M851 Periodic Task Design



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1 Introduction

The M851 Kernel is a platform that is geared for developing a variety of applications that can be incorporated into the operating system during power up or downloaded to EEPROM through USB Datalink communications.

This document serves as a guide for developing one type of application referred to as a Periodic Task. The periodic task is executed only if the TOD is the foreground application. It is sub-divided into tasks that are executed based on the the events occurring in the primary time zone. These events are the following:

- Minute updates
- Hour updates
- Day updates

The periodic task can be used to do the following features:

- Automatic forward/backward update at specified daylight-savings-time
- Visual effects during any of the periodic task events (minute, hour or daily)
- Screen savers
- Etc.

1.1 Applicable Documents

The following documents serves as references in the creation of this document.

- M851 Application Design Guide
- M851 WristApp API Reference Guide
- S1C88349 Core CPU Manual

2 Overview

The periodic task are executed when specific update events from the primary time zone are detected. The flowchart shown below shows when a specific periodic task is executed. The periodic tasks are highlighted in gray. Take note that the TOD update and display occurs first prior to the execution of the periodic task.



3 Bus Clock Speed Notes

By default, the bus clock is at 32768Hz. The following conditions below indicates when the MCU switches to a 2Mhz bus clock.

- When the system detects that a periodic task is to be executed, it will check if the correct periodic task code is loaded into the overlay memory area. If the task is already loaded, it will execute it immediately and not change the bus clock setting. If not, the system will increase the MCU bus clock to speed up loading the code from EEPROM.
- When an hour or day update is detected, the system will increase the MCU bus clock to speed up processing of all the system tasks that needs to be processed during these conditions.
- When a switch or ring event is to be processed by the application, the system will increase the MCU bus clock speed. It will automatically go back to the lower bus clock setting after 5 seconds.

4 Resetting the WatchDog

It is recommended that the periodic task complete its processing in the shortest possible time. When processing of the periodic task takes longer then 2 seconds, then the reset watchdog API must be included at certain location in the code to prevent the MCU from resetting.

5 Code File Structure

The code file uses the variable-size random access structure having 4 records. The task for seconds update is not supported in the M851, but it should still have its own record structure. The following diagram shows the code file structure of a periodic task.



Allocation Size

A 16-bit quantity that specifies the number of bytes that is alloced in the EEPROM for the periodic task code. This value is a multiple of 64 bytes. This optimizes the download speed during communications.

NumberOfPages = DatabaseSize / 64
If (DatabaseSize mod 64) > 0 then
 NumberOfPages = NumberOfPages+1
Endif

	Allocation	Size = NumberOfPages * 64			
Database Size	A 16-bit quantity that specifies the number of bytes of the actual code file.				
	DatabaseSize = Offset(L) - Offset(A)				
Number of App Specific Information	An 8-bit quantity that specifies the number of bytes stored in the application specific header.				
	NumAppInfor =	Offset(D) - Offset(C)			
Number of Records	A 16-bit quantity that indicates the number of records in the code file. This field is always 0x0004.				
Periodic Task Control Byte	An 8-bit quantity that specifies the available tasks stored in the code file. This will be used by the M851 OS to check if a particular task is available in the code file prior to loading it into the overlay memory. If a bit is set, the task code must be				
	Bit Description				
	BitDescription10000000BDay task available				
	0 1 000000B	Hour task available			
	00 1 00000B	Minute task available			
	000 1 0000B	Second task available (not supported)			
Second Task Offset	A 16-bit quantity sp second task code is	becifying the base offset of the record where the stored.			
	SecondTaskOff	<pre>set = Offset(H) - Offset(D)</pre>			
Minute Task Offset	A 16-bit quantity sp minute task code is	becifying the base offset of the record where the stored.			
	MinuteTaskOff	set = Offset(I) - Offset(D)			
Hour Task Offset	A 16-bit quantity sp hour task code is ste	becifying the base offset of the record where the ored.			
	HourTaskOffset = Offset(J) - Offset(D)				
Day Task Offset	A 16-bit quantity sp day task code is sto	becifying the base offset of the record where the red.			
	DayTaskOffset = Offset(K) - Offset(D)				
Second Task Code Record	The record contains Field	s three fields: Description			
	Code Size	Number of bytes of entire record. RecordSize = Offset(I) - Offset(H)			
	0xFC	Indicates the task type.			
Minute Task Code Record	The record contains	s three fields:			
	Field	Description			
	Code Size	Number of bytes of entire record.			

		RecordSize = Offset(J) - Offset(I)
	0xFD	Indicates the task type.
Hour Task Code Record	The record contains	three fields:
	Field	Description
	Code Size	Number of bytes of entire record.
		RecordSize = Offset(K) - Offset(J)
	0xFE	Indicates the task type.
Day Task Code Record	The record contains	three fields:
5	Field	Description
	Code Size	Number of bytes of entire record.
		RecordSize = Offset(L) - Offset(K)
	0xFF	Indicates the task type.

6 Screen Saver: Putting it all together.

This section will go through the process of building a periodic task that will implement a simple screen saver. During a minute rollover, it will clear the display and prevent the TOD application from refreshing the time. The display will be restored when user switch inputs are detected.



WARNING: There is no debugging capability once the periodic task is downloaded into the watch. You will either have a fully operational periodic task or the watch resets during periodic task execution.

6.1 Files

The minute periodic task will be coded into one file while the rest will be created by the periodic task utility (which are RET by default).

FileDescriptionblank.asmMinute task to blank out the display.

6.2 Directory Structure

The build scripts requires a specific directory structure to facilitate location of required files. Create the required directories for the application prior to using the build utilities.

- All source files are to be stored under the C:\M851\APP\appname\SRC directory.
- All header files are to be stored under the C:\M851\APP\appname\H directory.
- All build scripts will be created under the C:\M851\APP\appname\BUILD directory.
- Output files during periodic task creation will be in the C:\M851\APP\appname\BUILD directory.
- All executable files will be located in the C:\M851\BIN directory.
- All the M851 header and macro files will be in the C:\M851\INCLUDE directory.
- The assembler, linker and locator executable will be located in the C:\C88 directory.

The figure below shows a snapshot of the blank directory structure:



The figure below shows the file list for the blank periodic task source files:

C:\m851\app\blank\src	
<u>File E</u> dit <u>V</u> iew F <u>a</u> vorites <u>T</u> ools <u>H</u> elp	**
🚱 Back 🔹 🕥 - 🏂 🔎 Search 🔊 Folders [-
Address C:\m851\app\blank\src	🛩 🄁 Go
Folders ×	blank.asm
🖽 🖾 average 🔷 📘	3 KB
🔁 build	
in since a second secon	
🗉 🧰 chrtod	
🗄 🧰 Copy of timewarp	
🗄 🥅 counter	
🖿 🛄 demo 🛛 💉	

6.3 Coding the Periodic Task

6.3.1 Definitions

There are no definitions required for this periodic task.

6.3.2 Variables

A periodic task cannot use the ASD or ADD for data storage. It can however allocate a specified number of bytes in the code and treat it like RAM since the code itself is located in RAM area. There are no variables required for the blank periodic task.

6.3.3 Suspending TOD Seconds Update

The TOD application uses 3 Time Zone Resource. Only one TZ resource is designated as the primary time zone. The TOD application requests the primary time zone resource to send a display event every second for display purposes.

For the screen saver, it will suspend the resource's display events using the following code:

```
; disable both second and minute updates from the primary time zone resource ld A, [COREPTZINdex]
KTOD_DEACTIVATE_ALL_DISPLAY_UPDATES
```

6.3.4 Blank Screen Saver Code

The following code is the complete screen saver implementation.

```
*****
; Periodic Task: Screen Saver - Blank Screen
; Written By: Nino L. Sarmiento
; File Change History:
 05/14/2003 NLS - Created file
;
; Definitions
IF @DEF('SUBROUTINE')
   UNDEF SUBROUTINE
  ENDIF
  DEFINE SUBROUTINE "'ScreenSaverTask'"
    jr
      ScreenSaverTask
    ;
; DATA AREA
; no data required for this task
```

```
;
; CODE AREA
;
ScreenSaverTask:
        ; DISABLE TOD UPDATES
        ***
        ; disable both second and minute updates from the primary time
zone resource
        ld
            A, [COREPTZIndex]
        KTOD_DEACTIVATE_ALL_DISPLAY_UPDATES
        ; clear display
        LCD_CLR_DISPLAY
ScreenSaverTaskExit:
        ; All periodic task must exit through this section.
        ; The periodic task builder will insert code to complete task.
```

6.4 Creating the Periodic Task

This section will guide you to a series of steps to build a Periodic Task. At this point, it is assumed that all files required for the periodic task has been coded (and hopefully reviewed). A Periodic Task Builder utility is provided in the SDK package that will facilitate the process. The utility is located in the C:\M851\BIN directory.

M851 Periodic Task Design

Application Name Boneen Saver - Blank Folder Name Marik Description Blanks out display every minute solover Version Required 951018 PC Interface Periodic Task Control Allow Minute Task Execution Allow Day Task Execution Allow Day Task Execution Allow Day Task Execution Keader Directory C:\m851\app\blank\size Build Directory C:\m851\app\blank\size Assembler Directory C:\m851\app\blank\size C:\m8	Loois Gep	<u></u>	
Periodic Task Control Allow Minute Task Execution Allow Hour Task Execution Allow Daly Task Execution Header Directory C/m851/sap/blank/h Source Directory c/m851/sap/blank/build Include Assembler Directory c/m851/sap/blank/build Include Include Include Directory c/m851/sap/blank/build Include Inc	Application Name Folder Name Description Version Required PC Interface	Scieen Saver - Blank blank Blanks out display every minute rollover 951018	Application Minute Task File C:\m851\app\blank\ssc\blank.asm Hout Task File Day Task File
Source Directory c:\m851\app\blank\arc Build Directory c:\m851\app\blank\build Include Directory c:\m851\include Assembler Directory c:\m851\include Create Build Scripts Run build Scripts Create Build Scripts Create Periodic Task	-Periodic Task Con	trol	
Build Directory @\m851\app\blank\build Include Directory @\m851\include Assembler Directory @\m851\include Create Build Scripts File Flue Periodic Task Periodic Task Downloader	Allow Minus	a reak Execution	
Include Directory Create Build Scripts Create Build Scripts Create Periodic Task Analyze Periodic Task Periodic Ta	Header Directory	ask Execution Task Execution ask Execution ask Execution ask Execution	
Assembler Directory CNc68 Add File Remove File Create Build Scripts Create Periodic Task Analyze Periodic Task Periodic Task Downloader	Header Directory Source Directory Build Directory	Constant Constants Constant Co	
Create Build Scripts Run Build Scripts Create Periodic Task Analyze Periodic Task Periodic Task Downloader	Allow Minus Allow Hour Allow Daly Header Directory Source Directory Build Directory Include Directory	c.\m851\app\blank\b c.\m851\app\blank\b c.\m851\app\blank\build c.\m851\app\blank\build	
Create Build Scripts Run Build Scripts Create Periodic Task Analyze Periodic Task Periodic Task Downloader	Header Directory Allow Hour Allow Hour Allow Daly Header Directory Source Directory Build Directory Assembler Directory	c.Vm851\app\blank\br c.Vm851\app\blank\br c.Vm851\app\blank\br c.Vm851\app\blank\brid c.Vm851\app\blank\brid c.Vm851\app\blank\brid	Add File Filemove File
	Allow Minu Allow Hour Allow Daly Header Directory Source Directory Build Directory Include Directory Assembler Directory	ak Execution Task Execution [c:\m851\app\blank\in [c:\m851\app\blank\inc [c:\m851\app\blank\inc [c:\m851\app\blank\inc [c:\m851\include [c:\m851\include	Add File Remove File

Section	Description
Periodic Task Control Byte	Indicates the available task when this periodic task code is loaded into the watch.
Directory Map	Shows the locations of source files, executables, include files, and assembler files.
Periodic Task Info	Data source to fill out the *.TSK file used by the PIM to download a periodic task to a watch.
Source File Map	A hierarchal view of the files associations to the actual periodic task function.



NOTE: The information displayed in the utility is stored in a file *APPNAME*.PSC. The file is created when the build scripts are generated or it was saved through the **File****Save** menu. The file is stored in the build directory of the application.

6.4.1 Periodic Task Control Byte

This control byte will be used by the M851 OS to determine the availability of the specific periodic task code in EEPROM. If the box is unchecked, even if the code is available in the code file, it will not be executed by the M851 OS.

6.4.2 Directory Map

Specifies the directories that will be used in the creation of the build scripts.

6.4.3 Periodic Task Info

Fill up all the required information in periodic task info section.

Field	Description
Application Name	Descriptive name of the application.
Folder Name	Indicates the application folder name. Entering data in the Folder Name text box will automatically fill up the required entries in the Directory Map section.
Description	A brief description of the application.
Version Required	Indicates the M851 firmware version that the periodic task is referencing.

6.4.4 Source File Map

Add the files associated with the different application sections.

Section	Description
Second Task File	The source code to be located in the second task record. Second Task is not supported by the M851 OS version 018.
Minute Task File	The source code to be located in the minute task record.
Hour Task File	The source code to be located in the hour task record.
Daily Task File	The source code to be located in the daily task record.

There are two procedures in adding files into each section of the Source File Map.

- Using the Add File button;
- Using Drag & Drop method from File Explorer.

Adding a File using the Add File button.

Click on a section where the new file is to be added (the figure shows the "Minute Task File" being selected. Then click on the "**Add File**" button to open up the Open dialog window.

Rev 1.0

pproductin champed	14	Source File Setup
Application Name	Screen Saver - Blank	□ Application
Folder Name	blank	Minute Tesk File
Description	Blanks out display every minute rollover	- Day Task File
Version Required	851018	
PC Intelface	-	
Periodic Task Cor V Allon Minu Allon Hour Allon Daly	kol Ia Task Esocution Task Execution Task Execution	
Header Directory	c:\m851\app\blank\h	
0	c:\m851\app\blank\arc	
Source Directory		
Build Directory	c:\m851\app\blank\build	
Source Directory Build Directory Include Directory	c:\m851\app\blank\build .	
Source Directory Build Directory Include Directory Assemble: Directory	c-1m851\app1blank\build c-1m851\include c-1c88	Add File Remove File

Select the file to be added in the section and click **Open**. The figure below shows the file "BLANK.ASM" selected.

Open					? 🗙
Look in My Recent Documents Desistop My Documents	: 🔁 src Bitlank.aom		1	^ب ک ک	
My Network Places	File game: Files of type:	blank.asm Source Files (".asm) Open as (ead-only			Open Cancel

After this operation, the file BLANK.ASM will be added under the "Minute Task File" section. See figure below.

plication Parameter	*	Source File Setup
opplication Name	Screen Saver - Blank	Application
older Name	blank	☐ Minute Tesk File
escription	Blanks out display every minute rollover	- Hour Task File
fersion Required	851018	— Day Task File File.
°C intelface		
The Alleria Lines.	Test Description	
Allow Pade Allow Daly	Lass Execution Task Execution	
In Alion Daily	c:\m851\app\blank\/n	
Internet Directory	c:\m851\app\blank\h c:\m851\app\blank\h c:\m851\app\blank\h c:\m851\app\blank\h	
Header Directory Source Directory Suid Directory notade Directory	c:Im851\app1blank\build c:Im851\app1blank\build c:Im851\app1blank\build c:Im851\app1blank\build c:Im851\app1blank\build	
Header Directory Nucle Directory Nucle Directory Nucle Directory Nucle Directory	I ask Execution Task Execution Ic:Im851\app\blank\\n Ic:Im851\app\blank\src Ic:Im851\app\blank\sudd Ic:Im851\include Ic:Im851\include	Add File Remove File

Adding a file using File Explorer.

Click on a section where the new file is to be added (the figure shows the "Header File" being selected.

Mool Periodic 13	EX DURDET		(L) (L
Tools Help			
Application Parameter	8	Source File Setup	
Application Name	Screen Saver - Blank	E- Application	
Folder Name	blank	Minute Task File	
Description	Blanks out display every minute rollover	- Day Task File File	
Version Required	851018		
PC Intelface			
Periodic Task Cor Periodic Task Cor Allow Hour PAllow Hour Now Daily	kol e Taok Execution Taok Execution Taok Execution		
Header Directory	c:\m851\app\blank\h		
Source Directory	c:\m851\app\blank\arc		
Build Directory	c:\m851\app\blank\build		
Include Directory	c:\m851\include		
Assemble: Directory	6:3088	Add File Remove File	
Create Build Scripts	Run Build Script: Cleate	odic Task Analyze Periodic Task Pe	nodic Task Downloader
du .			5/15/2003 9.45.AM

Open File Explorer and select the files to be added. Then click on the highlighted files and drag them over the Source File Setup List window.



After this operation, the file BLANK.ASM will be added under the "Minute Task File" section. See figure below.

Application Parameter	18		Source File Setup	
Application Name	Screen Saver - Blank		E- Application	
Folder Name	blank		Minute Tesk File	
Description	Blanks out display every minute rollo	over	- Hour Task File	ni, asin
Version Required	851018		- Day Task File File	
PC Intelface				
Periodic Task Con Allow Minut Allow Hour Allow Daily	lool le Taek Essocution Taek Execution Taek Execution			
Header Directory	c:\m851\app\blank\b			
Header Directory Source Directory	c=1m851\app\blank\b c=1m851\app\blank\src			
Header Directory Source Directory Build Directory	c:1m851\app\blank\h c:1m851\app\blank\h c:1m851\app\blank\build			
Header Directory Source Directory Build Directory Include Directory	e-Im851\app\blank\h e-Im851\app\blank\m e-Im851\app\blank\build e-Im851\include			
Header Directory Source Directory Build Directory Include Directory Assembler Directory	c:\m851\app\blank\b c:\m851\app\blank\br c.\m851\app\blank\br c.\m851\app\blank\build c.\m851\include c.\c88		Add Trie Remove File	

6.4.5 Saving the Current Workspace

Selecting **File****Save** menu option will store the current workspace under the filename C:\M851\APP\appname\build\appname.psc. It can be loaded again by using the **File****Open** menu option.

6.4.6 Creating the Build Scripts

Clicking on the "Create Build Scripts" button will create all the required scripts that automates the assembly and linking of the source files. All script files will be created under the C:\M851\APP\appname\BUILD directory. This process will also save the current workspace under the filename C:\m851\app\appname\build\appname.psc.



Once the build scripts are created, it is not required to create them again during the debugging process.

6.4.7 Executing the Build Scripts

Clicking on the "Run Build Scripts" button will execute all the scripts generated in the previous section. This process will open up a command window where all the required scripts are executed. The build process will take some time to complete.



C:\WINDOWS\System32\cmd.exe					- 🗆 🗙
Could Not Find C:\m851\app\blank\build\ Could Not Find C:\m851\app\blank\build\ Could Not Find C:\m851\app\blank\build\ Could Not Find C:\m851\app\blank\build\ Could Not Find C:\m851\app\blank\build\	*.err *.lnl *.cal *.bak *.ers				
EØC88 assembler v1.2 r2	SN00088242-048	(c)	1999	TASKING,	Inc.
Section summary:					
NR ADDR SIZE CYCLE NAME 1 00F31A 0003 3 .text E0C88 object linker v1.2 r2 E0C88 locator v1.2 r2	SN00088242-018 SN00088242-027	(c) (c)	1999 1999	TASKING, TASKING,	Inc. Inc.
EØC88 assembler v1.2 r2	SN00088242-048	(c)	1999	TASKING,	Inc.
Section summary:					
NR ADDR SIZE CYCLE NAME 1 00F31A 000f 20 .text E0C88 object linker v1.2 r2 E0C88 locator v1.2 r2	SN00088242-018 SN00088242-027	(c) (c)	1999 1999	TASKING, TASKING,	Inc. Inc.
EØC88 assembler v1.2 r2	SN00088242-048	(c)	1999	TASKING,	Inc.

Build Window

A successful build of the code sections for the periodic task will generate the following SRE files:

- DAILY.SRE
- HOUR.SRE
- MINUTE.SRE
- SECOND.SRE



NOTE: Wait until the build process is complete. Do not click on the "Create Periodic Task" button until the command window is closed.



WARNING: Executing the build scripts does not nescessarily mean that all the code sections has been compiled properly.

6.4.8 Creating the Periodic Task Downloadable File

Clicking on the "Create Periodic Task" button will create the files that are downloaded to the watch.

Create Periodic Task

If all the code sections has been compiled properly with no compile and build errors, the distribution files are generated for download and testing.



The distribution files are described below:

File	Description
appname.tsk	This file is required by the PIM. This contains information about the periodic task such as: the code file, firmware version requirements and descriptive comments.
	The appname is the name of periodic task.
appname.txt	Description file for the PIM. This is a template only. Modify this template and save it under another directory for distribution
appname_code_nnn.bin	This is the Periodic Task code stored in a format that the watch can readily grab the correct section to be loaded into the overlay area for execution.
	The appname is the name of the periodic task. nnn is the version number of the required M851 firmware.

For the blank periodic task, these are the following files generated:

- blank.tsk
- blank.txt
- blank_code_018.bin

If there are no errors in the source files, all the required files to build the downloadable file will be available and executing the Create Periodic Task Downloadable Files would be completed.

If the Create Periodic Task button displays a message indicating that a ???????.SRE is not found (as shown in the screen snapshots below), this indicates that the build script was unable to complete compiling the section due to errors in the source files attached to a section.



Source files attached to the MINUTE section have errors.

If an error exists then you can view the source of the errors by opening the following files:

File	Description
sourcename.ers	This error file is generated by the assembler (AS88.EXE). If

	successful, the output of the assembler is an OBJ file.
	The sourcename could be the section that generated the error.
sourcename.elk	This error file is generated by the linker (LK88.EXE). If successful, the output of the linker is an OUT file.
	The sourcename could be the section that generated the error.
sourcename.elc	This error file is generated by the locator (LC88.EXE). If successful, the output of the locator is an SRE file.
	The sourcename could be the section that generated the error.

To incorporate this periodic task into the PIM, copy the above files into the APP directory of the PIM.

6.4.9 Periodic Task Memory Usage Analysis

Clicking on the "Analyze Periodic Task" button will open up a window that shows the memory usage of the periodic task and determines if it can fit in the overlay memory area of the M851. A sample display is shown below. The maximum state usage must not execced the 900 byte limit of the overlay area.

Analyze Periodic Task

🚰 Periodic Task Script B	uilder	
Code File: bla	ank_code_018.bin	
Periodic Task Control Byte	0x20 (Min)	
EEPROM Memory Usage	64	
Code Size	52	
Maximum State Usage:	15	
Overlay Size:	900	
Periodic Task Second Task (not supported) Minute Task Hour Task Daily Task	Memory Usage 3 15 3 3 3	
	OK	

6.4.10 Downloading and Testing the Periodic Task

Clicking on the "Periodic Task Downloader" button will execute the "**M851 Periodic Task Download Utility**". Once open, click on the "**Browse**" button and select the *appname*.tsk indicated in the previous section.

Period	lic Task Downloader	
PeriodicTask Download		
c:\m851\app\blank\build\blank	tsk	Browse
[Periodic Task] Name=Screen Saver - Blank Description=Blanks out display e Version Required=018 CODE=blank_code_018.bin App Interface=	very minute rollover	APP Interface

Connect the watch to the PC using the USB cable. Once the watch displays "COMM READY", click on the "**Download**" button of the utility.

		Contraction of the local division of the loc
(LAP	**** ⁷ 88.88.8	
		Ŧ
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C.		HHH -
Ø		



NOTE: The M851 Periodic Task Download Utility can be executed directly. It is located in the C:\M851\BIN directory.

6.4.11 Creating a Description File

Prepare a description file that will be used by the PIM to describe the periodic task. The filename is the same as the task file name. In this example, the description file is: BLANK.TXT. The text below shows a sample entry for the description file.

```
PERIODIC TASK: SCREEN SAVER - BLANK OUT
Description:
```

A "screen saver" for the TOD application. Once activated during a minute rollover, it will clear the display and prevent the TOD application from refreshing the display during updates.

The display will be restored during user switch inputs.

```
Usage:
------
NONE
Files:
------
blank.tsk - application info
blank.txt - application description (this file)
blank_code_018.bin - application code
```

6.4.12 Distributing the Periodic Task

The following files generated by the system and one manually created by the user will be used for distribution of the periodic task.

Filename	Description
application_name.TSK	Information file required by PIM.
application_name. TXT	Description of the periodic task and its operation.
application_name_CODE_018.BIN	Periodic task code.
application_name_DBASE_018.BIN	Periodic task database file.
application_name.DLL	Periodic Task PC interface

The blank periodic task distribution files:

Filename	Description
BLANK.TSK	Information file required by PIM.
BLANK.TXT	Description of the periodic task and its operation.
BLANK_CODE_018.BIN	Screen Saver - Blank code.

7 Trademarks

TIMEX is a registered trademark and service mark of Timex Corporation. TIMEX DATA LINK and WristApp are trademarks of Timex Corporation in the U.S. and other countries.

Night-Mode is a registered trademark of Timex Corporation. INDIGLO is a registered trademark of Indiglo Corporation.