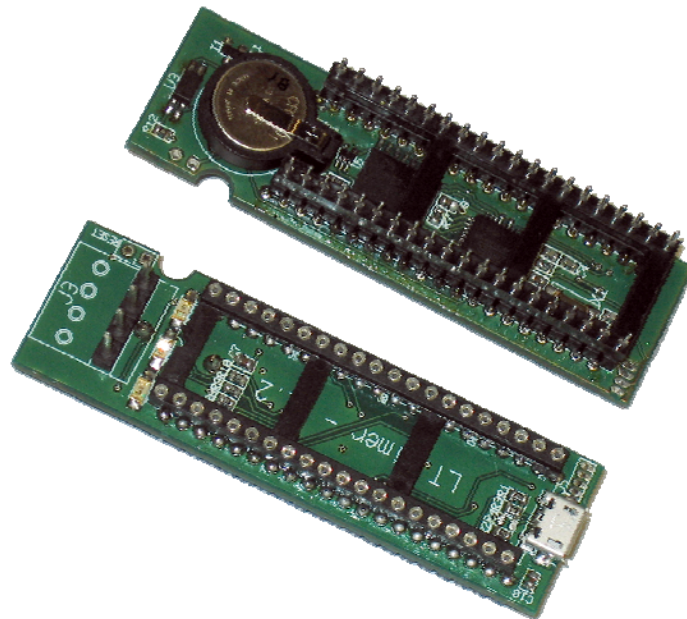# LPTimer™ EnviroStart Three Phase Timer Control Installation & Commissioning Guide

Version 1.0 August 2010

**Timer Capability for TPMEC and TPSS
Three Phase Motor Controls**

Three Phase Timer Control

IMPORTANT WARNING

Failure to read and comply with this manual may result in damage to the LPTimer Unit and driven equipment and may render the warranty invalid.

1. **Only a competent electrician should carry out the electrical installation.**

2. **Internal components and areas of the control circuit boards to which the LPTimer is fitted, (except the isolated I/O terminals), can be at mains potential when an EnviroStart is connected to a three-phase supply. The voltage is extremely dangerous and may cause death or severe injury if you come into contact with it.**

3. **When the EnviroStart is connected to the mains, the output connections U, V and W should be treated as being live even if the load is not being driven.**

4. **The control I/O terminals are isolated from mains potential but the relay outputs may have dangerous voltages present even if the mains are not connected.**

5. **Do not make any connections when the EnviroStart is connected to any live supply.**

6. **Do not make voltage withstand tests on any system to which LPTimer is installed without first isolating the LPTimer and the EnviroStart motor control unit.**

7. **Do not touch IC-circuits on the PCB. Certain items are static-sensitive and static voltage discharge may destroy the components.**

8. **Updated and current Installation and Commissioning Guides are maintained on the EMS (European) web site at http://www.envirostart.com; always check the web site for latest issue documents before commencing installation.**

CONTENTS

1 <u>INTRODUCTION</u>

Thank you for choosing the **LPTimer** Three Phase Motor Control Daughter Board Timer which has been designed to be used with all three phase motor energy control and soft start control boards.

The system has been designed with the ease of use in mind and uses a simple Micro USB interface to programme the on – off times and dates. The **LPTimer** unit sits as an interface between the EnviroStart main control processor and the motherboard and interrupts the start signal on Connectors 1 through 4 of the Soft Start or Motor Energy Control.

This Installation and Commissioning Guide provides the details of these modes of operation and how they interact so familiarising yourself with the contents of this guide is essential.

The LPTimer has been designed to provide a long life; components have been selected with reliability in mind and have generally been over-rated. Using the standard IQA, (Institute of Quality Assurance), methodologies the expected lifetime of **LPTimer** >100,000 hours continuous use, (twelve years),

In the unlikely event that you do need further support please contact your local EMS (European) Distributor or failing that contact us directly either by e-mail or fax. All details of how to contact us are available on our web site at http://www.envirostart.com, please remember that we are constantly updating documentation and information about the **LPTimer**, all such information is posted and publicly available on the web site.

1.1 FEATURES

The **LPTimer** is a high specification digital time control for use with the EnviroStart range of Soft Starts and Motor Energy Controls.

The **LPTimer** enhances the existing facilities of the EnviroStart Motor Energy Control and Soft Start systems providing a full time and date control to allow scheduling and management of the EnviroStart systems.

‣ FULL TIME AND DATE CONTROL WITH INTEGRAL TEN YEAR CALENDAR

‣ OVER RIDE FUNCTION TO ENABLE A RUN STATE WHEN IN "OUT OF TIMER" PERIOD

‣ BATTERY BACK UP TO MAINTAIN TIME, DATE AND OVER RIDE FUNCTION WHEN SYSTEM MAINS SUPPLY IS DISCONNECTED

‣ UNIT PLUGS THROUGH EXISTING MAIN BOARD CPU AND DERIVES ITS POWER FROM THE MAIN BOARD SO OTHER THAN PROGRAMMING FUNCTIONS VIA THE BUILT IN MICRO USB NO OTHER CONNECTIONS ARE NECESSARY

‣ FULL SYSTEM STATUS LED's

2   CE DECLARTION OF CONFORMITY

C E

MANUFACTURERS DECLARATION OF CONFORMITY

This declaration covers all **LPTimer** Motor Energy Control units.

This product fulfils the following European Community Directives when applied as follows:

Low Voltage Directive

The above products fulfil the Low Voltage Directive 73/23/EEC, 89/336/EEC and 93/68/EEC amendment for industrial equipment; however, they must be installed to general good electrical engineering practices and regulations by a suitably qualified person with strict reference to the instructions in the product's Technical Manual.

EMC Directive

The above products are intended to be a sub component in a system or a machine. They must be mounted, with their controlled board, into an appropriate enclosure and system designed to fulfil the CE directives plus IEC and local industrial standards. Units must be installed by a suitably qualified person to comply with general good electrical engineering practices and regulations with strict reference to the instructions in the product's Technical Manual.

IEC-1000-4-2 Level 3; IEC-1000-4-3 Level 3; IEC-1000-4-4 Level 4; IEC-1000-4-5 Level 3; IEC-1000-4-12 Level 3; EN 50081-2, EN 50082-1 and EN 50082-2.

Harmonised Standards Applicable

BS EN 6094.4.4 (which calls on EN 56011); EN 55022; EN 51000.4.2;
EN 61000.4.3; EN 51000.4.4; EN 61000.4.5; EN 61000.4.6; EN 61000.4.8;
EN 61000.4.11; BS EN 50081.1; BS EN 50081.2; BS EN 50082.2; EN 6094.4.2;
IEC-947-4-1; IEC-68-2-6, (NFC2076; BV1); IEC-947-4-2.
EN 60439; EN 60831.1, EN 60831.2, EN 61921.2003

Electrical Requirements Specification G5/4 - 2 (2008)

Dated: July 2010

3. <u>GENERAL SPECIFICATION</u>

3.1 TECHNICAL SPECIFICATION

SUPPLY VOLTAGE	5V derived from main CPU
FREQUENCY	Not Applicable
STARTS PER HOUR	Unlimited
COOLING	Naturally Cooled
CONTROL CIRCUIT	24MHz clocked Atmel MPIC
MECHANICAL RATING	IP00
EU DIRECTIVES	Meets all EMC and Low Voltage Directives
OPERATING HUMIDITY	Up to 95% Non Condensing (Conformally Coated Systems Can Be Provided)
OPERATING TEMP	-15°C to +40°C

3.2 GENERAL CONSIDERATIONS

1. The installer should be a competent person for installation of electrical goods.
2. The power should be disconnected from the unit to which the **LPTimer** is to be fitted before installation and only put back on once installation is complete.
3. Care should be taken when removing and re-inserting the Main CPU as it is static sensitive, it is best to earth yourself via a static handling link prior to removing the chip from the motherboard.
4. Care should also be taken to ensure that no leads are bent when the chip is re-inserted in the **LPTimer** socket.
5. Ensure that the CPU Chip is correctly oriented by aligning the cut out on the chip with the cut out on the socket.

3.3 HARMONICS & EMISSIONS

The **LPTimer**, like all electronic systems, does produce harmonics during operation. The **LPTimer** is however a controlled very low power system and therefore the level of harmonics are negligible. (Typically this is <.05% THD with no contributed radiated or conducted harmonics).

3.4 HEAT LOSSES

For heat calculation purposes it should be assumed that **LPTimer** units have a contributory power loss of <0.02W

3.5 IMMUNITY FROM INTERFERENCE

The **LPTimer** generally has a high level of immunity to externally generated interference.

3.6 INPUT/OUTPUT CONTROL CONNECTIONS (OVER-RIDE)

To avoid interference and cross talk, all input and output control cables should be kept as short as possible and should if possible, be shielded. If noise free lines cannot be guaranteed, an interposing relay with suitable suppression should be used, this should be mounted as close to the **LPTimer** as possible.

4. INSTALLATION

4.1 GENERAL PROCEDURES

When ready to install the **LPTimer**, unscrew and remove the lid of the EnviroStart Motor Energy Control or Soft Start to which the timer is going to be fitted. Making sure that you are "static safe", carefully remove the existing main CPU chip from its socket on the motherboard and place it on a static safe surface. Insert the **LPTimer** PCB carefully into the now open socket. Ensure that you orient the **LPTimer** so that the Micro USB connector is at the edge of the motherboard PCB. When the **LPTimer** is securely positioned on the motherboard, insert the Motor Energy Control or Soft Start control chip previously removed, into the socket on the top of the **LPTimer** ensuring that your align the cut out on the end of the chip with the cut out on the socket. You can now safely programme the time and date functions into the **LPTimer**. Once this programming is completed you can re-secure the EnviroStart lid.

4.2 SETTING UP

The **LPTimer** should be set up using the PC interface via the Micro USB connector to be found on the PCB.

Initially when you connect your LPTimer to a PC or Laptop the "found new hardware" wizard will detect the "new" system, follow the on screen instructions at this stage and, if you haven't already done so, install the control software on your PC. This software is essential for setting up all of the various functions of your **LPTimer.**

All software adjustments and settings can be implemented without the need to have the EnviroStart unit powered, the supply from the Micro USB interface is sufficient to drive the on board processor and allow for the uploading and downloading of programmes as required. Undertaking the programming in this "power off" manner is by far the safest and is recommended.

The **LPTimer** is simply an interrupt that sits between the switched input controls on the main EnviroStart PCB on Connectors 1 through 4, (see the appropriate Installation and Commissioning Guide for either the Soft Start or the Motor Energy Control for details of this), and the control CPU. Therefore, when the **LPTimer** is installed on a motherboard, it is necessary not only to have a valid "run" signal on Connectors 1 through 4 of the motherboard but also to have a valid "run" condition set within the timer software of the **LPTimer**. Either condition being open will stop the EnviroStart from running the controlled motor.

4.2.1 CONFIGURATION TOP LEVEL MENUS

To configure the **LPTimer** you need to have the software installed on your PC and the **LPTimer** linked to the PC via a USB cable. When first plugged in your PC should recognise the **LPTimer**. If it does not then using Control Panel from within Windows, remove the **LPTimer** software and re-install it.

Once you have the USB cable plugged into the **LPTimer** LED 6 should illuminate Red which indicates that the PCB is powered. LED 5 should be flashing Green four times with a pause in between; this indicates that the **LPTimer** is ready to be programmed.

At this time you should open the ACMEC programme that has been loaded onto your PC. The initial screen should look like the following:
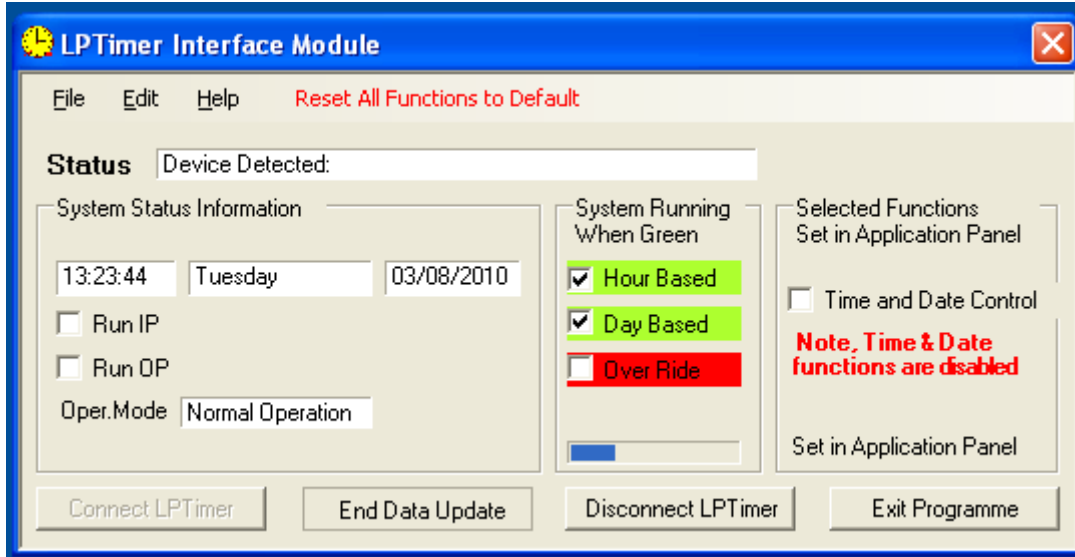
At this time the PC is not talking to the **LPTimer**, to enable this click on the "Connect to AC" button. When you do this the Status should change to "Device Detected", the Connect to AC button should grey out, the "Start Data Capture" button should highlight and the "Reset All Functions to Default" should highlight in the Menu Bar.

If this is the first time that you have set up this particular **LPTimer** then it is a good idea to use the "Reset All Functions to Default" function prior to making any other changes as this will set everything back to a base condition which will ensure that the motor will operate. When you click on this function you will see a confirmation message as follows:
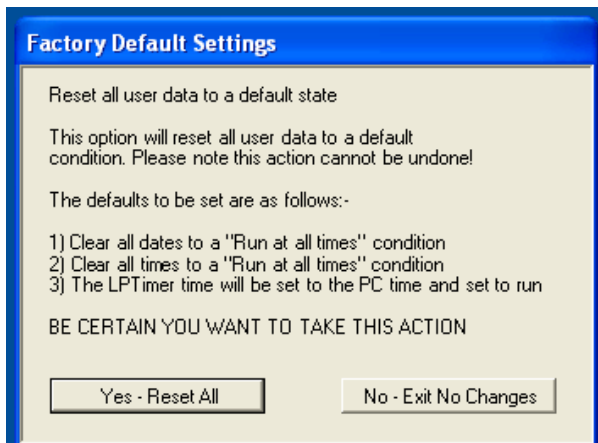

You should click "Yes – Reset All" at this stage. This operation will take up to 15s following which you will see a confirmation dialog box advising that all base data has been reset.

At this time click on the "Start Data Update" button. You will immediately see that the detail changes to reflect what is now programmed in the **LPTimer**, you will also note that the clock and date details shown synchronise with your PC and that the "Update Time" bar keeps counting down, (though unseen, from 60s). The **LPTimer** does not update the parameters on the chip within the unit continuously otherwise the interrupts would disturb the motor control sequence; as such we address the unit and action changes to the parameters every minute – this does not affect the operation of the control from the unit to the motor which is running with a 48MHz refresh rate.
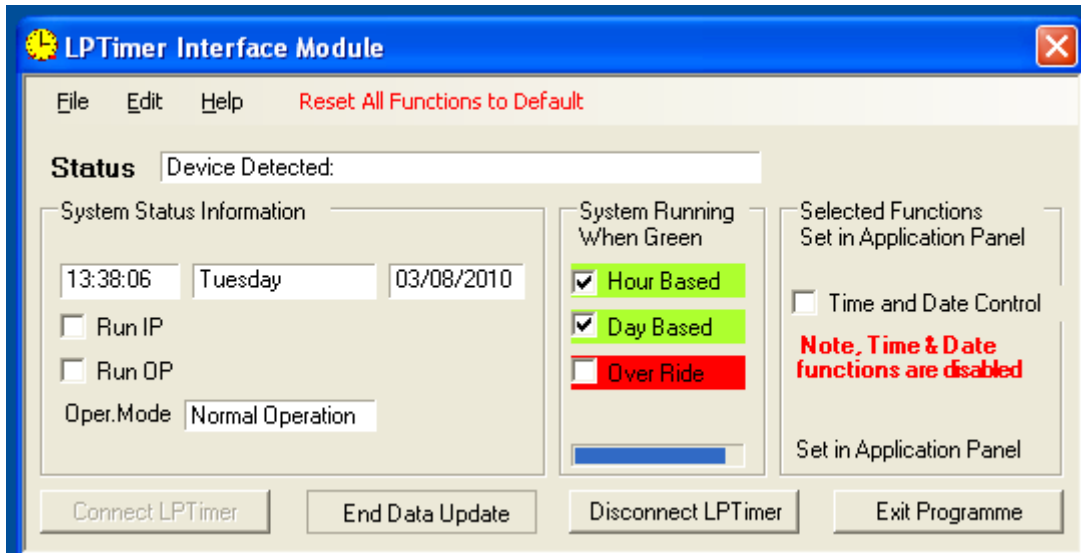
At this stage you now have a functional interface with the **LPTimer** and can implement changes to the various operational modes. These activities are accessed via the "Edit" function in the Menu Bar; the first of these menu items is "Control Application Configuration" shown here. Note that the time and date shown on the Interface Module, above, should be coincident with the time and date on the PC with which you are programming the **LPTimer**. If it is not then use the "Clock Control" functions within the Application Configuration window. If you cannot synchronise the time and date from this window then check the cabling is properly inserted into the connectors.
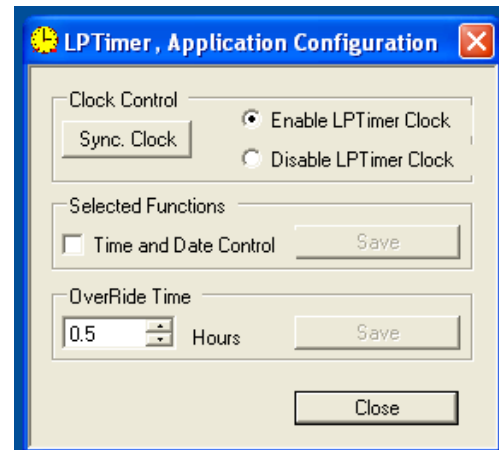
The Application Configuration window, accessed via the top line Edit command allows you to enable or disable the Time and Date Control function.

To change the selection use the tick box and ensure that you save the changes made. Once you have the appropriate function condition selected and have saved the changes and closed the dialog window you will see that the changes will reflect in the "Interface Module" as is shown below.
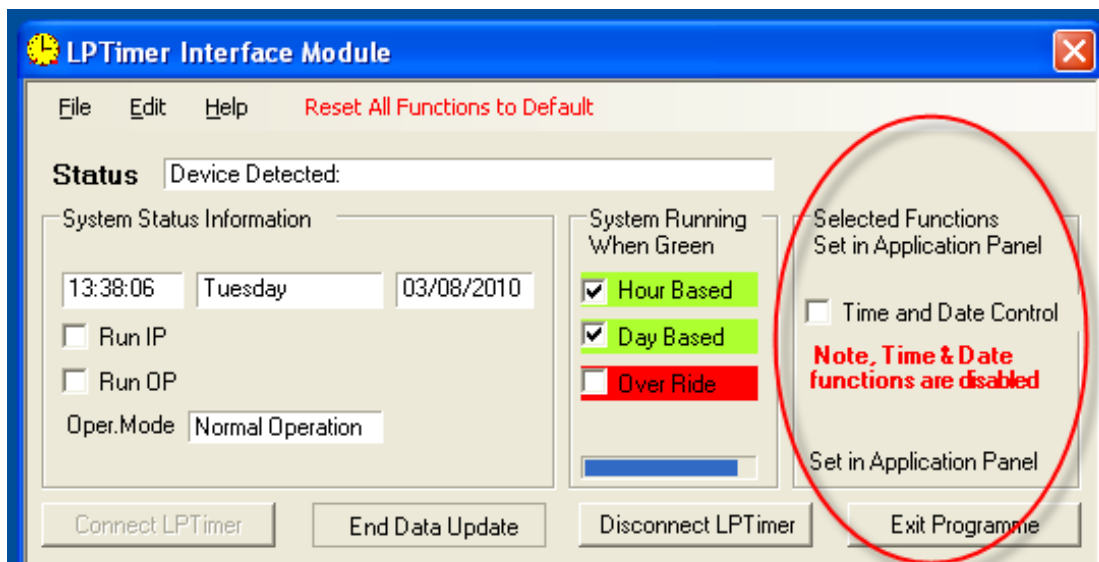
Having selected the function that you want to be operational you need to set the parameters as required for that function. All of these areas are set via the Edit function accessed from the Menu Bar.

4.2.2 CONFIGURATION - TIME

Time and Date Control are set through two windows; the first dealing with time is as follows:
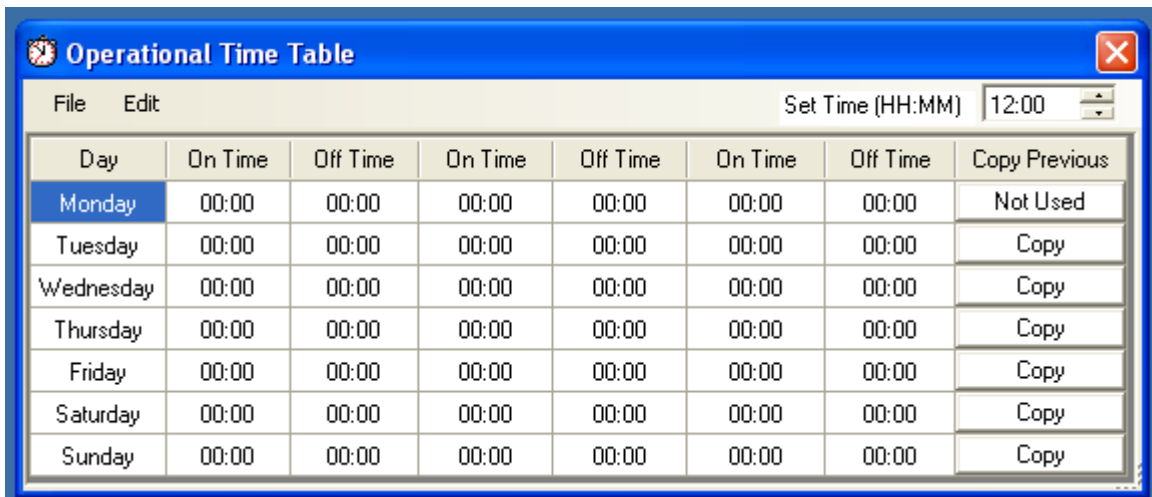

You can set the start and stop times for the **LPTimer** manually if required, by using the "Set Time" function to the top right of the window or if you highlight an "On Time" and then right click with the mouse you will call up the "Time Select Slider" window which allows you to input start and stop run times visually.

This is easier and less fiddly than direct entry but is less fine in its control. (Note that you can use the right and left arrow keys on your keyboard to increment and decrement the time set.

Having set the details for one day they can easily be copied to the next

day using the "Copy" button which is the right most column in the window. Once data is entered it must be uploaded to the **LPTimer**

If any changes are made to the detail on this page then the "Upload to **LPTimer**" button will highlight and if you attempt to exit without saving you will be asked to confirm you want to leave the page without saving the changes. When you upload the detail the day detail on the left of the window will change to pink to confirm that the detail has been uploaded. If you download from the **LPTimer** then the days detail on the left of the window will change to blue to confirm that the detail has been downloaded.
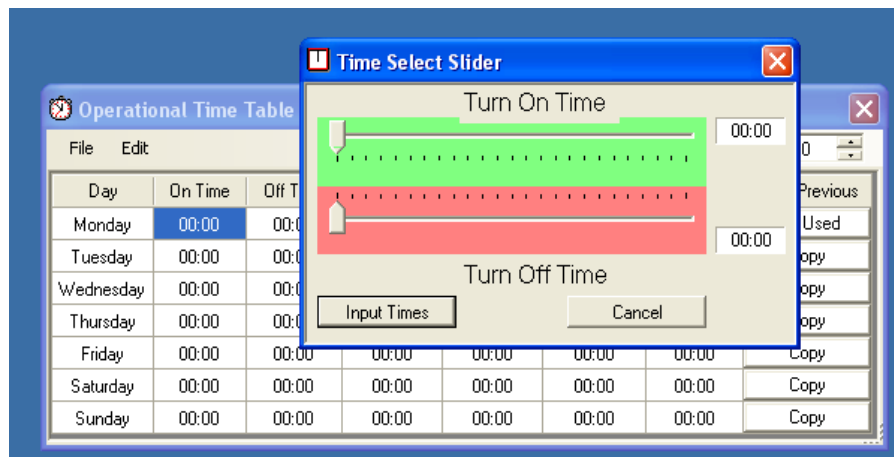
4.2.3 CONFIGURATION - DATE

The date configuration window looks like this:
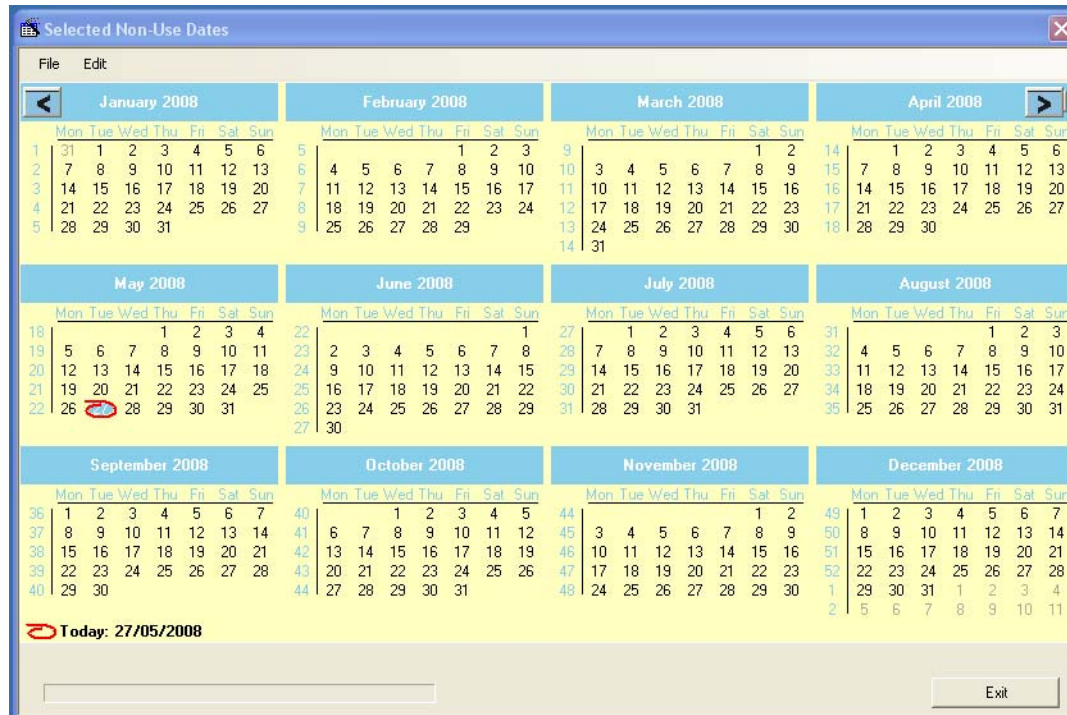
Selecting Non Use Dates allows you to utilise the onboard ten year calendar to tell the **LPTimer** to shut off the motor for a given day irrespective of what is selected in the Run Times described above. This would allow for the exclusion of use on public holidays for example or factory shutdowns.

As with the previous time functions if you make changes they must be transferred to the **LPTimer** itself using the Upload and Download functions to be found in Edit on the Menu Bar. Both uploads and downloads are confirmed by a progress bar which should highlight when the upload or download command is given.

In all the cases above it is possible not only to send the detail to the **LPTimer** but also to store it as a named file. This is the normal windows operation and would allow you to set up one **LPTimer** save the details in a file and then recall those and use those parameters for any other units fitted on site; you may even want to create a "template function" for bottle coolers, vending machines, refrigeration compressors and the like so as to create a library of functional times.

4.3 COMMISSIONING – GENERAL

When commissioning the EnviroStart Motor Energy Control or Soft Start it is initially wise to have the unit operating without any time switching limitations so as to avoid the possibility of becoming confused by the unit not operating because of time exclusions and to have a base set of parameters in place which should "run" the motor without complication.

To do this open the **LPTimer** control programme by clicking on the icon which should have been placed on your desktop when the software was installed, this will open the **LPTimer** Interface Module; if you are at that time connected via a USB cable from your PC to the **LPTimer** use the "Connect LPTimer" button then you will see "Status" as showing "Device Connected" and the "Reset All Functions to Default" should be highlighted and available. Click on this reset function and accept the changes, this will reset all the parameters of the **LPTimer** to a base level and will clear all the timers held in the system; it will also have the effect of synchronising the clock on the **LPTimer** with the clock on your PC. This is good

practice the first time you connect to a new **LPTimer** as it clears all temporary test files that may have been installed during final inspection prior to shipping.

Once the **LPTimer** is reset to "run all of the time" then set up the EnviroStart Motor Energy Control or Soft Start in accordance with the Installation and Commissioning Guide for that unit. Only once the MEC or SS operation is properly established should the **LPTimer** be enabled and set up.

> **Care should always be taken to ensure that the timer does not affect any critical applications associated with the motor and that the operators associated with the machine to which the EnviroStart and control is fitted know that a timer has been fitted otherwise they may be concerned if the motor does not operate when expected.**
>
> **It may be wise once the timed programme has been established to produce a sheet to append to the controlled system to advise when the timer is "holding the motor off".**

4.3.1 COMMISSIONING – OVER-RIDE TIMER

Having set the primary time management parameters note whether the installation has included an override button function to allow the system operator to temporarily override the timing function as set by the time and date management windows detailed in Section 4.2.2 and 4.2.3 above.

The over-ride function is enabled by momentarily making a connection between J3 Pin 1 and J3 Pin 2. (This connector is the one at the opposite end of the PCB to the Micro USB Connector. Pin 1 is the one nearest to the cut out on the PCB to provide access for the main LP or HP MEC/SS PCB reset).

J3 Pin 3 and J3 Pin 4 provide a zero voltage switch capable of handling up to 30mA at 24V non inductive. This switch is closed, (enabled), when the motor is turned off thereby enabling this function to, for example, illuminate an LED or similar low voltage, low current device within the over-ride switch.

If a connection between J3 Pin 1 and J3 Pin2 is momentarily made through a push button or switch then the controlled motor will run on for a period as defined by the time, in hours, shown in the data entry box as detailed within Section 4.2.2. Multiple presses of the switch will not yield multiples of this time.

This function is intended to allow system users who may want to operate equipment outside of the "normal" defined operational hours as set within the time and date function; this would be particularly applicable to office air conditioning systems where someone may be working overtime and want the refrigeration compressor to continue working outside of the normal operating hours.

The over-ride time period can be set between 0.5 and 4.0 hours.

The timer retains its "knowledge" of the over-ride time even if the power to the controlled MEC or SS PCB is removed. The over-ride period includes any motor power off time created through other means such as if the motor was controlled by a thermostat, the motor switching on or off during the over-ride period would not extend the over-ride period.

When the over-ride timer is in operation the LED 2 on the **LPTimer** PCB will flash three times to indicate that it is in over-ride and if a PC is connected to the **LPTimer** PCB and data capture is enabled then you will see that the "Over-Ride" System Status button will change from Red to Green as is shown below.
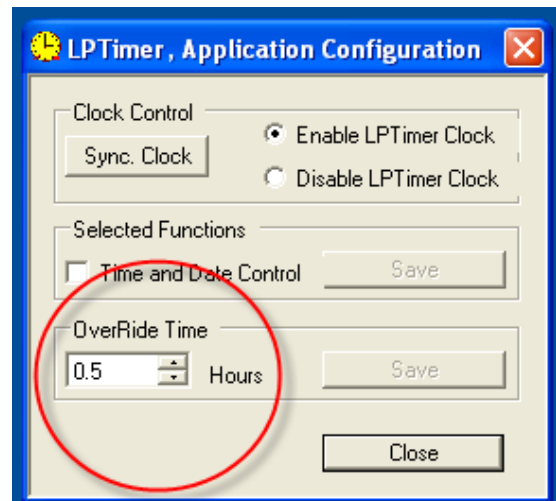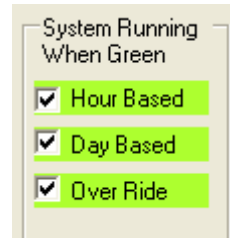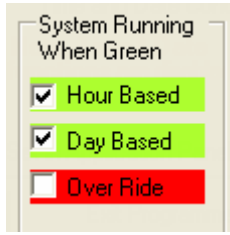
4.3.2 COMMISSIONING – TIME AND DATE MANAGEMENT

This function requires little explanation if you have familiarized yourself with the basic operation as detailed in Sections 4.2.2 and 4.2.3.

Initially set up the operating hours for each day; you can independently set up to three "On" and "Off" times in a given twenty four hour period and can independently set different times for each day of the week.

When setting operating times be careful to understand the demands of the application such that for example on a vending application, you may have the unit turn off at the end of the shop opening hours however if you want the goods to be cold when the shop opens in the morning then the system will have to be started a few hours prior to opening.

Never use Date or Time Management where perishable goods are being cooled!

The date function runs for a period of ten years from the date the real time clock within the **LPTimer** is synchronised with the clock on the PC. It is possible therefore to set exclusion dates up to ten years in advance.

On days where the unit is identified as being excluded from operation the software will continue to run however the "Day Based" running indicator on the Interface Module window will be red.

It is possible to use the left hand mouse to highlight many dates simultaneously to create a period of exclusion beyond one day.

4.4 PCB MOUNTED LED INDICATORS

LED 1	Not Assigned	.
LED 2	LPTimer Operational Status	**This LED has multiple indications as follows:** Continuous – Normal Run 1 Flash – Run mode inhibited by time clock 2 Flash – Run mode inhibited by calendar. 3 Flash – Motor running in Over-Ride mode.
LED 3	Power	The LPTimer PCB is powered

Note that LED 1 through LED 3 are in one bank adjacent to the main CPU connector on the PCB.

4.5 PCB MOUNTED BATTERY

The **LPTimer** has an on board battery to maintain the time, date and over-ride time functions. The battery has an extended life thanks to the power management inbuilt into the timer control chip. If the timer ceases to function then replace the battery with a 3V Lithium CR1220 or equivalent. It is imperative that you insert the battery the correct way, positive face up, otherwise damage may be caused to the timer chip.

If the battery is replaced it is wise to re-synchronize the **LPTime**r timer to ensure that time and date registration has not been lost. The **LPTimer** will retain the time and date settings for a short period, (approximately 5 minutes), without the battery in place.

END OF INSTALLATION AND COMMISSIONING GUIDE