



Goodrich ISR Systems

Tach / Deadman Interface Control Document

October 12, 2011

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The Piccolo Autopilot avionics system and all of its versions (such as Piccolo, Piccolo Plus, Piccolo II, Piccolo LT, and Piccolo SL) were designed for use **only** on un-manned aircraft. **USE OF THESE PICCOLO AUTOPILOT PRODUCTS IN AIRCRAFT WITH HUMAN OCCUPANTS IS PROHIBITED BY THE FEDERAL AVIATION ADMINISTRATION.** Cloud Cap Technology, Inc. is not permitted to sell the Piccolo Autopilot to any customer that intends to use the product on aircraft with human occupants.

1 Introduction

Tach / Deadman boards:

- Magneto Version: CCT part number - 900-00591-00
- 5V CDI Version: CCT part number - 900-00590-00

The Tach/Deadman board offers a flexible engine/avionics interface that provides:

- Deterministic control of ignition state for both magneto and electronic ignition modules via a single 5-volt level discrete input (typically driven by Piccolo Deadman output).
- Conditioning of the incoming RPM signal for sampling by the host avionics system.
- The option for an external (vehicle mounted) engine kill switch and companion status LED. This provides operators manual control over the ignition state regardless of the autopilot commanded state, providing an additional level of safety during ground operations.
- The option to power an electronic ignition module directly from the Piccolo Deadman 5-volt output or from an external battery or power source.

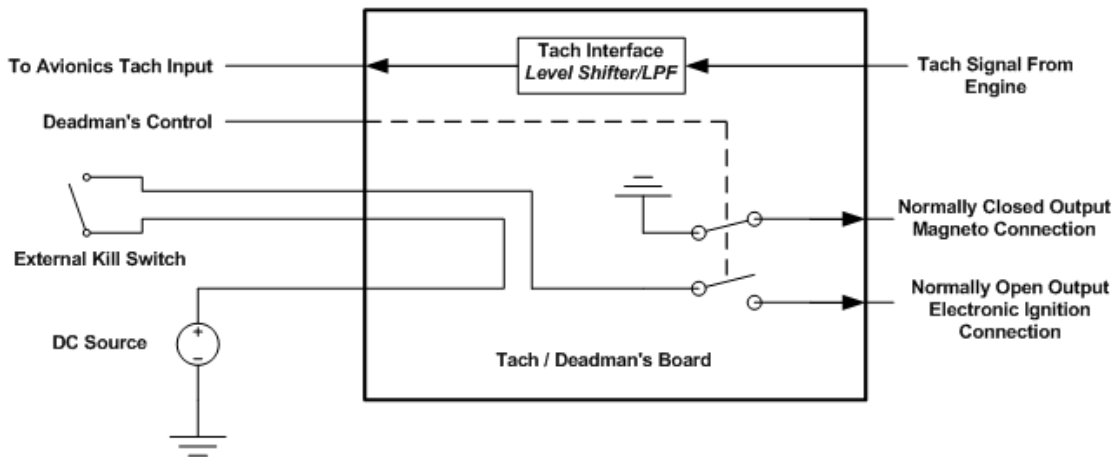


Figure 1 - Tach/Deadman Block Diagram

2 I/O Connectors and Signal Descriptions

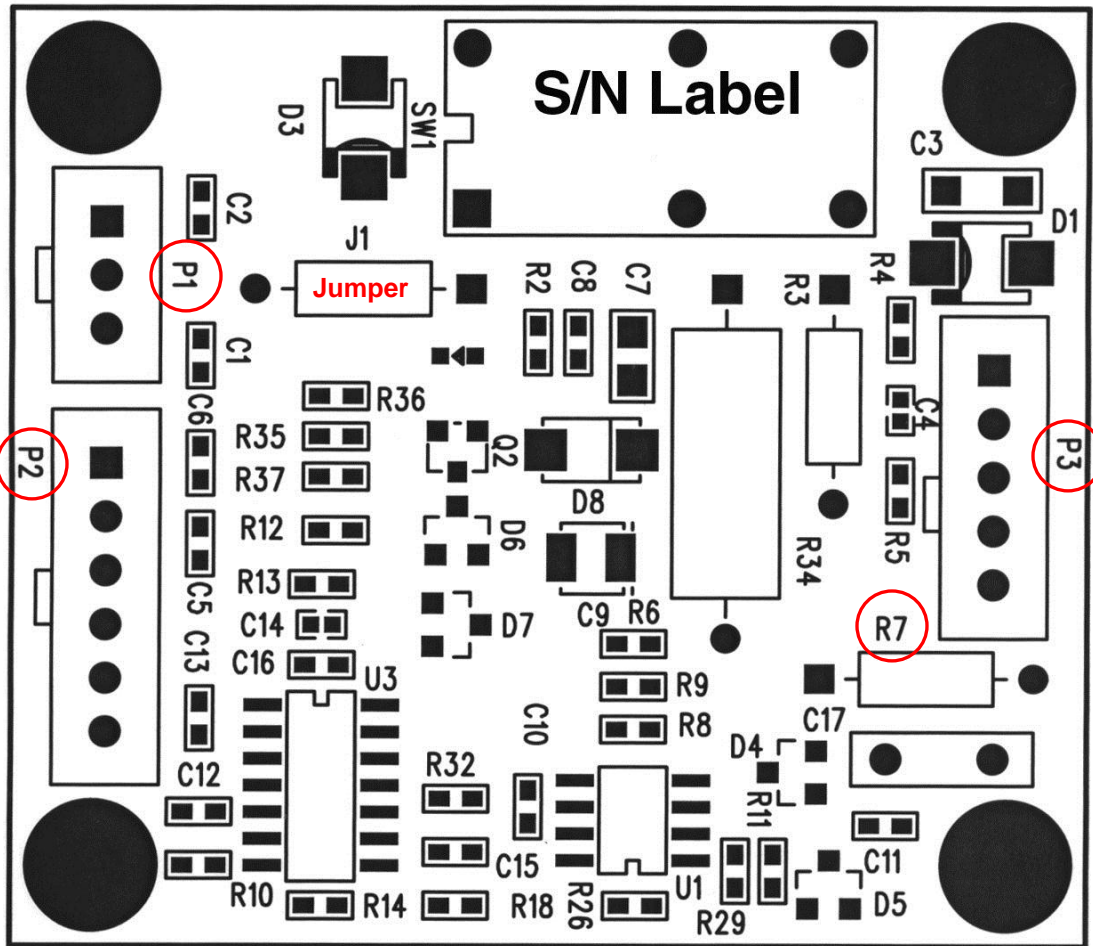


Figure 2 - I/O Connectors and Signal Descriptions

2.1 P3 - Engine Interface Connector

This connection is used to sample the engine RPM signal and to provide ON/OFF control to either an electronic (externally powered) ignition or magneto (self powered) ignition. P3 is a 5-pin AMP MTE Protected Latch Header AMP 103670-4, Digikey # A28483-ND. The mating harness requires the following items:

- Mating MTE 5-pin Receptacle: AMP 104257-4 Digikey # A28405-ND
- 20-24 AWG Receptacle Contacts: AMP 104479-6 Digikey #A28333-ND

Table 1 - P3 Engine Interface

P3		Engine Interface		
Pin	Name	Type	Level	Description
1	*Magneto Kill	I/O	300V	Normally Closed relay contact - Grounded when not energized, open circuit when energized. Used as engine kill output and doubles as the Tach input for magneto ignitions.
2	Ignition Power Out	O	User Defined	Normally Open relay contact - open circuit when not energized, hooked to P2 pin 1 when energized.
3	GND	I	5V	Ground
4	Tach	I	5V	Unfiltered Tach input from ignition hall sensor
5	GND			Tach Return

2.2 P2 - Avionics (Piccolo) Interface Connector

This connector provides the relay control signal input from and a filtered rpm signal output to the host avionics. It also provides the main supply input for electronic ignitions. P2 is a 6-pin AMP MTE Protected Latch Header AMP 103670-5, Digikey # A28486-ND. The mating harness requires the following items:

- Mating MTE 6-pin Receptacle: AMP 104257-5 Digikey # A28409-ND
- 20-24 AWG Receptacle Contacts: AMP 104479-6 Digikey #A28333-ND

Table 2 - P2 Piccolo Interface

P2		Piccolo Interface		
Pin	Name	Type	Level	Description
1	Ignition Power Input	I	User Defined	Ignition supply input - relay controlled power for ignition connected to P2 pin 2.
2	GND			Ground
3	5-Volt Deadman Input	I	5V	Control input used to power relay coil
4	GND			Ground
5	Tach Out	O	5V	Tach Output 0-4V Filtered RPM signal
6	GND			Tach Return

2.3 P1 - External Kill Switch Connector

This is used to connect a remotely mounted manual override or ignition kill switch. The three-pin connection allows for the addition of a status LED for visual indication of the ignition state as well. Please refer to the attached schematic for the harness details and parts list. P1 is a 3-pin AMP MTE Protected Latch Header AMP 103670-2, Digikey # A28477-ND. The mating harness requires the following items:

- Mating MTE 3-pin Receptacle: AMP 104257-2 Digikey # A28397-ND
- 20-24 AWG Receptacle Contacts: AMP 104479-6 Digikey #A28333-ND

Note: Jumper J1 must be removed if the manual override switch is to be used (see markings on board for details).

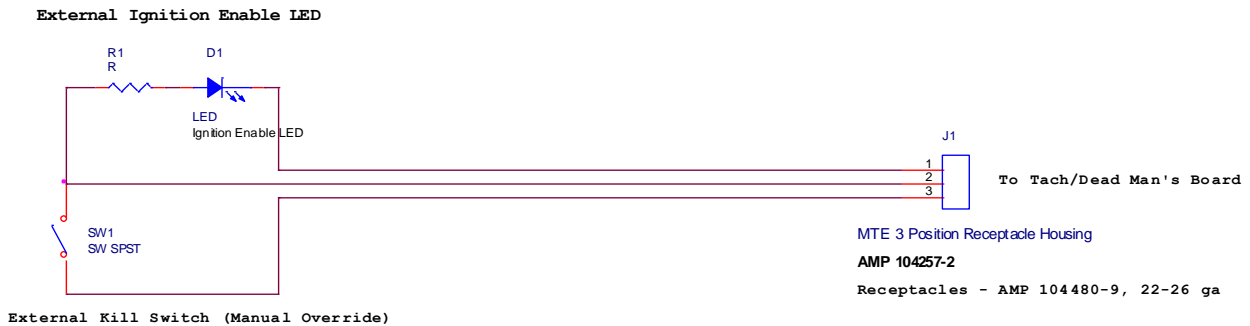
Table 3 - P1 External Kill Switch

P1 External Kill Switch (Optional)				
Pin	Name	Type	Level	Description
1	Manual Switch GND			External Status LED Return
2	Manual Switch Input	O	5V	Deadman Output TO External Switch
3	Manual Switch Output	I	5V	Deadman Output FROM External Switch

Notes:

Use bulkhead mount LED for external status of ignition state. Mount next to Manual Kill Switch.

Switch should be rated to handle 200% of expected peak ignition current



External Kill Switch (Manual Override)

We use Digikey part # SW322-ND - SPST switch
 We use Digikey part # L10075-ND - Green panel mount LED
 R1 should be set to between 150-500 ohms

Cloud Cap Technology		
Title External Engine Kill Switch Harness - Example		
Size A	Document Number <Doc>	Rev 1.0
Date Tuesday, May 25, 2004	Sheet 1	of 3

Figure 3 - Example Kill Switch Harness Schematic

2.4 Deadman Relay (Engine Kill Interface)

The onboard DPST relay was designed to accommodate both 5-volt electronic and magneto type ignitions. There are three typical hardware modes that we support:

- Mode A: Electronic ignition module powered off an independent battery with the Deadman output providing ON/OFF control driving the relay coil.
- Mode B: Electronic ignition module powered directly off the Piccolo Deadman output in parallel with the Deadman output driving the relay coil.
- Mode C: Magneto module with the Deadman output driving the relay coil.

2.4.1 Mode A Operation

This is the typical method of connection for vehicles with either a separate ignition battery or a generator driven power conditioning system and electronic ignition (see **Figure 4**).

In this mode the 5-volt Deadman output from the Piccolo is used to power the relay coil, closing the normally open switch, and powering the ignition from the external source – ignition ON state. Upon loss of the Deadman 5-volt input, the spring loaded contacts return the switch state to the normally open or ignition OFF state.

Mode A allows for ignition operation at other than 5-volt levels. It also facilitates driving ignitions with high current draw requirements (greater than 1-amp).

Note: The onboard relay is rated for 5 amps DC operation.

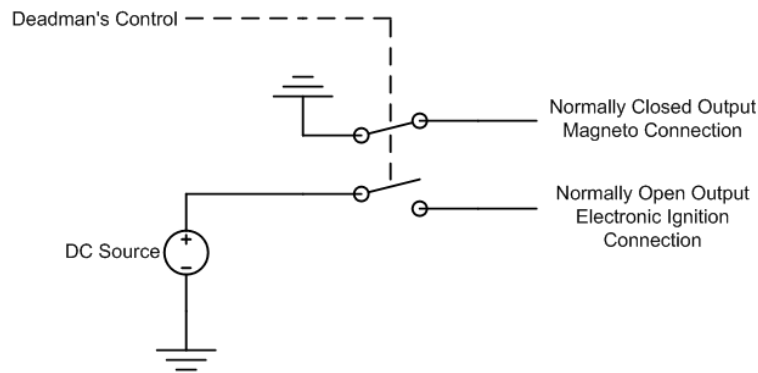


Figure 4 - Mode A

2.4.2 Mode B Operation

In this mode the Piccolo Deadman output is used to power both the relay and the electronic ignition in parallel, i.e. simultaneously drives both P2.1 and P2.3 (see **Figure 5**). This mode allows you to operate the servos and ignition off a single power source. The following conditions must exist for this mode to operate effectively:

- The ignition current draw is less than 1-amp (limited by the FET switch on the Piccolo Deadman output);
- The power source used to power the vehicle’s servos (5-volt servo input on the Piccolo) can handle the extra current load;
- The ignition module will operate within the specified servo voltage range - typically 5-volts.

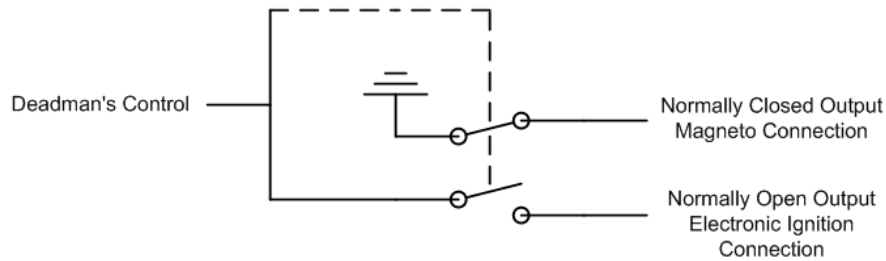


Figure 5 - Mode B

2.4.3 Mode C Operation

This mode is for operation with a magneto ignition, which requires an open circuit on the magneto coil for normal operation (see **Figure 6**). Normally to kill or disable a magneto ignition, you must short and hold the coil input to ground. This is opposite in the case of an electronic ignition where you hook the magneto control input up to the normally closed contact on the Deadman relay. The coil is driven by the Piccolo’s Deadman output, opening the normally closed contact, which enables the ignition. Upon loss of the Deadman 5-volt input, the spring loaded contacts return the switch state to the normally closed grounded ignition OFF state.

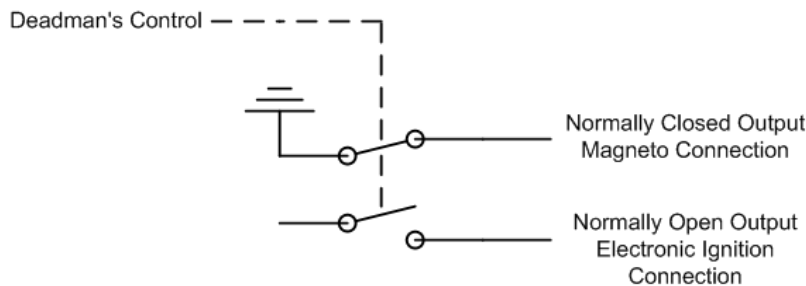


Figure 6 - Mode C

2.5 Tach Interface

In **Figure 7**, the RPM interface circuit will accommodate 5-volt hall sensor inputs or high voltage magneto inputs. This is done by using a separate pin for each type of input, P3.4 and P3.1 respectively, and by changing one resistor (R7) as noted on the schematics. R7 is selected to provide the appropriate voltage divider so that comparator U1 sees a 5-volt level signal over the entire RPM range.

C17 was added to provide additional low pass filtering if needed. Both comparator stages provide hysteresis (added noise and glitch reduction) with Q2 providing the final output drive for the 100-ohm series termination.

***Note:** The board is also padded out for a pull-up resistor at location R3. This is stuffed only if your particular hall sensor setup requires it.*

3 Schematic Diagram

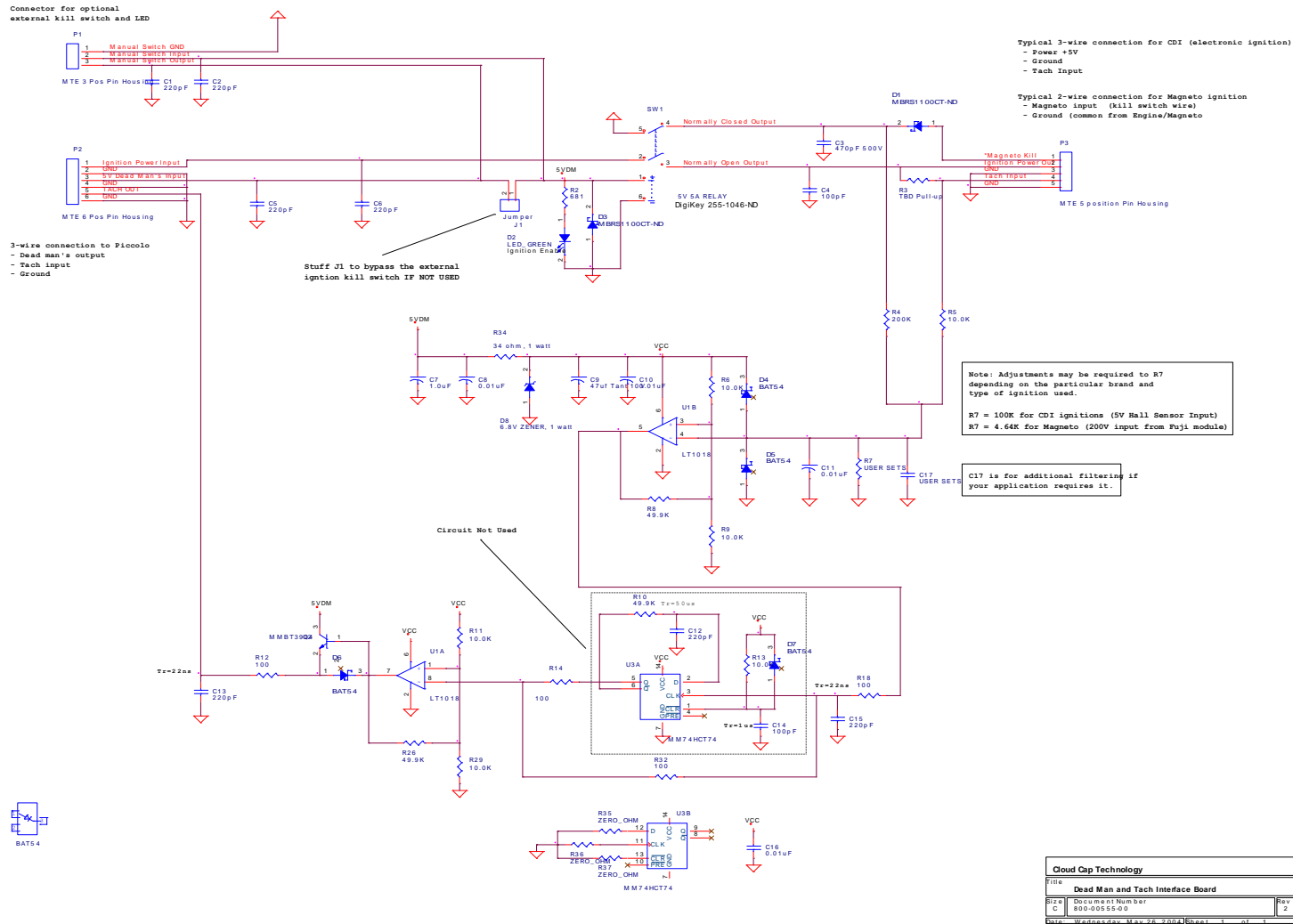


Figure 7 - Tach/Deadman Schematic

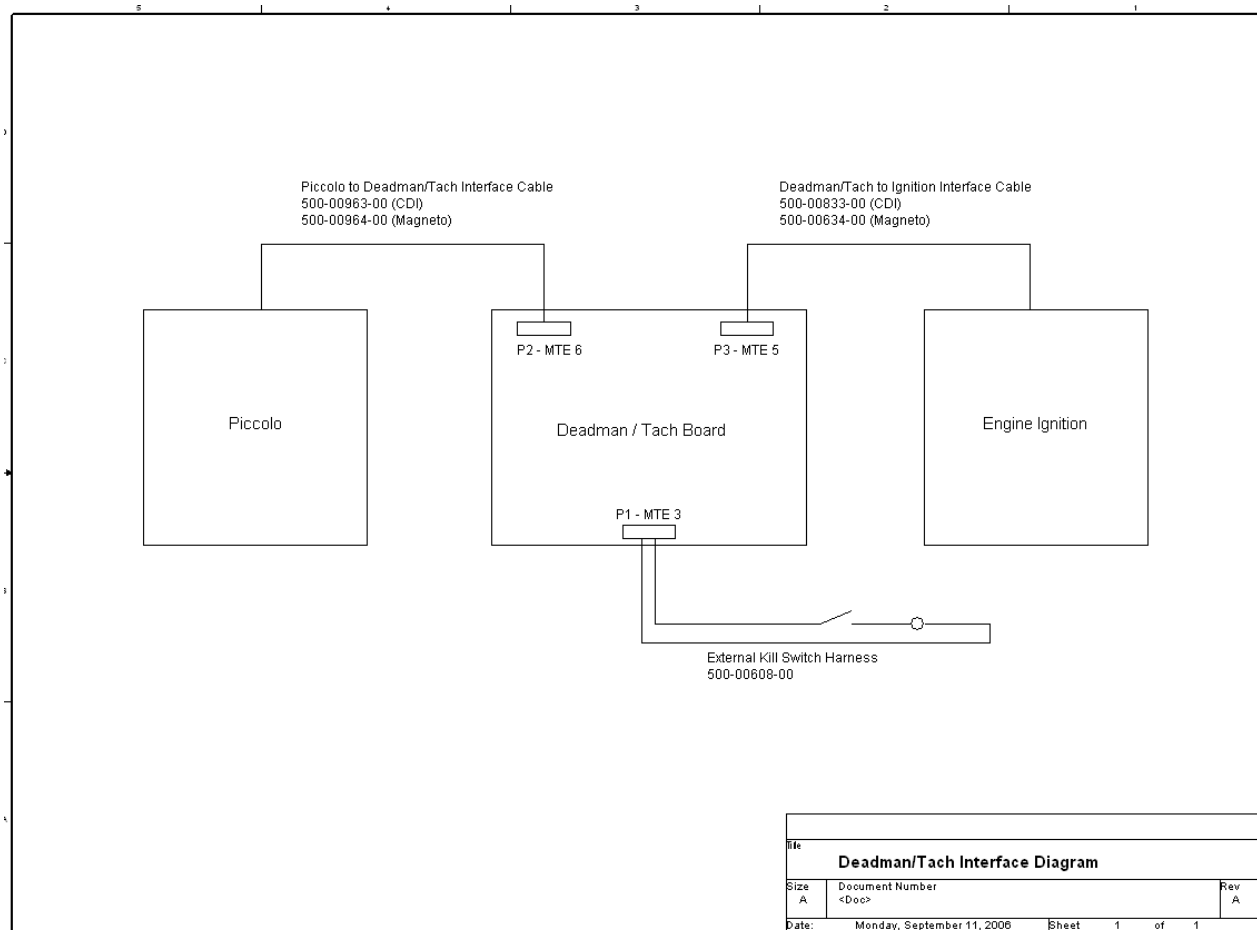


Figure 9 - Deadman/Tach Interface Diagram

The electrical interface to the Deadman/Tach board is shown in **Figure 9**. Refer to **Figure 10** through **Figure 16** for cable schematics and installation instructions.

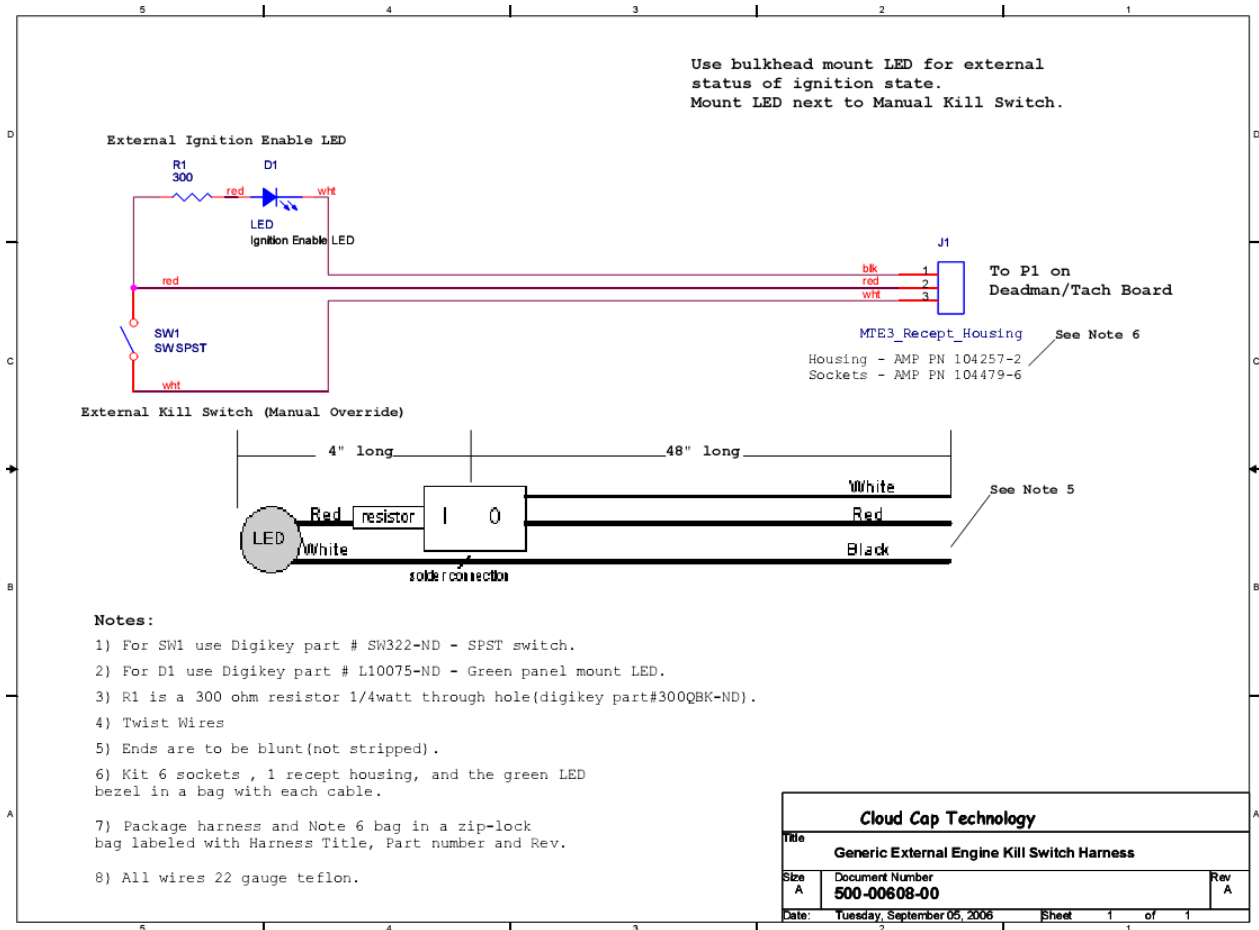


Figure 10 - External Engine Kill Switch Harness

1. To install the External Engine Kill Switch Harness, mount the switch and LED within 48 inches of the Deadman/Tach board.
2. Cut the wires to length and terminate with the included contacts and connector.

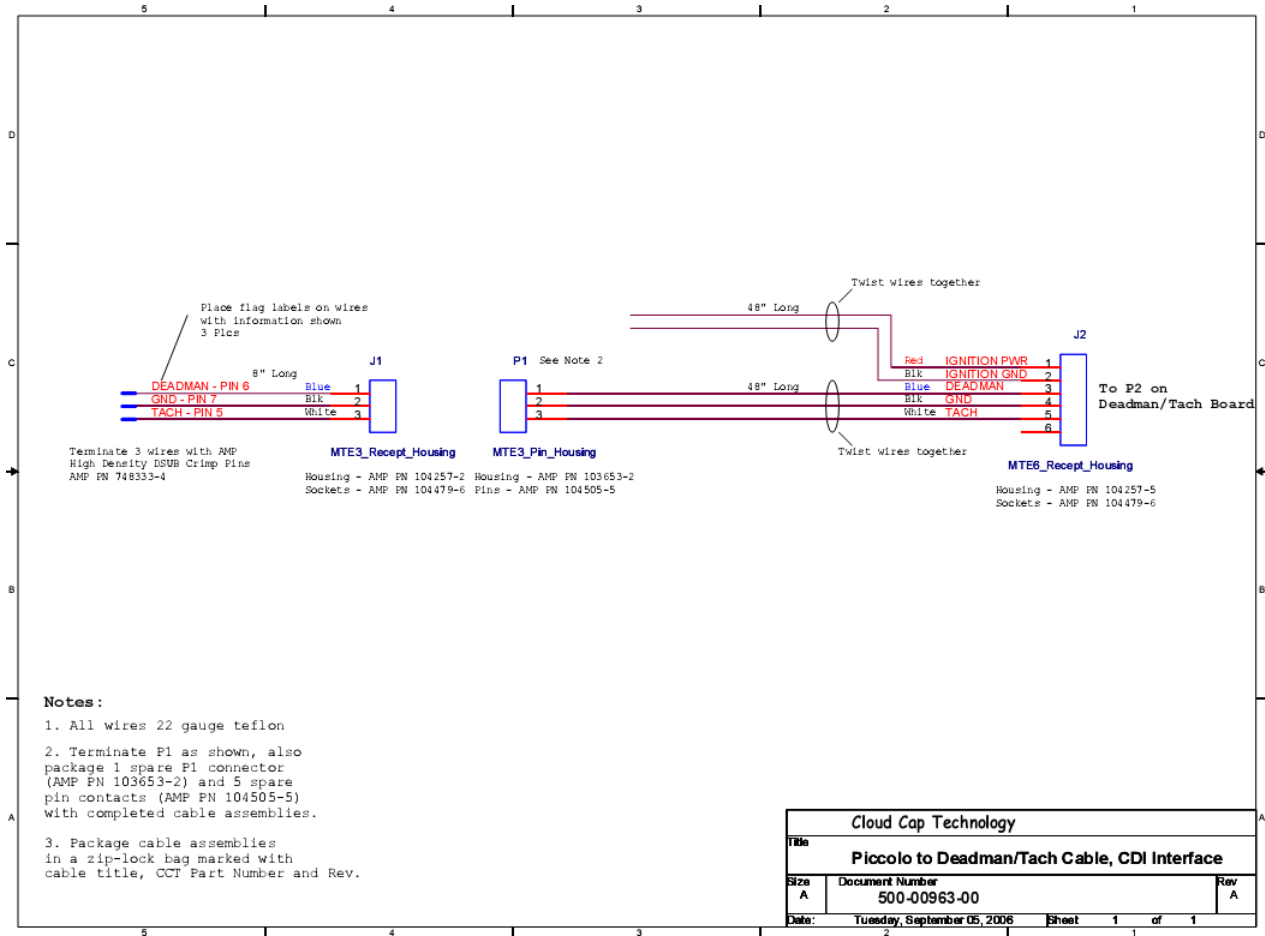


Figure 11- Piccolo to Deadman/Tach Cable, CDI Interface

1. To install the Piccolo to Deadman/Tach Cable, insert the J1 pigtail pins into the Piccolo flight harness connector. The pigtails are labeled with their associated pins on the 44 pin high density DSUB connector. If your flight harness already has a Deadman/Tach connector, the J1 pigtail is not required.
2. Plug P1 into J1 and J2 into the P2 connector on the Deadman/Tach board. The length of this harness can be shortened to any length by cutting off P1 and using the spare contacts and connector included with the harness.
3. Complete the installation by connecting the ignition power and ignition ground wires to the ignition power source.

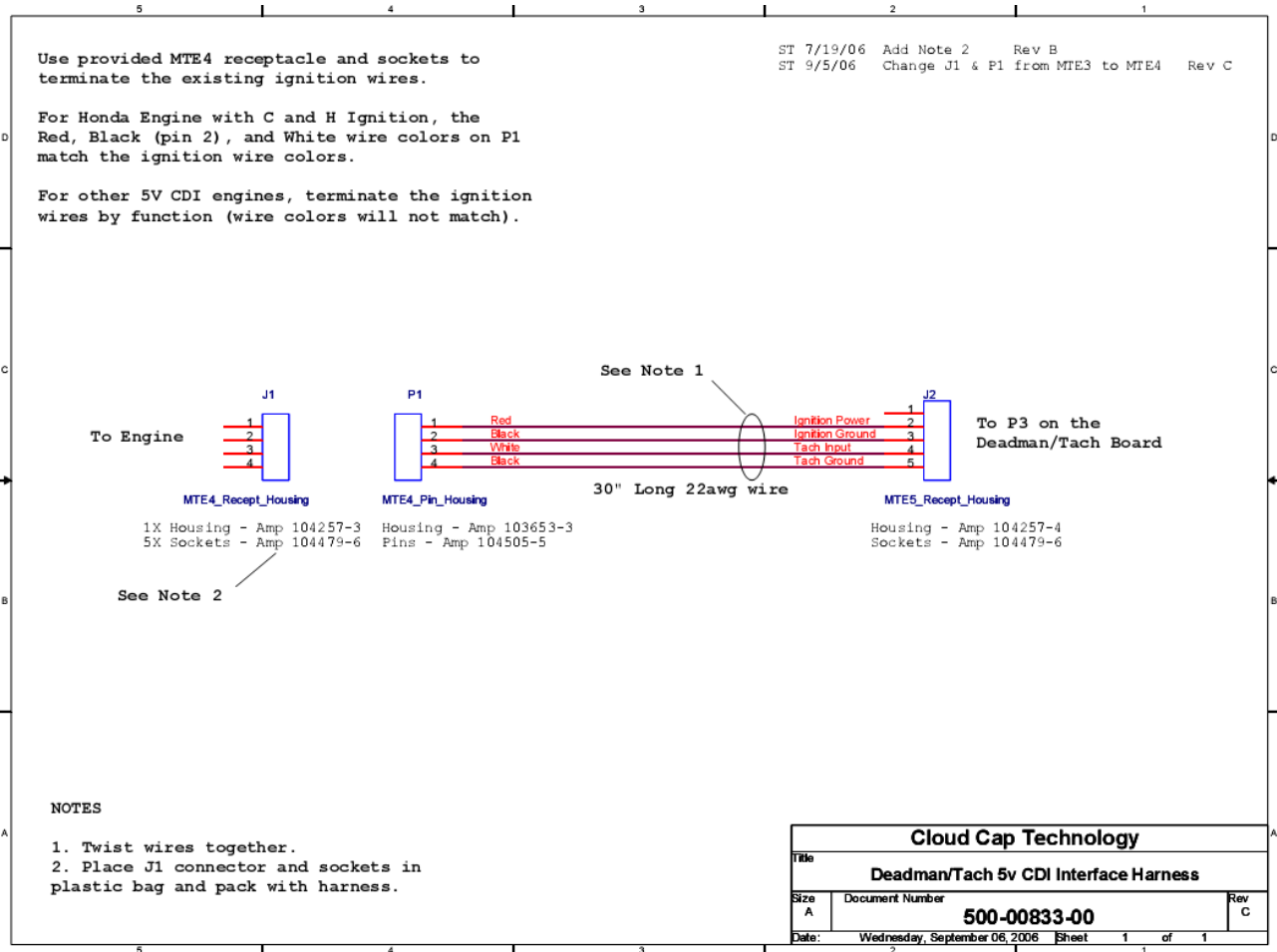


Figure 12 - Deadman/Tach to 5v CDI Interface Harness

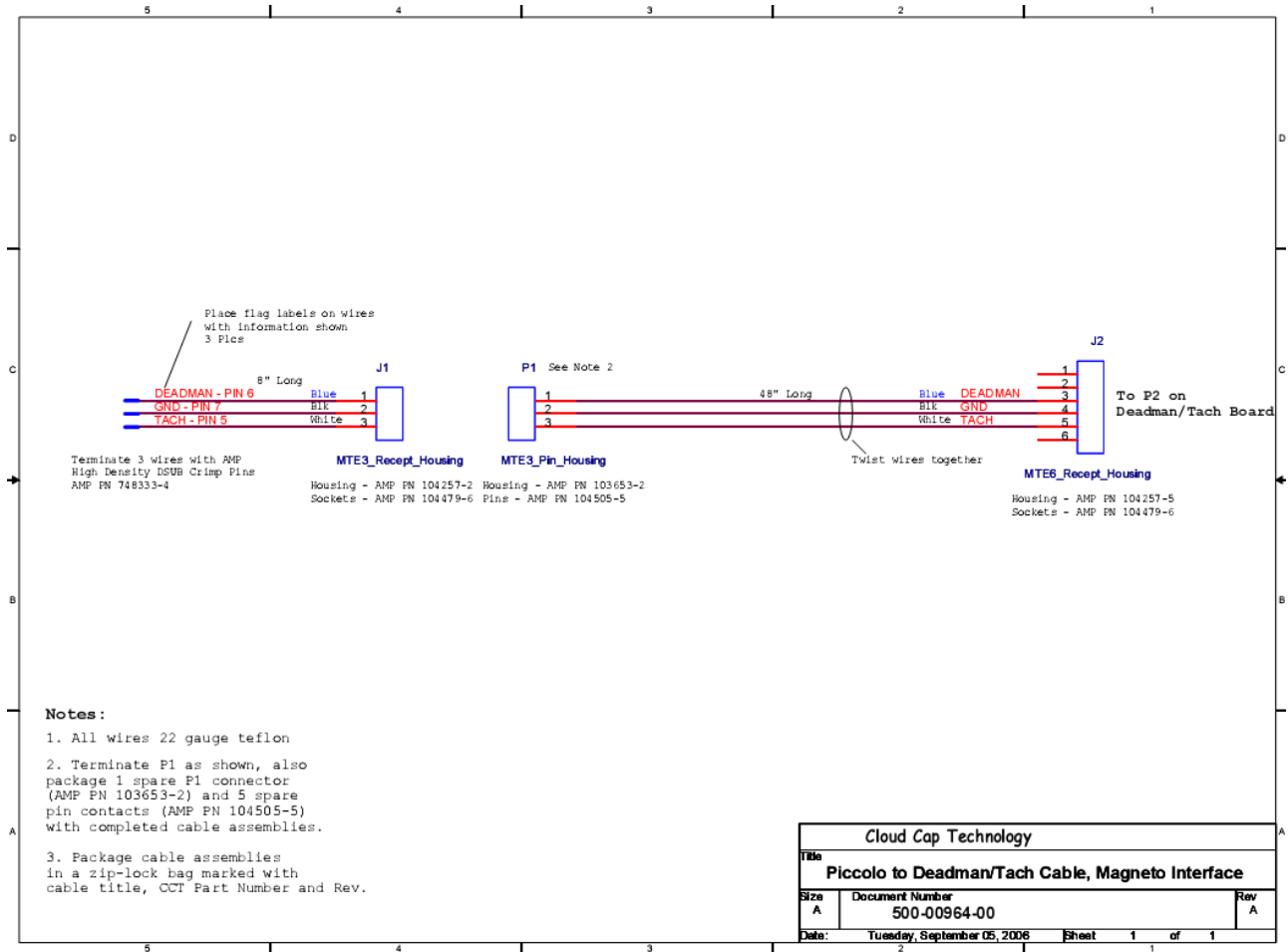


Figure 13 - Piccolo to Deadman/Tach Cable, Magneto Interface

- To install the Piccolo to Deadman/Tach Cable, insert the J1 pigtail pins into the Piccolo flight harness connector. The pigtails are labeled with their associated pins on the 44 pin high density DSUB connector. If your flight harness already has a Deadman/Tach connector, the J1 pigtail is not required.
- Plug P1 into J1 and J2 into the P2 connector on the Deadman/Tach board.

Note: The length of this harness can be shortened to any length by cutting off P1 and using the spare contacts and connector included with the harness.

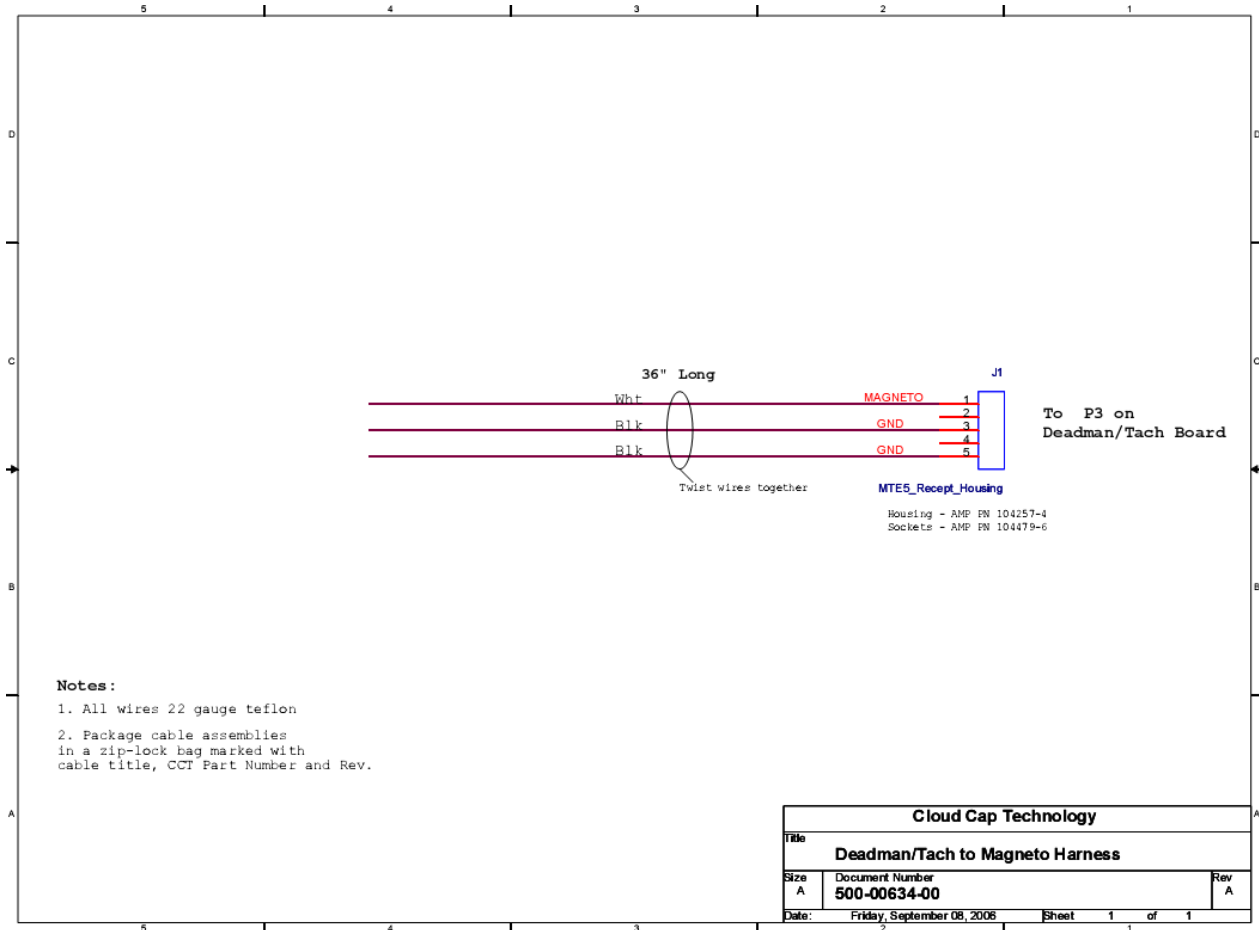


Figure 14 - Deadman/Tach to Magneto Harness

1. To install the Deadman/Tach to Magneto Harness, cut the wires to length.
2. Attach the white Magneto wire to the ATM Module Tachometer Signal contact.
3. Attach the two black ground wires to engine ground.

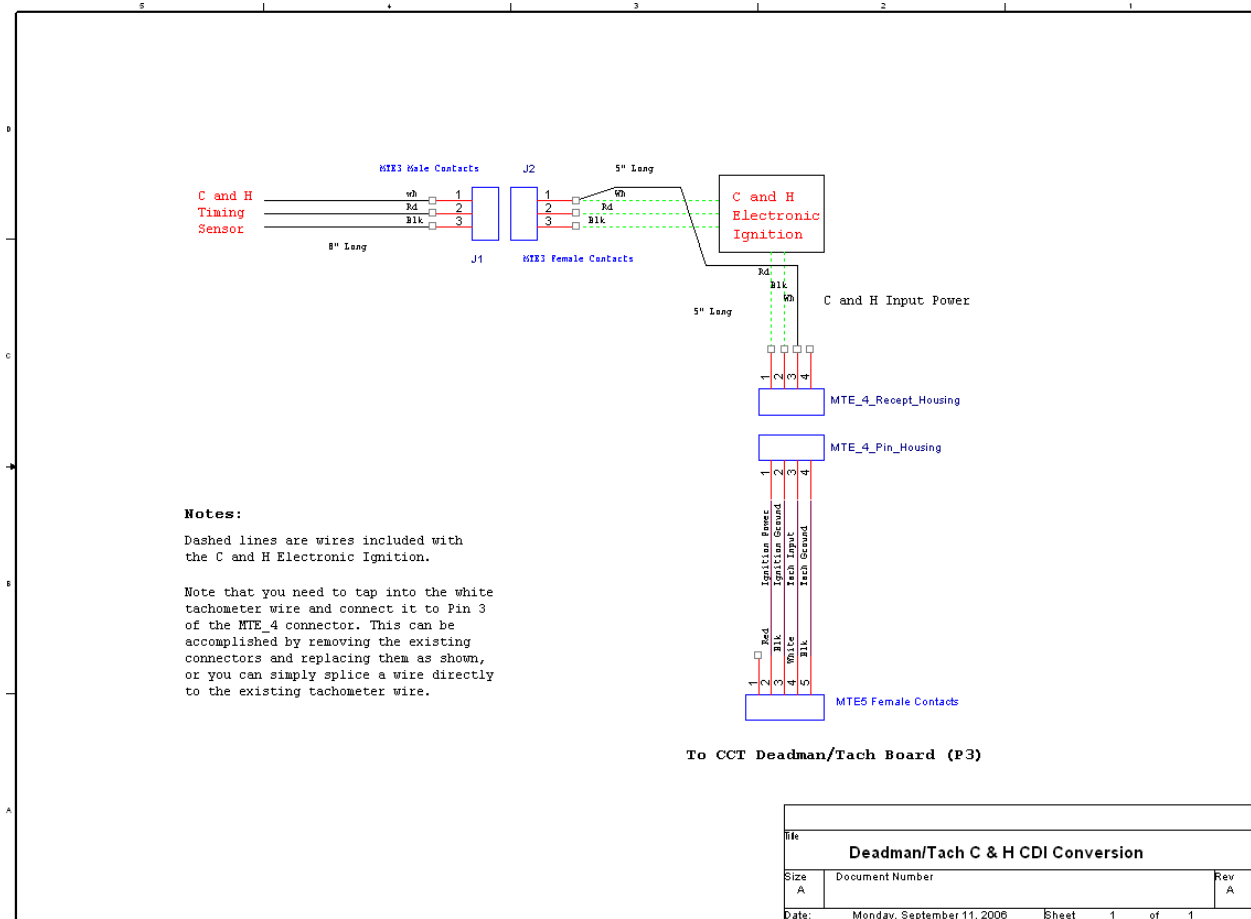


Figure 15 - C & H Ignition Interface

In **Figure 15** the Deadman/Tach to CDI Ignition Cable (CCT p/n: 500-00833-00 is installed on a C & H Ignition.

Note: You need to tap into the white tachometer wire for attachment to Pin 3 of the MTE_4 connector. The original connector can be removed and replaced as shown, or a wire can be spliced to the existing wire.

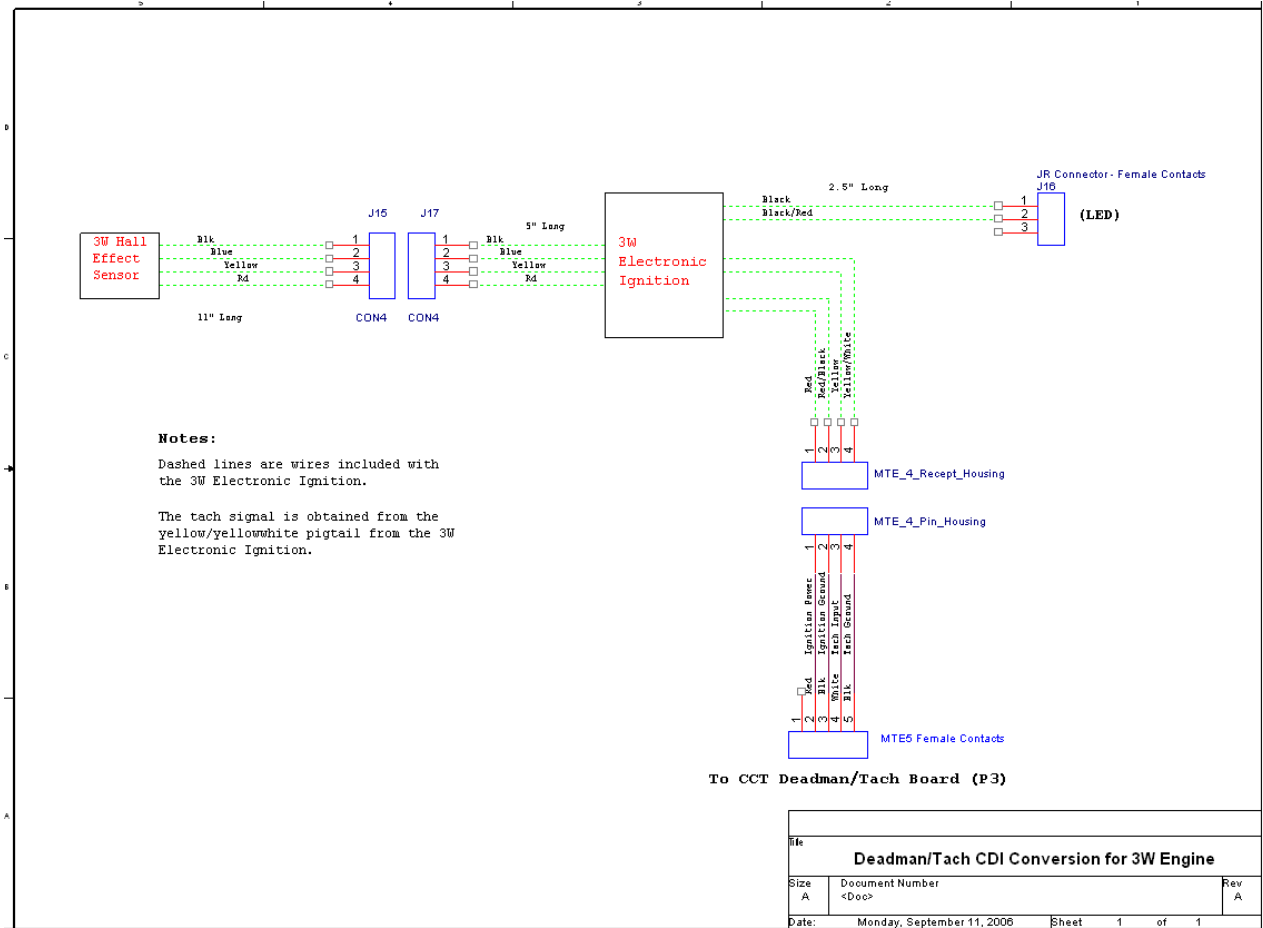


Figure 16 - 3W Ignition Interface

In **Figure 16** the Deadman/Tach to CDI Ignition Cable (CCT p/n: 500-00833-00) is installed on a 3W Electronic Ignition.