

## Chapter 3

### Configuration & Operation

This chapter describes the “how to” for all principal NUSS forms, tasks, features and functions. It focuses initially on the specific functions needed to *configure* and *operate* NUSS itself, and then to *configure* and *operate* each NetScanner module, individually, and in coordinated groups. Major functions like **Calibrate**, **Test**, and **Run** are only introduced here, but explained fully in later chapters: See Chapter 4 (**Calibration**), Chapter 5 (**Testing**), and Chapter 6 (**Running Modules**). Only the methods of invoking these major functions are described here.

All major functions of NUSS are invoked from standard Windows menus. However, many forms and pop-up dialogs boxes also contain mouse-manipulated *controls* (various buttons, options, check-boxes, combo-boxes, text boxes, sliders, etc.) to make functions more intuitive and easier to use. Other “hidden” controls are obtained by *clicking* or *double-clicking* some *key display fields* and the *frames* surrounding some grouped controls. *ToolTips* reveal these when you hover the mouse over any control, status bar, label, frame title, or datum field.

**Please make yourself familiar with the NUSS-wide conventions (described in the following three text boxes) before reading this chapter:**

#### NOTES ON MOUSE & KEYBOARD USAGE:

The menus and various controls on NUSS forms are all normally operated by your *mouse*. Standard *right-handed* mouse terminology is used throughout this manual. The terms **click** or **drag**, when used alone, means “press or drag the **left (or primary)** mouse button”. When pressing or dragging with the **right (or secondary)** mouse button” is required the terms **right-click** or **right-drag** are used explicitly. If your mouse was **reconfigured** to change these meanings, you must remember to *reverse* the terms when you encounter them

Most NUSS forms also permit their controls to be operated by special *keyboard* functions as well as the mouse. Here, the <Tab>, <Space>, <Enter>, <Esc>, and various <Arrow> keys have specific meanings. See **Appendix K** for a complete description of these **Keyboard Shortcuts**. Most such shortcuts follow standard Windows conventions.

**USE OF COLORS ON NUSS FORMS:** Several standard *background* and *foreground (text) colors* used on NUSS form controls have symbolic meanings:

A *light-green* background means that a control (text box, check box, radio control) contains an *editable* datum *meant to be modified* by the user. A *white* background generally indicates that the **item is for display only** (i.e., the field cannot be modified by the user). The datum's background turns *dark pink* to indicate that the control's *editable* datum has *been edited (already modified)* by the user. A *light pink* background means that the datum was simply clicked to mark it for *inclusion* in a multiple-module *broadcast* (Save To All) operation that writes it (changed or not) to a module.

Many forms have text labels, used for displaying error and status messages, which have *light-yellow* or *light-orange* backgrounds. Such colors have no particular meaning. However, several Test programs may change these label backgrounds to other brighter colors (*red, green, yellow*) to give them conventional *final result* meanings like *Test Failed*, *Test Successful*, or *Test Finished, But with Errors*, respectively. Some other controls may also take on these bright colors to distinguish [Stop] or [Abort] from [Go] or [Pause]. Also, a *pressure set point* datum might be *yellow* while being set, *green* when set successfully, or *red* if failed to set...

Tabular datum display fields on **Run** forms have *white* backgrounds for *normal* values. *Over-scale* values are *orange* with value replaced by \*\*\*\*\* characters. Special *barometer calculations* that are *disabled* (because barometer datum is unavailable for some reason) are also *orange* but with the underlying channel's native datum still shown (without the barometer value added or subtracted). If these special *barometer calculations* are working then a *light-blue* background displays a "differential" calculation result, and a *light-yellow* background displays an "absolute" calculation result. These last two "pressure mode" colors are also seen on the '**Configure | Calibrators**' form to distinguish "differential" and "absolute" pressure set points specified for each calibration range used.

The **Run** function uses *salmon* or *turquoise* colored status lines to distinguish the single-module **Run** function from the **Run Group** (or **Playback Only**) function.

On the '**Configure | Other Options**' form, the foreground (text) color, normally *black* everywhere, may have special meanings: *magenta* for *write-only*, *brown* for *read-only*, and *green* for *NUSS controlled* (you shouldn't change it) or option is only stored by Nuss files (not in the module itself).

**FREQUENTLY USED TERMS AND ABBREVIATIONS IN NUSS:**

Any references to *this* host, means the particular host PC currently executing NUSS.

The abbreviation **<modid>**, or *module identifier* is used by NUSS to label every module, and has the form **<model#>-<serial#>** for all NetScanner modules (e.g., 9116-113). A **<serial#>** of zero (0) indicates the module is *simulated* by NUSS (not real).

The abbreviation **<modclass>** is a *string* describing the *class* of a module: “Scanner” (models 9x16, 9022, 9x46), “Calibrator” (models 9034, 9038), “Standard” (9032, 9033)). An *absolute standard* (9032) is sometimes labeled “Barometer”.

The abbreviation **<yourmodname>** is any (up to) 16-character name that you assign to a module with the ‘**Configure | Other Options**’ menu functions. It is saved in NUSS internal files and not in the module itself.

The abbreviation **<grpид>**, or *group identifier*, is a single character used to reference any defined group of modules. It may be any upper-case alphabetic character (A-Z) for user-defined groups, or the asterisk character (\*), also referred to as “star”, for the dynamically created “All Connected Modules” group.

The abbreviation **UnitsX** (a.k.a. **Units Multiplier** or **EU Scalar**) is a key modifiable configuration option, stored in the non-volatile memory of each module. Its value sets the *native units* of all *pressure* data processed in the module (the factory default being **1.0** for *psi* units). It is actually a coefficient *plus* an enabling option for modules of the Calibrator or Standard class, and a coefficient only for modules of the Scanner class. NUSS hides these differences in the ‘**Configure | Other Options**’ form that allows you to change it. The impact of changing this option is sufficient to require that NUSS itself be restarted after changing it (for one or more modules). For Calibrator modules, the native pressure value a user specifies to Set a pressure is actually “divided” by this “multiplier” to get the psi units used internally to set that pressure.

The term **persistent** simply means that the value of some option is saved in some type of non-volatile memory (e.g., file) so that it is restored the next time you use it.

For scanner modules *transducer #* and *channel #* may be used interchangeably.

### 3.1 Home-Base Status Bar and Menu

When NUSS is started, it opens two *windows* (called *forms*) immediately. The *first* form, titled **NetScanner Unified Startup Software**, but nicknamed *home-base* throughout this manual, is nothing more than the top-level menu and a *Status Bar*. It is anchored initially at the top left of your display screen, but its size and position are adjustable and persistent.

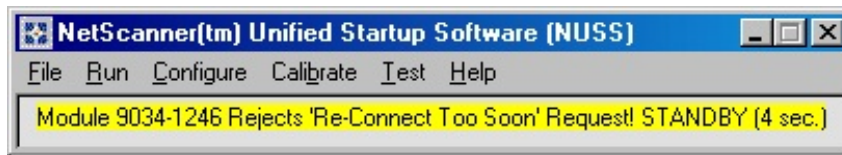


The NUSS **Home-Base** form

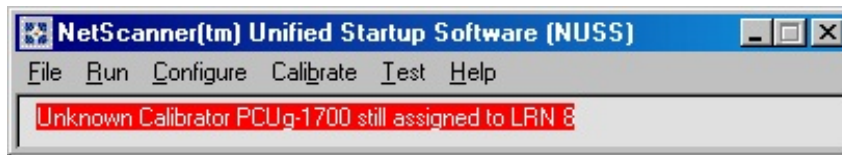
The *home-base* menu contains the usual **File** and **Help** functions for the overall NUSS application — just as you would expect any typical Windows application to have. However, this menu also provides additional “group” functions that operate on multiple modules in a *coordinated* fashion. Such menu functions include **Run**, **Configure**, **Calibrate**, and **Test**. The **Run** function is multi-faceted, having integrated **Acquire**, **Display**, **Record**, **Playback**, and **Module Control** features, all in one useful multiple-module *operation* function (plus a special **Playback-Only** function). Invoking both the single-module and group forms of **Run** are described below (in **Section 3.3.1** and **3.4.1**). Detailed usage information on **Run** (and its many built-in features) is continued in Chapter 6. Methods for invoking the other **Calibrate** and **Test** functions are described later in this chapter, and continued in Chapters 4 and 5, respectively.

The home-base **Status Bar** appears just below the home-base **Title Bar** and **Menu Bar**. It normally contains a *Current Directory* text string initially showing the *hard disk path* where you installed NUSS. The NUSS *shortcut* on your Windows **Start** Menu or Windows Desktop (that is used to start NUSS) points to the **NUSS.exe** file in this path. This *install path* is also called the *Main Base Path* of several other *subfolders* (e.g., **Ini**, **Dat**, **Report**, **Cmd-Log**, **Firmware**) where NUSS keeps all its configuration and history files, recorded data files, Report files, Command scripts (with their Logs), and Firmware Download files, respectively.

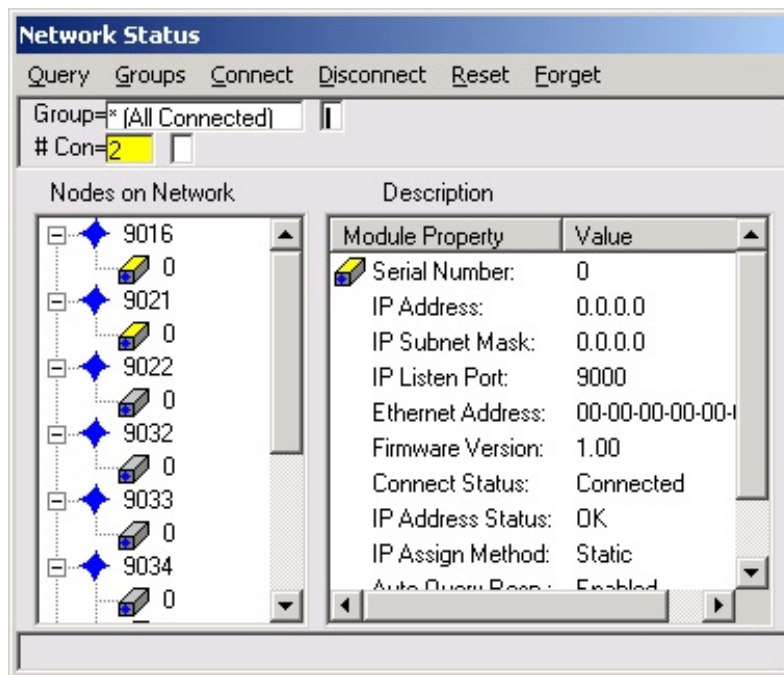
You may view these internal NUSS files by using the **‘File | View Files (NUSS)’** menu function — or by simply *clicking* the **Status Bar** with your mouse. Details of this process are described in the following section (**3.1.1**). Using this function may change the *Current Directory* string displayed in the **Status Bar** from its initial Main Base Path to other paths. Other functions often restore the initial path. The **Status Bar** may also show various *status* and *error* conditions for NUSS and its subsystems (see example below).

Status Bar showing a common *status* message

The *yellow* status message shown above may appear if you *disconnect* any module and then *reconnect* it too soon. The *minimum re-connect time* is 10 seconds in NetScanner module firmware versions. Other *error* messages, when they appear in this **Status Bar** have a *red* background and *white* text, and are accompanied by a “beep” or “bell” sound.

Status Bar showing a common *error* message

The *second* form, always opened by NUSS when started, is the **Network Status** form. It provides an overall hierarchical view of the NetScanner modules functioning on your network — and it provides ways to select and connect to *modules*, individually and in groups.

**Network Status** form

This **Network Status** form has its own unique Menu and Status Bar. Several “hidden” controls are operated by clicking important display fields on the Status Bar. Two other

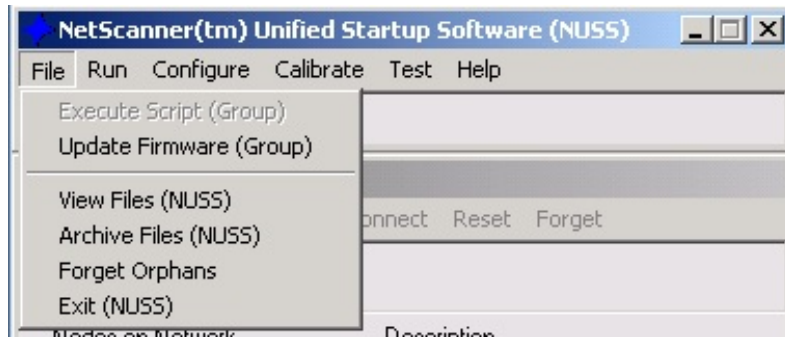
expandable window panes (with scroll bars when needed) display information about all or selected modules. This form's size and position are adjustable, and the two panes adjust with the size of the form. The example above shows only simulated modules (serial # 0). Such modules appear only if NUSS is started with the “**-sim**” command line switch. They can do most things that *real* modules can do. They are useful for demonstrating and learning how to use NUSS.

Both **Home Base** and **Network Status** forms are *attached* to each other (by default) when you first start NUSS. They are also initially located at the top left of your screen — a recommended position since many other NUSS forms “like to” start to the “right” of its **Nodes Map** and just “below” the *home-base* form. However, both forms can be resized and moved anywhere on the screen, and these changes are persistent across a NUSS restart. Both forms also act as one when you click the Exit [**X**] or Minimize [**\_**] button in upper right corner of the **home-base** form. They are restored to the screen together when you click the [**NetScanner...**] button on your Windows Task Bar. You can also alternately minimize and restore the forms together by clicking repeatedly. Each form's main menu is available when its title bar is highlighted – or anytime you click a visible menu item.

The “group” home-base menu functions (***Run, Configure, Calibrate, and Test***), located between menu items ***File*** and ***Help***, are very useful once you have organized and configured NUSS to recognize your particular network of modules — and NUSS has learned how you normally use them. **However, since such configuration tasks are accomplished via module-specific menus (in other forms), we defer detailed descriptions of these “group” functions until Section 3.4** — after we know how to view your particular network of modules, and how to configure and operate each module *individually*. However, get ready to learn the “overall” NUSS functions on this menu now.

### 3.1.1 Home-Base ***File*** Menu Functions

The ***File*** menu selection, on the *home-base* strip, leads to a submenu containing one Group function and three “overall” NUSS functions. The ***Update Firmware (Group)*** subfunction of ***File*** is used to download new firmware to a group of like modules (all with same model number). Its discussion is deferred to Section 3.4 where the subject of all “Group” functions is covered in detail. Below, we continue with a description of the last submenu item first.

Home-Base ***File*** Menu

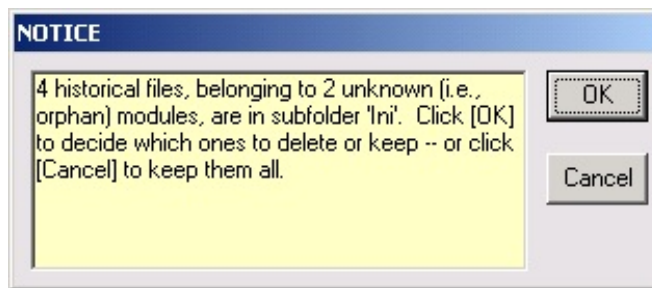
#### 3.1.1.1 *Exit* NUSS function

The ***Exit (NUSS)*** subfunction of ***File*** is used to terminate overall NUSS execution. ***Exit*** terminates all concurrently running NUSS tasks. If any files are open, they are closed. If any modules are currently connected to the network, they are disconnected (and restored to some pre-connection states). The [X] button at the right end of the **home-base** form's Title Bar performs the same ***Exit (NUSS)*** function. Both the **Home Base** and **Network Status** forms of NUSS disappear together. Any other secondary forms you may have opened while running NUSS, that are still visible at the time of ***Exit***, are also closed.

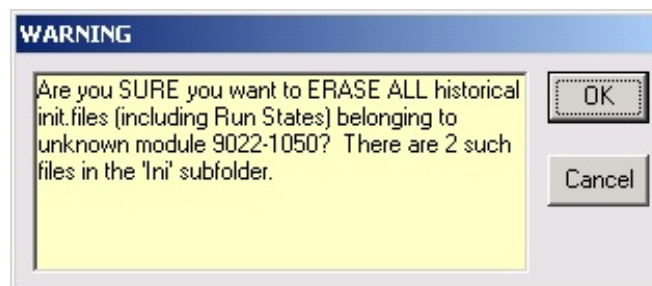
### 3.1.1.2 Forget Orphans function

The **Forget Orphans** subfunction of **File** is designed to make NUSS “forget” certain common *history* files belonging to the **Run** forms of certain modules that are *no longer used on your system (orphans)*. It assumes that any module found to have existing **Run** history files – but is not currently visible on the **Nodes Map** of the **Network Status** form – is an orphan. If your installed NetScanner module complement does not normally change, you probably need not use this function. It is mainly useful to installations where modules come and go (like a module testing or calibration lab or PSI’s factory).

When activated, this function first pops-up a dialog form indicating how many files from orphan modules it has found, and asks how the user wishes to proceed.



If the [OK] button is clicked, the function pops-up an additional dialog form for *each* orphan module it found – and asks the user whether or not that module’s historical **Run** files should be deleted. The user has the choice to keep these files or delete them.

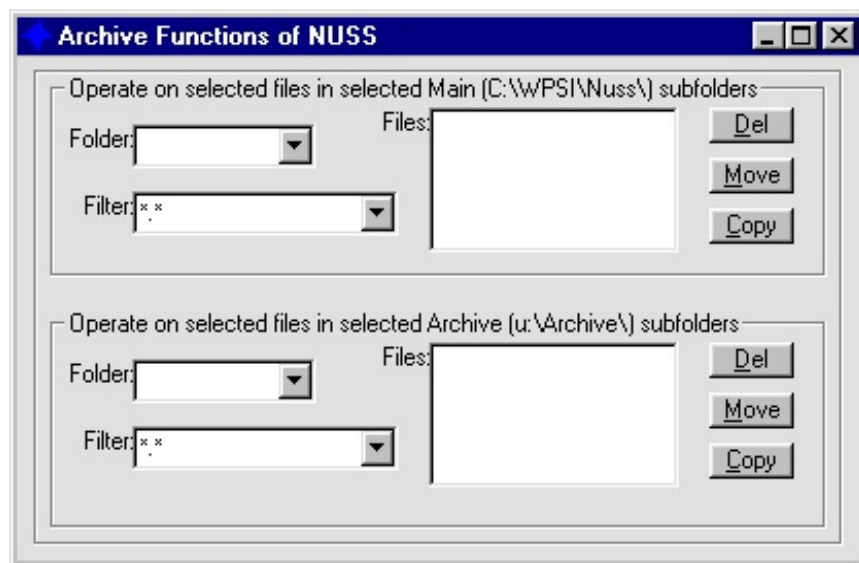


The last dialog repeats until all orphan modules either have their files deleted or retained.



### 3.1.1.3 *Archive Files NUSS* function

The ***Archive Files (NUSS)*** subfunction of ***File*** causes a special ***Archive*** form to pop-up (normally to the right of the Nodes Map and just below home-base — a common starting point for many secondary NUSS forms). The ***Archive*** form contains two identical frames of controls. The first frame displays folders, filters, and their files from the *Main Base Path* (i.e., where NUSS.exe is installed, and where NUSS keeps its main data files in subfolders). The function allows you to *Delete* any of these files — as well as *Copy* or *Move* selected groups of them to *like-named subfolders* of the *Archive Base Path* (i.e., a separate place on your hard drive, a removable drive, or a network drive, where these primary files can be saved for archive or back-up purposes). The second frame displays folders, filters, and their files from the *Archive Base Path* (if one has been configured by ‘***Configure | General Options (NUSS)***’). It allows you to *Delete* any of these files — as well as to *Copy* or *Move* selected groups of them to *like-named subfolders* of the *Main Base Path*.



***Archive*** Form for Normal Users

Each of the frames operates exactly the same. Clicking the arrow at the right of the **Folder:** box, reveals the names of all subfolders currently defined in its base path. Clicking the arrow at the right end of the **Filter:** box reveals many useful “starter” filters that may be used to limit the actual number of files that appear in the **Files:** list box of the selected folder. However, you may click the **Filter:** box after any filter is displayed there, and edit it to anything useful you need. The **Files:** box changes *immediately* as you *change the characters of the filter*. If the **Files:** box is empty, then there are no files in the selected folder that match the filtering criteria. If files appear in the box, they meet this criteria. A

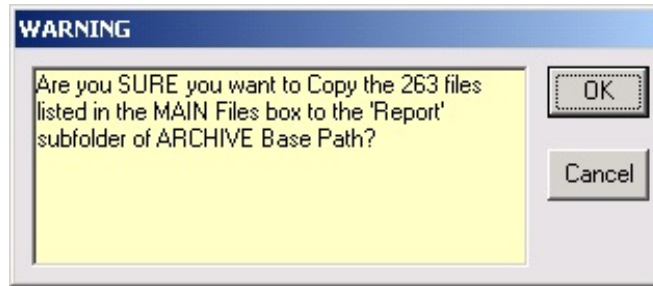
scrolling bar appears in the **Files:** box if more files are included in it than can currently be seen. The three function buttons act directly on ALL the files currently contained in the **Files:** box. Thus, clicking the **[Del]** button *Deletes* all those files, and clicking the **[Move]** or **[Copy]** button *Moves* or *Copies* all those files to the *other* frame's like-named subfolder (and creates a target subfolder if it does not already exist).

The second frame becomes dim if you have not yet assigned a unique *Archive Base Path* to NUSS using the '**Configure | General Options (NUSS)**' home-base menu item. In that case the *Archive* form is only capable of *Deleting* files in the Main Base Path subfolders.

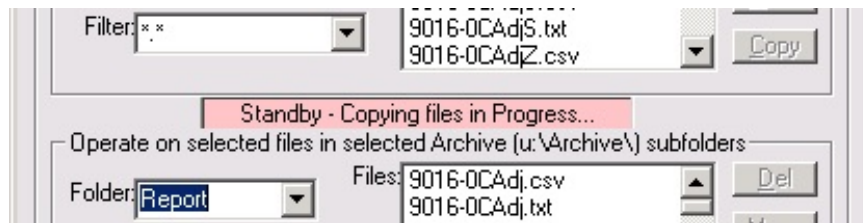
Although the *Archive* form is highly restricted as to which folders it can copy or move files to, or to which it can delete files in, it has some other very useful (but non-obvious) features that you may use (in either frame):

- Hovering the mouse pointer over the **Files:** *label* (not the box) reveals a *ToolTip* that indicates the *total number of files* currently in the box.
- If you *click* any file name currently displayed in a **Files:** box it is highlighted. At the same time the ToolTip for that **Files:** box (not the **Files:** label) is changed, so as to include information about that highlighted file (i.e., it shows full path, filename, size, type, and date-modified). However, to see this updated ToolTip information — you must move your mouse cursor outside the box — and then move it back into the box. Note that the current ToolTip only describes the *highlighted* file, not just any file name entry in the box (over which you may be hovering the mouse pointer). To see the same information for another file in same box, you must click it to highlight it first, to update the ToolTip, then reposition the mouse cursor to see updated information.
- If you *double-click* a *highlighted* file name in either **Files:** box, the NUSS text editor (configured with '**Configure | General Options (NUSS)**') pops-up in a window to allow you to view the contents of that file (if it is readable text).

Note that highlighting any file entry in a **Files:** box only provides the above functions. It does not in any way affect which files are copied, moved, or deleted. *All* the files in the box are affected when you click a **[Del]**, **[Move]**, or **[Copy]** action button in the subject frame. After selecting either action button, a form similar to the following may pop-up to warn you of the consequences of your action – and list the number of files affected.



This allows you to rethink and possibly cancel your request. If you press **[OK]**, however, a *pink* status bar is displayed – indicating the selected operation in progress. You are not able to do anything else on this form until that operation is completed.

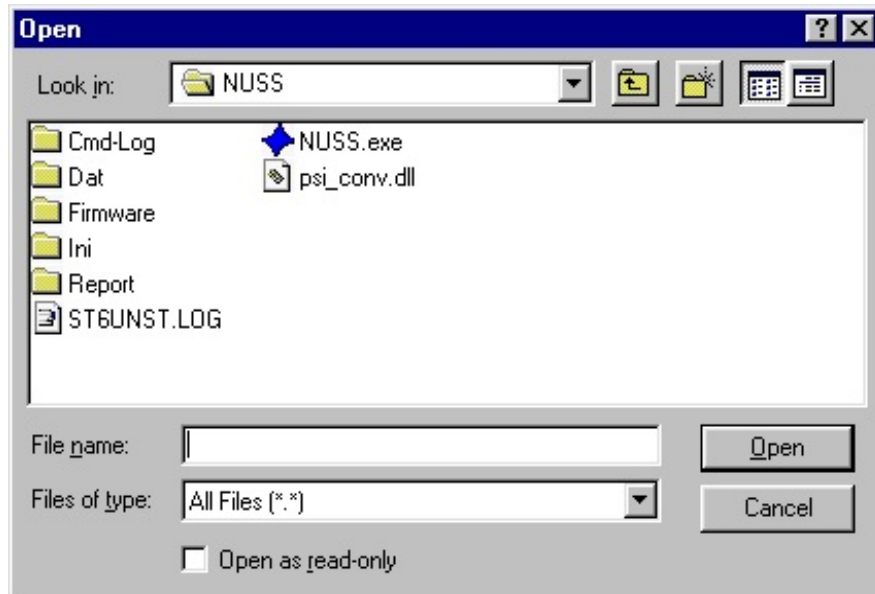


When you initially start the Archive form, and there are *many* files to be recognized and listed in its file boxes (particularly on a slow network drives) it may take quite a noticeable time before the form appears. It is cataloging lists of all the files it finds – so it can display them on that form during this delay. To avoid apprehension, the following status form may pop-up until the main form is ready to be shown.



### 3.1.1.4 View Files NUSS function

The **View Files (NUSS)** subfunction of **File** causes a Windows dialog box to pop-up over the home-base form.



Standard Windows **Open File** Dialog for various file operations

The example **Open File** dialog box above shows the *Main Base Path* of NUSS. It displays the five working subfolders of this path, the NUSS.exe file, and two supporting files:

- (1) a DLL containing subroutines (written in C but callable from Visual Basic), and
- (2) a LOG file used to support Removing the NUSS application from your PC.

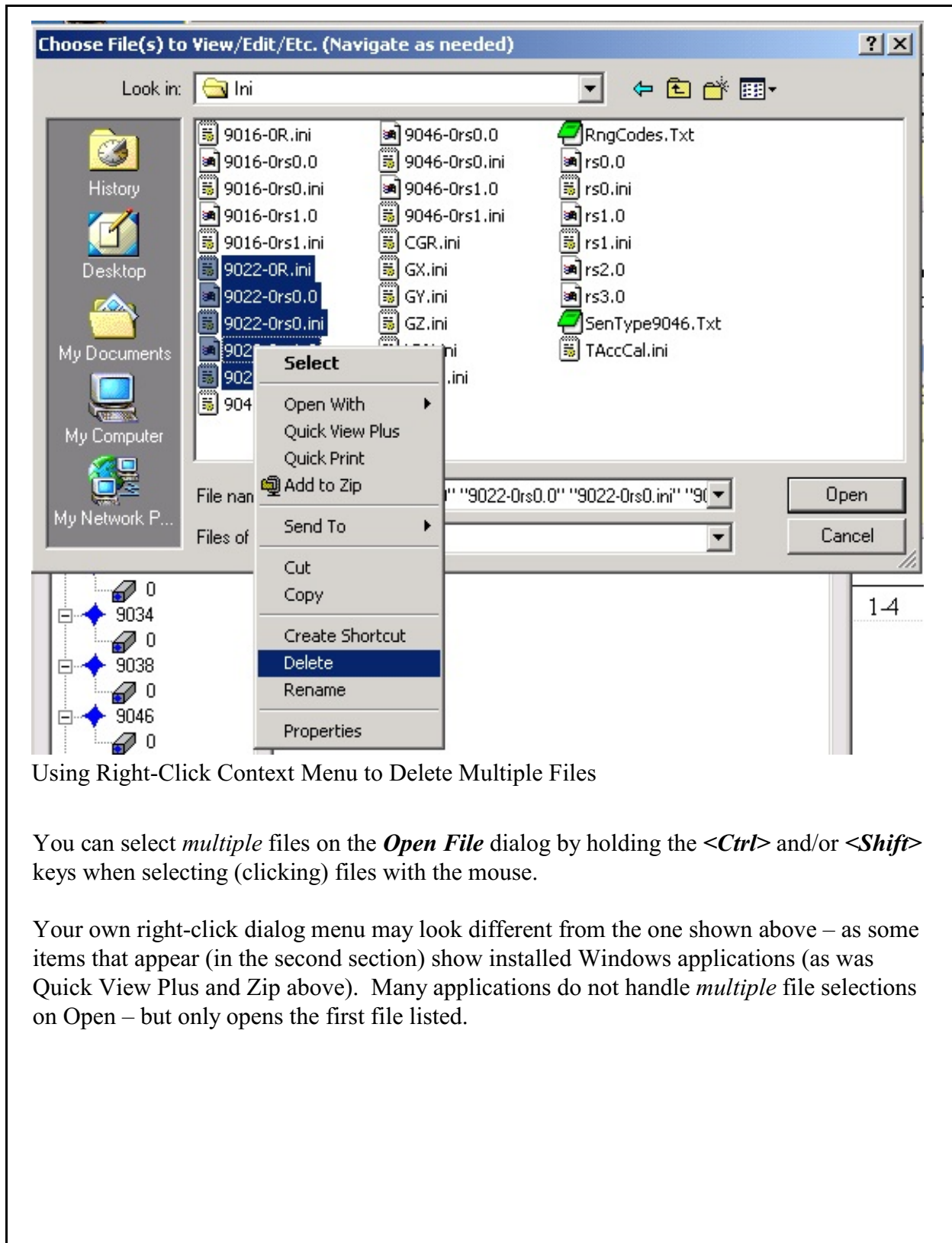
You should **not delete** any of these main path files. Always use the **Add/Remove Programs** application in **Windows Control Panel** to uninstall NUSS. However, if you display any of the working subfolders with this dialog (by double-clicking them), you may *delete* one (or more) file(s) displayed there if you know the consequences (see **Section 2.4** in Chapter 2).

NOTE: The **Open File** dialog form may look somewhat different, depending on the particular version of Windows you use. Two particular examples are shown above (Win9x) and below (WinXP).

The File Dialog's **Look in:** box permits you to navigate anywhere on a hard disk drive, removable drive, or network drive. However, the dialog generally starts in the *Current Directory* (normally the *Main Base Path* where NUSS was installed and where it keeps its main working file subfolders). Double-clicking any *subfolder icon* should move the *Current Directory* path forward to allow you to view the files in that subfolder. A "backup" button (a folder icon with bent arrow) returns you to a previous path. Other buttons let you view or hide displayed file details or to create new subfolders. Various filters may be invoked by clicking the arrow on the **Files of type:** box. Highlighting (clicking) a file makes its name show up in the **File name:** box. Clicking the **[Open]** button opens that selected file as a text file (with NotePad, WordPad, or any text editor you may have configured NUSS to use) and also dismisses the dialog box. *Double-clicking* the highlighted file name has same effect as clicking the **[Open]** button. Click the **[Cancel]** button to dismiss the dialog without opening a file.

**NOTICE:** There is a down-side to using all the built-in Windows *Open File* dialogs within NUSS (like the one above) – in that they tend to always takeover the CPU exclusively, and block the *multiprogramming operations* being accomplished by other NUSS forms. Thus, you should avoid using them if you are currently using single-module or group *Run* forms – **and also recording live data**. If you use the *Open File* dialog during such times, the *Run* tasks stall, and any acquired live data streams are discarded until the dialog form is subsequently exited. You can use the separate Windows applications **My Computer** and **Windows Explorer** as an alternative, as these naturally multi-program better with NUSS – because they are separate applications. However, one must always avoid any major copying and other file maintenance operations – **while NUSS is recording live data** – since such disk-intensive operations tend to rob NUSS of the disk bandwidth it needs to dispose of the acquired data streams to disk in a timely fashion.

You may also *right-click* highlighted file(s) to obtain a Windows *context menu*. Choosing **Select** on that context menu is the same as clicking the **[Open]** button on the form. However, selecting the *Open* item on the context menu passes the highlighted file name to some other registered application and activates it — if the file's particular *extension* is registered for such. For example, if you right-click *Open* a *comma-separated-variable* file (with **.csv** extension), it opens a spreadsheet application (like Excel) with the highlighted file already open. After selecting *Open* (or any item in bottom section of context menu) the dialog box *stays put* — allowing it to be reused immediately for viewing or *doing other things* (e.g., *copying, deleting, printing, moving, etc.*) with other files. Starting with Release #3 of NUSS, you can also select *multiple* as well as single files, and operate on them with any functions available on your Windows right-click context menu.



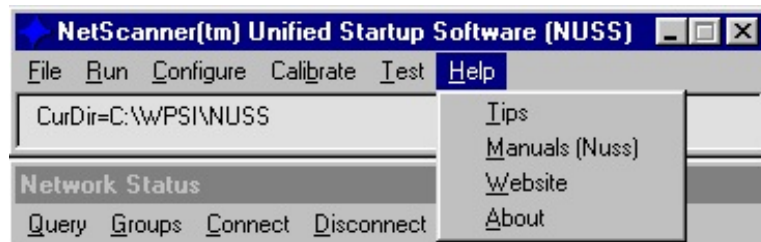
Using Right-Click Context Menu to Delete Multiple Files

You can select *multiple* files on the **Open File** dialog by holding the <Ctrl> and/or <Shift> keys when selecting (clicking) files with the mouse.

Your own right-click dialog menu may look different from the one shown above – as some items that appear (in the second section) show installed Windows applications (as was Quick View Plus and Zip above). Many applications do not handle *multiple* file selections on Open – but only opens the first file listed.

### 3.1.2 Home-Base *Help* Menu Functions

The *Help* menu selection, on the *home-base* strip, leads to a submenu of high-level *help* information items for NUSS.



Home-Base *Help* Submenu

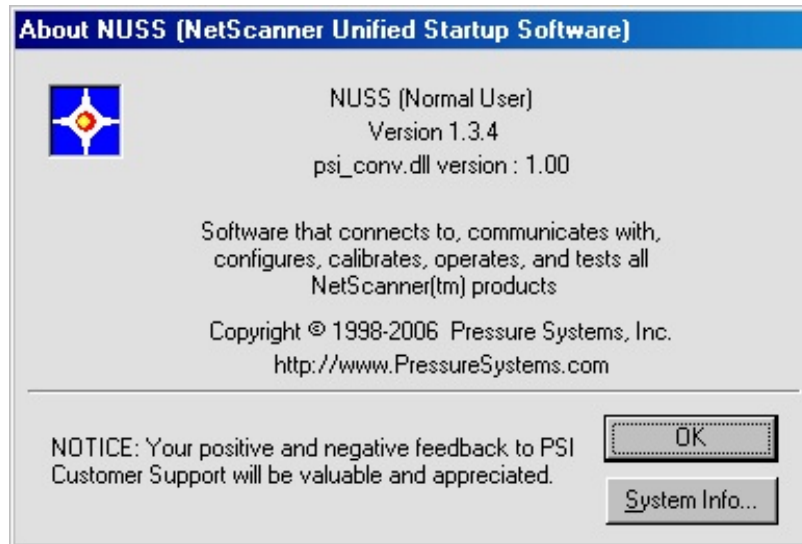
NUSS does not have a “conventional” Windows-like Help file. However, all NUSS forms provide copious *ToolTips* as the primary help information for each control, label, and display field. Simply hover your mouse cursor over each such item to see what it is and how it is used. Should you ever find these *ToolTips* annoying, get into the habit of hovering the mouse cursor over a form’s Title Bar (or Menu Bar) to avoid them.

The *Tips* submenu selection displays a screen of summary information about various NUSS Help features. This includes descriptions of *ToolTips* and all the major menu items (which do not have *ToolTips*).

The *Manuals (Nuss)* submenu selection makes the full text and color illustrations of the complete NUSS User’s Manual available to be read and searched. However, the manual’s CD may need to be loaded into your CD drive — **or** you can install the manual on your hard drive (or on a network drive shared by other NUSS users), thus making it always available. Before this works however, NUSS must be told where your manual is located (see the *Configure* menu examples in Section 2.1.1.2 and 2.1.2.2 of Chapter 2). A summary index of the individual chapters and appendixes is displayed via your *Internet Browser* (using **.htm** files). These index files then provide links to each of the separate **.pdf** files for each part of the manual. Adobe’s Acrobat Reader (version 4 or later) software is required and must be separately installed on your computer (see [www.adobe.com](http://www.adobe.com)).

The *Website* submenu selection provides quick pop-up access to your principal installed *Internet Browser*, which starts with its URL set to the PSI website. You would use this selection to get the latest published information on NUSS, as well as the latest updates to NUSS software and NetScanner module firmware. Copies of the latest NUSS version and its User’s Manual are downloadable from this site. Try clicking the **Downloads** link on the home page, then click **NetScanner System**. If that does not work, use the following explicit link: [www.PressureSystems.com](http://www.PressureSystems.com).

The **About** submenu selection, opens a form that shows the current “user” level and latest release/version number — of the NUSS software you are currently executing (see example below). When seeking support for NUSS it is useful to give this information to the PSI support team.



***‘Help | About’ form for Normal users***

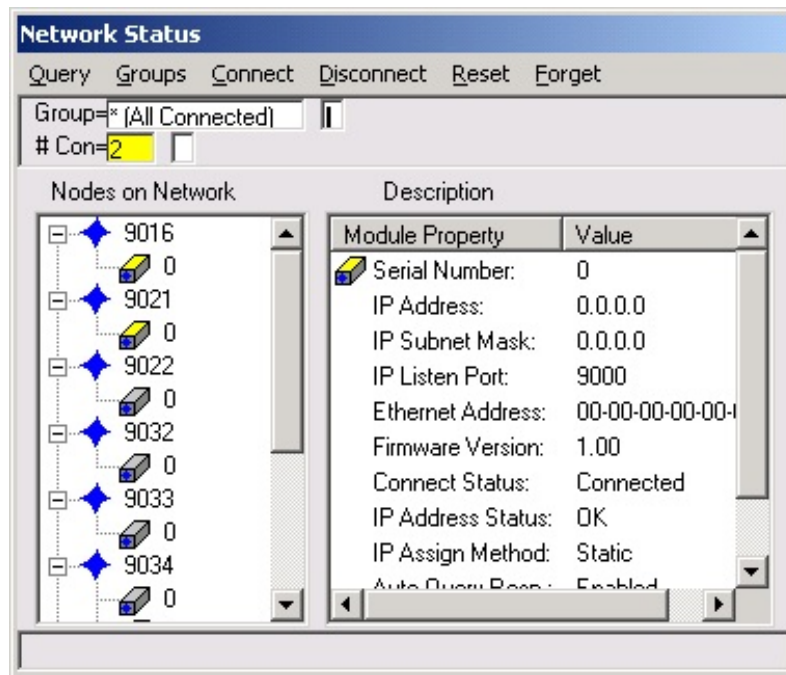
Notice that all NUSS version numbers have three integer numbers separated by dots (e.g., x.y.z). The last numeral in the sequence will be updated for minor changes within a release cycle. The middle and first numerals will be incremented depending on the magnitude of the change or features which have been included.

The second version number on the above form is for a shared library (.DLL) that NUSS uses, and is also used by other NUSS software packages. A copy of that file is found in the same folder that holds the NUSS executable (.exe) file.



## 3.2 Network Status Bar & Menus

The **Network Status** form opens and closes with the *home-base* strip whenever NUSS is started and exited. It has its own *title bar*, *menu bar*, and *status bar* (at the top), and two information display panes (at the bottom). This form normally hangs down from (and is attached to) the *home-base* strip, but can be moved elsewhere on the screen if it gets in your way.



Network Status form

The main purpose of the **Network Status** form is to show every working NetScanner module on your network in its *left pane*: labeled “**Nodes on Network**”, but hereafter called the **Nodes Map** for simplicity. This information is compiled from each module’s response (received by the host) that results from an automatic query command broadcast by NUSS when it starts up. The map remains updated as modules change their states — if modules are properly configured to generate a response automatically each time they are reset (i.e., power is applied or module is re-booted). Map update also occurs on *this host* — due to the startup and operation of NUSS on *other hosts* on the same network. The Nodes Map also provides a way for you to select (with mouse) any one module (or module type), and to then see its status (or the status of all modules of a selected model #) in the *right pane*: called the **Description Pane**. If the scroll bars on each pane are annoying, you may increase both horizontal and vertical size of the form (by dragging boundaries) to eliminate them

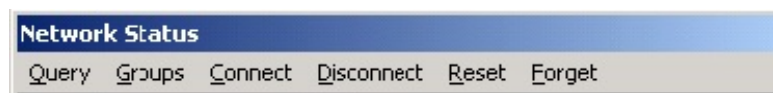
When a *module type* (e.g., model #) is highlighted in the **Nodes Map**, the **Description Pane** lists every module of that type as *rows* of a spreadsheet. The various status fields for each *module* (of that *module type*) appear as *columns* of a spreadsheet. Depending on the type of module and the number of modules responding of that type, you may need to resize the form or use the pane's scroll bars to see all this available status information.

When a *particular module* (e.g., serial # or its icon) is highlighted on the **Nodes Map**, the **Description Pane** changes to a simpler view – the status of only that selected module (as a two-column spreadsheet: label and value). The **Description Pane** is a display feature only. To modify any of the *options* of a module which are displayed there, you must use the **Configure** and **Calibrate** menu functions described later.

The **Network Status** form has *two (2) separate menus*. The *first (or main) menu* appears on a conventional *menu bar* at the top of the form, just below that form's Title Bar. It provides several network-specific functions we discuss below. The *second menu* is a pop-up menu, called the *single-module's context menu*. It appears only when you click a *particular module's icon or serial # label* on the **Nodes Map** (to highlight it) and then **right-click** anywhere in the **Nodes Map**. A special context menu appears listing most of the functions you need to configure and operate that *one* selected module, by itself. Both menus are described in detail in the following sections.

### 3.2.1 Network Status Form's Main Menu Functions

You select the **Network Status** form by clicking its Title Bar, to highlight it, making it the *current* form with the Windows input focus (mouse and keyboard). Then, you can execute any of its *main menu* functions (actually you can click a menu item and select the form containing it with one click):



Main menu of **Network Status** form

The **Query** menu function, broadcasts an immediate *manual query* to all modules on your Ethernet network. NUSS continuously listens for modules to broadcast a suitable response. Every NetScanner module that responds then appears on the **Nodes Map**, and its latest operational status is shown by the *decorations* shown on its particular icon (described in Section 3.2.4). You need to use this manual **Query** function less frequently if you configure each of your modules to automatically respond when they are *reset* (i.e., power-up or reboot). Section 2.5.1 in Chapter 2 has a procedure for accomplishing this when NUSS is initially installed, or whenever a new module is added to your network.

The **Groups** menu function, opens an auxiliary form labeled **Group Editor** that allows you to view, define, or edit *labeled groups* of modules, and to select one as the **Current Group** (displayed in field labeled “**Group=**”) in the **Network Status** form’s Status Bar just below its menu.

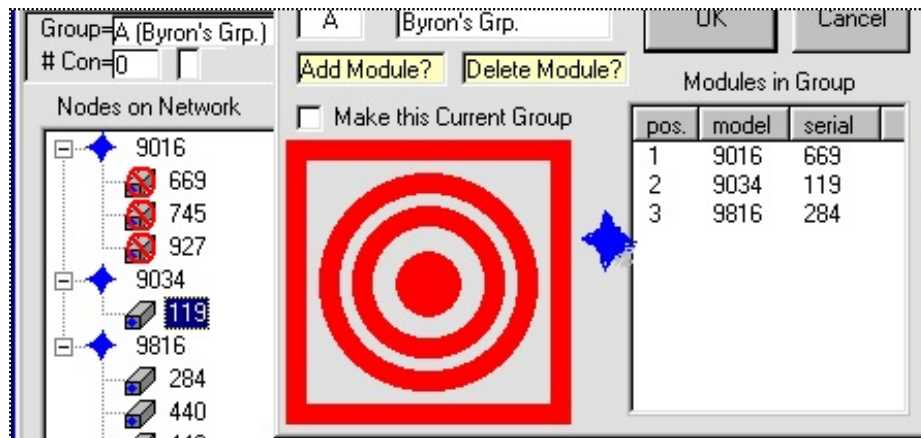
pos.	model	serial
1	9016	669
2	9034	119
3	9816	284

**Group Editor** Form

Once a *Current Group* is selected, you may collectively perform *functions* to all modules in that group using various “*group*” menu functions. There can be up to 26 *labeled module groups* (A-Z), but three are reserved for system use (X-Z). One special *dynamically-changing* group labeled “\*” (also called Group Star) is also known as the “Currently Connected” modules group. Special files automatically save these *group definitions* (except group \*) on your hard disk (in the INI subfolder of the path where NUSS is installed). Group “\*” continuously changes its definition (as modules are connected and disconnected) and is not stored on a file.

The **Group** field in the **Group Editor** form is clicked to select which group is to be viewed/edited. A pop-up form of *all choices* then appears. Once a group is selected the **Modules in Group** pane shows any modules currently defined in the group. A **Name of Group** text field allows you to assign the group a suitable *functional label* (16-characters max.). However, group star (\*) can only be viewed, not edited. To use the editor to define or edit a group, simply highlight modules on the Nodes Map, then drag them to the target on the Group Editor. If that module is acceptable for that group, its <modid> then appears in the **Modules in Group** pane. To delete a module already appearing in this pane, highlight its *position (pos)* field first, then drag it to the target (or press the <Del> key).

Once a <modid> (or *pos*) is highlighted for add (or delete) you **must drag and drop somewhere**. Otherwise, the editor may appear to lock up. If a *PSI logo* appears (as mouse cursor) **but does not allow you to do anything**, you must first drag this cursor to a background area **just outside the target's square boundaries** and drop it (see example below). This causes a beep to be heard. After this *PSI cursor* is *discarded* in this manner, you are then free to *make another selection* for dragging or do anything else.



Discarding the *PSI cursor* to allow for a *new selection*

The two “yellow” labels **Add Module?** and **Delete Module?** have no function except as suitable places to *hover* the mouse cursor to get *ToolTip* information per that label.

Before you exit the **Group Editor**, you may select other *groups* for viewing and editing in its form by clicking the **Group** field again. When you are ready to exit, you have **[OK]** and **[Cancel]** buttons, and a **[Make This Current Group]** *check box*, to contend with.

Click the *check box* if you want the current group you have selected (and possibly edited) to become the displayed *Current Group*. Click **[OK]** to exit normally (saving any and all edit changes to special Group definition files), or click **[Cancel]** to exit and discard any edit changes your have made.

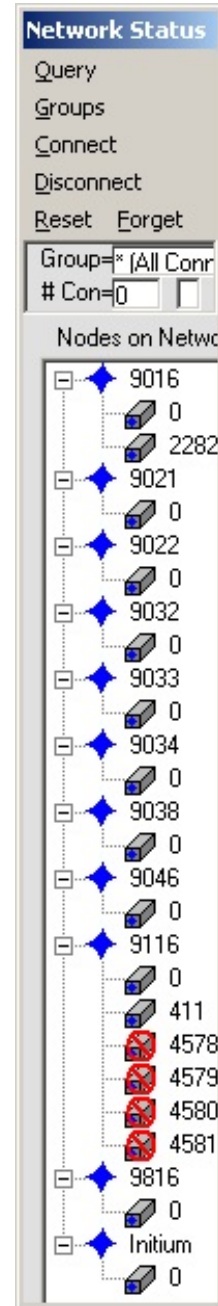
Once the **Group Editor** form disappears, the *Current Group* (shown in field to right of “**Group=**” label in **Network Status** form) is either changed to the group you edited (if you checked the box) or remains what it was before (if you did not check the box). You may also click the field itself, now, to assign the *Current Group*. In either case, the final *Current Group* is the *target* for all “group” functions on all menus

The **Connect**, **Disconnect**, **Reset**, or **Forget** menu functions may be used at any time to act on all the modules in the *Current Group*. However, if the *Current Group* was assigned to

the special dynamically-changing Group “\*” (All Connected Modules) the **Connect** menu function is useless. This is because that function ignores any modules that are already connected — and if there are *no* modules connected then it obviously does nothing. Thus, **Connect** only works with true statically-defined groups (A-Z) created by the **Group Editor**.

The **Forget** function is similar to the **Forget Orphans** function described above on the Home-Base menu, but focuses on deleting the historical files (of the modules in the current group) whose modules **do** appear on the current Network Map — rather than modules that **do not** appear (orphans). This feature is described more fully in the section below that describes new functions of the Single-Module Context menu. It is particularly useful to users that have scanner modules with changeable transducers (Models 9022, and 9x46).

The **Network Status** form may be resized by dragging its boundaries. When you exit NUSS it remembers this form’s size and position (and several other major form’s sizes and positions) on the screen — and restores it (them) when restarted. The example (see inset right) shows the narrowest useful form of this form. This size no longer shows any **Description Pane**, but still has a useful **Nodes Map**, and most other status fields and “hidden” controls are operable. Notice that it no longer has any scroll bars on the Nodes Map, as the bottom edge was dragged down to lengthen it (until scroll bar disappeared). However, there are several *less narrow* widths that permit you to retain the scroll bars. Many users operate this form without showing the **Description Pane** in order to save screen space for other active forms. You can always drag the right boundary to reveal it when you need it. Also, much of the same information shown on the **Description Pane** may also be found (sometimes in more detail) by selecting a module’s **Configure** functions from its *context* menu. The various pop-up **Configure** forms also permit some of their options to be *changed* as well as viewed.

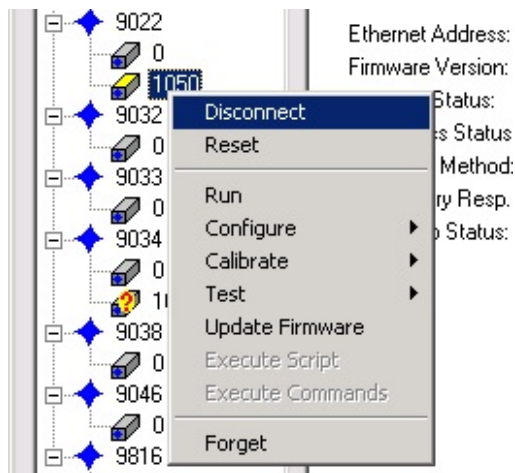


Narrowest useful width of the **Network Status** form

### 3.2.2 Selected Module's Context Menu Functions

Accessing the context menu for a particular module requires two distinct steps. First you must *select* that module by **left-clicking** its icon or serial # until it is *highlighted*. Then, you may **right-click** (anywhere in **Nodes Map**) to obtain the *context* menu.

**NOTE:** You *cannot* select the module, and obtain its *context* menu, in one single **right-click** step. You must release the mouse between separate left and right movements.



Typical *Single-Module* Context menu

If the module is not yet *connected*, only the top section of the context menu is visible, and this section allows you only to **Connect** (if module is available and not currently connected to some other host) or **Disconnect** (if module is already connected to this host) — or to **Reset** (reboot) the module. Once a module is *connected* to the host, the many functions in the *bottom* parts of its *context menu* (left example above) also become available for use (i.e., they are no longer dim). These are labeled **Run**, **Configure**, **Calibrate**, **Test**, and **Update Firmware**. Those menu items having a triangle “pointing” right, pop-up a submenu of additional choices when highlighted.. These context menus are similar to the “group” functions available on the **home-base** menu, but only affect the single selected module when executed. Any *remaining dim* selections (like above) are only available to *Advanced* users.

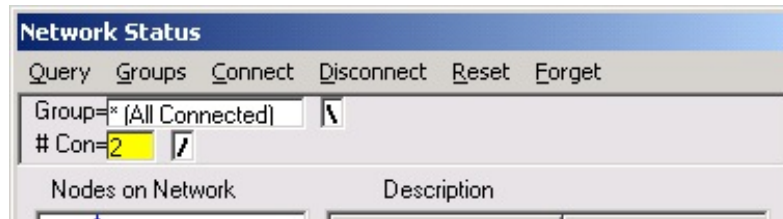
Since NUSS allows you to have *more than one module connected at any one time*, it is possible to sequentially obtain the *context* menu of several modules, one at a time, and thus activate more than one of the above module-specific functions concurrently. Having such multiple instances of these function forms open and active, at any one time, is useful — but it can become inefficient and clumsy to operate in this way — for more than a few



modules. Instead, the “group” functions are highly recommended when multiple module operation is desired on a grander scale, or when you need to control the group of modules in a more coordinated way. Section 3.3 details these “group” functions.

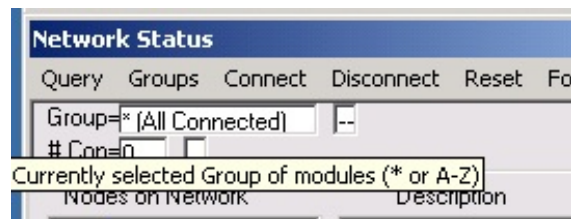
### 3.2.3 Network Status Form’s Status Bar

Four (4) status fields (or boxes) appear within the Status Bar of the **Network Status** form.



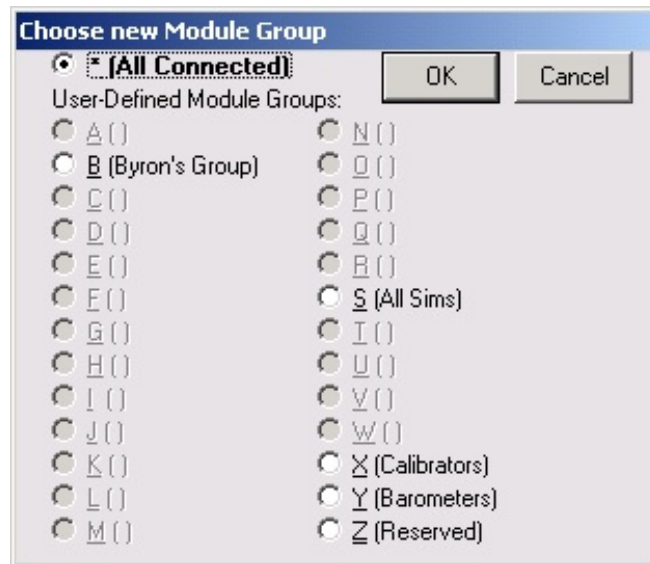
The first *field*, labeled “**Group=**”, displays the **Current Group** (and its Group label in parentheses). Just to the right of this field, a tiny (unlabeled) **UDP Receive Activity** field appears. A third *field*, labeled “**# Con=**”, displays the **Number of Modules Connected**. Just to its right, a tiny **TCP Receive Activity** field appears alone (unlabeled) just like the **UDP Receive Activity** field. These fields also “hide” several other *useful “hidden” controls*, that can be operated simply by *clicking* that field with the mouse.

The example below shows the *ToolTip* obtained by *hovering over* the field label “**Group=**”. Note that you get a different *ToolTip* depending on whether you hover over this *label* or the two *white data fields* to its right.



The *Current Group* that NUSS uses may be selected within the **Group Editor** by clicking an optional *check box* before you exit it. However, you may also select it by *clicking* the displayed contents of this *Current Group* field (i.e., by clicking the *white datum field* to right of label “**Group=**”). This “hidden control” causes a pop-up form to appear (see first example on following page), that allows you to select *any currently defined* group. Notice that any *undefined* groups are *dim*, and not selectable. This example form below shows several groups available for selection: **Group \* (All Connected)**, user-defined **Group B (Byron’s Group)** and **Group S (All Sim’s)**, and finally the dedicated system groups: **X**

(Calibrators), Y (Barometers), and Z (Reserved). These last three groups are automatically created, but can be viewed and modified.



Current Group selection form

The **Current Group**, once selected (after clicking [OK]), is used as the target for several “group” menu functions on the **Network Status** form’s menu and on the **home-base** menu. NUSS remembers the **Current Group** you select even when you exit it and restart it later. There is one special Group called “\*” (star) that represents “all currently connected modules”. It is always defined, and changes its meaning dynamically as you *connect* or *disconnect* modules on the **Nodes Map** manually. You can view this special group with the **Group Editor** (i.e., **Groups** menu option) but you cannot modify it there. It is often very useful when you need to do things quickly with a group, and just do not want to spend the time defining an explicit group. You only need to connect several modules manually, then operate on them as a group. It is useful for every “group” function except **Connect**.

The **Number of Modules Connected** (displayed in the small field to the right of the abbreviated label “# Con=”) is *white* if no modules are connected, and *yellow* if one or more modules are connected. It is useful in tracking the success or failure of module connection requests – which take a finite time. Clicking this field also provides a major useful “hidden” function: the ability to **Run** all the modules *currently connected* (and to Stop them again once they are running if you click it again). It turns *green* when this special **Run** function is in progress. Please note: this function starts or stops single-module **Run** instances — independent of whether or not the special Group “\*” is assigned to the **Current Group**. It should also not be confused with the **Run Group** function on the “home-base” menu, that does **not** run multiple instances of the single-module **Run** function — as



this special **Run** function does. This “hidden” control certainly beats having to start each connected module separately via its context menu.

Two (2) tiny **Receive Activity** fields (unlabeled) are located to the right of the larger labeled fields already described above on the Status Bar. These fields are blank until some particular *receive activity* is detected and processed by NUSS — after which they display a *baton* character (alternately |, /, --, \) that “rotates clockwise” for every *receive* operation processed from any module.

The *top* tiny “baton” field registers all **UDP** *receive activity* (i.e., any module responding to a **Query** command issued by this host or other hosts — or after any module is **Reset** (if it is configured to do so)). If you *click* this field, three (3) additional fields appear to its right — and these disappear if you *click it again*. From left-to-right, they are a *UDP Receive Counter* (i.e., each **Query** response received from modules), a *UDP Transmit Counter* (i.e., each **Query** command send by *this* host), and finally a *Last UDP Error Message*. Clicking any of the extra *counter* fields resets their internal counters. This tiny “baton” field turns *light green* (for one second) from the time a **Query** command is transmitted — until all received responses are updated on the **Nodes Map**.

The *bottom* tiny “baton” field registers all **TCP** *receive activity* (i.e., as when any connected module emits a *command response* or *autonomous stream*). If you *click* this field, four (4) additional fields appear to its right — and these disappear if you *click it again*. From left-to-right, they are a *TCP Receive Counter* (i.e., each **TCP** response or stream received from a connected module), a *TCP Transmit Counter* (i.e., each **TCP** command send by this host to a connected module), a *TCP Error Counter*, and finally a *Last TCP Error Message*. Clicking any of the *counter* fields reset their internal counters.

You may need to widen the Network Status form (by dragging its right boundary) to see all the optional status fields described above. An example showing all the fields follows:

The screenshot shows a window titled "Network Status" with a menu bar containing "Query", "Groups", "Connect", "Disconnect", "Reset", and "Forget". Below the menu bar is a table with two rows of data. The first row shows "Group=\* [All Connected]" with a baton character, a "Disconnect" value of 2, and a "Reset" value of 1. The second row shows "# Con=1" with a baton character, a "Connect" value of 55, a "Disconnect" value of 55, and a "Reset" value of 0. Below the table is a section labeled "Nodes on Network" with a "Description" column.






Group	Disconnect	Reset
Group=* [All Connected]	2	1
# Con=1	55	0

All UDP/TCP Activity Fields revealed

On the first line, 2 modules have responded to 1 Query command. Also, no UDP error has occurred on this system (there is only one possible during NUSS startup). This is why the UDP line has no *error count* box (see Section 2.7.2). On the second line, after one module was connected, it sent 55 commands, and received 55 command responses. There have been zero (0) TCP errors so far (thus no error message).

### 3.2.4 Module Icons in Nodes Map

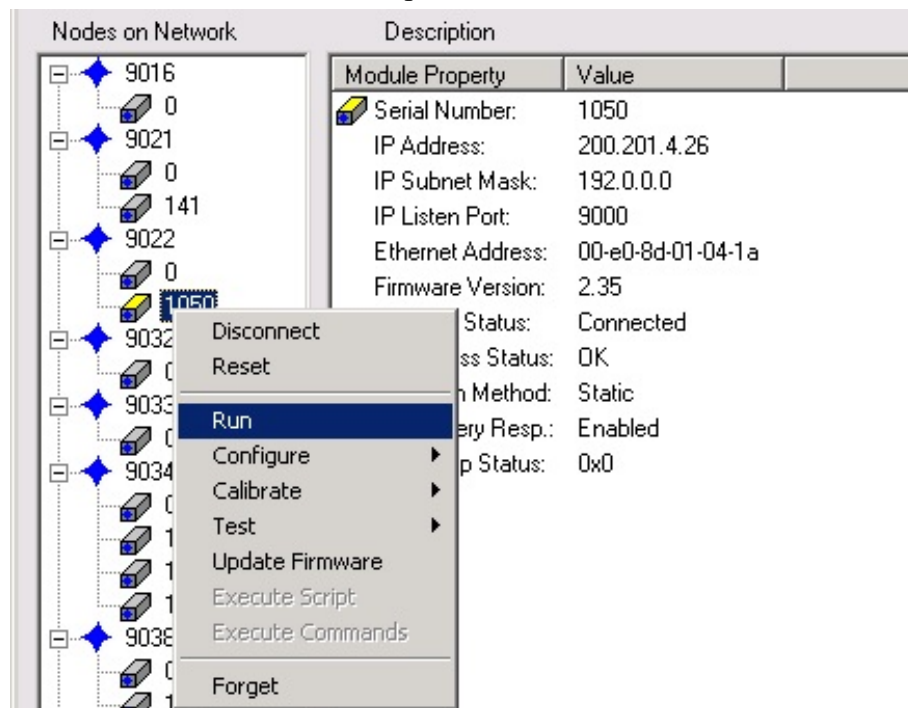
The various *module icon types* are described in the following table.

Icon and Description	Definition
 <p>Module Ready To Connect (module top colored <b>grey</b>)</p>	<p>The module is running and <b><i>available for a connection</i></b> to be opened to it. This is the default state when a module has been powered-up and has a valid IP address.</p>
 <p>Connection Open to NUSS (module top colored <b>yellow</b>)</p>	<p>The module has a <b><i>connection open</i></b> to NUSS and is ready to communicate with it. Use any NUSS function in <i>bottom section</i> of module's <i>context</i> menu (or module may participate in other <i>group</i> functions)</p>
 <p>Not Available for Connection (<b>red circle</b> with slash)</p>	<p>The module is <b><i>not available</i></b> for a connection to be opened to it. This may mean that another application (in this or another computer) already has a connection open to it, or that it has been recently disconnected from NUSS and is still timing out.</p>
 <p>Module Not Found (<b>yellow oval</b> with <b>red</b> question mark)</p>	<p>The module did not respond to the last Query request asking for information. This happens if a module previously known to NUSS has disconnected from the network (or if the most recent Query request was somehow not received by the module).</p>
 <p>Module Waiting for IP Address (<b>yellow oval</b> with <b>red</b> exclamation point)</p>	<p>The module is active and running on the network but has yet to receive an address request reply from a Dynamic IP Address server. A connection <b><u>cannot</u></b> be opened to the module until it gets a valid IP address from the address server (an Advanced feature)</p>

### 3.3 Configuring and Operating Single Modules

The *middle* and *bottom* sections of a module's *context* menu (described briefly in the previous section, and detailed below) are the normal way to *initiate* most NUSS functions for a *connected* single module — or for several such modules sequentially.

In the example below, a Model 9022 *scanner* module has been previously selected (highlighted), and its *context* menu obtained by *right-clicking* anywhere in the **Nodes Map**. This module is already *connected* (i.e., its icon top is *yellow*, and **Disconnect** is available in menu's *top-section*), thus all the *single-module* functions in the *lower-sections* of the menu are now available for use. In this example the **Run** function is about to be selected.



Typical Single-Module Context Menu

Some of these functions are activated with one click. Others lead to submenus of several other classes of functions that can be activated with two clicks. After a particular function is initiated a new *module form* appears. Such a form sometimes shows only *minimum* functionality (to avoid overwhelming the new user) — and at other times it shows *maximum* functionality (once the user has learned to manage it and use it). The form generally displays the amount of functionality it had when the function *was last used* by NUSS for each specific module. Other forms display information immediately loaded from the module itself.

### 3.3.1 The Single-Module *Run* Function

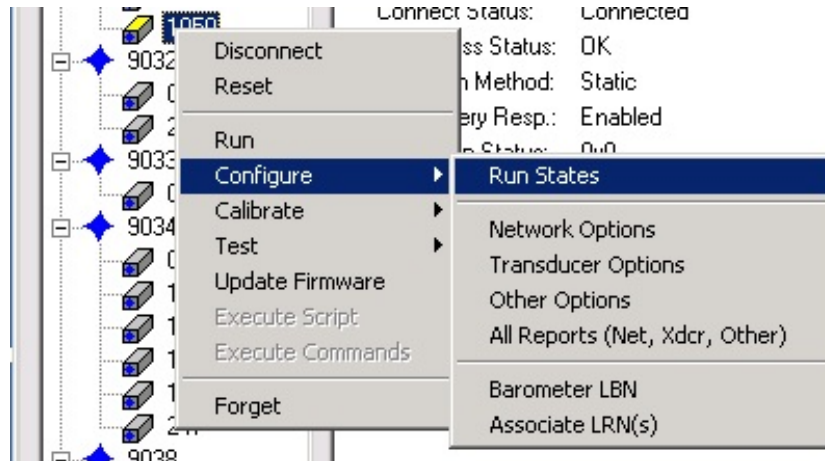
The *Run* function for a single module is started by clicking the *Run* menu item on the module's context menu (see example above). The module must already be connected before its *Run* menu item is enabled. A unique *Run* form for that module is immediately displayed, showing all (or selected) channels for the module (in both tabular and graphic form). This form has two default sizes: *minimum* and *maximum*, as set by the **[Less]** and **[More]** buttons (actually one button that changes its name appropriately). However, the form can be resized in many other ways by dragging its boundaries and corners. When this form is dismissed with the **[X]** button, it remembers its last size and position on the screen.

The *Run* form's module is initialized according to a default (or user defined) **Run State** script, and acquisition (normally) begins immediately – driven by three autonomous streams (running at various rates) – and generated by the module periodically once acquisition has been started. All or some of the data from these streams are displayed on the form. Such data depends upon each stream's defined content and “scan” rate – and also depends on the form's historical configuration of its display fields: called its **Display Set**. Some module controls (in the bottom frames of *maximum Run* form) allow the user to control the module directly. One frame allows the user to operate any valves (or other control functions) of that module. Another frame contains controls that allow user to *stop*, *start*, or *pause* acquisition of the above-mentioned streams, to display current stream “scan” counters, and also to change the module's **Run State** script. A final frame of controls let the user operate *Record* (and *Playback*) features of NUSS. These features are used to capture all (or selected parts) of the acquired module data streams in their raw (binary) format as data files. These files can later be processed (played-back) on the data displays, and also converted into one or more human-readable reports.

In order not to overload the reader with any further details now, the complete description of the multi-faceted *Run* function (with example screen shots) is deferred entirely to a separate chapter labeled **Running Modules (Chapter 6)**. This allows the reader to learn more of the rather mundane *configuration* and *calibration* facilities of NUSS first (in this chapter) — before tackling the very large subject of operating modules on *Run* forms. This order may be particularly useful, since some of the remaining *Configure* functions (to be discussed below) are prerequisite to using the *Run* functions effectively.

### 3.3.2 The Single-Module *Configure* Function

The *Configure* function, selected from the *context* menu, leads to an expanded submenu.



Selecting '*Configure* | *Run States*' function on context menu

This submenu has three sections. The *top* section has a single item that executes the **Run State Editor** (on behalf of the subject module only) for the purpose of defining (or editing) a suitable data acquisition “script” for that module when it is using the *Run* form. Each script defines up to three *autonomous streams* that the module can generate periodically, at different rates when it is running. Access to the **Run State Editor** is also available via hidden controls on each module’s *Run* form.

The *middle* section (first three *Options* items) has functions that select for display (and editing) a particular “class” of *configurable options* for the subject module. Such module options are broken into classes mainly because there are too many module options to fit on one form. Each submenu item displays a particular option form, showing the current state of all readable options of that class in that module. The last item in the middle section allows final summary reports to be generated and viewed (with text editor) for *all the classes of options* in one operation – though such reports can be also generated singly on each option class’s own form.

The *third* section appears for *scanner* modules only, and contains two submenu items. These configure whether or not each transducer of the module has any special *associations*. The first item sets LBN (Logical Barometer Number) associations, which allow each channel’s natural *differential* data to be transformed to *absolute* form (by adding the natural value to the most recent absolute pressure value acquired from the assigned barometer) when the Run form displays its data. The second item sets LRN (Logical Range Number) associations, which allows each channel to be associated with a particular range of

*calibrator (and its particular set of calibration set points)* — an important configuration function that facilitates automatic calibration adjustments on the scanner module later.

Each of the above **Configure** choices (except the **Run State Editor**) is described fully below (in the following sections). The **Run State Editor**, because it is an important configuration tool specifically for the **Run** function, is deferred to **Chapter 6**, where the **Run** function is detailed. Calibration is discussed in greater detail in **Chapter 4**. There are some *gray areas* relative to **Calibrate** and **Configure** functions, causing some functions to appear on both submenus. Some special modules (particularly the 903x and 9x46 modules) use some special *calibration coefficients* as module *options*.

### 3.3.2.1 Viewing/Editing Options In A Module

Though **Run States** (scripts used to control modules during operation) do modify certain *Module Options*, they are only invoked (i.e., sent to the module) when the module operates in a **Run** form of NUSS. There are many *Module Options* that may be “loaded” into the module’s internal control memory immediately at the time you configure them. Some of these remain there forever after, even after a *reset* of the module (i.e., they are automatically stored into nonvolatile module memory). Many options are stored (by default) in DRAM (volatile memory) in the module, and survive only until a *reset* occurs. However, you may choose to make most of these permanent (i.e., copy them to nonvolatile memory). There are other notable option variations discussed below (e.g., NUSS-Only, NUSS-Affected, Read-Only, Write-Only, Read/Write, and Change@Reset Only types).

Since there are so many *options*, they are *functionally grouped* by NUSS and displayed on several different forms, to make them easier to understand. Some *options* are common to all **NetScanner** classes (e.g., those in the **Network** group). The **Other** and **Transducer** groups have some items common to only **NetScanner** module classes. Still others are only specific to particular module-types.

Some items on the **Configure** menu show module options that are never loaded into the module itself. These are therefore *NUSS options* used on behalf of the module by NUSS. The Module Name and the Barometer and Calibrator associations are an example of this type of option. NUSS has also insured that some *Module Options*, that it absolutely needs, are always set by it explicitly, when a module is *connected*. These are called *NUSS-Affected* options. NUSS may restore some of these (to their original saved state) when a module is *disconnected*. However, if NUSS aborts due to some unexpected error (thus, skipping the process of disconnecting all connected modules, as when it exits normally), these restoration attempts may be bypassed. However, a *reset* of the module usually

restores its normal defaults since such option changes are not saved in non-volatile memory.

When an option class is chosen from the **Configure** submenu, a form opens labeled:

### <optionclass> Options of Single Module

The main frame of this form has its own title, indicating the particular module being affected. Several separate **Configure** forms can be opened concurrently. A **Configure form** has many capabilities for viewing all the current settings of a particular class of the module's *operating options* — and you can also *modify* many of these options (if module's **Run** form is not also active). Also note that a few options are designated **Write-Only** (and their label and value text are *magenta* in color). That is, they display no current value, unless you enter one. Others are designated **Read-Only** (their label and value text are *brown* in color) thus cannot be changed. Still another type of option (text colored *blue*) is designated **Change@Reset Only**, meaning: they are changed and stored in non-volatile memory, but do not take effect until the module is **Reset**. Several Network options are of this type.

When any option is modified in these forms, its *text box* (or *option field*) background color turns *dark pink* to indicate it has been changed. Normally, when you finally press the **[Save]** button, only then are such *Changed* fields actually saved to the module itself. However, you may force any enabled option in an option form to be *Saved* even if it did not change. Why would you want to do this? Well, suffice it to say that it becomes clearer when you understand the “group” option forms, which can broadcast a set of options to *all modules* in a *group*. Until then, just remember that you can *Include* any option (i.e., force it to be stored by **[Save]** button) by simply clicking its *text box* (or *choice frame title*), without actually changing its value/choice. These *Included* options are indicated by a background that turns *light pink* instead of *dark pink*. To assist this function, all such option forms also have an **[Include All Fields]** button. Clicking this button once marks all the enabled option fields as *Included* (*light pink*). After that, clicking any single fields *un-marks* them. Clicking **[Include All Fields]** again un-marks all fields already marked, and marks any that are not. However, once a value/choice has been *Changed* (becomes *dark pink*), it cannot be marked *Included* (*light pink*) or unmarked as *Excluded* (white).

The **[Save]** button on all option forms has a *check box* labeled **Non-Volatile** immediately under it, that is normally *checked* by default. This causes the **[Save]** button to execute a special module command that forces all options normally saved in DRAM only – to also be saved in non-volatile memory. You can uncheck this box if you ever need to save a module option in DRAM without also saving it in non-volatile storage. For example, should you

not be sure about a particular DRAM option, and you want to use the module's **Reset** function as a safety net to get the module back to its original state.

Only one of the options in the **Transducer** Options class (Date of Next Cal.), for scanner modules only, can be modified. All other **Transducer** Options are read-only for Normal users. Most of the **Network** and **Other** options may be changed, unless they are dimmed.

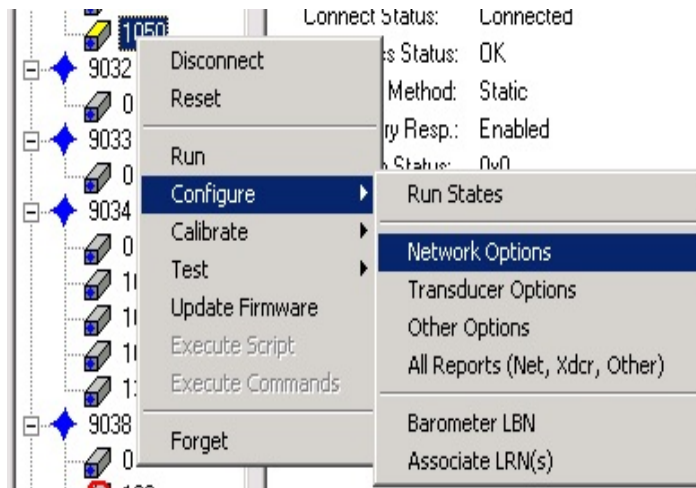
Each of the three '**Configure** | *<class> Options*' menu selections and their forms, described above, has a **[Report]** button and a **[View]** button. Clicking the **[Report]** button causes the **[View]** button to be dimmed, and a report (directly readable text file) is then written to NUSS's **Report** subfolder. This report summarizes the current state of all the options that can be shown on its form for a particular module. Depending on the amount of data that must be read from the module, and written to the report file, this operation may seem "instantaneous" or take several seconds to accomplish. When finished, however, the **[View]** button is re-enabled to allow viewing the newly generated file. Clicking the **[View]** button pops-up a common file-selection dialog form, that shows (by default) the most recent such report generated for a particular module. Other *filters* may be selected to allow the form to list the names of other files as well. To select a file, highlight its name (e.g., **9116-0CfgNet.txt**) and then click the **[Open]** button on the pop-up dialog form — or simply *double-click* the desired file name. NUSS's configured text editor then pops-up a form showing the text contents of that report file: for viewing, copying, printing, etc.

As mentioned above, there is also a special fourth menu item ('**Configure** | **All Reports (Net, Xdcr, Other)**') in the middle section of the **Configure** submenu – that allows the reports above to be generated (and viewed) for all three classes of options at the same time.

See Chapter 2 (Section 2.5) for examples that use **Configure** to change several typical *module options*. Any *module options* which are transducer specific and associated with **Calibration** (e.g., coefficients) are not viewed/modified via the **Configure** menu. These are deferred to the separate **Calibrate** menu function instead (described in a subsequent section).



### 3.3.2.1.1 Network Options



Selecting '**Configure** | **Network Options**' for single **NetScanner** module

After selecting this function, the following **Configure** form pops-up to display all options of the **Network** class for the selected **NetScanner**. You may modify (or include) any modifiable entry by clicking its text box or choice frame label. Clicking the **[Save]** button transmits all changed (or included) options to the module. Click **[Exit]** when you are finished inspecting/changing options (a warning is issued if you try to exit when changes have been made but not saved).

**Network Options of Single Module**

9022-1050 (J) Scanner

IP Address: 200 . 201 . 4 . 26

Subnet Mask: 192 . 0 . 0 . 0

TCP Connect Port: 9000

Backoff Delay: 0

Non-Volatile: ☒

UDP-Broadcast@Reset: ☒ Disabled ☒ Enabled

IP Address Resolution: ☒ Static ☐ Dynamic

Response Prefix: ☒ Disabled ☒ Enabled **Orig. Enabled**

Options are Normal (black) or Change@Reset-Only (blue) or NUSS-affected (green) -- (see ToolTips)

Typical *Network Options* form

Note that the first two major options (*IP Address* and *Subnet Mask*) are displayed with *blue* text labels and values. As indicated earlier, this means that the option does not actually take effect when you save them to the module. Instead, you must actually perform a **Reset** of the module before they take effect. An initial note in the *light yellow* status box at the bottom of the form reminds you of such distinguishing color meanings.

The *TCP Connect Port* option, normally 9000 by factory default, can be changed if necessary. Usually this is necessary only if the user has other software (than NUSS) that requires some other connect port.

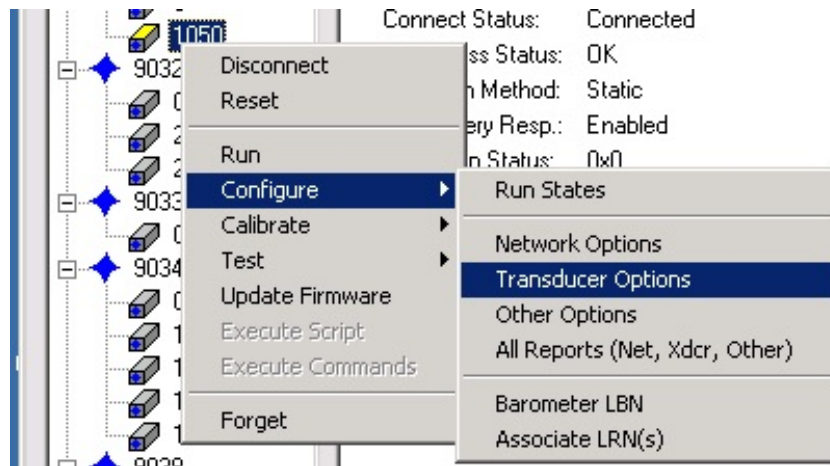
The *Backoff Delay* option, determines how long after the module has a command response or stream ready to return to the host, that the module should wait before actually sending it to the host. This may be useful in some systems with many modules operating at high stream repetition rates, to help reduce Ethernet collisions. The factory default (0) indicates there is no such delay programmed. A special value (-1) causes the low order data field of the Ethernet address (multiplied by 20 microseconds) to be used as the *Backoff Delay*. However, this option also allows you to set an explicit (positive) relative delay value (also multiplied by 20 microseconds).

Be sure to hover over the *ToolTips* of every option's label, entry box, or choice frame for more specific information on the purpose of the option, or the values permitted to be entered. Notice that the last two frames at the bottom are dimmed, indicating they are not

changeable by Normal users. The last frame (bottom right) is interesting – in that it is a *NUSS-affected* option (shown with green lettering). This means that NUSS always sets this **Resp.Prefix** option to the Enabled state regardless of its saved original state – because NUSS requires the module always generate an optional “bytes length” prefix at the start of every command response and autonomous stream. However, this frame does show the modules original state (in this case “Orig.Enabled” in a field with *red* lettering just below the option select radio buttons). This is the same state the module is set back to when NUSS disconnects from the module (or NUSS exits normally).

The **[Report]** and **[View]** buttons generate and show (respectively) a one-page **Configure Network Options** report (text file) summarizing all the Network Options currently set in the module. The name of this report file is **<modid>CfgNet.Txt** and is stored in NUSS’s Report folder. Any new such report file always overwrites any previous such report for the same module.

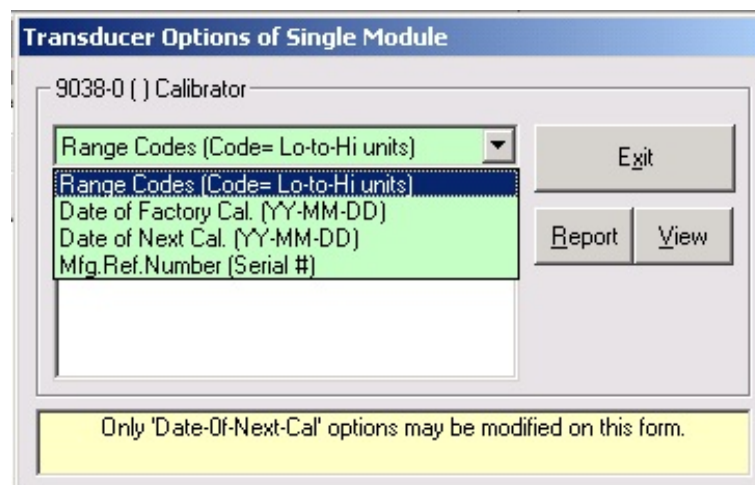
### 3.3.2.1.2 Transducer Options



Selecting '**Configure | Transducer Options**' for single module

After selecting this function, a **Configure** form pops-up to display all options of the **Transducer** class for every channel of the particular module, Three examples are shown below for different module types.

The first example is for a Model 903x *calibrator* module, which has only one transducer channel. Clicking the arrow button in the selection list box (top-left) allows you to choose one of four basic display items for each channel/transducer. The selected data are then displayed in the larger white list box. None of these options are meaningful for 903x modules – except **Date of Factory Cal.** and **Date of Next Cal.**. Note, that you are reminded that **Date of Next Cal.** is the only item that can be modified (see initial posted message in *light-yellow* status box at bottom of form). Click **[Exit]** to exit form after viewing the desired data.



Four types of **Transducer Options** selectable from list

The second example is for a 9816 scanner module. It is the same for any module of the scanner class, except that a larger display list box adjusts to accommodate the number of channels/transducers of the particular model.

**Transducer Options of Single Module**

9816-0 (888) Scanner

Date of Next Cal. (YY-MM-DD) ▼

Range Codes (Code= Lo-to-Hi units)

Date of Factory Cal. (YY-MM-DD)

Date of Next Cal. (YY-MM-DD)

Mfg.Ref.Number (Serial #)

Exit

Report View

Date to Save

Save Date

for Channels..

4	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16	13	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3 00-00-00

4 00-00-00

5 00-00-00

6 00-00-00

7 00-00-00

8 00-00-00

9 00-00-00

10 00-00-00

11 00-00-00

12 00-00-00

13 00-00-00

14 00-00-00

15 00-00-00

16 00-00-00

17 (S) 00-00-00

18 (P) 00-00-00

Only 'Date-Of-Next-Cal' options may be modified on this form.

**Date of Next Cal.** data displayed for each channel (1-16)

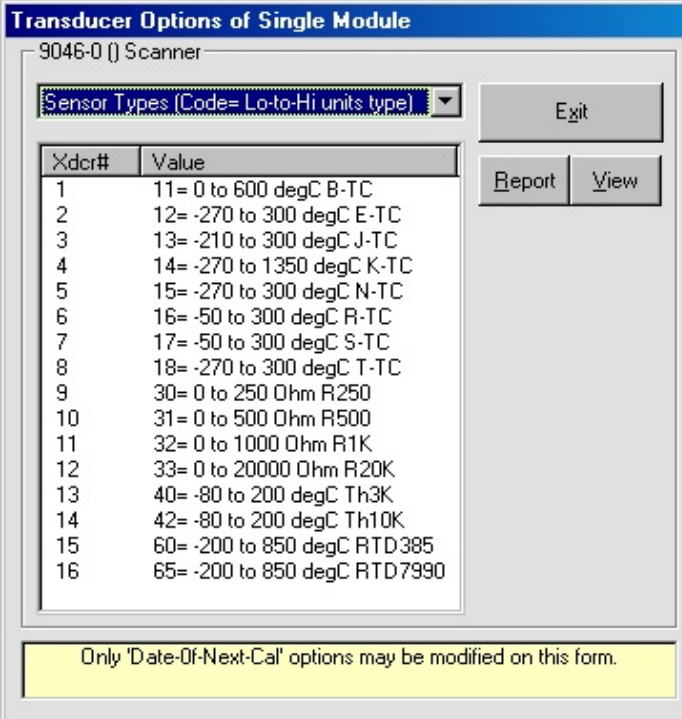
These data groups are for view only (not modifiable), except for the *third* (**Date of Next Cal**) which causes additional controls to appear on the form (as shown above). These extra controls allow this particular data group to be *edited* and *saved* for selected channels (all channels by default). Simply click the text box labeled **Date to Save**, and enter a 6-digit integer date in the form YYMMDD (without any of the '-' characters shown in the displayed list). Next, un-check the check boxes of any channels for which this change is not to be made. Then, press the **[Save Date]** button to make the change to the display list **and** to save that data immediately to the module. This is a non-volatile save. Note that for a Model 9816 module, the special "rack" channels (S and P) cannot be so modified.

The **[Report]** and **[View]** buttons generate and show a one or two page Configure Transducer Options report (text file) containing the current Transducer Options in the module (all four data groups are included in the report). The name of this report file is

<*modid*>**CfgXdcr.Txt** and is stored in NUSS's **Report** subfolder. Any new such report file always overwrites any previous such report file for the same module.

The **Transducer Options** form for a Model 9x46 temperature/resistance scanner are similar to those of a Model 9116, however this special scanner model assigns a different meaning to the first page of options on the form. Instead of factory-installed **Range Codes** for each DH pressure transducer channel, this scanner shows user-configured **Sensor Types** (Thermocouples, Thermistors, RTDs, Resistance Ranges) for each transducer channel.

In the *simulated* module example shown below, the first 8 channels each have a different type of thermocouple configured. The next four channels are assigned to each of four resistance ranges. Two thermistor types and two RTD types round out the last four channels. Any of the displayed data ranges for any Sensor Type above may be modified by the user (see text file **SensorType9046.txt** in **Ini** subfolder) to get different *bar graph* ranges on **Run** forms.



**Transducer Options of Single Module**  
9046-0 ( ) Scanner

Sensor Types (Code= Lo-to-Hi units type) ▼

Xdcr#	Value
1	11= 0 to 600 degC B-TC
2	12= -270 to 300 degC E-TC
3	13= -210 to 300 degC J-TC
4	14= -270 to 1350 degC K-TC
5	15= -270 to 300 degC N-TC
6	16= -50 to 300 degC R-TC
7	17= -50 to 300 degC S-TC
8	18= -270 to 300 degC T-TC
9	30= 0 to 250 Ohm R250
10	31= 0 to 500 Ohm R500
11	32= 0 to 1000 Ohm R1K
12	33= 0 to 20000 Ohm R20K
13	40= -80 to 200 degC Th3K
14	42= -80 to 200 degC Th10K
15	60= -200 to 850 degC RTD385
16	65= -200 to 850 degC RTD7990

Exit Report View

Only "Date-Of-Next-Cal" options may be modified on this form.

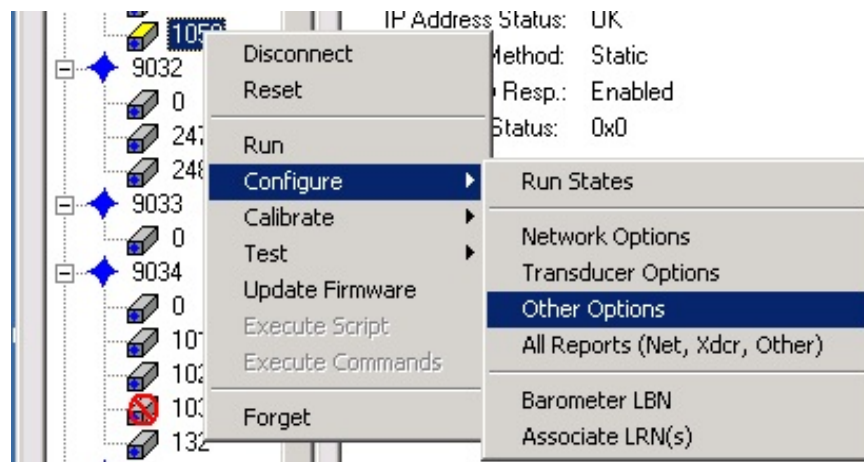
Model 9x46 **Sensor Type** Options

The three other selectable per-channel transducer option types (two calibration dates and serial #) for a PSI-manufactured **Model 9x46** have the same meanings as they do for other *pressure* scanner modules.

Although the changing of the **Sensor Type** is not allowed on this form, it can be changed on the '**Calibration | View/Edit Coefficients**' form as coefficient #81. This capability is described in **Section 3.3.3.2** below

**WARNING:** For the **Model 9x46** the changing of the **Sensor Type** (coefficient 81) is a necessary but not sufficient condition to change a channel's data type. For some Sensor Types other **jumpers** inside the module may also require reconfiguration to complete a sensor change operation.

### 3.3.2.1.3 Other Options



Selecting '**Configure** | **Other Options**' for single module

After selecting this function, the following **Configure** form (see example next page) pops-up to display all options of the **Other** class for the module. The controls available are similar to those of the Network Options discussed above. However, some of these options are Read-Only, some are Write-Only, but most are normal (Read/Write). However, some Read/Write options may have write (i.e., change) *disabled (dimmed)* for **Normal** users (but enabled for **Advanced** users).

You modify a changeable numerical field by clicking it, then typing its new value. You modify a changeable choice by clicking the appropriate *radio button*. Clicking the **[Save]** button then saves all changed options to the module. Click the **[Exit]** button when you are finished inspecting/changing options (a warning is issued if you try to exit when changes have been made but not saved). Normally only *Modified* (indicated by a *dark pink* background) options are normally saved, but others may be saved without modifying them if they are marked *Included* (*light pink* background) by simply clicking their *text box* (or *choice frame title*).

The option text color *brown* indicates *Read-Only* options (i.e., those that can be displayed but never modified), and the form starts with a frame of two such options (Model 903x modules may have three such options). These are both 16-bit status fields displayed as a 4 digit hexadecimal bit map. You must access your module's User Manual (see its 'q' command) for interpretation of these bit maps. These values are only updated once (at time option form first appears), not continuously. However, on a module's **Run** form, the *Temp Alarms* are displayed in a more useful form, and are refreshed periodically by changing the background color of the "Other Datum" display fields (red=in alarm, white=not). See Chapter 6 for an example of this form.



The option text color *green* indicates NUSS-Only options (i.e., not saved in module itself but in a [xxx]NUSS.INI file on behalf of module) or NUSS-Affected options (ones that NUSS may change to what it wants, even if you attempt to change them in the module).

**Other Options of Single Module**

9816-0 (888) Scanner

**Read-Only Status**

PwrUp: 0000 Temp Alarms: 0000

**Module's Name (crs)**: 888 **Units X**: 1

**# A/D Samples/Avg.**: 8 **# Channels**:

**Cal.Zero Valve**: ☐ Disable ☐ Enable

**Periodic Tasks**

Therm. Scan Period: 60 ☐ Disable ☐ Enable Min. Temp. Alarm S.P.: 0

Ext. DH Scan Period: 60 Max. Temp. Alarm S.P.: 60

**Source Air Check**

Minimum Pressure: ☐ Disable ☐ Enable

Options are Normal (black), Read-Only (brown), Write-Only (magenta), or NUSS-only/NUSS-affected (green)

**‘Configure | Other Options’ form (9816 shown)**

The *Module Name* option belongs to the NUSS-Only class. You may modify it by simply clicking it (to get an entry cursor), then type in the new *Module Name*. Note that only Model 9816 modules have their *crs* (*cluster/rack/slot*) parameter assigned to its name by default, but this can be changed to any more meaningful text name (up to 16 characters in length) if desired.

The *# A/D Samples/Avg* value and the *Cal.Zero Valve* choice are options that belong to the NUSS-Affected class. Because changing them can be complicated or even dangerous, they are write-disabled for *Normal* users (i.e., you can view them but not change them, though *Advanced* users can change them).

The *UnitsX* option (a.k.a, *Units Multiplier* or *EU Scalar*) is actually a module *calibration coefficient*, but is treated here as a module *option* for sake of simplicity. Its factory default is 1.0 which causes the module to process all pressure values as PSI units. If it is changed to any other positive value, then all *acquired* pressure values are multiplied by that constant before being returned to the host in the new native units. For calibrator modules, any specified pressure value to be *Set* is “divided” by this “multiplier”. If specified “close” to a *known UnitsX value* (see table below), the module’s **Run** form also labels the tabular pressure datum fields with the corresponding units name. Thus, if you change it to 6.894757, all subsequent pressure values are returned and labeled kPa (kilo-pascal) native units, persistently from then on (until the **Run State/Display Set** is changed or erased). In addition to the ‘root’ units names shown in the table, an ‘A’ is appended when the *pressure mode* is known to be *absolute*, rather than *differential* or *gauge* (e.g. **kPa** units would be displayed **kPaA** and **psi** units would be displayed **psiA**)..

Native Units Name	<i>UnitsX</i> Value
ATM	0.068046
Bar	0.0689475
G/cm2	70.30696
inH2O	27.673
kG/m2	703.0696
kPa	6.894757
mBar	68.94757
mmHg	51.71493
mmH2O	703.08
Pa	6894.757
psf	144
psi	1.0

See **Section 2.5.2** in Chapter 2 for detailed procedures on how to change this coefficient for single or multiple *pressure* scanner modules. The table above shows all possible choices for *UnitsX*. that returns standard *native units names* for labeling each displayed tabular datum field on the module’s **Run** form. For **Model 9x46** *temperature/resistance* scanner modules, *UnitsX* should never be changed from its nominal value (1.0).

Please note that if you click the *unit names* of any tabular datum on a **Run** form a pop-up form gives you an additional capability of displaying any other “alternate” pressure units (in table above), regardless of the native units specified for the module. This feature also gives you the option to display special *barometer* calculations as well. You can option these changes for each channel separately on either the Left side (Primary EU) or Right side (Other) tabular columns of the **Run** form. These changes are persistent until the **Run State/Display Set** is changed or erased (see **Forget** function). These alternate displays work for all pressure scanner modules and pressure calibrator/standard module. However, for calibrator modules, if you choose to display any “alternate” rather than “native” pressure unit, you can still only **Set** pressures in the native units specified by *UnitsX*.

The option text color *magenta* is used to indicate Write-Only options (i.e., those that can be saved in the module *if a value is supplied*, but which cannot be displayed normally because there is no module command that NUSS can use to retrieve it from module). These only show a value/choice, which can be saved, if you enter/change them. The *# Channels* option is an example of this, but normal users should not change it.

The option color *black* is used to indicate *Normal (Read/Write)* options. Most remaining module options fall into this class (except as indicated).

The next frame, labeled *Periodic Tasks*, groups several related or similar options controlling the periodic rate and enable/disable choice of certain internal module tasks. All pressure scanner modules have a *Thermal Update* task that periodically reads the temperature sensors of each pressure transducer, and limit checks that temperature between specified limits. Out of limit channels are indicated as 1 bits in the Read-Only *Temp Alarms* hexadecimal bit map at top of the form above, and also by turning the background color to *red* for all Other Datum display fields on the *Run* form of the module. Both the period and low/high temperature limits are specified by Read/Write options fields, but this task’s enable/disable choice is Write-Only (i.e., cannot be viewed), but is always Enabled after a module *Reset*. Thus, changing this choice is only useful if you want to disable it until next module *Reset*. For the Model 9x46 temperature scanner, this temperature alarm frame looks somewhat simplified due to a different algorithm used (see example below).

Periodic Tasks

Therm. Scan Period	<input type="radio"/> Disable	UTR Temp. Alarm S.P.
60	<input checked="" type="radio"/> Enable	60

Model 9x46 Periodic Tasks frame

There is only a single alarm value. It must be set to the “number of degC” that all UTR junction temperatures must deviate from all other TC (thermocouple) channels, before the alarm is triggered. The value shown above (for a simulated module) is not realistic – it is normally set to only a few degC or even set to a fraction of a degC before alarms can occur.

For model 9816 only (shown previously) there is also a periodic *External DH Channel Update* task, used to read the External Purge and Supply (P & S) channels (a.k.a., Channels 18 and 17 in the rack, which are not in the module itself). Only its period may be changed here. For the Model 9022 scanner this same field is used to specify the period of a *Front-End Calibration Update* task instead.

Finally, the last frame (in example above) appears only for Model 9816 modules, which have a special *Source Air Check* function. All these options are Write-Only.

Other special scanner modules (with changeable transducers like the 9022) may have similar frames, and in some cases entirely different frames near the end of the form.

The screenshot shows a software window with the following elements:

- Periodic Tasks:**
  - Therm.Scan Period:** A text box containing the value '15'.
  - Min.Temp.Alarm S.P.:** A text box containing the value '0'.
  - F.E.Cal.Scan Period:** A text box containing the value '60'.
  - Max.Temp.Alarm S.P.:** A text box containing the value '0'.
  - Two radio buttons labeled 'Disable' and 'Enable' are positioned between the 'Therm.Scan Period' and 'F.E.Cal.Scan Period' fields.
- Non-digitally-compensated Transducer Options:**
  - Generic Xdcrs.:**
    - Two radio buttons: 'Use Stored Par.' and 'Use Default Par.'.
    - A checkbox labeled 'Clear All Par.'.
  - 940x Xdcr w. EEPROM:**
    - A grid of checkboxes for values 6, 12, 1, and 7.
    - Two checkboxes: 'Store Par.' and 'All'.

Frames from Model 9022 Scanner modules

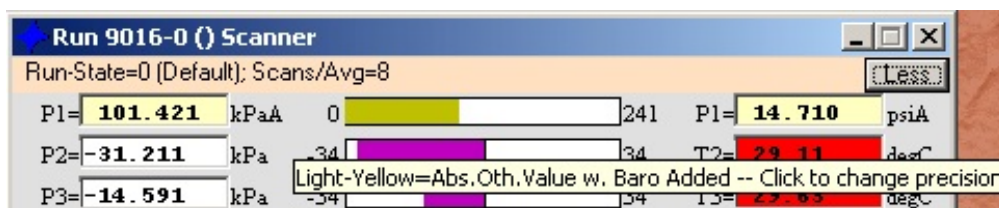
Notice that this module has a special periodic task with its own period. This is the **F.E. Cal.Scan Period** option (F.E. means Front-End). Also, the special Model 9400 external pressure transducers that can plug into these module types have additional options that can be specified on this form. Some 9400's have no temperature compensation and no memory at all – requiring that the module's firmware compensate by providing module storage on a per-transducer basis for such “generic” transducers. Still other 9400 transducers have EEPROM memories, but the user has to decide what to do with it.

The **[Report]** and **[View]** buttons generate and show a one page Other Options report (text file) containing all the Other Options currently in the module (except for Write-Only ones).

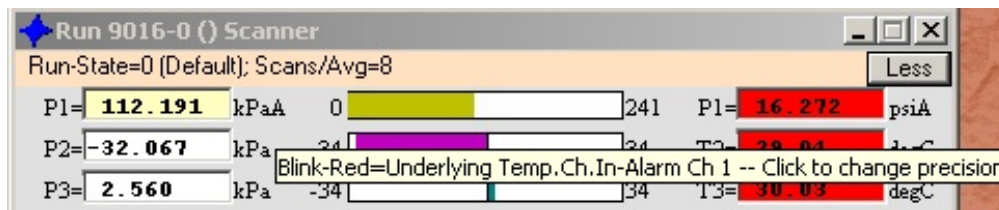
The name of this report file is **<modid>CfgOth.Txt** and is stored in NUSS's Report folder. Any new such report file always overwrites any previous such report for the same module.

If one analyzes the raw commands used by a module to read its options (see 'q' command in module's hardware User's Manual) and to write its options (see 'w' command in same manual) you may find other options and functions not found on any of these option forms. All of these do show up in other forms, either directly or indirectly, however. See the *Valve Control* frame (and the *Internal Function* frame that replaces it if you click its frame title) in the **Run** form for each module for most of these.

The Read-Only *Temperature Alarms* status (shown as only a hex bit map above) also appears in the *Other Datum* fields of a module's **Run** form, and is periodically updated. Such datum fields show their datum value on a *white* background if the channel is within alarm limits, but turns that background *bright red* if the channel is out of limits (see Right tabular column data for T2 and T3 (obscured by *ToolTip*) in first example below).



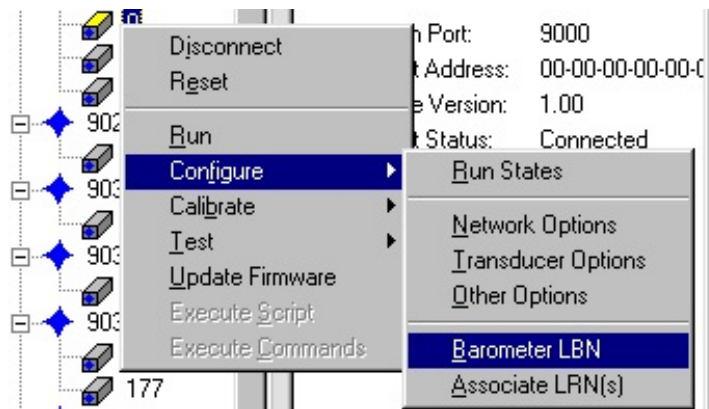
Run form showing Temperature Alarms with Other EU Datum displayed



Same form later showing Other EU Datum "blinks" Red for missing T1

If a particular "other" channel in the Right side tabular data columns is configured to show some other datum in this field (than the default *temperature*), and the original temperature channel "underneath" (T1 replaced by P1 in example above) is still alarming, then the Other EU datum field's background "blinks" between whatever color is normal for the alternate datum (light-yellow for added barometer P1 calculation in psiA for first example above) and *bright-red* (for the hidden alarming temperature datum) in second example. This brief blink to *bright-red* (as seen in both examples) gives the user some indication that the "hidden" temperature (T1) is actually in alarm. Notice that the *ToolTip* for P1's datum value also changes dynamically to document the reason for the red blink – and also to document the meaning of each datum background color.

### 3.3.2.2 Barometer Associations



Selecting '**Configure** | **Barometer LBN**' from menu

After selecting this function, the following **Configure** form pops-up to display all **Barometer** associations for each transducer of the module.

**Barometer LBN** form (9022 shown)

The current Barometer association is shown in the combo frame field for each transducer. You may modify this association by clicking the *arrow* in its *combo frame*.

NOTE: As a prerequisite to using this **Barometer to Transducer** association function, you must have previously performed two other configuration operations. First, verify that **Group Y (Barometers)** as automatically created by NUSS at startup. Do this with the **Group Editor** (see **Groups** menu item in **Network Status** form). Second, use the '**Configure | Barometers (NUSS)**' function on the **home-base** menu to assign each **Barometer** module (already in **Group Y**) to a particular **Logical Barometer Number (LBN)**. Then, you may associate LBNs with specific channels of any module to be able to perform special barometer calculations on the **Run** form (as described below).

A drop-down list appears showing each available **Logical Barometer Number (LBN)** which includes a **None** choice. You may then click the **None** selection, or click any valid LBN (1-4) in the list. If most of the module's transducer channel's are assigned the same LBN, then it may be quicker to click the checkbox at the bottom of the form. This transfers the selection you make (for transducer #1 by default) to all other transducers. Notice, however, that this checkbox can copy any other transducer to any contiguous range of transducers (by clicking and editing the boxes at the right of this checkbox). You may assign an LBN to a transducer even if you never use it. This is because you do not actually enable the optional *barometer calculation* for a channel until you click its units field, and then select a check-box option (to *Add* or *Subtract* the barometer value from the acquired native pressure datum) during interactive Display Set configuration on the **Run** form.

You may determine, on the **Run** form of any pressure scanner module, if any pressure channel has any LBN association by observing the ToolTip of its *units name* label (at the right of channel's EU Datum field).

You may have noticed that this menu selection appears only on the menus for *Scanner* modules. *Calibrator* and *Standard* (including *Barometer*) modules do not have such associations. However, a *Barometer* (absolute standard) module does need to be declared as such, and be assigned to satisfy a particular LBN. This is accomplished on the **home-base Configure** menu as described in the inset note box above. Absolute *Calibrator* modules may also be assigned as Barometers if no *Standard* is available.

When finished making any changes on this form click **[Save]** to save the changes. This writes the changed data to a file, then redisplay the final file's data for your verification. Then, click **[Exit]** to leave the form. You are warned if you click **[Exit]** without first clicking **[Save]**. A *group* version of this form is described later in **Section 3.4.2**.

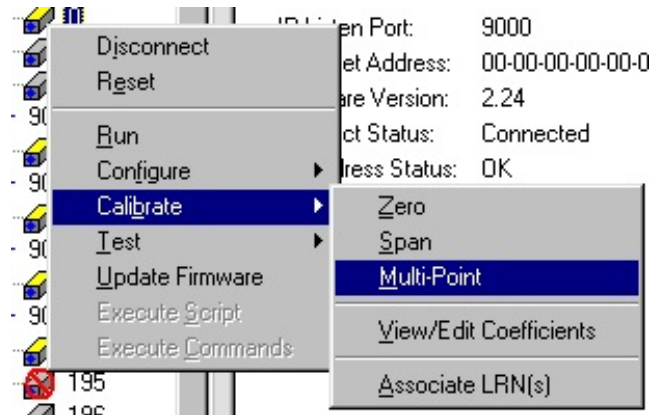


### 3.3.2.3 Calibrator Associations

Discussion of the last item on the *Configure* submenu, labeled *Associate LRNs*, is deferred until we discuss the *Calibrate* submenu below. Since it is a key *Calibrate* function and is also used to *Configure* that function, it is duplicated on both menus.

### 3.3.3 The Single-Module *Calibrate* Function

The ***Calibrate*** function, selected from the *context* menu, leads to a submenu of *calibration adjustment functions* (in first section), a *view/edit calibration data function* (in second section), and “other” *calibration-related configuration functions* (in third section). Model 903x modules only show the second section. Scanner modules have all three sections.



Selecting ***Calibrate Adjust*** functions on menu

Each of the ***Calibrate*** functions, in each section of the submenu, are summarized below.

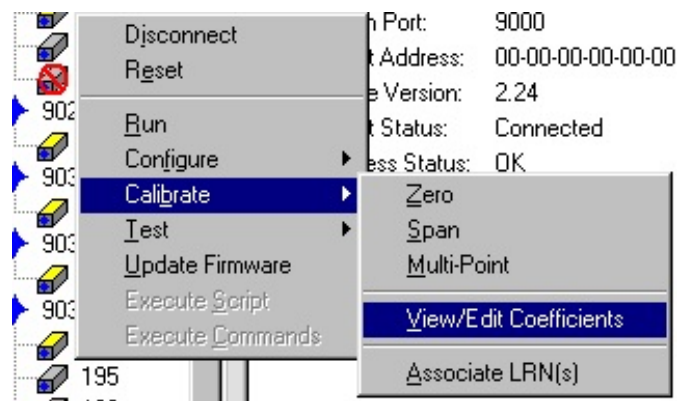
#### 3.3.3.1 Calibration Adjustment Functions

Each transducer channel of a *scanner* module may have its adjustable *Offset* and *Gain* coefficients adjusted by one of three (3) basic **Calibration Adjustment** functions: *Zero-only*, *Span-only*, and *Multi-Point*. These adjustment functions may be performed:

- for a single module via a module’s context menu ***Calibrate*** function (i.e., here),
- for a group of modules via the **home-base *Calibrate*** menu function.

For either menu choice, the same basic program and pop-up form is used. The only difference being that a single-module is adjusted from the context menu, but possibly many scanner modules may be affected in the Group (home-base menu) version. If the group contains any non-scanner modules (e.g., calibrators or standards) they are ignored. However, *calibrator* modules, used to supply pressure data from the calibration adjustment, need not be defined in the group. See **Chapter 4 (Calibration)** for more details on ***Calibrate adjustment*** functions, forms, and their prerequisite setup functions.

### 3.3.3.2 Viewing/Editing Calibration Data



Selecting '*Calibrate* | *View/Edit Coefficients*' form

**View Coefficients for Single 903x Module**

9038-0 () HASS Calibrator

Select Internal Array  
**Standard Calibration (aa=00)** Refresh

☒ Non-Volatile

Coef#	Coefficient Name	Value
0	Full Scale Range	5.000000E+000
1	Zero Adjustment	0.000000E+000
2	Span Adjustment	1.000000E+000
3	A0	6.917888E-002
4	A1	7.014410E-001
5	A2	4.237341E-001
6	A3	3.371161E-001
7	A4	5.436864E-001
8	B0	5.213265E-001
9	B1	4.838530E-001
10	B2	8.474332E-001
11	B3	1.907137E-001
12	B4	2.963092E-001
13	C0	2.607116E-001
14	C1	4.614376E-001
15	C2	7.649603E-001
16	C3	5.747900E-001

☒ Display/Write Exponential Format

Save Exit Report View

Coefficient Name  
 Enter New Value  
 Set

Coefficient I/O Options  
 Load Dump

NOTES: (++) = Meaningful for Calibrators Only (Models 9034/9038)  
 Standard Type: (Q)=Quartz (9032/9034), (H)=Hass or (M)=DPT (9033/9038)  
 Pressure Mode: (A) = Absolute (9032/9034), (D) = Differential (9033/9038)  
 Quasi-Diff. Mode: (QDif++) = (9034 calibrator only)

*View/Edit Coefficients* form for 903x Calibrator/Standard modules

After selecting this function, a **Calibrate | View/Edit Coefficients** form pops-up to display all **data** for each transducer of a module. The function is handled by two separate (but similar) programs, one for *Calibrator and Standard* modules and another for *Scanner* modules. The first example (shown on previous page) is for a typical 1-channel (903x) Calibrator/Standard module. The second example (below) shows a similar form for a typical 16 or 18 channel (9x16) or 12-channel (9022) Pressure Scanner module.

**View Coefficients for Single Module**

9016-0 ( ) Scanner

Select Transducer (or Internal Array)

Transducer 1 (aa=01) Refresh Save

☒ Non-Volatile Exit

Report View

Coef#	Coefficient Name	Value
0	Zero Cal.Adj.(Offset Coef.)	0
1	Span Cal.Adj.(Gain Coef.)	1
2	Dynamic EU Coef.(c0)	0.2166951
3	Dynamic EU Coef.(c1)	0.3467829
4	Dynamic EU Coef.(c2)	0.2240366
5	Dynamic EU Coef.(c3)	0.7272242
6	reserved (factory only)	0
7	Date-of-Next-Cal (yymmdd)	10101
8	Date-of-Fact-Cal (yymmdd)	61225
9	DH Mfg.Ref.# (Serial#)	12345
10	DH Press.Range Code	10
11	Temp.1 Press.1 volts	0.5874641
12	Temp.1 Press.2 volts	0.4360752
13	Temp.1 Press.3 volts	0.7888626
14	Temp.1 Press.4 volts	0.2221385
15	Temp.1 Press.5 volts	0.8848963
16	Temp.2 Press.1 volts	0.6963665
17	Temp.2 Press.2 volts	0.8002249
18	Temp.2 Press.3 volts	0.061343

Coefficient Name  
Zero Cal.Adj.(Offset Coef.)

Enter New Value  
0.0

Set

Transducers to be Set:  
1

Modification of a few coefficients permitted for Factory users only

**View/Edit Coefficients** form for Model 9x16 Pressure Scanners

Though the word “Edit” appears in the functional title of each form, editing is restricted. For *Calibrator* and *Standard* modules only *Factory* users can modify all coefficients. For *Pressure Scanner* modules editing is restricted to a few selected coefficients only. For Model 9022 scanner modules, an *Advanced* user may modify a additional selected coefficients. However, for Model 9x46 Temperature Scanner modules even a *Normal* user may modify selected coefficients (see more about this below). The allowed modifications are listed in a message initially displayed in form’s light-yellow status box.

Performing a **Calibration Adjustment Function** (previous section) changes the *adjustable* coefficients (Coef # 0= Offset and #1=Gain) for each transducer of a *Scanner* module.

You may only view a module's special *UnitsX* (a.k.a., *Units Multiplier* or *EU Scalar*) coefficient by selecting the **Other Coefficients (aa=11)** group of coefficients. Please note that for Model 903x (calibrator or standard) modules this coefficient is accompanied by an extra coefficient (with the value 1 or 0) which enables or disables the multiplier, respectively. Scanner modules do not have this extra enable/disable coefficient. NUSS hides this difference across module types, and gives **all** users the ability to modify it, by treating *UnitsX* as a *simple module option* on the '**Configure | Other Options**' form. For this reason no user is not allowed to modify these particular coefficients on a **View/Edit Coefficients** form. This restriction is also listed in the light-yellow status box.

Since most modules have many coefficients to display, a list box labeled **Select Transducer (or Internal Array)** lets the user select a particular functional *array* grouping (**aa=nn**, where *nn* is a hex number). For scanner modules, this list box selects one transducer's array at a time, or a final array (**aa=11**) that contains data common to all transducers. For calibrator/standard modules that have only a single transducer (a.k.a., as its standard), there are five (5) arrays that vary in content depending on the particular type of standard (Quartz, HASS, or DPT) used.

Some transducer coefficients are static values and some change dynamically in real time. The values shown on the display are initially read from the transducer only when the form is first loaded. They are not normally read again until you exit the **View/Edit** form. However, if you would like to *refresh* the display to view "later" values of the *dynamic* coefficients, just click the **[Refresh]** button located just above the data display spread-sheet. Double-clicking this spreadsheet data display area also refreshes that set of displayed coefficients. Changing the "array" (aa) selection in the list box labeled **Select Transducer (or Internal Array)** no longer can be used to perform a *refresh* operation.

For either of the above forms, the **[Report]** and **[View]** buttons generate and show a several page View/Edit Coefficients report (text file) containing *all* the coefficients in the module. The name of this report file is **<modid>CCoef.Txt** and is stored in the **Report** folder. Any new report always overwrites any previous such report for the same module. This coefficients report is rather long for Scanner modules (with up to 100 coefficients for each of up to 18 transducers) thus requiring some time to generate it. After the **[Report]** button is clicked, the **[View]** button remains dim until the report is generated. Also, a blinking message in the *light yellow* status box (at bottom of form) indicates this long report generation time. The **TCP Receive Activity** status box (rotating baton) on the **Network Status** form also indicates considerable module command activity during the report generation period.

As indicated above for Normal users, the single-module '**Calibrate | View/Edit Coefficients**' function allows a few coefficients to be modified by any user for the Temperature / Resistance Scanner modules (Model 9x46). The forms illustrated below demonstrate this capability.

Coef#	Coefficient Name	Value
76	reserved (factory only)	0
77	Primary Xdcr. Gain Code	0.9385781
78	Other Xdcr. Gain Code	0.7477233
79	reserved (factory only)	0
80	reserved (factory only)	0
81	Sensor Type (9x46)	16.0
82	EU Filter Stage (9x46)	0.696701
83	reserved (factory only)	0
84	reserved (factory only)	0
85	reserved (factory only)	0
86	reserved (factory only)	0
87	reserved (factory only)	0
88	reserved (factory only)	0
89	reserved (factory only)	0
90	reserved (factory only)	0
91	reserved (factory only)	0
92	reserved (factory only)	0
93	reserved (factory only)	0
94	reserved (factory only)	0

Coef# 0-1 ('Zero' and 'Span' Cal.Adj.),  
81 ('Sensor Type') and 82 ('EU Filter Stage') can be modified.  
Click (highlight) Coef#.. then Click 'Enter New Value' box

**View/Edit Coefficients** form for Model 9x46 Temperature Scanner

The *light yellow* status field, at the bottom of the form above, indicates exactly which options can be modified for this particular selected transducer (#1) array and this 9x46 model. Only coefficients 0, 1, 81, and 82 can be modified in this example. By clicking one of these coefficient numbers (in **Coef#** column only) you can highlight it – and both its name and current value “lights up” in two special edit boxes on the right side of the form. In this example coefficient 81 (known as **Sensor Type**) has been selected and is already modified (to a new value 16) in the **Enter New Value** box – after which the **[Set]** button is clicked – to move the new edited value to the main display window at the left.

**WARNING:** For the **Model 9x46** the changing of the **Sensor Type** (coefficient 81) is a necessary but not sufficient condition to change a channel's data type. For some Sensor Types other **jumpers** inside the module may also require reconfiguration to complete a sensor change operation.

The entry box has a *ToolTip* that displays the acceptable range of values that can be entered for that particular coefficient. Note this feature in the next example where the mouse cursor (not visible) is assumed to be hovering over the entry box. In this example the new value 16 selects a Type R Thermocouple for the selected transducer.

The screenshot shows a list of coefficients on the left and a dialog box on the right. The list includes:

Coef	Description	Value
80	reserved (factory only)	0.0000000
81	Sensor Type (9x46)	16.0
82	EU Filter Stage (9x46)	0.0000000
83	reserved (factory only)	0.0000000
84	reserved (factory only)	0.0000000
85	reserved (factory only)	0.0000000
86	reserved (factory only)	0.0000000
87	reserved (factory only)	0.0000000
88	reserved (factory only)	0.0000000
89	reserved (factory only)	0.0000000
90	reserved (factory only)	0.0000000
91	reserved (factory only)	0.0000000
92	reserved (factory only)	0.0000000
93	reserved (factory only)	0.0000000
94	reserved (factory only)	0.0000000

The dialog box on the right has the following fields:

- Coefficient Name: Sensor Type (9x46)
- Enter New Value: 16.0
- Set button
- Transducers to be Set: 1

A tooltip is visible over the 'Enter New Value' field, displaying the acceptable range of values: Enter 11-18=TC(B/E/J/K/N/R/S/T), 30-33=R(250/500/1K/20K), 40-42=Thermistor(3K/5K/10K), 60=RTD385, 65=RTD7990.

Example *ToolTip* for **Enter New Value** of coefficient 81 for 9x46

The **Enter New Value** box also turns pink to indicate its coefficient's modification in the PC's memory for this editing session, after the **[Set]** button is clicked. However, this change is not yet made to the module – until the **[Save]** button is also subsequently pressed. This two-step process allows several changes to several coefficients to be made in one session – and these changes are saved to the module (by clicking the **[Save]** button) only just before you exit the form by pressing the **[Exit]** button. You are warned if you try to exit (or switch modules in a group) without saving a change.

Notice that a text box labeled **Transducers to be Set:** has the same *transducer number* in it as selected in the "array" select list box at the top of the form. This transducer is the one whose changed value is recorded by the **[Set]** button, by default. However, before clicking the **[Set]** button, you may edit this text box, adding *other transducer numbers* whose same coefficient value is changed to the new value entered. This saves a considerable amount of time if you have several different transducers (channels) on the module that must be changed to the same value. When editing this box, a blank character must separate each new transducer number. You may also specify a range of contiguous transducer numbers with a dash character (negative sign) separating them (e.g., the range "3-9" is the same as entering "3 4 5 6 7 8 9"). In the example (see inset right) transducer #1 was originally specified to be changed. Then the box added single transducer #'s 3, 5, 7, and 16, plus a range of transducers 9 through 12, inclusive. When **[Set]** was clicked all these transducers were marked changed (and is pink if you check them). When you click the **[Save]** button commands to each transducer is written to assign the new value of this coefficient to the module.

The inset screenshot shows the 'Transducers to be Set' text box with the value '1 3 5 7 9-12 16' entered. The text box is green, indicating it is ready for input.



You may note that Transducer coefficients #0 (Offset Adjustment Coefficient) and #1 (Slope Adjustment Coefficient) can be manually changed for all scanner modules. These are also the coefficients automatically modified by the **Calibration Adjustment** functions. One might also like to manually edit these (for example, after a “bad” calibration), in order to set them back to default (un-adjusted) states (0.0 and 1.0, respectively).

There is one additional special array of *Other Coefficients* that are module-specific rather than transducer/channel specific. It is selected as the “17<sup>th</sup> transducer or channel” from the combo box pull-down list at the top left of the form (see example below).

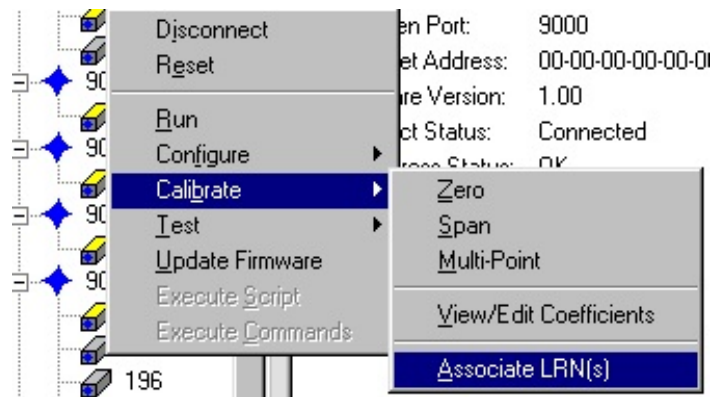
Coef#	Coefficient Name	Value
0	reserved (factory only)	0
1	UnitsX Press.Multiplier	1
2	reserved (factory only)	0
3	Reference Voltage	0.5121956
4	Gain= 1 Ref.Coeff.	0.7676544
5	Gain=20 Ref.Coeff.	0.789303
6	Gain=45 Ref.Coeff.	0.2977825
7	Gain=90 Ref.Coeff.	0.2395681
8	reserved (9816 only)	0
9	reserved (9816 only)	0
10	reserved (factory only)	0
11	Module Temp.Units (9x46)	1.0
12	reserved (factory only)	0
13	reserved (factory only)	0
14	reserved (factory only)	0
15	reserved (factory only)	0
16	reserved (factory only)	0
17	reserved (factory only)	0
18	reserved (factory only)	0

**View/Edit “Other” Coefficients** for Model 9x46 Temperature Scanner

Note that the *light yellow* status box indicates that only coefficient 11 may be changed for this array of this module. The 11<sup>th</sup> coefficient shown may be changed in a Model 9x46 Temperature Scanner to change the temperature units (of all separately configured transducer channels) from degrees C to degrees F. Note the visible *ToolTip* of the **Enter New Value** box (see inset right) uses the value 0.0 to select degC and the value 1.0 to select degF. Note that this option is not changeable on a per transducer basis. As a result the **Transducers to be Set:** text box below the [Set] button is empty and disabled.



### 3.3.3.3 Calibration-Related Configuration Functions



Selecting '*Calibrate | Associate LRN(s)*' on menu

This *Associate LRN(s)* menu item is also available on the *Configure* menu to avoid confusion as to whether it is a *Configure* function or a *Calibrate* function. Actually, it is both. Selecting it from either menu causes the following form to appear:

Transducer #	LRN	Cal.to..	End with..
Transducer #1	1	None	None
Transducer #2	1	None	None
Transducer #3	1	None	None
Transducer #4	1	None	None
Transducer #5	1	None	None
Transducer #6	1	None	None
Transducer #7	1	None	None
Transducer #8	1	None	None
Transducer #9	1	None	None
Transducer #10	1	None	None
Transducer #11	1	None	None
Transducer #12	1	None	None

☐ Make Transducer# 2 - 12 same as # 1

Typical *Associate LRNs* form (9021 shown)

This form displays and sets all LRN (and indirectly its assigned Calibrator) associations for each transducer (channel) of the module. It is an essential configuration function (for any

scanner module) before any of the **Calibration Adjustment** functions (in top half of same menu) may be used for that module. The form has to be able to set different LRNs to calibrate each transducer. This is because some scanner models have plug-in external transducers (e.g., Models 9022, 9x46) which may be configured with dissimilar transducers (i.e., different channels having two or more unique ranges). The *checkbox*, at the end of the form, allows any transducer's data row to be copied, and then pasted to any other contiguous range of transducers (it defaults to copying transducer #1's edited entry row to the rows of all other transducers on the form).

NOTE: As a prerequisite to using a **Calibration Adjustment** function for single-modules (or groups), you must have previously performed the **LRN-to-Transducer** association function described above, and two other configuration operations. First, verify that *module Group X (Calibrators)* was created automatically by NUSS at startup. Use the **Group Editor (Groups item on Network Status menu)**. Second, use the '**Configure | Calibrators (NUSS)**' menu selection on the **home-base** menu to assign each **Calibrator** module (already in **Group X**) to a particular **Logical Range Number (LRN)**. Also, at this stage, you may define all the **Calibration Setpoints** (in *pressure* normally, but also in *temperature* or *resistance* for Model 9x46) to be set for this **LRN**. For details, see **Chapter 4**.

You may have noticed that this menu selection appears only on the *context* menu for *Scanner* modules. However, it may also appear on the context menu for *Standard* modules to allow limited calibration adjustments to be performed on these modules. *Calibrator* and *Standard* (or *Barometer*) modules have their calibration adjustments normally performed at the factory only using a precision secondary standard (i.e., dead-weight calibrator). Such calibrations are not performed using NUSS but with a separate calibration program designed for that purpose.

When finished making any changes on this form click **[Save]** to save the changes. This writes the changed data to a file, reopen and read the modified file, and then redisplay the final data for your verification. Click **[Exit]** to leave the form. You are warned if you have made changes and click **[Exit]** without first clicking **[Save]**.

A *group* version of this form also exists, but its description is deferred to **Section 4.1.1.2 of Chapter 4** — along with a more detailed description of the overall *LRN-to-Transducer Association* function. That chapter provides both the overview and the details on the subject of LRNs and module **Calibration** adjustment, for both single scanner modules and defined groups of scanner modules.

You may determine, on the **Run** form, if any pressure channel has any LRN association by observing the ToolTip of its *measurement name* label (left of channel's EU Datum field).

### 3.3.4 The Single-Module *Test* Function

The **Test** function, selected from the *context* menu, leads to a submenu of *named tests* that can be performed on a particular module. This submenu may be different for each module class, and per the user's capabilities (i.e., Normal, Advanced, etc.). This **Test** function is only summarized in general terms here, but is detailed in **Chapter 5** for each specific test procedures provided for Normal users.

After a particular test is selected from this submenu, a separate form opens labeled:

***"Test <modid> (<yourmodname>) <modclass>"***  
(e.g., ***"Test 9116-1234 (Right Wing) Scanner"***).

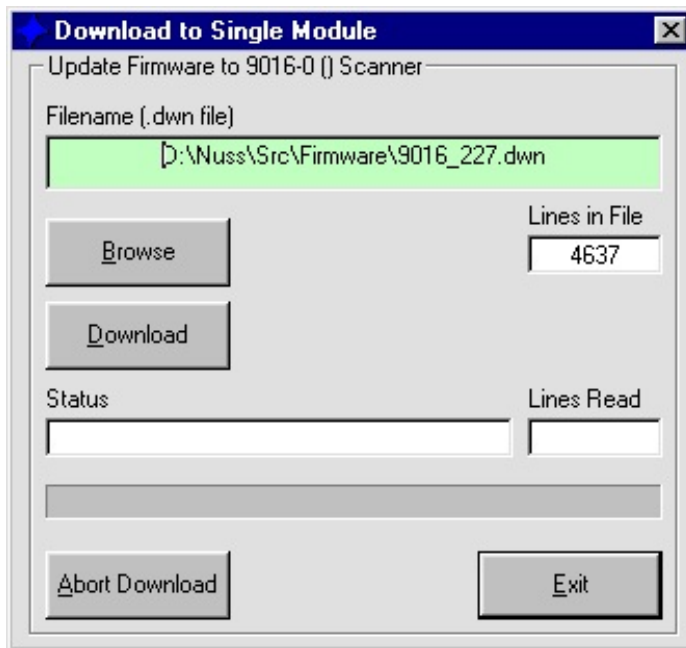
The main frame of the pop-up form has another label indicating the nature of the test (e.g., **Noise Test**). A separate such form can be opened for more than one module concurrently, but only one test at a time can run on a particular module. The particular **Test** forms are very module-type specific from this point on — except for the following general features.

Before you start a test, there may be various entry boxes visible (with light green backgrounds) on the form that accept a *required* or *optional* data value entry. Required ones generally already have the Form's "entry focus" (i.e., the entry cursor appears in the first of these boxes, and you cannot start the test until you enter a valid number in that box). Other data boxes (with white backgrounds) may appear that do not accept entries, but may display other information about the test or the module being tested. There is a single **[Run]** button, grayed out until all required entry data is entered correctly. This button may change its caption to an **[Abort]** button after the test is started. An indicator "light" also shows "yellow" when the test is in progress. An **[Exit]** button allows you to avoid ever starting the test, or erases the form after the test is finished and you have seen its displayed results. Generally, test results are written to a Report text file in the **Report** subfolder. Click a **[View]** button on the form to view, delete, or copy this file. See the specific Test in Chapter 5 for report file naming convention and an other test-specific information. Generally the last such report file for a particular test for a particular module remains in this subfolder, but is overwritten if you run a new test. An **AppRep** (Append to Report) check box may be clicked to avoid overwrite. Finally, a Status Box (with *light yellow* background) appears at the bottom of each **Test** form, that displays various information or error messages for the test.

See **Chapter 5** for more information on specific tests available for Normal users and for specific examples of **Test** forms.

### 3.3.5 The Single-Module *Update Firmware* Function

The *Update Firmware* function, selected from the *bottom-section* of the *context* menu, opens a form like the one below (where () contains any name given to the selected NetScanner):



*Update Firmware* form for single-module

A separate such form can be opened for more than one module concurrently — but is not the recommended way to update multiple modules concurrently. Instead, see the **'File | Update Firmware (Group)'** home-base menu selection, for a more efficient way of concurrently updating firmware for multiple modules *of the same "type"*. Usually a *"type"* is a particular *model number*, but often similar model classes (e.g., 9022 or 903x) can often be updated at the same time.

The form above has a **Filename** field, that you click to set to the full path of the special file (with **.dwn** file name extension) containing the new firmware to be downloaded to the module. Such files may be obtained first from the PSI website, and stored on your hard disk in NUSS's **Firmware** subfolder (of the NUSS install path). If it is elsewhere, and you do not know the full path name of this file, you may click the **[Browse]** button (or double-click the light green field). This opens a new pop-up form, useful for navigating through the various Windows folders and drives until the desired file is located.

When the file is located, its name and full path are transferred to the **Filename** field described above, and the pop-up form disappears.

The **[Download]** button starts the process of updating the module with new firmware, once the file is located. Other status fields in the form show the progress of this operation.

**WARNING:** You may briefly press the **[Abort Download]** button to stop this process after it starts — but soon the button disappears — after which you must **not** attempt to abort the download process by any overt method (i.e., do not try to kill NUSS with <Ctrl>+<Alt>+<Del>) — or your module may be left in an inoperable state.

The **[Exit]** button may be pressed when you are finished. The program forces the module to *Reset* and disconnect before it exits, since the upgrade to the new firmware is only complete after module reset. However, since the UDP command used to Reset the module is potentially unreliable (particularly on a busy network) you may occasionally find it necessary to power down the module and restart it to get normal operation.

#### ARE WE DOWNLOADING OR UPLOADING HERE?

The labels on the buttons (**[Download]** and **[Abort Download]**) used to start and abort the above **Firmware Update** process, and even the *file type* of the PSI firmware update files (\*.dwn), are naming conventions that come from older PSI products that pre-date the popularity of the Internet. By using the term **download** the original PSI designer apparently assumed that NUSS was a high-level server providing update services to many lower-level NetScanner clients. If NUSS is a *client* PC application and a NetScanner module is a remote *server*, then we should be *uploading* to the NetScanner, by today's terminology.

## 3.4 Operating Modules in Coordinated Groups

We now return our attention to the “group” functions on the **home-base** menu, that we have only mentioned in previous sections.



The middle functions (**Run**, **Configure**, **Calibrate**, and **Test**) seem to actually mirror the exact same functions available on a particular module’s *context menu*, but perform that function in a more *coordinated* fashion on the various modules of the *Current Group* (shown in Network Status form). ***You should be familiar with the simpler “single-module” task first before attempting to run its “group” equivalent. That way, you need not have to reread detailed descriptions of all the functions they have in common.***

The **Configure** menu also contains some “system wide” NUSS **Configure** functions that did not show up on the *single-module Configure* menus. The **File** and **Help** menu items were already fully described in **Section 3.1**.

**A Basic Rule:** You are expected to pre-connect all the *Current Group*’s modules (via the “group” **Connect** menu item in the **Network Status** form or by manually connecting each module via its context menu) before starting any “group” function on the **home-base** menu. If you forget, you are warned by pop-up dialog forms, and allowed to correct this mistake or continue with only the modules of the group that are connected.

For some “group” functions the selected group may be limited to *specific module classes* for the particular function being executed. If this is the case, any extraneous modules of *another type*, that are defined in the group, are either ignored or brought to your attention (via a pop-up dialog form) and you can either run anyway (ignoring them in the *Current Group*) or you may abort the function. Better yet, configure another group to use, first, that contains only the modules of the common type, and assign this new group as the *Current Group*. The special dynamically changing Star (\*) group (i.e., all connected modules) is useful for that purpose.

All “group” functions offer a *submenu* of choices, before you make the final selection.

### 3.4.1 The *Run Group* Function

The *Run Group* function, which coordinates the operation of a group of modules (the **Current Group**), is started by clicking the “home-base” *Run* menu item. This leads to a *submenu* with only two (2) selections: *Run (Group)* and *Playback Only*.



Home-base *Run* submenu choices

Either submenu selection starts the *Run Group* form, which looks somewhat like a single-module *Run* form — but without any data display features or module control features. This “central control” form also pops-up one or more other “display” forms (which can show each module’s data— and can operate a module’s control features).

The first submenu selection, *Run (Group)*, expects every module in the **Current Group** to be available and connected. If not, it warns you, then allows you to either connect or ignore individual modules in the group. Live Acquisition is then started for each module in the group according to its currently defined (or default) **Run State** script. Thereafter, the function operates just like multiple-instances of the single-module Run function — except that all Acquisition controls, Run-State selection controls, and Record/Playback controls are located on the “central” *Run Group* form. All data display (and live module control functions) are located on the separate “display” forms.

The second submenu selection, *Playback Only*, totally ignores every module in the **Current Group** — but activates the *Run Group* form immediately, placing it directly into the *Playback* mode. The special form cannot start and module Acquisition. Next, click the blank frame to the right of the **[Play]** button, to get an Open File dialog form for data file selection. Select (highlight) any desired pre-recorded data file (with **.dat** extension) from the **Dat** subfolder by clicking it – and it can be one containing group data (from several modules) or one containing data only from a single module. Then, click that pop-up form’s **[Open]** button (or double-click the file name) and the form is dismissed – as the file’s header is read to determine what module(s) had streams recorded in that data file. Next, a separate *Display* form opens for each such module. Click the *Options* spot (button) to specify any playback options, and then click the **[Play]** button to start playback of the selected data file.

This *Playback-Only* feature is particularly useful if you have previously recorded data from modules (via either the single-module *Run* or *Run Group* functions) and the modules

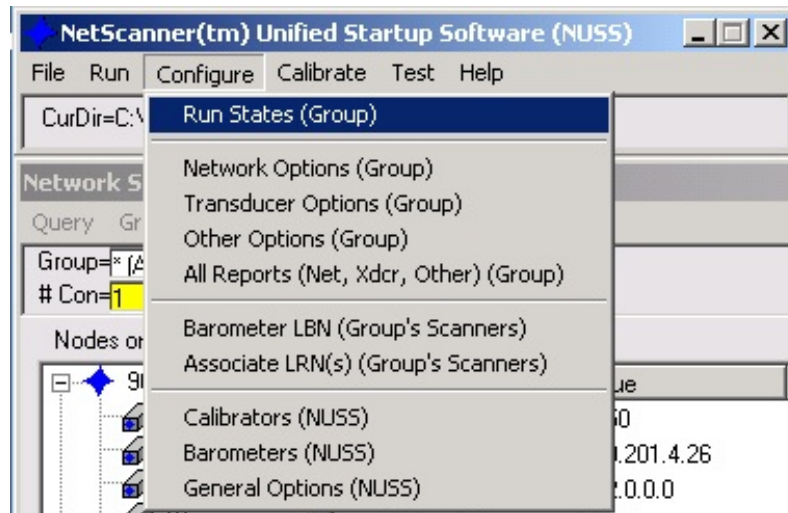
whose data was recorded are no longer available to NUSS. For example, such modules might be off, non-functioning, shipped to a customer, or returned to PSI for calibration. With this feature, you can still playback and process data previously recorded from such modules. The other ***Playback*** features for single or module groups require each module to be present and working.

In order not to overload the reader with any further details now, the complete description of this multi-faceted ***Run Group*** function is deferred entirely to a separate **Chapter 6**.



### 3.4.2 The *Configure Group* Function

The *Configure Group* function, selected from the *home-base* menu, is *somewhat* similar to its single-module version.



*Configure* submenu for group/other functions

Clicking any of the items in the first three sections of this menu reveals the same basic functions as the single-module *Configure* has on a module's context menu, but they operate on the **Current Group** of modules, rather than a single module. Note that submenu items have added notes (in parentheses) to indicate the *scope* of their particular **Group** action (e.g., (Group) or (Group's Scanners) or (NUSS)).

The first menu item in *Configure Group* provides access to the basic **Run State Editor**. The editor works just as it did for a single-module, but comes up ready to edit the *first module* in the *Current Group*. A **[Next Module]** button allows you to advance the display to any of the other modules, allowing you to easily compare them with each other. However, if you stop and edit any thing for a particular module, clicking **[Next Module]** warns you must save the first modules changes first.

When you are ready to save the new or modified **Run State** of the currently displayed module, you press the **[Save]** button. An alternate **[Save to All]** button allows you to *replicate (broadcast)* these option changes for all the other modules in the *Current Group*.

The menu items for other specific Module Option classes (e.g., Network, Transducer, and Other), *Configure Group* are operated in a similar fashion. Note that these forms look the same as they do for single modules, except for the additional **[Save to All]** and **[Next Module]** buttons.

**Network Options of Group \* (All Connected)**

Module 1: 9016-0 (Left Wing) Scanner

IP Address: 200 . 200 . 0 . 1

Subnet Mask: 128 . 0 . 0 . 0

TCP Connect Port: 9000

Backoff Delay: -1

Buttons: Save, Save to All, Next Module, Exit, Include All Fields, Report, View

Options: ☒ Non-Volatile

UDP-Br@Reset: ☒ Disabled, ☐ Enabled

IP Adrs.Resol.: ☒ Static, ☐ Dynamic

Resp. Prefix: ☒ Disabled, ☐ Enabled

Options are Normal (black) or Change@Reset-Only (blue) or NUSS-affected (green) -- (see ToolTips)

Typical *Network Options* form for Group \*

If you edit (change) or otherwise enter a value for any option of the currently displayed module, the background of that value field turns *dark pink* as a “change” indicator. You can also simply click a field, without actually changing it, to *include* it, which changes its background color to *light pink*. *Including* (i.e., saving options to the module even if they were not modified) insures that the marked option field is written to the module by the **[Save]** and **[Save to All]** button(s). There is also an **[Include All Fields]** button for *including* all enabled fields on the form. Pressing it a second time *un-cludes* all fields.

The **[Report]** and **[View]** buttons generate and show a one page Network Options report (text file) containing *all* the Network Options in the currently displayed module. The name of this report file is **<modid>CfgNet.Text**, written to the Report subfolder. Any new report always overwrites any previous such report for the same module. After the **[Report]** button is clicked, the **[View]** button is dim until the report is generated (almost instantaneously). Since this report generation (and viewing) feature works strictly on a per-module basis, you must repeat it for each module displayed (by clicking the **[Next Module]** button) if you want reports from each module in the group. See the separate home-base menu item **‘Configure | All Reports (Net, Xdcr, Other) (Group)’** for generating reports for all option classes for all modules in current group in one operation.

Eventually, you click the **[Exit]** button to exit the form. But first, you click either the **[Save]** or **[Save to All]** button to save any changes made – just as you did for the Run State

Editor. **[Save]** saves the changed/included option(s) for only the currently displayed module (i.e., the one whose name is display in the title of the main frame). **[Save to All]** allows you to “broadcast” the changed/included option of the current module to all of the other modules in the current group.

Some options must be unique across all modules. When you try to “broadcast” these to the other modules in the group (with **[Save to All]** button), NUSS *maintains uniqueness* by “incrementing” that option. A module’s IP Address (in example above) is just such an option. If you change/include it for one module, the new value is stored for that module, but it increments before its is broadcast to each of the other modules in Group.

For the **Other Options** form, the **Module's Name** option has its last character of text changed to insure uniqueness. In example below, a module name like "Rib 1" would become "Rib 2", "Rib 3", and so on, if broadcast to all the modules in the group.

**Other Options of Group \* (All Connected)**

Module 2: 9021-0 (Rib1) Scanner

**Read-Only Status**

PwrUp: 0000 Temp.Alarms: 0000

Module's Name (crls): Rib1 Units X: 1

# A/D Samples/Avg.: 8 # Channels:

Cal.Zero Valve: ☐ Disable ☐ Enable

**Periodic Tasks**

Therm. Scan Period: 60 ☐ Disable ☐ Enable

Min. Temp. Alarm S.P.: 0

Max. Temp. Alarm S.P.: 60

Buttons: Save, Save to All, Next Module, Exit, Include All Fields, Report, View

Typical **Other Options** form for Group \*

If the *UnitsX* option is changed, it causes NUSS to exit as soon as this form exits. See **Section 2.5.2** in Chapter 2 for detailed procedures on how to change this key coefficient for single or multiple modules.

The '**Configure | Other Options**' function has a feature for 9x46 Temperature / Resistance scanner modules only. All users can view this optional **Hardware Connector**

**Type** option box (which takes the place of the **Cal Zero Valve** option box for other scanners). This is a *read-only* option that can only be changed at the factory.

Hardware Connector Type: ☐ Modular ☒ Screw Term.

Buttons: Report, View

The **[Report]** and **[View]** buttons generate and show a one page Other Options report (text file) containing *all* the Other Options in the currently displayed module. The name of this report file is **<modid>CfgOth.Txt.**, and is written to the **Report** subfolder. Any new report always overwrites any previous such report for the same module. After the **[Report]** button is clicked, the **[View]** button is dim until the report is generated (almost instantaneously). Since this report generation (and viewing) feature works strictly on a per-module basis, you must repeat it for each module displayed (by clicking the **[Next Module]** button) if you want reports from each module in the group. See the separate home-base menu item **‘Configure | All Reports (Net, Xdcr, Other) (Group)’** for generating reports for all option classes for all modules in current group in a single operation.

For the **Transducer Options** form (see below), all the options are currently Read-Only for *Normal* users — except for the **Date-of-Next Cal** as shown — which can enter and save a new value for *selected* channels by pressing the **[Save Date]** button. This form therefore has no **[Save]** and **[Save to All]** buttons like other forms similar to it. It does have a **[Next Module]** button, to allow you to *sequentially* view all the **Transducer Options** for each module in the group.

**Transducer Options of Group \* (All Connected)**

Module 1: 9022-1050 (Scanner)

Date of Next Cal. [YY-MM-DD]

Xducer #	Value
1	00-00-00
2	00-00-00
3	00-00-00
4	00-00-00
5	00-00-00
6	00-00-00
7	00-00-00
8	00-00-00
9	00-00-00
10	00-00-00
11	00-00-00
12	00-06-01

Next Module Exit

Report View

Date to Save

Save Date

for Channels..

4	1
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	5
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	9
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Models 9x2x must have External Transducers connected to save date

The **[Report]** and **[View]** buttons generate and show a one page Transducer Options report (text file) containing *all* the Transducer Options in the currently displayed module. The name of this report file is **<modid>CfgXdcr.Txt**, and is written to the **Report** subfolder. Any new report always overwrites any previous such report for the same module. After the

[**Report**] button is clicked, the [**View**] button is dim until the new report is generated. Since this report generation (and viewing) feature works strictly on a per-module basis, you must repeat it for each module displayed (by clicking the [**Next Module**] button) if you want reports from each module in the group. See the separate home-base menu item '**Configure | All Reports (Net, Xdcr, Other) (Group)**' for generating reports for all option classes for all modules in current group in one operation.

The *third* section of the **Configure** submenu contains two **Group** configuration functions. The first of these is the '**Configure | Barometer LBN (Module's Scanners)**' function. This version is similar to its single-module version, but has additional buttons described below.

**Barometer LBN** (9021 shown) from home-base menu

With this form you may view each of the modules in the group, *sequentially*, by pressing the [**Next**] button. The next module's data appears, and its <modid> appears at the top of the form (just below its title). You can edit any one or all of these modules, saving the results for the current module — before you move to the next. The [**Next**] button warns you if you make any changes to current module without saving them with the [**Save**] button first.

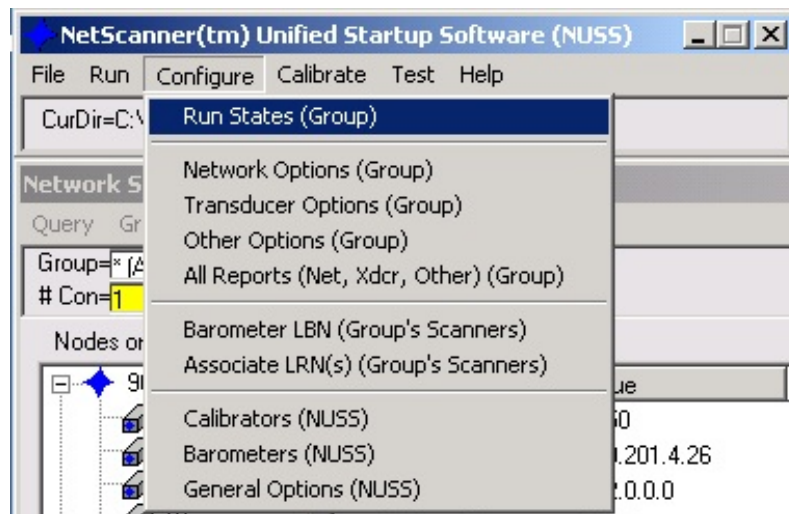
You may also use this form to edit one of the modules in the group and then copy its data to others. Click the [**Copy**] button to copy the data from any currently viewed module (edited or not) into a scratchpad. Then, press [**Next**] to view any other module in the group. Click



the **[Paste]** button to paste (and then save) the scratchpad's contents, thus replacing the data of the currently displayed module with another's data. There is no **[Save to All]** button on this form, however these **[Copy]** and **[Paste]** buttons perform a similar function.

The second item is the '**Configure | Associate LRNs (Module's Scanners)**' function, operates similarly to the other form just described above. However, it is described fully in **Section 4.1.1.2 of Chapter 4**.

The *bottom* section of the **Configure** menu has submenu items that are not related to the current module group, but which are used for *manually configuring some overall NUSS options and features*. These are the **Calibrators**, **Barometers**, and **General Options** selections:



Note (NUSS) items in bottom section of menu

The last menu item in this section (**General Options (NUSS)**) specifies options of NUSS, not easily categorized elsewhere. When you select this menu item, a form appears as follows:

 A screenshot of the 'Configure General NUSS Options' dialog box. It has a title bar with the text 'Configure General NUSS Options'. Inside, there are three text input fields with labels: 'Choose Path for Report Viewer (a favorite Text Editor):', 'Choose Path for Nuss Manuals:', and 'Choose Base Path for Archive Folders:'. The first field contains the path 'C:\Program Files\JGsoft\EditPadPro\EditPadPro.exe'. The second field contains the path 'S:\RELEASED\9000\Nuss\UserMan\nussindx.htm'. The third field contains the path 'ur:\Archive\' (with a trailing backslash). To the right of the fields are 'OK' and 'Cancel' buttons.

'**Configure | General Options (NUSS)**' form

There are only three *general options* for Normal users as seen in above example. All these options are remembered in a [xxx]**NUSS.ini** file (in the NUSS **Ini** subfolder) when they are saved by clicking the **[OK]** button. The form has a large blank space at the bottom (not shown above) because other options are made visible on it for *Advanced* and *Factory* users. All three options may be entered by *clicking* its text box and typing in a full path name (including a file name with the first two options, but not the last). However, to avoid typing such long paths, you may *double-click* the text box to pop-up a dialog that allows you to *navigate* to anywhere on any disk drive (local or network) to locate the desired path (and file name). Click **[Cancel]** instead of **[OK]** to exit the form without saving any changes made.

The first option (in top text box) specifies a *favorite text editor* to be used by NUSS whenever the user needs to *view* any plain text (report) files generated by other forms. The default is to use the **NotePad** application if this field is *unspecified (blank)*. However, if you have a *superior text editor*, with better printing and file management features, you should select it instead. Either enter the full path and file name of its **.exe** file or navigate to it by double-clicking the text box. Such a “better” text editor is required if you wish to actually print optional *Page Breaks* in these reports. The full path name of a *popular commercial editor* is shown in the example above. See **Section 2.6.1** in **Chapter 2** for more detail on selecting it.

The second option (in middle text box) specifies where the NUSS User’s Manual is installed. It operates just like the other option (i.e., *double-click* the text box to navigate to where the manual is installed). In the example above, the user has installed the manual on a network drive where it was installed to be shared by other NUSS users. The “root” browser index file **nussindx.htm** is used. See **Section 2.6.2** in **Chapter 2** for more detail on selecting it..

The third option (in bottom text box) specifies the base path where NUSS should archive (backup) any of its internal data and initialization files it keeps in various subfolders (in the base path where NUSS is installed). It operates just like the other options (i.e., *double-click* the text box to navigate to somewhere on some network or hard drive). In this case, however, you are specifying only a drive and base path (no file is specified). The final path shown in the option field must end with a backslash (\), which is normally added automatically. In the example above a network drive (u:) with a folder (named Archive) is the specified base for all archived copies of other NUSS subfolders. See **Section 2.6.3** in **Chapter 2** for more detail on selecting it.

The other two overall NUSS options in the bottom section of the home-base **Configure** menu are similar in operation, and are discussed together below. Examples of each form is shown below.



**Configure NUSS's LRN=Calibrator Associations + Set Points and Options of Highlighted LRN**

LRN	Calibrator	Abs	Calibrator's Range
1=	Extern.	<input type="checkbox"/>	-40 to 140 degF
2=	9038-0	<input type="checkbox"/>	-5 to 5 psid
3=	9034-0	<input type="checkbox"/>	-12 to 15 psid(*)
4=		<input type="checkbox"/>	
5=		<input type="checkbox"/>	
6=	Extern.	<input checked="" type="checkbox"/>	-1 to 1 psia
7=	Extern.	<input checked="" type="checkbox"/>	-12 to 15 psia
8=		<input type="checkbox"/>	

Options for LRN 1 (Extern.)

Help Enter 'Diff' pts. below Stabilization Delay: 6

Zero-Only Set Point: 0 Span-Only Set Point: 15

Dup. Number of Multi-Point Set Points: 3

Point #01: -12 Point #02: 0 Point #03: 15

OK Cancel (\*) Quasi-Differential Modules are Connected/Disconnected as needed to get Range

Common Options:

- ☐ Add Page Brks.
- ☐ Include Details
- ☐ Gen. Csv Files
- ☐ Show Run

Accuracy Test Options:

- ☐ Add Mid-Points between Unique Cal. Points
- ☐ Rezero 1st

Leak Test Options:

Duration: 120

The **LRN-to-Calibrator** configuration form (with other **LRN** and **Test** option defaults)

**Configure Logical Barometers used by NUSS**

LBN	Barometer	Range of Barometer
1=	9032-0	0 to 30 psia
2=	9032-0	0 to 30 psia
3=		
4=		

OK Cancel

Modules are Connected, then Disconnected and Queried, if Assigned

The **LBN-to-Barometer** configuration form

Both of these configuration forms depend on modules being defined in two *automatically-created* module groups each time NUSS is restarted. All *calibrator* modules found in your system are added to **Group X (Calibrators)**. Likewise, all *barometer (and absolute calibrator)* modules found in your system are added to **Group Y (Barometers)**. Although automatically created, both groups may be *viewed* and *edited* by the **Groups Editor** (see **Groups** menu item on the **Network Status** form after NUSS has started and has completed

its first *Query*). However, any edited changes to these groups do not survive the next restart of NUSS.

Operationally, both LRN and LBN configuration forms are similar. The first allows any Calibrator modules defined in **Group X**, to be assigned to any **Logical Range Number** (1-8) or abbreviated **LRN** (see first example above). The second allows any Barometer modules defined in **Group Y**, to be assigned to any **Logical Barometer Number** (1-4) or abbreviated **LBN** (see second example above).

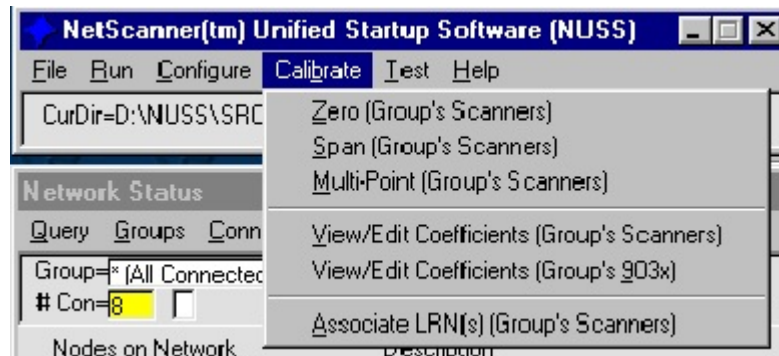
Once all applicable LRN or LBN assignments are made on these forms, and any other auxiliary data associated with them are also entered, you have completed the first half of the LRN or LBN configuration equation. To complete the other half of the configuration equation, requires you to also assign specific affected transducers of any scanner module to these LRN or LBN targets as well (see the *Calibrate | Associate LRN(s)* menu item or the *Configure | Barometer LBN* menu item on both the home-base or context menus).

Details of using the *LRN-to-Calibrator Association* function (see the larger example form on previous page) are deferred to **Chapters 4 and 5**. **Chapter 4** provides both the overview and the details on the rather large subject of scanner module **Calibration Adjustment**, for both *single* scanner modules and *defined groups* of scanner modules. In particular, you should read **Section 4.1** about the basic purpose and usage of an **LRN**. Since the **LRN** associations to specific scanner module channels, and the **LRN** linkage with specify *Calibrator* modules, are very useful also to various *Test* functions as well, additional details are found about this form described in **Chapter 5**. In particular, you discover why the bottom frames on this form have specific default options for a *Leak Test* and an *Accuracy Test*. The specific calibration set points on the form (for each LRN) are also used by these *Test* functions as well as by the *Calibration Adjustment* function.

Details of using the *LBN-to-Barometer Association* function (see the smaller example form on previous page) are deferred to **Chapter 6**. That chapter provides both the overview and the details on the subject of **Running Modules**, for both single and defined groups of modules. That chapter describes how the LBN associations are used by specific scanner module channels to convert their data from *differential* pressure measurements to *absolute* pressure measurements. This feature is only enabled by the interactive **Display Set** configuration function of the *Run* form, when “absolute” (psia) units are specified. Acquired barometer data are also recorded (as special “synthesized” stream 4) by the *Record* feature and read by the *Playback* feature of the *Run* and *Run Group* functions.

### 3.4.3 The *Calibrate Group* Function

The ***Calibrate Group*** function, selected from the *home-base* menu, is similar to the ***Calibrate*** single-module functions available on the top three sections of a module's *context* menu, except that it can be directed to operate on multiple modules concurrently. Items have added notes in parentheses to indicate the *scope* of their particular **Group** action (e.g., (Group's Scanners) or (Group's 903x)).



Selecting ***Calibration*** functions from home-base menu

The first section of the submenu provides the same ***Zero-Only***, ***Span-Only***, or ***Multi-Point calibration adjustment*** function choices, but each can perform its function collectively on all the *scanner* modules (with LRNs defined) in the *Current Group* instead of just a single module. The second section contains two ***View/Edit Coefficients*** functions that display either Scanner coefficients or Calibrator/Standard (903x) coefficients of a group's modules *sequentially*. The third section duplicates the ***Associate LRN(s)*** function, also available in the third section of the ***Configure*** context menu. See **Section 4.1.1.2 in Chapter 4** for details (and example) about using these functions.

Like all group functions, you should *connect* all the modules in the group before selecting any of these functions. Each of the middle group of menu items is module class specific. Any non-scanner modules in the group are ignored by the first (Group's Scanners) item. Likewise, any Scanner modules in the group are ignored by the second (Group's 903x) item.

Any *calibrator* modules needed to carry out any *adjustment* procedure in the first section need not be defined in the group (but can be), as the procedure automatically connects them as needed (if not already connected) and disconnects them when finished (if they were not already connected at the start). Before you perform these group *adjustment* functions for the first time, you must have setup all the necessary prerequisite LRN-to-transducer and LRN-to-calibrator associations. Such calibration setup functions are defined fully in **Chapter 4**.

Unlike many other group (or single-module) functions, the ***Calibration Adjustment*** functions (in first menu section above) may be started — even when their target scanner (and calibrator) modules are already active in ***Run*** forms. This has the advantage of allowing you to see the results of all pressure setting operations as the function proceeds. Also, when the adjustment function is finished, you can see the immediate results of the adjustments by the improved data quality that appears in the ***Run*** form of each module. It is unwise, however, to start any ***Run*** functions for any scanner modules in the group, or any calibrator modules being used to calibrate them, *while* the ***Calibration Adjustment*** function is in progress. To avoid this latter possibility, the *adjustment* functions have a **ShowRun** option that allows them to pop-up simple single-module ***Run*** forms for each affected module to the right of the main adjustment form.. See **Chapter 4** for more detailed hardware and programming information on the Calibration *adjustment* processes.

### 3.4.4 The *Test Group* Function

The *Test Group* function, selected from the *home-base* menu, is *somewhat* similar to the single-module version of *Test* available from a module's *context* menu. However, there are currently only two specific tests that can be carried out for the Current Group, and these only test the scanner modules in the group (other module classes are ignored).



Selecting '*Test* | *Leaks*' from home-base menu

After a particular test is selected in the first section of this submenu, a separate form opens labeled **Test Group x** (where *x* specifies the *Current Group*). These test functions are detailed in **Chapter 5**, with all other single-module and group tests.

The second section of this submenu contains a unique NUSS-wide function not found on the single-module context menu. This function allows a *Test* operator (conductor, technician, et al) to sign in his/her name only once (after NUSS starts) thus avoiding having to enter that name on each Test form that requires it. When NUSS exits, this name is not saved, so another sign-in is required after NUSS restarts.

### 3.4.5 The *Update Firmware to Group* Function

The **File** function, selected from the *home-base* menu, has a submenu item in its top section labeled **Update Firmware (Group)**,



Selecting '**File | Update Firmware**' from home-base menu

This function is similar to the **Update Firmware** function on a module's *context menu*, but can update *all* modules (of the same selected **NetScanner**) *concurrently*. This could save you considerable time over having to update each module separately. The function is essentially identical to its simpler single-module version, except that it expects like modules in the *Current Group* to be already *connected*. You are warned if you present it with a group of dissimilar modules. If you do not have such a group defined, then assign Group "\*" (Star) as the *Current Group* and then *connect* only the group of similar modules you need. See **Section 3.3.5** for details of operation.



**Update Firmware** form for Group of Like modules

This program forces the modules in the group to **Reset** and disconnects them before it exits, since the switch over to the new firmware can only be complete after module reset. However, since the UDP command used to **Reset** the module is potentially unreliable (particularly on a busy network) you may occasionally find it necessary to power down one or more modules in the group, and restart them, to get normal operation after the download is completed.

#### ARE WE DOWNLOADING OR UPLOADING HERE?

The labels on the buttons (**[Download]** and **[Abort Download]**) used to start and abort the above **Firmware Update** process, and even the *file type* of the PSI firmware update files (\*.dwn), are naming conventions that come from older PSI products that pre-date the popularity of the Internet. By using the term **download** the original PSI designer apparently assumed that NUSS was a high-level server providing update services to many lower-level NetScanner clients. If NUSS is a *client* PC application and a NetScanner module is a remote *server*, then we should be *uploading* to the Netscanner, by today's terminology.

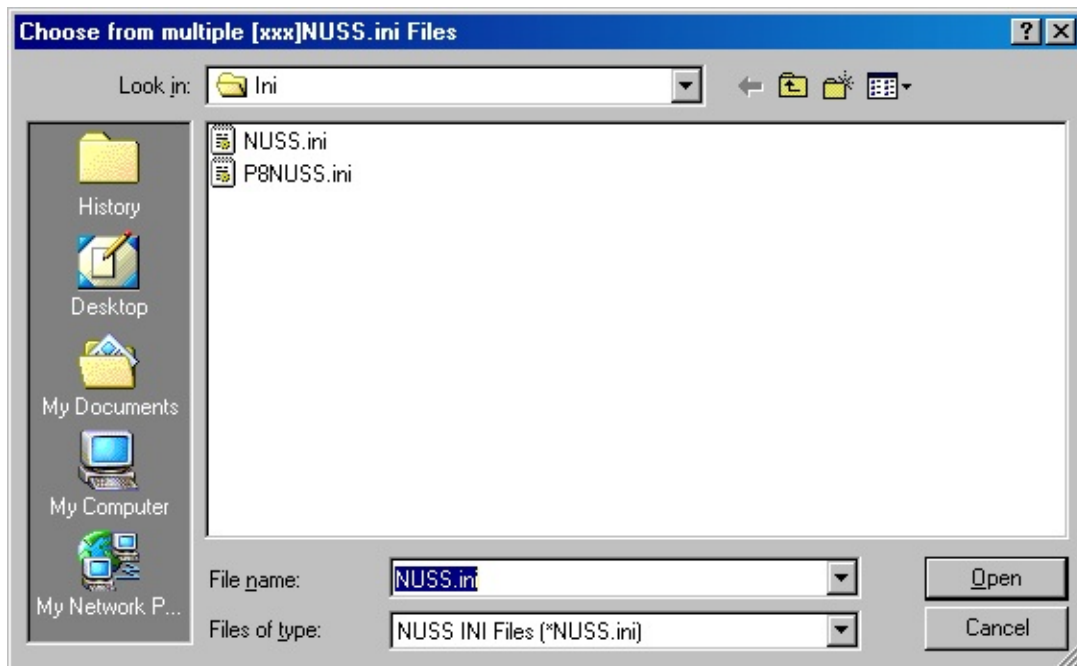
The second section of this **Files** menu contains several NUSS-wide functions that have already been described in Section 3.1 of this chapter.



### 3.5 NUSS Persistent Memory ([xxx]NUSS.ini Files)

When NUSS exits it creates a persistent memory file (named **NUSS.ini** by default) that saves various configuration data describing devices and features, that NUSS was using when it exited. For the next NUSS usage session this file is opened again, and used to restore all saved parameters (by default).

If more than one such file exists in the **Ini** subfolder when NUSS starts, it pops-up a Open file dialog form (as in example below) to let the user select which such file he wishes to use – for the current usage session. Such files all have names like [xxx]**NUSS.ini** names, where the leading characters [xxx] of the name can vary.



If you click either **[Cancel]** or **[Open]** buttons in example above, without selecting any file shown in the large white box, the default file (**NUSS.ini**) is chosen to both start and exit NUSS for the current session. However, if you select the other file **P8NUSS.ini** instead, that file is used to both start and exit NUSS for the current session.

This feature allows you to keep as many such files as desired, and always choose the one you want to use.