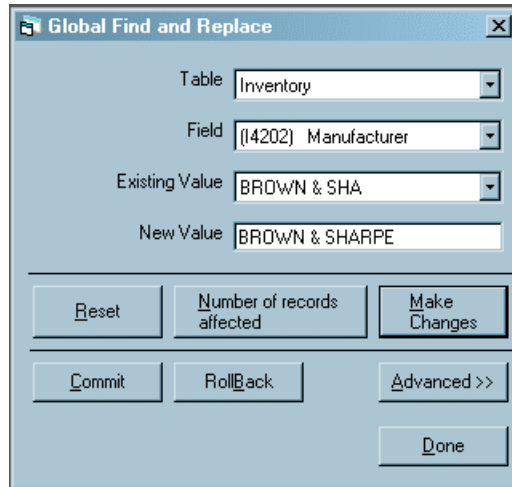
zv846s.bmp

Making Global Changes

1. Select the **Table** that the field to change resides on.

2. Select the specific field to change.

3. Find the **Existing Value** to change by clicking on the scroll arrow and selecting the correct data.

4. Enter the desired **New Value** for the field or fields.

5. Click the **Make Changes** button.

6. A confirmation box appears showing the number of records to be changed if the process is completed.

7. If the change looks valid, and the number of records looks correct, click the **Commit** button to commit changes to the database.

8. If the changes do not look valid or the number records seems wrong, click the **Rollback** button to undo the changes.

9. Use the **Reset** button to start another change process.
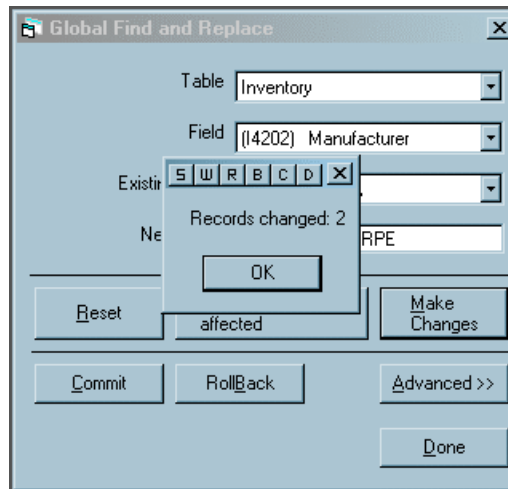
zv847s.bmp

This is a powerful tool to maintain database consistency. It can also cause database problems if used incorrectly. The rules established by the Field Properties setup must be adhered to when making changes to data in the fields.

Data Importation

The **Data Importation** menu item allows importation from another database. Any data file that can be formatted into a delimited source file can be imported into the MET/TRACK database. A source file is simply a file with data separated into individual fields through the use of commas, semicolons, tabs or other allowed delimiters. When selected, the **Data Importation** menu item will open up a program wizard that steps the user through the mapping process.

The mapping process allows the user to determine which source data goes into which corresponding MET/TRACK data field. The wizard displays the Source File Data in Columns and Rows. A listing of all the MET/TRACK Database Tables, with their corresponding fields are also displayed. Select the Source Data column number with the mouse and, once the column is highlighted, find the appropriate MET/TRACK Data Field. Press the Enter key once the correct MET/TRACK data field has been selected. The column heading will now show the selected field. To make changes in selections clear the headings by selecting the **Reset** button or highlight the desired column and click anywhere in the column with the right mouse button and select **YES** to clear. Not all columns of the source file need to be imported. Select only those with crucial information. Additional information can always be added at a later time. Clutter-free databases are easier to manage.

All records or just a specified number of records from the Source File can be imported. Choose "All" or enter the number of lines to import. Experiment with a small number of assets first and test the import. Importing in sections will make import failures easier to find and correct and the program will run faster. The **Begin at Line** box sets the point in the source file where importing begins. This is useful for delimited files which contain unwanted data in the beginning lines. Selecting the start line will ensure that this unwanted data is not imported into MET/TRACK. The Begin at Row box is only available with ASCII delimited Source Files.

Once all Source Data Columns have appropriate MET/TRACK data headings select the **Import** button. The import program will total changes to records and rejected changes. It will also allow the user to generate an error log.

Existing databases can be successfully and quickly imported into MET/TRACK if the data is clean. Unfortunately, most data needs to be reviewed to see what is missing, and what needs changing. The best way to review the data is to use a spreadsheet program, like Excel, to view, correct and format data into a file that is easier to import. Data importation can be tedious. It may take 3 or 4 attempts to get the data successfully installed. After each try, the errors and problems are corrected, and another attempt is made. Each time, fewer errors will occur until finally all or most of the data is successfully imported.

For additional information on importing please see the help files under "Results". Or for Portocal users please refer to the application note, "Importing Portocal Data into the MET/TRACK Database".

User Tables and Merge Tables

Additional information that will not fit or is not related to one of the existing tables can be added in the form of a **User Table** or a **Merge Table** Selecting the menu item **Create User Table** will allow a new table to be created. Select the **Simple** radio button to create a stand-alone **User Table** or the **Field linked (merge)** radio button to create a **Merge Table**, linked to an existing database field. Select the field on which to create the Merge Table with the down-arrow key.

The **User Table** feature, new with version 7, will allow the Administrator to create a table, including defining field names, field types, lengths and other properties, such as default values and required or not required designations. There are excellent samples of user defined tables already in the software.

Adding or Editing a User Table

1. To access these samples, sign in to MET/TRACK using the MT Administrator login and password.

2. Click on D**atabase** and **Create User Defined Table**.

zv848s.bmp

3. Look at the tables listed under Samples. Select any of the tables by pointing the cursor and clicking once with the left mouse button.

4. To add a new table make sure that the **Simple** table type is selected.

5. Type in a Table Name to call this new Table.

6. Type a Name in the **Field Name box** to start the table.

7. Select the Data Type from the pull-down list and set the width.

8. Set the Default Value and determine whether any entry must be unique or required or both.

9. Click the **Add** button.

10. Add additional fields the same way.

11. When All the fields have been added, Click the **Add Table** button.

12. Click the **Close** button when the table has been successfully added to the database,.

These tables can be created in any way the administrator chooses. Note that once **User Tables** are created and defined, they can only be edited from an Entry Screen. The **Merge Tables** can be edited by the System Administrator from the **Database** Menu, as discussed below.

Dropping User Tables

The **Drop User Table** menu item allows the Administrator to quickly delete a user table that is no longer necessary. A list of all User Tables displays from which the Administrator can select the desired table to delete.

Adding or Editing Merge Tables

1. Click on **Database** and **Create User Defined Table**.

2. To add a new table, select the **Field Linked** (merge) radio button.
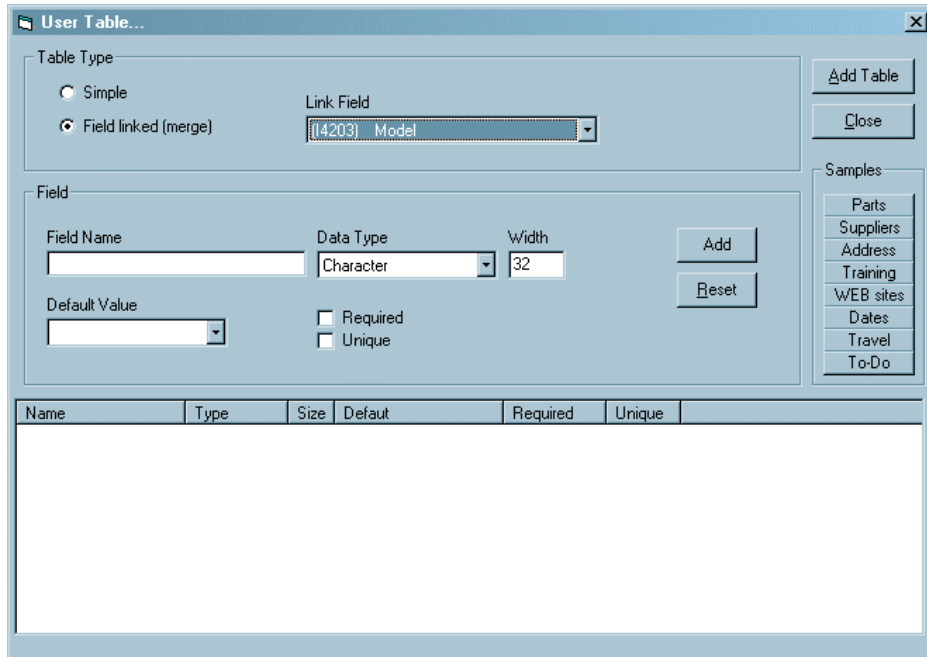
zv849s.bmp

3. Select a database field with which to Link the Merge Table.

4. Type a Name in the **Field Name box** to start the table.

5. Select the **Data Type** from the pull-down list and set the width.

6. Set the **Default Value** and determine whether any entry must be unique or required or both.

7. Click on the **Add** button.

8. Add additional fields the same way.

9. When all the fields have been added, Click the **Add Table** button.

10. Click the **Close** button when the table has been successfully added to the database.

If a Merge Table has been created it can be edited from the Edit Merge Table menu item. Again, a list of all possible merge tables is displayed. The merge table to be edited is selected. From the Merge Table Edit Screen the choices are to Add, Delete or Update lines (or records) in the Merge Table. A choice of views is also available.

View Options for Merge Tables

- Normal, or Fields in Columns and Records in Rows.

- Pivot, Fields in Rows and Records in Columns.

- Group, which will allow the user to group by any of the Field Titles.

- Filter, which allows viewing of records that meet filter criteria.

	Merge	Name	Address	City	State	Zip	Phone	FAX	Commer
	Fluke	Fluke Electronics Co	Seaway Blvd	Everett, WA	WA	98203			Stuff
	LeCroy	LeCroy Corp							
▶	HP	Agilent Corporation	Shaker Road	Palo Alto	CA	40405			

○ Normal ○ Pivot ○ Group ☐ Filter
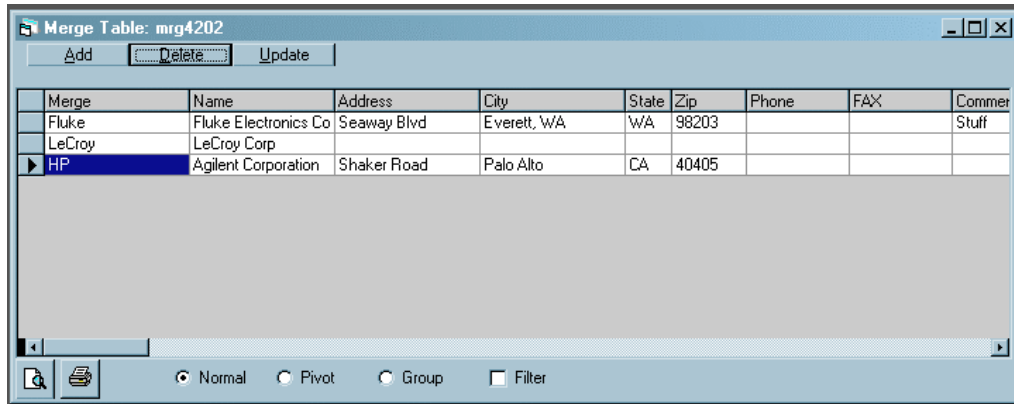
zv850s.bmp

Dropping Merge Tables

Merge Tables can be deleted easily as well. The **Drop Merge Tables** menu item will bring up a list of current merge tables when selected. The table to be deleted is selected and a dialog box will double-verify that the user really wants to delete the Merge Table.

Using User-Table and Merge Table Data in a Report

When a **User Table** or **Merge Table** is created, the database is expanded. A table and a number of fields is added. The table created can be used in reports, just like any other table. Besides the rules given at the beginning of this discussion, there are a few points to note about the merge tables added:

- When a User Table or Merge table is created, a new table is created in the database. The name of this table is always mt.mrg<field number>, where <field number> is the root field number, in the case of a Merge Table or mt.user<name> where <name> is the name or number designator of the table. The first field in the merge table is always named "merge." This field cannot be blank, must be unique, and must be the same size as the root field.

- When used in a report, the merge table must be specifically linked to the root field. This is done using Crystal Report's Visual Linking Expert.

System Customization Using the Set Up Menu

Adding Users and User Passwords

The Set Up Menu is used primarily for user, system and report configuration. The System Administrator can customize what the individual user will see by logging in to the MET/TRACK application. The **Users/Passwords** selection is where users are added or edited , user security levels are configured and passwords are maintained. The figure below represents the User tab.
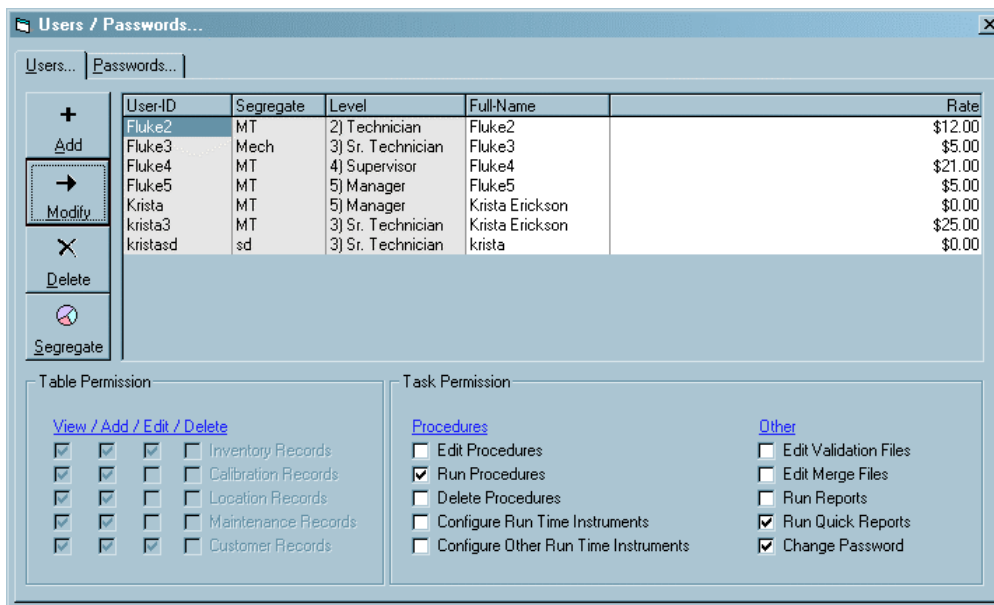
zv851s.bmp

Selecting the add or modify a user buttons will bring up a User Configuration form. This is where users are managed. The radio buttons are used to select the user level. The user level will determine what tasks the user can and cannot do, what database fields they are allowed to access, what segregate of the database they belong to and what hourly labor rate will be calculated for any work that they do.

Table 8-6. User Access Levels

Access Level	Typical User Permissions
MT	No permissions for adding or changing data; but MT is the only user authorized to configure the database and system. The MT user can delete or modify the entire database and all its users. The MT user is the System Administrator
5, 4	These two levels perform supervisory and error correction functions, and write Calibration procedures. They have read and write permission for the entire database, including historical records. These two levels have similar security clearance, but can be differentiated from each other through Task Permissions. These user levels are usually assigned to Sr. Technician/Metrologists and Managers.
3, 2, 1	Basic data entry/technician. Persons holding these access levels can add new Inventory and Calibration records, and in MET/TRACK applications, can add Maintenance, and Location records. Level 1, 2, and 3 users cannot alter historical data. These levels are appropriate for most users and are usually assigned to technicians and data entry personnel. The actions these three levels can perform are established through Task Permissions.
0	Read only. Users with level 0 access can look at data but have no write permission.

Setting User Permissions for Specific Tasks

The **Task Permission** section is where some specific task permissions are determined. The choices available are divided into two groups, **Procedures** and **Other**:

Edit Procedures allows a user to change Runtime procedures from the Editor program.

Run Procedures grants a technician permission to run an automated calibration procedure.

Delete Procedures gives the user the ability to delete procedures from the directory entirely. This permission is best suited for a Cal Lab Manager or Metrologist.

Configure Run Time Instruments allows the user to add and edit standards used in Run Time procedures. This includes changing asset numbers, IEEE and port addressing and installed option or auxiliary device configuration. A Sr. Technician that has some computer system knowledge is a good candidate for this task.

Edit Other Run Time Configuration allows the user to configure other properties of Run Time from the Run Time or Editor programs. This task is best assigned to a Manager.

The **Other Task Permissions** determined here are general permissions that do not fall under a specific program.

Edit Validation Files gives the user the ability to add and change entries in a field configured with a required validation list.

Edit Merge Files lets the user add and edit Merge data associated with a configured Merge field.

Run Reports allows the user to Run, Preview and Print Run Time and General reports from the Run Time and Manual Entry applications.

Run Quick Reports allows users to configure and run reports from the Quick Reports application.

Change Password allows a user to change his or her own password. The password change frequency and length are set in the Password configuration screen and those rules are followed whether a user is allowed to change the password or if a system administrator is required to change all passwords.

Select the user with a single click of the mouse. Check or uncheck the **Task Permission***s* to grant permissions for specific tasks. Users can be modified in the same way they were added. Task permissions can be granted or taken away.

The User configuration screen is shown below.
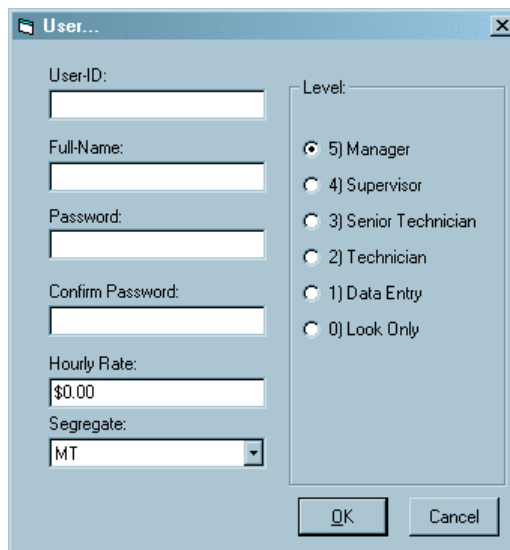
zv852s.bmp

User Password Configuration

Configuration of **User Passwords** is a key System Administrator's task. The user name and password is assigned to a user, who is assigned a user lever, which affects how that user accesses the MET/TRACK program. Many companies have internal quality requirements that mandate a certain password expiration period.

That period may be 30 days, 1 year, 7 days, or the password may never expire. This expiration period and other password attributes are configured in the **Password** tab of the **Users/Passwords** set-up screen. This screen allows the System Administrator to set the Maximum age, or maximum length of time in days a password can be used, the Minimum age, or minimum length of time in days a password is in effect before it is changed, the minimum character length and whether the change will be forced or optional. Passwords should be short enough to be remembered easily, but long enough to be secure and not easily decoded. Once user passwords are assigned they cannot be recovered. The only way to recover a lost password is to create a new user and password. Users and Administrators should write down passwords in a secure place.

Note
This is also the screen where the MT password can be changed.
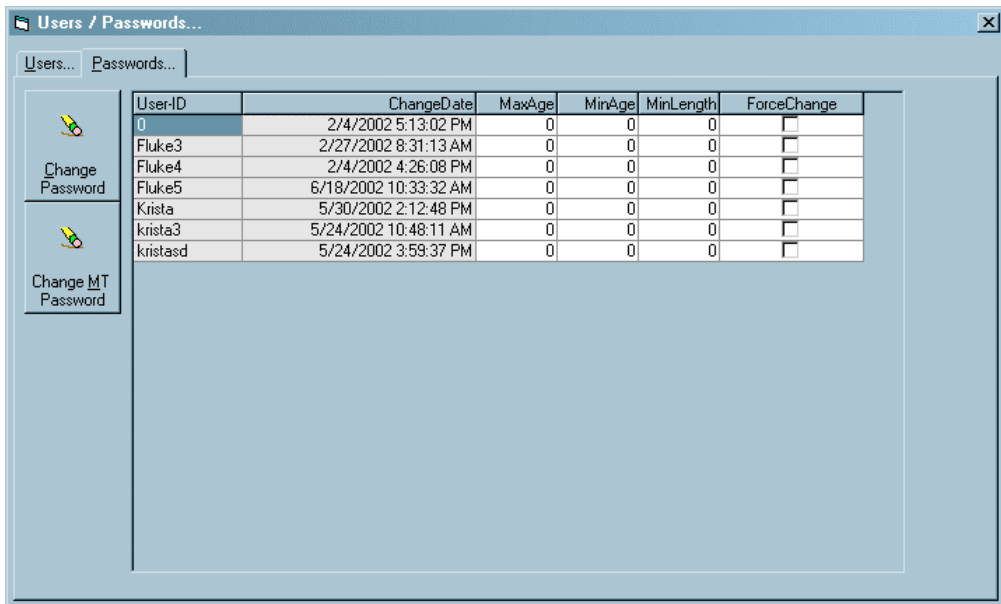
zv853s.bmp

Deleting a User

Selecting the **Delete** button will allow the System Administrator to delete a user, However, *a user that has created records will have associated history and should not be deleted*. Setting a user to look only and changing the user password will guarantee no access to the program, but will keep all historic database records intact.

Creating and Assigning Segregates

The **Segregate** button allows the creation of new database segregates. Once created, users and assets can be added to these segregates. Segregates are segments of the database. A company may have a mechanical and an electrical lab that have separate employees, assets and workload. Segmenting the database will allow the company to track these two labs individually, while maintaining the same database and database administrator. The segregate feature allows the division of the database into separate, mini-databases for some users while keeping all of the data together.

Data may also be segregated based on customers. Each customer is assigned a segregate value. This allows customers to log into the system and view the status of their assets, but prevents them from seeing what other customers have. It allows the service lab to keep track of which assets belong to which customers.

The add user screen, add asset screen, and add customer screen all have a segregate field that can be assigned to one of the values created in the Segregate configuration. Note that it is possible for a user to add an item to a segregate other than their own, but they will never be able to view the item again. The record being added will default to the user's segregate, but can be changed by the user. However if the user tries to search for the asset later a Notice box will open that displays the following error message: "The asset is in a segregate you do not have permission to view". Reports can also be assigned to a segregate. This means that if a report is assigned to a specific segregate, only a user in that segregate can execute that report.

Segregates and Their Effect on Reports

Most reports will be assigned to the <any> segregate, which allows any user to run the report. A report that is written using table linking must be created for a specific segregate. So, in addition to assigning it to a segregate in the add reports dialog, The report must be written for that segregate in Crystal Reports.

Reports written to run off stored procedure output can be assigned to the <any> segregate, or to a specific segregate. Because the report works off a stored procedure, any user can execute it.

Special Segregates

There are two special segregates, MT and STD. The MT segregate contains all of the data in the database. Any user who is assigned to the MT segregate can access all of the data. Typically, users in the cal lab are assigned to the MT segregate.

The STD is a special segregate intended to be used for standards. Since one segregate does not have access to data in another segregate all of the standards in a segregate would have to be duplicated in every other segregate. This can be

overcome by putting standards in the STD segregate. Assets in the STD segregate can be accessed by other segregates as standards in calibration events.

Changing the MT Password

Every copy of MET/BASE is shipped with the same Administrator password. When the software arrives at your site, the administrator's User Name and Password are both **MT**. The administrator's User Name is set, but for security reasons, the password should be changed once the System Administrator is satisfied that the software is installed and communicating properly.

Change the MT password as soon as possible after verifying a reliable log on. The MT user has full authority within the database, and the MT password should be treated with care.

To change the password of the MT user, proceed as follows:

1. Make certain that the database engine is running.

2. On a client workstation, start the Data Requester.

3. Log in to the MET/TRACK application with the user ID **MT** and the password **MT**.

4. When the application starts, open the **Set-Up** menu and choose **Users/Passwords**.

5. Select the Passwords tab then select the **Change MT Password** button.

6. Type in the new password carefully, avoiding typographical errors and then type it in again, for confirmation. Select **Assign** to save the changes.

7. Record the password in a secure place.

⚠**Caution**

Do not forget the password for the MT user. Without this password, it is impossible to access the configuration application required for managing the database.

Fluke cannot recover any data lost due to a forgotten password.

Configuring User Desktops

New with version 7 MET/TRACK is the ability to customize **User Desktops**. After setting up a new user, the System Administrator can customize how the entry screens will look according to the tasks the user performs. **Title** and **Data Field** font types are configurable by selecting the **Font** and **Color** buttons. The **Required** field and **Default** field colors can be changed by selecting their associated buttons. The Asset Number field will display the selections made so some experimentation can be done. Customize the appearance of like desktops for users with like tasks or let the individual users choose fonts and color schemes.

In addition to appearance customization the System Administrator can add database customization unique to each desktop. Fields can be added or suppressed for different desktops, security levels for adding and updating can also vary from desktop to desktop. The system administrator can create a custom user interface for each different department, segregate, user type or individual.

1. To Customize a Desktop go to the **File** menu. Go to **Select Desktop** and choose the correct desktop from the list.

2. Proceed with any database customization as described earlier in the chapter.

3. Note that Validation is universal and cannot carry from desktop to desktop. This includes Simple and Linked Validation, Picklists, Merge Tables and User-Defined Tables.

⚠ Caution

Make certain the desired desktop is selected under the File menu , Select desktop item prior to making any customizations. Form and Field Customization done while one desktop is selected will not be reflected on an unselected desktop.

General Configuration

As a rule, the system configuration options only need to be set up one time because the settings are not likely to change from day to day and are more permanent in nature.

From the server or a stand-alone installation start the data engine, or from a client machine, start the data requestor. Log in to the MET/TRACK application using the MT user and the applicable Administrator password (MT or the new MT password assigned by the administrator).

1. Log in as **MT**, and provide the MT or System Administrator password. Only the MT user is permitted to Set Up System Configuration.

2. Select the **Set-Up** heading and choose **Configuration** from the menu**.** A configuration screen with 4 tabs, **System**, **Company**, **Holidays** and **Uncertainty** appears as shown below.
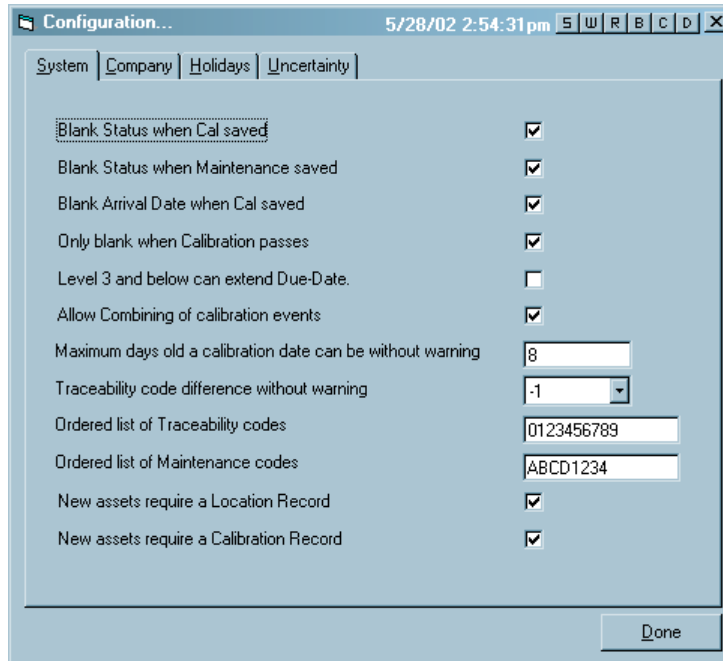
zv854s.bmp

Configuring the System

The options configured in the System Configuration screen are explained in the following paragraphs.

Blank Status when Cal saved

Blank Status when Maintenance saved

Blank Arrival Date when Cal saved

Blank Arrival Date when Cal saved

Field 4225 (Status) of the Inventory table is intended to store the temporary status of an asset. In larger installations, this field can be used to indicate that the asset has arrived for calibration, is on a bench, is undergoing testing, or other process milestones.

Field 4224 (Arrive Date) is intended to store the date the asset arrived.

If assets move through the process rather quickly, These fields can be disregarded. To do so, configure the field to be blanked. The status or date is blanked each time

a new calibration or Maintenance event is recorded in the database. By checking these boxes a null value is stored in the field, signifying that temporary status or arrival date information is not stored. If instruments that do not pass the initial calibration need to be flagged in some way, selecting to blank only when Calibration passes will maintain the Arrival date.

If Status is not blanked, eight characters are available to record the temporary status of the assets; by not blanking I4224, the date field can be used to store the date of arrival of the asset. Any query or report that checks the value of these fields can show the whereabouts of the asset at a glance.

Level 3 and below can extend Due-Date

Users having access level 3 and below are not usually permitted to extend the Due Date past the date calculated by the software. Levels 4 and 5 can always extend the Due Date. Checking this box permits levels 3 and below to enter dates after the calculated due date. The Administrator should make this determination based on the established practices at the user site.

Note

Customization can restrict which lower level users can access this field.

Maximum days old a calibration date can be

Every time a calibration date is entered, the system checks to be sure it is not too old. Each calibration date is checked against the system date. Operators with access levels 1, 2, and 3 can only enter cal dates of today's date minus the number of days you set here. For example, the default is seven days; if today is the 18th, these operators can not enter a date earlier than the 11th. To relax this check, enter a larger number. A setting of 30 days may be more realistic in some situations. This would let all operators input any calibration date up to one month old.

Traceability Code Difference Without Warning

The traceability code difference is not enforced because a standard for one procedure may not be considered a standard for other procedures. The difference is simply a check to warn of possible traceability violations.

The difference can range between 15 and -15. Normally, a difference of 1 would be an appropriate and useful setting. This would mean that a warning would occur if a standard's code was not at least one code higher than the asset being calibrated. If standards are fairly well defined and a strong check is required, a larger difference, like 2 or 3 can be selected.

A very weak check can be achieved by setting the difference to 0 or -1. Zero means that a standard with the same code as the calibrated asset could be used, and negative one (-1) indicates that an asset could be used to calibrate a standard one level higher than itself.

To completely disable the warning, enter -15 (negative 15). This setting allows any asset to be entered as a standard without a warning.

Ordered list of traceability codes

Traceability codes are an ordered sequence of single characters that define the traceability hierarchy for asset inventory. They represent classes of standards, and are therefore loosely related to accuracy.

The codes come into play when standards are selected for a calibration event. If the difference between the positions of the codes in the ordered sequence is less than a pre-set value, the software displays a warning.

In this selection, the traceability codes are defined that will be used by the system to check hierarchy. 15 codes can be specified. The order descends from left to right. For example, the letters RCTWPN could be the ordered list with the letters carrying the following meaning:

R	Reference standard
C	Consensus standard
T	Transfer standard
W	Working standard
P	Production standard
N	No calibration required

Or the default sequence 12345 can be used, or some other alpha or numeric scheme invented that can be easily remembered.

Ordered list of maintenance codes

As with Traceability Codes, Maintenance Type Codes are open to user definition. 32 different maintenance codes can be established.

The database can cover ALL assets, even those that are not directly involved in calibration, like bar code readers or CD recorders or players. Maintenance type codes are selected at the **Maintenance Type** field (3251) on the Maintenance form. The numbers 1 through 32, may be used with a particular meaning assigned to each code for all laser printers and an entirely different meaning for bar code readers. Since asset Maintenance history records also include an interval specification field, each of 32 different types of events can be scheduled for each asset. There is one active due date for each Maintenance code.

New Assets require a Location Record and/or a Calibration Record

This option will prompt the system to display an error message if an attempt is made to save a new inventory record without a new Location and/or Calibration Record. This will ensure that a new asset can be located and is currently calibrated. For smaller installations tracking instruments by Location Record may not be necessary. For third-party calibration labs that only receive new assets when they are due for calibration, the Calibration Record requirement may not be necessary either. Checking the selection boxes makes the record creations required for new asset entry, leaving them blank makes the record creations optional for new asset entry.

Configure the Company

When MET/BASE is installed, the installation program prompts for company name. This entry is specific to each work station and is used for the header of any calibration created by the user at that workstation.

Company name for report purposes is configured under the **Company** tab of the **Configuration** item under the Set-Up Menu. Company name and up to 5 additional lines of string data can be added to be displayed on calibration reports. This will allow the System Administrator to configure Company Name, Company Division, Lab Manager's Name, Address, Phone, e-mail address, etc.

Configure Holidays and Non-working Days

When configured, **Non-working Days** or **Holidays** will never be calculated by the system as a due date for any type of scheduled event. Determine which weekdays are Non-working Days, such as Saturdays and Sundays. Select the days chosen by checking the adjacent box. Select additional dates, that occur on regular working days, by browsing through the calendar with the arrow keys and selecting the appropriate dates by double clicking the date with the mouse. Like **Non-working Days**, **Non-working Dates** selected will not be calculated as a due-date by the system.

Note

*Because calibration and maintenance events have specific intervals the system will never allow a due date to occur after the specified interval. The due date will fall **before** the required date calculated by the interval and interval type if the calculated due date falls on a non-working day or date.*

Configure Uncertainty

MET/CAL allows the System Administrator to specify the uncertainty configuration for the entire site. Select the Uncertainty tab of the configuration menu item under the Set-Up menu. The Uncertainty Configuration screen is shown below.
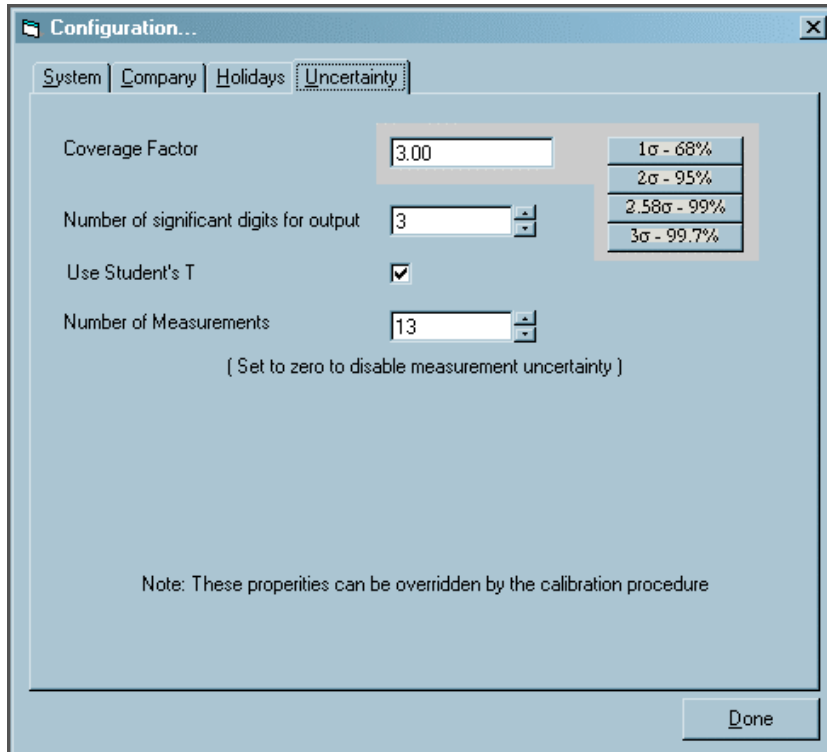
zv856s.bmp

Parameters configured here can be overridden at the workstation by setting them up in the metcal.ini file, or in the procedure by using the VSET FSC. See the MET/CAL Help files and the MET/CAL Reference Manual PDF file for more information.

Coverage Factor

The coverage factor is the value multiplied by the standard uncertainty to get the expanded uncertainty.

Number of Measurements

The number of measurements that are taken in a calibration procedure can be set by configuring it here. Enter any number, other than zero, to enable measurement uncertainty.

Note that the number of measurements can be set to one. However, with one measurement, the standard deviation of the readings cannot be computed. This can only be used if the metrologist has some prior information about the test being performed. This is rarely, if ever, used.

Note

If number of measurements is entered as zero, measurement uncertainty is disabled and the run time works as it did in prior versions. See the MET/CAL Help files for more information.

Use Student's T

This can be set to either **Y** to enable it or **N** to disable it. If set to Y, then the standard deviation of the measurements are multiplied by a factor relating to the degrees of freedom in the test. See the MET/CAL Help files for more information.

Adding and Removing Licenses

Licenses are added to or removed from the database in the MET/TRACK program, regardless of the type of license being applied. This is done initially, when a system is being installed and then if additional licenses are added later. This selection in the Set-Up menu also shows the System Administrator how many licenses are applied to the database (or how many and what types of licenses the company owns) and which users are connected to which applications. It also gives the System Administrator control over user connections in case of a sudden need to log all the users off of the system. Selecting the **Licenses** tab will allow the addition or removal of a license by following the system prompts. See the installation and upgrade guide for more details on license installation. The **Connections** tab will show the Logged-in User ID, the Applications being used, the Workstation Number, the Connection Number and the Connection time. The **Drop Connections** button is used to quickly log all users off of the system in case of a system emergency.

Choosing Titles/Languages

This selection will show field titles in the language specified here. The choices are English, German, Spanish, French and Italian.

Installing Reports

> This menu selection will allow the System Administrator to manage reports.
> Reports can be installed to run in the MET/TRACK and Run Time applications.
> From the **Report Installation** menu item the Administrator can also, **Preview,** to
> get an idea of what the report looks like, **Print** a hard copy and view **Report**
> **Properties**. The report properties available for viewing are General things like the
> file type, size and location, Security permissions for the file, Summary Data like
> the Title, Subject, Author and Synopsis and Statistical information like create,
> access and modify dates. This gives the System Administrator the vital statistics
> about the report.

Configuring Reports
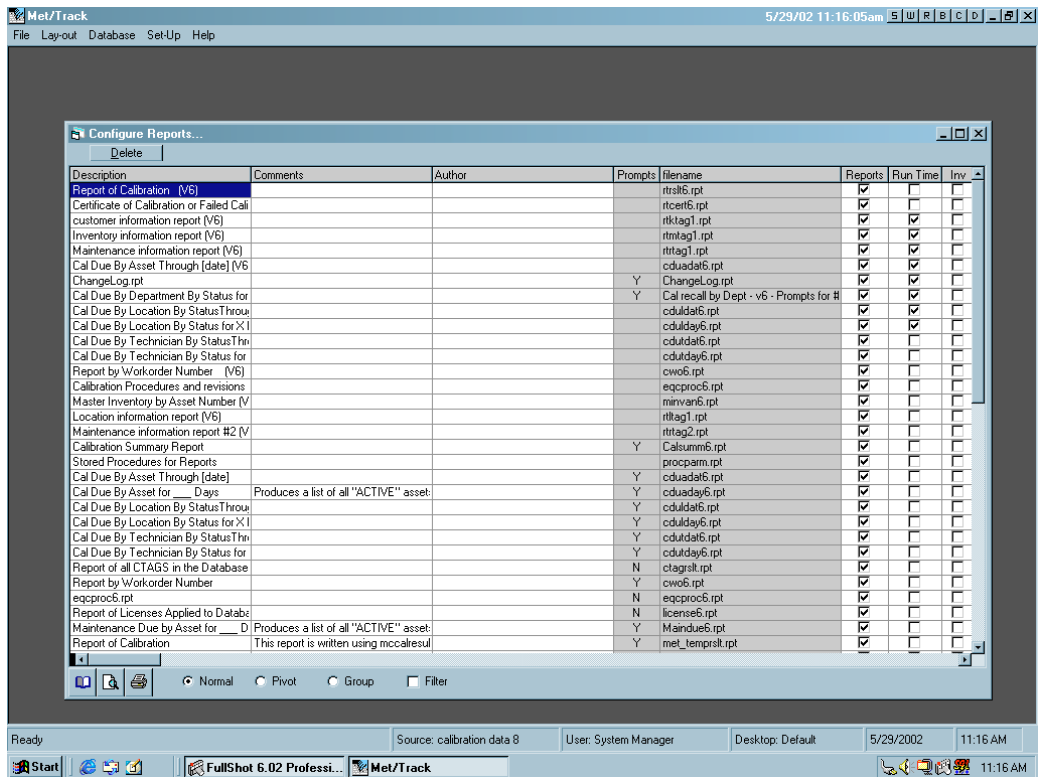
zv855s.bmp

For a summary list of available reports select **Configure Reports**. At a glance the System Administrator can view information about each report in the list, such as the Description, Filename, special Comments, Author, what Tables the report uses, whether the report is a **General** report or a **Run Time** report and if there are any user prompts. Reports can also be added from the Report Configuration screen. See Chapter 5 for additional information on MET/CAL reports.

Using the Help Menu

Searching the Contents of the Help Files

Help files are accessible for MET/TRACK using either the **Content**s or the **Search for Help On** menu items. This file operates in the same manner the Windows help files operate and contain much valuable information.

Getting Technical Support

To contact the Met/Support group select the MET/TRACK Support menu item. This screen contains live links to Hardware, Software, Training and Literature for all Fluke Precision Measurement and Hart Scientific products.

About MET/TRACK

When calling or e-mailing Met/Support look for software version under the **Abou**t **MET/TRACK** menu item. Have the version and the operating system information available when contacting the Met/Support Help Desk.

Appendices

Appendix	Title	Page

Appendix A
How to Access MET/SUPPORT™

Introduction

Fluke Metrology Software is supported by a highly skilled and conscientious team of professionals who are available to answer questions, help solve unique problems, and assist in troubleshooting in the event you run into difficulties.

Telephone Support

Free telephone support is available, but only to registered users of Fluke software. Be sure to register your software as soon as possible so you can make use of this service should the need arise.

Within the United States, toll free telephone support is available from 8:00 AM to 4:30 PM, Pacific Standard Time at **1-800-825-7411.**

To call Fluke from anywhere in the world, call **1-425-446-5500.**

Mail, E-mail, and FAX

You may also contact us by mail, E-mail, and FAX.

FLUKE Corporation   **E-mail** metsupport@fluke.com
PO Box 9090   **FAX**   1-425-446-5992
Everett, WA 98206-9090
Attention: MET/SUPPORT, M/S 275G

Before Calling Technical Support

You may be able to discover the answer for yourself, so take the following steps before calling for support:

- Check the manual
- Check the online help
- Check the FLUKE World Wide Web site at www.fluke.com

Please Have the Following Information Available

If you do find it necessary to call for assistance, take a few moments to jot down some information. If this information is readily available, the support person can more quickly get to the exact details of the difficulty you are having, and will be able to resolve the issue more efficiently.

- Product name, applicable licenses, version and serial numbers
- Manual title, part number and version
- Operating system and version
- Network information if applicable
- List of steps necessary to recreate the problem
- Version of *Crystal Reports*

International Support

For more information on international MET/SUPPORT™, please contact the Fluke office nearest you or your local representative.

	TELEPHONE	FAX
Fluke Canada	905-890-7600	905-890-6866
Fluke China	86-10-6 512-3435	86-10 6 516-3437
Fluke Europe Headquarters (NL)	31-40-2678239	31-40-2678255
Fluke France	33-1-48-96 6300	33-1-48-96 6350
Fluke Germany	49-561-95940	49-561-9594-119
Fluke Japan	81-3-3434-0181	81-3-3434-0170
Fluke Singapore	65-276-5161	65-276-5759
Fluke UK	44-923-240511	44-923-225067

Web Support

Fluke provides a web site exclusively for the Metrology Software user. This site provides the most current phone numbers, downloadable procedures, reports, application notes, and other pertinent information. To access this support site:

1. Enter http://support.fluke.com/register in your browser's URL address input box.

2. Enter met-support in the "Name of the Site where you want to go:" box.

3. Click Register.

4. Complete the registration questionnaire.

Approval of your registration should be complete within one or two days. You will receive an email notice of your Web/Support user name, password and the Web/Support site address.

Appendix B
Computing Test Uncertainty Ratio

Computing Test Uncertainty Ratio

The Test Uncertainty Ratio (TUR) is computed only after compilation or execution of a result-generating instrument FSC and the MEMC FSC. This computation is done both during the final pass of compilation and while executing the procedure. At compilation, the Test Tolerance is determined as the distance to the closest tolerance limit (unless one of the limits is zero.) For example, a +3U in the TOLERANCE field (implying -0U tolerance) will cause the Test Tolerance to be 3U. At execution, the TUR is calculated as the distance from the specified Nominal to the tolerance limit which falls on the same side of the Nominal as the System Actual.

Note

MET/CAL gives a warning when the TUR drops below tur_lim. The compilation still succeeds. For example, a test can specify that a 1% meter should be perfect. The test tolerance is therefore zero. Even a 10 ppm calibrator is not good enough to avoid the creation of a warning, since the TUR is also zero.

All accuracies of calibration instruments are symmetrical around the programmed nominal value. However, the tolerance of the test can specify different tolerances in the positive and negative directions. In that case, for the purposes of computing the TUR, the tightest tolerance is used. This means specifying the tolerance as +0.1% implies the negative tolerance is 0. This always results in a TUR warning of 0 that normally can be ignored.

Example TUR Calculation

```
UUT Indicated = 100V
Tolerance      = -2U +1U
System Actual = 99V
```

The test tolerance on the lower side of the UUT Indicated is used because the System Actual is less than the Nominal. The test tolerance on the lower side of 100V is 2V, so the ERROR%TOL is 50%.

Instrument Evaluation Test with Known Nominal Value

The calibration system uncertainty is obtained from the information in the calibration instrument related Accuracy File.

The allowed tolerance for the test is derived from the procedure line. In the most common situation, the evaluation step appears in a fully defined test; for example:

```
STEP   FSC    RANGE NOMINAL    TOLERANCE    MOD1    MOD2   3   4 CON
2.001  5700   10    10V        0.1%         0.1%                   2W
```

The allowed tolerance is 0.1% of nominal (10V) and 0.1% of range (10), so the total tolerance is 0.02V. The TUR is:

   test tolerance / calibration system uncertainty

If the TUR drops below tur_lim, the calibration system reports the following as a warning during compilation:

- The absolute value of the test tolerance.

- The absolute value of the calibration system uncertainty.

- The Test Uncertainty Ratio.

If the TUR drops below tur_lim, the calibration system adds to the test result the value of the TUR.

Note

All TURs are computed in linear scale units. Any nominal values or Accuracy File information expressed in dBm are first converted to volts. A warning includes the linear values.

The Test Uncertainty Ratio of a Comparison Test is computed using the stated Nominal value. It is possible for erroneous warnings to result from this assumption if the value stored in MEM and the NOMINAL field differ substantially.

Instrument Evaluation Test with Unknown Nominal Value

If the nominal value is not defined in the procedure, it is difficult or impossible to determine the TUR when the procedure is compiled. However, during calibration procedure execution, the TUR can be defined since the nominal value is known. Therefore, the reporting of the TUR being too low is the same as previously described.

During procedure compilation, the system attempts to estimate a worst case TUR for the test. The worst case occurs with the worst tolerance of the calibration system instrument and the minimum tolerance of the test. It is not possible to verify that the conditions assumed are indeed worst case, although they typically are. Some estimate can be made if at least the range is specified. Without that information, no TUR estimate is possible.

The allowed tolerance for the test cannot be totally derived from the procedure line. For example:

```
STEP    FSC   RANGE NOMINAL    TOLERANCE      MOD1    MOD2  3  4 CON
2.001   5700  10    V          0.1% 0.1/                          2W
```

The allowed tolerance is 0.1% of nominal (the nominal value to be taken from memory register MEM) plus 0.1% of range (10), which amounts to 0.01V. In this case, the TUR is computed as follows:

$$\text{The TUR} = \frac{\text{test tolerance with Nominal set to the Range value}}{\text{calibration system uncertainty with Nominal set to Range value}}$$

If this TUR value drops below tur_lim, the calibration system reports the following as a warning:

- Estimated absolute value of the test tolerance at the Range value.

- Estimated absolute value of the calibration system accuracy at the Range value.

- Estimated Test Uncertainty Ratio.

MEMCX FSC with Known Nominal Value

The MEMC FSC is used most often in closed loop calibration using a Setup FSC, followed by an IEEE FSC, a MEME, and a MEMC to determine the outcome of the test. For example:

```
STEP    FSC    RANGE NOMINAL   TOLERANCE    MOD1    MOD2  3  4 CON
2.001   IEEE         F1R3
2.002   5700         10.00V                              S   2W
2.003   IEEE         ?[I]


2.004   MEMCX 10     V         0.1% 0.1/

3.001   ....
```

The calibration system uncertainty is therefore generally determined by the last instrument Setup FSC preceding the MEMCX FSC. In this example it is step 2.001: the Setup test of the 5700 FSC. Whenever a Setup FSC is encountered, the MET/CAL compiler stores the calibration system uncertainty of this Setup test using the information of the Accuracy File of the related instrument, in this case the 5700A. This accuracy is used for computing the TUR when the MEMCX FSC line is being verified during compilation or executed during procedure execution.

The allowed tolerance for the test is derived from the MEMCX procedure line. According to the example, the allowed tolerance of the test is 0.01% of the nominal value (MEM1) plus 0.001% of the range (10) so that the total tolerance is 0.011. In this case

> The TUR = test tolerance/stored calibration system uncertainty

If the TUR drops below tur_lim during procedure compilation, the calibration system reports the following as a warning:

- The absolute value of the test tolerance.

- The absolute value of the calibration system accuracy.

- The Test Uncertainty Ratio.

During test execution, if the TUR drops below tur_lim, the calibration system reports the value of the TUR.

Note

Erroneous warning messages can be generated when the last Setup test is not the one that represents the calibration system accuracy.

MEMC FSC with Unknown Nominal Value

A MEMC FSC with an unknown nominal value is similar to the case of an instrument FSC with an unknown value. When you execute the procedure, the nominal value is known, and the TUR is reported, if it is below the tur_lim value. During procedure compilation, a TUR may be estimated or an estimate may not be possible.

If no range information is provided, an estimate of the TUR cannot be defined during compilation and no estimate is made. Some estimate could be made if at least range information were present. The MEMC line in the previous example now appears as follows:

```
STEP    FSC  RANGE NOMINAL    TOLERANCE    MOD1    MOD2  3  4 CON
2.004   MEMC 10    V          0.1% 0.1/    01/
```

The calibration system accuracy is determined again by the last Setup test in the procedure, as was described earlier where the Nominal value of the MEMC FSC was defined. It is assumed that the nominal value is set to the range value.

The allowed tolerance for the test is 0.1% of nominal (the nominal value to be taken from memory register MEM) plus 0.1% of range (10), which amounts to 0.01V. In this case:

$$\text{The TUR} = \frac{\text{test tolerance with Nominal set to the Range value}}{\text{system uncertainty with Nominal set at the Range value}}$$

If this TUR value drops below tur_lim, the calibration system reports the following as a warning:

- Estimated absolute value of the test tolerance at the range value.

- Estimated absolute value of the stored calibration system uncertainty at the Range value.

- Estimated Test Uncertainty Ratio.

Note

Erroneous warning messages can be generated when the last Setup test is not the one that represents the calibration system accuracy.

Warnings are given only when the TUR drops below tur_lim. The compilation is still successful. For example, a test can specify that a 1% meter should be right on. The test tolerance is therefore zero. Even a 10-ppm calibrator is not good enough to avoid the creation of a warning, since the TUR is also zero.

Note

*The variable tol_ref in the MET/CAL initialization file determines if the relative test tolerance computations are based on the UUT_Indicated value (as currently implemented) or the Nominal value (as requested by some MET/CAL users).Most specifications of DMMs are based on their reading, i.e., their UUT Indicated value. In many situations (closed-loop calibrations), this leads to the unexpected result that the tolerance band is not symmetrical around the fixed Nominal value. The tol_ref variable allows symmetrical tolerances around the Nominal value. The tol_ref variable can assume one of two values: tol_ref = UUT_INDICATED or tol_ref = NOMINAL, but only affects the portion of TOL that is **% or PPM.***

Appendix C
Table Definitions for Reports

Introduction

This appendix contains information about the database tables and fields for help in creating your own reports, or to add fields to the supplied reports. The illustration in Figure E-1 shows all the tables that you will be concerned with as you create reports.

Run TBLDEFS.RPT to get field information on tables.
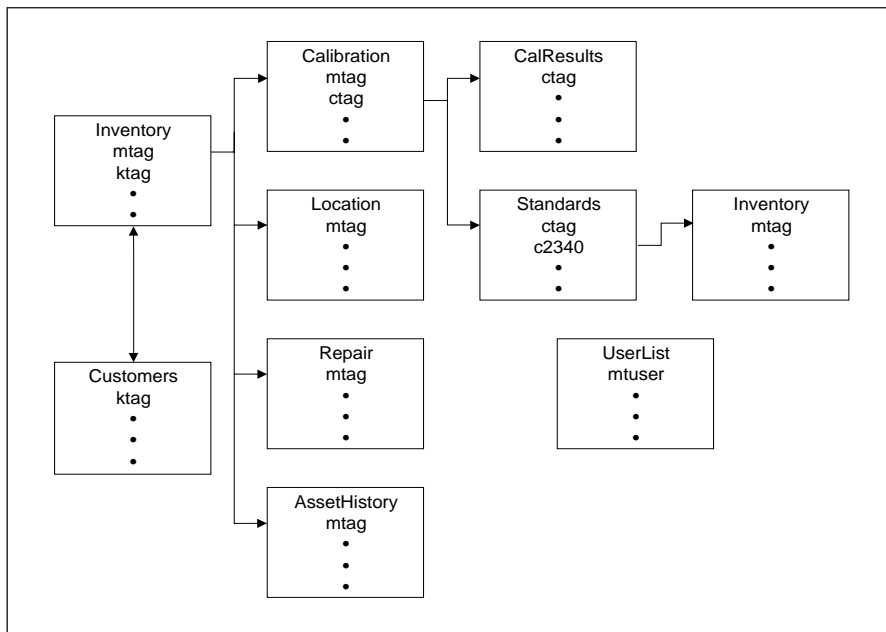
Table Structures

Figure C-1. Tables Used in Writing Reports

Contents of the Tables

The following list describes table contents.

- The ***Inventory*** table contains information that describes every asset being tracked.

- The ***Calibration*** table contains summary information about each calibration event performed.

- The ***CalResults*** table contains individual test results for each calibration if available.

- The ***Standards*** table can contain *mtag* values in field C2340 for each of the standards used during a calibration event.

- The ***Location*** table contains information about where the asset can be found when it is in-use.

- The ***Repair*** table contains information about repairs made to the asset.

- The ***AssetHistory*** table tracks all changes made to asset number in the ***Inventory*** table.

- The ***UserList*** table contains information about every user ever allowed into the system.

- The ***Customers*** table contains information about every customer ever entered into the system.

MET/CAL makes automatic entries in **Inventory**, **Calibration**, **CalResults** and **Standards**.

Rules for Linking Tables when Designing Reports

- Every asset record in the ***Inventory*** table has a unique *mtag* value.

- Link ***Inventory*** to ***Calibration*** history records using the *mtag* field.

- Link ***Inventory*** to ***Location*** history records using the *mtag* field.

- Link ***Inventory*** to ***Repair*** history records using the *mtag* field.

- Every cal event record in the ***Calibration*** table has a unique *ctag* value.

- Link ***Calibration*** to ***CalResults*** records using the *ctag* field.

- Link ***Calibration*** to ***Standards*** records using the *ctag* field.

- Link ***Standards*** to another instance of ***Inventory*** using C2340 and *mtag*

- Link ***Customers*** to ***Inventory*** using ktag.

Various tables can be linked to *UserList* to find the real name of the person who made entries and changes to the database. For example, link *Inventory.I4239* to *UserList.mtuser* to find out who created an inventory record.

Appendix D
Glossary

Accuracy File

An Accuracy File contains information about the accuracy specification of an instrument associated with an FSC. Unless TUR checking is disabled, there must be one Accuracy File associated with each instrument FSC that is being used in a calibration procedure.

As Found/As Left

As Found/As Left represents a calibration philosophy about how calibration is performed. MET/BASE supports three basic philosophies. Which philosophy you choose determines how the Found/Left field (2308) is used.

asset

A single piece of equipment; each asset is numbered, and the number is used for identifying the asset throughout the database.

backend data

Any data residing on a server.

backup

It is important to make regular backups of your database files in case of media failure. A backup is a copy of the database file (mtrack.db) and may also include a copy of the transaction log file (mtrack.log). You can make backups using the SQL Anywhere backup utility or other archiving software of your choice.

-C-

client

The term client is widely-used to mean several different things. Without modification, it may mean for example, "client application", or "client workstation".

Just as with the term "server", the word requires modification, otherwise if may be ambiguous whether it refers to a program or to the computer on which the program is running.

client application

An application that executes on the workstation and interacts with the user.

client computer, client workstation

A computer that accesses shared network resources provided by another computer (called a server). Also referred to as a workstation or client machine.

client/server

A term generally applied to a software architecture in which processing functions are segmented into independent collections of services and requesters on a single machine or segmented among several machines.

One or more processing servers provide a set of services to other clients on the same or across multiple platforms. A server completely encapsulates its processing and presents a well-defined interface for client applications.

For example, MET/BASE is a client/server program. It always runs over some type of network. In a standalone installation, it makes use of a loopback network; the client and server are running on the same computer.

client/server computing

A mode of distributed network computing in which an

application is executed cooperatively by two computers. The client application (the front end) executes on a workstation, while the data engine (the back end or data server) runs on a second computer. (Note that in a MET/BASE standalone installation, both would run on the same computer.)

Client/server computing allows more effective use of computing resources, higher performance, greater flexibility, simpler upgrades, greater reliability and data integrity.

confirm password

Passwords never display, so when you get a new password, you must type it twice. This is a safety measure, and it helps you to remember the new password.

copy data

A configurable attribute of a field that specifies whether the data in the field is to be copied forward to the next record. This field attribute can be used in many different ways to simplify data entry; for example, when first setting up a system, you might set field 4202 (manufacturer) to copy forward while you key in all the assets made by a particular manufacturer.

Correction File

A file that contains information on special calibration

points of the instrument associated with the instrument FSC. An electronic instrument is far more stable during a limited period of time than its stated accuracy indicates. By providing specific calibration points and reducing the calibration interval, the uncertainty of the calibration instrument under those conditions can be significantly reduced.

CTAG

A special field in the database that serves to link tables to one another so that all the information about a particular calibration event can be retrieved.

The ctag links a calibration event to test results generated during the event and to the standards used.

The ctag is the unique identifier that the software assigns to each calibration event.

Also see mtag and rtag.

customization

The process of selecting operating parameters and defaults to personalize the system for a particular site. For example, the default name of a field may not be the same words as you generally use, so field titles can be changed (customized) to something more familiar to the personnel at the site.

<div align="center">***-D-E-***</div>

Database Administrator

The database administrator is a person responsible for maintaining the database. The database administrator is generally responsible for all changes to customization, for managing users and their access levels, and for backing up the database.

Also see System Administrator.

database engine

Software such as Watcom or Sybase SQL Anywhere Server that provides high-performance database access to requests for data. Part of the server software package.

data server

Also called a database server; a computer for storing programs and data shared by users on a network. A database server provides database intelligence such as transaction processing, indexing, transaction logging and security, while a file server offers operating system-type file and print capabilities.

default data

A configurable attribute of a field that specifies what text is to appear in the field when the form is opened.

directory

A computer term denoting a subdivision of media that can contain other directories or files. Also called a folder.

<div align="center">***-F-G-***</div>

field types

Fields are one of the following types:

Decimal	A real number, generally one or two decimal places.
Integer	A whole number.
Alphanumeric	Any sequence of ASCII characters, except for leading or trailing white space characters (e.g., Space, Tab).

Date	Always eight characters, two each for day, month, and year, plus two slashes for separating the numbers.

The style is configurable in the Database Setup application. The three selections available are:

> **MM/DD/YYYY**
>
> **DD/MM/YYYY**
>
> **YYYY/MM/DD**

Time	Always eight characters, two each for hours, minutes, and seconds, plus two colons for separating the numbers. Times can range from 00:00:00 through 23:59:59.
Boolean	Boolean type fields accept a Y or an N meaning YES or NO.

file server

A computer for storing programs and data shared by users on a network. A file server offers operating system-type file and print capabilities, while a database server provide database intelligence such as transaction processing, indexing, logging and security.

Also see server, client.

focus

In working with forms and tables, a field is said to have focus if it is currently the field that can be edited, or have information placed into it. Focus is always on one of the fields of a form, and there is usually some visual indication of the field having the focus, such as the location of a cursor, or sometimes the field with focus has a small dashed border in addition to its regular border. Most Windows applications make use of this device.

folder

A computer term denoting a subdivision of media that can contain other folders or files. Also called a directory.

forward traceability

The term "traceability" or "forward Traceability" refers to the ability of a calibration laboratory to trace an instrument's calibration credibility back to a national, recognized, legal standard.

The first listing in a traceability report shows the standards against which the subject asset was calibrated. The next level are the assets that participated in the calibration of those assets, and so on.

A forward traceability report (also called a "trace up" report), shows the traceability tree of an asset to any given depth, up to the software's maximum.

Also see traceability and reverse traceability.

FSC

Function Selection Code, a keyword in the MET/CAL procedure language. The FSC instructs the Run Time system to perform a task requested by a procedure.

For example, the 5700 FSC instructs the system to provide a stimulus output from the Fluke 5700A Calibrator. The DISP FSC directs the system to display a message to the operator during the execution of a calibration procedure.

See the MET/CAL Reference Manual for details.

-H-

history

A database contains information about an asset that changes over time. There is only one Inventory record per asset, but there may be any number of history records. The three types of history records are the Calibration, Location, and Maintenance (Repair).

-I-J-K-

import, importation, importing

In a general sense, the word "import" means to bring something from one environment into the current environment. Used in relation to Fluke Metrology Software, the word refers to the process and the specific steps one must take to move data from some other system into the Fluke MET/BASE database.

Contrast to migration, which is the one time operation of bringing DOS MET/TRACK data into MET/BASE. The importing of data may occur any number of times, and may even be a scheduled activity at the site. ASCII delimited data from other sources can be brought into MET/BASE at any time.

If your data exists in another database, i.e., not gathered using a Fluke database product such as MET/CAL or MET/TRACK, you must import the data into the database. Importing data is not complicated, but it may require close attention to detail, since metrological traceability is at stake.
Also see migration.

initial data entry, initial access
Initial access or initial data entry refers to the first time that the Inventory data is entered (a new asset), or the first time that Calibration, Location, or Repair data is entered (the first calibration).

-L-

length
The horizontal dimension. In MET/CAL and MET/TRACK forms, the number of characters that a value can contain.

License
A software license is the proof of your agreement with Fluke regarding your proper use of our Software.

A software license constitutes a legal agreement between a purchaser and a software provider. This agreement typically covers such topics as the number of copies you can legitimately make, onto how many systems you can load the software, as well as other issues concerning the legal usage of the software.

Fluke Metrology Software is licensed. It is the purchaser's responsibility to understand and comply with the terms under which the software was purchased.

linked validation
Feature allowing multiple fields to be entered simultaneously. Validation data is associated with a base field and is entered into the linked fields automatically. In the customization editor, the validation entry is the name of the base field. Linked fields are indicated by the name of the base field, a colon, and the number of the column from which data is to be taken. See the printed manual for complete information.

Local Area Network (LAN)
Two or more computers connected to a network that is limited to an area such as a single office building and does not extend across public rights-of-way.

-M-

migration
Migrating data is similar to importing it, but with significant differences.

Importing data implies bringing it from a source other than Fluke Metrology Software. On the other hand, migrating data just means bringing in data from a DOS or Legacy version of MET/CAL or MET/TRACK.

If you gathered your current data using DOS MET/CAL or Version 4 in Legacy Mode, or DOS MET/TRACK, you bring it into the new database by migration.

Also see importation.

MTAG

A special field in the database that serves to link tables to one another so that all the information about a particular calibration event can be retrieved.

The mtag links an asset to the Calibration, Location, and History tables. Any time you create a new asset in the Inventory table, the software automatically assigns a new mtag link so that reports can locate other information about that asset.

Also see ctag and rtag.

-N-

network driver

A network driver is the software logically located between the operating system and the network card, which allows applications to communicate to the network card.

network operating system

An operating system optimized for server deployment, such as Microsoft Windows NT Server Edition. Typically used on the file server and/or data server.

normal data entry, normal access

Normal access or normal data entry occurs any time the Inventory data is changed, or any time (after the first time) the operator accesses Calibration, Location, or Repair data.

network operating system

An operating system optimized for server deployment, such as Microsoft Windows NT Server Edition.

NULL

The NULL value is a special value for a database entry, different from any other valid value for any data type. The NULL value represents missing or inapplicable information.

-O-

old password
Changing a password requires you to know the original password. This is a security measure to protect the data that you put into the system. If you have forgotten your password, you cannot get a new one using this menu. You must have a new password assigned by your Administrator.

Open Database Connectivity (ODBC)
The Open Database Connectivity (ODBC) interface, defined by Microsoft Corporation, is a standard interface to database management systems in the Windows and Windows NT environments.

ODBC driver
A dynamic link library (DLL) used to connect a specific Open Database Connectivity data source with a client application.

ODBC driver manager
Provides the interface from the host language to the specific back-end data source driver.

operator access level
A number in the range 0 - 5 that designates the tasks the operator is authorized to perform. There must be at least one level 5 operator. This level has full permissions to customize the system, set up other operators, assign their permission levels, and so on.

-P-

password
Your password is a word or set of characters that confirms your identity. The password is never displayed or printed for anyone.

At your first login, enter the password that the Administrator assigned to you, then change your password using the SECURITY | PASSWORD menu. Otherwise, simply enter the password you selected at your first login.

A password can be up to 16 alphanumeric characters. MET/BASE ignores the case of the username and password. The password is NOT optional.

purge
To delete an asset from the database. Only level 4 and 5 operators can purge assets. When purged, the entire history of the asset is removed. Standards cannot be purged. Purging is done on the Inventory form.

-Q-

query

Commonly, a formalized instruction to a database to either return a set of records or perform a specified action on a set of records as specified in the query.

Also, the name of one of the MET/BASE applications, so called because it provides an interface for users to seek information from the database.

-R-

replication

For databases, a process by which the changes to data in one database (including creation, updating, and deletion of records) are also applied to the corresponding records in other databases.

RTAG

A special field in the database that serves to link tables to one another so that all the information about a particular maintenance event ("repair" event) can be retrieved.

The rtag links a maintenance event to the results generated during the event and to the standards used. The rtag is the unique identifier that the software assigns to each maintenance or repair event. Also see ctag and mtag.

reverse traceability

To trace those instruments that a subject instrument calibrated directly, or indirectly.

Also see traceability and forward traceability.

-S-

segregate

A subdivision of the database that permits restricting user access to a particular subset of data.

server

The term server is widely used to mean several different things.

Just as with the term "client", the word requires modification, otherwise it may be ambiguous whether it refers to a program or to the computer on which the program is running.

Whenever the word "server" is used without modification, it means the system designed to share data with client applications; servers and clients are often connected over a network. A server can simply share files or resources (such as printers), or it

can act as host for a database management system designed to provide logical access to a database. A database server usually contains and manages a central repository of data that remote client applications can retrieve and manipulate.

Standard (1) (Measurement Standard)

An object, artifact, instrument, system, or experiment that stores, embodies, or otherwise provides a physical quantity that serves as the basis for measurements of that quantity. In the context of MET/BASE, a standard is the next object in the traceability tree above the current level. For example, If we are calibrating a Fluke 87 (the UUT) in the RunTime, a standard could be a Fluke 5700.

See forward traceability.

Standard (2) (Paper Standard or Protocol)

A document that describes the operations and processes that must be performed in order for a particular end to be achieved. In Europe, the term "protocol" is preferred to avoid confusion with a physical (measurement) standard. For example, ISO Guide 25 describes the requirements for a calibration laboratory.

standard security

Uses SQL Server's own login validation process for all connections. To log into a SQL Server, each user must provide a valid login ID and password.

Stored Procedure (SP)

Stored procedures are programs kept in the database itself. They can be called from client applications. Stored procedures provide a way of providing uniform access to important functions automatically, as the procedure is held in the database, not in each client application.

Structured Query Language (SQL)

A database query and programming language.

SQL is commonly pronounced "sequel" and was originally developed for IBM mainframe computers. There is an ANSI-standard for SQL.

SQL Server

A relational database management system that is capable of supporting hundreds of simultaneous users, depending on your application and hardware environment.

System Administrator

The system administrator (SA) is the person responsible for the administrative and operational functions that are independent of any particular application, and is likely

to be a person with a comprehensive overview of the environment. Not to be confused with the Database Administrator.

System administration tasks typically include such things as installing software; configuring servers and clients; managing and monitoring the use of disk space, memory, and connections; creating devices and databases; authorizing users and granting them permissions; transferring data in and out of SQL Server databases; backing up and restoring databases; and diagnosing system problems.

The system administrator operates outside the protection system, which means that the Server does no permission checking for the system administrator. The system administrator is also treated as the owner of whatever database he or she is using. Anyone who knows the SA password can log in and act as system administrator.

Contrast with Database Administrator.

-T-

table
The basic unit of data storage in a relational database. A table stores data in records (rows) and fields (columns) and usually contains information on a particular category of things, such as employees or parts. Also called a base table.

TCP/IP
Transmission Control Protocol/Internet Protocol (TCP/IP) is a network protocol supported by SQL Anywhere.

tool
One of the programs that make up the application. MET/CAL features the following tools: Runtime, Editor, Manual Entry, Database Setup, and Workstation. MET/TRACK has these tools: Manual Entry, Import Data, and Database Setup.

traceability
Traceability represents an unbroken chain of comparisons from the measurement being made, to a recognized, national, legal standard.

Also see forward traceability and reverse traceability.

trace report
A report that establishes an instrument's traceability. MET/TRACK provides forward and reverse traceability for an asset to a selectable depth.

Also see forward traceability and reverse traceability.

transaction log

A log storing all changes made to a database, in the order in which they are made. In the event of a media failure on a database file, the transaction log is essential for database recovery. Therefore for optimal security, the transaction log should be kept on a different device from the database files.

transaction log mirror

An identical copy of the transaction log file, maintained at the same time. Every time a database change is written to the transaction log file, it is also written to the transaction log mirror file.

A mirror file should be kept on a separate device from the transaction log, so that if either device fails, the other copy of the log keeps the data safe for recovery.

TUR

Test Uncertainty Ratio, the specified uncertainty of the test instrument divided by the uncertainty of the calibrating instrument. A reliable TUR is obtained only when the specifications for the two instruments are correlated according to their respective uncertainty specifications and confidence intervals.

See Appendix D for details and example calculations.

-U-

user name

A user name is a name assigned to a login ID for the purpose of allowing a user to have access to a database. The abilities a user has within a database depend on the permissions granted to the user name.

User names are assigned by the Administrator. A user name is a unique, single word that may be as short as a single letter, but contains no more than 16 alphanumeric characters. The software enforces upper-case only user names.

-V-W-X-Y-Z-

uncertainty

An estimate of the possible error in a measurement. More precisely, an estimate of the range of values which contains the true value of a measured quantity. Uncertainty is usually reported in terms of the probability that the true value lies within a stated range of values.

validation

Validation restricts the data allowed in a field to a set of authorized, or valid, values. The software uses validation files to store the allowed values. These files are specified on a field-per-field basis as a part of customization; each field's validation file has a unique name, by default, the field number.

Index