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

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DBW **DigitalPro**

By PerfectPass

Version 6.5N

ST300 Paddlewheel

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PERFECT PASS®
World Record Speed Control

Driving PerfectPass DBW

Existing PerfectPass Customer?

If you are familiar with PerfectPass Systems, here is what you will find driving with the all new DBW PerfectPass used on new GM engines with electronic throttle control.

- Settings, Display adjustment and engagement / disengagement is almost identical to existing mechanical systems.
- You may find the DBW to be more responsive under certain conditions. For example, if you throttle up aggressively beyond the set point, you will notice a more dramatic drop to the set speed.
- When you are on the fly, you can turn control on or off without returning to neutral. The system will become immediately disengaged if you press OFF, and boat speed will move to wherever the throttle handle is positioned. Ideally, turning control on & off should be done at idle or in neutral position for enhanced safety.

Driving PerfectPass DBW

If this is your first experience with PerfectPass, you will find operating the system is very easy and straightforward.

For most operations, particularly in Wakeboard mode you simply start engine, turn PerfectPass ON and select desired speed using the Up & Down Keys.

Once speed is selected, you pull the rider / skier up normally and once you reach or exceed the set speed, you will hear a beep and PerfectPass will take control automatically. Speed changes can be made on the fly and if the rider falls you simply pull back on the throttle and PerfectPass will disengage. Return to the rider slowly, pull them back up and PerfectPass will once again take over.

Throttle Override – This system is equipped with override capability. Example: You are engaged at 22 mph and need additional throttle for a "double up" or in a tight turn. You can advance the throttle which will override the speed control and engine will accelerate. You will need to pull the handle back to its original position for the speed control to once again take control at 22 mph. If you pull it back too far, the ## sign will appear on screen meaning you have come back too far.

When you are finished with the speed control, return to neutral and press the OFF Key. You are now running the boat in full manual operation.

TABLE OF CONTENTS

APPENDIX

USER'S GUIDE

Section 1. INITIAL SET UP

(1) INITIAL SET UP (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)*

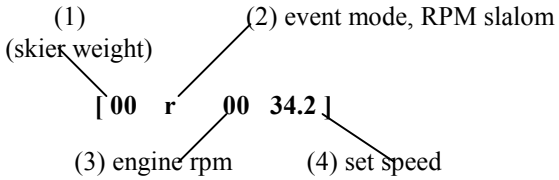
Step (1) Engine Selection. You will be asked to confirm which engine is in your boat. **[MCX / 5.7 ^ = Yes**]. For these engines press Up Key. If you have the big block 6.0 or 8.1L, press the Down Key.

Step (2) The display will now show [Read in Mph ^ = Yes]. It is asking you if you would like the display to operate in m.p.h. If you do confirm so by pressing the up key. If you want k.p.h. press the down key. (We have selected m.p.h. for illustration purposes)

Step (3) **[DigitalPro ^ = Yes]** If you have a three event DigitalPro system, press the Up Key. For a WakeboardPro, press the Down Key.

Step (4) The display will now ask you what the total crew weight is:
[CREW ADJ 000]. Dial in the approximate total weight of the driver and crew (in pounds). Press menu key to proceed. (This is for use in the slalom & jump modes only)

Step (5) The display will now move into the slalom mode, which will appear as:



1. Skier weight - leave at 00, details later
2. Event mode, r means rpm based slalom (Class R Time Charts)
3. Actual rpm of the engine (digital tachometer)
4. Set speed is the speed you wish to run and as shown is set at 34.2 mph (55 kph), this will convert to a digital speedometer as the boat speed is increased.

At this point you may wish to scroll through the menu while sitting still and get comfortable with the various features and with moving between modes before proceeding. If you are not using your system for slalom, you can ignore this section and move direct to trick or wakeboard mode.

Moving between modes:

If you wish to move from slalom to another mode, press menu key until **[Slalom ^ = jmp]** appears. This means press the up key to move from Slalom to jump mode. Keep pressing up key until the desired mode is found (Jump, Trick, Wakeboard, Magnet Test).
Any time you scroll through the menu and see a prompt with **" ^ = Yes"**, this means press the up key to confirm. Example: [WAKBD SPD ^ = MAGT] means you are in wakeboard speed mode, press up to move to the next mode which is magnet test. Example: [In Neutral ^ = Yes] The system is asking you to return to neutral and confirm you are in neutral by pressing the up key.

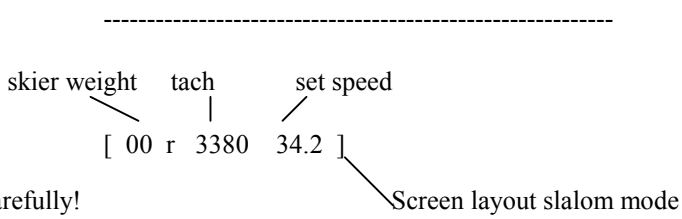
Section 2. SLALOM

Setting Baselines / Speedometer Calibration

Make sure the skier weight remains at 0 during this procedure.
(A slalom Course is required for this important procedure)

RPM Baseline values must be set for each of the speeds you intend to use. In slalom and jump modes the system controls the boat speed based on RPM, and therefore it is necessary to set up the correct r.p.m. value to accurately run each speed. This is commonly called " the baseline rpm value."

Understanding how it works? : Since the system does not know how many RPM it takes to run your boat at each speed it is necessary to set up a RPM baseline value to run each official speed. This is done without a skier. When properly set up your boat should run near actual times at each speed without a skier. When towing skiers you will add a "skier weight value" to compensate for the weight and pull of the skier. (this is discussed later.)



The display should now be in slalom mode as shown above**.** The 34.2 represents the desired speed (set speed). This set speed can only be changed by pressing the menu key twice, which will take you to Speed Adjust. You may wish to set up all of the official slalom speeds or just the ones you use most.(at this point we recommend just the ones you use most). Now it is time to set the proper **baseline RPM** required for your engine to run the speeds you wish to use without a skier, therefore the skier weight should be set to 00. PerfectPass has been loaded with a default baseline R.P.M. for each speed (an estimate) and now we are going to adjust it so it is accurate for your Boat. Let's assume you want to set up 34.2 and 36 m.p.h. We will start with 34.2.

Without a skier, drive your boat through the slalom course timing the pass using the optional PerfectPass Hand Timer or Smart Timer magnetic sensor if you have magnets in your course. Drive as you normally would by bringing the boat up to or beyond the target speed well prior to the entrance gates to **engage system**. Once the default baseline R.P.M. is reached for that speed the system will take over automatically and will indicate so by underlining some of the data on the display and there is an audible beep from the display.
You must time the first and second segments as you pass through the course (Entrance Gate, Ball 3 & Exit Gate) and these times will be displayed instantly as you exit the course. (Also for a brief second the display will show you how many RPM it will take to get an actual time. This will appear as **{ + 40 ADJ }.** *In this example it is suggesting the speed error was 40 RPM.* Bring the boat to neutral, review the times and use the "Quick Calibrate" feature to automatically adjust the baseline value.

Quick Calibrate - After the times are displayed, press menu key five times until **[RECAL 34.2 ^ = Y]** appears and press up to confirm recalibration. It will then show **[+ 40 = >RPM @ ^=Y]**

Press up and the 40 rpm will automatically be added to the baseline value. Your baseline value for 34.2 mph has been adjusted for your boat and will be retained in the system memory.

Now you must complete this same procedure for 36 m.p.h. and all other speeds you wish to set up. Change the set speed by going into the **Speed Adjust feature** by pressing the menu key twice and change the speed to 36 using the up key. Once again, drive up to 36 mph or beyond to engage system. Time the boat through the course and after the times are displayed go into "Recalibrate" in the menu. These timing measurements are also being used to automatically calibrate the digital speedometer.

Speeds Under 24.9 MPH (40 KPH) – If you select a slalom speed of 23 mph or less, the system changes from RPM based to speed based using the paddlewheel. When you are calibrating these slow speeds, once you get times at 23 mph go, to "Recalibrate ^ = Yes" in the menu. You will then see [Master Recal ^ = Yes] If you answer yes then all of your speed

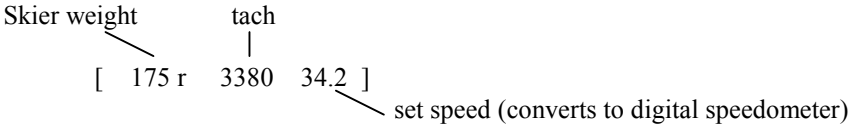
based slalom speeds will be automatically calibrated. Next [Trick Recal ^ = Yes] will appear and this will accurately calibrate all trick speeds. (Only use the "Speedo Adjust" feature as discussed in following paragraph).

Cannot get valid times while running baselines? - Whether you are running in the speed based mode (under 24 mph) or the standard rpm slalom speeds, if the timer is "timing out" prior to the end of the course the boat speed may be too far off of actual. In this case, the "quick calibrate" will not work. You must do the following to manually adjust the speed so it is closer to actual so "quick calibrate" can be used.

RPM Speeds (24.9 – 36 mph) Go into the menu to [RPM @] and manually adjust the baseline setting. (Remember, 100 rpm is about 1 mph). Use menu key to return to slalom screen and run timing pass again.

Speeds under 23.0 mph – To speed up or slow down the operating speed, go into the menu and find [Speedo Adjust] and manually adjust up or down the speed to more accurately reflect the target speed. Use menu key to return to main screen and run timing pass again.

Driving Slalom Skiers



Once your baselines have been set, you are ready to tow skiers. Turn control ON (this should always be done in neutral).

Step 1 – Go to **"Crew Adjust"** in the menu and dial in the total weight of driver and crew. (Only required when crew weight has changed).

Step 2 – Select the desired **Speed** by going into menu to "Speed Adjust".
Step 3 – Enter the **Skier's Weight**. This is done using the up and down keys when the main slalom screen is on the display. [175 r 00 34.2] The 175 represents the skier's weight.
(Expert skiers will generally require their weight to get a good time, while novice skiers will likely use a lower value).

Pull the skier up normally and when the boat speed reaches the desired set speed you will hear an audible beep as it takes control. (Data on the screen will also become underlined to confirm engagement).

If you are timing (using Smart Timer or manually timing using the PerfectPass Hand Timer) the timer on the screen will start as you enter the course. At the end of the course, the display will show the times and will make a suggested change to the skier weight if the times were not actual. It will appear as [+ 20 ADJ]. In this case the time was just slightly on the slow side so it is suggesting you increase the skier's weight by 20 for the next pass. (This change will add 20 rpm to boat speed).

Timing – At the end of each timed pass, the full course time will be briefly shown as [0.0 16.95 OK] The OK means the time was within tolerance. (The first digits displayed was the error from actual time, if any). The screen will then flip over and display the first and second segment times followed by the error and suggested RPM change for the next pass. At any point, you can press the Menu Key to review the times prior to the next pass. (To quickly clear times and return to main screen, press the Up Key).

OTHER FEATURES:

Digital Speed Readout – The digital speedometer on the screen is for information only in slalom mode. If you feel it is not reading accurately, go into "Recalibrate" in the menu after any timed pass and recalibrate.

Speeds 23 MPH or Lower – If you are towing at these speeds, the system will control via speed instead of RPM. If future passes are at speeds above 23 mph (37 kpm) then you must go into menu and select "New Skier" and enter their weight and KX/PX preferences, which will enable the system to seamlessly switch over to RPM mode when the higher speeds are selected.

Speedo Adjust – Speedo Adjust has been added to the speed based slalom speeds. Example: If you find the times are a little on the fast or slow side, press the up or down keys to make the adjustment. In this example, +.2 mph was entered to speed up the overall time. [+ .2 S 21.1 0.0] This adjustment only affects the selected speed. This is also convenient if driving in a waterway with currents.

Wind Adjust - If you are driving in a wind, most drivers will increase the skier adjust (skier weight) a little when driving into the wind and lower the skier adjust when running down wind to compensate.

The alternative is to use the "Wind Adjust" feature found in the slalom menu, which allows you to set an rpm value for wind strength. It will appear as { WIND ADJ 000 }
Set a value such as 20 and press menu to continue. It will then ask if the next pass is a head wind (h) or a tailwind (t). The wind direction request will appear after every pass.
If you do not wish to use wind adjust, always reset the wind adjust value to 0.

Fall Button (Competition Use outside North America only) - If you are not using "All Ball Timing" you will require the optional Fall Button in a tournament situation. Because the slalom mode is designed to hold a constant r.p.m. value, the boat will pick up speed when a skier falls or stops skiing which may result in a fast time. In tournaments, the boat judge must push the remote Fall Button.

The general rule is this:
1. If the skier has fallen and lost the handle the fall button should be immediately **pushed once**.
2. If the skier has not fallen but has stopped cutting, the remote fall button should be pushed once, and pushed again once the skier has returned to the wake behind the boat. **(Total two presses)**. In either case, the system will adjust the RPM of the engine to produce a good time.

At the end of a pass where the Fall Button has been pressed following the times, the display will show **"Fall Button 2"** for example to confirm the Fall button was pressed two times.

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 Menu to [RPM @ 36.0 3650] and raise the baseline about 100 rpm. (This will speed up the boat to about 36) Menu back to main screen and run boat again. 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 menu to [RECAL 36.0 ^ = Yes] and press yes. [SPEEDOMTER ADJUST] will appear. Now press the down button and lower speedo calibration by one mph. Run boat again to confirm accuracy.
Once the baseline and calibration is set, it will be remember forever. Now change speed to 34.2 and repeat. All speeds must be done.

More Throttle – If you see the "#" sign after the speed pop up on the 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.

Pop Up Metric Converter - Since skier weight must be entered in pounds, the system will now easily convert for you from kilograms to pounds. To access, press the Menu and ∨ key together. Enter skier weight in pounds and the Pop Up Metric Converter will calculate the weight in kilograms. Then press the menu key to revert back to previous mode.

Crew Weight Calculator - The system will add the weight of the individual crew members. Simply go to "Crew Weight" in the menu, then press the ∨ and ^ 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.

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).**

Optional Slalom Switch – If you have a rope 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.
Adjustable Settings - For details on adjustable settings, see appendix at rear of Manual.

Section 3. JUMP EVENT

JUMP MODE (Establishing Baseline RPM Values)

WARNING: (Timing **must** be used in Jump Event and a proper two segment jump course is required for system to work properly. Do not use PerfectPass in jump mode without a proper course, integrated timing and experienced operators). 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. Segment balance letter must be set at **A** for this process.*

The first step is to go to the jump mode by pressing the menu button until **" SLALOM ^ = jmp"** appears. It is asking if you want to move from the slalom mode to another event and if so press the up key. Press the up key once and **" JUMP ^ = Trick "** will appear. Now you are in the jump mode. The screen will appear as:

event mode — segment balance (only for jump switch users)

JUMP A 00 35.4

tachometer — set speed, converts to digital speedometer

The first step is to dial in the **weight of the crew** by going to crew adjust. (If it is the same as when you set up slalom it will retain that weight.)

You can set baseline rpm values for all of the official jump speeds (28, 29.8, 31.7, 35.4) or just the ones you use regularly. (You require a proper 2 segment jump course) Let's assume you wish to set up 35.4 mph (57 kph) Up the set speed on the display to 35.4 by pressing menu key three times which will take you to "Speed Adjust". Now bring the boat smoothly up to the set speed to engage the system. *(The system engages as soon as the default RPM baseline value is reached and the data will become underlined as well as an audible beep)* Enter the jump course and time both segments with a Smart Timer. As you exit the course the times will be displayed and then the difference from actuals. The display screen will show the 35.4 mph times in the following example screens which will each appear for about 2 seconds. Because the jump letter is set at A, RTB (return to baseline times are used)

[5.18 2.59 OK] [+0.0 +.05 OK] [+0.0 +.0.0 BAS]

The first screen shows actual times just run. The second screen shows the actual error on 1st segment and error against RTB time on 2nd segment. The final screen and most important when timing the boat shows the segment error against true actual speeds.

If they are not in tolerance or close to actual then the baseline RPM values will require adjustment. The easiest way to do this in jump mode is to go to Recalibrate by pressing the menu key until you see **" Recal 35.4 ^ = yes".** Press the up key to recalibrate. This will calibrate the digital speedometer and then the system will suggest how much the baseline value should be adjusted. It will appear as **" + 60 ADJ "** In this example it is suggesting your baseline should be increased by 60 rpm. The system will then ask if you want it to automatically adjust the baseline as suggested. It will appear as: **"+60 =>RPM@^=Y"** Confirm you want the auto adjustment by pressing the up key.

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 baseline rpm values for other speeds, ie. 31.7, (51 kph) change the set speed and repeat the above steps.

IMPORTANT NOTE: *The segment balance letter will appear on the screen and is factory set at A. This is only used with optional jump sensor and should be left at A if the jump sensor is not being used.*

OTHER FEATURES:

Crew Weight Calculator - The crew weight calculator can be accessed in Jump Mode as well as by pressing the (+ and -) keys together when **Crew Adj** is on the screen.

Pop Up Metric Converter KG <> LB
M <> FT

Simply press the menu and **v** keys together.

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

WARNING – Using the Jump program 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)

JUMP DRIVING

letter
[JUMP J ^ 00 35.4]
tach set speed

Assuming the baseline settings have been accurately set, you are now ready to tow skiers.

The first step is to go into menu to start a new jumper. It will appear as:
[V = S2% ^= NEW JMPR]

Press the **up key** and select speed, then dial in the skiers weight (pounds), press menu and dial in the skiers typical distance jumped in feet. Once this is done press menu and the system will ask **[Fast 2nd Seg ^ = Y]**. If you wish to run the faster second segment times, press the Up key. If you want the system to simply return to baseline (RTB), press the Down key. The display will now return to the main screen with a **Jump Letter** selected. In the above example, the letter "J" with fast second segment (^) has been selected. *(This can be changed by pressing the up & down keys.)* This letter represents how much throttle will be applied once the Rope Switch is closed as the skier pulls. (*The higher the letter, the more aggressive the pull)*

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.

ADJUSTABLE PARAMETERS

There are a number of adjustments that can be made (on the fly and between passes) to adjust the timing and pull characteristics).
(Access by turning control off, then press up & down keys together. S2% and S2 Fine can be adjusted on the main screen)

		Typical Values	
S2%	**Faster**	**60**	(higher number, faster 2nd segment time)
CT		**190**	(higher number, longer throttle application)
S2 Fine		**0**	(higher number, speeds up 2nd segment only)

S2% - (Second Segment) 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.
Example: If the 1st segment times are good, but the 2nd is a little slow, you would raise the number.

CT – (Countercut Time) – The maximum length of time the system will throttle once the skier pulls and closes the switch on the countercut. 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 – 2.2 seconds)

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. 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 in tolerance.

RPM Adjust – RPM Adjust is found in the normal menu screen and appears as
[ADJUST RPM]. 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 skier (a heavy puller) or for a number of skiers if the times are drifting in a certain direction. When a value has been entered the screen will add a **"+"** sign on the display to remind the driver this feature is in effect. [JMP + R 35.4].

Return to Baseline (RTB) – If you selected return to baseline instead of the faster second segment, 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 the faster second segment is selected).

(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).

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.

<u>OTHER FEATURES:</u>

Faster 2nd Segment – If you selected to run the faster 2nd segment, the screen will add the icon **" ^ "** next to the letter as a reminder to the driver that you are running the faster times. [JUMP R^ 35.4].

V = S2% ^ = New Jumper – At any point the driver wishes to tweak the S2% or S2 Fine, simply go into menu and press the down key.
[S2% Faster 060] this will appear first. Press menu and [S2fine RPM 000] will appear.

Section 4. 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 trick screen will appear as:

set speed

[TRICK 17.0 0.0] actual speed

Driving Tricks is relatively easy. Turn control on, select the desired speed and drive smoothly to the set point so PerfectPass can seamlessly take over. *(if you accelerate aggressively past the set speed, 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 set speed is reached.
Speed changes can be made "on the fly".

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

OTHER FEATURES:

Calibrate Digital Speedometer – (Calibrate Speedo) – If your digital speedometer is not accurate, you can go into the "calibrate speedo" feature in the menu. Example: If you are set at 17 mph, but the analog speedometer or GPS is reading 18 mph, menu to "calibrate speedo" on the screen and press the down key several times until the boat speed drops to 17 mph so the PerfectPass matches the GPS or other speedo.

All other trick and wakeboard speeds are also corrected.

KD – This adjustable parameter controls the "firmness of the Pull". It can be accessed by turning control Off, then press the Up & Down Keys together. Typical values are 14 – 18. Press menu and NN will appear.

NN (Adjustable 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. Press Menu key to return to Trick Mode.

Trick Timer – The system now has a built in trick timer. Connect the optional manual hand timer into the fall button port on the master module, press the button and the on-screen timer will activate and run for 20 seconds. At 20 seconds it will provide an audible beep.

Pop Up Metric Converter - To determine an equivalent metric speed or miles per hour, press Menu and Down keys together.

Section 5. WAKEBOARD MODES

There are two operating modes to choose from. RPM Mode or Speed based Wakeboard Mode which uses the signal from the paddle wheel.

Why two choices ?

Some prefer the pull of the RPM mode which is very smooth, particularly if you do not have a large load such as fat sacs & numerous people. If the boat is heavily loaded, the rpm mode may not control well coming out of the turns or recover speed quickly enough after a strong pull. RPM mode is also ideal for open water slalom skiing and other towed water sports.

The speed based wakeboard mode is generally more accurate and load does not generally affect its ability to control speed. **Wake Surfing** in speed 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).

Speed Based Wakeboard

Set speed
[WKBD w 20.0 0.0]
Actual Speed

Turn control ON and screen will appear as above. (Always turn control on or off when boat is in neutral).
The set point desired speed is shown in the center and is changed by pressing the up or down keys. This can be done on the fly.

The key to driving is to smoothly drive to the set point so the system can seamlessly take control. If you accelerate aggressively past the set point 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.

OTHER FEATURES:

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

Digital Speedometer (Speedo Adjust) – If you feel the digital speedometer is not reading accurately, it can be easily adjusted via the **"Speedo Adjust"** feature in the menu. When "speedo adjust" is on the screen, you can press and hold the up or down key and the boat speed will increase or decrease until the correct speed is reached.

Example: To calibrate the PerfectPass system to match the conventional speedometer or GPS reading, set the system at a desired speed (such as 18 mph). Bring the boat up to speed and engage the system. If the conventional or GPS reads 19.5 then you would go into "calibrate speedo", press and hold the down key until the boat speed dropped to 18 mph on the conventional speedometer (or GPS) so it matches the PerfectPass readout. By adjusting one speed, the system automatically adjusts all wakeboard and trick speeds.

Let the boat speed settle for a few seconds to confirm accuracy.

Kdw (Adjustable Pull Characteristics) The pull can be quickly adjusted to tailor your boat, load and riding style. KDW is accessed by turning the control Off, then pressing the Up & Down Keys together. A typical value is 80. Boats with larger loads may require much higher values such as 100- 150. The higher the number, the more aggressive the system will control speed corrections. Press menu to proceed.

NN (Adjustable 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. (Typical range 100 – 180). Press menu to return to main screen. If the speed is "swinging" try lowing NN.

RPM Based Wakeboard

Set value actual speed
{ 2500 w 2500 22.5 }
tachometer

To drive in this mode, simply set the desired set speed (as an RPM Value), then drive to the set point and PerfectPass will take over. Speed adjustments can be made on the fly by pressing the up or down keys.

Section 6. THE DISPLAY / MOVING THROUGH MENU

Every time you turn the system on it will return to the last event and speed that was used.

Once the engagement point is reached PerfectPass will let you know it has taken control by underlining data on the display plus there is an audible beep.

On/off The ON button turns the servo motor control on and off. When off, the system will not engage. Note: Any time you operate your boat the system will be powered up, although it can be in the off mode.

Menu (Moving Mode to Mode) The menu button allows you to move through the various features and event modes as well as for recalling timing data. For example, if you wish to move from the slalom mode to the trick event, simply press the menu button until " SLALOM ^ = jmp" appears (this means you are in slalom mode, press the "Up" key to move to the jump mode). Press the ^ button and " JUMP ^ = Trk " will appear, press the up key to go to the trick mode etc.

By scrolling through the menu you will find the following event options:

SLALOM - For slalom skiing which is RPM based.

JUMP - Jump mode which is RPM based.

TRICKS - For all trick skiing, speed based.

WAKEBOARD - Two modes RPM or Speed Based Wakeboard

MAGNET TEST - A unique feature for checking your magnet strength and polarity. **DEVICE TEST** (See details in appendix).
Also features **Rope Switch Test, Fall Button Test & Servo Motor Test & Battery Voltage Test.**

RECALIBRATE - Any time you feel the digital speedometer is not reading accurately (slalom & jump modes only), you can recalibrate the speed readout after any successful timed pass. Recalibration only affects the digital speed value.

BATTERY VOLTAGE HOUR METER - To view battery voltage press **MENU & UP** keys together, then press the **DOWN** key to enter battery voltage.

CALIBRATE TEMPERATURE - If the accuracy needs to be adjusted, press the Up and Down keys together when Water Temp is on the screen. You can now calibrate the temp up or down.

SOFTWARE CONFIRMATION - On many boat brands, the software on initial start up allows you to select the engine that is in the boat. (This ensures the correct RPM control). Which engine is selected is found in the Battery Voltage sub-menu (Menu and UP keys together).

Examples:
MasterCraft 6.0 / 8.1 or MCX

If yours is selected incorrectly, perform a "System Reset".

Section 7. INTEGRATED TIMING

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

(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.

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. The optional Hand Timer is used much like a stopwatch. 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)

At the end of each 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. 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.

SMART TIMER MAGNETIC SENSOR

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. The directions on the timer indicate the correct orientation which is dependent on whether your magnets are north pole up or south up. (Magnet testing is performed with the sensor in this same position. See magnet test in appendix). The sensor should be placed as close as possible to the outside of the boat typically beside and under the passenger seat in a dry location. The Velcro should hold it firmly on the carpet.

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 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 tow boat** can activate the timing system. In tournament conditions **only** press the talk button and communicate with shore officials before the boat is up to set speed 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 set speed 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 set speed 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 set speed 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>**

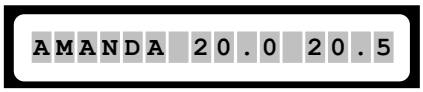
For quality magnets contact PerfectPass at (902) 468-2150.

Section 8. ADDITIONAL FEATURES

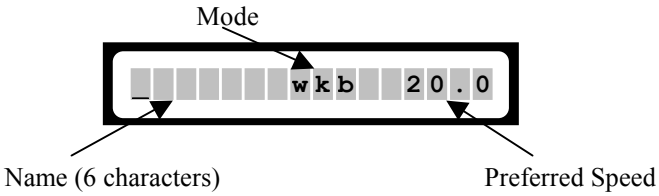
Additional PerfectPass features are accessed by pressing the **MENU** & **UP** keys together. The features available vary depending on the make and model of your boat. If a feature is not present on your PerfectPass then it is not available on your system. To move to the next feature press **MENU**.

QUICK LIST

This version of PerfectPass allows you to store up to eight names and their preferred speed.



Creating Names – While in neutral, press **MENU** & **UP** keys together and [QUICK LIST ^ =Yes] will appear. Press **UP** key and [MENU = list ^ = new] will appear. You will press **UP** key to enter new names, **MENU** key to access names already entered.
If you press **UP** key to enter new name, [NEW ENTRY ^ = Yes] will appear. Press **UP** key to enter new name. Screen will then appear as follows depending on mode you are in. Mode cannot be changed while entering a name. You must be in the mode you want before creating name.



Scroll through the alphabet using **UP** & **DOWN** keys, and then press **MENU** to move to next position. When the name & setting have been entered, exit via **MENU** key and entry will be saved.

Selecting Names – Press **MENU** & **UP** keys together to access [QUICK LIST ^ =Yes]. Press **UP** key and then **MENU** key to enter list. Once in the list, the **MENU** key is used to scroll through list. Once the name is on screen you wish to select, press the **UP** key.

Editing List – 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 List" but can only be deleted by performing "System Reset".

BATTERY VOLTAGE

Displays the voltage measured at the Master Module. If voltage drops below 10.5 V the system will shutdown.

Notes on revised DBW MasterCraft software version 6.5n.06

CR and CS

When the PerfectPass system engages and control is transferred by the ECM from the throttle handle to PerfectPass the system must calculate the best location to initially place the engine throttle. This calculation must include the setpoint speed or RPM and the characteristic of the ECM / engine / hull / propeller combination. Because of the slight difference from boat to boat of this group of items the compensation setting (CR in RPM modes or CS in speed based modes) must remain as an adjustable setting. The best measure of the effect of these items is the calibrated baseline RPM at 36 mph (58 kph), this value can be used as a guideline for the initial CR and CS settings as this table shows.

Baseline at 36 mph	initial CR	initial CS
3580	1600	720
3610	1635	730
3640	1645	750

Final adjustment of these settings will require a few actual engagements of the PerfectPass system in both the slalom mode for CR adjustment and the trick mode for CS adjustment. Adjust these to provide the smoothest engagement in these modes. If the system fails to engage because the boat speed is not able to reach the minimum engage speed or at the engagement point the boat slows down slightly and then climbs back up to the set speed then the appropriate setting needs to be increased. If the boat engages on the fast side and then is slow in settling back to the set speed then the setting should be reduced. A setting that is a bit higher than the optimum setting is better than a setting that is below the optimum value. If the set point speed is exceeded by 0.6 mph or more during engagement in the trick mode then the CS value needs to be reduced.

XU

This setting adjusts amount of throttle added by PerfectPass when the throttle handle is pushed forward with the system engaged and the override feature is applied. A larger XU setting will increase the rate at which the throttle control is added and the total amount of throttle added. The standard default value is 4 with the normal range of 3 to 6.

Other Notes

1. These settings are accessed from slalom / jump in the case of CR and trick for CS by pressing the ON/OFF key to turn the system control OFF and then pressing the UP and DOWN keys at the same time, the MENU key steps through each setting. CS affects the engagement of the speed based slalom speeds 23.3 mph (37 kph) and below but for adjustment is accessed in the trick or wakeboard modes.

2. Once the PerfectPass system has been engaged it records the final position of the manual throttle handle after a 2.5 second delay, with the override feature enabled if the handle is then moved forward by more than approximately ¾ of an inch then the override will be triggered. While the handle is in this advanced position the system will continue to add throttle and keep

the engine at a speed above the normal set speed. Bringing back the handle to approximately the original engaged position will stop the override application and return the engine to normal control.

3. If the throttle handle is pulled back below the position required for PerfectPass to maintain the current speed or RPM then the ‘ # ‘ character will flash on the screen and the manual throttle handle will be in full control of the engine. Pressing the handle forward far enough to stop the # from flashing will allow PerfectPass to regain control of the engine.

4. When turning the boat tightly while driving for tricks it is best at about the mid point of the turn to ease the throttle back slightly to hold the engine RPM from climbing too much and then as the boat is straightened back out to ease the throttle ahead slightly to regain the set speed. If the engine/ECM is held back too long it will tend to run a bit fast for a short time before settling back under the control of the PerfectPass system.

5. It has been found that the Kd value for tricks may need to be increased to 20 or so for the larger/stronger trick skiers in order to maintain a minimum speed variation. On some 2005 boats the NN value has been increased to 145 to also improve the speed holding characteristics.

Section 9. INSTALLATION

DBW – FOR ELECTRONIC THROTTLE ENGINES

Easy as 1, 2, 3, 4.

1. Install Master Module.
2. Install Plug & Play Engine Harness (To MC connector & PP Module).
3. Plug in Display Harness to Master Module and Connect Display.
4. Connect the pink "spade" connector on engine harness to pink "spade" on display harness. (This is for throttle over-ride capability. This feature may not be available on all boats depending on build date).
5. Flash ECM with Indmar PerfectPass Program **.

** If your dealership cannot flash the ECM, contact Indmar to exchange with one already flashed.

Section 10. TROUBLE SHOOTING / GENERAL INFORMATION

The **PerfectPass "Drive by Wire" (DBW)** system for new electronic throttle engines results in a simplified and enhanced version of PerfectPass. From the drivers seat, PerfectPass operation is virtually identical to the present mechanical systems.
PerfectPass is now comprised of just four main parts:

1. DBW Master Control Module
2. DBW Plug & Play Engine Wiring Harness
3. Plug & Play Display Harness
4. In-Dash Display

Servo motors, throttle cables, etc. are not required on these engines. The ECM must be "flashed" with the PerfectPass Program in order for PerfectPass to control the engine.

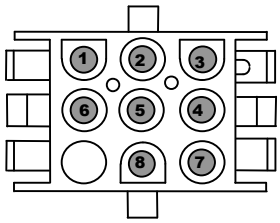
How it Operates:
The ECM of an electronic throttle engine allows an external device such as PerfectPass to control the engine rpm using the throttle servo motor when all control signals are valid and manual throttle lever position exceeds the rpm level request of PerfectPass.

Just three individual wires in the PerfectPass DBW wiring harness connect the speed control to the engine ECM.
1. The **Request Line** from PerfectPass requests the ECM to allow PerfectPass to take control.
2. The **Status Line** from the ECM indicates PerfectPass now has control of the engine. The Status Line is the signal that confirms engagement (beeper) and system control.
3. The **VGOV Line** establishes the engine RPM level as set by PerfectPass.

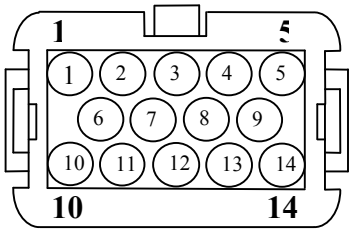
Problems with PerfectPass should be rare given the few components that now make up the system. Most trouble shooting will simply involve voltage/continuity testing on the PerfectPass engine harness.

Wiring Identification

2005 DBW Engine Harness



9-Pin MATE-N-LOK
(White)
Front View
Connected to MasterCraft Harness



14-Pin AMPSEAL
(Black)
Back View
Connected to PerfectPass Module

Signal	Color	9-Pin MATE-N-LOK	14-Pin AMP Seal	ECM
STAT	**Orange**	**1**	**1**	**J1-9**
VGOV	**Blue**	**2**	**10**	**J2-4**
RQST	**Brown**	**3**	**12**	**J1-21**
Ground	**Black**	**4**	**14**	
RPM	**White**	**5**	**9**	**J1-14**
Speed	**Green**	**6**	**8**	
12 Volts	**Red**	**7**	**4**	
Throttle F/B	**Gray**	**8**	**23-Pin AMP Seal, pin 23**	

Problems with PerfectPass Controlling / Not Controlling

Open circuit (bad connection/broken wire) symptoms of a PerfectPass DBW system

Problem #1 RQST Line Open – PerfectPass never takes control in any mode, the engine is controlled only by the manual throttle handle.

Problem #2 VGOV Line Open (RQST Line OK) – With the PerfectPass system control ON, the engine will not go above idle no matter how far the manual throttle is pushed. With PerfectPass control OFF, the engine is controlled as normal by manual throttle handle.

Problem #3 STAT Line Open (RQST Line and VGOV Lines OK) – Engine operates normally with PerfectPass control ON, the engine RPM's become limited at speed slightly above system set point, but there is no proper control and speed remains one or two mph above setpoint. The PerfectPass does not beep to acknowledge engagement and the underline characters never appear.

TESTING

Prior to proceeding with Test # 1-4 below, run the system on a fake-a-lake in RPM Mode set at 3800. With neutral lock in place, advance throttle up past 2800 on the digital tachometer. If the system engages and controls as 2800, this confirms the control loop in good. It should also control in Speed Mode if a paddle signal is present.

(Tests #2, 3 and 4 are normally performed without the engine running). (Test #1 is performed with engine ON).

To enter the Test Mode, turn key on and quickly press & hold the Menu & Down Keys together. Continue holding for a few seconds until [Servo Test ^ = Yes] appears. Press Up to enter test and the screen will appear as follows:

[THROTTLE 180]	In this test mode, PerfectPass measures the throttle handle position. As you move the throttle, you should see this number changing from approximately 150 – 950. **Only required for throttle override**. Press the **MENU** key to continue
[CONTROL R 1.0]	In this test mode, PerfectPass requests control of the ECM and maintains a constant 1 volt control level.

TEST #1

This test requires the engine to be running – with screen showing:

[CONTROL R 1.0]

Lock the gearshift in neutral and advance the throttle handle to 1700 RPM. When all is working correctly an "S" will appear next to the "R" and the engine will hold at approximately 1400 RPM. If the RPM is holding at 1400 but the "S" is not on the display, there is a problem with the "stat" line. Pressing the UP Key will change the output voltage by 0.1 volt as shown on the display and the RPM will increase by 140 RPM for each 0.1 volt increase.

If the RPM does not hold at 1400 the "RQST" line may not be connected. If the RPM remains at a fast idle when the throttle is increased, then the "VGOV" line may not be connected.

If Test #1 fails, proceed to Test # 2, 3 and 4.

TEST #2 (Engine Not Running)

These voltage tests confirm the integrity of the PerfectPass Module outputs.
Locate the white Mate-N-Lock connector on the PerfectPass engine harness where it plugs into the MC boat harness. (leave connected)
(The following voltage tests will be performed with black lead of the voltmeter to ground.)

- Measure the voltage on the **brown wire** (request line) which should measure less than 1 volt. (0 to 1 volt)
- Measure voltage on **blue wire** (vgov line) which should measure about 1 volt. (.8 to 1.2 volts)
- Measure voltage on **orange line** (stat line) which should be 10 + volts.
- Press the OFF key and the "R" will disappear. Now measure voltage on Brown wire again which should now measure more than 10 volts, this confirms proper operation of PerfectPass Request driver and ECM connection.

These tests should confirm the proper wiring from the PerfectPass Master Module to the Mate-N-Lock connector. If one of these tests fails, proceed to Test #2.

TEST #3 (Engine Not Running)

Press ON key so the "R" is on screen. Unplug the Mate-N-Lock connector and supply 12 volt power to the red wire and supply ground to the black wire which will power the PerfectPass Master Module & Display. Repeat the same voltage tests as described above in Test #1 with [Control R 1.0] on screen. If voltages are OK, this confirms that the PerfectPass supplied parts (Master Module & Engine Harness) are OK, the problem must be originating from the ECM or MasterCraft Harness.
(Do not press OFF to remove "R" from screen. This test from Test # 1 is not required.)

TEST #4 (Engine Not Running)

Reconnect Mat-N-Lock connector.
The next step is to test voltages at ECM connector to confirm continuity. You should see the same voltages as in the above tests.

	ECM Pin#	
Check	J1-21	Less than 1 volt
Check	J2-4	1 volt +/-
Check	J1-9	10+ volts

If any of the voltages are not as above, there is a problem between ECM and the Mat-N-Lock connector. Perform a continuity test on wire.

Note:

1. If all tests appear OK, confirm that the ECM is properly flashed with the PerfectPass software.
2. If you determine there is a problem with the PerfectPass supplied engine harness or Master Module, contact MasterCraft for parts replacement.

Trouble Shooting DBW

Problem – System shows rpm & speed on Display, but does not take engage & take control.

Check*- Perform Open Circuit tests #1 - #3 as described on previous page.*
If system is new, confirm you have correctly "flashed" ECM.

Problem – No speed reading on PerfectPass Display

Check – Paddle wheel signal on green wire coming into the Master Module on Amp Seal Connector. If paddle is spun slowly, you should see 0 volts / 12 volts as wheel slowly turns. As wheel is spun quickly, you will see an average of 6 volts.

Problem – No rpm reading on PerfectPass display

Check *– The RPM signal wire at the Amp Seal connector coming into Master Module. With engine off you should see about 9 volts. (With engine running, you should see a normal tach pulse signal) If no signal, check the pin at ECM.*

Problem – PerfectPass in Wakeboard mode is set at 22 mph and digital speedometer shows 22, but actual speed is 24.

Check *– Press menu once and "SPEEDOMETER ADJUST" will appear, quickly press down key several times and lower speed by 2 mph. All Wakeboard speeds now calibrated.*

Problem – Key is on, but PerfectPass screen does not become active and show data.

Check *– PerfectPass requires 12+ volts for start up. Check voltage on red wire (12 v) power source to Master Module.*

Problem – Button on PerfectPass Display does not work.

Check - *If system was just installed, unplug Display from harness and inspect all brass pins on connector to ensure they are inline. If problem occurs after much use, the Display will require repairs by PerfectPass.*

Problem - System not smooth in RPM Mode.

Check *– Confirm whether the correct engine selection was made on initial set up. Press Menu & Up keys together. Menu through until engine selection appears. It will show either [MCX / MPI] or [6.0 / 8.1] If it was selected incorrectly, do a System Reset and select properly.*

Problem – In Wakeboard mode, system sluggish or exhibits some surging.

Check *– Insp1ect paddle wheel. If paddle appears OK, go into adjustable parameters by turning control OFF, then press Up & Down Keys together.*
KDW *will appear. This value represents how firm the system will control. Heavily loaded boats may need higher settings. (Typical values 60 – 200)Press Menu to proceed.*
NNW *will appear. This is the filter factor of paddle. The higher the value, the more filtering is done prior to making a speed change.(Typical values 80 – 180)*

Software Adjustments

System Reset – To reset the entire system back to original factory values, press & hold ON/OFF & MENU Keys together as you turn key on to power PerfectPass. Continue holding for a few seconds until [System Reset ^ = Yes] appears. Then simply answer questions as they appear.

Engine Selection – On initial start up or during a system reset, PerfectPass will ask whether you have a big block 6 or 8.1 litre or a standard 5.7 litre engine. This will appear as [6.0 / 8.1 L ^ = Yes] This means press up for the big block, down for all others.
To confirm if correct engine was selected, press Menu & Up Keys together to get into back ground screen. Following battery voltage, etc you will see which engine was selected. If incorrect, perform a system reset.
(An incorrectly selected engine can cause unsettled control in rpm mode only)

WakeboardPro to/ DigitalPro – The Master Module for both systems are identical. The only difference is in the way they were initialized, i.e.: As a DigitalPro or WakeboardPro. You can change the way it was set by performing a system reset.

Calibrate Speedometer – In Wakeboard mode, press Menu Key once.

KDW / NN – Adjustable Pull Characteristics – In WakeboardPro mode, press OFF, then the Up & Down Keys together.

APPENDIX

MAGNET TEST/DEVICE TEST

All drivers and officials should be familiar with the process of testing magnets for strength and polarity. Studies have shown that an upside down magnet can cause the signal to be distorted by 4 feet causing an unbalance in the times. *Generally, all magnets are designed to be North UP, but most importantly all magnets have the same polarity.*

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

Other test features such as Jump Switch Testing, Voltage Supply Testing and Servo Motor Testing are found via Magnet Test Mode. You will see "Device Test ^ = Y" appear. Press the up key.

There are two screens in the magnet test mode. They are:

Screen 1. **"MAGT T RPM 00"** rpm & speed

Screen 2. **"T1 MAG:1 38"** magnet strength (will appear as you pass over a magnet). In this example magnet #1 has a strength of 38.

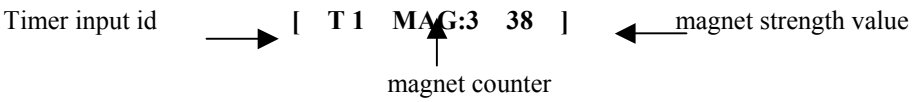
Using Magnet Test (Smart Timer(s) required)

Place the timer in the direction as indicated on the Timer label to match the polarity of the magnets.
Screen 1. - This mode in the menu allows you to test the timing magnets in the slalom and jump course for field strength and polarity. A set speed of approximately 32 mph (3200 RPM) is displayed when this mode is selected, as usual the boat is brought up to the set RPM to engage the system and the boat is driven through the course.
Screen 2. - As each magnet is passed a value representing field strength is displayed. Normally, acceptable values for magnetic strength are 35 or greater. Values below 30 may not produce accurate times. *(If two Timers are in use, then when either Timer picks up a magnet it will be identified by T1 or T2 on the display)*

(If a magnet is showing a low value, check the depth of the magnet or it could possibly be weak or be upside down).

Your test can and should be done in both directions through the course.

MAGNET TEST



"REV" message indicates that the polarity of the magnet and direction of the arrow on the Smart Timer pick up are reversed from the correct orientation. A "+" or "-" in front of the magnet strength value indicates that the magnet was sufficiently strong to be detected in the Smart Timer enhanced mode.
A very large or strong magnet can saturate the sensor and cause the "Rev Pole" 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.

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.

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.

Jump Magnets

Generally, the Smart Timer sensors are placed on the outside edge of the boat, behind the driver's seat and under the passenger seat. They should be lined up evenly so they are both adjacent each other.

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.

Test Timers *– Engage the system and drive a split boat path and note the strength readings, which should be in the range of 35 – 45. 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.*

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.*

Summary

It is very important that all timing magnets in a given course have similar field strengths and naturally all have the same polarity. (usually 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.

DEVICE TEST (Rope Switch, Fall Button, Servo Motor)

The following are accessed through the Magnet Test mode.

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 "On" and there will be an audible beep to confirm proper operation. Since it takes 250 pounds of torque 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 underline character beside digital speedometer. It will move up & down as switch is activated.

Fall Button Test - Works the same as the jump switch test. This will appear as **" FALL BUTTON TEST".** If you are using the remote Fall Button, Press the button and the display will show "ON" and there will be an audible beep to confirm proper operation. *(If you are not using the remote Fall Button, disconnect it from the Master Module).*

Slalom Settings

PX (Switch Setting)

Factory setting is 0, which is the off position (typical values range from 5 – 15). 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.

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 segment. (SSB is calculated as a % of skier weight. ie. If SSB is set at 10% for a 200 pound skier, 20 RPM would be removed in the 2nd segment).

Most boats use a value of about 8. Some hulls may require values as high as 20 to keep the 2nd segment from running fast.

KX (Throttle Response)

Represents the throttle control response of the system. Under the current rules, a skier is encouraged to use factory settings, but has the right to opt for a higher (++) or lower (-) KX. (Higher means slightly more immediate control response).

If the driver presses the menu key several times, [V = KX, PX] will appear. Press the down key and KX will appear as [KX Normal]. You can press the up key for a higher KX (+) or the down key for a lower KX. The system will always return to the same KX selection, even if boat was powered down.

Skier Factor (Skier FAC)
Factory setting 100%. The system is designed that a competitive skiers weight can be entered and the resulting time will be in tolerance. Should you constantly have to run a much lower (or higher) weight than actual, Skier Factor can be adjusted to allow actual weights to be entered. Example: A 200 pound skier must be entered at 160 in order to get a good time. Skier Factor should be set at 80%. (200 x 80% = 160)
(To access, turn control OFF and then up & down keys together)

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.

(To access wait time, turn control off, then press Up & Down keys together).

Jump Settings

New Times (Faster Second Segment)

Jump Settings	**S2%**	**S2 RTB**	**CT**
Ski Nautique	Faster 80	Faster 10	190
MasterCraft	Faster 80	Faster 10	190
Malibu	Faster 60	Slower 5	190
Others	Faster 80	Slower 5	190

(Examples Only When Towing Jumpers over 120 Feet).

S2% (Second Segment)
This is a percent of the jump letter rpm that is applied once the boat enters the second segment. The higher the number, the faster the boat will go. There are now two independent values, S2% is applied by the system when the Fast 2nd Segment is selected and S2 RTB is applied when return to baseline is selected by saying No to Fast 2nd Segment in the New Skier menu. Because the ideal average speed in the 2nd Segment for return to baseline times are in fact 0.6 mph (1 kph) above the baseline speed. Some boats require a positive S2 Fine RPM setting or S2 RTB set at Faster 10 or higher setting to produce the proper RTB second segment times.
(The S2% values above are typical of 120 – 130 foot jumpers. Longer distance jumpers generally require a lower value, ie. Faster 40).

S2 RTB
If you selected “Return to Baseline RTB”. Only applicable if skier’s are activating switch and use a letter of J or higher.

S2 Fine
[S2 Fine RPM 000] This feature appears after S2% and allows the driver to simply adjust the 2nd segment speed only. It is particularly useful with light or novice skiers who do not engage the switch and the boat speed in the 2nd is running on the slow side.

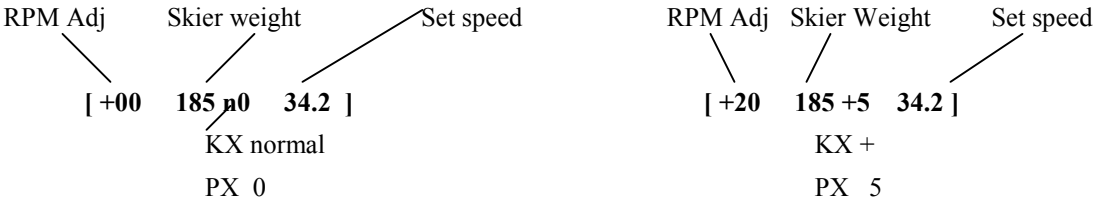
CT (Counter Cut Time)
To access, press control off, then UP and DOWN keys together. The maximum length of time the system will throttle once the switch is triggered on the counter cut. i.e. 190 = 1.9 seconds.
(You may require a higher value in headwind conditions, a lower value in a tailwind).

RPM Adjust [Adjust RPM 020] is set at 20 in this example. In this case, 20 rpm would be added to the boat speed throughout the entire course. The driver may use this if both segments are running on the slow or fast side as an alternative to adjusting the "baseline value". (*A single wake cutter that does not fully engage the switch may also require more speed*). If a value is added, the "+" character will appear on the screen to remind the driver.
[Jump + R 35.4 35.4]
(The "-" character will appear if you have selected a negative value which will slow the boat below the baseline setting).

Tournament Mode (Slalom)

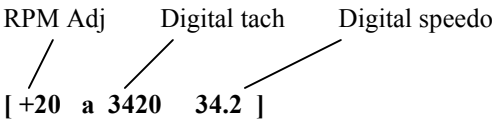
There is now a Tournament Mode which must be used in R level tournaments. It can be accessed when in slalom mode by pressing the ^ & v keys together. The main difference in Tournament Mode is that RPM adjustments between passes are made via RPM adjust on the main screen, versus changing the skier weight. This allows the system to hold the skier's weight as a static value which should give a more consistent pull as PX, G% and SSB are affected by the skier's weight. (The pull is the same as normal slalom mode).

When you first move into Tournament Mode, the screen will appear as in the following examples:



You use the Menu Key to enter your Crew Weight and Skier Weight. Crew Weight is found in menu as [^ = CRW+] (CRW + means enter here for Crew Weight, SSB and RPM offset). The Skier Weight will be shown on the main screen.

As you accelerate, the screen will change and appear as:



At the end of the pass if a speed change is required (Example 20 RPM), then simply press the Up key to add 20 RPM to the RPM Adjust as in the above example.

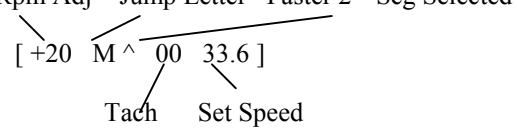
The PX and SSB can be quickly found and adjusted in the main menu.

To return to normal slalom mode, press the ^ & v keys together.

RPM OFFSET – This is available in tournament mode only and works in a somewhat similar fashion as "Skier Factor." The difference is it can be more accurate and can be set for 36, 34.2 and one value will control all slower speeds. If you are finding that you are running less (or more) than a skiers weight to achieve a good time, you can enter an rpm offset value. **Example**: On a typical boat with a skiers 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 (ie: -25) and the system will allow you to run all other values as you normally would.
The offset value is independently set for 36.0, 34.2 and all speeds below 34.2. (OFFSET LWR)
Rpm offset is found after SSB and will appear as [OFFSET 34.2 000]

Tournament Mode (Jump)

This operating mode is similar to slalom in that the RPM Adjust is on the screen at all times and can be tweaked as required with the up & down keys. In this mode the screen will appear as follows:



All other adjustments such as S2%, S2Fine and New Jumper can be accessed via Menu key on the fly.

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 full course time 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

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

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. The PerfectPass Speed Control device should not be used for any other purpose or under any other conditions.

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 by 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)

PERFECTPASS®
THE WORLD LEADER IN SPEED CONTROL