June 26, 2000

Subject: General Description of the Standard Charge Module (Model WM7200)

Inductive Power Transfer Function

The Standard Charge Module (SCM) is an inductive power supply that has been designed to charge electric vehicles equipped with inductive Charge Ports (CP). The primary purpose of the SCM is to convert utility power into high frequency AC. The SCM includes a charge paddle (i.e. the inductive charging "plug") which is attached to the SCM chassis by a flexible output cable. When the charge paddle is physically inserted into the vehicle CP (i.e. the inductive charging "receptacle" described below), the primary windings in the charge paddle and the secondary windings in the CP form a transformer allowing power to be magnetically coupled from the charge paddle to the CP.

The SCM can be installed in two different configurations. Depending on the application, a floor or a wall mount kit can be used to securely mount the charger to either the ground or a wall. A dedicated branch circuit capable of providing 208 - 240 V / 30 A service is used to provide utility power to the unit through a hardwired connection. The SCM is intended for use in both indoor or outdoor locations.

Additional Information About the Charge Port

The CP is an inductive power receptacle permanently mounted on an electric or hybrid electric vehicle. Its primary purpose is to receive high frequency magnetically coupled power from an inductive charger and transfer this power to the vehicle power electronics for the purpose of recharging vehicle batteries.

RF Communications Link

The RF communications link is a standard charger/vehicle communications link which is common to inductive charging systems. Devices of this type have been previously authorized by the FCC for marketing with an FCC identifier of :

FCC ID #	Model No.
ABO1019TR	WM100
ABO1020TR	WM200
ABO1021TR	FM100
ABO1022TR	FM200

Communication is required between the vehicle and the charger during power transfer for the vehicle to control the charging current into the batteries. During charging, the vehicle monitors critical battery parameters (e.g. voltage, current, state of charge, etc.) and determines the optimum charging current required by the batteries. The vehicle controls the charging current into the batteries by adjusting the charge port input power level via a bi-directional RF communications link to the charger. The link is bi-directional for a number of reasons including charger parameter passing, fault detection and recovery, diagnostics, and flexibility for future uses.

The RF communications interface (communications board and antenna/coaxial assembly) is physically located in the CP (RF model only) on the vehicle and the charge paddle (the part of the charger that is physically inserted into the CP during charging). These antennas are placed in sufficiently close proximity for communication only when the charge paddle is fully inserted in the CP. In addition to this being a close-coupled, low power system, there is a magnetic switch in the CP which activates the vehicle communication circuitry only when the charge paddle is fully inserted in the CP. There is no direct metal-to-metal contact for communications between the charger and the vehicle.

The RF signals received from the inductive charger by the CP antenna are converted to electrical signals inside the CP and sent to the vehicle charge controller via a coaxial J1850 communications link. The electrical signals received by the CP from the vehicle charge controller are converted to RF and sent via the antenna to the inductive charger.

The critical RF communication link parameters are given below:

Frequency	915 MHz ± 500 KHz
Modulation	AM
Data Rate	10.4 KBits/Sec.
Direction	Bi-directional
Max. Transmit Power	+10 dBm
Receiver Sensitivity	-23 dBm
Nominal Transmit Range	.25 Inches
Receiver Bandwidth	$\geq$ 26 MHz

IR Communications Link

An IR communications link has been incorporated into the standard charger design which will allow the unit to communicate with electric vehicles equipped with IR charge ports.

Communication is required between the vehicle and the charger during power transfer for the vehicle to control the charging current into the batteries. During charging, the vehicle monitors critical battery parameters (e.g. voltage, current, state of charge, etc.) and determines the optimum charging current required by the batteries. The vehicle controls the charging current into the batteries by adjusting the charge port input power level via a bi-directional IR communications link to the charger. The link is bi-directional for a number of reasons including charger parameter passing, fault detection and recovery, diagnostics, and flexibility for future uses.

The IR communications interface (communications board and IR transceiver) is physically located in the CP (IR model only) on the vehicle and the charge paddle (the part of the charger that is physically inserted into the CP during charging). These IR transceivers are placed in sufficiently close proximity for communication only when the charge paddle is fully inserted in the CP. There is a magnetic switch in the CP which activates the vehicle communication circuitry only when the charge paddle is fully inserted in the CP. There is no direct metal-to-metal contact for communications between the charger and the vehicle.