



Twin Tec

Twin Tec Model 1005 and Crane HI-4 Teardown

SUMMARY



Twin Tec Model 1005



Crane HI-4

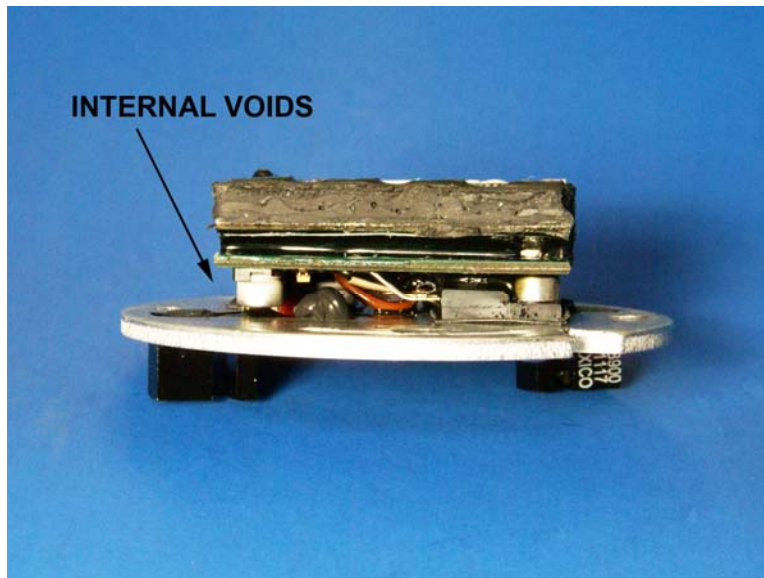
Feature	Twin Tec Model 1005	Crane HI-4
<i>Single and dual fire modes in one part number</i>	<i>Yes. One part number</i>	<i>No. Separate part numbers for each mode</i>
<i>Precise digital advance and RPM limit settings</i>	<i>Yes. Highly legible rotary switches</i>	<i>No. Primitive trim pots with approximate settings</i>
<i>Rugged and water proof construction</i>	<i>Yes. One piece billet housing with fully encapsulated electronics</i>	<i>No. Plastic cover riveted to base plate. Internal voids can trap moisture</i>
<i>Reliable state-of-the-art electronics</i>	<i>Yes. Advanced Atmel FLASH based processor and Fairchild IGBT coil drivers</i>	<i>No. Obsolete Microchip one-time programmable processor and ST bipolar transistor coil drivers</i>
<i>Optional PC Link</i>	<i>Yes. Can upload custom advance curves and download warranty statistics</i>	<i>No</i>
<i>Air Resources Board approved 50 states legal version available</i>	<i>Yes. Model 1005 EX has ARB E.O. No. D-641-1</i>	<i>Yes</i>

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ASSEMBLY

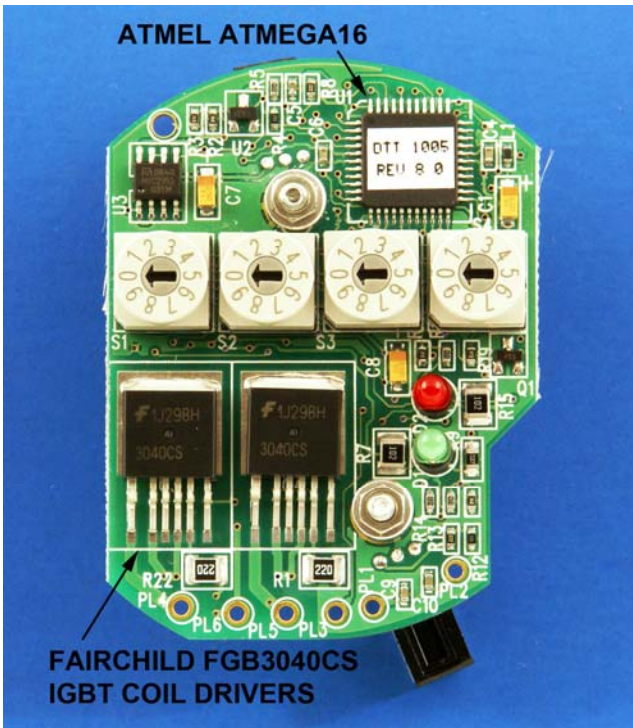
The Twin Tec Model 1005 utilizes one piece billet aluminum housing construction. A single printed circuit board (PCB) has components mounted on both sides and is completely encapsulated within the housing with a thermally conductive and flexible urethane material. There are no voids that can trap moisture. The PCB is manufactured using robotic assembly in an ISO9000 rated facility and the only hand soldering operations involve the wire harness and Hall effect sensors.

In contrast, the Crane HI-4 has two PCBs, with components mounted on one side. The two PCBs are stacked and joined with two 5 pin connectors. These two connectors and the important coil drivers are hand soldered, significantly increasing the probability of bad solder joints and consequent product failure. The PCBs stack is mounted on a stamped aluminum plate. A molded plastic cover is then riveted to the aluminum plate. The final assembly is partially encapsulated. The resulting voids that are clearly visible in the picture below can trap moisture, resulting in corrosion and product failure.

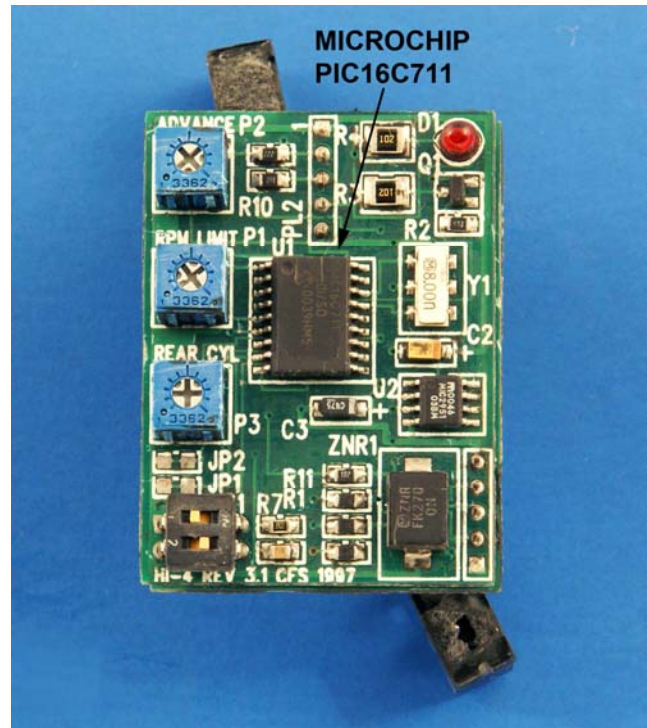


Crane HI-4 with Cover Removed Showing Internal Voids

TECHNOLOGY



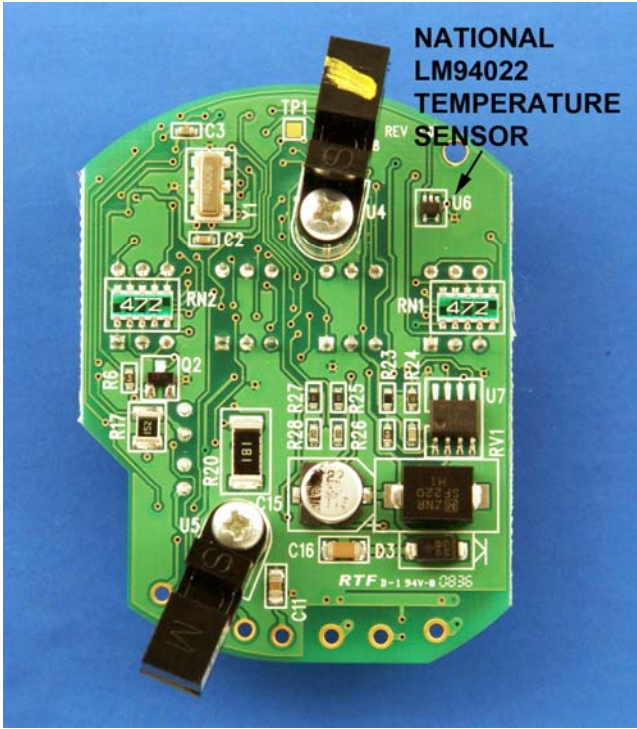
Twin Tec Model 1005 Top View



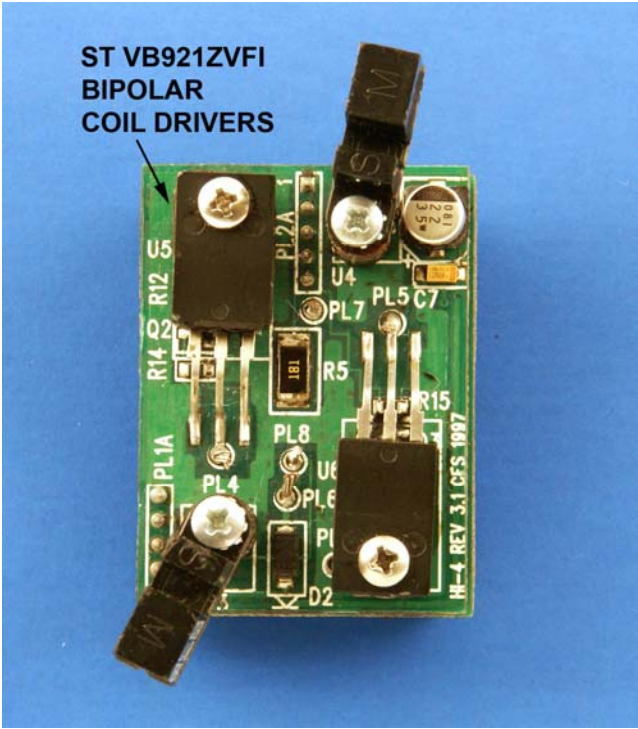
Crane HI-4 Top PCB

The Twin Tec Model 1005 utilizes an Atmel ATmega16 FLASH based processor versus the Microchip PIC16C711 one-time-programmable processor found in the Crane HI-4. Both processors use fast RISC technology, but the newer Atmel processor executes instructions four time faster than the now obsolete Microchip processor. The Atmel processor stores the program in FLASH memory that can be reprogrammed using the PC link, even after final assembly. This feature makes it possible for us to offer custom versions of the product without minimum production runs. The Atmel processor also has EEPROM (electrically erasable programmable read-only memory) for storage of custom advance curves and operating statistics including elapsed time in RPM and temperature bands. None of these capabilities are possible with the Microchip processor used in the HI-4.

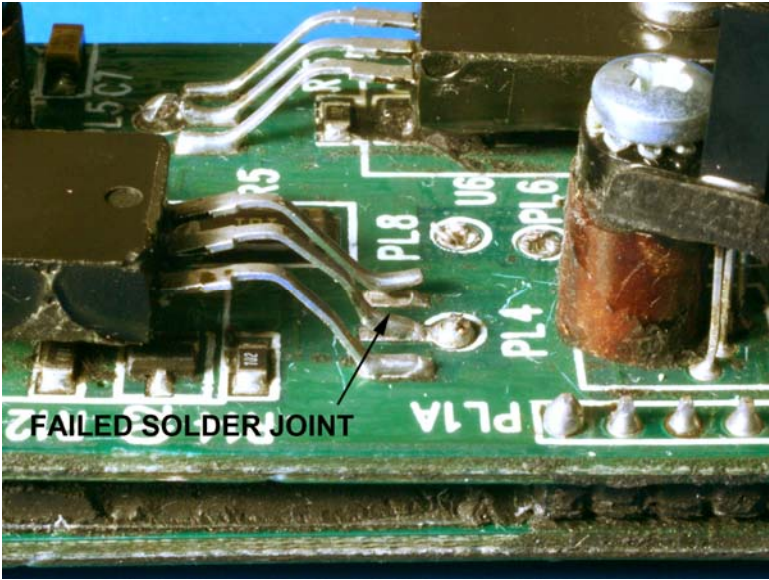
Another significant difference between the Model 1005 and the HI-4 is the coil driver technology. The coil driver controls ignition coil current and fires the spark. Due to the high power and voltage levels, the coil driver is the most critical part. The Model 1005 utilizes new Fairchild FGB3040CS coil drivers based on IGBT (insulated gate bipolar transistor) technology. These devices have very low power dissipation and are in reliable surface mount packages rated for operation up to 175° C (350° F). The HI-4 utilizes ST VB921ZVFI bipolar transistor coil drivers that have been discontinued by ST. The obsolete VB921ZVFI devices have significantly higher power dissipation and are only rated for operation up to 150° C (300° F). While the VB921ZVFI was intended by the manufacturer to be through-hole mounted and then flow soldered, in the HI-4 the leads are crudely bent down on the board and hand soldered. Failure of one of these solder joints is common and results in one cylinder not firing. In fact, the HI-4 unit used for this teardown had failed due to a bad solder joint in this area.



Twin Tec Model 1005 Bottom View



Crane HI-4 Bottom PCB



Failed Solder Joint on Crane HI-4