



HAMILTON DIGITAL DESIGNS LTD.

## USER MANUAL

PR04200, PR04203, PR06035  
Hockey Scoreboard Controllers

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## Quick Start Guide

### Starting a New Game

1. Press **NEW GAME** then **CLEAR**
2. Press '1' for timer direction down
3. Press **ENTER** if period is OK
4. Press **ENTER** if minutes is OK
5. Press **ENTER** if seconds is OK
6. Press **ENTER** if 1/100 seconds is OK

### Timer Operation

1. **GAME TIMER RUN** to start
2. **GAME TIMER HOLD** to stop
3. **SET TIMER** to correct Game Time
4. When Period is finished, press **PERIOD** to advance to the next one

### Intermission/Warm Up

1. Press **INTERMISSION**, to switch to intermission/warm up
2. Press **TIMER RUN/HOLD** to start/pause intermission timer
3. To END INTERMISSION/WARMUP, press **RECALL, INTERMISSION**, then enter a time of 0:00

### Scoring

1. Press **SCORE** (either HOME or GUEST)
2. For corrections, press **RECALL, SCORE** and enter a corrected score

### Penalties

1. Press **PENALTY** (Home or Guest)
2. Press **ENTER** for normal penalty or **ALT PEN** for delayed penalty or misconduct
3. Enter player number and press **ENTER**
4. Enter penalty minutes and press **ENTER** (or just **ENTER** for default)
5. Enter penalty seconds and press **ENTER** (or just **ENTER** for default)
6. To cancel a penalty after a power-play goal, press **RECALL, PENALTY** (Home or Guest), **CLEAR, ENTER**

### Displaying Time of Day on Scoreboard

1. Press **RECALL, TIME OF DAY** to switch to Time of Day display
2. Press **RECALL, SET TIMER** to switch back to Game Timer display

### Entry of Team Names

1. Press **TEAM NAMES** (Home or Guest)
2. Pressing a key on the numeric keypad cycles through a set of letters accessible by that key
3. Press '+' to advance to the next character, '-' to go back
4. Press **ENTER** when finished
5. When starting a new game, press **RECALL, TEAM NAMES** to display the last entered name

## 1. Introduction

This manual describes the model PR04200 and model PR04203 hockey scoreboard Controllers. Note that these Controllers get their operating power from the scoreboard and will not function if disconnected from the scoreboard.

## 2. Features

### 2.1. Displays Controlled

- Main Timer with "last minute timing" feature
- Time of Day
- Scores to 99 (optionally to 199)
- Horn (end of period, end of time-out, auto-horn, manual)
- Period
- Shots-on-goal
- Penalties
- Team Names

Note: Not all models of scoreboards display all of the above information. Team Name capability might not be available on all controllers.

### 2.2. Horn

This scoreboard normally sounds the horn for 5 seconds at the end of each period, and for 2 seconds at the end of a time-out or warm-up. In addition, the horn can be set to sound (for 2 sec) at a specified repetition rate during the period (the auto-horn feature - see section 3.3). The horn can also be operated manually from the keyboard.

### 2.3. Keyboard and LCD Display

A keyboard is provided to allow the user to communicate with the controller. This has individual push-buttons which correspond to the displays being controlled, and a 4x4 telephone-style keypad for entry of numbers and team names. An audible beep should be emitted every time a key is pressed. A longer than usual beep is used to indicate a possible mistake. A two-line LCD display is provided for communication with the operator.

### 2.4. Timing

The timer can display either the elapsed time (count-up mode) or the time remaining in the period (count-down mode). Normally, minutes and seconds are displayed, but a 'last-minute timing' option can be selected. This changes the display to seconds and hundredths during the final minute of a period in count-down mode. A setup option is also available to blank the last digit of the timer so that only tenths of a second are shown. A period is displayed between the seconds and tenths or hundredths, instead of the normal colon, to show that last-minute timing is in effect. Timing can be stopped/started using the **TIMER HOLD** and **TIMER RUN** keys. Alternately, on some controllers, an external switch can be connected which will toggle the run/hold status.

The controller also maintains a time-of-day clock which can be displayed when no game is in progress.

The penalty timers always operate in synchrony with the game timer seconds display, but they can be paused without stopping the game timer by using the **PENALTY RUN/HOLD** keys.

## 2.5. Data Protection

The game timer, time-of-day clock and most of the game data are protected by a 'supercap', which is similar to a rechargeable battery. This should last for 24 hours or more, and regains its charge within a few minutes once power is reconnected. The time-of-day clock will continue running under these conditions, but other functions, such as the game timer, are just frozen at their current value. Fractions of a second in the game time will be lost (set to zero). After a power outage, the game timer will be on hold, but penalty count-downs will be enabled.

The auto-horn duration, period and intermission lengths, time-out reset value and timer direction are stored with the configuration data in the setup memory. This memory is completely non-volatile and should not be affected by a power outage of any duration.

The setup data can optionally be protected by a 4-digit password (P.I.N.). If enabled, this password will also be required before the user can set the time-of-day clock.

If the Controller is disconnected from the scoreboard, the board will switch to time of day display after about a minute (if this is not already being shown). The scoreboard also has an internal clock with supercap backup, and will attempt to display time of day on its own if powered up without the Controller.

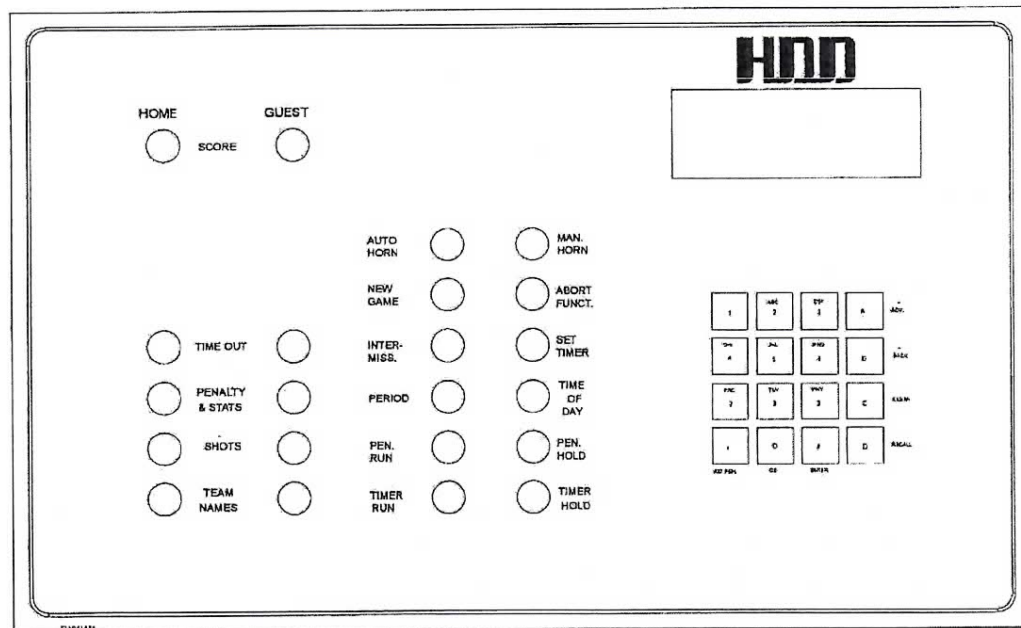


Figure 1 - Controller Layout

### 3. Operating Instructions

#### 3.1. Software Setup

The controller has a separate memory for setup data which is non-volatile (EEPROM) and should not change in normal use. For this Controller many of the features are fixed, and only a few can be changed by using the setup function.

To change the setup, press **RECALL** at power-up (while the HDD software number is displayed). Setup is also forced if the exiting setup data is unreadable. In either case, the controller should display "Push ENTER for Setup". If a P.I.N. has been set, the user is required to enter it. The user is then asked to specify the following items:

Is the last-minute timing feature wanted? (NO/YES)  
 Display 100ths of a sec. in last minute? (NO means show 10ths)  
 24-hour time-of-day clock format? (NO/YES)

To set or change the P.I.N., press **RECALL** while the first prompt is displayed. Any of the keys in the left-hand block can be included, except **CLEAR** and **RECALL**. Entry of a PIN of four **CLEARs** will remove the PIN completely.

#### 3.2. LCD Operation and Status

The LCD display is used to guide the operator when new data is being entered or to show the status of the controller. When data is not being entered, the LCD display will normally show:

```
Game Timer mm:ss.cc
P-Run mm:ss mm:ss
```

On line 2, 'P-Run' may be change to 'P-Hld' if penalty count-downs are not enabled. (Normally, penalties will count down whenever the game timer is running.) The two 'mm:ss' combinations on line 2 of the LCD display are the time remaining in the first Home and Guest penalties. They will be blank if there are no outstanding penalties. If the time includes an asterisk '\*', the penalty is a misconduct. On line 1, 'mm:ss.cc' is the time remaining (or elapsed time, if counting 'UP'). Note that the 1/100ths of a second are not accurate unless the timer is on Hold. Note also that if the timer is counting 'DOWN', the value displayed on the scoreboard will be rounded up. For example, 12:34.56 on the LCD display will become 12:35 on the scoreboard.

If the timer is counting up for an indeterminate time (period length = 0), then a different display will be shown:

```
Event Timer
h:mm:ss.ccc
```

This display is similar to the normal game timer display, but includes hours and thousandths of a second, although these are not shown on the scoreboard.

If time of day is being displayed, the LCD will show:

```
Time of Day
hh:mm:ss xm
```

('xm' is 'am' or 'pm', or blank if 24-hour format was selected during setup.)

During an intermission or time-out, the time remaining in the intermission or time-out will be displayed on the scoreboard and the LCD, as "mm:ss. "; the minutes 'mm' will also be blank during a time-out.

The controller should abort a function in progress and switch back to the status display if no keys are pressed for about 2 minutes.

On power up, or after a reset, the controller should display the software identification number on line 1 of the LCD for about 2 seconds. It should then revert to the display that existed before it was switched off. If the down time has been too long, so that all data (except setup) have been lost, the controller will jump into the NEW GAME function, to ensure that all data are reset. If this happens, the time-of-day clock will probably also need to be set.

If the controller is not showing the normal status display, try pressing the **ABORT FUNC** key. If that fails, try re-setting the controller by temporarily disconnecting the control cable.

### 3.3. Right-hand Keypad

These keys are used to enter values for the functions described below. Apart from **D=RECALL**, they are ignored if not preceded by a function key. Use of the **ALT PEN** key (bottom left) is described later under 'PENALTY'.

**Numeric Keys** - These keys are used to enter numbers for period number, scores, shots on goal, player numbers, and times. In all cases, an identifying phrase and a suggested new value is displayed on the LCD. "Correct & push ENTER" will normally be shown on the second line. For the period number, the suggested new value is one more than the current value. For scores and shots, see section 3.6. In other cases, the suggested value is either the current value or a suitable default value.

**+ /A & - /B** - In most cases these keys merely add or subtract 1 from the current value, but they are also used to step through the penalty list for a team when editing penalties.

**CLEAR/C** - This key changes the value to blank or zero, whichever is more appropriate.

**RECALL/D** - This key restores the original suggested value, or takes the function back to the previous number in a multiple number sequence like a time. If **RECALL** is pressed before **SCORE** or **SHOTS**, the entry mode for these keys is changed from 'instant action' to 'dialogue'. **RECALL** before **TIME OF DAY** or **SET TIMER** has the opposite effect; it allows a quick change of display mode with no dialogue.

**ENTER** - This key makes any changes part of the displayed data, and moves on to the next entry in a multiple number sequence. Pressing any other function key (including **ABORT FUNC**) will abort the current function without changing the current value, and move immediately to the new function.

For some entries, such as timer direction, only two or three values are possible. In these cases the expected keys should be displayed on line 2 of the LCD, for example "0=Up, 1=Down". Not shown is the fact that the **ENTER** key will also be accepted; this just leaves the setting unchanged. (Useful, for instance, when skipping quickly through the Setup procedure).

### 3.4. Centre Function Keys

These keys allow the operator to select functions to be updated or changed that are not specific to a particular team.

**AUTO HORN** - Displays "Auto-horn mins nn", where nn is the current auto horn minutes setting. Use the numeric key-pad, as described above, to enter a new value. The maximum value allowed is 10 minutes. Next, "Auto-horn secs nn:nn" is displayed. Enter the number of desired seconds. The maximum is 59. A short (2-sec) horn will be sounded after every 'mm:ss' minutes and seconds of elapsed time. If the auto-horn setting is zero, the auto-horn feature will not operate, but there will still be a short (2-sec) horn at the end of a time-out or warm-up and a long (5-sec) horn at the end of a period. The auto-horn setting is held in non-volatile memory and restored at power up.

**MANUAL HORN** - Causes the horn to sound immediately, for as long as the key is pressed. The controller's beeper will sound at the same time.

**NEW GAME** - The LCD displays

"New Game: Push CLEAR"

Press **CLEAR** to clear the period number, scores, shots, penalties and any incomplete intermission or time-out. The LCD should then show:

"Timer Direction? D" (or U)  
"Press 0=Up or 1=Down".

Press **'0'**, **'1'** or just **ENTER** to continue with the current setting. **NEW GAME** then runs into the **PERIOD** function, described next, with a suggested period number of 1.

To start a display-test sequence, press **NEW GAME** followed by **RECALL**. This should cause all the numeric digits on the score-board and LCD display to count upwards repeatedly from 0 to 9, at one count per second. The indicators and relays should be energized for one second in every 11 seconds (colons behave in the opposite way). To end the test, press any function key on the controller. Note that the horn relay is deliberately omitted from this test; if necessary, its operation can easily be checked using the **MANUAL HORN** key. A display test should not change any of the values stored in memory, such as the current scores.

**PERIOD** - Displays "Period # n", where n is the expected new period number (one more than current). Press **ENTER** to accept this, or enter a new number (maximum allowed is 9). If a period number of '0' is entered, the controller will switch to entry of a warm-up. This feature is described under **INTERMISSION** below. In the normal case, the controller should display "Period mins nn", where nn is the suggested period length (same as the last time this function was used). Press **ENTER** to accept this, or change it using the numeric key-pad. The maximum allowed is 99 minutes. This model of the controller allows for optional entry of seconds, in case extra time has to be added to a period. Just press **ENTER** for the usual value of zero. The scoreboard should switch to game-timer display, with the value at either 0:00 (timer UP) or the period length (timer DOWN). This function does not actually start the timer, but any intermission or time-out is cancelled and the auto-horn timer is reset.

Open-ended timing can be selected by setting the period length to zero. In this case, timer UP mode is forced and there is no end to the period. The displayed time will cycle from 59 minutes to 0 minutes. The Controller LCD display is extended to include elapsed hours and milliseconds, although these are not displayed on the scoreboard. The milliseconds will usually be zero unless external timing is being used.

**ABORT FUNC** - This key can be used to abort any other function without changing the values displayed on the scoreboard.



**INTERMISSION** - Displays "Intermission min mm", where mm is the suggested time in minutes (the same as when the function was last used). Change this if required using the numeric key-pad. The maximum value allowed is 99 minutes. Press **ENTER** and the display should switch to intermission time remaining, but with the timer on hold. Press 'Timer Run' to start the clock. When the intermission expires, the controller will continue to display "0:00" until a new period is begun. An intermission can be cancelled by entering a second intermission with a time of zero. The Period and New Game functions also cancel an intermission.

If the period number at the time of an intermission is zero, it is defined as a 'Warm-up'. These have a separate default duration. The end of a warm-up is marked by a short (2-sec) horn, whereas the end of an ordinary intermission is only marked by a beep from the controller.

**SET TIMER** - Puts the game timer on hold and displays "Game Timer nn", where 'nn' is the current timer minutes. (This may represent expired time or time remaining.) To change the timer value, enter a new time, using the numeric key-pad, **ENTER**, then enter seconds, **ENTER**, enter 1/100s of a second (if relevant) and **ENTER** again to update the display. Note that the time displayed by this function always includes 1/100s of a second, whereas that shown on the scoreboard is normally rounded to the nearest second. There is no direct option to change the milliseconds, but if the 1/100s of a second are changed, the milliseconds will be set to zero, otherwise they will be unchanged. If the timer is changed by less than a minute either way, the Controller will also adjust the time remaining in any penalties, and the auto-horn timer, provided these functions were running when the game timer stopped.

To just select the game timer for display, press **RECALL** then **SET TIMER**.

**TIME OF DAY** - To protect against unintended changes to the time-of-day clock, this routine begins by displaying "Set the Clock?". Press '1' to confirm that you want to set the clock. If a P.I.N. has been set, this must be entered next. The Controller should then show "Time of Day hh", where hh is the current hour in 24-hour format. (12-hour or 24-hour format can be selected for the scoreboard display during setup, but 24-hour format is always used when setting the time-of-day.) To set the clock, enter a new value for the hours using the numeric key-pad, **ENTER**, enter the minutes, **ENTER**, enter the seconds (default value is zero), then **ENTER** again to update the display.

If you just want to set the clock forward or back by an hour, use '+' or '-' to change the hour, **ENTER** it, then press **ENTER** again without changing the minutes, and the seconds will not be reset.

To just select the time-of-day clock for display, press **RECALL** then **TIME OF DAY** (or **TIME OF DAY, ENTER**).

Whenever time of day is being displayed, the backup clock in the scoreboard itself is synchronized to the Controller, so that it can continue to display time of day with the Controller disconnected.

### 3.5. Timer Control Keys

The bottom four keys in the centre block are for timer control. They can be used at any time, even within another function and are effective immediately; no dialogue takes place.

**PENALTY RUN** - Allows penalties to count down provided the game timer is running. Line 2 of the LCD status display should show "P-Run".

**PENALTY HOLD** - Immediately stops all penalties from counting down. Line 2 of the LCD status display should show "P-Hld".

**TIMER RUN** - Immediately starts the game timer (unless in count-down mode and showing '0:00').

**TIMER HOLD** - Immediately stops the game timer and penalty count-downs.

### 3.6. Left-hand Function Keys

These are team-specific keys and work in the same way for either the home team (H) or the guests (G). Home team is assumed in the following descriptions.

**SCORE** - The score for the selected team will immediately be increased by 1. To correct a Score, press **RECALL**, then **SCORE**. The LCD should display "H-Score nn", where 'nn' is the current value. Enter a new value in the usual way (use the '+' & '-' keys for minor corrections) and press **ENTER**. The maximum value allowed is 199 (although some scoreboards do not show 100's.)

**SHOTS** - These keys work in the same way as Score, including use of **RECALL** + **SHOTS** for corrections, except that the maximum allowed is only 99. See section 3.8 for use of the auxiliary control box.

**TIME OUT** - Puts the game timer on hold. The Controller displays "H-Time Out 30", where 30 is the suggested time in seconds. It can be changed to any other value (maximum 99) using the numeric key-pad. Once **ENTER** is pressed, the time-out time will be displayed, and the count-down will begin immediately. When the count-down is completed, a short (2-sec) horn will sound (unless the auto-horn setting has been **CLEAR**ed) and the display will change back to the game timer. This will remain on hold until the **TIMER RUN** key is pressed. Entry of a new time-out replaces a current time-out immediately, so that an entry of zero can be used to terminate a time-out prematurely. The New Game, Intermission and Period functions also cancel a time-out.

### PENALTIES

For hockey, the Controller recognizes four types of penalty:

- 1) Immediate (normal) penalties (major or minor).
- 2) Delayed (held) penalties. These do not start until a previous immediate penalty has expired.
- 3) Misconduct penalties. These count down like ordinary penalties, but their expiry does not release a delayed penalty.

4) Delayed misconducts. A misconduct may be awarded at the same time and to the same player as a normal penalty, in which case it must be delayed until the normal penalty has expired.

If two or more penalties are entered for the same player, or three or more for the same team, the later ones will be delayed automatically, provided the player number is not zero. To ensure that a major penalty is served before a minor, just enter the major one first.

Up to 24 penalties can be entered for each team, although only the first 5 are displayed. The penalty lists are kept sorted in the order given above. The order of the running penalties depends on time left, so that the normal penalty with the shortest time remaining should always appear at the top of the scoreboard. Delayed penalties are kept in their original entry order and this is the order in which they will be released to run.

When a normal penalty expires (time = 0:00) or is cancelled, the first delayed penalty in the list for that team (if any) is released. The controller then checks for a misconduct for the same player (using the player number). If found, this is also released to count down. When a misconduct expires, however, other penalties are not affected. In all cases the list is moved up one place and re-sorted.

#### **Entry of a new penalty:**

As soon as a penalty key is pressed, the controller should display:

```
"H-Penalty at m:ss"  
"ENTER for Norm Run"
```

where m:ss is the current elapsed time. If there are already two penalties for this team, the controller will show "ENTER for Norm Hld" instead. For a normal penalty (major or minor) just press ENTER, but if the penalty is to be one of the other types, press the \*/ALT PEN key until the desired penalty type is shown, before pressing ENTER. The controller will then ask for the player's number. Enter this using the numeric key-pad, press ENTER, enter the total time for that player in minutes, press ENTER, enter the seconds, if not zero, then press ENTER again to display the penalty on the scoreboard. The controller can handle a maximum of 24 penalties per team at one time. An attempt to enter a 25th penalty for a team gives the message "Too many penalties!". The controller will wait for the next key-press, then abort the function.

If a penalty is entered with a non-zero player number and another penalty for the same number is already in the list, the new penalty is automatically delayed. It will not be allowed to run until the previous penalty for that player has expired.

If the scoreboard cannot display penalty player numbers, or if the player number is not immediately available, a quicker method of entering penalties can be used. Press a penalty key, as above; change the penalty type if necessary; then press a digit key, such as '2' for a 2-minute penalty. The controller will skip the player number (it will display as '00') and go straight to the time entry step. Multiple penalties to the same player will not be handled properly, however, unless a non-zero player number is entered.

#### **Examining the penalty list for a team:**

Press the **RECALL** key immediately after (or before) one of the **PENALTY** keys, and the controller will allow inspection of the current penalty list. In this mode the '+' and '-' keys

can be used to move up or down the list of penalties for the selected team. Penalties may continue to count down (if so enabled and the timer is running), but expired penalties will not be removed or processed, and no sorting of the list will take place, until you exit this option by pressing **ENTER** or the **ABORT FUNC** key.

#### Changing existing penalty data:

Proceed as described above until the penalty to be changed is displayed on the Controller's LCD. To cancel it, press **CLEAR** followed by **ENTER**. To change the penalty type, press the **ALT PEN** key one or more times, then **ENTER**. Note that in these two cases, you can cancel the operation by pressing '+' or '-' instead of **ENTER**. Cancellation of a penalty in this way is handled like a normal expiry, so that a delayed penalty may be released to count down. To stop this happening, change the penalty type to anything but 'norm run' before pressing **ENTER**.

To change the time or the player number, you must first make sure that the cursor (an underline) is under the item you want to change. If it is under the wrong item, press **RECALL**, which should switch the cursor from the player number to the penalty time or vice-versa. Then start entering the new value (player number or minutes) and the LCD display will change to either :

"H-Line l P-Num= n" or "H-Line l Time= m".

Where 'l' is the scoreboard line (counting from the top) on which the penalty is displayed. Complete entry of the new value in the usual way, and the normal status display should return as soon as you press **ENTER**.

**TEAM NAME** - These keys are used to enter names to be displayed on team-name panels, if they exist. Press either key and the LCD should display:

H-Name : \_  
+Adv -Bak ENTER=done

Enter the name for display using the numeric keys as a phone style pad. Use '0' to enter 'Q' or 'Z'. Press 'C' on the numeric keypad to clear the entire line.

The team names are cleared by the **NEW GAME** function, but can be restored by using the sequence **TEAM NAME, RECALL, ENTER**.

### 3.7. Control of Shots-on-Goal using the Auxillary Box

Press **HOME** to increase the home shots by 1; press **GUEST** to increase the guest shots. If **DOWN** is pressed at the same time, the action is reversed. Press all three buttons at the same time to reset both shot totals to zero. These displays can also be controlled from the main console, as described above, and this is the easiest way to make a large correction.

### 3.8. Control of Display Brightness

The display normally defaults to maximum brightness, but it can be dimmed. Eight levels of dimming are available. To reduce the brightness, press the 'B' key several times while the status display is showing on the LCD. To increase the brightness, press 'A'. If you are not sure of the current brightness setting, press the 'A' key at least 8 times to force the maximum setting.

## 4. ASCII Output Option

H.D.D. Hockey Scoreboard Controllers can be optionally equipped with an RS232 port to output an ASCII stream of the current game and penalty times.

### Port Settings

The RS232 port settings are as follows

- 8 bits
- No parity
- 1 Start/Stop bit
- No flow control
- 38,400 bps

### Message Format

The message format of the ASCII data is:

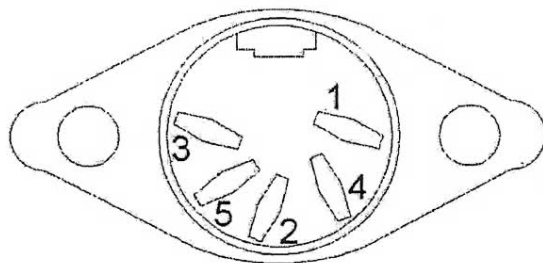
```
Tmm:ssHmm:ssGmm:sshmm:ssgmm:ss<CR><LF>
```

mm:ss - indicates a time, usually in minutes and seconds  
 T - precedes the main timer, as shown on the scoreboard  
 H - precedes the first home penalty  
 G - precedes the first guest penalty  
 h - precedes the second home penalty  
 g - precedes the second guest penalty  
 <CR><LF> - signifies the end of a message

If last-minute-timing is in effect, the 'T' field will show seconds and hundredths and the separator will be changed from a colon to a period.

### RS-232 Connection

In addition to the Cinch-Jones connector, which is used to connect to the scoreboard, there will be a 5-pin DIN plug located on the back of the controller. The pinout of the DIN plug is as follows:



Pin 1 - RxD  
 Pin 2 - Gnd  
 Pin 3 - TxD

H.D.D. will have supplied an adapter cable that brings these signals out to a standard DB9 RS-232 female connector. This is a "straight-through" cable that can be connected directly, for example, to a laptop or desktop PC.

### Reset Button

On the back of the controller, beside the DIN plug is a green reset button. If for any reason, the ASCII output should freeze (which is very unlikely), press this button to reset the ASCII output. NOTE: this does not affect the operation of the main controller, only the ASCII output - you don't have to worry about affecting the main game timer. Within a fraction of a second, the ASCII output should resume. of the current brightness setting, press the 'A' key at least 8 times to force the maximum setting.

## 5. PR06035A – Controller with Rechargeable Battery

PR06035A is equipped with a rechargeable battery similar to those used in cordless drills. Replacements and battery chargers can be purchased at any hardware store. There is a green button located beside the battery on the back of the controller. This is used to turn the unit on and off. When the battery is running low, the message:

\*LOW BATTERY\*

is displayed on the LCD. At this point there is still some battery power left and the controller will continue to work, however it would be wise to replace the battery as soon as possible. To replace the battery, first turn the unit off. Insert a fresh battery and turn the unit back on. As long as the battery is replaced in a reasonable amount of time, the current game data will still be in the controller's memory.