Official Speed Control of USA WaterSki & U.S. National's

DigitalPro

By PerfectPass

Version 6.5NG
Mechanical

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PERFECTPASS®
World Record Speed Control

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Warning: PerfectPass highly recommends you become familiar with the operation of your new boat prior to using the speed control. (Leave in OFF position). Once you are familiar and comfortable with the operation and handling of your boat, try

the speed control in the different modes without a skier to familiarize yourself with its operation. If you feel it is not working properly or have questions, leave in the OFF position and contact PerfectPass or your dealer immediately.

USER'S GUIDE

Section 1.   GETTING STARTED

INITIAL SETUP - **The display will guide you through this set up. Read slowly and carefully.**

> Your new PerfectPass system must now complete a short set up procedure to familiarize itself with your particular boat and engine. *(This may have been performed by your dealer if factory installed)*

Step (1)   Engine Selection. On some systems you will be asked to select the engine in your boat. It will appear as [5.7 / MPI ^ = Yes]. This means if you have standard engine, press **UP.** For optional big block 6L or 8.1L, press **DOWN**.

Step (2)   The display will now show [read in MPH ^ = Yes]. It is asking you if you would like the display to operate in mph. If you do; confirm by pressing the **UP** key. If you want kph press the **DOWN** key. (We have selected mph for illustration purposes)

Step (3)   [WAKEBOARDPRO ^=Y] The display will now ask if waqnt the system to be a WakeboardPro or a 3-Event DigitalPro. Press UP Kay for WakeboardPro and press DOWN for DigitalPro.

Step (4)   The display will now move into the Slalom mode, described in the next section.

GETTING FAMILIAR WITH PERFECTPASS

Turning System ON and OFF – All system functions require the PerfectPass control system to be powered up (ignition in ON or Accessory position). The **ON/OFF** key turns the PerfectPass control ON or OFF. The system requires the boat to be in neutral before turning the system ON or OFF. After pressing the **ON/OFF** key [IN NEUTRAL ^ =Yes] may appear to remind the driver, and confirm the boat has been returned to neutral. When PerfectPass is OFF it will not engage. Any time you operate your boat the system will be powered up, although it can be in the OFF mode. Every time you power up PerfectPass it will return to the last event and speed that was used.
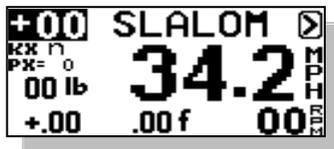
System ON   System OFF
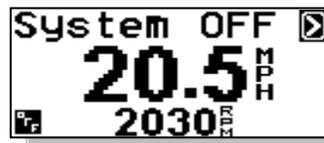
Engaging System – With PerfectPass ON, the system will automatically engage once the **SETPOINT** is reached. PerfectPass requires the driver to bring the boat up to and slightly past the **SETPOINT** before it will engage. When the system engages it will sound an audible beep and the top line will become highlighted. In Slalom mode the screen appears as follows:

**Disengaging System** – The PerfectPass system is unable to increase throttle position past the physical position of the throttle handle. This important feature gives the driver the power to over ride the system at any point by simply pulling back on the throttle. If the throttle handle is moved back past a point slower then where the system needs to be to control it will disengage and boat will be under manual control.

Moving Around The Screen– The **MENU** key allows you to move around the screen to the various features. Any time you scroll to the Menu Arrow Icon ⧁ the system is prompting you to press either the **UP** or **DOWN** keys to select or confirm an option. Pressing the **DOWN** key on the ⧁ brings you into a calibration screen. The calibration screen varies depending on the mode; the specifics of these screens will be covered within each mode description. Pressing the **UP** key on the ⧁ brings you into the Mode Select Screen.

MODE SELECT SCREEN

To change modes press the **MENU** key until the desired mode is highlighted. Press the **UP** key to go into the highlighted mode. Press **DOWN** to go into the Mode's background Setting Screens.

DOWN key for Mode settings   **UP** key to Select Highlighted Mode (Trick)
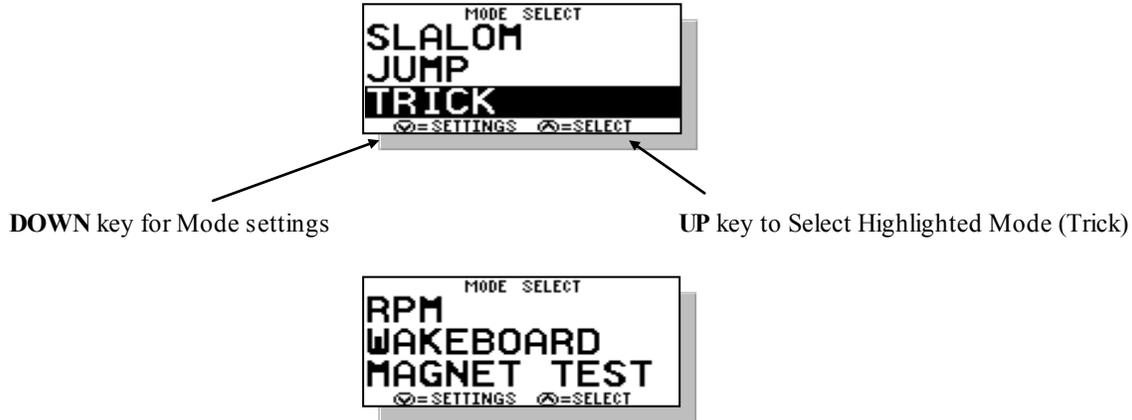
SUBMENU SCREEN

To enter the SUBMENU press the **MENU** and **UP** keys together, on any of the main mode screens.

Contrast – To adjust the darkness of the lettering on the screen you can change the contrast. This value can be adjusted from 0-5 and is saved in the memory. The smaller the number, the brighter the screen will be in bright sun.

If you turn your boat on but cannot see the screen, press **MENU** & **UP** Keys together and adjust contrast Up or Down.

Name List – You can pull or enter a name from the name list here. The full description of the Name List is in Section 10 of the manual

System Info – General system information can be found here. The software version, engine selection, system voltage, system hours, and water temperature (not equipped on all boats) can be found here. *See Section 10. ADDITIONAL FEATURES* for more information on this feature.

Device Test – This test allow you to test for proper control of the rope switches, servo motor (Mechanical only), or throttle feedback (DBW only). *See Section 10.*

Tip: Screen Contrast can be adjusted by pressing MENU and UP Keys together. Range is 0 – 5, 3 is normal.

Section 2.   SLALOM MODE

USING SLALOM MODE

The Slalom mode is designed to give a skier an optimum and consistent pull through a Slalom course while producing perfect timing passes. This section covers the various Slalom Modes within the PerfectPass system.

The main RPM based Slalom (36 mph – 24.9 mph) screen appears as follows:
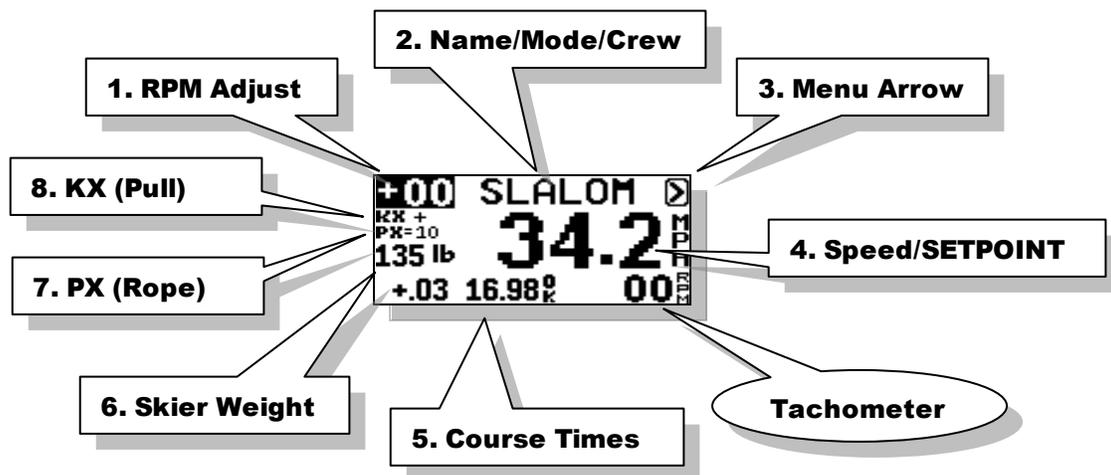
As you press the **MENU** key you will move around the circle following the numbers above.

1.   RPM Adjust

This value directly adjusts the RPM/Speed value the system is trying to hold. If a time is fast or slow, you can enter an RPM value for the next pass. Example: A time was a little fast and PerfectPass suggested "-20 RPM". Enter –20 on RPM Adjust. You may also use this in a headwind/tailwind situation.

2.   Name/Mode/Crew Weight

This section of the screen displays either the Mode, Slalom or a Skier's Name pulled from the Name List. Press **UP** key to access the Name List:

Name List is discussed in Section 10.

Press **DOWN** key to access the Crew Weight

Enter the Crew Weight in pounds using the UP and DOWN keys. Press the MENU key to confirm and continue.

3.   Menu Arrow ▷

Press **UP** key to change modes or mode settings:

Change between modes using Menu Key.

Press **DOWN** key to Calibrate system:
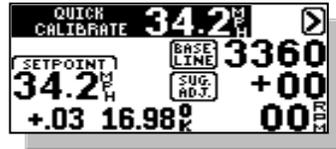
The calibration screen is described below in this section on Page 6.

4.   Speed/SETPOINT

The speed readout will turn into the SETPOINT when the engine is below 1500 RPM or the Speed/SETPOINT is highlighted. When this is highlighted the metric conversion will appear in this area of the screen.
Press **UP** or **DOWN** keys to select desired **SETPOINT**:

5.   Course Times

This section of the screen displays the timing information from the last pass. As well as the suggested RPM adjustment based on the times. These screens will scroll automatically at the end of each pass. The result of this check is shown to the right of the times as shown below.

Tolerance Indicator
o/k = Good Times
s = Slow Times
f = Fast Times

Full Course Error and Time

1st and 2nd Segment Times

1st and 2nd Segment Errors

Suggested RPM
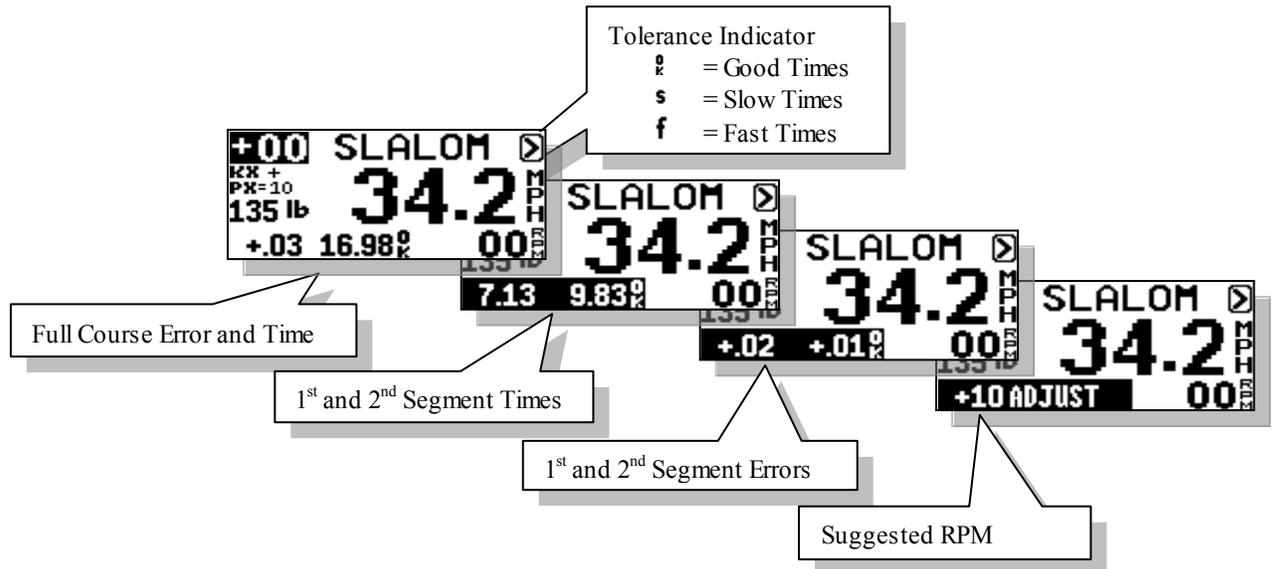
With the times highlighted on the screen you can press the **DOWN** key to view the All Buoy Timing information.

ABT

All buoy times are displayed on one screen with full course error and full course time at the top. Press any key to return to main screen.

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6. Skier Wight

To enter or adjust skier weight simply highlight this section of the screen and press the UP or DOWN keys to make adjustments. The skier weight is entered in pounds, i.e. the above example shows a skier with a weight of 135 pounds. The skier weight is required so the PerfectPass system can apply the correct amount of RPM to compensate for their pull. (1 pound = 1 RPM).

7. PX (Rope Switch Setting)

Factory setting is 0, which is the off position (typical values range from 5 – 10). If the optional Slalom Switch is used, this is the percentage of skier weight which is applied during each pull (i.e. A value of 10 would apply 20 rpm to a 200 pound skier). A value of 0 means no pull from the switch.

8. KX (Throttle Response)

The KX value represents the throttle control response of the system. Under the current rules, a skier is encouraged to use the factory settings or normal (represented by an "n" on the screen), but has the option for a higher more immediate throttle response setting (+ or ++). As well they have the option for a lower KX (-).

Tips:

1. Crew Calculator – When on Crew Weight, press UP and DOWN together to access Crew Calculator. See Page 13.
2. Skier Weight (Shortcut) – To make a change between skier's you can hold MENU Key for a few seconds and weight will become highlighted.

Tournament Mode – Slalom

If you press the Up & Down Keys together while in slalom mode, the new Tournament Mode will appear. The only difference in this mode is the screen layout, particularly the size of the timing data.

Baselines should be set and established in standard slalom mode.
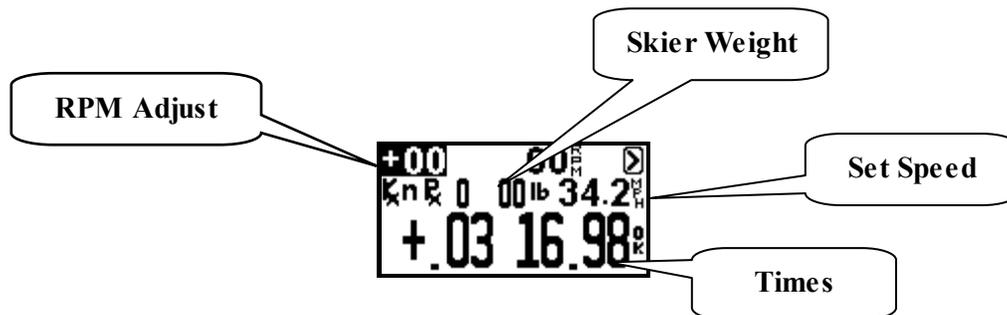
SLALOM CALIBRATION / SETTING BASELINES

(Your new system must be calibrated for accuracy)
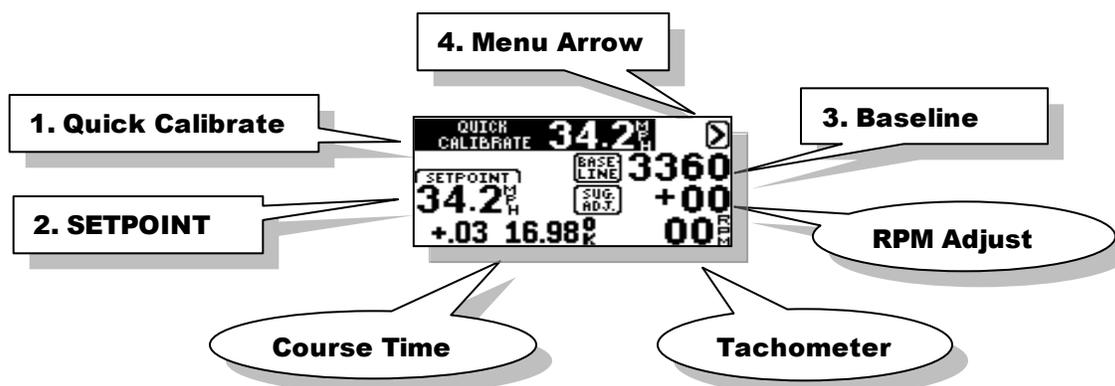
Your system must be calibrated for accuracy in a course. This is often called setting **Baseline RPM Values.** In slalom mode (without a skier) you must complete a timed slalom pass at each official speed you intend to use. This must be done in a course using magnets and Mag Sensor or a PerfectPass Hand Timer. Once calibrated, these new settings will be maintained in the system memory.

Step 1. In Slalom Mode, enter accurate Crew Weight, set **Skier Weight to 0 and RPM Adjust to 0.**

Step 2. Set speed (ex: 34.2) and engage system prior to course.

Step 3. Mag Sensor will trigger at entrance gate, ball 3 gate and exit gate. (Alternatively, if using Hand Timer push button at same gate locations).

Step 4. Stop boat, highlight ▣ Key and press Down to access **"Quick Calibrate".** Press Up Key to confirm Quick Calibration request. System will confirm "Baseline and Speedometer Calibrated".

**Step 5.** After system confirms calibration at 34.2, change speed and repeat procedure.

23 MPH AND LOWER

As you calibrate the various slalom speeds, you will note that 23 mph and lower are speed based. After you do a Quick Calibrate at 23 mph, you will be asked to perform a "Master Recal". A yes to "Master Recalibrate" will automatically calibrate all other "under 23 mph" slalom speeds.

(These under 23 mph speeds can be timed and calibrated independently for greater accuracy if desired).

TOWING A SKIER (The Basics)

Step 1. Enter Crew Weight, Enter Speed and Skier Weight.

Step 2. Pull skier up and engage system prior to course. (You will hear an audible beep).

Step 3. As you exit course review times on screen. If time was not perfect, the system will show an rpm suggested change. I.e. "+20 ADJUST". You should enter an RPM Adjust value or 20 on main screen for next pass. This will speed up boat by 20 RPM. You may also use this feature in a headwind / tailwind situation.

ADDITIONAL SLALOM SETTINGS

Additional Slalom Settings are accessed by pressing the **UP** key on the Main Slalom Screen with the ⊠ highlighted. Then press the **DOWN** key when SLALOM is highlighted on the Mode Select Screen. The first two options can be accessed from the Main Slalom Screen as described above as well as here in the Slalom Settings Screen.

Crew Weight – This setting can also be accessed on the main Slalom Screen as mentioned above on Page 3 or through the Slalom Settings screen. This value should be set to represent the total Crew Weight in pounds in the boat. It is essential this value be properly setup to ensure you get good times.

> **Crew Weight Calculator** - The system will add the weight of up to 3 individual crewmembers. Simply go to "Crew Adj" on the list, then press the **DOWN** and **UP** keys together, enter the weight of crew member #1, press **MENU** and do the same for crew member #2. The system will total the weight automatically.

Calibrate – Press the **UP** key to enter the Baseline Calibration screen. This can also be accessed by pressing the **DOWN** key with the ⊠ highlighted on the Main Slalom Screen. To check baselines, complete a timing pass and then go to this calibrate option. Press Up to enter Calibration Screen and then Up on Quick Calibrate to confirm calibration.

SSB (Second Segment Balance) - The percentage of skier value driven RPM that is removed during the second segment to maintain an ideal time in slalom.

> **Example**: If your 2nd segment is running a little on the fast side relative to the first segment time, you would raise the SSB. The higher the value, the more RPM removed from the boat speed in the 2nd. Typical value is about 10.

RPM OFFSET – Press the **UP** key on this feature to view and edit the 3 Offset values, 36, 34.2 and LWR. The lower (LWR) is used for all slower speeds. If you are finding that you are continually running less (or more) than a skiers weight to achieve a good time, you can enter an rpm offset value. The OFFSET value is only applied when a skier weight is entered. With a zero skier weight the OFFSET value has no effect.

> **Example**: On a typical boat with a skier's actual weight entered, you have to run 25 less rpm to achieve an accurate time. If you are consistently seeing this, you can enter an offset rpm value (i.e.: -25) and the system will allow you to run all other values as you normally would.
> The offset value is <u>independently set for 36.0, 34.2 and speeds 32.3-24.9 (LWR).</u>

RPM Offsets

WT (Wait Time) - For tournament use to provide each skier the same wait time between passes. The number of seconds between passes (i.e. 40 seconds). Starts timing as boat exits the course. Two short beeps are indicated with 10 seconds left, followed by three long beeps when time is up.

Previous Times – To reload the previous times simply highlight this item and press the **UP** key. The full course and segment times can be viewed from the Main Slalom Screen. The ABT's can be viewed by pressing the **DOWN** key with the Timing Information highlighted on the Main Slalom Screen.

ADDITIONAL SLALOM INFORMATION

Digital Speed Readout – The digital speedometer on the screen is for underline only in RPM based Slalom. If you feel it is not reading accurately, go into Quick Calibrate feature after running any timed pass and press the **UP** key to recalibrate the speedometer.

Setting Baselines / Calibrating Speedometer without a Course – If you do not have the benefit of a course, you can manually set baselines and calibrate the speedometer. This must be done at each slalom speed and you will require an accurate boat speedometer or GPS.

> **Example:** Starting at 36 mph, you engage system and note actual speed on the GPS is 35. Go into the Baseline Calibration screen and raise the RPM Baseline about 100 rpm. This will speed up the boat to about 36 (100 rpm = 1 MPH). If speed is now accurate, the final step is to calibrate digital speedometer. Note the digital speed readout and if it is reading 37, go into Speedometer Calibration Screen. Now press the **DOWN** key and lower speedometer calibration by one mph. Run boat again to confirm accuracy. Once the baseline and calibration is set, it will be saved within the system memory. Now change speed to 34.2 and repeat. All speeds you plan to use must be done.

More Throttle – If you see the ⊞ replace the ▶ on the Main Slalom Screen, the system is indicating it needs more manual throttle in order to maintain the speed. In this case just move the manual throttle forward a little.

Smart Timer False Triggered - The Smart Timer is sensitive and will false trigger outside the course on waves, etc. To avoid false triggering, always slow the boat slightly to disengage the system after exiting the course between passes. The system will not false trigger if it is not engaged. (In the event the Timer does trigger before the course, press the **UP** key to reset Timer). If your timer(s) is securely fastened to the floor but false trigger often, including in Mag Test Mode, move location of timer(s) forward or back.

Optional Slalom Switch - If you have a Slalom Switch, refer to detailed instructions sent with switch. The switch is beneficial to "short line skiers". For full details, please contact PerfectPass, or log on to www.perfectpass.com.

Tournament Mode – Slalom

If you press the UP and Down Keys together while in slalom mode, the new Tournament Mode will appear. The only difference in this mode is the screen layout, particularly the size of the timing data.

Baselines should be set and established in standard slalom mode.
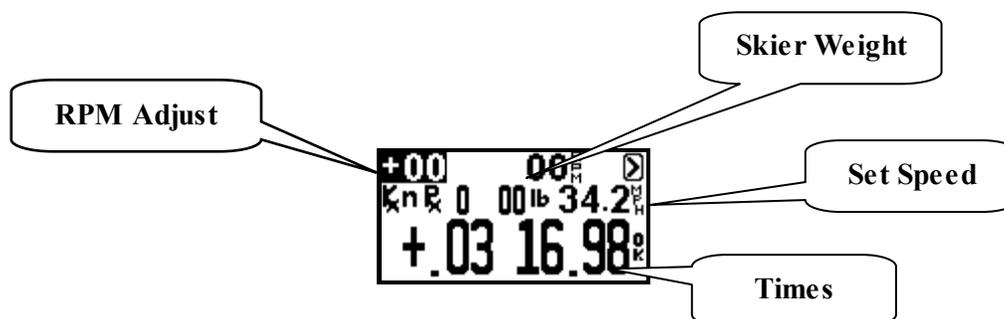
To exit Tournament Mode, press UP and DOWN keys together.

Section 3.   JUMP MODE

USING JUMP MODE

WARNING: (Timing **must** be used in Jump mode and a proper two segment jump course is required for system to work properly. <u>Do not use</u> PerfectPass in Jump mode without a proper course, integrated timing and experienced operator. Because the counter cut pull and cut to the ramp are different, you must have timing activated and running as the boat heads towards the ramp.

*The Jump mode is RPM based and therefore baseline values must be established just as in Slalom mode. Setting the jump baseline values must be done in a proper two segment jump course. Jump Letter must be set at **A** for this process.*

The Jump mode main screen will appear as follows:
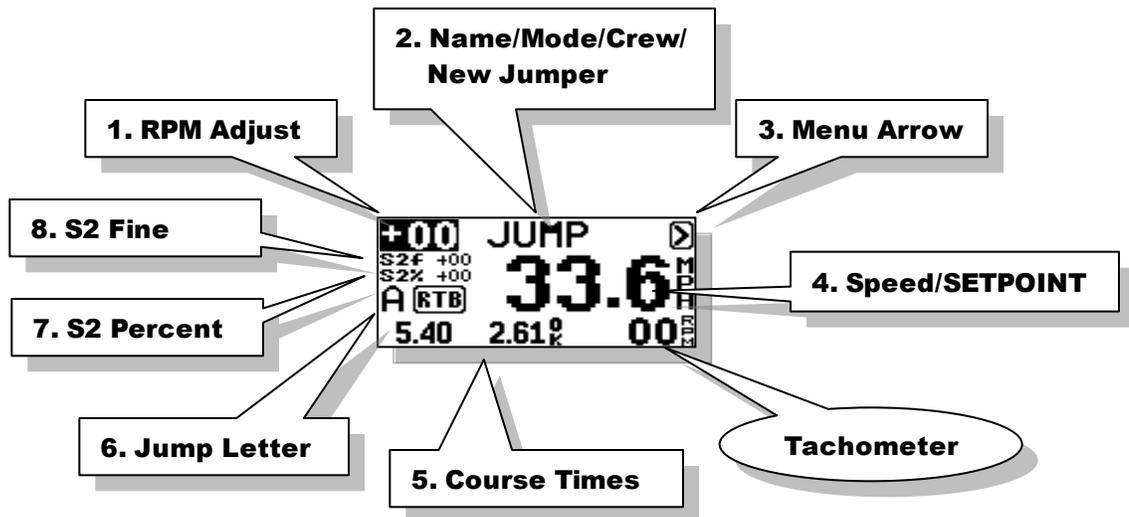
1. **RPM Adjust**

    RPM adjust allows the driver to increase or decrease the overall times (1st & 2ng segment) by putting in a positive or negative RPM adjustment.

    Example: If the times are running consistently slow on both segments, you could add a value such as +20 rpm and the speed will be increased. You may wish to do this for a particular jumper (a heavy puller) or for a number of jumpers if the times are drifting in a certain direction

2. **Name/Mode/Crew/New Jumper**

    This section of the screen displays either the Mode Name or a Skier's Name pulled from the Name List.
    Press **UP** key to access the Name List:

    Name List is discussed in Section 10.

    Press **DOWN** key to access the New Jumper and Crew Weight

    Press the UP key to enter a new jumper or DOWN key to enter or edit the crew weight. New Jumper is covered

below.

```
+00  JUMP        ▷
Crew    Weight
        520
5.40  2.61 º      00 R
        K         P
                  M
```

Enter the Crew Weight in pounds using the **UP** *and* **DOWN** *keys. Press the* **MENU** *key to confirm and continue.*

3.   Menu Arrow

Press **UP** key to change modes or mode settings:

```
      MODE  SELECT
SLALOM
JUMP
TRICK
   ▽=SETTINGS  ⊘=SELECT
```

This allows you to change modes and mode settings. The Additional Jump Settings will be discussed below.

Press **DOWN** key to Calibrate system:

```
   QUICK    33.6 M    ▷
 CALIBRATE       H
                BASE  3285
                LINE
[SETPOINT]
33.6 M          SUG.  +135
     H          ADJ.
5.16  2.38 f      00 R
                  P
                  M
```
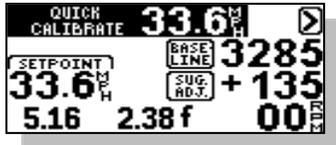
The calibration screen is described below in this section.

4.   Speed/SETPOINT

The speed readout will turn into the SETPOINT when the engine is below 1500 RPM or the Speed/SETPOINT is highlighted. When this is highlighted the metric conversion will appear in this area of the screen.
Press **UP** or **DOWN** keys to select desired **SETPOINT**.

```
+40    JUMP        ▷
S2f +00
S2% +40    33.6    M
N [FAST]  =54K     P
                   H
5.40  2.61 º  00   R
          K        P
                   M
```
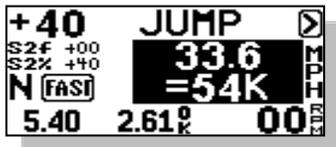
5.   Course Times

This section of the screen displays the timing information from the last pass If Jump Letter is set to A and RTB, the second segment error from Return to Baseline will be displayed after segment errors as seen below:

Tolerance Indicator
ºk = Good Times
s   = Slow Times
f   = Fast Times

```
+00  JUMP        ▷
S2f +00
S2% +00    33.6 M
A [RTB]         H
5.40  2.61 º  00 R
          K      P
                 M
```

```
  JUMP        ▷
  33.6  M
        H
        R
        P
-.07  -.07 º  00
           K
```

```
  JUMP        ▷
  33.6  M
        H
        R
        P
-.07  -.13 º  00
           K
```

1st and 2nd Segment Times

1st and 2nd Segment Errors

2nd Segment Error from Return to Baseline Times

13
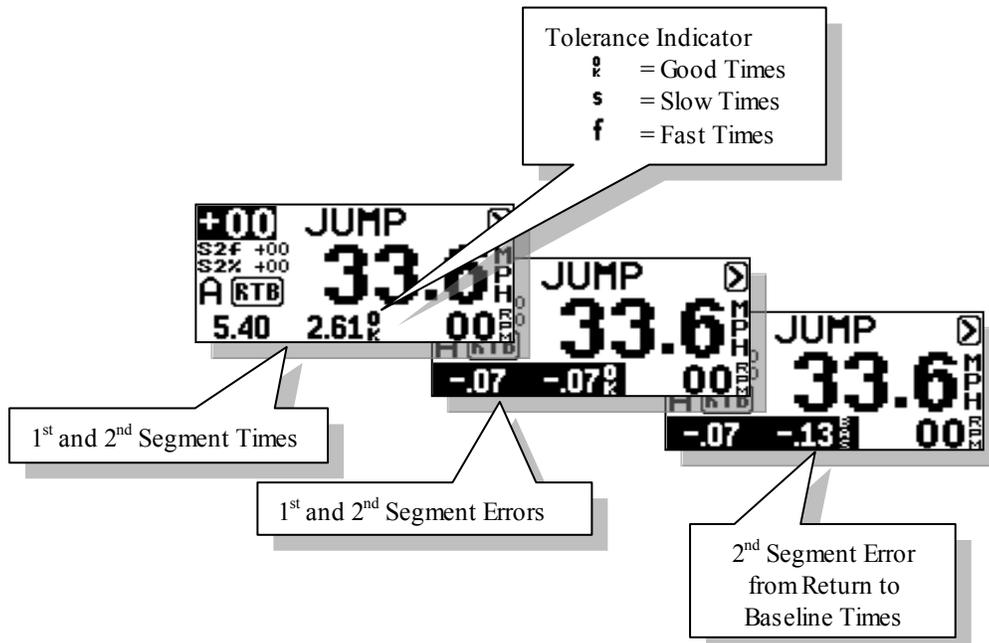
6. Jump Letter

The Jump Letter is a combination of Jumper Weight, Jumper Distance and ability. . This Jump Letter represents how much throttle will be applied once the Rope Switch is closed as the skier pulls. The higher the Jump Letter selected the more aggressive the pull will be. If you are unsure what Jump Letter you should use then start by using the 'New Jumper' feature as described below. This will automatically generate a Jump Letter based on your weight and distance.

7. Second Segment Percent (S2%)

This is a percent of the Jump Letter RPM that is applied once the boat enters the 2nd segment. Under IWSF and AWSA rules, the boat is permitted to speed up in the 2nd segment. The higher the number, the more the boat will accelerate. A typically value for S2% is +60, the higher the value, the faster the 2nd segment.

Example: If the 1st segment times are good, but the 2nd is a little slow, you would raise the number.

S2 RTB – Works similar to S2%. Used when "Return to Baseline" is selected. Only applicable if skiers are activating switch and use a Jump Letter of J or higher.
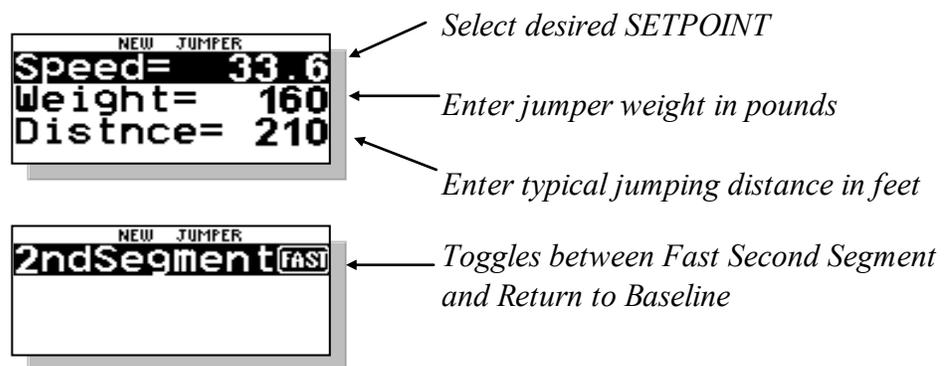
8. Second Segment Fine Adjust (S2 Fine)

This adjustment allows the driver to effectively fine adjust the 2nd segment only. It comes set at 0, which means a neutral effect. A number such as 30 would increase the 2nd segment by 30 rpm. Higher number speeds up the second segment. If skier does <u>not</u> trigger switch or has a letter less than J, S2 fine should be used to speed up second segment.

Example: A jumper that does not cut and does not fully activate the switch may require extra rpm in the 2nd segment to keep the 2nd segment in tolerance. (In this case, S2 Fine is more effective than S2%).

Entering a New Jumper – To enter a new jumper highlight the NAME/MODE/CREW/NEW JUMPER section of the screen and press the **DOWN** key. Then press the **UP** key to confirm you would like to enter a New Jumper.

You will be asked to enter and answer the following information after which a Jump Letter will be calculated for you and displayed on the main screen. Move to the next selection by pressing **MENU**.

Select desired SETPOINT

Enter jumper weight in pounds

Enter typical jumping distance in feet

Toggles between Fast Second Segment and Return to Baseline

Return to Baseline (RTB) – If you selected Return to Baseline the screen will show ⟦RTB⟧ to the right of the Jump Letter. When RTB is selected the boat speed will immediately go to the baseline value as boat enters the second segment. If you have a skier using the switch with a value of J or higher, you can enter an S2 value which is a % of switch driven RPM. A setting above 0 will speed up boat in second segment if required to balance times. (This is similar to S2% used when Faster 2nd Segment is selected).

Fast 2nd Segment – If you selected to run the fast 2nd segment, the screen will show ⟦FAST⟧ to the right of the Jump Letter.

Calibrating RPM Baselines - You can set RPM Baseline values for all of the official jump speeds (28, 29.8, 31.7, 33.6, and 35.4) or just the ones you use regularly. Let us assume you wish to set up 33.6 mph (54 kph). Enter the **SETPOINT** of 33.6 mph by pressing the **MENU** key until the 'Speed/SETPOINT' section of the screen is highlighted, then adjust the **SETPOINT** to 33.6 = 54K. <u>Set the Jump Letter to A</u>. Now bring the boat <u>smoothly</u> up to the **SETPOINT** to engage the system. *(The system engages as soon as the default RPM Baseline value is reached, the NAME/MODE section will become highlighted, and an audible beep will sound)*. Enter the jump course and <u>time both segments</u>. As you exit the course the times will be displayed and then the difference from actuals. The display screen will show the 33.6 mph times. The jump letter is set at A, RTB (return to baseline times are used). An example of this is shown in JUMP TIMING screens shown earlier in this section.

If the times are not in tolerance or close to actuals then the RPM Baseline values will require adjustment. The easiest way to do this in Jump mode is to go to Quick Recalibrate by pressing the **DOWN** key with the ⚡ highlighted. This will bring you to the Calibration screen as seen below.
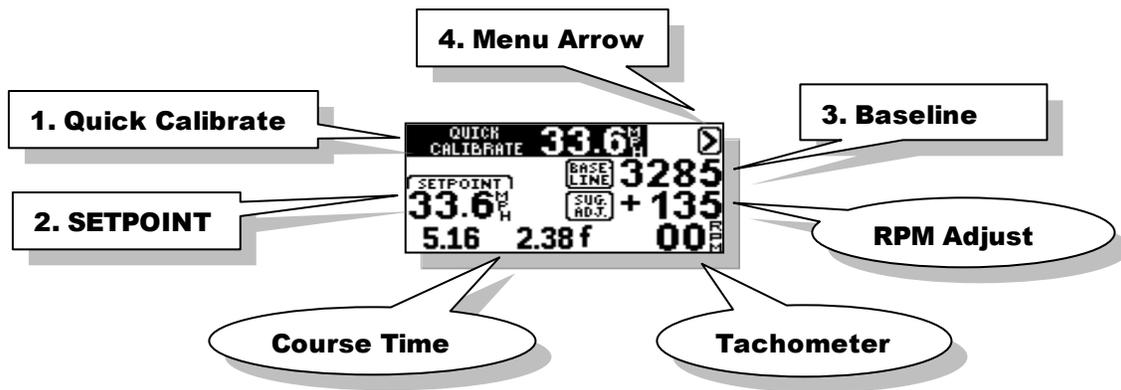
Press the **UP** key on the Quick Calibrate message to recalibrate the baseline based on the times recorded from the last pass. In this example it is suggesting your RPM Baseline should be increased by 135 rpm. When you perform a Quick Calibrate the suggested adjust of 135 will be added to the baseline and saved in memory. The system will also calibrate the digital speedometer if the times are with in the "OK" tolerance.

Now engage system and time boat again. If the times are still not close enough, repeat above steps until accurate. If you wish to set up RPM Baseline values for other speeds (i.e. 31.7 mph), change the SETPOINT and repeat the above steps.

JUMP DRIVING

WARNING – Using the Jump mode with Jump Switch is for experienced drivers and skiers only. Please read carefully prior to operating. The pull is very aggressive and designed for tournament water skiers only. You MUST have integrated timing and a proper jump course for system to operate properly.

Assuming the RPM Baseline values have been accurately set, you are now ready to tow skiers.

First enter your Jump Letter or enter a "New Jumper" as explained above. The Jump Letter can be changed by pressing the **UP** or **DOWN** keys with the Jump Letter highlighted on the screen.

The key to a good pull and good times is to get the correct Jump Letter. If the pull to the ramp is solid and the first segment time is good, you know the Jump Letter is OK. If the time on the 1st segment was slow, you will require a higher letter on the next pass and vice versa.

If the first segment time was good, but the 2nd was slow, raise the S2%.

Important Note: If the timer is triggered prior to entering the course, it must be reset by pressing the **UP** key. Failure to reset will result in an improper pull to the ramp.

ADDITIONAL SETTINGS

Additional Jump Settings are accessed by pressing the **UP** key on the Main Slalom Screen with the ⊡ highlighted. Then press the **DOWN** key when JUMP is highlighted on the Mode Select Screen. The first three options can be accessed from the Main Slalom Screen as described above as well as in the Jump Settings Screen.
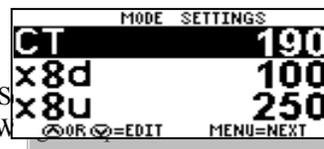
Crew Weight – This setting ~~is accessed through the Main Slalom S~~ ~~through the Jump~~
Settings screen. This value ~~represents the Total Crew W~~ it is essential this value be properly setup to ensure you get good times.

> **Crew Weight Calculator -** The system will add the weight of up to 3 individual crewmembers. Simply go to "Crew Adj" on the list, then press the **DOWN** and **UP** keys together, enter the weight of crew member #1, press **MENU** and do the same for crew member #2. The system will total the weight automatically.

Calibrate – Press the **UP** key to enter the Baseline Calibration screen. This can also be accessed by pressing the **DOWN** key with the ⊡ highlighted on the Main Jump Screen.

New Jumper – Details for entering a new jumper are outlined above. This should be used when unsure what Jump Letter to select.

CT (Counter Cut Time) - The maximum length of time the system will throttle once the skier pulls and closes the switch on the counter cut. Example: a value of 175 is 1.75 seconds and may be used in a tail wind. In a head wind you may want a longer pull so you could move it to 200 – 220 (2.0 – 2.2 seconds). The factory default is 190, or 1.9 seconds.

x8u and x8d - These settings were always riding in the software, but were not adjustable values. With the higher horsepower engines and strong props being produced, these values are available for adjustment if needed for high-end jumpers.

> **x8u** – Represents the rate of <u>throttle up</u> on counter cut and cut for ramp once switch is activated. The larger the value, the softer the start will be. In other words, the pull will not be as aggressive on the start, but more gradual. The smaller the value, the more aggressive it will throttle up as switch closes.
> > **Example**: A strong 6 Litre engine may need a larger X8u to avoid a strong initial pull as switch closes.

> **x8d** – Represents the rate of throttle down once skier stops pulling. The higher the value, the slower (softer) the throttle will return. The lower the value, the more aggressive it will throttle back.
> > **Example**: If a boat was not slowing quickly enough in the 2nd segment, you would lower the value.

Typical values 2005 Promo Boats

	5.7L	6.0L
x8u	85	200
x8d	250	200

ADDITIONAL INFORMATION

Jump Switch - For details on the optional Jump Switch (Slalom Switch) contact PerfectPass or log on to www.perfectpass.com .

Jump Settings

New Times (Faster Second Segment)
Examples for when towing jumpers over 120 Feet.

Jump Settings	S2%	S2 RTB	CT
Ski Nautique	Faster 40	Faster 0	190
MasterCraft	Faster 40	Faster 0	190
Malibu	Faster 40	Slower 0	190
Others	Faster 40	Slower 0	190

Tournament Mode – Jump

If you press the Up & Down Keys together while in jump mode, the new Tournament Mode will appear. The only difference in this mode is the screen layout, particularly the size of the timing data.

Baselines should be set and established in standard jump mode.
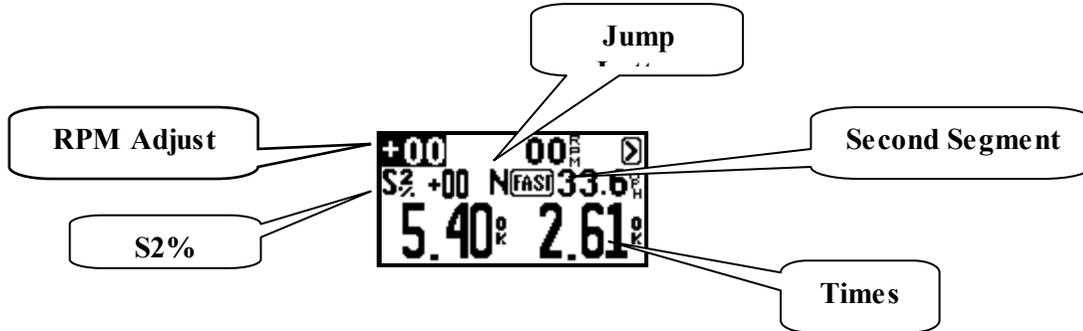
To exit Tournament Mode, press UP and DOWN keys together.

Section 4.   TRICK MODE

USING TRICK MODE

The trick mode is controlled via the speed signal from the paddle wheel. (You simply select the desired speed and go. RPM values are not used and no other settings are required)

The main Trick screen will appear as:
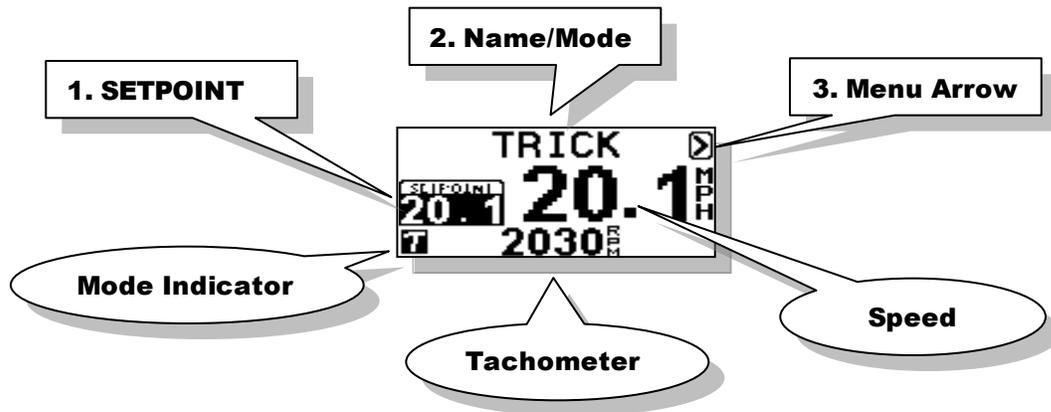
1. SETPOINT

The speed at which would like the boat to engage and control. This number is adjusted in 0.1 mph (0.2 kph) increments. It can be adjusted while engaged ("on the fly"), or before it is engaged.

2. Name/Mode/Crew

This section of the screen displays either the Mode Name or a Skier's Name pulled from the Name List.
Press **UP** key to access the Name List:

Name List is discussed in Section 10.

3. Menu Arrow

Press **UP** key to change modes or mode settings:

As mentioned above this allows you to change modes and mode settings. The setting for the Trick mode will be discussed below.

Press **DOWN** key to go to Speedometer Calibrate screen (**Speedo Cal**):

TRICK DRIVING

Using Trick mode is relatively easy. Turn control ON, select the desired speed and drive smoothly to the **SETPOINT** so PerfectPass can seamlessly take over. *If you accelerate aggressively past the **SETPOINT**, it will take the system several seconds to lock in the speed.*

You should keep your hand on the throttle to ensure it does not pull back and disengage the system. If you see the **"#"** sign on the screen, this indicates the system needs a little more manual throttle.

If the skier falls, pull back on the throttle to disengage system. Slowly return to skier and pull them back up again. System will take over automatically once **SETPOINT** is reached. Speed changes can be made "on the fly".

When you are finished with the speed control, go to neutral and press the **ON/OFF** key.

TRICK SETTINGS

Trick Settings are accessed by pressing the **UP** key on the Main Trick Screen with the ▶ highlighted. Then press the **DOWN** key when TRICK is highlighted on the Mode Select Screen.

Calibrate – Used to calibrate the PerfectPass digital speedometer readout. The procedure for adjusting this can be found in the Digital Speedometer Calibrate Section 7, Page 19. The calibration screen can also be accessed from the Main Trick Screen by pressing the **DOWN** key with the ▶ highlighted.

Kd – This adjustable parameter controls the "firmness of the Pull". Higher the number, more aggressive the pull. Normal range 14 – 18.

NN (Paddle Filter Factor) – NN is set at 120 and represents the "Filter Factor" of the paddle. The higher the value, the more speed samples are taken from the Paddle prior to speed adjustment. It is rare for NN to require adjustment from Factory setting. If you believe your system is more "nervous" than it should be, try raising the NN. If the speed is floating too much, try lowering NN. This value is shared with Wakeboard Mode. Adjustments made in either mode will change the value in both modes.

Section 5.   RPM MODE

USING RPM MODE

In this mode, the screen will appear as follows:
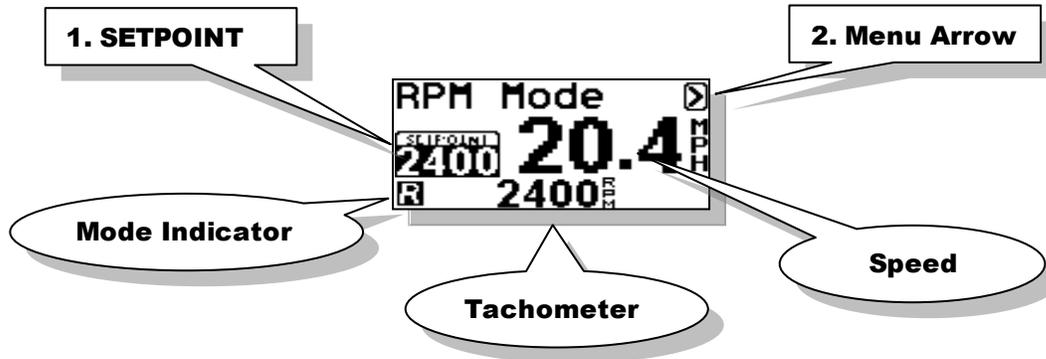
Operating in this mode is very similar to using the Wakeboard or Trick modes, except the system is now controlling to an RPM **SETPOINT**.

RPM DRIVING

Prior to towing the rider / skier, select the RPM **SETPOINT** by using the **UP** or **DOWN** keys with the SETPOINT highlighted on the screen. Pull the rider up smoothly and continue to accelerate up to or beyond the RPM **SETPOINT** so the system can engage and take control.

Changes can be made to the RPM SETPOINT while the system in engaged ("on the fly") to fine-tune the RPM you desire.

Note: You cannot enter "Names" in this mode.

Section 6. WAKEBOARD MODE

USING WAKEBOARD MODE

This is a speed-based mode using the paddlewheel to control similar to the TRICK mode. The Main Wakeboard Screen will appear as follows:
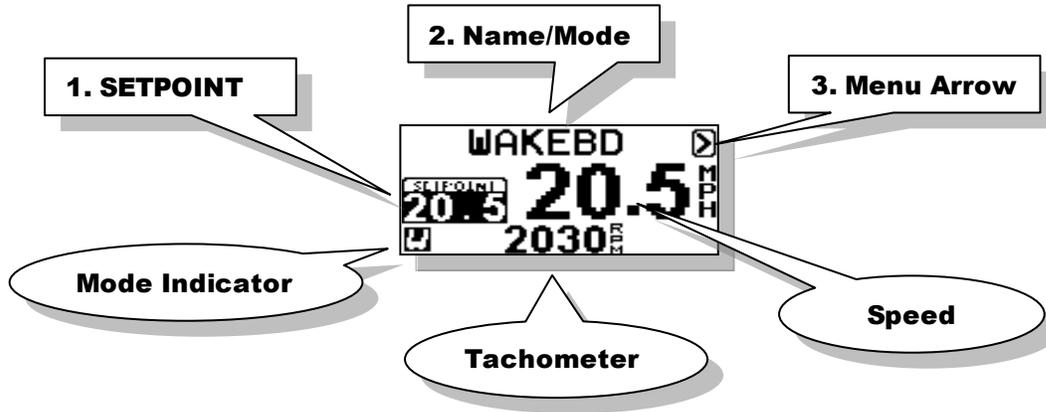
1. **SETPOINT**
   The speed at which would like the boat to engage and control. This number is adjusted in 0.25 mph (0.5 kph) increments. It can be adjusted while engaged ("on the fly"), or before it is engaged.

2. **Name/Mode/Crew**
   This section of the screen displays either the Mode Name or a Skier's Name pulled from the Name List.
   Press **UP** key to access the Name List:

   Name List is discussed in Section 10.

3. **Menu Arrow**
   Press **UP** key to change modes or mode settings:

   As mentioned above this allows you to change modes and mode settings.

   Press **DOWN** key to go to Speedometer Calibrate screen (**Speedo Cal**):

   Details Section 7.

DRIVING WAKEBOARD

Select the desired **SETPOINT** by pressing the **UP** or **DOWN** keys. Pull the rider up normally and accelerate smoothly up to or slightly beyond the target speed. Once PerfectPass sees the actual speed reach the **SETPOINT** it will <u>automatically</u> take control and will notify you of this with an audible beep. (Top line will become highlighted during engagement).

While in engaged the WakeboardPro should hold a smooth steady speed in a straight course down the lake. The driver should keep their hand on the throttle for safety, and to prevent it from pulling back on its own which will cause PerfectPass to disengage.

The key to driving is to smoothly drive to the SETPOINT so the system can seamlessly take control. If you accelerate aggressively past the **SETPOINT** it will hunt around for several seconds before settling in. You will hear an audible beep when the system automatically takes control. If the rider falls, simply pull back on the throttle and the system will disengage.

To Disengage System: If the rider falls simply slow the boat down. This will disengage speed control. Return to rider slowly and pull up again. System will once again take over when **SETPOINT** is reached.

Turns / Over-riding the system: As the boat enters a turn, the engine RPM may increase to keep the craft at the **SETPOINT**. If the driver would like less throttle (so the rider does not get whipped) then simply pull back some on the throttle and help the system maintain a safe speed. As you complete the turn, move the throttle gently forward and the system will re-take control. (The driver can override the system at any time by pulling back or advancing the throttle).

Wake Surfing in Wakeboard mode is excellent in the 9 – 11 mph range. Prior to using your boat for wake surfing, check with your boat builder or dealer to confirm it is safe for this sport.

Double Up – When approaching a "double up" turn, the driver can manually assist the system to maintain the desired speed.

WAKEBOARD SETTINGS

Wakeboard Settings are accessed by pressing the **UP** key on the Main Wakeboard Screen with the ▶ highlighted. Then press the **DOWN** key when WAKEBOARD is highlighted on the Mode Select Screen.

Calibrate – Used to calibrate the PerfectPass digital speedometer readout. The procedure for adjusting this can be found in the *Section 7: Digital Speedometer Calibrate*. The calibration screen can also be accessed from the Main WAKEBOARD Screen by pressing the **DOWN** key with the ▶ highlighted.

KdW (Pull Characteristic) - KdW can be changed using the **UP** or **DOWN** keys with it highlighted on the screen. Higher values = more aggressive control response. Factory setting is 80. (Example: Heavily loaded boats may need a higher value to maintain a steady, crisp pull. Try 100– 150). After adjustment, press **MENU** to proceed. (Maximum recommended setting 200).

NN (Paddle Filter Factor) – NN is set at 120 and represents the "Filter Factor" of the paddle. The higher the value, the more speed samples are taken from the Paddle prior to speed adjustment. It is rare for NN to require adjustment from Factory setting. If you believe your system is more "nervous" than it should be, try raising the NN. If the speed is floating too much, try lowering NN. This value is shared with Wakeboard Mode. Adjustments made in either mode will change the value in both modes. (Norman range 80 – 150).

Section 7. CALIBRATING PERFECTPASS SPEEDOMETER (Trick / Wakeboard)

If your digital speedometer is not accurate, you can go into the **Speedo Cal** screen of the system. This is accessed by pressing the **DOWN** key with the ⊡ highlighted on the:

- Main Trick or Main Wakeboard Screen – Trick and Wakeboard Modes
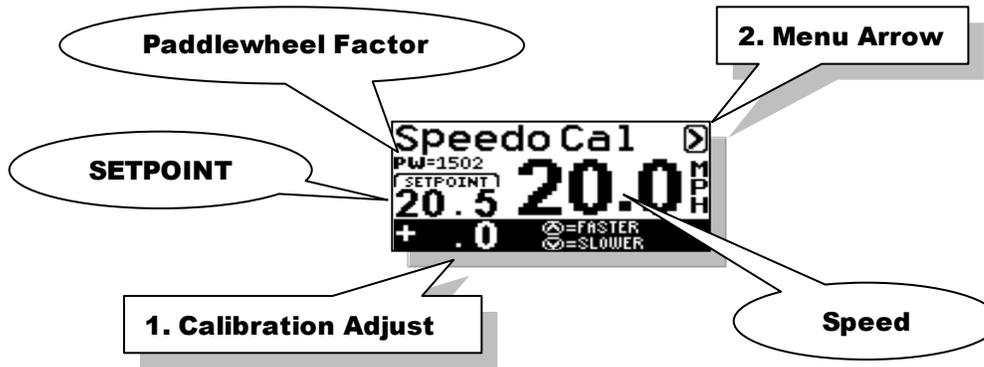
There is one speedometer calibration value for Wakeboard and Trick Modes: (If you calibrate in Trick Mode, Wakeboard is adjusted as well). If you calibrate, we recommend you do so at 20 mph .

With the Calibration Adjust highlighted on the screen press either the **UP** or **DOWN** keys to speed or slow the boat.
CASE 1: Boat speedometer reading lower then PerfectPass Speedometer
     Press the **UP** key until the boat speedometer matches the PerfectPass speedometer
CASE 2: Boat speedometer reading higher then PerfectPass Speedometer
     Press the **DOWN** key until the boat speedometer matches the PerfectPass speedometer
When the speed readout matches the boat or reference speed press **MENU** once to highlight the ⊡ then press the **UP** arrow to return to main screen.

Example: If you are set and engaged at 20 mph, but the analog speedometer or GPS is reading 22 mph, go into the **Speedo Cal** screen and press the **DOWN** key several times until the boat speed drops to 20 mph so the PerfectPass Digital Speedometer matches the GPS or boat's speedometer.

Paddlewheel Factor – This value is the actual calibration value much like an RPM baseline. This number can be used to quickly determine where the calibration is at when troubleshooting the paddlewheel. This number is also very useful when trying to set calibration to match another system or to reset the calibration after a system RESET had been performed.

Section 8.   INTEGRATED TIMING

USING INTERGRATED TIMING

An integrated timing system is another unique feature of PerfectPass. This timing system is set up for both the Slalom and Jump modes. For tournament skiing and in Jump mode **timing must be used and be interfaced into the Master Module** for PerfectPass to work properly.

The system has been loaded with the USA Water Ski / I.W.S.F. Record Capability time tolerance chart for the Slalom and Jump modes. At the end of each timed pass the display will briefly display the full course time. It will then show the 1st and 2nd segments and variance from actual. To review the times again, simply press the **MENU** button to highlight the timing section of the screen. The system always resets after a few seconds. If the skier has fallen or the run has ended early, PerfectPass will know and resets.

PerfectPass All Ball Timing – Our simplified "All Ball Timing" Method 4 is also loaded on this DigitalPro System. For operating details, see information in the Appendix at rear of manual. All Ball Timing is for tournament use only, and is not required for daily practice.

Hand Timer - The optional Hand Timer is used much like a stopwatch when you do not have magnets in your course. As you enter the course press the button, then again at the ball three timing gate and again at the exit gate. If you have a Smart Timer & magnets, the timer will pick up each magnet automatically and an audible beep will be heard.

Smart Timer - If you have a Smart Timer magnetic sensor and magnets you will not require the Hand Timer. The Smart Timer plugs into Timer 1 or Timer 2 input jack on the Master Module. If you do not have magnets in your course, disconnect the Smart Timer and plug the optional Manual Hand Timer into Timer 1 or Timer 2. If you have magnets and a Smart Timer, you do not require the Hand Timer.

PLACING SMART TIMERS

The sensor should be placed as close as possible to the outside of the boat. Typically the sensor is beside and under the passenger seat in a dry location. The Velcro should hold it firmly on the carpet. Place the timer in the direction as indicated on the Timer label to match the polarity of the magnets. If you are using 2 Smart Timers they should be lined up evenly so they are across from each other in the boat.

In tournament use it is recommended that two Smart Timer pick-ups be used. One will be plugged into Timer 1 and the other into Timer 2. Both Timers should be used to test the strength and polarity of jump magnets.

Note: For the jump event and for all buoy timing (ABT) you may require two Smart Timers, one located on each side of the boat. Both will plug into the Master Module. If using one Smart Timer you may have to move it to the driver's side depending on where your magnets are located.

Note: Some two way radios operating **from the towboat** can activate the timing system. In tournament conditions **only** press the talk button and communicate with shore officials before the boat is up to **SETPOINT** and after it has exited the course.

Note: Whether using the Hand Timer or Smart Timer magnetic sensor, they will not operate or register a signal unless the boat is up to **SETPOINT** and system has engaged. This feature helps to avoid false triggering.

Note: Smart Timer is designed for tournament skiing under tournament conditions. In other conditions such as **lake cruising it will likely false trigger** if you engage the system in Slalom or Jump mode. In this case you may wish to disconnect the Smart Timer when not in tournament like conditions.

False Triggering - To reduce the chance of false triggering, drive a few miles per hour below the **SETPOINT** after exiting the course and during the turning route between passes. If you are <u>not</u> dropping skiers between passes do not fully accelerate to SETPOINT until you have passed through the boat wakes from the previous pass. (Smart Timer will not accept signals until speed control is engaged). **In the event the timer false triggers outside the course and system is engaged,** <u>**press the UP key to clear timer.**</u>

INSTALLING COURSE MAGNETS

Magnets should be placed as close to the surface as possible for the most accurate and reliable timing.

It is very important that all timing magnets in a given course have similar field strengths and all have the same polarity (North Pole facing up). With the same polarity each magnet will generate the timing trigger pulse exactly at the centerline of the timing buoy. A reversed magnet causes this trigger point to move towards the oncoming boat, this change in trigger location can be as much as four feet. At the higher boat speeds these timing errors can cause a perfectly in tolerance pass to become an out of tolerance re-ride. With a reversed magnet this error is also affected by boat path, depending upon which magnet is reversed either one or both timing segments can be affected.

If you are unsure about the actual polarity of your magnets and are not getting the REV message, then make a pass with the Smart Timer arrow pointing towards the bow and make a note of the values displayed. Then reverse the direction of the Smart Timer sensor by pointing it towards the stern and make another pass in the same direction. The correct direction to point the Smart Timer is the direction, which produces the largest field strength values.

Jump Magnets: *It is very important that no other magnets are present in the course other than the official jump course magnets. For example, if the jump course runs next to the slalom course any slalom course magnets that could trigger the jump timer should be removed.*

For quality magnets contact PerfectPass at (902) 468-2150.

# Section 9. MAGNET TEST MODE / DEVICE TEST

TESTING MAGNETS

This mode allows you to test the timing magnets in the slalom and jump course for field strength and polarity. This mode uses a set RPM value (approximately 3080 rpm) to control. If you are running "All Ball Timing" or are in the jump mode, you should check that both of the Smart Timers are detecting properly, to do this you may need to drive the boat beside the course to test each sensor alone. Your test can and should be done in both directions through the course.

Note: Sitting with engine OFF in this mode will indicate if any of your timers are overly sensitive or if something in the boat is causing a magnetic signal. With engine ON and boat at idle, the timers may trigger due to alternator noise. On the fly, you can press "Clear" and complete testing

The boat is brought up to the set RPM to engage the system and the boat is driven through the course. After engagement the screen should appear as follows:
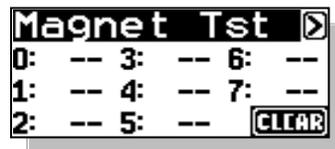
Drive a split boat path and note the magnet strength readings. After passing two magnets using 2 Timers the system could display a message similar to the following:
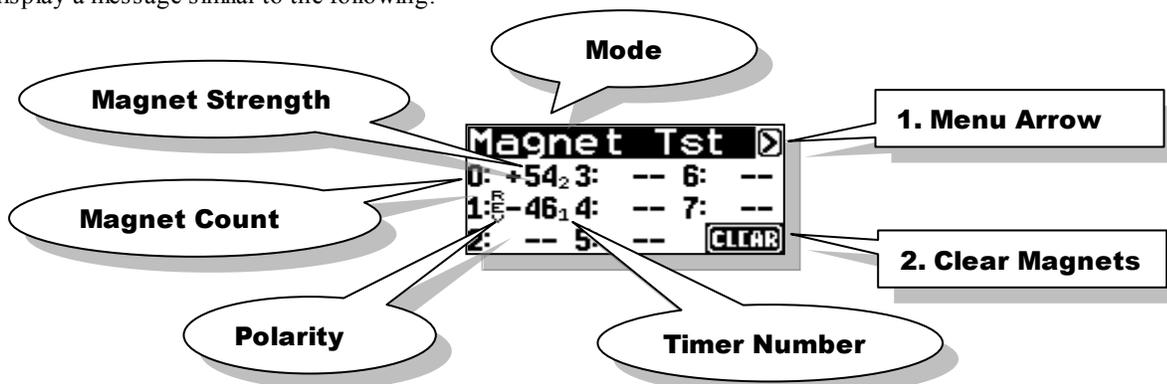
Timer Number- indicates the timer which has been triggered (labeled on Master Module "Timer 1" or "Timer 2").

Polarity - In the above example, **MAGNET #0** indicates a correct positive polarity "+" with a good strength of 54 from Timer 2. **Magnet #1** shows a Reversed Magnet with a negative polarity "-" from Timer 1. A weak reversed magnet may only display the "REV" without the "-" sign in front of the strength. **NOTE:** A very large or strong magnet can saturate the sensor and cause the "-" message to occur incorrectly. In this case move the sensor towards the middle of the boat by about 16 inches and retest. Your test can and should be done in both directions through the course.

Magnet Count – Indicates the order each time a magnet is detected. Counts from 0 to 7 then scrolls back around to 0.

Magnet Strength – Indicates the strength of a particular magnet. Acceptable values for magnetic strength are 30 or greater. Values below 30 may not produce accurate times. To have extremely accurate times, it is best that all magnets have a similar strength (usually within 5). You can drive back through in the opposite direction and should see similar readings.
Sometimes you may need to unplug one sensor and test each one separately or run slightly wide and then slightly narrow in order to separate the sensor readings.

Understanding Magnet Test Results
One or more (not all) magnets are showing a low values or "-" polarity
- -Check the depth of that magnet.
- -Check magnet polarity. See 'Placing Magnets'.

All magnets are showing low values
- -Check the depth of that magnet.
- -If this course is known to be good, the Smart Timer may be failing.

All magnets are showing "-" polarity
- -Check direction of the Smart Timer. Possibly needs to be reversed.

Section 10.   ADDITIONAL FEATURES (Menu & UP Keys together)

Additional PerfectPass features are accessed by pressing the **MENU & UP** keys together from any main screen. The features available vary depending on the make and model of your boat. If a feature is not present on your PerfectPass then it is not available on your system. To move to the next feature press the **MENU** key.

SCREEN CONTRAST

You can adjust screen contrast by pressing UP or DOWN Keys. (Setting 1-5). In bright sun, you may have to use a smaller value to improve visibility. (When boat is parked in direct sun you may wish to place a towel over instrument panel).

NAME LIST

This version of PerfectPass allows you to store up to eight names and their preferred speed. The Name List can be accessed by pressing the **UP** key when the NAME/MODE section is highlighted or by going into the SUBMENU and selecting the Name List. Once in the Name List press the **MENU** key to move through the list. With the desired name highlighted press the **UP** key to select the name from the list and load their settings or press the **DOWN** key to edit the name.

```
        QUICKLIST
☑ AMANDA 20.5
New    Entry

 ♡= EDIT     ⊗=SELECT
```

Creating Names – First enter the Name List. Press the **MENU** key until [**NEW   ENTRY**] is highlighted. Then press the **UP** key to enter a new name. The following screen will then appear:

```
Name= AMANDA
Mode= wkb
Speed=   20.5
```

Scroll through the alphabet using **UP & DOWN** keys, and then press **MENU** to move to next position. Press the **MENU** key to move through the settings. If you are programming a JUMP or SLALOM name there will be another page of settings to enter.

Editing Names – As you scroll through list of names, instead of pressing **UP** key to select that name, press the **DOWN** key to edit.

Note: Names can be changed by "Editing Names" but can only be deleted by performing "System Reset".

SYSTEM INFO

General system information can be found here. The software version, engine selection, system voltage and water temperature (not equipped on all boats) can be found here.


```
Version

Engine Selection          Water Temperature

Ver 6.5ng.01
5.7/MPI/TBI
12.8V  92.5°F
        1.2hr

System Voltage           System Hours
```

34
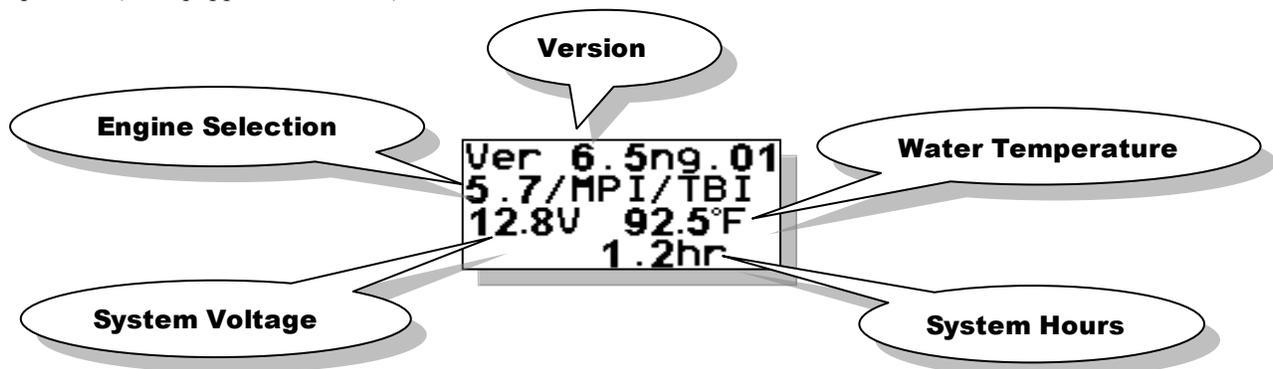
NOTE - System Hours and Water Temperature are only available on limited boats)

DEVICE TEST (Rope Switch, Servo Motor) (MENU and UP Key together)

Other test features such as Jump Switch Testing, Voltage Supply Testing and Servo Motor Testing are found here via MENU and UP Key. Test mode or through the SUBMENU. These tests can be performed with or without engine running. PerfectPass must be switched ON.

Rope Switch Test – This feature allows you to test the rope switch to be used prior to a tournament and will appear as [ROPE SWITCH TEST]. Pull hard on the rope to close switch and it will change to [ROPE SWITCH ON] and there will be an audible beep to confirm proper operation. Since it takes 250 pounds of force to trigger a Slalom Switch, it is very difficult to do. The easiest way to confirm operation is to ski with it and watch the ▶ symbol in the upper right corner. This symbol will turn into ⊟ when the switch is activated.
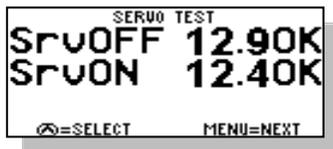
Servo Motor Voltage Supply– This test will check the 12 V supply attached to the PerfectPass Servo Motor (via Master Module). Voltage level ranges will be slightly lower if the boat engine is not running.

SERVO TEST
SrvOFF 12.90K
SrvON 12.40K

⊘=SELECT   MENU=NEXT

SrvOFF 13.5 OK– The system powers down the servo motor and measures the supply voltage level. The voltage with engine running should be in the range of 13 to 14 V. If the voltage is below 13.0 V, the display will show it as low ("LO").

SrvON 12.7 OK– The system turns the servo motor on ands measure the supply voltage. The voltage should be in the range of 12.5 – 13.5 with engine running. A reading below 12.1 V will produce a "LO" indication. Press **MENU** to continue.

The difference between the voltage readings of these two tests indicates the condition of the power connections. A difference of more than 1.2 V indicates a potential wiring problem.

Servo Motor Phase Test - The servo motor will slowly rotate and continually check all phase circuits (Green, Black, Brown, White, and Red). If a circuit is bad or "Open", the voltage will show as 00 as seen on the black phase on this example. The brown wire should be checked at the Master Module and at the servo motor white six-pin connector. If all phases show non-zero the phase test has passed. Press the **MENU** key to continue.

Servo Motor Rotate Test - This test will continually rotate the servo motor back and forth one full rotation. This is usefully when tracking intermittent wire faults. Example: 'Servo Motor Phase Test' checks OK but throttle feels "limp" and boat engine is unresponsive after a few minutes of operation.

Reset Servo – This function RESETS the servo to its home position. This does not AUTO-TIGHTEN the servo.

Section 11.   INSTALLATION INSTRUCTIONS

Step 1.   Installation of Servo Motor

Using the two provided hose clamps, loosely mount the servo motor on top of the cooling water hose leading to drivers side exhaust manifold (starboard side on standard inboard engines). See Figure A. Tighten later after final positioning (or as specified in any Addendum photos).

Remove ball joint connector from throttle control lever and remove the coupling from end of Morse control / Teleflex cable. (See Figure B).

Position the servo motor throttle cable in line with the throttle control lever. Ensure the 10/32 locking nut is in place on Morse control / Teleflex throttle cable. Screw threaded brass hex connector on PerfectPass cable onto the end of the Morse control throttle cable. (Do **not** over tighten hex nut). Install L shaped brass throttle adapter to throttle control lever using identical hole as original ball joint. (L adapter must be able to swivel). Using an Allen key, tighten L shaped adapter-mounting bolt. (See Figure C). You may find it helps to move the Morse control lever into gear during installation to allow more clearance. Be sure the washer is next to the brass L-adapter and not under the nut.

Check and adjust position of servo motor ensuring the motor box cover closes properly and servo throttle cable is not in contact with any moving parts. Make sure the servo motor cable has 2 or 3 inches of free travel. Securely tighten hose clamps on servo motor. (Do not "tie wrap" the throttle cable as it must be able to move freely).

With the throttle in neutral position, adjust brass hex connector if necessary to ensure there is **no gap** between it and the end of the servo motor cable (any gap may cause engine to surge up and down in neutral). Adjust and snugly tighten all parts. (See photos, **DO NOT OVER TIGHTEN**).

Turn the black servo motor knob in a <u>clockwise position</u> until **snug**. With throttle in neutral, the linkage should appear as in Figure C.

Servo Motor / Cable Testing - It is vitally important that the stainless steel cable inside the plastic jacket has the ability to move freely or the system will not perform properly, may hunt and not settle down. The alignment of the PerfectPass cable and the boat's throttle cable should be straight.

Linkage Test - An easy way to confirm proper operation after installation is to perform the following quick linkage test. With key **OFF**, push the manual throttle lever to ¾ open position. Then take the black knob on servo motor and slowly wind the knob in a counter clockwise, then clockwise direction. As you do this, the engine throttle arm will slowly open and close. This should happen <u>very smoothly</u> and in no place shall the cable *"catch"* or *"hook"* which will cause the servo to hunt. If the cable does "catch", adjust servo & cable to eliminate this problem.

If the cable comes into any interference with the fuel rail, decorative engine cover or anything that causes this problem, adjust motor and cable accordingly.

The brass L bracket on the throttle linkage must be able to *swivel freely* for system to work smoothly.

IMPORTANT:	- Make sure all wires are tied away from hot or moving parts and there is adequate clearance.
	- The manual throttle on your boat should operate and feel the same as before the PerfectPass was installed, or you may have to adjust hex nut.

If you have re-installed a decorative engine cover, with key <u>"OFF"</u> push the throttle down to full open and back to neutral. At no point should the PerfectPass cable "hook" or "jam". (Never tie wrap on restrict the PerfectPass cable from free movement).

Step 2.   *Installation of Master Module*

Mount the Master Module under the dash normally on the bulkhead accessible behind and right of the passenger seat in a dry location. It can also be installed on the left side of driver's bulkhead. The wires from under the dash pod can be easily fed across the bulkhead.

Route servo motor power cable from Master Module to servo motor and connect. A wire snake is helpful. (Use tie wraps to keep cable away from moving parts). Make sure the tips **on the plug are facing up** towards the top of the Master Module box will.

Step 3.   *Mount Dash Display*

Remove the right speedometer and install the **In Dash PerfectPass Display** and connect into Master Module. (If there is a speedo tube on back, it can be plugged using a golf tee).

If you have the standard **External Display**, install using supplied <u>mounting post</u> to the right of dash next to wind screen. In the event you have **5" gauges**, generally the PerfectPass 5" display replaces the tachometer. (On 5" gauges, refer to specific instructions sent with gauge).

Step 4.   *Connect Power Wire*

Depending on the boat and model, there are a number of ways to connect to a switched (12 volt) power source.

1. On boats with traditional analogue gauges and posts on back of tachometer, there is a 12 volt (+) post often marked (IGN) which is an easy connection to the purple wire. The black wire end can attach to the ground (-) post marked (GND).
2. On boats with Borg Warner gauges with no posts, attach the PerfectPass purple power wire to the purple wire leading to the ignition terminal. The black wire can be securely grounded to the grounding bar or other suitable ground location.
3. **2000 – 2005 Nautiques** – There is a main wiring harness and large white plug located behind the dash pod. Connected to this plug is a purple wire carrying the switched 12 volts and a black wire which is a suitable ground connection.
4. **2002 – 2005 MasterCraft** – Power, RPM and Paddle Wheel speed is all located in the special plug and play harness supplied with each system. The MasterCraft supplied white connector is on every boat specifically for PerfectPass. You may have to remove the driver's foot panel to locate this connector in the boat's wiring harness.
5. **2005 Malibu** – The plug & play harness will provide RPM, Power and Speed signal.

Step 5.   *RPM Cable Installation*

This connection will depend on the brand and year of boat you own.

(1)   **Standard Installation** (Older boats and boats with traditional Analogue gauges with Posts on back)

The **Gray wire** with ring terminal can be easily attached to the "SEND" post on back of tachometer. This Gray wires picks up the raw engine rpm from this post. The **Black wire** ring terminal can be attached to any suitable ground, including the ground post on the tachometer. (If there is not a post, connect to the solid gray wire coming from the tachometer).

(2) **2002 - 2005 MasterCraft** – The custom wiring harness supplied by PerfectPass allows for plug & play for RPM, Power & Paddle Wheel.

(3) **1998- 2004 Malibu** (Borg Warner Gauge System)

In behind the dash pod on most models, Malibu has left a Gray (RPM) wire that terminates at a large female spade connector. If you can locate this, you can simply attach the Gray wire on the rpm sensor cable to this connector.
Alternatively, you can locate the solid gray wire in the main wiring harness that leads <u>into the</u> Borg Warner control box under the dash. Use a blue "Tee Tap" connector to connect to this gray wire. You can then attach the gray rpm sensor wire to this using a push on spade connector. The black wire can be securely connected to any suitable ground.

LS-1 On this engine (pre 2002 only), you only connect the Black wire on the RPM Sensor cable to the Gray wire leading to the Borg Warner control box. (Same as LT-R MasterCraft). The gray RPM sensor wire is left un-connected.

2005 Malibu - See Plug & Play Harness.

(4) **1999 – 2001 MasterCraft, 2000 Supra, 2000-2002 Infinity (All Other Brands Using Borg Warner Gauges)**

TBI & Multi Port Engines (except LT-R) – Locate the solid gray wire in the main wiring harness that leads from the engine <u>into the</u> Borg Warner control box under the dash. This solid gray wire carries the raw engine rpm. Use a blue "Tee Tap" connector to connect to this gray wire. You can then attach the gray wire on the rpm sensor to this using a push on spade connector. The black wire can be securely connected to any suitable ground.

LT-R / LT-1 - On this engine the Gray wire lead on the PerfectPass RPM Sensor cable <u>is not</u> <u>used and can be taped off</u>. The separate **Black wire** end must be connected to the Gray wire located in the main wiring harness <u>leading into</u> the Borg Warner MDC Control box. It is on the engine side of the box that the raw rpm is located. You can attach a blue "Tee Tap" connector to this Gray wire, and attach the RPM sensor cable end to this "Tee Tap" using a supplied spade connector.

(5) **2000 – 2002 Nautiques**

Same as standard #1 above, except the rpm signal can be picked from the Gray wire coming from the back of the tachometer.

(6) **2003 - 2005 Nautiques**

Located behind the dash pod is a large wiring harness with a large white plug. The Gray wire in this plug carries the raw rpm of the engine and has been brought to the pod solely for the PerfectPass system. This gray wire is not connected to any gauge. Use a blue "Tee Tap" connector or other splice method to attach the Gray wire on the PerfectPass rpm sensor cable to this Gray wire in the harness. The Black wire (ground) on the RPM Sensor cable can be attached to the black wire in this same boat harness.

Step 6. If you have a **Smart Timer Magnetic Sensor** connected into Timer 1 plug. The Smart Timer should be mounted on the floor, along the <u>outside wall</u> of the boat, generally under or beside passenger seat. With the arrow on the Smart Timer pointing forward. (If you have two Smart Timers, install the second one on floor beside driver seat along outside wall). If you do not have magnets in your course, connect the hand timer into "Timer 1" port so you can time manually. Only connect Smart Timer when you have magnets.

Optional Manual "Hand Timer". If you do not have magnets in your course, connect into "Timer 1". If you have a Smart Timer, do <u>not</u> connect hand timer.

Step 7. Install Paddle Wheel speed sensor and connect to Master Module. (See attached detailed instructions). (On some boat brands, paddlewheels are not included as the boat has a standard factory installed paddlewheel).

Following a short delay the Dash Display will become active.

(You will note each time the boat is started the system will perform an "Auto Tighten" function and servo will rotate clockwise).

Step 8.   Your manual throttle should act and feel just the same as before PerfectPass was installed. If it does not feel normal, inspect throttle and linkage connection, particularly the brass hex nut adjustment.

For assistance call (902) 468-2150.

Tools and Material Required

2 inch hole saw,   Sealant eg. GE silicone sealer

Installation

The 2 inch hole is placed approximately 6-7 inches (16 - 18 cm) perpendicular to the centerline of an inboard ski boat, beside the drain plug under the engine. Never install behind a strake, depth sounder, etc. Normally this is on the passenger side away from the bilge pump and other cables etc. Ensure there is sufficient room to pull the inner paddlewheel assembly from the housing when it is mounted under the engine. In this area of the bottom of the hull there is normally a flat surface away from the turbulence of the tracking fins and lifting strakes. The hole saw is used to cut the hole for the paddlewheel working from the bottom of the boat. (You may wish to drill a pilot hole with a drill bit from the inside to make it easier to locate from underneath)

Before disassembling the paddlewheel unit take note of the arrow on the bottom of the housing and on the top of the inner paddlewheel assembly near the cable exit, these arrows both point forward when the unit is installed. Disassemble the paddlewheel unit by unscrewing the locking cap until it is completely free to turn, then pull complete assembly up and separate from housing. Take care not to loose the paddlewheel itself and its stainless steel shaft which maybe free when the unit is disassembled.

Remove housing nut and rubber ring gasket. (This gasket will be installed later on the inside of boat). The sealant must be placed on the surface of the sealing flange on the housing and also on some of the lower threads of the housing to help lock the sealing nut in place. The bottom of the hull in the area of installation must be clean and dry for the sealant to seal properly; inside the bilge should also be clean to allow the seal nut to be properly tightened. Install housing from below boat with the arrow on the bottom surface of the housing pointed toward the <u>forward</u> direction of travel of the boat, parallel to the keel of the boat. Install gasket and seal nut should be tightened snuggly by hand so that the sealant is forced out of the sealing surface and the housing flange is as close as possible to the hull surface. The excess sealant <u>must </u>be wiped away from the housing to give the water flow a clear path. A final check of the location of this directional arrow and inside notch in housing should be made before the sealant is allowed to setup.

Reassemble the paddlewheel unit by sliding the inner unit into the housing with the arrow on the inner housing pointing toward the front. (Ensure paddlewheel assembly is properly centered in "notch" of housing, with arrow pointing toward bow). <u>Hand tighten</u> the locking cap.

The output cable should be run under the floor with the servo power cable so that it can be plugged into the master module. *(Included with this unit is a "Plug" and extra paddle and axle kit.)*

V-DRIVE / WAKEBOARD BOATS / STERN DRIVES – The paddle is typically installed in front of the engine, just behind the gas tank. *(This area is generally accessible from the engine compartment or under rear seat.)* It is installed typically 7 – 8 inches off center, clear of any strakes in the hull, depth sounders, etc. Refer to any addendums that may be included. Never install behind a water intake or any other item that could cause turbulence.

The key to a good installation is to place the paddle in a location where there is nothing to disturb the flow of water in front of the paddle for 5-6 feet.

Section 12. TROUBLE SHOOTING / GENERAL INFORMATION

You can learn a lot from just turning on key and watching system start up. Every time PerfectPass is powered you will see the back light in Display glow green followed by a beep as the screen becomes active. When the Master Module sees a solid 12 volts +, the Intel processor starts which puts the data on screen and the servo motor will perform its "auto tighten" check.

A.   **NOT CONTROLLING**

        Servo Motor "Auto tighten" Test

        Check: To confirm proper operation of the 4 phase servo motor, perform the following test. With key OFF, check to see if servo motor can be easily turned and that set screw in knob is snug. (It should turn freely, if not the motor may be seized) Turn knob in clockwise direction until snug, and then turn it back counter clockwise <u>one</u> full turn. Now turn key ON and servo should perform its "auto tighten" function and wind in the cable (approximately ¾ of a turn). (Every time system is powered, it will do an "auto tighten" which confirms all electrical phases are OK). Ideally, you should hold knob gently during "auto tighten" test to put a little extra load on the motor to check the connections.

        Remember the servo motor will run very hot, particularly the gold resistor.

        If motor <u>does not</u> wind in or just vibrates, then an electrical connection is likely bad. Unplug both connectors at servomotor and closely inspect the crimps and wiring. Gently pull on each wire to make sure the wire is securely crimped. Also check the connectors on the gray servo power cable at both ends   (See servo testing in addendum for detailed testing).

        If this test is OK, do a "Linkage Test" as described in section B.

B.   **Linkage Test -** With key OFF, push the manual throttle open to ¾ position. Then take the black knob on servo motor and slowly wind the knob in a counter clockwise direction, then in a clockwise direction. As you do this, the throttle will slowly open and close with each step of the motor. In no place should the cable catch or hook as this will cause the system to surge. If the cable comes into contact with any part, fuel rail, cross over pipe or decorative engine cover, adjust cable and servo as required. (The cable should have a nice smooth bend and be in good alignment with the throttle connection. If you feel the cable is too long, contact PerfectPass)

        The brass L adapter should <u>freely swivel</u> as the throttle opens & closes.
        (If your boat has a plastic decorative engine shroud, you may wish to remove it temporarily and see if the problem disappears).

        With key <u>OFF</u>, push manual throttle to full open and back to neutral. Does PerfectPass throttle cable move forward and back freely without jamming or rubbing against cover, fuel rails, etc?

C.   **System surging in neutral** – Check gap between the PerfectPass cable & the Morse control / Teleflex cable. There should be No Gap. (See photo C in instruction manual).

D.   **System accelerates past set point** – If the system accelerates past the set point and is very slow to work back to the set speed, the engine throttle return spring may be weak. PerfectPass can open the throttle, but depends on the engine return spring to bring it back towards neutral. A spring can be easily added. It may also be a throttle cable / mechanical problem. See Linkage Test, Section B above.

        On Water Test – To confirm this, drive the boat carefully with engine cover open. Set speed at a lower setting (i.e. 20 mph) and have driver engage system and press throttle up to 25 MPH. As boat speed exceeds 20 mph, the servo should turn counter clockwise to let out cable and slow engine. If servo counter rotates, the return spring should pull throttle back towards neutral. If servo rotates but boat does not slow, the return spring is not pulling or something is preventing the throttle or cable from moving.

E. **No RPM tachometer reading** – If the display tachometer reading is 00, check to make sure rpm sensor is plugged into the correct port on Master Module. Check connections of rpm sensor. (Check installation as per instructions).

F. **Digital speed readout** – If the digital speedometer is not reading at all, check to make sure it is plugged in correctly. Check the paddle wheel to confirm the wheel is not damaged and is spinning freely.

Low Speed Reading – If you have a very low speed reading and the paddlewheel looks O.K., perform a "System Reset".

G. **Blown Fuse (5 amp, 1.25 inch fuse)**

The most common reason a fuse will blow is if the red wire in the servo power cable is grounded or shorted. Inspect the wire for any breaks, pinches or failure especially near the gold resistor on the servo motor.

H. **System Reset** – If you would like to reset the entire system to original factory specifications, you can do so by **pressing & holding the ON/OFF & MENU Keys together as you power up the system.** After about 5 seconds the display will show [System Reset ^ = Y]. Press the **UP** key to continue with a reset.
 The next question will be whether you wish to reset all your baseline rpm values. [Reset RPM @ ^ = Y] If you are happy with your baseline values, press the **DOWN** key and your settings will be maintained. On some systems, you will be asked to select the engine in your boat. It will then ask if you wish to run in just wakeboard modes [WAKBD ONLY ^=Y].

I. **Change Display from MPH to KPH/Wakeboard only** – Perform a "System Reset".

J. **System surging in Trick or Wakeboard Speed Mode** –

Check: If your system works very well and controls smoothly in the rpm mode, but surges and hunts in the speed based mode, it is likely a paddle wheel related problem.

1. Does the paddle wheel impellar spin freely? (if not, change impellar)
2. Is the paddle wheel housing under the hull pointing straight forward. The arrow on the housing must be pointing straight ahead.
3. Is the impellar installed in the assembly in the correct direction?
4. Is the paddle insert <u>fully</u> and properly set in the housing?
5. Is the paddle wheel installed in the correct location? Call for details on your boat model. It can not be installed directly behind a strake, water intake, etc. which could disturb the flow of water.
6. Perform a System Reset. Press & hold the ON/OFF & MENU Keys together as you power up the system. Continue holding until you see the System Reset Prompt.
7. If it only surges when the boat is heavily loaded in a certain configuration, it may be a location problem.
8. Run your boat in RPM Mode at about 2800 and when boat is controlling smoothly, look at digital speed reading on PerfectPass. It should be steady as well or there is a speed signal problem.

If the problem cannot be corrected, it could possibly be a defective paddle wheel.

K. **Run in Wakeboard only Mode/Three Event Menu** – To run in just wakeboard modes or to return to the full event menu see (I) above.

L. **Display is Hard to Read** – Adjust contrast.

APPENDIX

PerfectPass All Buoy Timing   Version 4 IWSF Approved 2001

The All Buoy Timing Method (ABT) eliminates the need for a fall button. In Tournament Use, after a skier falls or misses during a pass, the boat is timed to the next set of boat gates. Because the boat travels only a relatively short distance before the time is measured, the boat speed does not change significantly. Thus the time is an accurate measure of the speed of the boat while pulling the skier.

If the skier runs a full pass, the <u>full course time</u> is used to determine if the boat speed was within tolerance. For scores less than six, a chart showing the timing tolerances for each buoy score is used. This method uses the cumulative time from the gates up to the last ball scored. With this approach, only one segment time is required.

After each pass, the PerfectPass system briefly displays the Full Course Time and then the two separate segments as in this 34.2 mph example. **[0.0 16.95 OK]** then **[7.13 9.82 OK]** If the score was less than six, then the ABT sub-menu is entered via the Down Key. The times are displayed in pairs preceded by the score identification and a colon. (Press any key to take you to the next set of scores). **For example:** if the score were four and a quarter, you would scroll through the ABT times until the 4 ID is found which would appear as: " **4: 12.50 5: 15.19** " The time of 12.50 would be called in. For a score of one and a half the display showing " **0: 1.77 1: 4.45** " is used and only the 4.45 time is reported. All of the existing rules for optional and mandatory rerides are applied to the ABT times. *(The guide is to always refer to the time segment corresponding to the score. Example: If the score starts with a 4 you look at the time following the 4 and call in that time only.*

Magnets: A minimum of eight magnets and two Smart Timers are required to run ABT, a course with ball one magnets had eight magnets already, two are on the entrance and exit gates and two Smart Timers are required for the jump event, so for many sites the equipment necessary to use ABT already exists.

(Check with our website at www.perfectpass.com for more details).

PerfectPass All Buoy Timing
36mph/58kph   IWSF approved method 4

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score	score id.	fast in	actual	slow in
0 to 0.5	0:	1.64	1.68	1.71
1 to 1.5	1:	4.15	4.22	4.28
2 to 2.5	2:	6.67	6.77	6.84
3 to 3.5	3:	9.20	9.31	9.41
4 to 4.5	4:	11.73	11.86	11.97
5 to 5.5	5:	14.25	14.40	14.53
6		15.92	16.08	16.22

PerfectPass All Buoy Timing
34.2mph/55kph   IWSF approved method 4

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score	score id.	fast in	actual	slow in
0 to 0.5	0:	1.73	1.77	1.80
1 to 1.5	1:	4.37	4.45	4.51
2 to 2.5	2:	7.03	7.13	7.23
3 to 3.5	3:	9.69	9.82	9.93
4 to 4.5	4:	12.35	12.50	12.64
5 to 5.5	5:	15.02	15.19	15.34
6		16.78	16.95	17.12

WARNING
RELEASE OF LIABILITY – ASSUMPTION OF RISK

IMPORTANT
(Detach, sign and mail immediately)

YOU MUST READ THIS!

The PerfectPass Speed Control device is a high performance mechanism designed solely for use with competitive water ski and wakeboard boats operating under ideal, calm conditions utilizing a spotter and all other safety crew and requirements of tournament water skiing. <u>The PerfectPass Speed Control device should not be used for any other purpose or under any other conditions.</u>

YOUR USE OF YOUR PERFECTPASS SPEED CONTROL DEVICE IS CONDITIONAL UPON YOU ASSUMING ALL RISKS, LOSSES AND DANGERS RELATING TO USE OF THIS DEVICE.

Both purchaser and/or anyone utilizing the PerfectPass Speed Control device acknowledges that their purchase and or use of this device is conditional upon them releasing and forever discharging PerfectPass Speed Control Systems Inc., its directors, officers, employees, agents and/or dealers, their heirs, and assigns **from any and all liability for personal injury or property loss** and from any other claims, demands, losses or causes of action, whether occurring prior to, during, or subsequent to or directly or indirectly connected with the use of the PerfectPass Speed Control device, **and whether caused by any persons negligence or otherwise**.

The PerfectPass release of liability, and warranty agreement shall be interpreted in accordance with the laws of the Province of Nova Scotia, Canada, and **IT IS FURTHER AGREED** that any legal proceedings that either directly or indirectly relate to the PerfectPass Speed Control device shall be conducted within the Province of Nova Scotia, Canada, regardless of where arising.

The purchaser hereby agrees to inform any subsequent purchasers or anyone using the PerfectPass Speed Control device, of the conditions of this Release of Liability, Assumption of Risk Agreement. It is agreed that there shall be absolutely no alterations to this agreement whether by implication or otherwise.

_____
                        _____
Purchaser Signature   Date

_____
Address

_____   _____
                                               Serial Number (found on Master Control Module)

_____
Name (Please Print)

(Must be signed to affect valid purchase and activate warranty agreement, detach and mail immediately to PerfectPass Control Systems Inc., 14 Trider Crescent Dartmouth, Nova Scotia, B3B 1R6, Canada).

LIMITED WARRANTY

During the first 12 months from date of original retail purchase, any PerfectPass component that fails due to defects in materials or workmanship will be repaired or replaced at the option of PerfectPass at no charge.

All warranty claims must be authorized in advance and a Return Authorization (R/A #) issued. All packages, correspondence, documents and packing slips must reference this R/A #.

Warranty excludes components damaged my improper installation or improper use of boat. Servo Motors are water resistant, but not water proof. Servo motors may become damaged if excess water is run in a boats bilge and this may void warranty. Ensure your boat is properly "bilged" prior to operating.

Warranty Service:

1. If your PerfectPass was factory installed, any warranty issues should be directed to your authorized dealer. PerfectPass encourages all customers to contact us prior to visiting your dealer for "technical support" as many issues may be easily handled direct with customer.
2. If your PerfectPass was purchased and installed by a dealer you may contact your dealer direct or initiate a warranty claim with PerfectPass.
3. If your PerfectPass was purchased directly from the Company, contact us at the number below.

Warranty Service / Technical Support
PerfectPass Control Systems Inc.
14 Trider Crescent
Dartmouth, Nova Scotia
CANADA B3B 1R6
(902) 468-2150

(Hours: Monday to Friday 8:00 am – 4:00 pm EST)

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THE WORLD LEADER IN SPEED CONTROL