Plimpton Innovations, LLC

Weather Sensor

Instruction Manual

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Introduction

The PI PRO SERIES Weather Sensor is the first sensor of its kind designed specifically for motorsports applications where environmental conditions and maximizing performance meet. Common uses of the sensor are recording weather conditions via aftermarket datalogger, displaying weather conditions to the driver and tuner on an aftermarket programmed dash, and even for minor closed loop tuning adjustments. The sensor output signals can be wired into most aftermarket ECU's capable of 0-5V analog inputs.

Typical information provided by the sensor are Temperature, Barometric Pressure, Density Altitude, and Watergrains. Some tuners and users may opt for custom channels in specific conditions which must be purchased in addition to the sensor and communicated at time of purchase.

Characteristics

- Power on using 5 Volt sensor power (NO GREATER THAN 5.5V)
- 0-5 Volt Analog outputs
- Low Power Consumption

Package Contents

- Weather Sensor
- Stainless Steel 10-32 Button Head mounting screws
- Components for mending with existing wiring harness
 - o 1.5ft Flying Lead Harness
 - o Heat shrink
 - Splices (x6)
- Components for DIY Harness
 - Mating connector
 - Wire terminals (minimum one extra)
 - o Terminal Lock
- Calibration Card





Terms of Use

The use of this equipment implies in total accordance with the terms described in this manual and exempts the manufacturer from any responsibility regarding product misuse. This product must be installed and tuned by specialized auto shops or professionals with experience in aftermarket motorsports wiring and vehicle tuning. The oversight of any of the warnings or precautions described in this manual can cause damages and lead to warranty void of this product warranty.

This product is not certified or designed for aeronautic purposes or any flying vehicles. In some countries where an annual inspection of vehicles is enforced, no modification in the OEM ECU is permitted. Be informed about local laws and regulations prior to the product installation.

Limited Warranty

This product warranty is limited to one year from the purchase date, only covering manufacturing defects and requiring purchase invoice presentation. Damages caused by failure or misuse of the unit are not covered by the warranty. Warranty void analysis is done exclusively by Plimpton Innovations, LLC technical support team.

Additional Legal Disclaimer

The use of this product is done so at the users own risk and his/her own responsibility. Information furnished by Plimpton Innovations, LLC is believed to be accurate and reliable. However, no responsibility is assumed by Plimpton Innovations, LLC for its use, damages incurred from its use, nor infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under patent or patent rights of Plimpton Innovations, LLC.



Installation

Before installation, ensure power to the vehicle is off and the battery is disconnected.

Mounting Location

There are multiple locations and orientations the sensor can be mounted. Follow the checklist below for determining if the location is suitable:

- □ Sensor is away from high temperatures
 - engine/drivetrain bays, turbo(s), exhaust piping/manifolds, or heat exchanger devices (Radiator, intercooler, exc.)
- □ Sensor is away from harsh chemicals
- □ Sensor is out of direct sunlight and rainfall
- □ Sensor vent port is open to environmental air
- Sensor is spaced off panels that may get warm from conductive, convective, or radiative effects (Achievable with nylon spacers, see Figure 1)
 - o firewall, exterior vehicle paneling in direct sunlight for long durations (Like a racecar wing)

Acceptable mounting locations on the vehicle may include:

- a. On the taillight panel (License plate area) if covered sufficiently with overhanging panels and/or wing.
- b. In the passenger cabin near the door jam, out of sunlight consider an alternative location if your vehicle is sealed via weatherstrip or if running cabin temperature controls
- c. Under a Drag racing style flat wing, with sufficient spacer between the sensor and wing
- d. Behind a bumper

Once a suitable location is determined, fasten the sensor using the supplied hardware in the enclosure.



Figure 1: Weather Sensor mounted with spacers.



Standard Pinnout and Calibration

The standard sensor pin out is shown below. If a custom programmed sensor was purchased, the alternative pin out will be provided on the calibration card supplied in the original package.

PIN	DESCRIPTION		
Ρ1	5V Sensor Power (5.5V MAX)		
P2	Sensor Ground	0 VOLTS	5 VOLTS
Р3	Temperature (Analog)	0 °F	150 °F
Ρ4	Barometric Pressure (Analog)	16 inHg	32 inHg
P5	Density Altitude (Analog)	-3,000 Ft	12,000 Ft
P6	Water Grains (Analog)	0 gpp	150 gpp

Table 1: Standard Programming Wiring Pinout and Calibration.

ATTENTION: Please follow the calibration examples in your ECU Provider's setup section closely as some of the units and values may be changed to accommodate ECU.

A white shrink label displaying "+5V" is preshrunk on the pin 1 wire of the pigtail. For further clarity, small abbreviations of the channels are shown on the backing plate and align with each corresponding pin.



Figure 2: Weather Sensor Backing Plate with Nomenclature.

Wiring

The wiring harness must be protected from sharp edges that may damage wires and cause short-circuits. Pay close attention when passing the wiring harness through holes, always using rubber shields or other kind of wire protection. Route the wiring through areas that aren't exposed to chemicals, excessive heat, and away from moving parts. Follow the following steps for wiring the sensor via pigtail.

- 1. Ensure power in the vehicle is off
- 2. Strip ¼" of the wire insulation away on pigtail (20awg wires supplied)
- 3. Strip ¼" of the wire insulation away on vehicle wires
- 4. Use proper size crimp style splice connector to join wires and protect splice with heat shrink
- 5. Push Molex connector into weather sensor until latching occurs
- 6. Once sensor is tightened, secure the wiring harness to body or chassis between 0.75"-1.5" away from sensor connection using a zip tie or wire clamp

For DIY wiring harness, please refer to the Nano-fit Molex Application Specification: <u>https://www.molex.com/pdm_docs/as/AS-105300-100-001.pdf</u>



Haltech Setup

- 1. Unplug the weather sensor.
- 2. Navigate to the "Sensors" page and enable Air Temperature, Barometric Pressure, and Humidity channels or channels as needed.



- 3. For each input newly enabled on the "Sensors" page
 - a. Navigate to the Sensor/Settings page
 - b. Setup the sensor wiring, and calibrations as follows:





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Figure 5: Haltech Barometric Pressure Configuration



Figure 6: Haltech Humidity Configuration

4. Now navigate to the "Generics" Page and under the "Sensor" column enable the next open Generic Sensor

5. Navigate to the newly enabled Generic Sensor dropdown and setup sensor wiring and calibration as follows:

6. Navigate to the "Datalog Page" and add the new channels into a lower frequency log list.

	Figure 9: Haltech Data Configuration
clite VMS ECU V3.00.1 - Release	
Engine Configuration	Datalog
Sensors	
Ignition Tuning	Always On Logger Off Delay 3.000 s
Engine Functions	O Datalog Switch Input
Electrical	
Transmission	
Vehicle Functions	Enabled RPM Select is Greater Than
▶ Generics	
Haltech CAN System	Note: If you add or remove channels, it won't take effect until the next time a new log is started.
OBDII CAN System	
Datalog	
I/O Expander Box A	
Dual Wideband Box A	Available Channels Channels in Group
Haltech CAN Supported Dash	PCB VERSION
	SETTINGS DEF MD5 Generic Sensor 1 Value (Density Altitude)
	Absolute Humidity
	Accumulated Engine Running Time Ambient Air Temperature

- 7. Once desired channels are complete, save configuration to ECU
- 8. Power the vehicle off, plug sensor in, and then return the vehicle electrical power back on
- 9. Reconnect with the ECU and verify appropriate values
 - a. This can be easily accomplished by adding digital gauges in the screen bottom dash and selecting appropriate "Custom" channels.

Holley Setup

- 1. Unplug the weather sensor
- 2. Navigate to the I/O Screen
- 3. Complete the following sections using the ACTUAL designated inputs wired for the sensor from your vehicle!

	Inputs '	1-20	Inputs 21-40	Inputs	41-60	Inputs 61-80	
Inputs	-INPU	TS					
Outputs		NAME	TYPE		ECU PIN	ENABLE	
Inputs/Outputs	#1		DIGITAL SPEED/FRE	EQ ~	NOT DEFINED	Enable	Configure
	#2		DIGITAL SPEED/FRE	Q v	NOT DEFINED	🗹 Enable	Configure
	#3	Air Temperature	5 VOLT	~	NOT DEFINED	🗸 Enable	Configure
	#4	Barometric Pres	5 VOLT	~	NOT DEFINED	🗸 Enable	Configure
	#5	Density Altitude	5 VOLT	~	NOT DEFINED	🗸 Enable	Configure
	#6	Water Grains	5 VOLT	~	NOT DEFINED	🗸 Enable	Configure

4. Once enabled, setup the configurations and calibrations as follows:

Figure 12: Holley Barometric Pressure Configuration

Figure 14: Holley Water Grains Configuration

5. Select the "PIN MAP" Button and assign the newly added Inputs to the corresponding pins on **YOUR** vehicle using the drag and drop method. Press done when complete.

alley EFI ECU Pin Map								?
View Inputs	View LCD	LCD View Outputs View Injectors View Fixed Drag and Drop I/O to Available Pins						Done
	NPUTS							
G N20 Input #1 G N20 Enable F	G Shift M G Race T H Launch	str Enable irans Launch i Input						
CONNECTOR J	1				CON	NECTOR J3		
Pin Input Number	Input Type				Pin I	nput Number	Input Type	I
A12 Input #1	Water Grains				B21 1	nnut #28	5	
A3 Input #2	5 Air Temperature	:			B15 I	nput #29	5	
A13 Input #3	5 Barometric Pres	6			B9 1	nput #30	5	
A4 Input #4	Density Altitude				B2 1	nput #31	5	
					B3	nput #32	5	
-CONNECTOR	2				B23	nput #33	5	
CONTLOTION					B25	nput #34	5	
Pin Input Number	Input Type				B24	nput #35	H ECU Log Trig	
A10 Input #5	5 2 I H G				B18	nput #36	5 2 T H G	
A1 Input #6	52186							
A27 Input #7	52186							
A19 Input #8	52186				· · · ·			
A11 Input #9	52166				CON	NECTOR J4		
A2 Input #10	52166				Cont			
A28 Input #11	521110				Pin I	nput Number	Input Type	
A20 Input #12	56				B17 I	nput #37	H Rev Limiter #1	
A12 Input #13	50				B25	nput #38	5 2 T H G	
A3 Input #14	6 Doublimiter #2				B18	nput #39	FS	
A23 IIIput #15	F S				B19 [nput #40	FS	
A13 Input #17	FS				B21	nput #41	5 H G	
A13 Input #18	FS				B15	nput #42	5 H G	
A30 Input #19	FS				B22	nput #43	5 H G	
A14 Input #20	5 H G				B23	nput #44	5 H G	
A5 Input #21	5 H G				89 1	nput #45	5 H G	
A31 Input #22	5 H G				88 1	nput #46	5 H G	
A23 Input #23	5 H G				BIU	nput #47		
A15 Input #24	5 H G				816	nput #48	EEC	
A6 Input #25	5 H G				D24	nput #49	E 5 G	
A32 Input #26	5 H G				020	nput #50		
A24 Input #27	5 H G							

a. If done correctly, you will see the CORRECT corresponding pin assignment next to the inputs!

	Figure 16: Holley Input Pin Assignment Check						
	NAME	TYPE	ECU PIN				
#1		DIGITAL SPEED/FREQ	NOT DEFINED				
#2		DIGITAL SPEED/FREQ					
#3	Air Temperature	5 VOLT	J1-A3				
#4	Barometric Pres	5 VOLT	J1-A13				
#5	Density Altitude	5 VOLT	J1-A4				
#6	Water Grains	5 VOLT	J1-A12				

Figure 15: Holley Pin Map Setup

6. Once desired channels are complete, navigate to the Data Manager screen and setup a "Weather Page" or add to an existing section.

			Figure 17: I	Holley Data Manage	r Setup					
.a Monitor Setup									?	
DM File										
N20 Purge Output	Trans Man DS Input	Brake Pedal		Sensors X	Idle Tuning	X	Fuel Tuning	X	Learn Tuning	×
N20 Dry Fuel #1 N20 Dry Fuel #2 N20 Dry Fuel #3 N20 Dry Fuel #4 N20 Dry Fuel #5 N20 Dry Fuel #6 N20 Dry Fuel #6 N20 Dry Fuel #8 N20 Dry Fuel #8 N20 Trng Mod #12 N20 Trng Mod #3 N20 Trng Mod #3 N20 Trng Mod #3	Trans Auto/Man In Trans Range Pos Race Trans Launch Shift Sungle Out Shift Output 1-2 Shift Output 2-3 Shift Output 3-4 Shift Output 3-4 Shift Output 5-5 Shift Output 5-6 Shift Output 5-6 Shift Output 7-8 Shift Output 7-8	DBW Pad2 TC Smartdrop TC Timing Retard TC N20 Decrease TC Boost Decrease DS Timing Offset DS Timing Offset DS Rev Limit CS Rev Limit TC Time TC Launch Input		RPM TPS MAP CTS CTS Baro Batery Oil Pressure Fuel Pressure IAC Position	RPM Target Idle Speed IAC Position Ignition Timing TPS CL Comp AFR Right AFR Left Ini FW Battery		RPM CL Status CL Comp AFR Right Estimated VE Target AFR Coolant AFR Offset Inj PW Fuel Flow		RPM Learn Status CL Status CL Comp Current Learn Target AFR AFR Right AFR Right AFR Average Coolant Enr	
N2O Tmg Mod #5	Shift Mster Enable	Diag #1		Startup-Cold Tuning	N2O Inputs-Outputs	X	Drive By Wire	X	Weather	x
N20 Ting Mod #6 N20 Ting Mod #7 N20 Ting Mod #8 N20 Timer #1 N20 Timer #2 N20 Timer #2 N20 Timer #3 N20 Timer #46 N20 Timer #6 N20 Timer #7 N20 Timer #8 N20 Timer #8 N20 Timer #8 N20 Timer #8	Shift Ignition Cut Shift Ignition Mod Shift Timer Conv Lockup #1 Conv Lockup #2 Conv Lockup #3 Conv Lockup #4 Conv Lockup E4 Spool Assist Out 1 Spool Assist Out 2 Dump #1 Dump #2	Diag #2 Diag #3 Diag #4 Diag #4 Diag #6 Diag #6 Diag #7 Diag #7 Diag #10 Diag #11 Diag #12 Diag #13		RPM Coolant Enr Coolant AFR Offset Target AFR CL Comp AFR Average AFR Right Air Temp Enr Afterstant Enr IAC Position	RPM TPS N2O Enabled N2O Stage 1 N2O Stage 2 N2O Stage 3 N2O Stage 4 N2O Input #1 N2O Input #2 N2O Input #3		RPM TPS Pedal Position Shiff Single Out Shiff Output 1-2 Shiff Output 2-3 Shiff Output 3-4 Shiff Output 3-4 Shiff Output 7-8 Shiff Output 7-8 Shiff Output 7-8 Shiff Over-Ride		Air Temperature Barometric Pres Density Attitude Water Grains	
N20 Pad2	Dump #3	Diag #14		Transmission Tuning 🛛 🗙	Boost	x	Traction ASM	x	Fuel	x
N20 Pad3 V20 Pad4 V Gear Speed Line Pressure Accum Pressure TCC Duty Cycle CC Duty Cycle Torque Time Torque Time Trans Man US Input	Trans Dump Disable Trans Pad 2 TB TPS #1 TB TPS #1 TB TPS #2 Pedal TPS #2 TB2 TPS #2 TB2 TPS #2 TB2 TPS #2 TB2 PS #1 TB2 PS #1 TB2 PS sition	Diag #15 Diag #16 Diag #17 Diag #18 Diag #19 Diag #20 AT Launch Input AT Shift Input AT Manual Reset AT Gear	Input #1 Input #2	RPM TPS Gear Speed Line Pressure Line Temp TCC Duty Cycle Input Shaft Speed Trans AutoMan In Trans Range Pos	Boost Target Boost Boost Gear Boost Stage Boost Sipeed Boost Safety Boost Solenoid Duty Boost Man Stage Inp Boost Went Sol DC		Conv Lockup #3 Conv Lockup #4 Conv Lock Disable Spool Assist Out 1 Spool Assist Out 2 Dump #1		RPM Fuel Flow Base Fuel Ib/hr Fuel Table 2 % Fuel Table 2 % Fuel Table 3 %	

- 7. Save setup and configuration to ECU
- 8. Power the vehicle off, plug sensor in, and then return the vehicle electrical power back on
- 9. Reconnect with the ECU and verify appropriate values
 - a. This can be easily accomplished by toggling through the data manager viewer pages on the bottom-left side of the main screen.

FuelTech Setup

- 1. Unplug the weather sensor
- 2. Navigate to the Sensor and Calibration Screen
- 3. For each input used, complete the sections as follow

Figu	ire 18: Temperature			Figure 20: Density Altitud	le
Import sensor	Calibrate sensor		Import sensor	Calibrate sensor	
Channel name Default name Custom measure type #1	Input sensor O Default		Channel name Default name Custom measure type	Input sensor Default	~
Custom name Air Temperature	Custom		Custom name Density Altitude		
Dash name Unit	Signal type Analog	Interpolation table Voltage Value	Dash name Unit. DA ft	Analog	Voltage Value
Decimal places 2 (Min: -320,00 Max: 320,00)	Enable pullup Average points	0.000 0.000 5.000 150.000	Decimal places 0 (Min: -32000 Max: 32000)	Average points	5.0003000.000
Offset Offset type	7		Offset Offset type		
Offset value	Digital sensor setup		Offset value	Digital sensor setup Digital options	
Digital filter	Higher level		Digital filter	Higher level	
Digital filter enabled Filter frequency	0.000 ÷ V		Digital filter enabled Filter frequency 5	0.000 ‡	V
Q factor 0.60 📥	0.000 ÷ V	v v	Q factor 0.6	0.000 ÷	V Eill values
Figure .	19: Barometric Pressure Calibrate sensor		Input enabled Import sensor	Calibrate sensor	; ;
Channel name	Input sensor		Channel name	Input sensor	
Custom measure type #	O Default		Custom measure type #		~
Custom name Barometric Pressure	Custom		Custom name Watergrains	Custom	
Dash name Unit Baro InH	Signal type Analog	Voltage Value	Dash name Unit	Analog	Voltage Value
Decimal places 2 (Min: -320,00 Max: 320,00)	Enable pullup Averagepoints 7	5.000 32.000	Decimal places 2 (Min: -320,00 Max: 320,00)	Averagepoints	5.000 150.000
Offset Offset type	· · ·		Offset Offset type		
Offset value	Digital sensor setup Digital options		Offset value	Digital sensor setup Digital options Hinher level	_
	HICITIECIEVEI				
Digital filter Digital filter enabled	Hi level 0.000 🗘 V		Digital filter ☑ Digital filter enabled	Hi level	v
Digital filter Digital filter enabled Filter frequency 50	Hillevel Lo level 0.000 + v		Digital filter Digital filter enabled Filter frequency 5	Hi level Lo level 0.000 ¢	V

- 4. Once desired channels are complete, save ECU configuration
- 5. Power the vehicle off, plug sensor in, and then return the vehicle electrical power back on
- 6. Reconnect with the ECU and verify appropriate values
 - a. This can be easily accomplished by adding digital gauges in the screen bottom dash and selecting appropriate "Custom" channels

Revision

Version	Change	Date
V1.0	Initial Release	
V1.1	Grammatical Corrections	June 4 th , 2022