Installation

National Semiconductor's code loader runs only on the Windows 95, Windows 3.1 or Windows 3.11 platform. The code loader software installation program consists of three diskettes. Insert disk 1 into drive a: or b:. The software is installed by running the "setup.exe" file on disk 1 from the Windows File Manager or Windows Explorer. The setup program guides the user through the installation.

Select device type

After the successful installation of the software, the program can be started by double clicking the "loader" icon which consists of a light blue background with the yellow National Semiconductor logo in the Windows 3.1 or 3.11, or clicking on "loader" icon under "PLL_Loader" sub-menu of "Start" menu in the Windows 95. The code loader can also be started by double clicking "loader.exe" which is located in the directory the user specified during the installation (default directory is "Programf/National/Pll_load/").

The default screen after program execution is shown below:

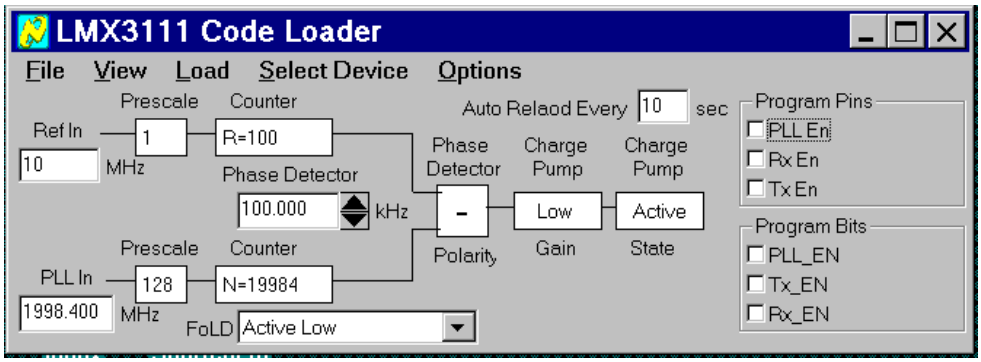


Figure 1: **Code Loader** main menu

Select device type by clicking on the **Select Device** pull-down menu, and clicking on the user's device type:

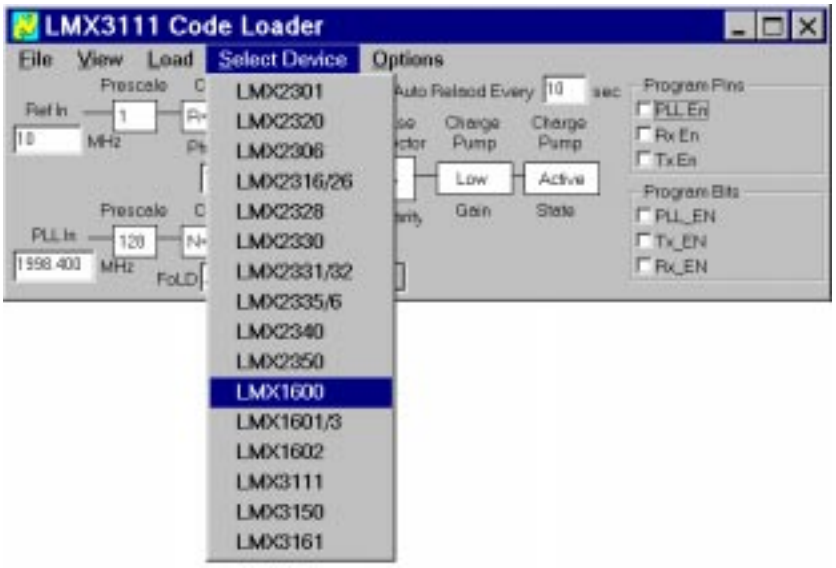


Figure 2: **Select Device** pull-down menu

Program port configuration

The code loader provides the user with the capability of customizing the port configuration and various program signals from the parallel port of the user's computer. A brief description of the required steps necessary to configure is presented below.

Choose the **View - Port Setup** selection from the pull-down menu :

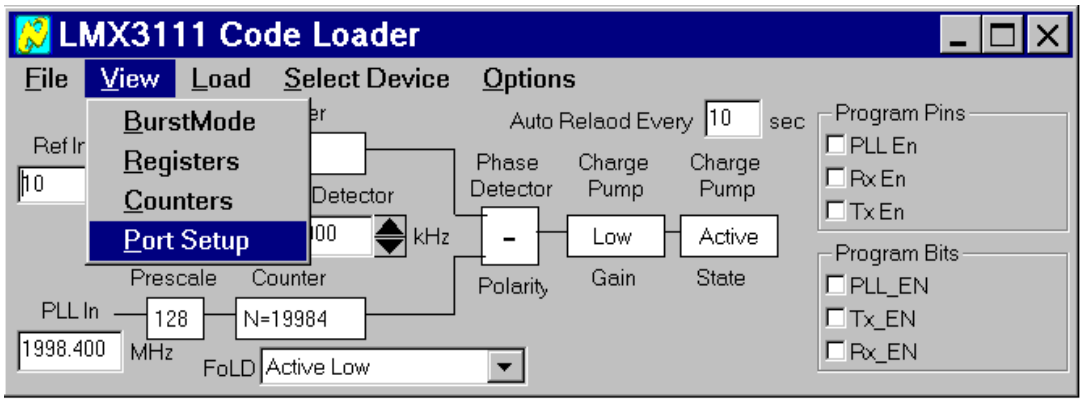


Figure 3: **View- Port Setup** pull-down menu

The **Port-Setup** dialog box is displayed:

Figure 4: **Port-Setup** dialog box

The above figure is an example from the LMX3111 **Port-Setup** dialog box. Refer to Appendix A of this document for a figure corresponding to the user's D.U.T, and configure the **Port-Setup** dialog box.

I
nstruction to configure the **Port-Setup** dialog box is as follows:

At the Port Address selection area, select a port (LPT1, LPT2, LPT3, or other HEX address) that corresponds to the PC's parallel port in use.
At the "…Bit", or "…En" selection area, select the address assignment for a given *program* ("Bit"), or *control* signal ("En") by selecting the button to the left of the desired address.

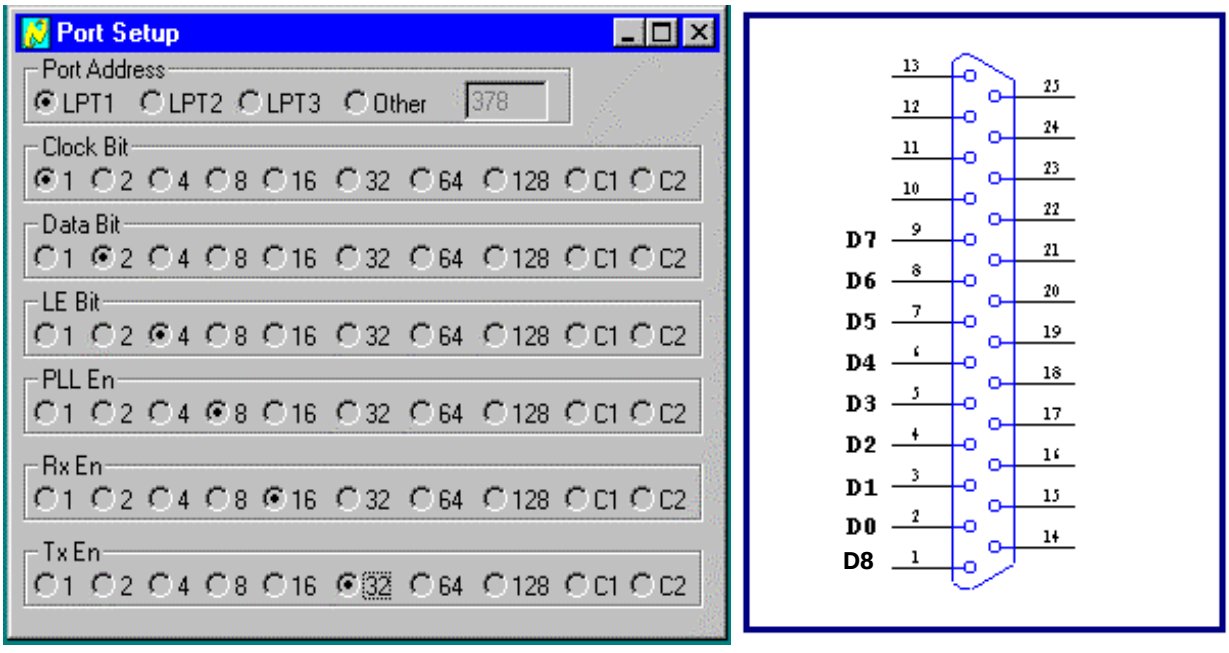
***Note** - **No two address numbers may be shared**. An addressing conflict will result.

The table displayed in the **Port Setup** dialog box is dependent on the device under evaluation by the user. Some devices require additional control signals to properly program the D.U.T. Other devices will require only 3 program signals. Thus, this table will be an array whose columns are constant and whose row count is dictated by the device being programmed.

The columns are named "1" , "2" , "4" , . . . "128" , "C1" , and "C2" represent a bit position for the given signal. The bit position specifies which pin of the PC's DB25 parallel port connector the signal will appear in.

The rows represent the specific device program and control lines required for configuration, and are labeled "Clock Bit" , "Data Bit", "LE Bit", etc.

Refer to the figure below for the address assignments for a standard DB25 connector used for the parallel port on most PC's.



Column 1 corresponds to the bit position of **D0**, **Column 2** to bit position **D1**, **Column 4** to bit position **D2**, and so on, up to **Column C1** which corresponds to bit position **D8**. **Columns C2** is not used for the datacable provided with the evaluation board. The user is allowed to use C2 if required for the user's own application. The C2 corresponds to pin 14 of the DB25 connector, and the user needs to provide an own cable.

Figure 5: The address assignments for a standard DB25 connector used for the parallel port on most PC's.

Data cable configuration

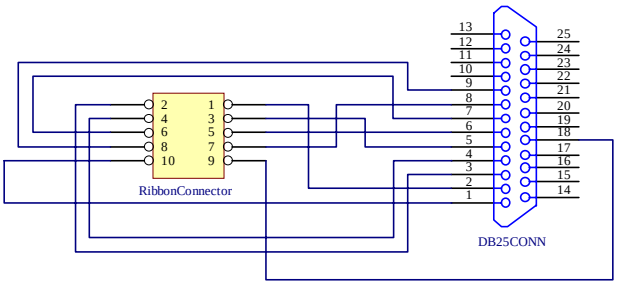
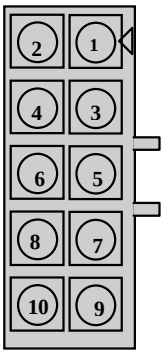


Figure 6: Datacable schematic



Ribbon Cable Connector
Female 0.100" X 0.100"
Double Row 10 Positions
Bottom View

Figure 7: Ribbon connector pin configuration

Ribbon Connector Pin:	DB25 Connector Pin:
1	2(D0)
2	3(D1)
3	5(D3)
4	4(D2)
5	6(D4)
6	7(D5)
7	8(D6)
8	9(D7)
9	18(GND)
10	1(D8)

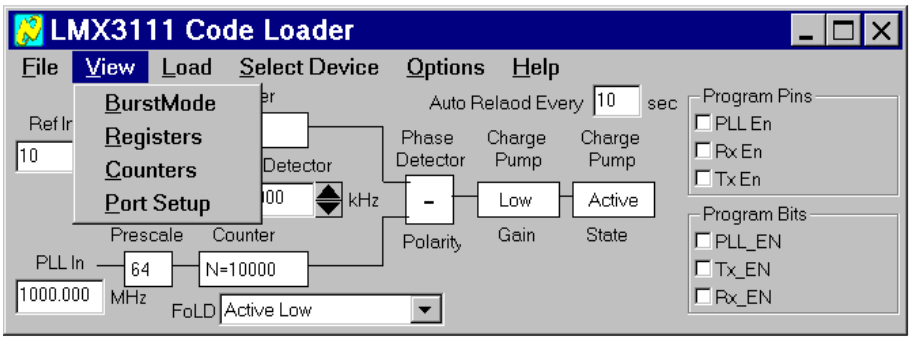
Table 1: Datacable pin-to-pin connection list

Program D.U.T.

The code loader software provides the user with the ability to program the D.U.T. into various frequencies and modes by entering desired frequencies or clicking on the specified boxes. Refer to **Code Loader** main menu as shown in Appendix B of this document for a figure corresponding to the user's D.U.T. Appendix B describes the function of each box in the **Code Loader** main menu.

Definition of **View** pull-down menus on the **Code Loader** main menu:

File - Exit pull-down menu closes the code loader software. The last state the user programmed in the code loader is stored when the program is closed.



- **View - BurstMode** opens **Burst Mode** dialog box when it is selected. Refer to the "Burst Mode configuration and operation" section in this document for operation of this dialog box.
- **View - Registers** opens the **Register Display** dialog box. Depending on the user's selected device type, the number and type of registers displayed will vary. For example, Figure 8 shows four registers for LMX1600 dual PLL (N and R registers). The **Register Display** dialog box allows the user to change each register content (divider counter values and program mode bits) bit-by-bit.

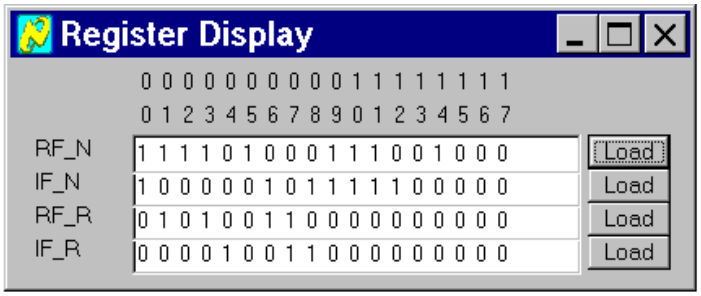


Figure 8: **Register Display** dialog box

The register contents represent the current program modes and divider values displayed in the **Code Loader** main menu. To change the bits contained in the registers, select a bit by clicking on the bit, and enter "1" or "0". Click on the **Load** button to load the new register value. The new register value is displayed in the **Code Loader** main menu when the **Code Loader** main menu is selected.

- **View - Counters** open the **Counters** dialog box when selected.

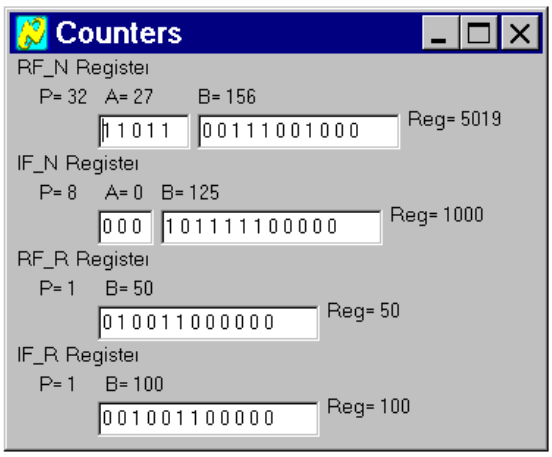


Figure 8: **Counters** dialog box

The **Counters** dialog box displays the current A, B, and R counter values and allows the user to program the counter values in the registers bit-by-bit. The number and types of counters displayed in this dialog box will vary depending on the user's selected device type. To change the bits contained in the registers, select a bit by clicking on the bit, and enter "1" or "0". The new register value is reflected in the **Code Loader** main menu when the **Code Loader** main menu is selected.

The **Counters** dialog box can also be opened by clicking on the **N** or **R Counter** box in the **Code Loader** main menu.

- **View-Port Setup** opens **Port Setup** dialog box. Refer to the **Program port configuration** section of this document for details.

Definition of **Load** pull-down menus on the **Code Loader** main menu:

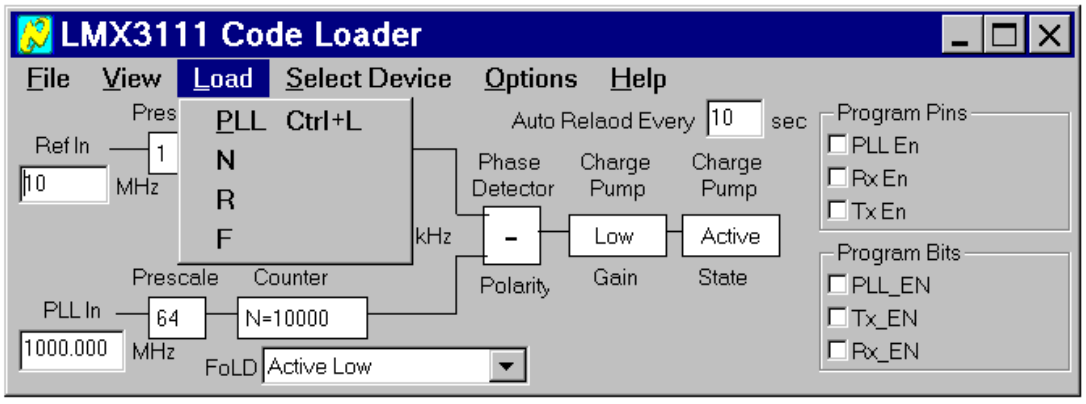


Figure 9: **Load** pull-down menu

- **Load - PLL** loads all counters in the D.U.T.
- The number and types of items listed under the **Load** pull-down menu depend on the user's selected device, and each item allows the user to program individual register when the menu is selected.

Definition of **Select Device** pull-down menus on the **Code Loader** main menu:

Select Device allows the user to choose the **Code Loader** main menu configured for the user's particular D.U.T. Refer to Figure 2 for the **Select Device** pull-down menu diagram.

Definition of **Options** pull-down menus on the **Code Loader** main menu:

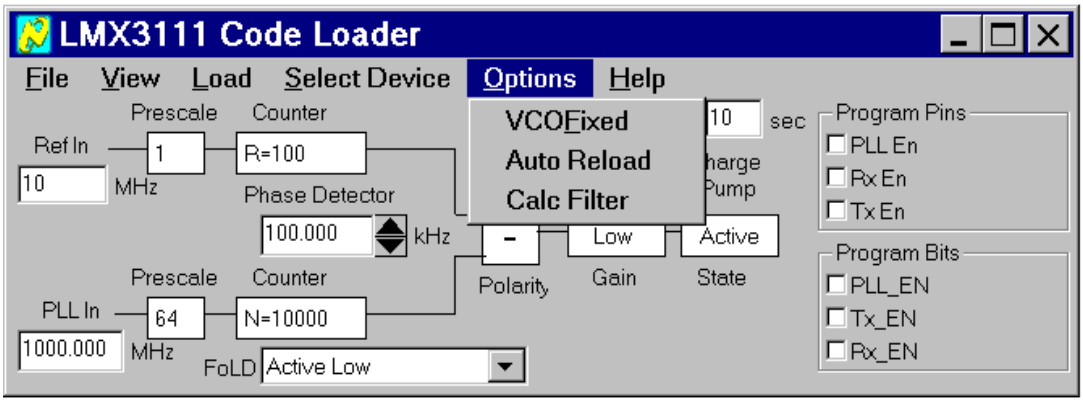


Figure 10: **Options** pull-down menu

- **Options - VCOFixed** allows the user to change the phase detector frequency and calculate the N counter value WITHOUT changing the PLL In frequency. A check mark is placed at the left of the pull-down menu when it is selected. When this option is not selected, the PLL In frequency is changed and the N counter value stays the same when the new phase detector frequency is entered.
- **Options - Auto Reload** sets the code loader to reload all counters in D.U.T. at every interval the user specifies in the **Auto Reload Every [XX] sec** box in **Code Loader** main menu. A check mark is placed at the left of the pull-down menu when it is selected. When any of the values and modes are changed by the user in the code loader, the code loader loads only the counter for which the change is relevant. For example, if the N **PLL In** box was changed to a new frequency and the enter key is pressed, only the N counter is reloaded. When the **Load - PLL** pull-down menu is selected, all counters are reloaded. When the **Auto Reload** is on, all counters are reloaded at every interval the user specified.
- **Option - Calc Filter** opens **Filter Design** dialog box.

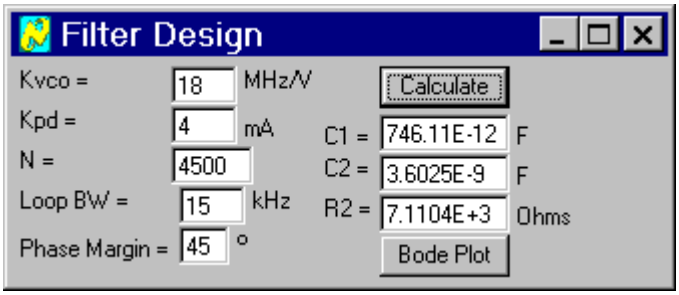


Figure 11: **Filter Design** dialog box

The **Filter Design** dialog box allows the user to calculate second order loop filter component values. It also allows the user to display and print the Bode plot. Parameters on the left half of the **Filter Design** dialog box can be changed by clicking in the each parameter box and

entering the desired values in the box. The definition of each parameter used to calculate the loop filter value is as follows:

* **Kvco** = Gain (sensitivity) of the user's VCO. Refer to the VCO manufacturer's datasheet.
* **Kpd** = Phase detector gain (charge pump output current). Refer to the user's DUT datasheet.
* **N** = VCO output frequency divided by the phase detector frequency.
* **Loop BW** = Loop bandwidth of the loop filter. Refer to the application note AN-1001 for the definition.
* **Phase Margin**: A common rule of thumb is to begin the design with 45 to 50 degrees. Refer to the application note AN-1001 for the definition.
* **C1, C2,** and **R2** are the calculated loop filter component values. After the above parameters are entered to the **Filter Design** dialog box, click on the **Calculate** button to calculate new loop filter component values.

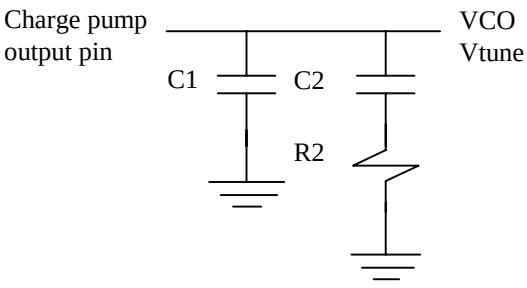


Figure 12 : Loop filter

* **Bode Plot** button opens the Bode Plot dialog box and displays the Bode Plot of the calculated loop filter.

Burst Mode configuration and operation

The code loader software provides the user with the ability to program the D.U.T. into various states such as power up and down, device block enable (ie: TX, RX, PLL, etc), frequency switching, etc. This mode of the program, titled “Burst Mode”, can be custom configured, and includes the option of inserting programming delays, etc. A brief description of the required steps necessary to configure is presented below.

(It is recommended that the user verify device programming operation, and cable configuration prior to Burst Mode operation)

Starting from the **Code Loader** main menu: (The default screen after program execution)

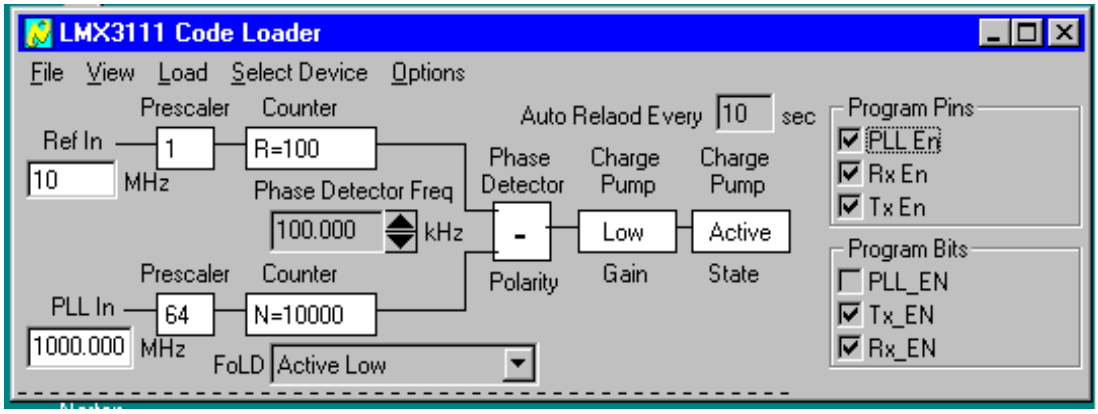


Figure 13: **Code Loader** main menu

Choose the **View - BurstMode** selection from the pull-down menu :

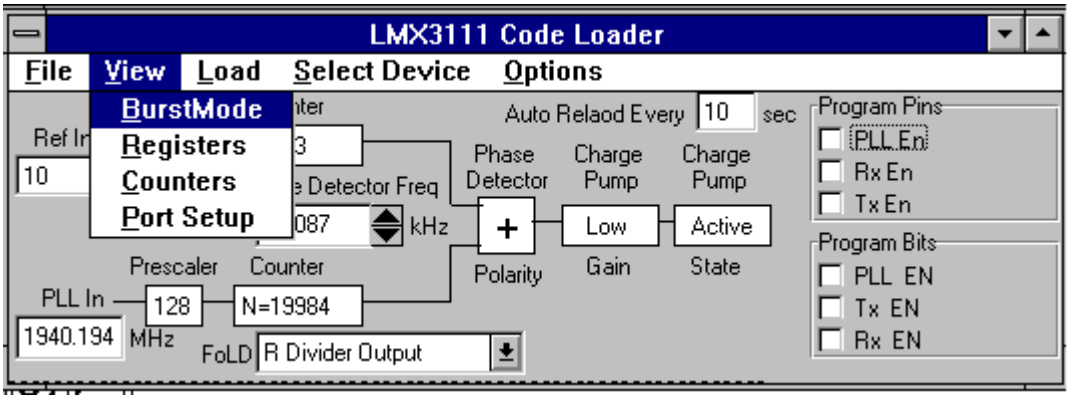


Figure 14: **View - BurstMode** pull-down menu

The **Burst Mode** dialog box is displayed.

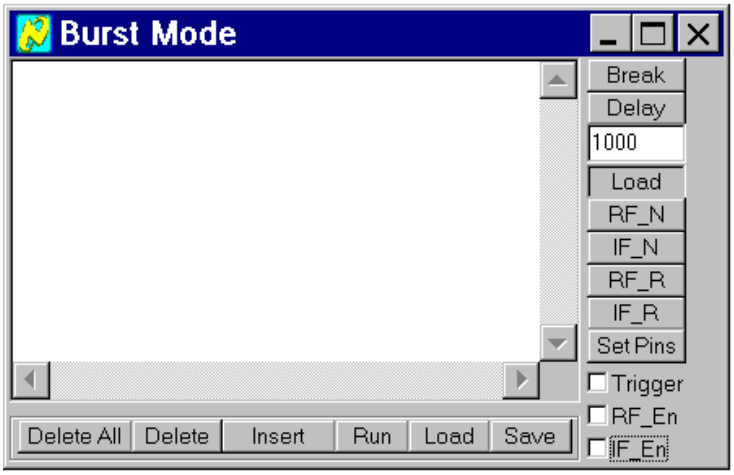


Figure 15: **Bust Mode** dialog box

Definition of **Burst Mode** function buttons:

- **Break;** pauses the program's operations in the Burst Mode window. The **Run** button will continue the programming operation proceeding the Break.
- **Delay:** pauses the program's operations in the Burst Mode window for the specific number of counts entered in the text box below the **Delay** button. The delay time in the text box is unitless. The number of counts specified is the value for a null operation loop, and the time delayed is machine and *operating system* dependent.
- **N:** inserts into the programming window the value of N specified on the **Main Menu**.
- **R:** inserts into the programming window the value of R specified on the **Main Menu**.
- **F:** inserts into the programming window the value of F specified on the **Main Menu**. The F latch is generally the program function (i.e.: TX, RX, Power Down, FastLock, etc) of the D.U.T.
- **Set Pins:** inserts into the programming window command line to set the enable lines of the device under evaluation to either High, or Low. Select the specific line by clicking the selection box to the left of the desired function. The D.U.T.'s enable lines are generally a hardwire function, and are independent of the function latch. The enable lines may override the function latch programming. It is recommended that the user consult the device's datasheet for additional information on the enable lines, and function latch.
- **Delete All:** deletes all entries in the programming window.
- **Delete:** deletes one programming line in the programming windows at a time. The user can select a line by clicking on the line and delete the line by pressing this button.
- **Insert/Overwrite:** allows user to select the user's entry to be inserted above or overwritten on the user's selected programming line.
- **Run:** loads all the programming commands in the programming window continuously until the **Stop** button is pressed or the sequence of the programming commands reaches the **Break** command.
- **Load:** allows the user to load a file with previously saved programming window command lines.
- **Save:** allows the user to save the programming window command lines in a file.