

ATC eX NEMA CONTROLLER



USER MANUAL

Version: 1.0

Product specifications: www.mccain-inc.com
Customer support: support@mccain-inc.com
Product Inquiries: 888-2-McCain (888-262-2246)



This page was intentionally left blank

REVISIONS

Rev	By	Date	Comments
1.0	GRubio	11/20/2010	Initial release

DISCLAIMERS

User Responsibility

This document is subject to revision. Users of this document are responsible for verifying the current version status before using this document and or discarding all older revisions.

McCain Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with furnishing, performance or use of this material. MCCAIN MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

This document contains proprietary and confidential information and is the sole property of McCain. No part of this document may be photo copied, reproduced, or translated to another language without the prior written consent of McCain.

This manual is copyright © 2010 by McCain Inc. All rights reserved.

McCain Inc. // 2365 Oak Ridge Way // Vista, CA 92081
PH 760-727-8100

Product Specifications: www.mccain-inc.com
Customer Support: support@mccain-inc.com
Product Inquiries: 888-2-McCain (888-262-2246)

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Benefits	1
1.2	Controller features.....	1
2	THE ATC eX NEMA CONTROLLER	3
2.1	Overview	3
2.2	Controller Operating System.....	4
2.3	Enclosure	4
2.4	Hardware Interfaces.....	5
2.4.1	Controller Front Panel	5
2.4.1.1	LCD with Backlight	5
2.4.1.2	Contrast Knob	6
2.4.1.3	Keypad	6
2.4.1.4	Ethernet Ports	6
2.4.1.5	USB Ports.....	6
2.4.1.6	SDLC Port, SP-3	6
2.4.1.7	Port 2, SP-4, Terminal PC or General Purpose port.....	7
2.4.1.8	SP-5 Port.....	7
2.4.1.9	SP-8 Port.....	7
2.4.1.10	Communications Modem Slot	7
2.4.1.11	A2 Connector	7
2.4.1.12	Fuse and Switch.....	8
2.4.1.13	Active LED.....	8
2.4.1.14	Connector Box with A, B, C and D Connectors	8
2.5	ATC eX NEMA Connectors Box.....	9
2.6	Internal Construction / Sub-Assemblies:.....	11
2.6.1	Power Supply Sub-Assembly (M45891).	11
2.6.2	Control Signals Board Sub-Assembly (M66450A).	11
2.6.3	Host Board Sub-Assembly (M69945A).	12
2.6.4	Engine Board Sub-Assembly (M69588A).	13
2.6.5	Modem Board Sub-Assembly (M66279A).	14
2.6.6	Internal Wiring.	15
2.7	Physical and Environmental Details:.....	16

3	CONFIGURATIONS	17
3.1	TS2 Type 1	17
3.2	TS2 Type 2	17
4	CONTROLLER BOOT-UP	18
4.1	Controller Follows Up the Next Boot Sequence:.....	18
4.2	Controller Storage Drives	22
5	MAINTENANCE, ADJUSTMENTS AND TROUBLESHOOTING	23
5.1	Preventive Maintenance.....	23
5.2	Adjustment	23
5.2.1	Control Signals Board Adjustment	23
5.2.2	LCD Contrast Adjustment	23
5.3	Trouble Shooting Analysis	23
5.3.1	DAT	24
	APPENDICES.....	25
A	SCHEMATICS	
B	ASSEMBLY DRAWINGS	
C	BILL OF MATERIALS	
D	CONNECTORS' DETAILS, FRONT PANEL	
E	CONNECTORS' DETAILS, OPTIONAL CONNECTOR BOXES	
F	UPDATING KERNEL AND UBOOT	

TABLE OF FIGURES

Figure 1: ATC eX NEMA controller 2

Figure 2: Hardware Interfaces on the Front Panel..... 5

Figure 3: Standard McCain option connector Box 10

Figure 4: Traconex compatible option connector Box 10

This page was intentionally left blank

1 INTRODUCTION

The McCain's ATC eX NEMA controller is an advanced, multi-application controller that simultaneously supports multiple software applications through a single platform. Designed from the ground-up based on NEMA TS-2 and ATC 5.2b standards, the ATC eX NEMA controller provides revolutionary flexibility and control. Best of all, the single ATC eX compliant housing can be configured for either TS-2 Type 1 or TS-2 Type 2 applications and is backward compatible with TS-1. This allows end users to upgrade existing intersections to a modern, high-performance platform without the need to replace cabinet hardware.

Built from the standards up, the controller is compliant with the latest NEMA and ATC standards.

The ATC eX features a wide variety of communications options, including serial and Ethernet, for connectivity in any kind of environment. Quick data transfers, firmware upgrades, and log retrievals can be done via USB.

The controller's Linux operating system provides a robust, flexible, open-architecture platform that can support third party applications.

1.1 Benefits

- NEMA TS-2 Type 1 and TS-2 Type 2 compatible.
- Compliant with current NEMA and ATC standards (Engine Board is fully compatible).
- Simultaneously supports multiple transportation software applications.
- Multi-tasking ability minimizes the amount of hardware required at intersections.

1.2 Controller features

Operating system: Linux.

Microprocessor: Freescale MPC8360 PowerQuicc II Pro microprocessor running at 400MHz.

Memory:

- 16MB Flash memory
- 128MB DDR2
- 2MB Non-volatile SRAM

Backup real-time clock (RTC)

Applicable standards:

- NEMA TS-2 2003 v2.06
- ATC 5.2b

Controllers' Interfaces:

Communication interfaces

- SDLC port (1) SP3 routed to NEMA TS-2 Port 1
- Serial (asynchronous) on front panel (3)
- Serial (asynchronous/synchronous) on 2070 compatible modem board slot (2)
- ENET 1: 100 Base-T Ethernet switch, 1 uplink and 3 additional ports
- ENET 2: 100 Base-T Ethernet port dedicated for local communications (i.e. laptop or similar)
- USB ports (4) with an internal USB hub

Front panel interface

- Display: 16 lines x 40 characters
- Keyboard: 7 x 4 keypad (28 key)

Cabinet interfaces

- NEMA TS-2 Type 1 Port 1 (SDLC), A2 connector
- NEMA TS-2 Type 2 A, B, C and D connectors



Figure 1: ATC eX NEMA controller

2 THE ATC eX NEMA CONTROLLER

2.1 Overview

The ATC eX NEMA controller unit is designed to meet TS2-2-2003 standard Ver 02.06, ATC 5.2b.

The controller unit uses an engine board fully compatible to ATC 5.2b standard; with the MPC8360 core at 400MHz, 128MB DRAM, 16MB FLASH and 2MB SRAM.

All ATC eX NEMA controller's interfaces to the cabinet, to other external devices, or to the user are accessible from the front panel.

The unit has three RS-232 asynchronous serial communication ports with software selectable speed from 1.2Kbps to 115.2Kbps, these ports are available over DB-9 male connectors. PORT 2 is used primarily for connecting a terminal computer, or as a general purpose port. SP-5 and SP-8 are general purpose ports but only SP-8 has modem control lines (RTS, CTS, DCD).

An SDLC port is designated to synchronous communications to cabinet's serial bus, it is a RS-485 serial communication port with software selectable speed from 19.2Kbps to 614Kbps available over a DB-15 female connector.

A 2070 compatible modem or expansion slot is available to use SP-1 and SP-2 serial ports. This slot works similar to 2070 controller slot A2.

Serial communications will be either synchronous or asynchronous depending on the type of board used (2070-7A, 2070-7B, 2070-6A, 2070-6B, etc). Speed for this port is also software selectable from 1.2Kbps to 115.2Kbps when it is operating on asynchronous mode and from 19.2Kbps to 614.4Kbps when it operates on synchronous mode.

The unit also has 4 high speed USB ports to download and upload databases. These 4 ports are connected directly to a USB hub and one port is routed to ATC Engine.

Two 100MBPS Ethernet ports are provided for communicating with a central, connecting to peripheral devices, and also for operating as a remote terminal to download/upload files, updates, log files, etc.

The interface for the user is an LCD with backlight and a 28-keys keypad to enter/retrieve all information about the status of the controller's or traffic application. A contrast knob is used to adjust the contrast as desired for user's optimal view.

ACTIVE LED shows the status of the controller's traffic application.

A circular connector A2 used to supply the AC input and fault monitor signals when required.

A rocker switch is used for turning ON and OFF the controller.

An AC line fuse holder for a 2A fuse with front access and removal without tools feature.

The functionality of the several modules/sub-assemblies which conform the controller unit is described in the below sections.

2.2 Controller Operating System

The Operating system is Linux with kernel version 2.6.22.

After boot-up the ATC Linux OS is available to run applications and for accessing to the low level drivers (block, character and network) provided by the kernel.

The OS is stored into a FLASH memory; this can be updated by using the Linux console or Ethernet Ports.

A Linux console is configured at power up to a speed of 115.2Kbps, no parity, 8 bits and one stop bit.

For details on the operating system update refer to appendix F.

2.3 Enclosure

The ATC eX NEMA controller has a modular design with all hardware interface located at the front panel: Power switch, fuse holder, serial ports' connectors, Ethernet and USB connectors, LCD, contrast control, keypad and ACTIVE LED indicator are accessible from the front of the unit.

The top cover of the ATC eX NEMA controller is closed and free of any vent or openings to avoid dirt, dust, water or other debris entering from the top of the unit. Ventilation holes are provided on the sides of the unit in order to cool the electronics; the design is such that foreign debris and water cannot easily enter case under normal operation and handling.

The controller is constructed so that it can be shipped easily via common carrier, such as the postal service, UPS, or Federal Express, without damage and without disassemble or removal of internal components or subassemblies.

2.4 Hardware Interfaces

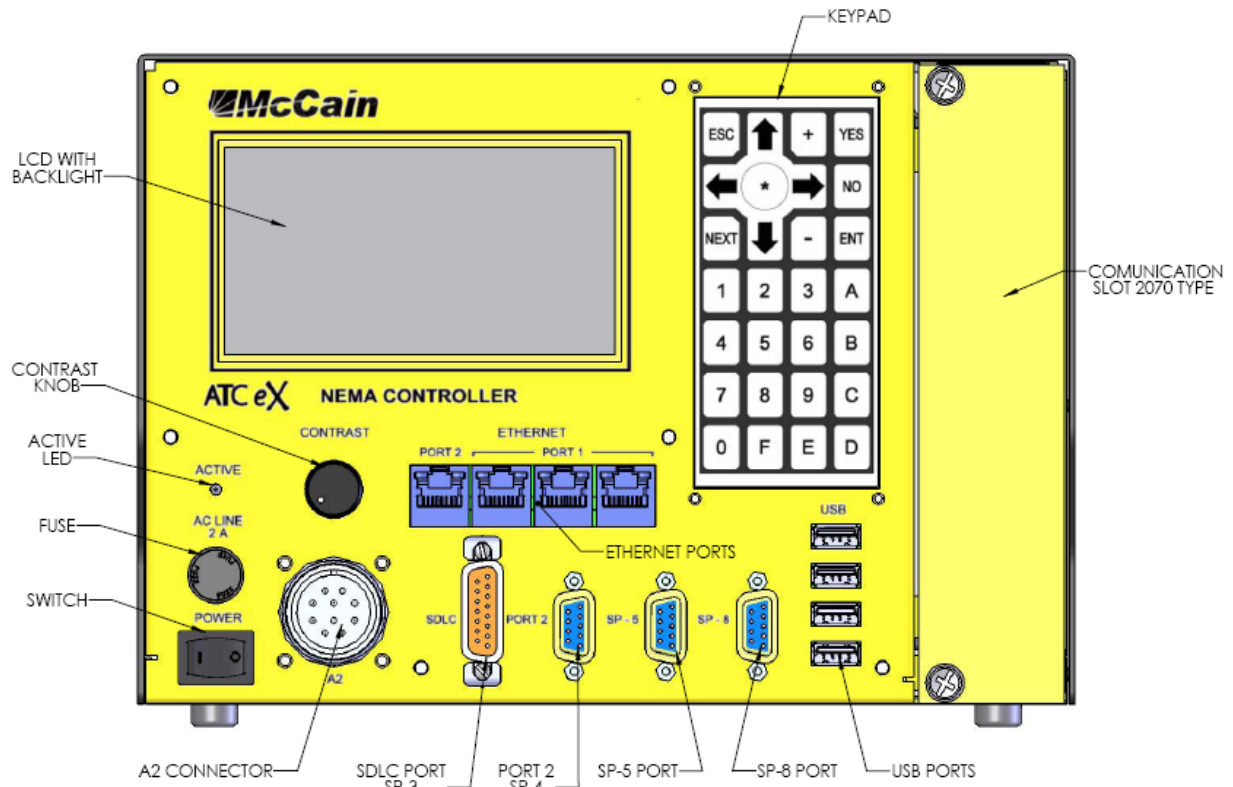


Figure 2: Hardware Interfaces on the Front Panel

2.4.1 Controller Front Panel

All ATC eX NEMA controller interfaces to the external world (cabinet, external devices, user) are accessible from the front panel.

2.4.1.1 LCD with Backlight

The controller unit has a 16 lines X 40 Columns LCD display with LED backlight. This is the visual interface of the user with the controller unit; through the different menus of the traffic application, it displays current status, entered values and functions of the traffic application and other useful information for the operation of the controller unit.

Character height is 0.2 inches.

The LCD backlight is turned on when any key from keypad is depressed and it will be extinguished after 60 seconds, this time can be programmed to be from 0 to 630 seconds.

The LCD operating range is from -20°C to $+70^{\circ}\text{C}$.

2.4.1.2 Contrast Knob

The CONTRAST knob adjusts the LCD display contrast for user's optimum viewing. The LCD will appear blank if knob while being completely clockwise and solid black if it is fully counterclockwise.

2.4.1.3 Keypad

The controller unit includes a 28 keys keypad to allow user for navigating and entering values to the contents of the LCD menus.

The keys are identified as: ESC (escape), NEXT, ENT (enter), YES, NO, ARROW DOWN, ARROW UP, ARROW RIGHT, ARROW LEFT; numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0; and letters A, B, C, D, E and F.

These keys allow the user to navigate thru the content of the LCD menus, confirm status, modify timing parameters, setting date and time, configuring serial ports and all other interaction with the traffic application.

2.4.1.4 Ethernet Ports

There are two Ethernet ports available on the front panel.

Port 1 is a 10/100 Base-T Ethernet switch with three RJ-45 jack connectors which can be used to handle traffic applications needs, such as configuration, databases, etc.

Port 2 is a 10/100 Base-T Ethernet port with one RJ-45 jack connector; this port is intended to be used for accessing to the controller's operating system.

Each jack has two LED indicators to show the LINK ACT and 10-100 TX status.

2.4.1.5 USB Ports

Four hot-swappable USB connectors are located on front panel to allow the controller support the use of USB memory devices for transferring data files from and to the controller; these data files can be firmware upgrades, databases, etc.

2.4.1.6 SDLC Port, SP-3

It is located on front panel as a DB-15 female connector with latching blocks and it is labeled as "SDLC".

This port uses an SDLC communication protocol and four (Tx, Rx, TxClk and RxClk) EIA-485 differential serial communications interfaces with a default speed of 153.6 Kbps in order to meet NEMA TS2-1998 specification.

The port has a software selectable speed of 19.2Kbps, 38.4Kbps, 57.6Kbps, 76.8Kbps, 115.2Kbps, 153.6Kbps and 614.4Kbps.

This port has a dedicated pin to disable all port communication when desirable; this is accomplished by mating a connector to this port, in which pin 8 and pin 10 are connected (0VDC = Disabled).

This port is primarily dedicated to synchronous communications in a TS2 NEMA cabinet (BIU's, MMU). This port is connected to cabinet's serial bus NEMA cabinet. The connection to the cabinet is thru a SDLC communications cable connected to the SDLC port at one end and to the termination board on the

other end. Ensure a reliable connection by properly latching the spring latches onto the connector's latching blocks.

For port's pin assignments see appendix D.

2.4.1.7 Port 2, SP-4, Terminal PC or General Purpose port

Port 2 is a general purpose port but it is primarily used for connecting a terminal and to perform data transfer between the controller and an external computer.

It is located on front panel on a DB-9 male connector with jackscrews and it is labeled as Port 2. RTS, CTS and DCD lines are not available on this port.

This port uses RS-232 asynchronous serial communications with a software selectable speed from 1.2Kbps to 115.2Kbps, with a default speed of 115.2Kbps.

For port's pin assignments see appendix D.

2.4.1.8 SP-5 Port

SP-5 Port is a general purpose port; it is located on front panel on a DB-9 male connector with jackscrews and it is marked as SP-5.

This port uses RS-232 asynchronous serial communications with software selectable speed from 1.2Kbps to 115.2Kbps, with a default speed of 38.4Kbps.

For port's pin assignments see appendix D.

2.4.1.9 SP-8 Port

SP-8 Port is a general purpose port; it is located on front panel on a DB-9 male connector with jackscrews and it is marked as SP-8. This port uses RS-232 synchronous serial communications with software selectable speed from 19.2Kbps to 614.4Kbps, with a default speed of 153.6Kbps.

For port's pin assignments see appendix D.

2.4.1.10 Communications Modem Slot

SP-1 and SP-2 are general purpose ports and they are available on the communications slot at DIN96 connector.

The ports' differential communications signals are used depending on the board plugged into the communications slot (2070-7A, 2070-7B, 2070-6A, 2070-6B, etc); if the board is an asynchronous communications board (such 2070-7A/6A/6B) the speed is software selectable from 1.2kBbps to 115.5Kbps, if the board is a synchronous communications board (2070-7B) the speed is software selectable from 19.2Kbps to 614.4Kbps.

For port's pin assignments see appendix D.

2.4.1.11 A2 Connector

This circular connector provides the AC connection (Line, neutral and chassis ground) and also the fault monitor (FM) output. This connector is intended to be used when the controller is installed into NEMA TS2 Type 1 cabinets.

2.4.1.12 Fuse and Switch

There is a fuse holder with a 2 amp fuse (3AG type) for the AC line located on the front panel which is easily removed without using any tools. Also there is a rocker switch used to power on and off the controller unit.

2.4.1.13 Active LED

This LED is used to indicate the status of the controller as defined for the application running into the controller. When the application uses the voltage monitor and fault monitor signals, it must be changing the status of this line in order to indicate that the controller is alive; if status does not change within a 2 seconds period then these lines are activated.

2.4.1.14 Connector Box with A, B, C and D Connectors

The ATC eX NEMA controller is a TS2 Type 1 controller that can be converted to a TS2 Type two controller by adding an optional connector box in order to support the functionality of the A, B, C connectors of the TS1 standard plus the special configuration D connector.

Currently there are two optional boxes, the Standard McCain connector Box and the Traconex compatible box. The only one difference between them is the special configuration D connector.

Notes:

See appendix E for details on the pin assignments.

See “Configuration” section to see the details when attaching the box to the ATC eX NEMA controller.

2.5 ATC eX NEMA Connectors Box

Overview

In order to support all of the legacy hardware already implemented in the field, there is an optional connector box for including the A, B and C connectors of a TS1 controller; D connector is a special configuration connector that depends on the user needs or defined by the manufacturer.

This box converts the TS2 Type 1 controller into a TS2 Type 2 controller which supports the round MilSpec connectors of the TS1 standard.

The controller uses an SPI bus in order to communicate to this box. Input and output pins use the NEMA standard: 0 VDC = True, 24 VDC = False.

Currently there are two optional boxes that can be provided by McCain; the Standard McCain connector Box and the Traconex compatible box. The only one difference between them is the special configuration D connector.

See appendix E for details on the pin assignments.

Construction

The connector box consists of a chassis with a PCB assembly and harnesses for interconnecting it to the controller. The PCB assembly contains all the circuitry and connectors for supporting the requirements of the TS1 standard plus the required D connector.

The connectors A, B, C and D along with a fuse holder with a 24 VDC @ 1 A fuse are properly located and labeled on the front of the box.

A three wires harness is used for receiving +24VDC, +5VDC and Logic Ground in order to feed all of the I/O circuitry and supply the +24VDC to "A" connector for external use; the harness is attached to the connector box and must be connected to the CONN BOX header located on Control Signals board (M66450A).

A two wire harness is used for supplying AC power to the controller; it is attached to the connector box and must be connected to the AC INPUT header located on Control Signals board (M66450A). A third wire is used for connecting the chassis ground from the connector box to the chassis stud located on controller.

A three wires harness is used for providing the Voltage Monitor (VM) and Fault Monitor (FM) signals from the controller to the connector box; the harness is attached to the connector box and is connected to the P1 header located on the Host board (M69945A).

A 10 position ribbon cable with plug connectors on both sides is used for the SPI communication between the connector box and the controller; it is connected to the box on P7 header and to P9 header located on the Host board (M69945A).



Figure 3: Standard McCain option connector Box



Figure 4: Traconex compatible option connector Box

Connector A

Connector A is a round, keyed connector with 55 male contacts.

Connector B

Connector B is a round, keyed connector with 55 female contacts.

Connector C

Connector C is a round, keyed connector with 61 female contacts.

Connector D

The pin assignment for this connector is not standard and it is defined by the manufacturer or depends on the application needs.

On McCain option it is a round, keyed connector with 61 male contacts.

On Traconex compatible option it is a round, keyed, CPC connector with 63 male contacts.

See appendix E for details on the pin assignments.

2.6 Internal Construction / Sub-Assemblies:

This section briefly describes the construction and operation of each sub-assembly of the ATC eX NEMA controller, indicating the interface connectors on each board and the relationship to the other boards.

For a more detailed understanding of a specific module or sub-assembly please refer to the proper appendices.

Appendix A Contains all schematics.

Appendix B Contains the assembly drawings.

Appendix C Contains the bills of materials.

2.6.1 Power Supply Sub-Assembly (M45891).

This sub-assembly consists of a switching power supply module with a large can back up capacitor. It provides the DC voltages to the Control Signals board (M66450A) and receives the AC power from such board. The DC voltages provided are +24VDC, +12VDC and +5VDC.

2.6.2 Control Signals Board Sub-Assembly (M66450A).

This board generates the POWERDOWN, POWERUP and LINESYNC signals and along with the DC voltages received from the power supply assembly. It also sends the signals and voltages to the other sub-assemblies through the corresponding harness.

The board also defines the trip and recover window for the AC power input; this is a factory set adjustment and should not be changed. The default is: 85VAC for power down and 90VAC for power up.

This sub-assembly contains the below circuits and connectors:

- A zero-crossing detector.
- Circuitry for generating the POWERDOWN, POWERUP and LINESYNC signals.
- An AC hysteresis trip/recover adjustment (POT1).
- A -12VDC power supply, it receives the +12VDC from the power supply sub-assembly (M45891) and returns -12VDC to the P1 connector.
- A 12 positions connector (P1) for providing the DC voltages and control signals to the host board (M69945A) and modem board (M66279A).
- A three positions header (CONN BOX) for providing the DC voltages for the optional connector box.
- A five positions header (AC INPUT) for receiving the AC power input.***
- A three positions header (FUSE/SWITCH) for connecting the AC+ line to the fuse and switch located on the front panel.
- A three positions header (AC OUTPUT) for providing the AC power to the power supply sub-assembly (M45891).

- A five positions header (DC INPUT) for receiving the DC voltages from the power supply sub-assembly (M45891).

*** The power input for this sub-assembly depends on the configuration chosen; it can receive the AC line input either through the “A” connector resident on the optional connector box or from the front panel’s A2 connector (M44301).

2.6.3 Host Board Sub-Assembly (M69945A).

This sub-assembly supports almost all of the circuitry and physical connections of the communication interfaces, as the name indicates, it is the host which supports the engine board, so that it contains all the necessary circuitry to receive all communication channels, control lines from the engine and all the necessary I/O interfaces to the external world. Below are briefly described the circuits and interfaces included onto the host board:

- Two 50pos receptacle connectors to allow the Engine board to be plugged (P1 and P2).
- The +5VDC backup circuit.
- Voltage and Fault monitor driver circuit with a 3 positions header (P10) to plug front panel’s A2 connector harness plug.
- An ACTIVE LED driver circuit.
- A 12 position connector (P8) to receive DC voltages and control signals.
- A 10 position box connector (P9) to handle the SPI communication with the optional connector box.
- A Header for a 10/100 Ethernet signal detection (J1).
- A 40 positions header (P3) for routing SP-1, SP-2, Ethernet, POWERUP and CPURESET signals to the Modem board (M66279A).
- One D-sub 15 positions connector (CN2) for SDLC communications.
- Three D-sub 9 positions connectors (CN3, CN4, and CN5) for general purpose communications.
- Two Ethernet switches and four Ethernet jack connectors (RJ1A, RJ2A, RJ3A, RJ4A); one switch handles three ports (RJ1A, RJ2A, RJ3A) on the front panel (Port 1) and another port routed to the Modem board (M66279A) thru a ribbon cable (Port 4). The second switch handles one port (RJ4A) on the front panel (Port 2) and three more ports located on a 40 position header box (P4).
- A USB switch and four USB connectors (USB1, USB2, USB3, USB4).
- An SPI EEPROM (U4) with factory set configuration parameters.
- A twenty positions header (P6) for attaching the LCD display.
- A three position header (P11) to plug the harness for LCD’s contrast control.

- A fourteen positions header (P5) for plugging the keypad.
- A buzzer (BZZ1) as an audible interface to the user.

2.6.4 Engine Board Sub-Assembly (M69588A).

This module meets the ATC 5.2b Standard (Form, fit and function) and it is the brains of the ATC eX NEMA Controller; all computational functions are concentrated here; it contains the CPU, memory devices, and serial interface devices providing synchronous and asynchronous serial communications channels, Ethernet interfaces, USB interface, RTC, and a SPI bus. It uses Linux operating system.

The board hardware features are:

- CPU, it is a Freescale microprocessor is a MPC8360 at 400MHz
- FLASH, 16MB are provided for storing the operating system and the applications programs.
- SRAM, 2MB are provided for non-volatile parameter storage.
- DDR2, 128MB are provided for application and OS program execution.
- RTC.
- Seven serial communication channels (SP1, SP2, SP3, SP4, SP5, SP6 and SP8).

SP1 and SP2 designated for communication on the modem board located on 2070 slot.

SP3 for a synchronous communication channel, it is the SDLC port on controller's front panel.

SP4 for a terminal and general purpose port (PORT 2) on controller's front panel.

SP5 for a general purpose port (SP-5) on controller's front panel.

SP6 for handling the LCD's and keyboard information.

SP8 for a general purpose port (SP-8) on controller's front panel.

- Two Ethernet interfaces (Port 1 and Port 2). These interfaces go to the Ethernet switches on the host board.
- One USB interface that goes to the USB switch on host board.
- One SPI bus that handles the communication to an optional connector box, when configuration for a TS2 Type 2 controller is needed.
- Two 50 positions plug connectors to be attached to a host board.

2.6.5 Modem Board Sub-Assembly (M66279A).

This board is installed as a backplane for the 2070 boards and is similar to 2070 controller slot A2. The modem board receives the SP1 and SP2 communication channels, POWERUP and CPURESET signals from the Host board (M69945A) through the 40 lines ribbon cable. The DC voltages +12VDC, -12VDC, +5VDC and the LINESYNC and POWERDOWN signals are received from the Control Signals board (M66450A). It also includes a DIN-96 receptacle connector (A5) for plugging the 2070 Type communication boards.

2.6.6 Internal Wiring.

A set of harnesses is provided for interconnecting the internal sub-assemblies of the ATC eX NEMA controller. Some of them are common for all configurations and others are used only for specific configurations.

Below are described the labels on the plug connectors and the connector headers where they belong.

Common Harnesses:

Harness C1-C2-Q1:

Connect C1 to P1 on Control Signals board (M66450A), C2 to P8 on Host board (M69945A) and Q1 to P2 on Modem board (M66279A). The ring terminals on green wires must be connected to the chassis stud on NEMA controller.

Harness J1-J2:

Connect J1 to CN1 on Power Supply Assembly (M45891) and J2 to AC OUTPUT on Control Signals board (M66450A).

Harness H1-P1:

Connect H1 to CN2 on Power Supply Assembly (M45891) and P1 to DC INPUT on Control Signals board (M66450A).

Harness J3:

Connect J3 to FUSE/SWITCH on Control Signals board (M66450A).

Harness G1-G2:

Connect CN1 on Host board (M69945A) to J1 on Engine board (M69588A).

Chassis wire:

This green wire with ring terminals on both ends connects the lower left corner of the Control Signals board (M66450A) to the chassis stud located on the bottom of the controller's chassis.

Harnesses for a TS2 Type 1 Application (A2 Connector):

When using a connector box for a TS2 Type 1 application, the below harnesses' connections on the controller apply.

Connect P4 to AC INPUT on Control Signals board (M66450A).

Connect J6 to P10 on Host board (M69945A).

Connect green wire with ring terminal to the chassis stud located on the bottom of the controller's chassis.

Harnesses for a TS2 Type 2 application (Connector Box harnesses):

When using a connector box for a TS2 Type 2 application, the below harnesses' connections on the controller apply.

Connect P3 to AC INPUT on Control Signals board (M66450A).

Connect J4 to CONN BOX on Control Signals board (M66450A).

Harness J5 to P10 on Host board (M69945A).

Connect ribbon cable from P7 on Connector box to P9 on Host board (M69945A).

Connect green wire with ring terminal to the chassis stud located on the bottom of the controller's chassis.

2.7 Physical and Environmental Details:

Input voltage: 85 to 135 VAC at 60Hz $\pm$ 3Hz.

Temperature range: -37C to +74C (-34F to 165F).

Relative humidity: 0 to 95% (non-condensing).

Style: TS-2 Type 1.

Dimensions: 7" H x 10" W x 10.5" D.

Weight: 7 lbs.

Mounting method: Shelf mounted.

Style: TS-2 Type 2.

Dimensions: 10" H x 10" W x 10.5" D.

Weight: 10 lbs.

Mounting method: Shelf mounted.

3 CONFIGURATIONS

The ATC eX NEMA controller can be configured depending on the application. In order to properly configure the controller follow the below directions.

3.1 TS2 Type 1

This is the default configuration for the controller; it uses an SDLC port to communicate to the Bus Interface Units. The A2 connector in the front panel is used to provide the AC lines (Hot and neutral) and the chassis ground, also the fault monitor signal and logic ground are provided; connect the AC harness to the AC INPUT header located on the Control Signals board (M66450A) and the chassis ground wire (green wire) is attached to the chassis stud located on the bottom of the controller's chassis.

TS2 Type 1 configuration must be defined through the traffic application running into the controller.

3.2 TS2 Type 2

This configuration is used to handle the round MilSpec connectors of the TS1 standard with the TS2 functionality. A connector box must be attached to the controller by using 4 screws and 4 washers to mechanically fix them together; then the electrical connections are as follow: the AC harness is connected to the AC INPUT header and the DC harness is connected to the CONN BOX header, both are located on the Control Signals board (M66450A); the Fault Monitor and Voltage Monitor signals are routed through the FM/VM harness which is connected to the P10 header and the ribbon cable is connected to P9 header, both two located on the Host board (M69945A). The chassis ground wire (green wire) is connected on the chassis stud located at the bottom of the controller chassis.

TS2 Type 2 configuration must be defined through the traffic application running into the controller.

Note: The next two connector boxes are available, McCain option and Traconex compatible option; in the future more connector boxes options will be supported according to customers' needs.

4 CONTROLLER BOOT-UP

Controller Linux Kernel version is 2.6.22

4.1 Controller Follows Up the Next Boot Sequence:

- Decompresses the Linux Kernel on system memory
- Prepares the system memory and the interrupt controller to run the Kernel
- Initialize drivers (Such USB Mass Storage Device drivers, Flash driver, Serial ports, RTC and Ethernet)
- Mount controller filesystem and drives (such root filesystem, /atc, /sram, /dev/shm)
- Configures the Ethernet with default parameters:

Eth0:

IP Address: 192.168.2.234

Netmask: 255.255.254.0

Gateway: 192.168.2.1

Eth1:

IP Address: 192.168.2.235

Netmask: 255.255.254.0

Gateway: 192.168.2.1

- Executes SysGo, this program runs in the background, loads the rest of the controller drivers (communication, I/O, Linesync and Powerdown), forks the /atc/atcstart script (if exists) and updates the RTC with the system Clock each hour.
- Opens the login prompt.

The default login information is:

User: root

Password: root

A normal boot up sequence is as follows:

```
U-Boot 1.3.0-rc2 (Jul 26 2010 - 07:17:39) McCainEngineBoard
Reset Status:
CPU:   e300c1, MPC8360E, Rev: 21 at 399.999 MHz, CSB:  266 MHz
Unit:  McCain ATC2008 Engine Board
I2C:   ready
DRAM:  128 MB
FLASH: 16 MB
In:     serial
Out:    serial
Err:    serial
Net:    UEC: PHY is Generic MII (0)
UEC: PHY is Generic MII (0)
FSL UEC0, FSL UEC1
Hit any key to stop autoboot:  0
## Booting image at fe050000 ...
   Image Name:   Linux-2.6.22
   Image Type:   PowerPC Linux Kernel Image (gzip compressed)
   Data Size:    1527929 Bytes =  1.5 MB
   Load Address: 00000000
   Entry Point:  00000000
   Verifying Checksum ... OK
   Uncompressing Kernel Image ... OK
   Booting using the fdt at 0xfe040000
   Loading Device Tree to 007fc000, end 007fefff ... OK
Using MPC836x MDS machine description
Linux version 2.6.22 (mguerrero@engdesign) (gcc version 4.0.2 20060628 (Wasabi))
 #21 Fri Oct 1 12:00:35 PDT 2010
setup_arch: bootmem
mpc836x_mds_setup_arch()
arch: exit
Zone PFN ranges:
   DMA             0 ->     32768
   Normal         32768 ->    32768
early_node_map[1] active PFN ranges
   0:             0 ->     32768
Built 1 zonelists. Total pages: 32512
Kernel command line: root=/dev/mtdblock3 rootfstype=jffs2 rw console=ttyS0,11520
0
IPIC (128 IRQ sources) at fdefc700
QEIC (64 IRQ sources) at fdefb080
PID hash table entries: 512 (order: 9, 2048 bytes)
Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
Memory: 126476k/131072k available (2980k kernel code, 4456k reserved, 124k data,
 176k bss, 124k init)
Mount-cache hash table entries: 512
NET: Registered protocol family 16

Generic PHY: Registered new driver
SCSI subsystem initialized
usbcore: registered new interface driver usbfs
usbcore: registered new interface driver hub
usbcore: registered new device driver usb
NET: Registered protocol family 2
```

```

IP route cache hash table entries: 1024 (order: 0, 4096 bytes)
TCP established hash table entries: 4096 (order: 3, 32768 bytes)
TCP bind hash table entries: 4096 (order: 2, 16384 bytes)
TCP: Hash tables configured (established 4096 bind 4096)
TCP reno registered
NTFS driver 2.1.28 [Flags: R/O].
JFFS2 version 2.2. (NAND) 2001-2006 Red Hat, Inc.
cryptodev_init(c02db048)
cryptosoft: registered as device: 0
talitos: des/3des aes md5 sha1
io scheduler noop registered
io scheduler anticipatory registered (default)
io scheduler deadline registered
io scheduler cfq registered
WDT driver for MPC83xx initialized. mode:reset timeout=65535 (16 seconds)
Serial: 8250/16550 driver $Revision: 1.90 $ 4 ports, IRQ sharing disabled
serial8250.0: ttyS0 at MMIO 0xe0004500 (irq = 16) is a 16550A
console handover: boot [udbg0] -> real [ttyS0]
serial8250.0: ttyS1 at MMIO 0xe0004600 (irq = 17) is a 16550A
nbd: registered device at major 43
usbcore: registered new interface driver ub
UCC Ethernet Controller MII Bus: probed
ucc_geth: QE UCC Gigabit Ethernet Controller
ucc_geth: UCC1 at 0xe0102000 (irq = 21)
eth0: MTU = 1500 (frame size=1518)

ucc_geth: UCC2 at 0xe0103000 (irq = 22)
eth1: MTU = 1500 (frame size=1518)

McCain Engine flash0 device: 800000 at fe000000 Partition number 4
McCain Engine Flash0 Map Info: Found 1 x16 devices at 0x0 in 16-bit bank
  Amd/Fujitsu Extended Query Table at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling erase-suspend-program due to code brokenness.
Creating 4 MTD partitions on "McCain Engine Flash0 Map Info":
0x00000000-0x00040000 : "Bios"
0x00040000-0x00050000 : "dtb"
0x00050000-0x00200000 : "kernel"
0x00200000-0x00800000 : "rootfs"
McCain Engine flash0 device (McCain Engine Flash0 Map Info) initialized
McCain Engine flash1 device: 800000 at fe800000 Partition number 1
McCain Engine Flash1 Map Info: Found 1 x16 devices at 0x0 in 16-bit bank
  Amd/Fujitsu Extended Query Table at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling erase-suspend-program due to code brokenness.
Creating 1 MTD partitions on "McCain Engine Flash1 Map Info":
0x00000000-0x00800000 : "atc user"
McCain Engine flash1 device (McCain Engine Flash1 Map Info) initialized
McCain Engine Ram device: 200000 at ff000000 Partition number 1
Creating 1 MTD partitions on "McCain Engine Ram Map Info":
0x00000000-0x00200000 : "ram"
McCain Engine Ram device (McCain Engine Ram Map Info) initialized
Generic platform RAM MTD, (c) 2004 Simtec Electronics
fhci_hcd_of: 2007 June Freescale QE USB Host Driver
fhci_hcd_of e01006c0.usb: FHCI HOST Controller
fhci_hcd_of e01006c0.usb: new USB bus registered, assigned bus number 1

```

```
fhci_hcd_of e01006c0.usb: irq 23, io base 0x00000000
usb usb1: configuration #1 chosen from 1 choice
hub 1-0:1.0: USB hub found
hub 1-0:1.0: 1 port detected
Initializing USB Mass Storage driver...
usbcore: registered new interface driver usb-storage
USB Mass Storage support registered.
usbcore: registered new interface driver libusual
NEMA Host & 60Hz PSU Were Detected
Nema Box Connector Type #0 was detected
hw-rtc hw-rtc.0: rtc core: registered hw-rtc as rtc0
TCP cubic registered
NET: Registered protocol family 1
NET: Registered protocol family 17
hw-rtc hw-rtc.0: setting the system clock to 2010-10-20 23:36:09 (1287617769)
VFS: Mounted root (jffs2 filesystem).
Freeing unused kernel memory: 124k init
usb 1-1: new full speed USB device using fhci_hcd_of and address 2
usb 1-1: configuration #1 chosen from 1 choice
hub 1-1:1.0: USB hub found
hub 1-1:1.0: 4 ports detected
Setting the hostname to mccain-engine
Mounting filesystems
Running sysctl
Setting up networking on loopback device:
Setting up networking on eth0:
phy_connect, flags= 0 phyid=e0102120:01
Adding static route for default gateway to 192.168.3.1:
Setting nameserver to 192.168.3.84 in /etc/resolv.conf:
Setting up networking on eth1:
phy_connect, flags= 0 phyid=e0102120:09
Adding static route for default gateway to 192.168.3.1:
Setting nameserver to 192.168.3.84 in /etc/resolv.conf:
Starting inetd:
```

Welcome to McCain Embedded Linux Environment

!!!!!! WARNING !!!!!!!

The default password for the root account is: root
please change this password using the 'passwd' command
and then edit this message (/etc/issue) to remove this message

mccain-engine login: PHY: e0102120:01 - Link is Up - 100/Full
PHY: e0102120:09 - Link is Up - 100/Full

4.2 Controller Storage Drives

The controller has three main storage drives; the user may use them accordingly to application.

- `/atc` drive. This is the non-volatile drive, the size of this drive is 8 MB, the user may use it for permanent storage such application files or any kind of file that does not require to be accessed for written so often.
- `/sram` drive. This drive may used for storing static information such database files, and logs. The content of this drive is retained for 7 days when the controller is not powered. The size of the drive is 2MB.
- `/.` This is the root file system; the size of the drive is 6MB. The user can use it for modifying the functionality of Linux. **Warning:** be careful using this drive, a bad management of it could cause to controller malfunctions.
- `/dev`, `/etc`, `/mnt/rwfs`, `/tmp`, `/var`. This drives are all together in a space of 1MB system memory. User may manipulate them; any changes done on these drives are not permanently applied, unless user dismounts them all together or separately.
- Use Linux Manual for additional details.

5 MAINTENANCE, ADJUSTMENTS AND TROUBLESHOOTING

This section is intended to indicate the way to perform regular maintenance on the ATC eX NEMA controller like cleaning and servicing when malfunctions occur. It also describes the adjustments of the controller and the troubleshooting procedures, precautions that need to be taken before servicing the unit, a list of test equipment needed for trouble shooting. A basic knowledge of electronics is needed when servicing this unit.

5.1 Preventive Maintenance

Always make sure to be in an antistatic environment before handling the controller for any type of maintenance, also the power source must be disconnected before any cleaning, visual inspection of the enclosure, sub-assemblies, connectors and cables.

Remove dust out of the unit.

Check the wiring, terminals and connectors, replace them if necessary.

Check all mounting hardware, tighten them if necessary.

The preventive maintenance should be based on the install and environmental conditions.

5.2 Adjustment

5.2.1 Control Signals Board Adjustment

Only the Control Signals Board (M66450A) can be adjusted in order to set the AC input hysteresis; this is a factory set parameter and should never need further maintenance.

5.2.2 LCD Contrast Adjustment

The front panel of the ATC eX NEMA controller provides an adjustment knob labeled as "CONTRAST". This adjustment knob is used to adjust the LCD contrast. The LCD contrast changes with variations in temperature and the direction from which the display is viewed. For example, if the LCD looks fine at eye level, adjusting the CONTRAST knob returns the sharp contrast. Also, cold or hot temperatures can cause the same effect, and can be corrected by adjusting the CONTRAST knob. There is no set adjustment procedure as the appearance of the LCD is left to personal taste.

5.3 Trouble Shooting Analysis

A visual inspection is recommended as a first step on the diagnostics; most problems are related to the harnesses used for interconnecting the sub-assemblies (broken wires or worn connections on headers and receptacles connectors).

The trouble analysis should be made by using all available information about the controller's failure and all related documentation (assembly drawings, schematics, DAT, etc) in order to isolate and define the cause; the deep of such analysis depends on the complexity of the failure and the intended solution (repair, interchange a module, reconfigure, software change, etc).

5.3.1 DAT

The DAT (McCain Diagnostic and Acceptance Test) is a set of test programs already loaded into the controller; It also can be stored into a USB memory stick.

The DAT is used for testing and validating the hardware of the McCain ATC eX NEMA controller units, and it is a useful tool when troubleshooting the controller.

It includes separated tests menus for the CPU, I/O, Serial Ports and Front Panel. Also includes a Continuous Test menu for serial ports and I/O.

Error logging report is available to user for troubleshooting purposes.

In order to use the DAT consult the manual "McCain ATC eX NEMA DAT, User's Manual".

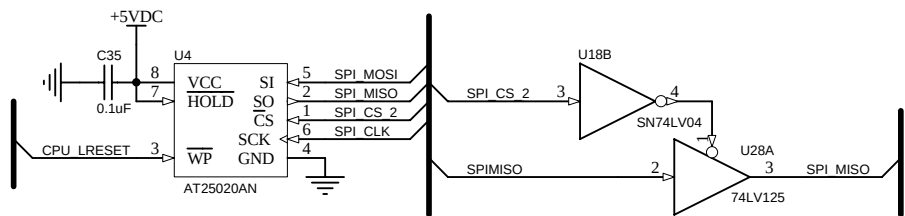
APPENDICES

APPENDIX A: SCHEMATICS

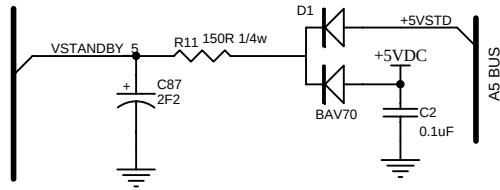
SCHEMATIC	TITLE
M69945	PCB, HOST BOARD, ATC NEMA
M69588	PCB, ENGINE BOARD , ATC NEMA
M66279	PCB, MODEM BOARD, ATC NEMA
M66450	PCB, CONTROL SIGNALS, ATC NEMA
M66449	PCB, CONN BOX, ATC NEMA, STD MCCAIN
M44647	PCB, CONN BOX, ATC NEMA, TRACONEX COMPATIBLE

SCHEMATIC	TITLE
M69945	PCB, HOST BOARD, ATC NEMA

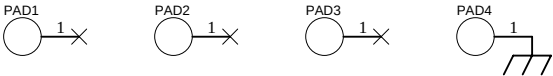
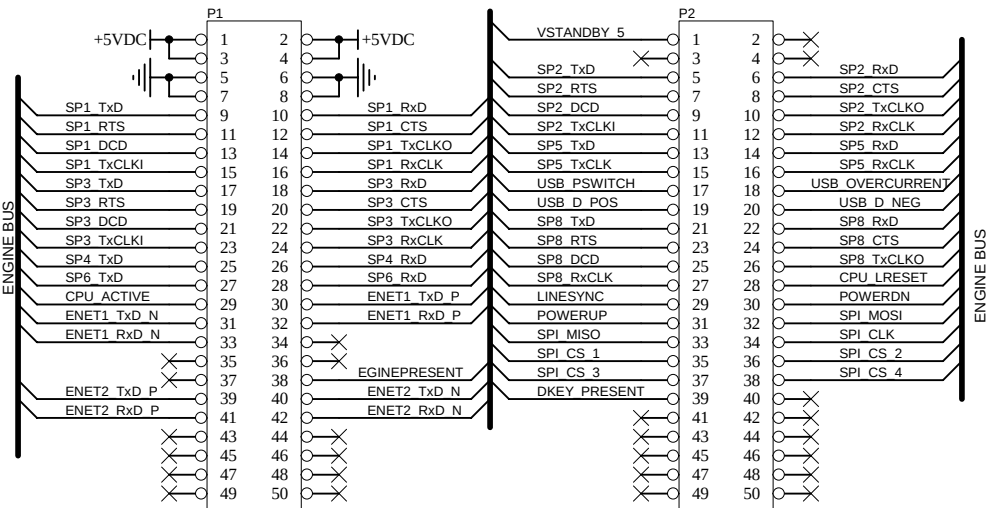
Engine Board Connection, Backup, Host EEPROM, Voltage and Fault Monitor Driver



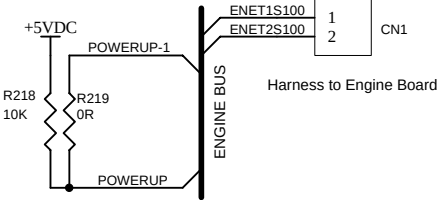
Host EEPROM



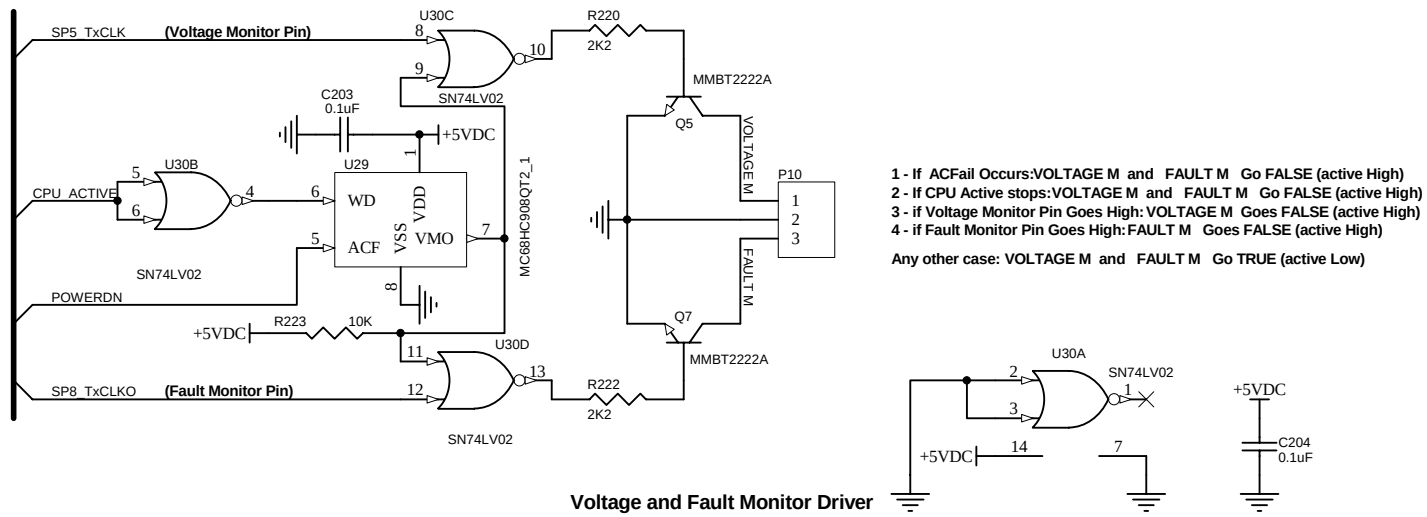
Backup Circuit



Engine board connectors

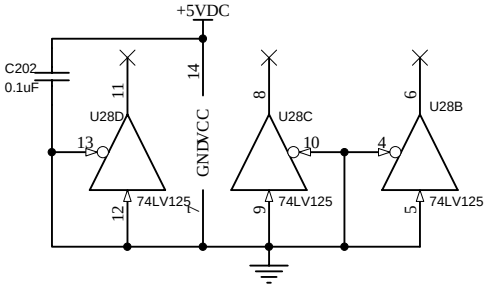
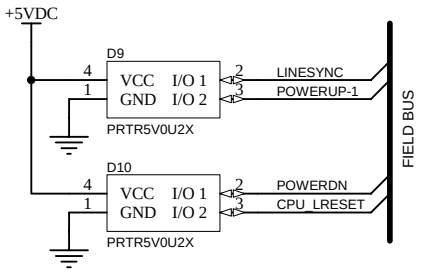
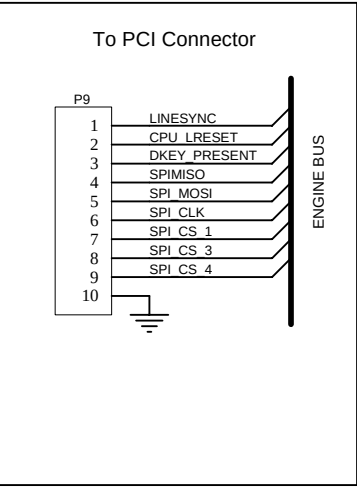
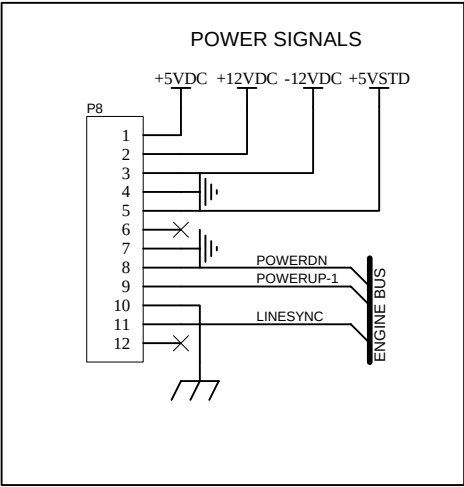
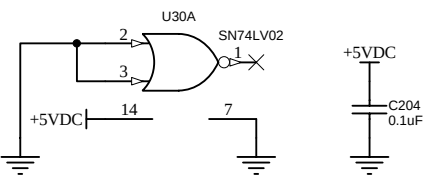


Harness to Engine Board



Voltage and Fault Monitor Driver

- 1 - If ACFail Occurs: VOLTAGE M and FAULT M Go FALSE (active High)
 - 2 - If CPU Active stops: VOLTAGE M and FAULT M Go FALSE (active High)
 - 3 - if Voltage Monitor Pin Goes High: VOLTAGE M Goes FALSE (active High)
 - 4 - if Fault Monitor Pin Goes High: FAULT M Goes FALSE (active High)
- Any other case: VOLTAGE M and FAULT M Go TRUE (active Low)

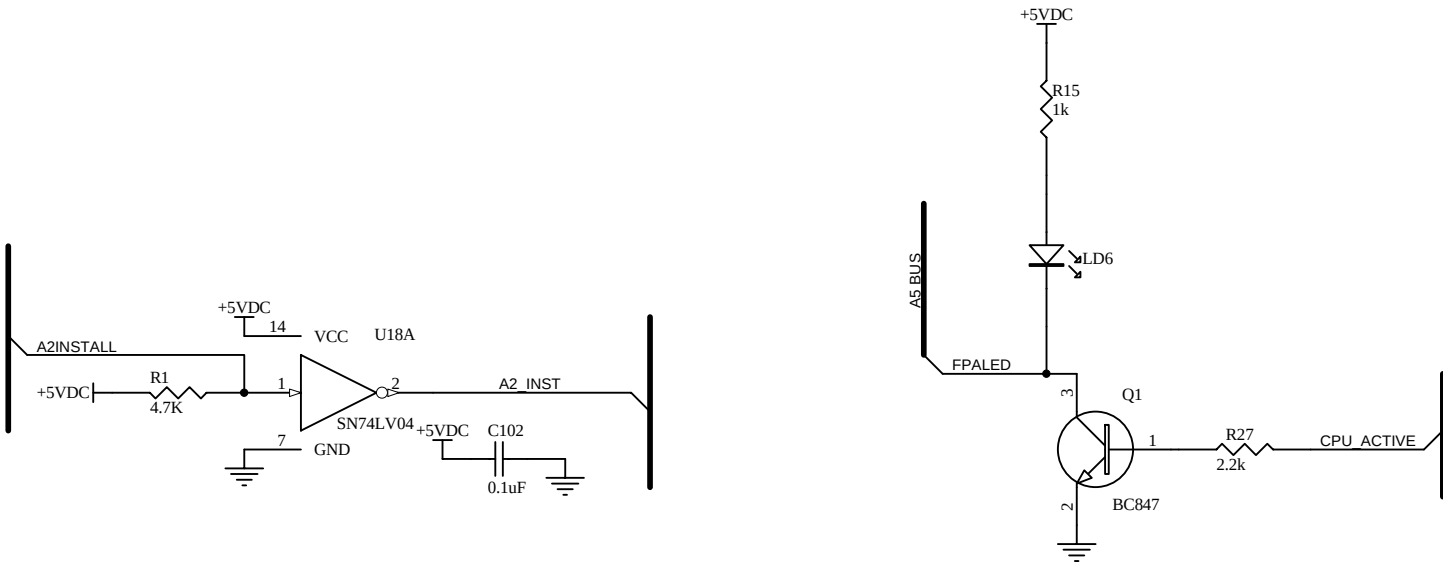
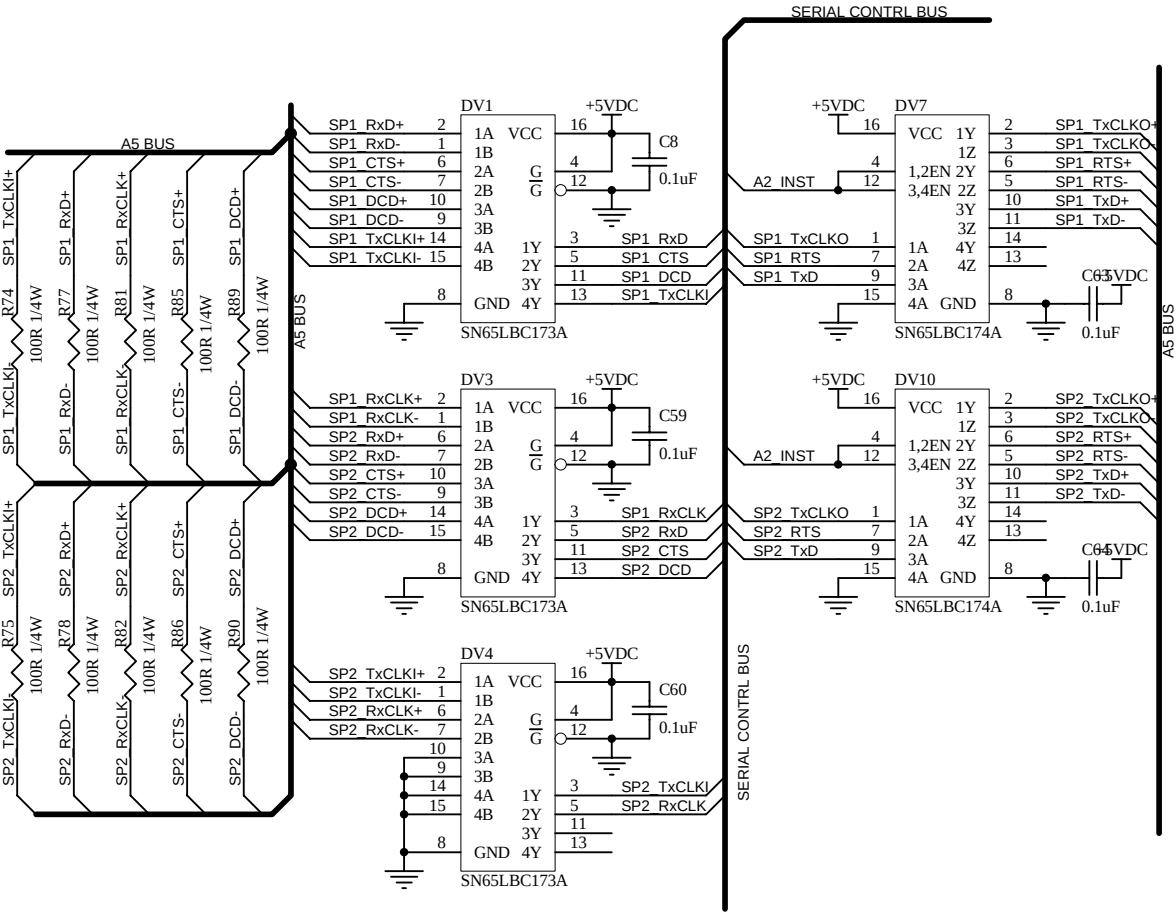
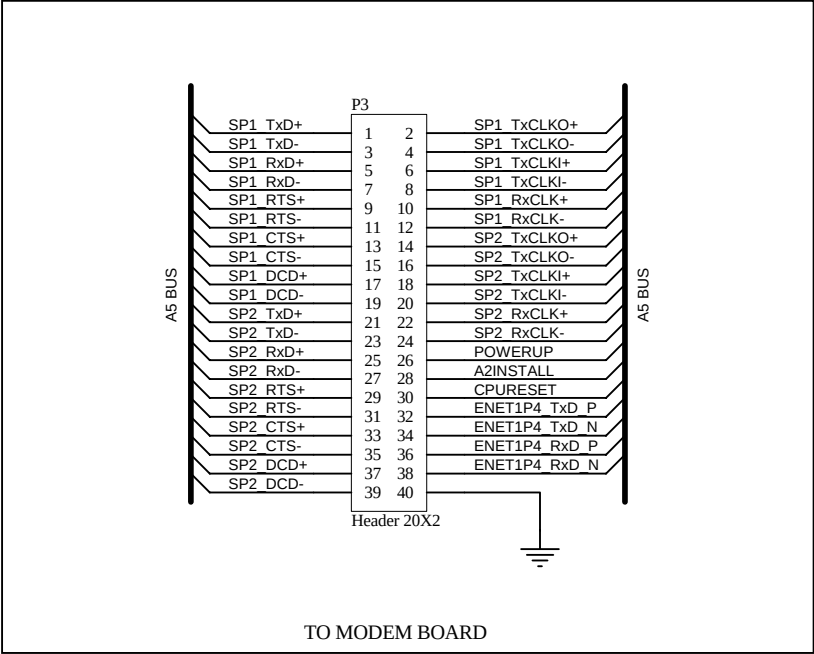


Engine Board Connection, Backup, Host EEPROM, Voltage and Fault Monitor Driver			
Title:	NEMA-ATC - Host Board -		
Size:	Tabloid	McNum: M69945	Revision: A1
Designed By:	M Guerrero	Sheet 1	of 7
Printed Date:	9/22/2010	Printed Time:	3:19:14 PM
File: C:\Documents and Settings\obelan\My Documents\obelan\NEMA CONTROLLER\NEMA_CAD FILES\M69945-REVA1\NEMA-HostBoard_2.SCH.DOC			

PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.



A5 Connector and Driver Interface

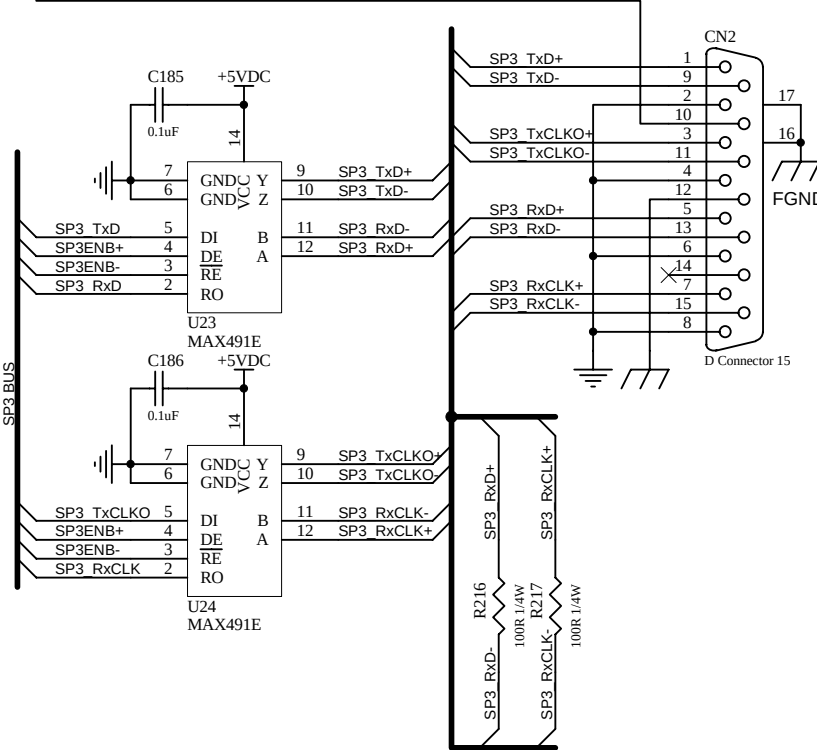
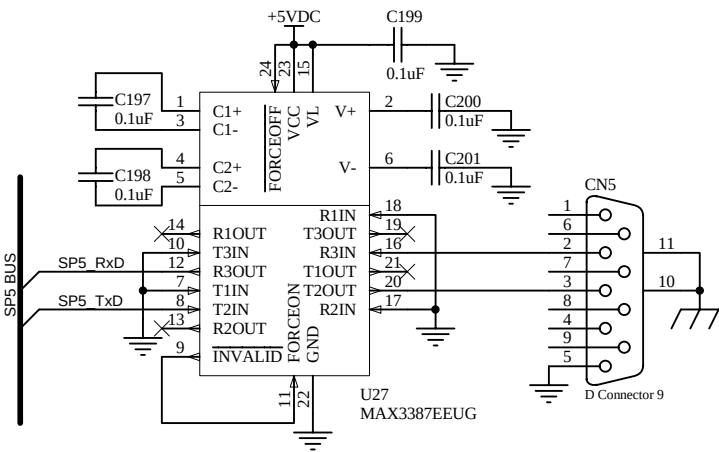
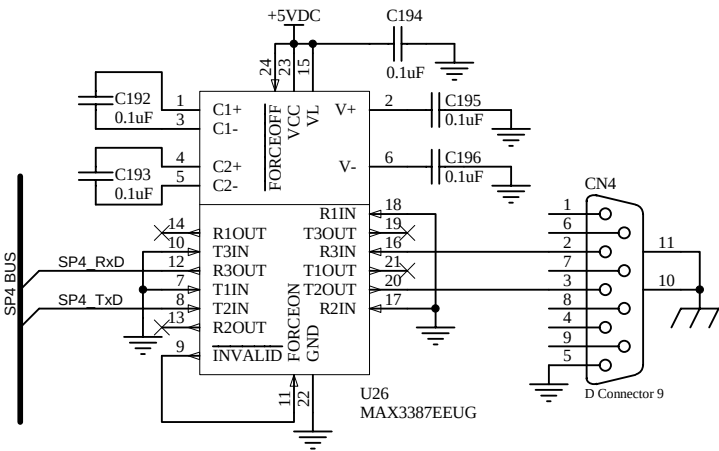
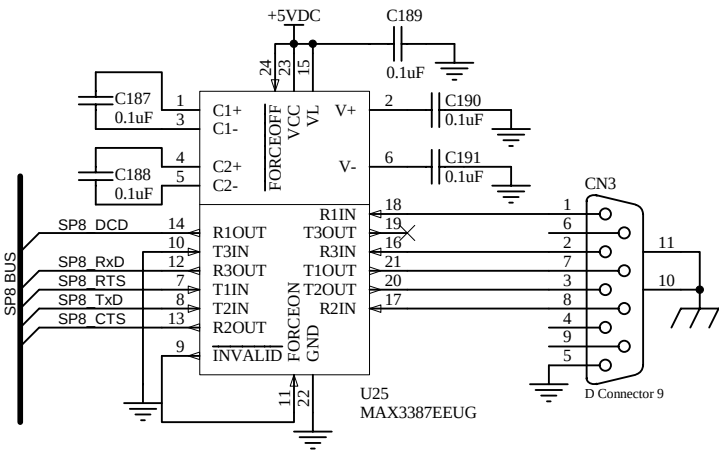
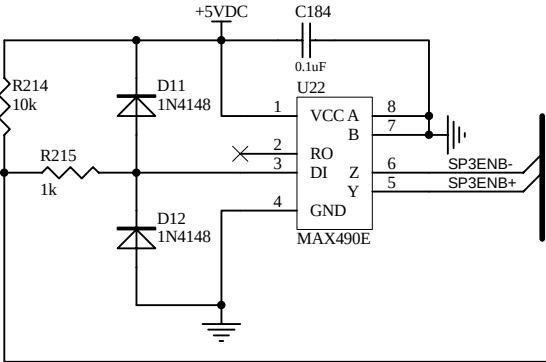
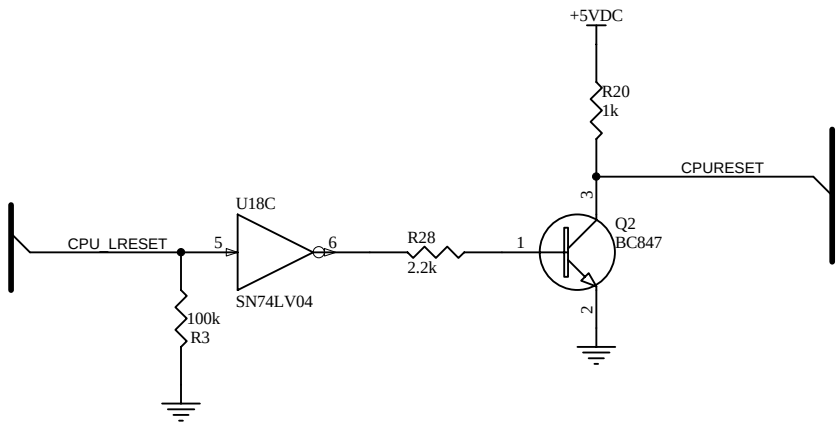


PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

A5 Connector and Driver Interface			
Title:	NEMA-ATC - Host Board -		
Size:	Tabloid	McNum: M69945	Revision: A1
Designed By:	M Guerrero	Sheet 2	of 7
Printed Date:	9/22/2010	Printed Time:	3:19:40 PM
File: C:\Documents and Settings\obeltran\My Documents\obeltran\NEMA CONTROLLER\NEMA_CAD FILES\M69945-REVA1\NEMA-HostBoard_3.SCH			



Serial Connectors and CPURESET signal

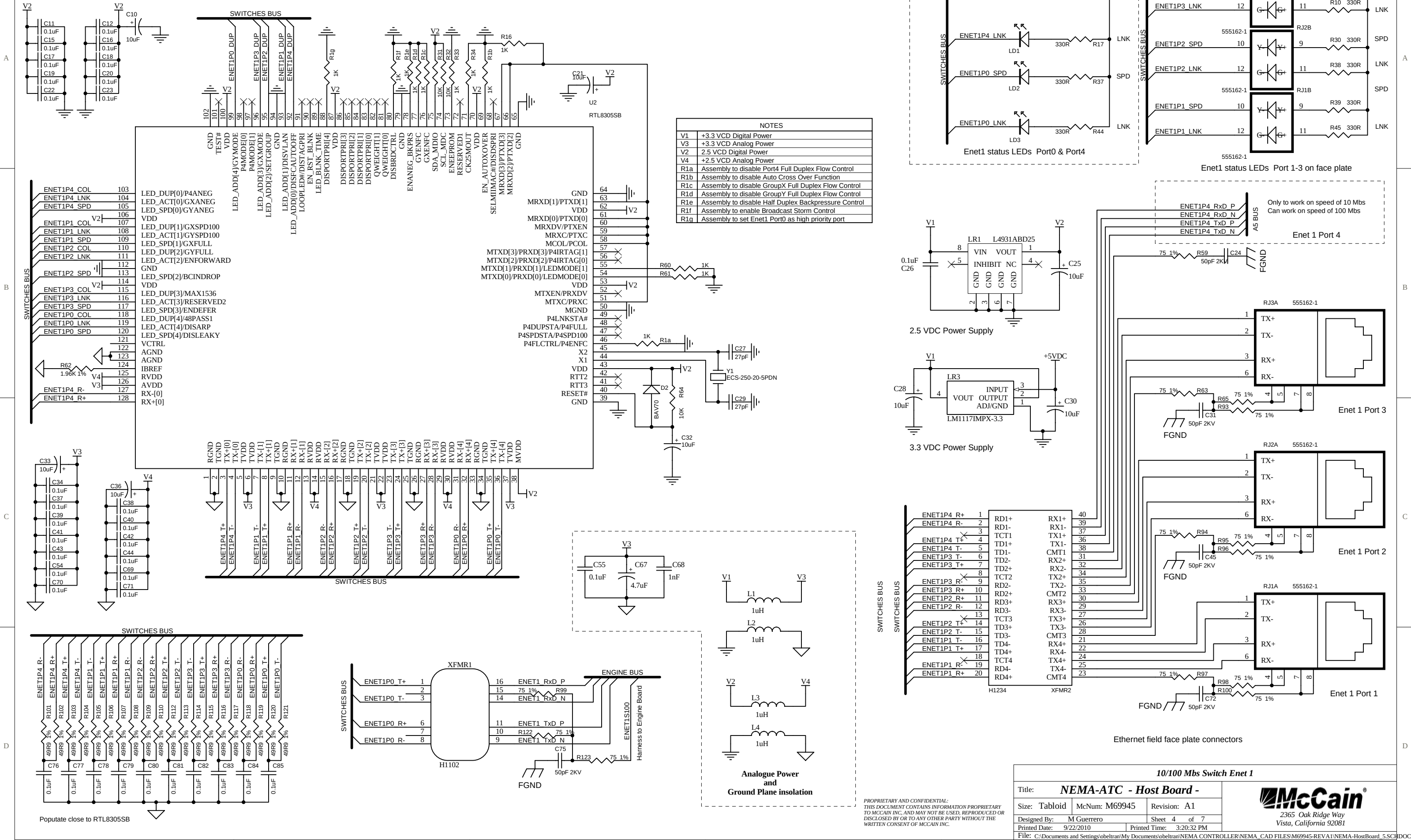


C13S Connector and CPURESET signal			
Title:	NEMA-ATC - Host Board -		
Size:	Tabloid	McNum: M69945	Revision: A1
Designed By:	M Guerrero	Sheet 3	of 7
Printed Date:	9/22/2010	Printed Time:	3:20:01 PM
File: C:\Documents and Settings\obeltran\My Documents\obeltran\NEMA CONTROLLER\NEMA_CAD FILES\M69945-REVA1\NEMA-HostBoard_4.SCH			

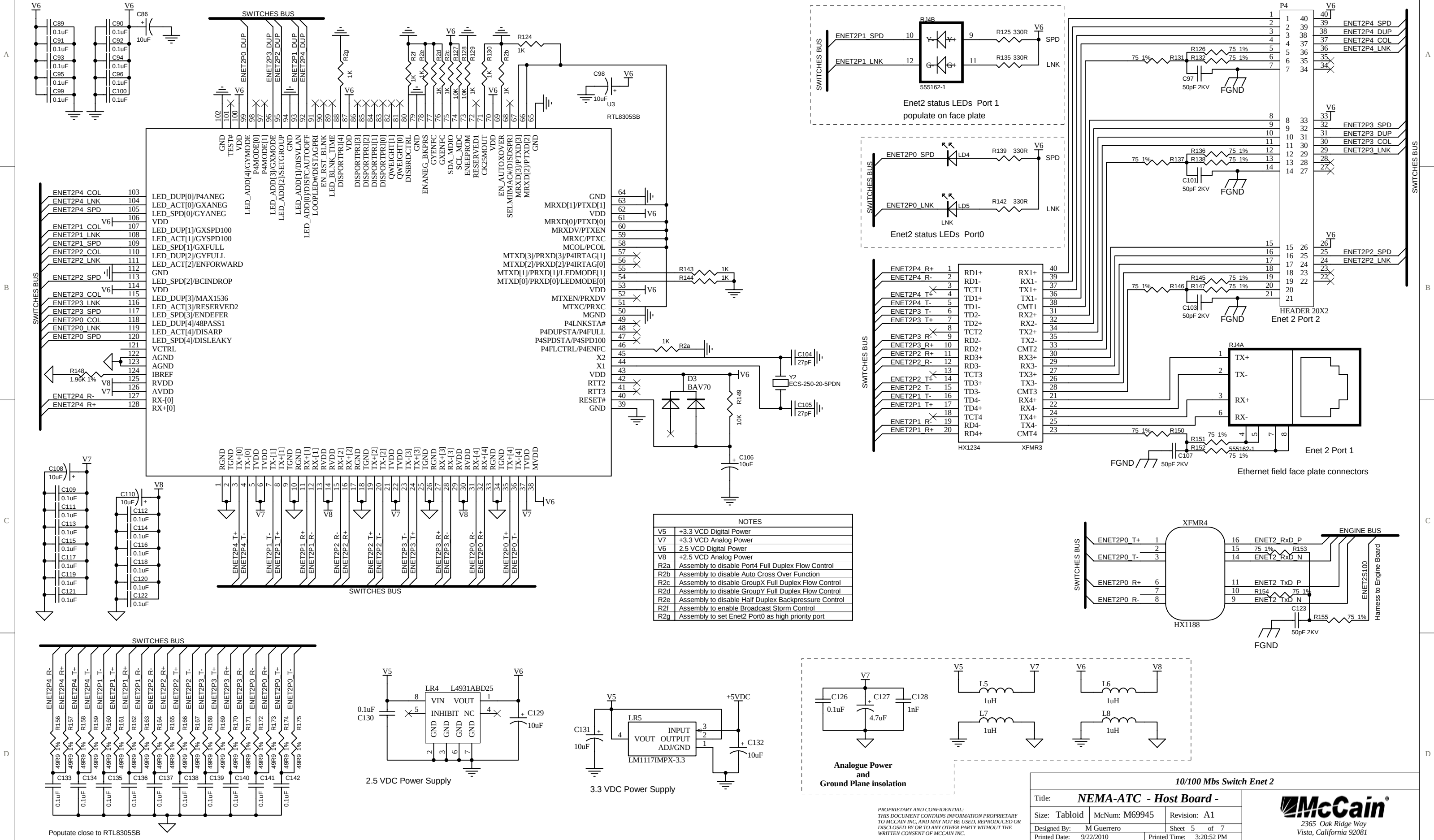
PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.



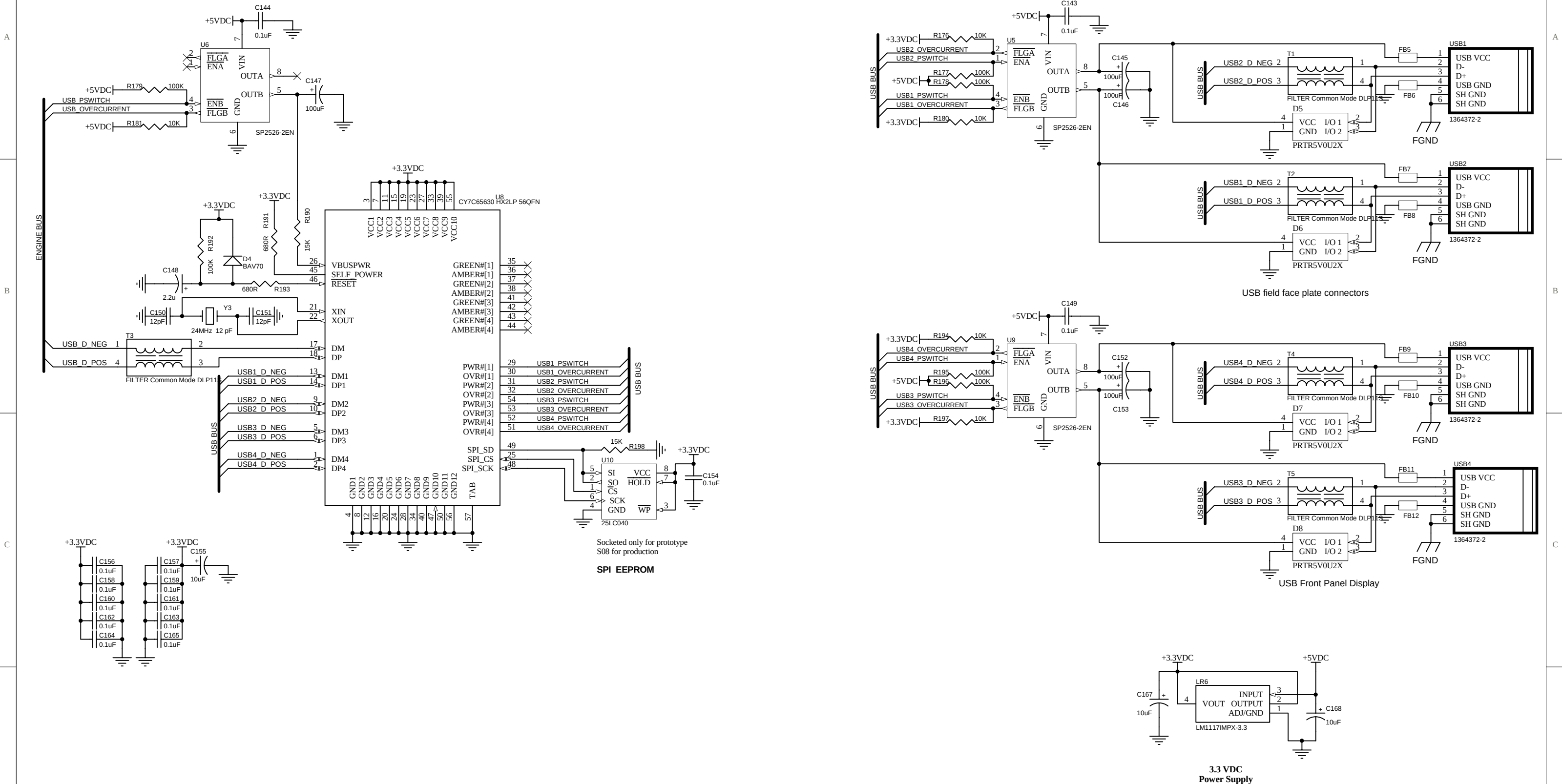
10/100 Mbs Ethernet Switch No. 1



10/100 Mbs Ethernet No. 2



USB Switch



USB Switch			
Title:	NEMA-ATC - Host Board -		
Size:	Tabloid	McNum: M69945	Revision: A1
Designed By:	M Guerrero	Sheet 6	of 7
Printed Date:	9/22/2010	Printed Time:	3:21:29 PM
File: C:\Documents and Settings\obeltran\My Documents\obeltran\NEMA CONTROLLER\NEMA_CAD FILES\M69945-REVA1\NEMA-HostBoard_7.SCHDOC			

PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

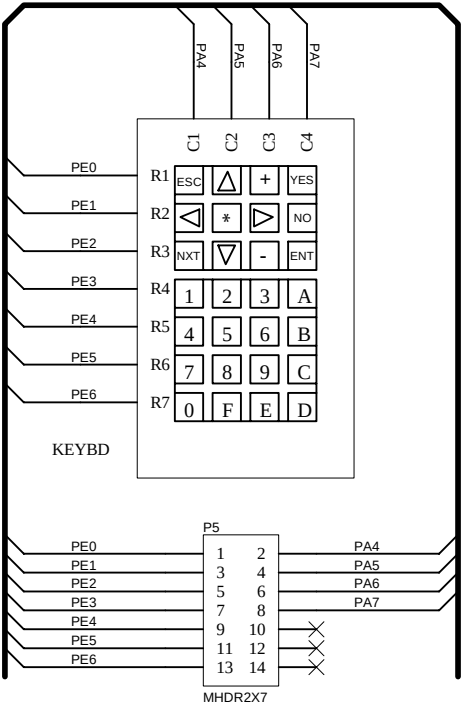
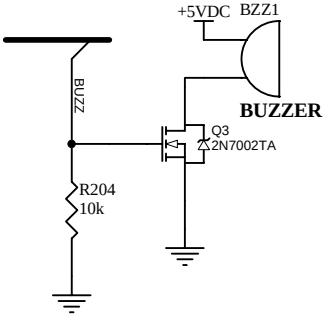


CONFIGURATION	
if the LCD has interval -VE	Remove R205, C180, C179, DC-DC

LCD DISPLAY INTERFACE

The diagram illustrates the LCD Display Interface circuit. It features a DC-DC1 converter (NMR102) that takes a +5VDC input and provides a +Vout (0V) output. A 0.1 uF capacitor (C180) is connected to the input, and another 0.1 uF capacitor (C179) is connected to the output. A 10R resistor (R205) is connected to the output. A 10R 2 WATTS resistor (R203) is connected to the output. A 10k resistor (R201) and a 0.1 uF capacitor (C178) are connected to the output. A 2.2k resistor (R202) is connected to the output. A BKLITE signal is connected to the output. A P11 connector is connected to the output. A P6 connector is connected to the output. The P6 connector pins are labeled: 1 RD, 2 C/D, 3 WR, 4 D1, 5 D2, 6 D3, 7 D4, 8 D5, 9 D6, 10 D7, 11 CPURESET, 12 MODE, 13 FS1, 14, 15, 16, 17, 18, 19, 20. The P6 connector is connected to a 10R 2 WATTS resistor (R203).

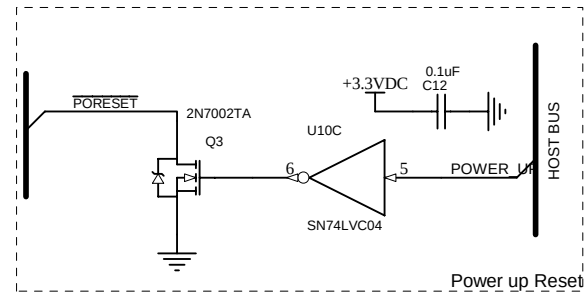
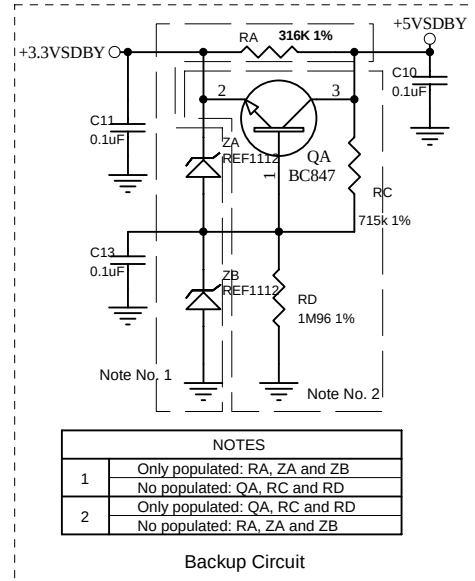
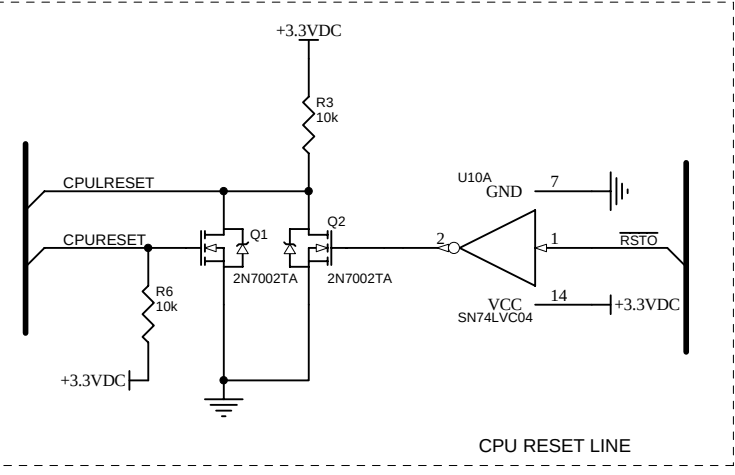
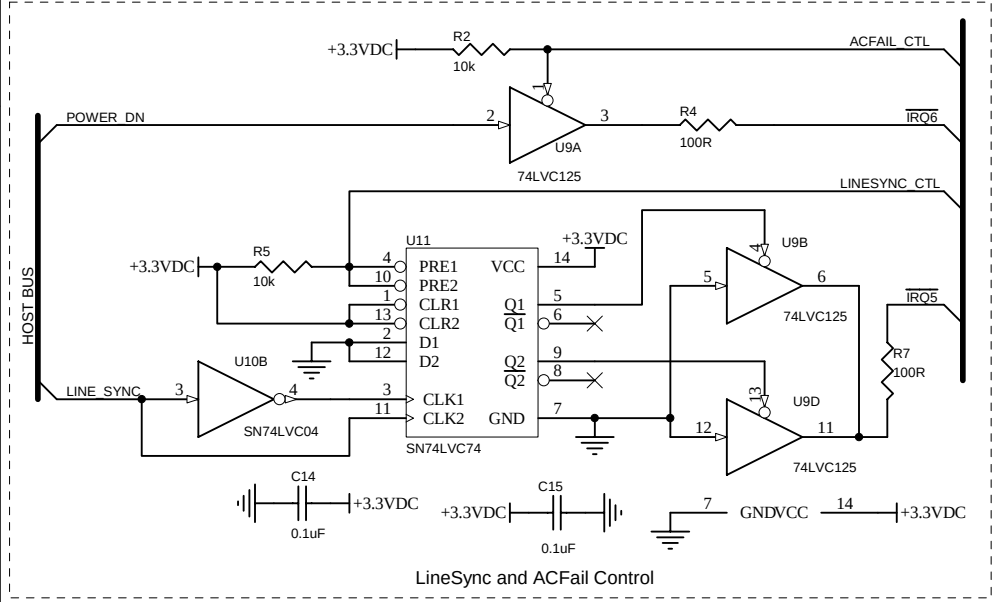
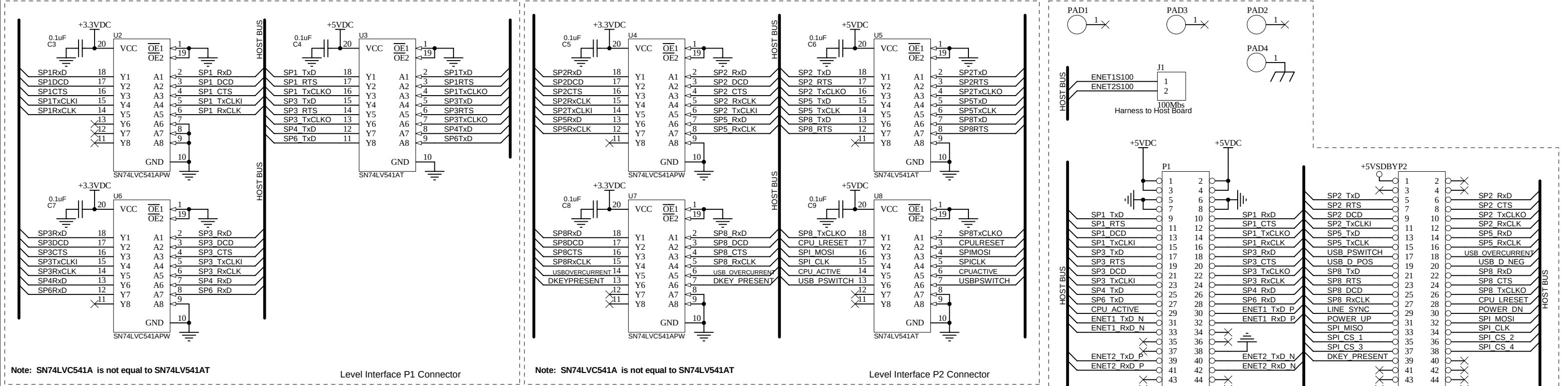
Font Selection			Command or Data	
MODE	FS1	Font	C/D	mode
0	1	6 x 8	0	Write or Read Data
1	0	8 x 8	1	Write or Read Command



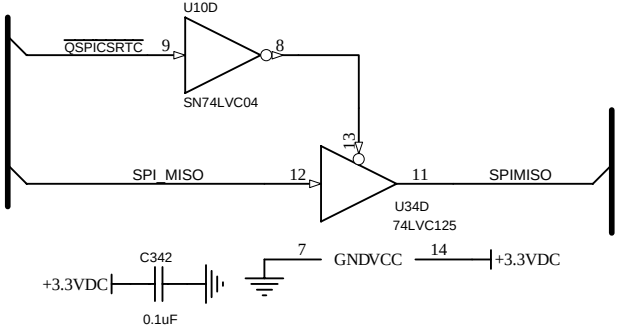
Keyboard and Display			
Title: NEMA-ATC - Host Board -			 2365 Oak Ridge Way Vista, California 92081
Size: Tabloid	McNum: M69945	Revision: A1	
Designed By: M Guerrero		Sheet 7 of 7	
Printed Date: 10/12/2010		Printed Time: 11:14:15 AM	
File: C:\Documents and Settings\lobletlan\My Documents\lobletlan\NEMA CONTROLLER\NEMA_CAD FILES\M69945-REVA1\NEMA-HostBoard_8.SCH			

SCHEMATIC	TITLE
M69588	PCB, ENGINE BOARD, ATC NEMA

Host Board Connection, Backup, Level Interface, Hardware Reset, Line Sync Control



Manufacturer Configuration										
AREA	OPTIONS									Device
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
System Memory	USED	No Used			X	X	X	X	X	DDR2
System Flash	X	X			USED	X	X	X	X	pSRAM
Disk Memory	X	X			X	USED	X	X	X	64 MBytes
Real Time Clock	X	X			X	X	USED	No Used	X	Parallel RTC
	X	X			X	X	USED	X	X	SPI RTC
USB Driver	X	X			X	X	X	USED	No Used	Internal Driver
	X	X			X	X	X	No Used	USED	External Driver



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Host Board Connection, Backup, Level Interface, Hardware Reset, Line Sync Control

Title: **ATC2008 - Engine Board -**

Size: Tabloid McNum: M69588 Revision: A

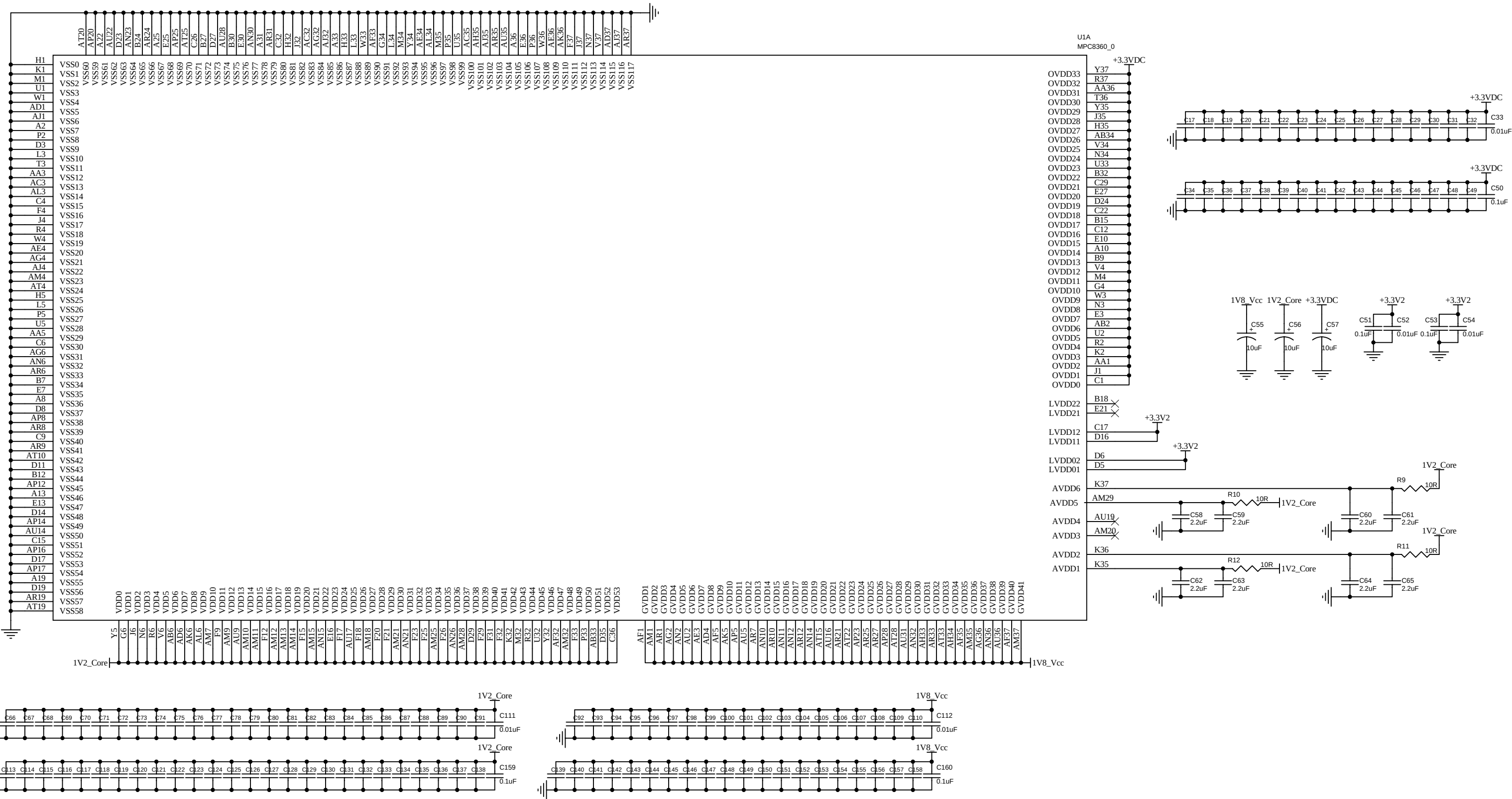
Designed By: M Guerrero Sheet 1 of 8

Printed Date: 9/23/2010 Printed Time: 9:23:04 AM

File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_2.SCHDOC

2365 Oak Ridge Way
Vista, California 92081

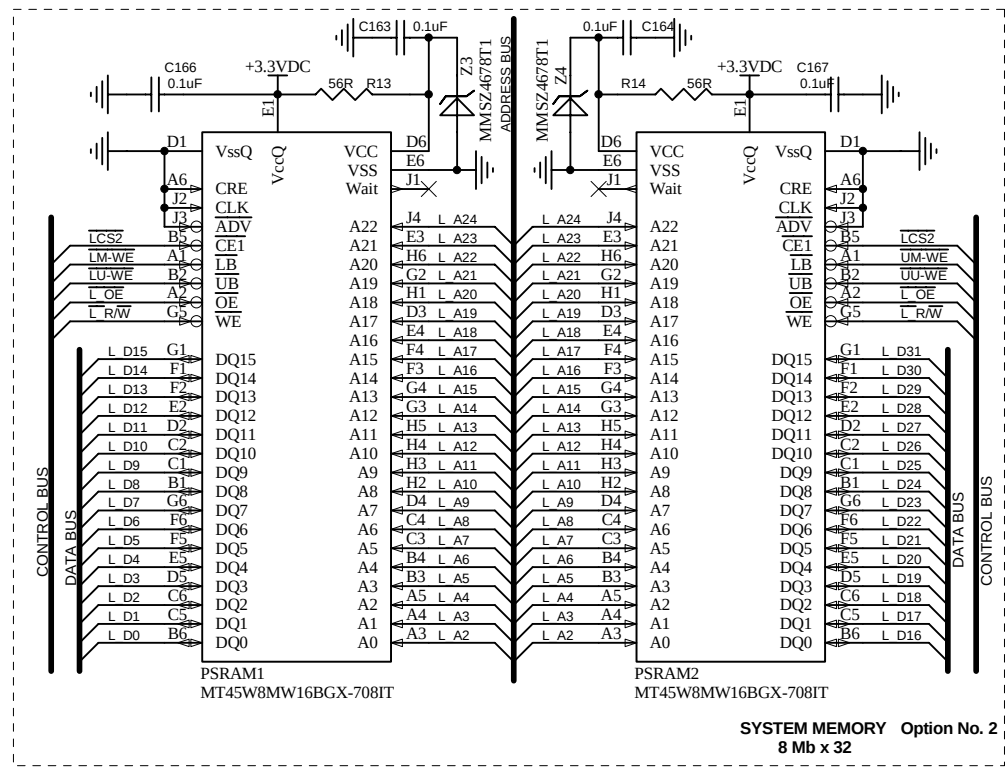
MPC8360 POWER PORTS



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

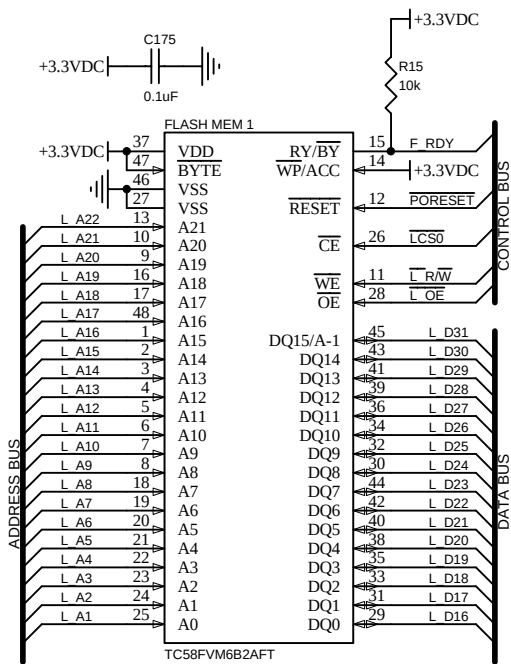
MPC8360 POWER PORTS				
Title: ATC2008 - Engine Board -			 2365 Oak Ridge Way Vista, California 92081	
Size: Tabloid	McNum: M69588	Revision: A		
Designed By: M Guerrero	Sheet 2 of 8			
Printed Date: 9/23/2010	Printed Time: 9:23:31 AM			
File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_3.SCHDOC				

Local Bus Interface, Flash memory, System Memory, SRAM backup memory and RTC

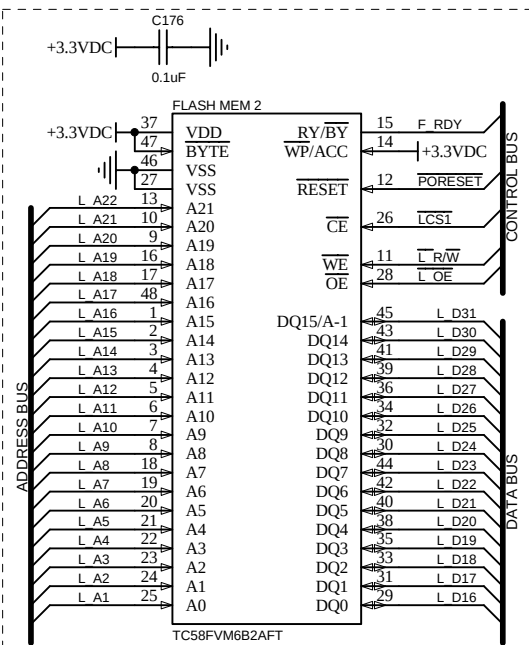


SYSTEM MEMORY Option No. 2
8 Mb x 32

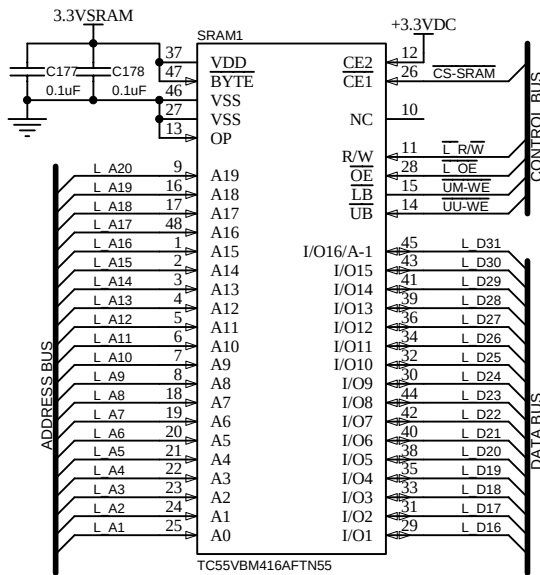
MAP MEMORY		
DEVICE	CS	ADDRESS RANGE
Main Memory DDR2	NA	0x00000000 to 0x3FFFFFFF
Internal Registers	NA	0xFF400000 to 0xFF5FFFFFFF
Flash Memory No. 1	LCS0	0xFF800000 to 0xFFFFF000
Flash Memory No. 2	LCS1	0x00800000 to 0x00FFF000
Main Memory PSRAM	LCS2	0x10000000 to 0x11FFFFFF
BackUp Memory	LCS3	0x01000000 to 0x011FFFFF
RTC Option No. 6	LCS4	0x01200000 to 0x0120FFFF
USB Option No. 9	LCS5	0x01300000 to 0x0130FFFF



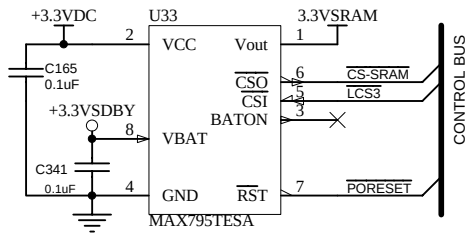
Flash memory Bank No. 1
4 Mb x 16



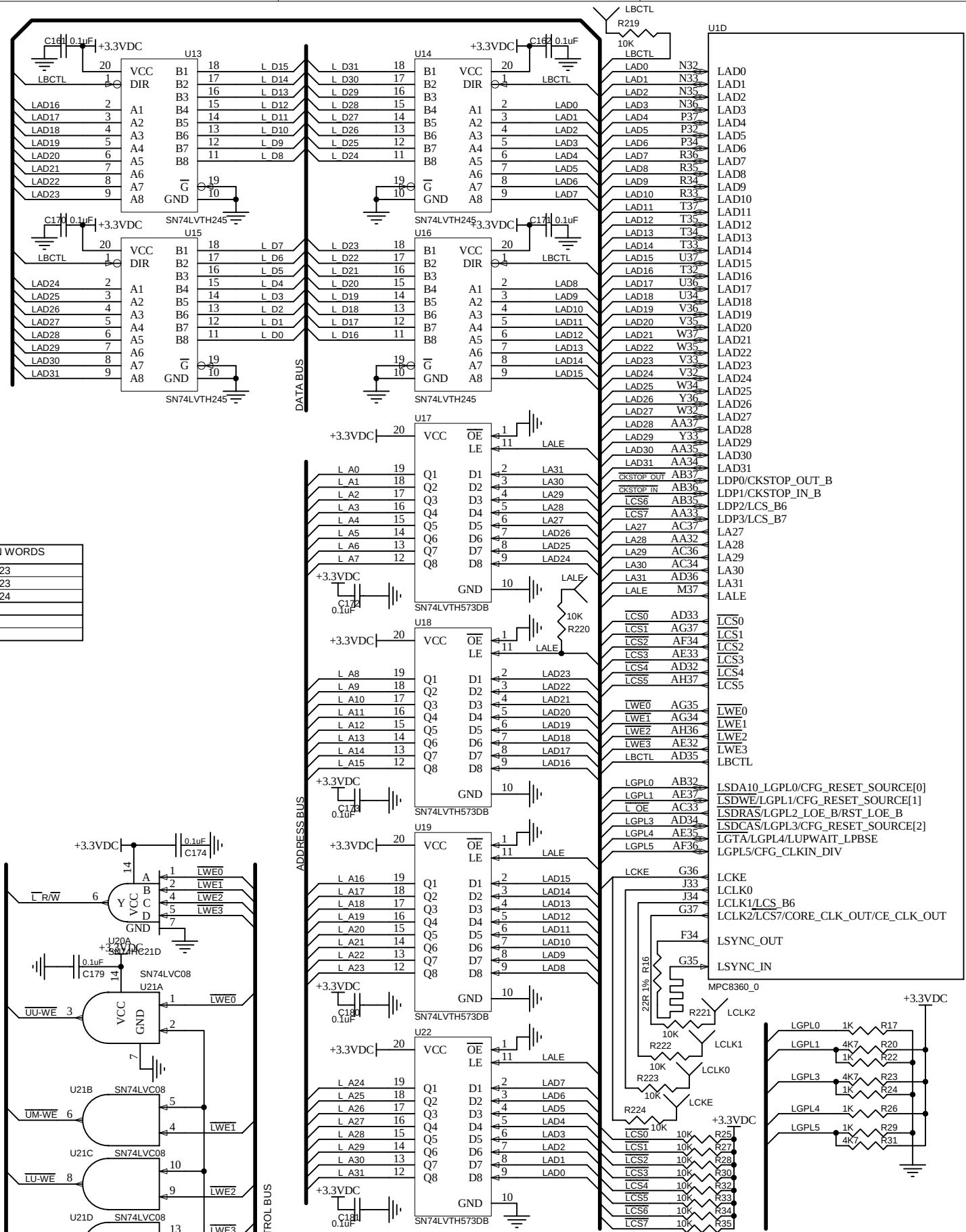
Flash memory Bank No. 2
4 Mb x 16
Option No. 4



SRAM Backup
1 Mb x 16



RESET CONFIGURATION WORDS	
Load from FLASH	Remove: R20, R23
Load from I2C	Remove: R22, R23
DEFAULT	Remove: R22, R24
CLKIN	Remove: R31
CLKIN/2	Remove: R29



Local Bus Interface, Flash memory, System Memory, SRAM backup memory and RTC

Title: ATC2008 - Engine Board -

Size: Tabloid MNum: M69588

Revision: A

Designed By: M Guerrero

Sheet 3 of 8

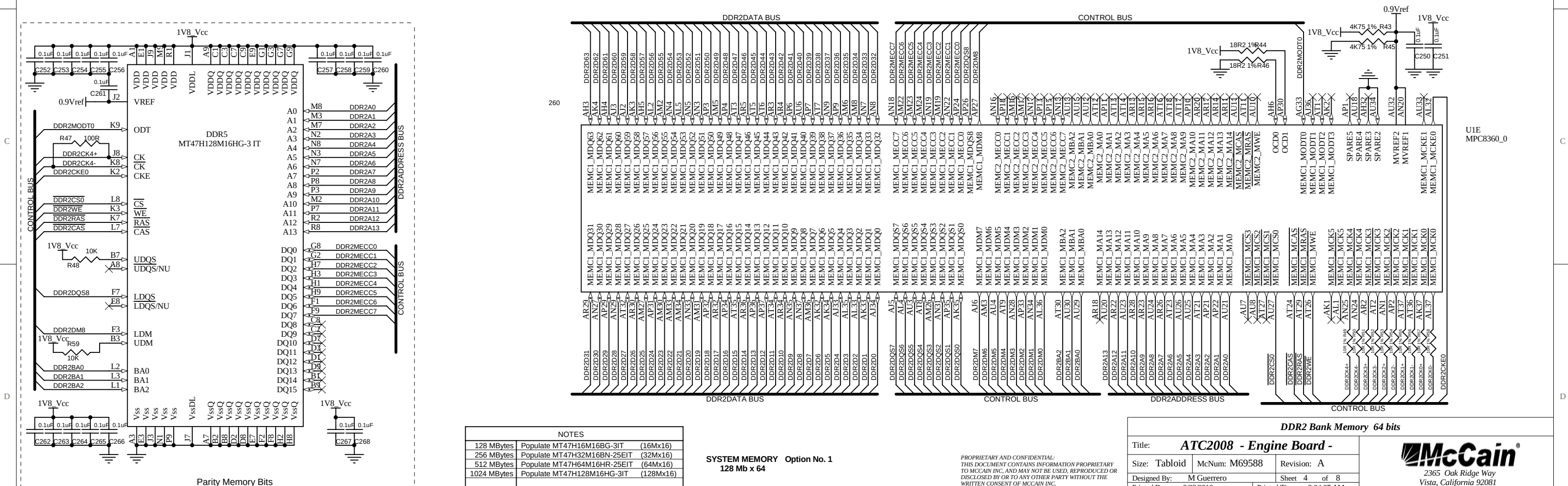
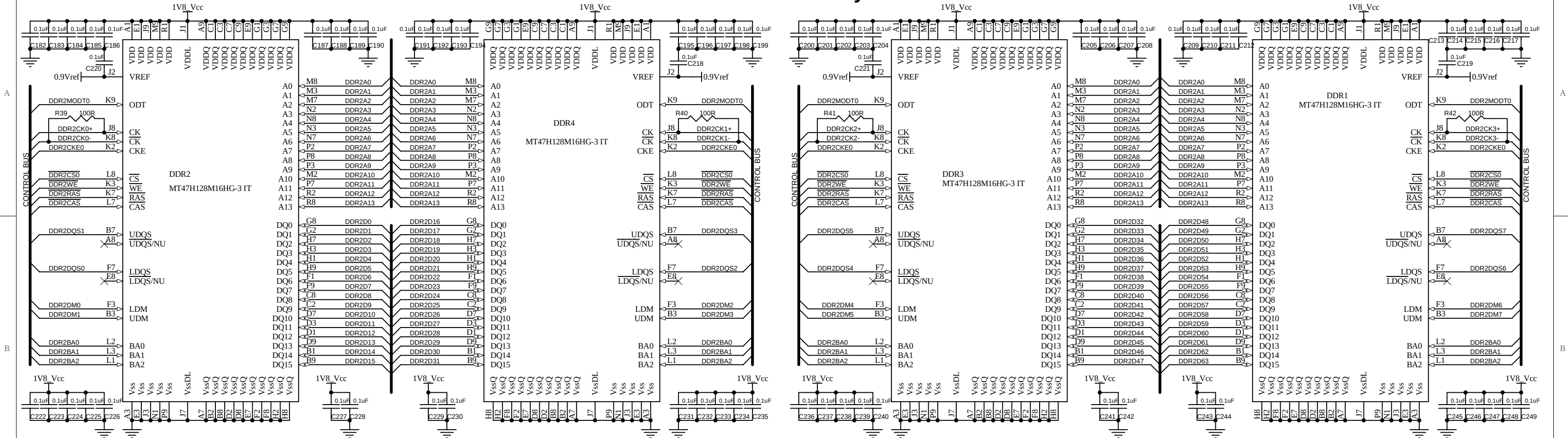
Printed Date: 9/23/2010

Printed Time: 9:23:53 AM

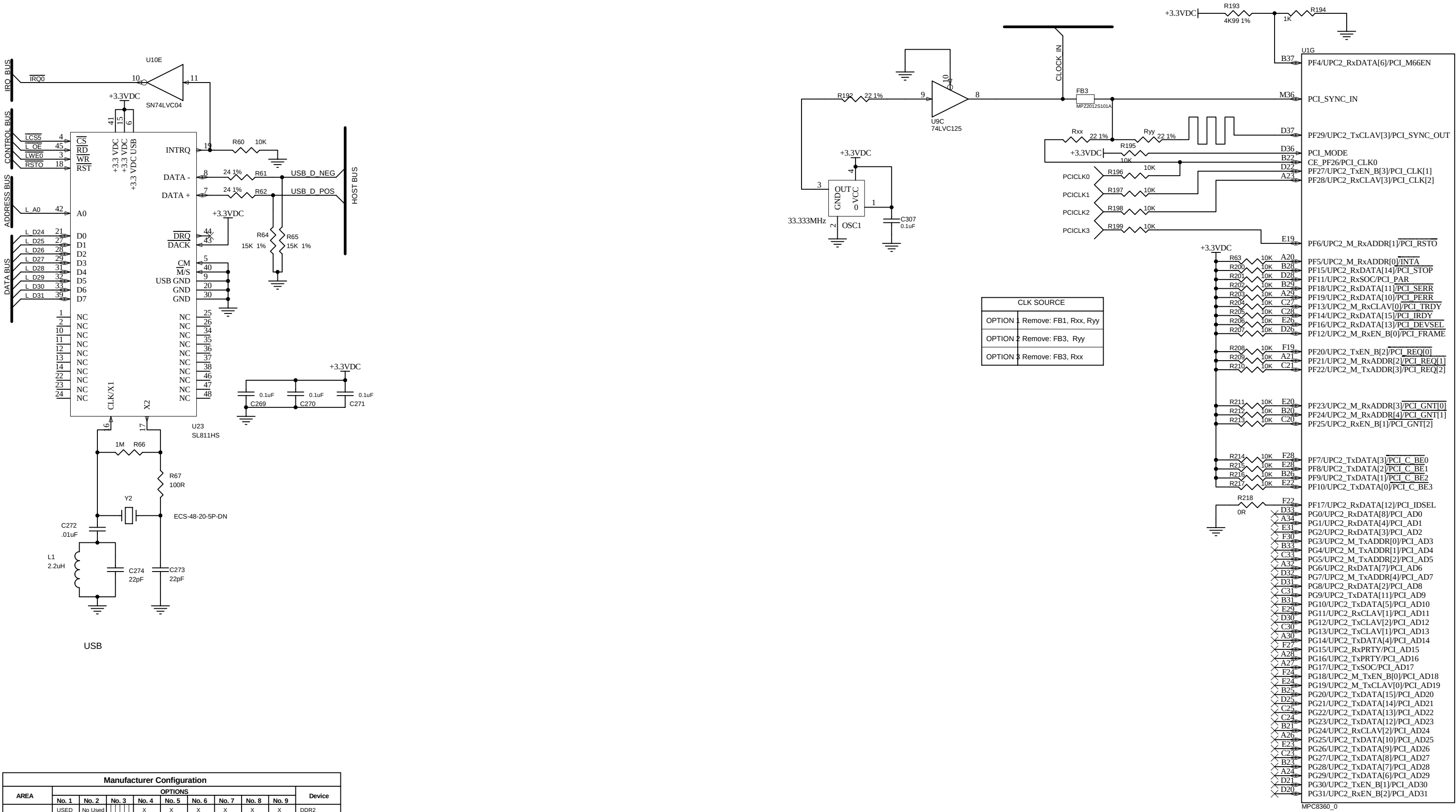
File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_4.SCHDOC



DDR2 Bank Memory 64 bits



External USB Port and PCI Port



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

External USB Port and PCI Port

Title: **ATC2008 - Engine Board -**

Size: Tabloid | McNum: M69588 | Revision: A

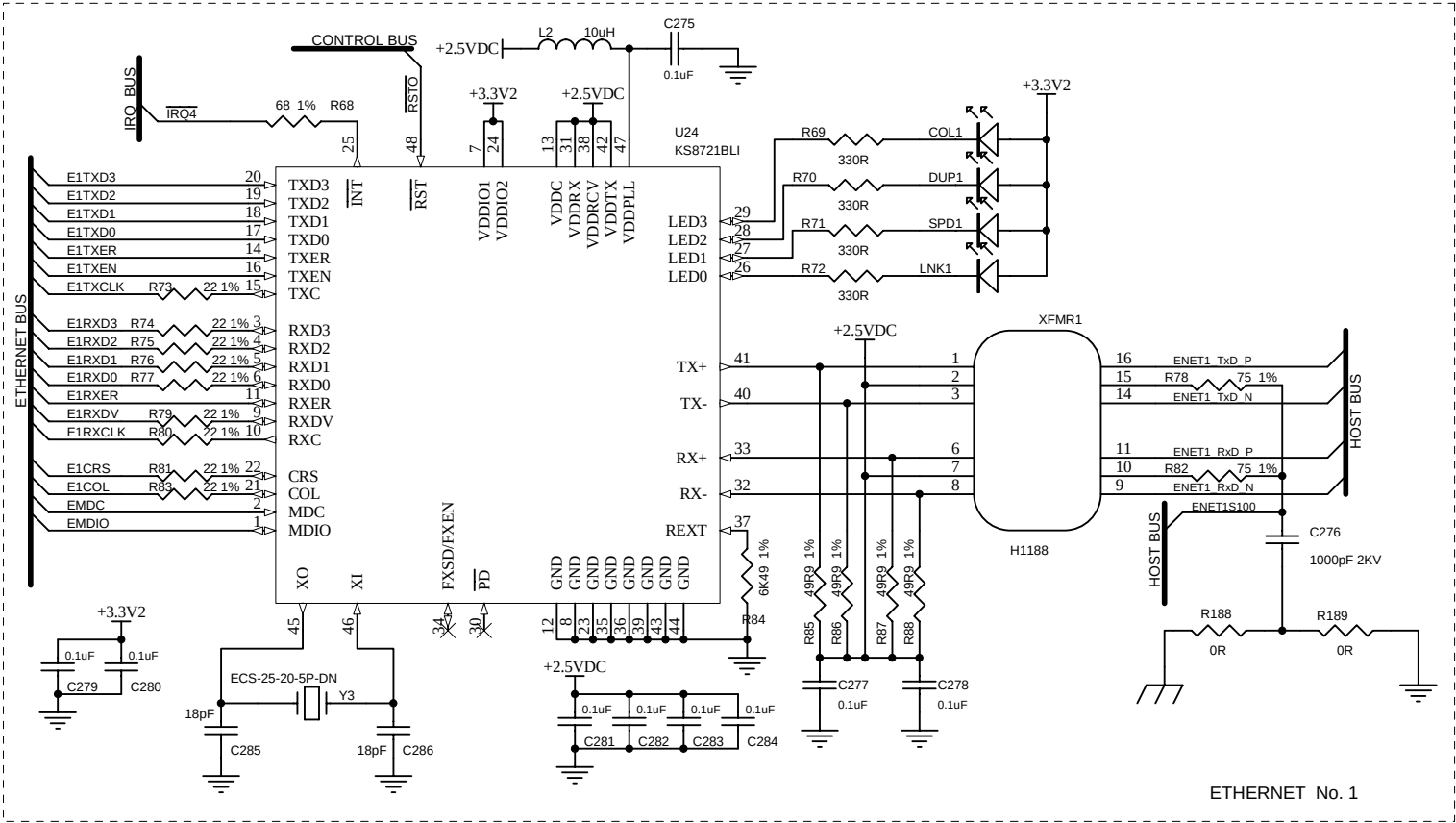
Designed By: M Guerrero | Sheet 5 of 8

Printed Date: 9/23/2010 | Printed Time: 9:25:01 AM

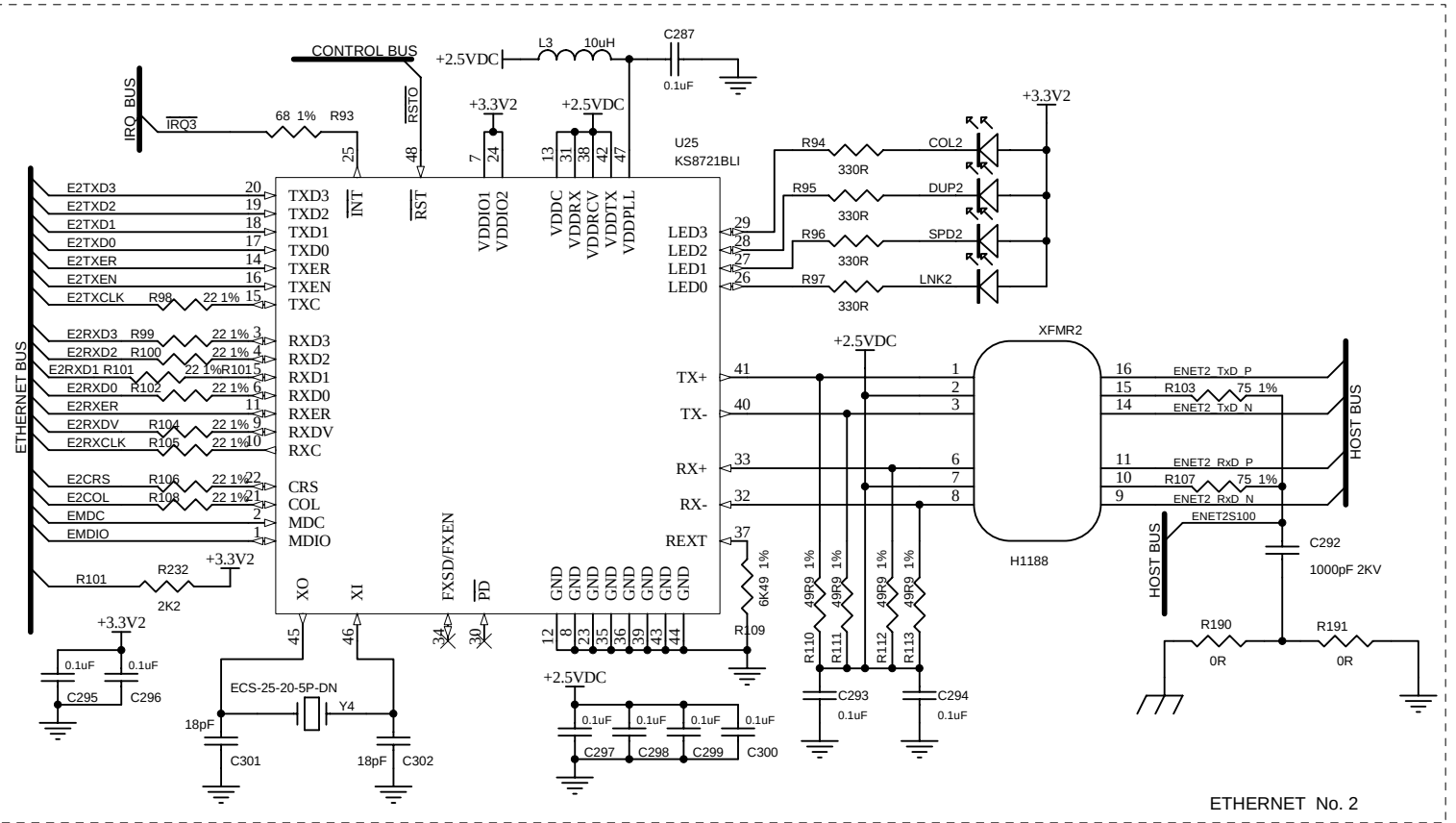
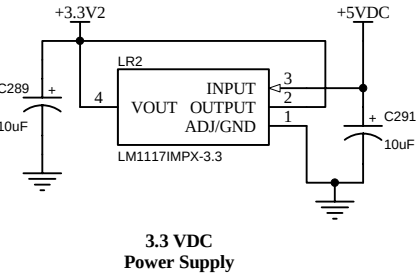
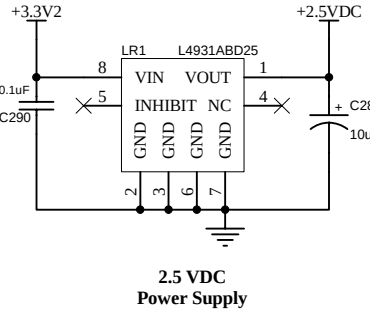
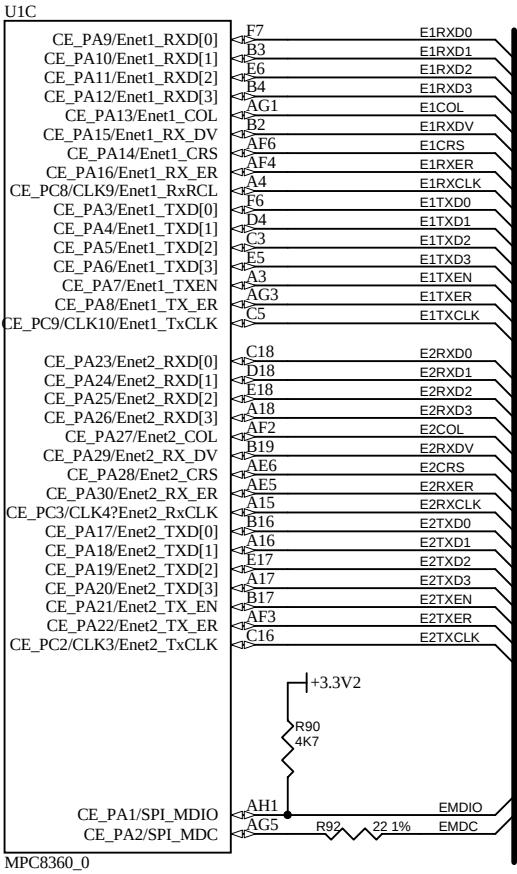
File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_6.SCHDOC

2365 Oak Ridge Way
Vista, California 92081

Ethernet No. 1, Ethernet No. 2, GPIO



Ethernet Clock Configuration		
PORT	RX CLK No.	TX CLK No.
ENE 1	CLK 09	CLK 10
ENE 2	CLK 04	CLK 03

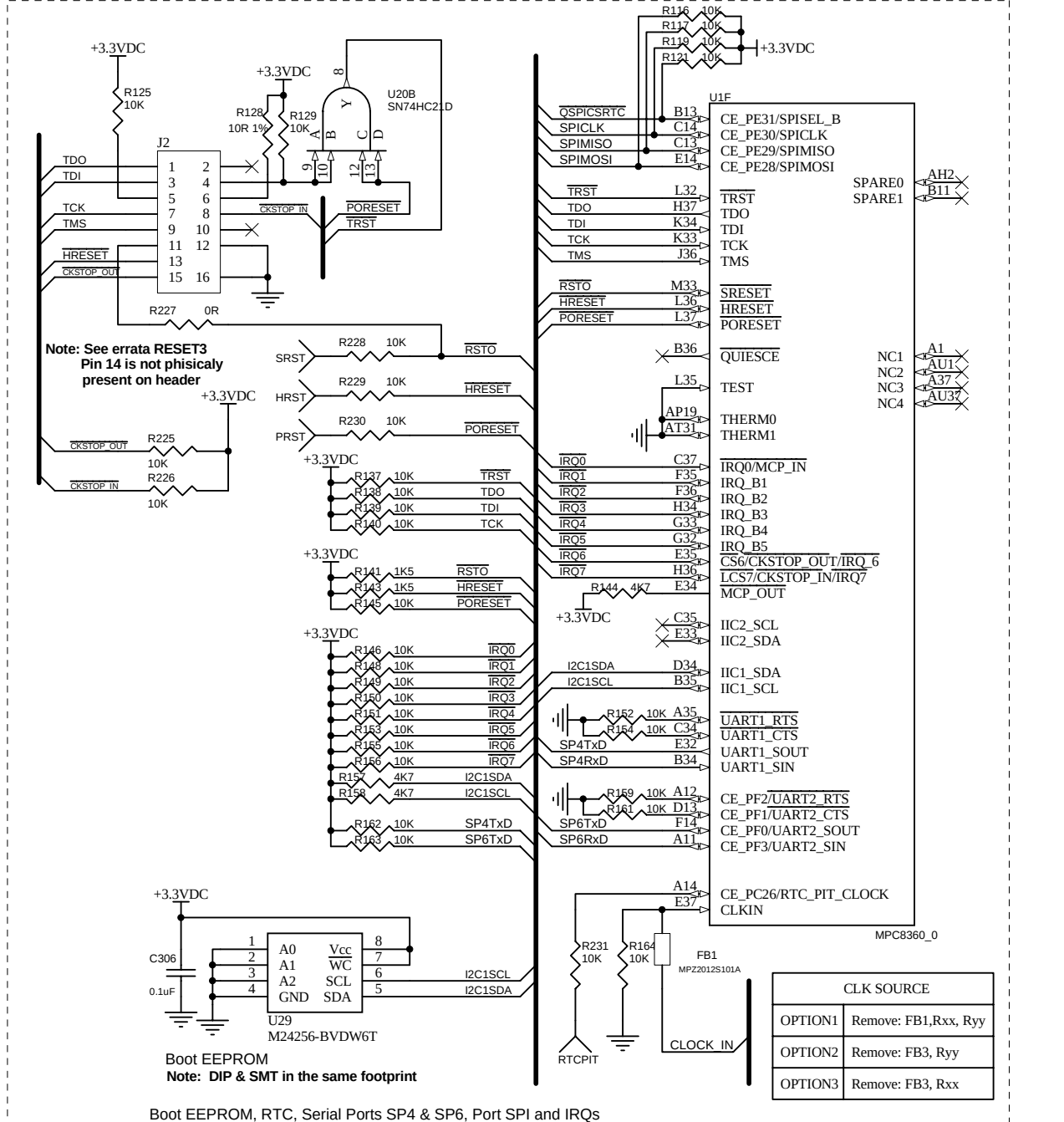
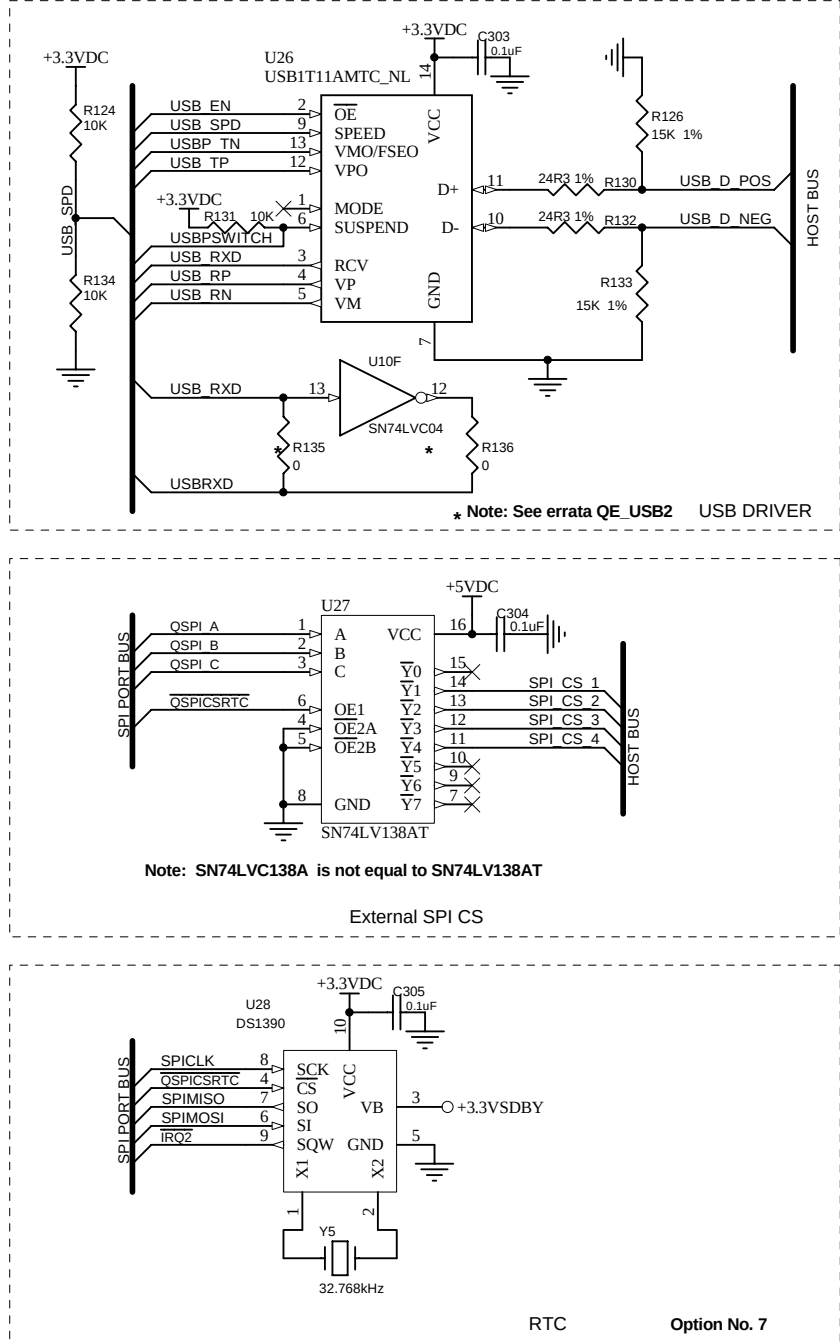
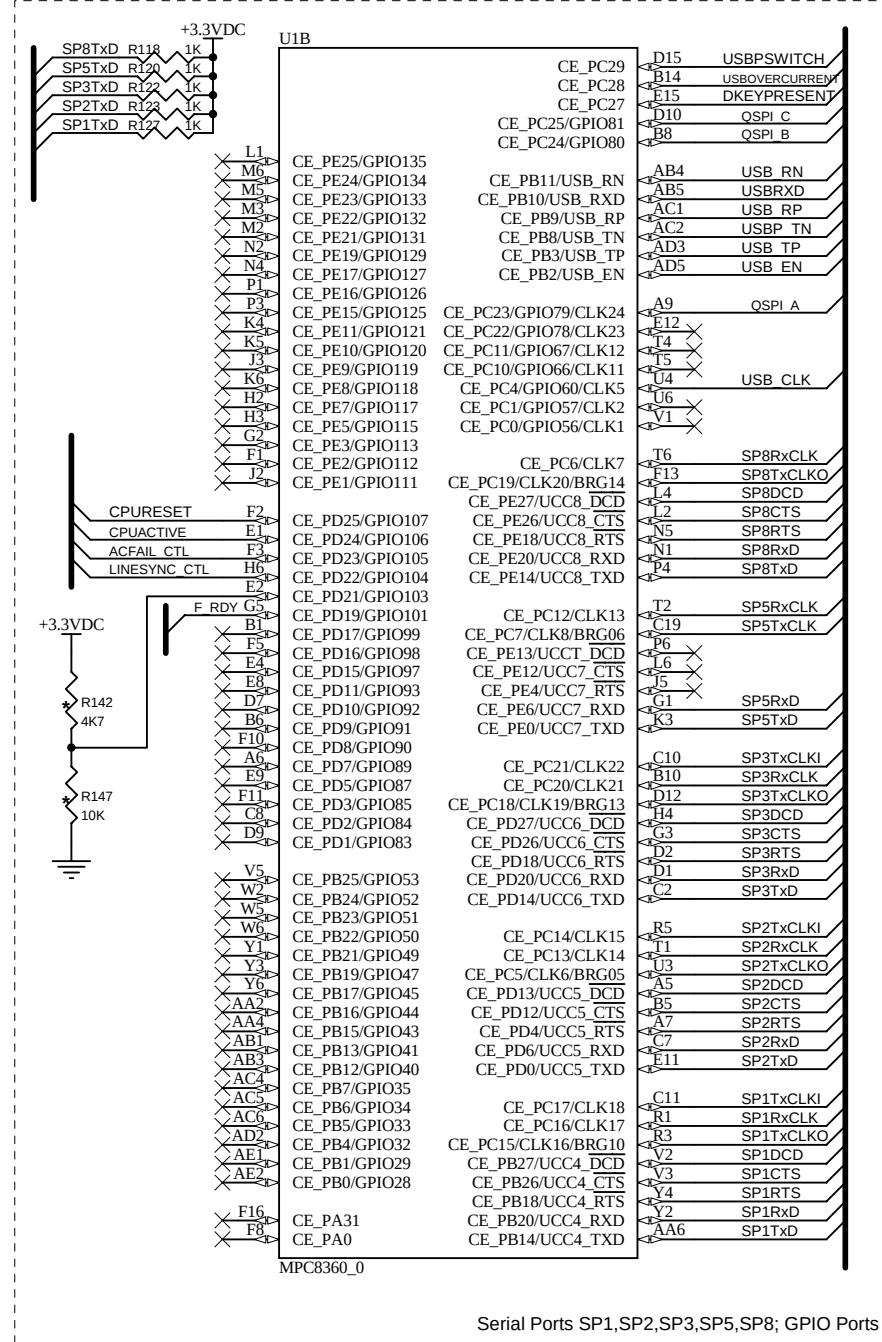


PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Ethernet No. 1, Ethernet No. 2, GPIO			
Title:	ATC2008 - Engine Board -		
Size:	Tabloid	McNum:	M69588
Revision:	A		
Designed By:	M Guerrero	Sheet	6 of 8
Printed Date:	9/23/2010	Printed Time:	9:25:21 AM
File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_7.SCHDOC			



Boot EEPROM, RTC, Serial Ports, USB Port, SPI Port, GPIO Ports and IRQs



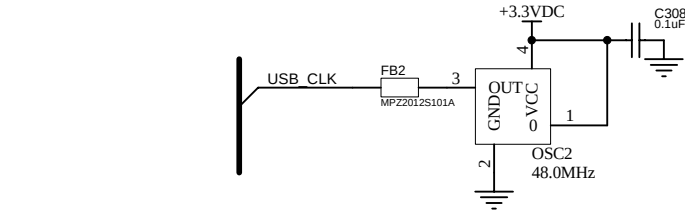
Serial Ports Clock Configuration				
PORT	RX CLK-I CLK No.	TX CLK-I CLK No.	TX CLK-O CLK No.	BaudRateGenerator
SP1	CLK 17	CLK 18	CLK 16	BRG 10
SP2	CLK 14	CLK 15	CLK 06	BRG 05
SP3	CLK 21	CLK 22	CLK 19	BRG 13
SP5	CLK 13	N.U.	CLK 08	BRG 06
SP8	CLK 07	N.U.	CLK 20	BRG 14
USB	CLK 05/N.U.	N.U.	N.U.	BRG 09

Ethernet Clock Configuration		
PORT	RX CLK No.	TX CLK No.
ENE 1	CLK 09	CLK 10
ENE 2	CLK 04	CLK 03

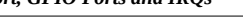
GPIO Configuration		
GPIO PORTS	DIR	USING FOR
PE-31	Output	SPI CS RTC Line
PC-23	Output	SPI Line C
PC-24	Output	SPI Line B
PC-25	Output	SPI Line A
PC-27	Input	Data Key is present
PC-28	Input	USB OVER CURRENT FLAG
PC-29	Output	USB POWER SOURCE ENABLE
PD-25	Output	CPU Reset after Booting
PD-24	Output	CPU Active LED
PD-23	Output	AC Fail Control Line
PD-22	Output	LineSync Control Line
PD-21	Input	System Memory Configuration 0 = DDR2 / 1 = pSRAM
PD-19	Input	Flash Ready Status Line

SPI Port CS Configuration				
CS	PC-23	PC-24	PC-25	PE-31
CS 1	1	0	0	1
CS 2	0	1	0	1
CS 3	1	1	0	1
CS 4	0	0	1	1
CS RTC	X	X	X	0

External IRQs Configuration	
GPIO PORTS	USING FOR
IRQ-7	it is not used yet
IRQ-6	AC FAIL
IRQ-5	Line Sync O/S Clock reference
IRQ-4	Ethernet No 1
IRQ-3	Ethernet No 2
IRQ-2	RTC No. 2
IRQ-1	RTC No. 1
IRQ-0	USB Option/No used
PC-28	USB over-current is occurring
PC-27	Data Key is present



Boot EEPROM, RTC, Serial Ports, USB Port, SPI Port, GPIO Ports and IRQs			
Title:		ATC2008 - Engine Board -	
Size: Tabloid	McNum: M69588	Revision: A	
Designed By: M Guerrero		Sheet 7 of 8	
Printed Date: 9/23/2010		Printed Time: 9:25:49 AM	
File: C:\Documents and Settings\obeltran\My Documents\obeltran\ENGINE\CAD FILES\EngineBoard_8.SCHDOC			

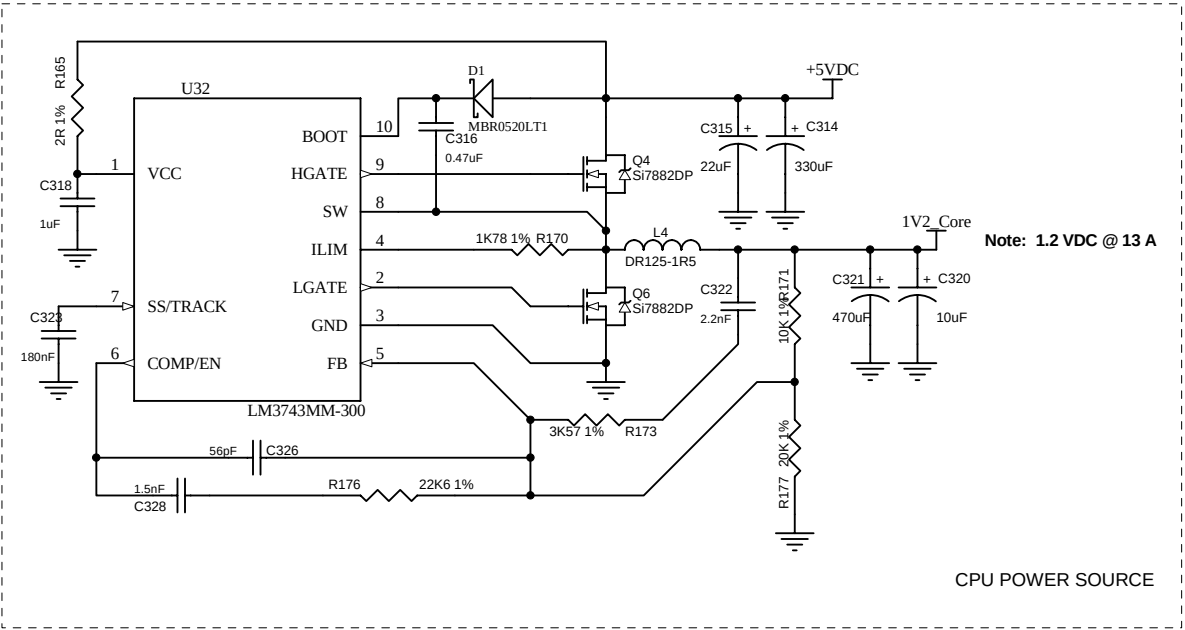
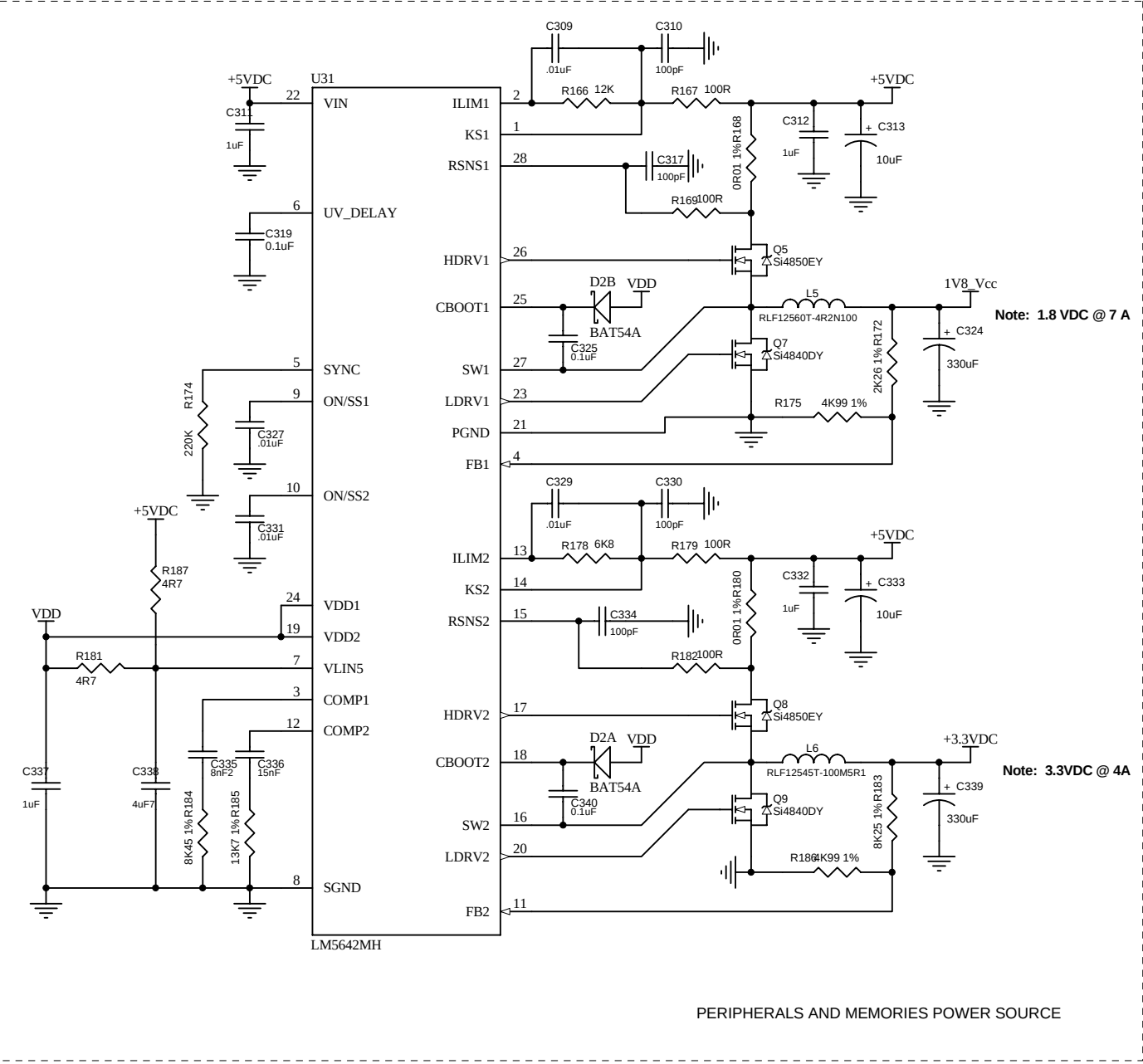


2365 Oak Ridge Way
Vista, California 92081



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Power Sources



SCHEMATIC	TITLE
M66279	PCB, MODEM BOARD, ATC NEMA

A

B

C

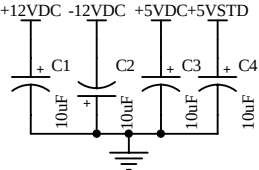
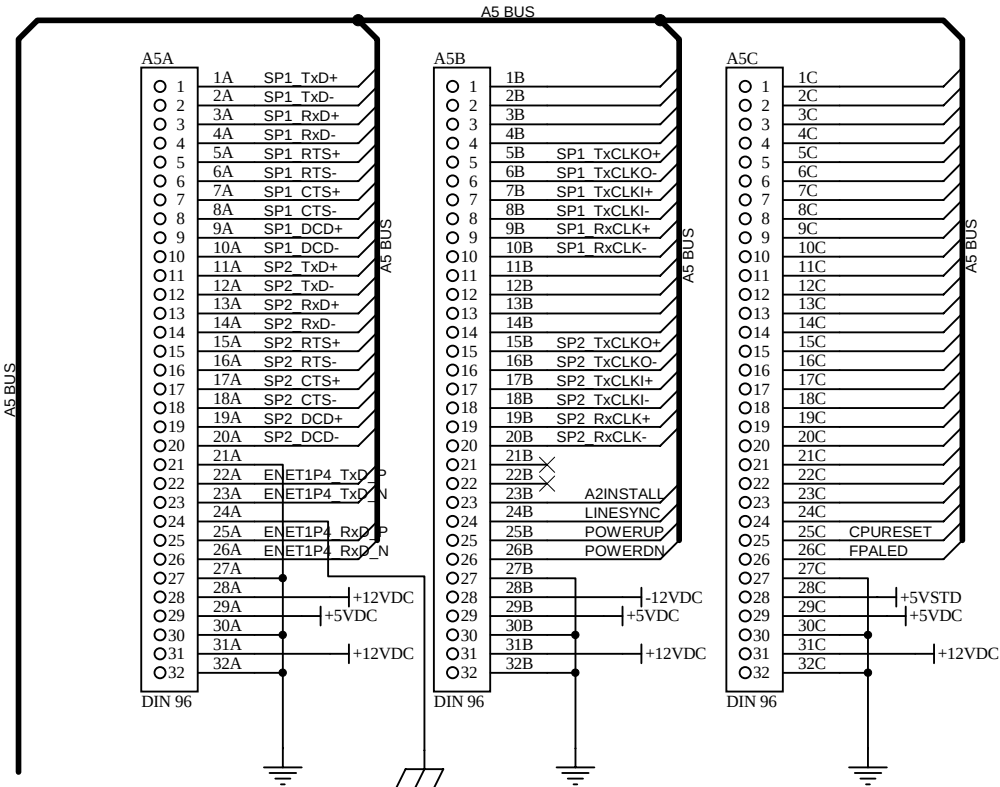
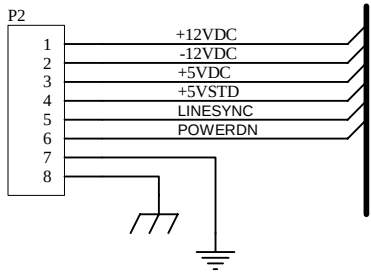
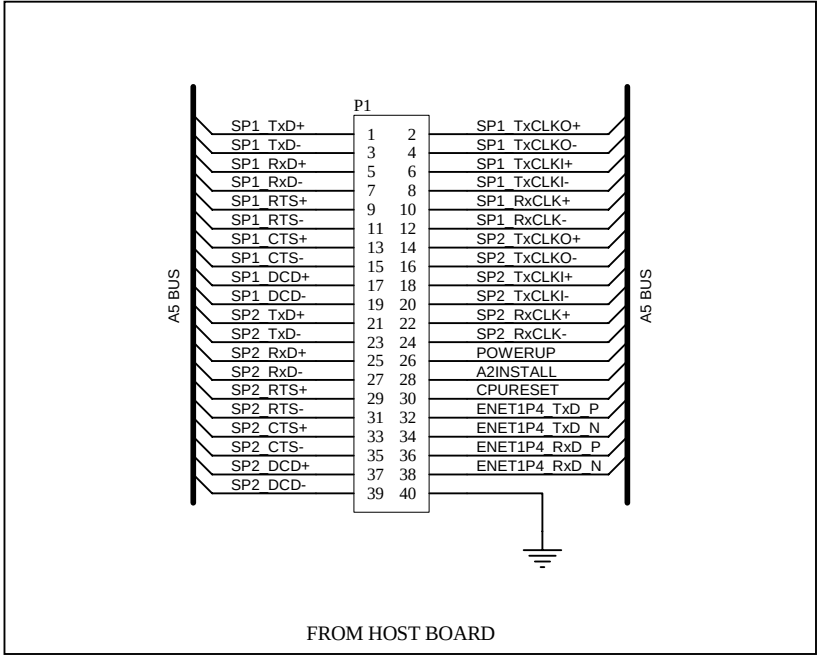
D

A

B

C

D

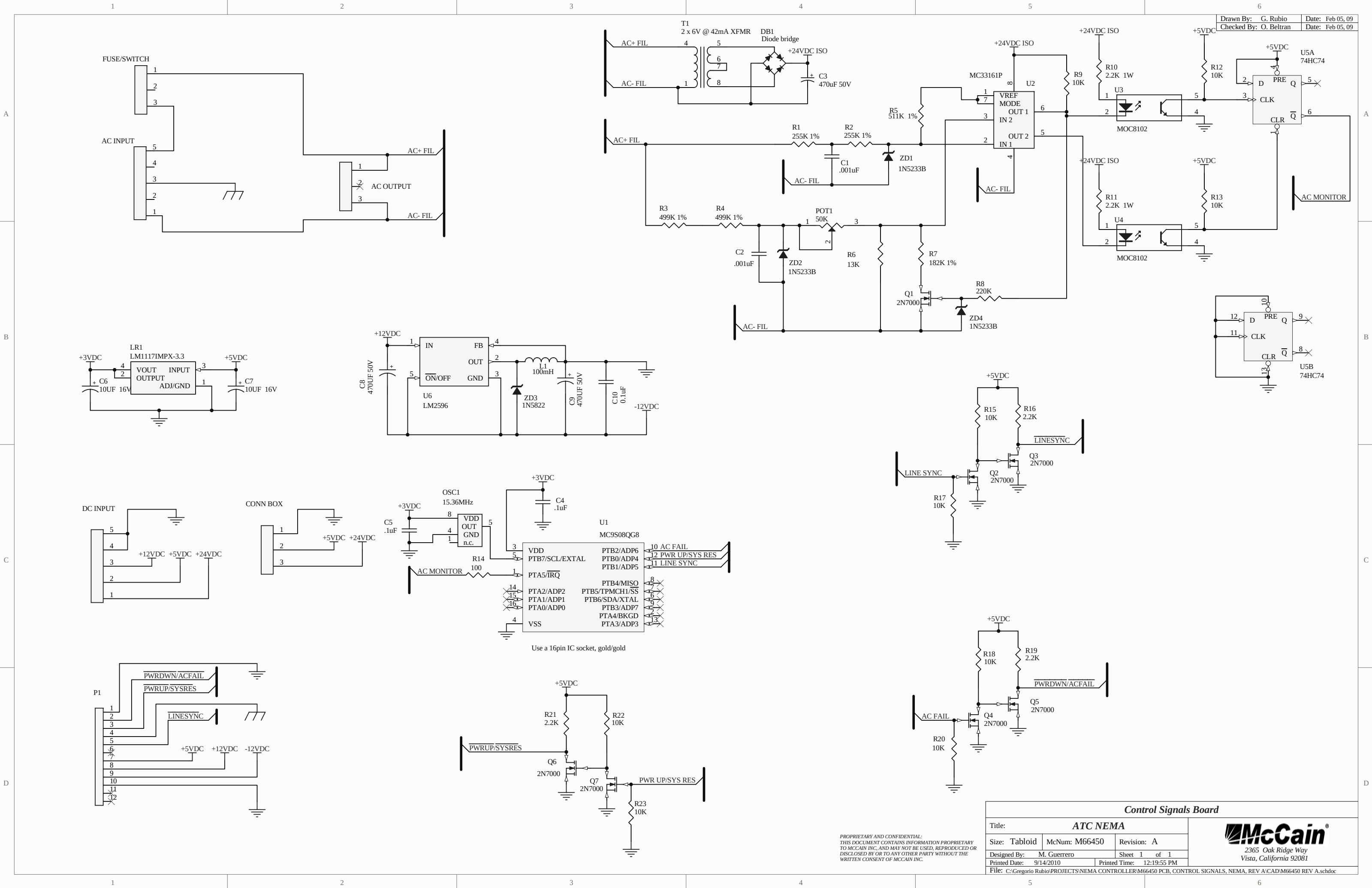


PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

SCH, MODEM BOARD NEMA				
Title: NEMA CONTROLLER		 2365 Oak Ridge Way Vista, California 92081		
Size: Tabloid	McNum: M66279			Revision: A
Designed By: M. Guerrero				Sheet 1 of 1
Printed Date: 9/23/2010				Printed Time: 9:31:04 AM
File: C:\Documents and Settings\obeltran\My Documents\obeltran\NEMA CONTROLLER MODEM PCB\CAD FILES\MODEM NEMA.SCHDOC				



SCHEMATIC	TITLE
M66450	PCB, CONTROL SIGNALS, ATC NEMA



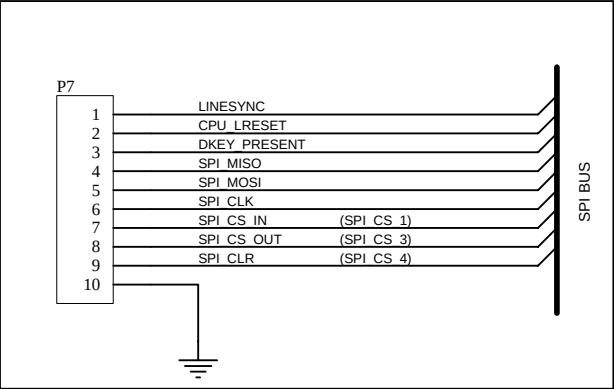
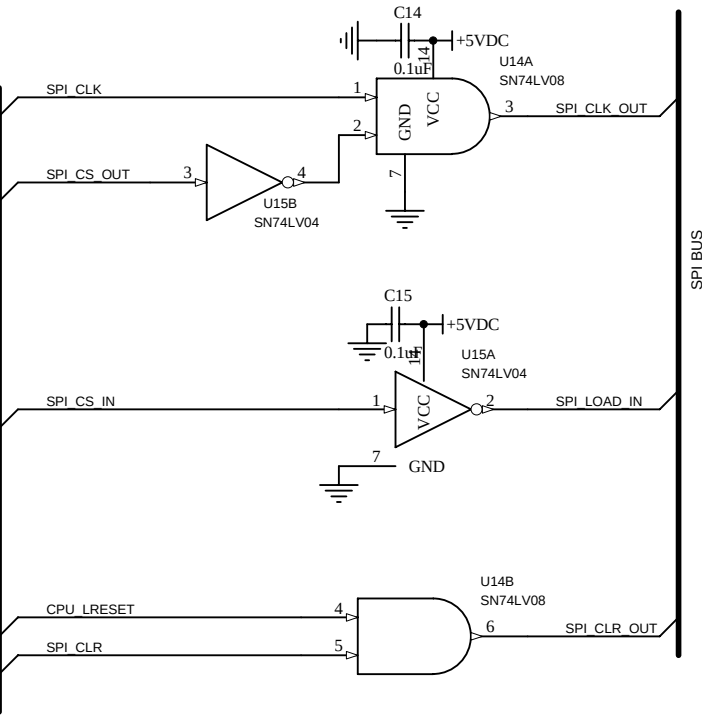
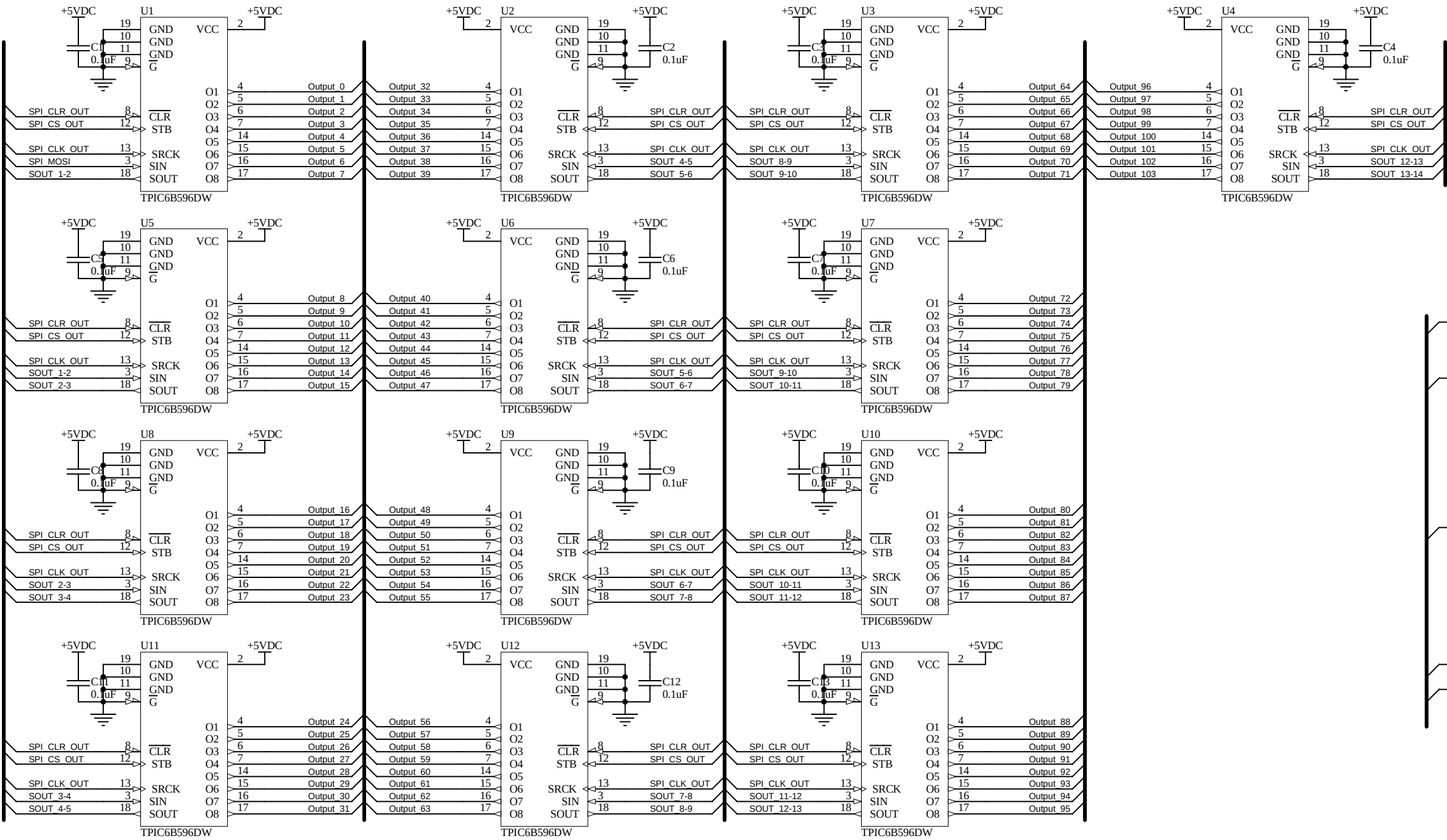
PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Control Signals Board			
Title:		ATC NEMA	
Size: Tabloid	McNum: M66450	Revision: A	
Designed By: M. Guerrero		Sheet 1 of 1	
Printed Date: 9/14/2010		Printed Time: 12:19:55 PM	
File: C:\Gregorio Rubio\PROJECTS\NEMA CONTROLLER\M66450 PCB, CONTROL SIGNALS, NEMA, REV A\CAD\M66450 REV A.schdoc			



SCHEMATIC	TITLE
M66449	PCB, CONN BOX, ATC NEMA, STD MCCAIN

Output Drivers

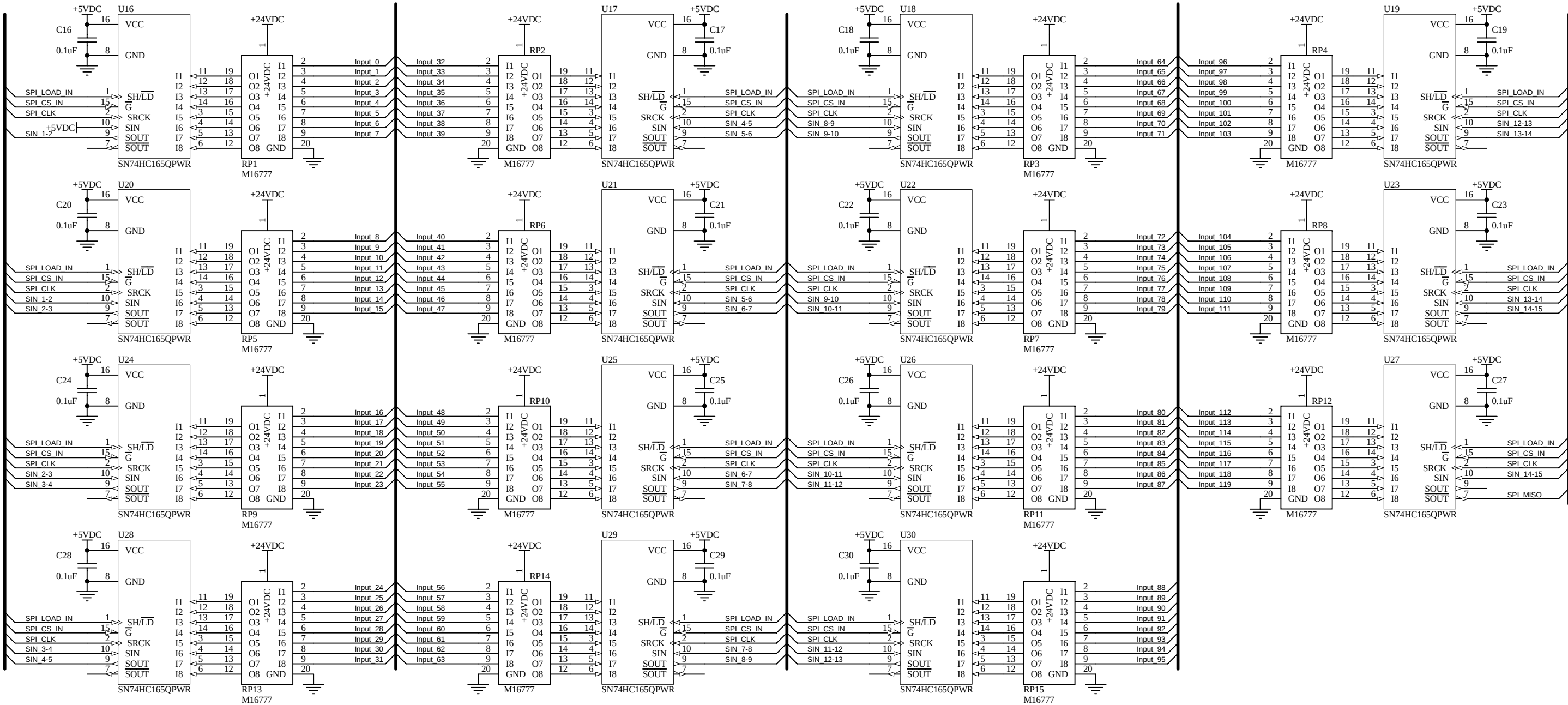


PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Output Drivers			
Title: - ABCD NEMA Connectors Box -			
Size: Tabloid	McNum: M66449	Revision: A	
Designed By: M Guerrero	Sheet 1 of 3		 2365 Oak Ridge Way Vista, California 92081
Printed Date: 9/23/2010	Printed Time: 10:58:43 AM		
File: C:\Documents and Settings\obeltran\My Documents\obeltran\INTERFACE BOX\CAD_files\NEMABoxConnector_1.SCHDOC			



Input Drivers



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Input Drivers			
Title: - ABCD NEMA Connectors Box -			
Size: Tabloid	McNum: M66449	Revision: A	
Designed By: M Guerrero		Sheet 2 of 3	
Printed Date: 9/23/2010		Printed Time: 10:58:12 AM	
File: C:\Documents and Settings\obeltran\My Documents\obeltran\INTERFACE_BOX\CAD_files\NEMABoxConnector_2.SCHDOC			



2365 Oak Ridge Way
Vista, California 92081



ABCD Connectors

P1	Fault Monitor	A-A	FaultMonitor
	+24VDC External	A-B	+24VDC
	Voltage Monitor	A-C	VoltageMonitor
	Phase 1 Red	A-D	Output 0
	Phase 1 Don't Walk	A-E	Output 24
	Phase 2 Red	A-F	Output 1
	Phase 2 Don't Walk	A-G	Output 25
	Phase 2 Ped Clear	A-H	Output 33
	Phase 2 Walk	A-J	Output 41
	Phase 2 Veh Detect	A-K	Input 1
	Phase 2 Ped Detect	A-L	Input 9
	Phase 2 Hold	A-M	Input 17
	Stop Timing - Rng1	A-N	Input 41
	Inh Max Term - Rng1	A-P	Input 42
	External Start	A-R	Input 56
	Internal Advance	A-S	Input 57
	Indicator Lamp Ctrl	A-T	Input 58
	110VAC Neutral	A-U	110VAC NTRL
	110VAC/Chassis Gnd	A-V	110VAC CHASSIS
	2070N DC Gnd	A-W	DGND
	Flashing Logic Out	A-X	Output 86
	Coded Stat BitC Rng1	A-Y	Output 90
	Phase 1 Yellow	A-Z	Output 8
	Phase 1 Ped Clear	A-a'	Output 32
	Phase 2 Yellow	A-b'	Output 9
	Phase 2 Green	A-c'	Output 17
	Phase 2 Check	A-d'	Output 49
	Phase 2 On	A-e'	Output 65
	Phase 1 Veh Detect	A-f'	Input 0
	Phase 1 Ped Detect	A-g'	Input 8
	Phase 1 Hold	A-h'	Input 16
	Force Off Rng1	A-i'	Input 40
	Min Recall All Phases	A-j'	Input 59
	Manual Control En	A-k'	Input 60
	Call Non-Actuated I	A-m'	Input 47
	Test Input A	A-n'	Input 64
	110VAC Hot	A-p'	110VAC HOT
	I/O Mode BitA	A-q'	Input 61
	Coded Stat BitB Rng1	A-r'	Output 89
	Phase 1 Green	A-s'	Output 16
	Phase 1 Walk	A-t'	Output 40
	Phase 1 Check	A-u'	Output 48
	Phase 1 Ped Omit	A-v'	Input 25
	Omit All Red Clr Ph 1	A-w'	Input 46
	Red Rest Mode Rng1	A-x'	Input 43
	I/O Mode BitB	A-y'	Input 62
	Call Non-Actuated II	A-z'	Input 55
	Test Input B	A-AA	Input 65
	Walk Rest Modifier	A-BB	Input 67
	Coded Stat BitA Rng1	A-CC	Output 88
	Phase 1 On	A-DD	Output 64
	Phase 1 Ped Omit	A-EE	Input 24
	Ped Recycle Rng1	A-FF	Input 44
	Max II Sel Rng1	A-GG	Input 45
	I/O Mode BitC	A-HH	Input 63

CONN A

P2	Phase 1 Next	B-A	Output 56
	Reserved	B-B	Input 68
	Phase 2 Next	B-C	Output 57
	Phase 3 Green	B-D	Output 18
	Phase 3 Yellow	B-E	Output 10
	Phase 3 Red	B-F	Output 2
	Phase 4 Red	B-G	Output 3
	Phase 4 Ped Clear	B-H	Output 35
	Phase 4 Don't Walk	B-J	Output 27
	Phase 4 Check	B-K	Output 51
	Phase 4 Veh Detect	B-L	Input 3
	Phase 4 Ped Detect	B-M	Input 11
	Phase 3 Veh Detect	B-N	Input 2
	Phase 3 Ped Detect	B-P	Input 10
	Phase 3 Omit	B-R	Input 34
	Phase 2 Omit	B-S	Input 33
	Phase 5 Ped Omit	B-T	Input 28
	Phase 1 Omit	B-U	Input 32
	Ped Recycle Rng2	B-V	Input 52
	Reserved	B-W	Input 69
	Reserved	B-X	Input 70
	Phase 3 Walk	B-Y	Output 42
	Phase 3 Ped Clear	B-Z	Output 34
	Phase 3 Don't Walk	B-a'	Output 26
	Phase 4 Green	B-b'	Output 19
	Phase 4 Yellow	B-c'	Output 11
	Phase 4 Walk	B-d'	Output 43
	Phase 4 On	B-e'	Output 67
	Phase 4 Next	B-f'	Output 59
	Phase 4 Omit	B-g'	Input 35
	Phase 4 Hold	B-h'	Input 19
	Phase 3 Hold	B-i'	Input 18
	Phase 3 Ped Omit	B-j'	Input 26
	Phase 6 Ped Omit	B-k'	Input 29
	Phase 7 Ped Omit	B-m'	Input 30
	Phase 8 Ped Omit	B-n'	Input 31
	Overlap A Yellow	B-p'	Output 73
	Overlap A Red	B-q'	Output 74
	Phase 3 Check	B-r'	Output 50
	Phase 3 On	B-s'	Output 66
	Phase 3 Next	B-t'	Output 58
	Overlap D Red	B-u'	Output 85
	Reserved	B-v'	Input 71
	Overlap D Green	B-w'	Input 83
	Phase 4 Ped Omit	B-x'	Input 27
	Not Assigned	B-y'	Input 53
	Max II Select Rng2	B-z'	Input 53
	Overlap A Green	B-AA	Output 72
	Overlap B Yellow	B-BB	Output 76
	Overlap B Red	B-CC	Output 77
	Overlap C Red	B-DD	Output 82
	Overlap D Yellow	B-EE	Output 84
	Overlap C Green	B-FF	Output 80
	Overlap B Green	B-GG	Output 75
	Overlap C Yellow	B-HH	Output 81

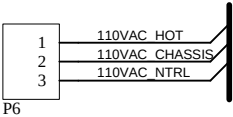
CONN B

P3	Coded St BitA Rng2	C-A	Output 91
	Coded St BitB Rng2	C-B	Output 92
	Phase 8 Don't Walk	C-C	Output 31
	Phase 7 Yellow	C-D	Output 7
	Phase 7 Red	C-E	Output 14
	Phase 6 Red	C-F	Output 6
	Phase 5 Red	C-G	Output 5
	Phase 5 Yellow	C-H	Output 4
	Phase 5 Ped Clear	C-J	Output 12
	Phase 5 Don't Walk	C-K	Output 36
	Phase 5 Next	C-L	Output 28
	Phase 5 On	C-M	Output 60
	Phase 5 Veh Detect	C-N	Output 68
	Phase 5 Ped Detect	C-P	Input 4
	Phase 6 Veh Detect	C-R	Input 12
	Phase 6 Ped Detect	C-S	Input 5
	Phase 7 Ped Detect	C-T	Input 13
	Phase 7 Veh Detect	C-U	Input 14
	Phase 8 Ped Detect	C-V	Input 6
	Phase 8 Hold	C-W	Input 15
	Force Off Rng2	C-X	Input 23
	Stop Timing Rng2	C-Y	Input 48
	Inh Max Timing Rng2	C-Z	Input 49
	Test Input C	C-a'	Input 50
	Coded Stat BitC Rng2	C-b'	Input 66
	Phase 8 Walk	C-c'	Output 93
	Phase 8 Yellow	C-d'	Output 47
	Phase 7 Green	C-e'	Output 15
	Phase 6 Green	C-f'	Output 22
	Phase 5 Walk	C-g'	Output 21
	Phase 5 Check	C-h'	Output 13
	Phase 5 Hold	C-i'	Output 20
	Phase 5 Omit	C-j'	Output 44
	Phase 6 Hold	C-k'	Output 52
	Phase 6 Omit	C-m'	Input 20
	Phase 7 Omit	C-n'	Input 36
	Phase 8 Omit	C-p'	Input 21
	Phase 8 Veh Detect	C-q'	Input 37
	Red Rest Mode Rng2	C-r'	Input 38
	Omit All Red Rng2	C-s'	Input 39
	Phase 8 Ped Clear	C-t'	Input 7
	Phase 8 Green	C-u'	Input 51
	Phase 7 Don't Walk	C-v'	Input 54
	Phase 6 Don't Walk	C-w'	Output 39
	Phase 6 Ped Clear	C-x'	Output 23
	Phase 6 Check	C-y'	Output 30
	Phase 6 Next	C-z'	Output 29
	Phase 7 Hold	C-AA	Output 37
	Phase 8 Check	C-BB	Output 53
	Phase 8 On	C-CC	Output 69
	Phase 8 Next	C-DD	Output 61
	Phase 7 Walk	C-EE	Input 22
	Phase 7 Ped Clear	C-FF	Output 55
	Phase 6 Walk	C-GG	Output 71
	Phase 7 Check	C-HH	Output 63
	Phase 7 On	C-JJ	Output 46
	Phase 7 Next	C-KK	Output 38
		C-LL	Output 45
		C-MM	Output 54
		C-NN	Output 70
		C-PP	Output 62

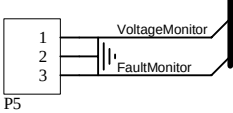
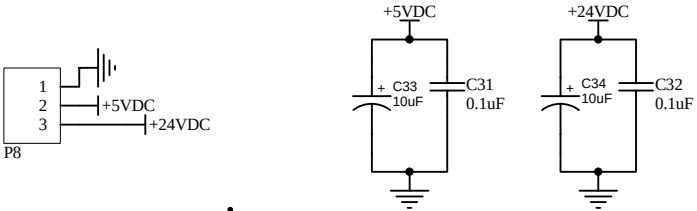
CONN C

P4	Detector 9	D-A	Input 72
	Detector 10	D-B	Input 73
	Detector 11	D-C	Input 74
	Detector 12	D-D	Input 75
	Detector 13	D-E	Input 76
	Detector 14	D-F	Input 77
	Detector 15	D-G	Input 78
	Detector 16	D-H	Input 79
	Detector 17	D-J	Input 80
	Detector 18	D-K	Input 81
	Detector 19	D-L	Input 82
	Detector 20	D-M	Input 83
	Detector 21	D-N	Input 84
	Detector 22	D-P	Input 85
	Detector 23	D-R	Input 86
	Detector 24	D-S	Input 87
	Clock Update	D-T	Input 88
	Hardware Control	D-U	Input 89
	Cycle Advance	D-V	Input 90
	Max 3 Selection	D-W	Input 91
	Max 4 Selection	D-X	Input 92
	Free	D-Y	Input 93
	Not Assigned	D-Z	Input 94
	Not Assigned	D-a'	Input 95
	Alarm 1	D-b'	Input 96
	Alarm 2	D-c'	Input 97
	Alarm 3	D-d'	Input 98
	Alarm 4	D-e'	Input 99
	Alarm 5	D-f'	Input 100
	Flash In	D-g'	Input 101
	Conflict Mon Status	D-h'	Input 102
	Door Ajaz	D-i'	Input 103
	Special Function 1	D-j'	Input 104
	Special Function 2	D-k'	Input 105
	Special Function 3	D-m'	Input 106
	Special Function 4	D-n'	Input 107
	Special Function 5	D-p'	Input 108
	Special Function 6	D-q'	Input 109
	Special Function 7	D-r'	Input 110
	Special Function 8	D-s'	Input 111
	Preempt 1 In	D-t'	Input 112
	Preempt 2 In	D-u'	Input 113
	Preempt 3 In	D-v'	Input 114
	Preempt 4 In	D-w'	Input 115
	Preempt 5 In	D-x'	Input 116
	Preempt 6 In	D-y'	Input 117
	Alarm 1 Out	D-z'	Output 94
	Alarm 2 Out	D-AA	Output 95
	Special Funct 1 Out	D-BB	Output 96
	Special Funct 2 Out	D-CC	Output 97
	Special Funct 3 Out	D-DD	Output 98
	Special Funct 4 Out	D-EE	Output 99
	Special Funct 5 Out	D-FF	Output 100
	Special Funct 6 Out	D-GG	Output 101
	Special Funct 7 Out	D-HH	Output 102
	Special Funct 8 Out	D-JJ	Output 103
	Not Assigned	D-KK	Input 118
	Detector Reset	D-LL	Output 87
	Not Assigned	D-MM	Input 119
	+24 VDC	D-NN	+24VDC
	2070N DC Ground	D-PP	

CONN D



110VAC CONNECTOR



POWER CONNECTOR

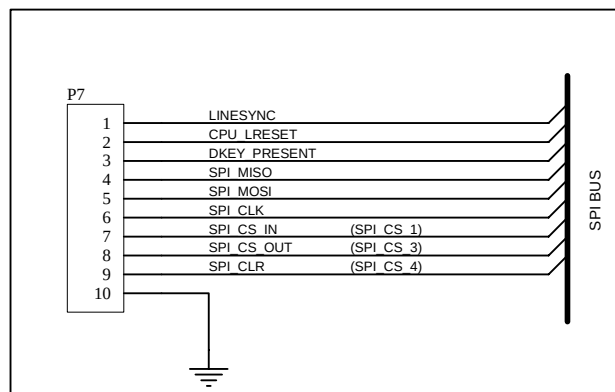
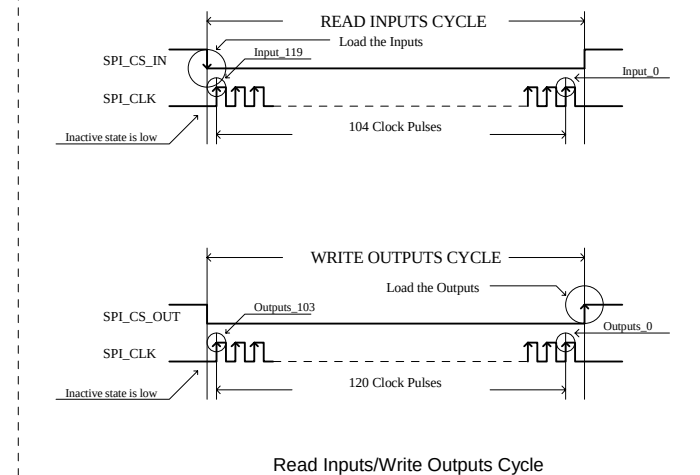
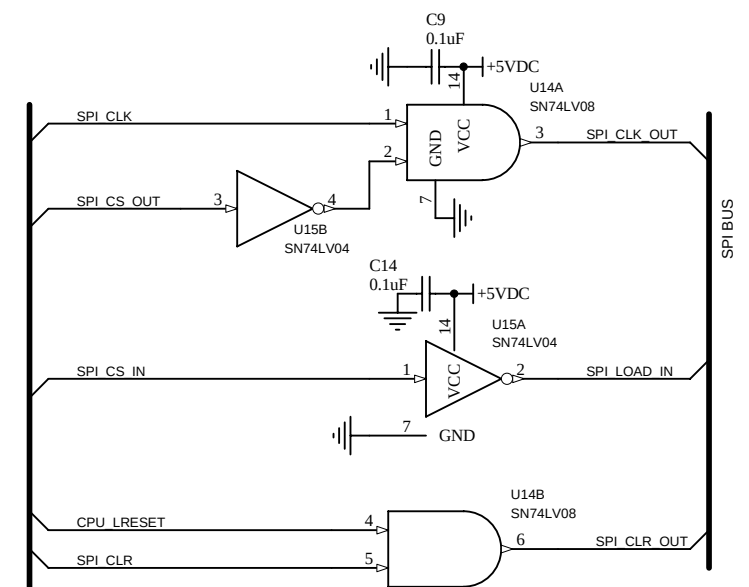
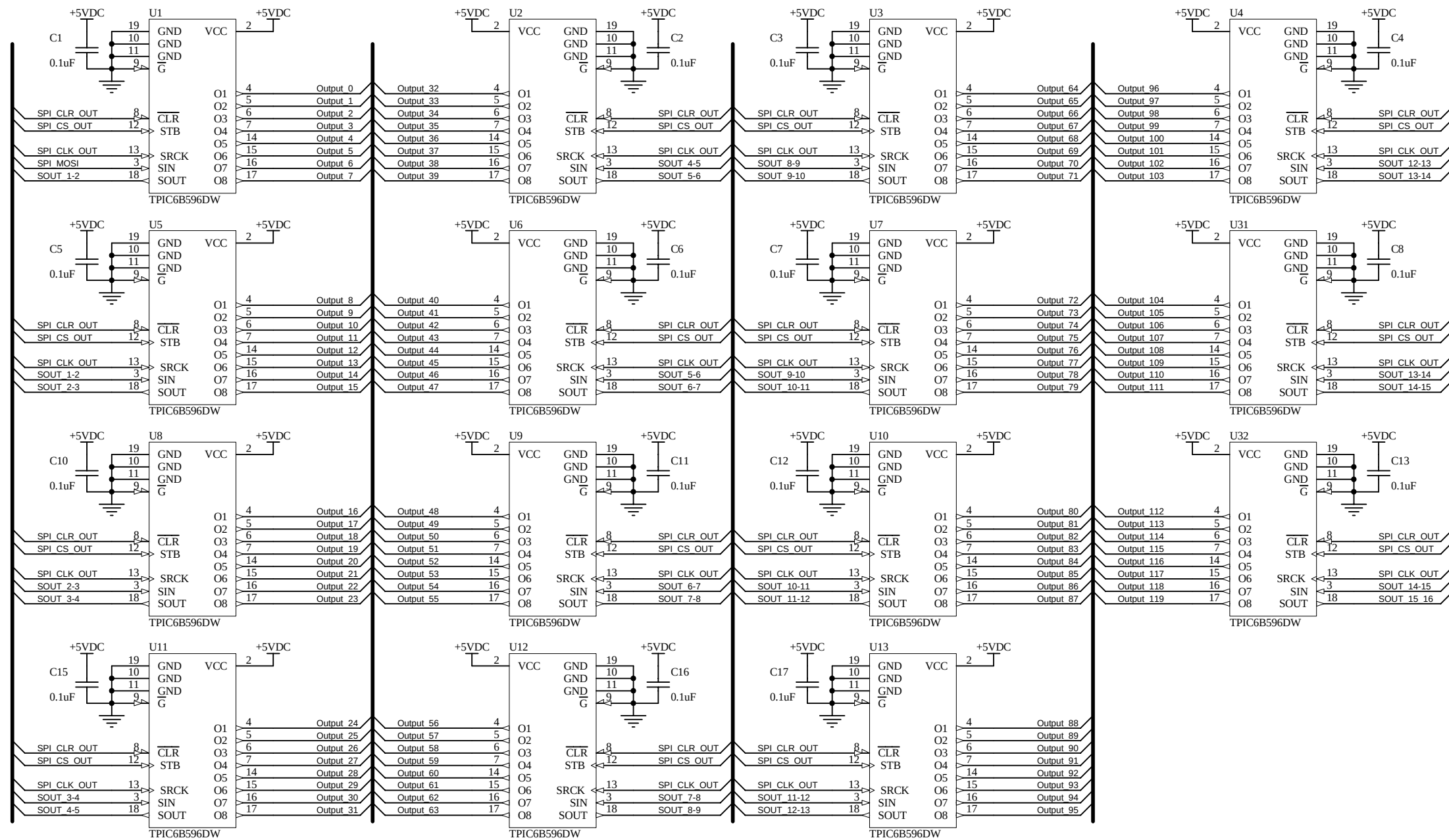
PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

ABCD(61 pins) Connectors				
Title: - ABCD NEMA Connectors Box -			 2365 Oak Ridge Way Vista, California 92081	
Size: Tabloid	McNum: M66449	Revision: A		
Designed By: M Guerrero		Sheet 3 of 3		
Printed Date: 9/23/2010	Printed Time: 10:59:05 AM			
File: C:\Documents and Settings\obeltran\My Documents\obeltran\INTERFACE_BOX\CAD_files\NEMABoxConnector_3.SCHDOC				



SCHEMATIC	TITLE
M44647	PCB, CONN BOX, ATC NEMA, TRACONEX COMPATIBLE

Output Drivers



Output Drivers

Title: **CONNECTOR BOX TRACONEX**

Size: Tabloid	McNum: M44647	Revision: A
---------------	---------------	-------------

Designed By:	M Guerrero	Sheet 1 of 3
--------------	------------	--------------

Printed Date: 10/5/2010	Printed Time: 11:59:26 AM	Visa, California 92081
File: C:\Documents and Settings\obeltran\My Documents\obeltran\CONNECTOR BOX(D CONN)\CAD FILES\NEMABox_2_Connector_1.SCHDOC		

PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC, AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

McCain®
2365 Oak Ridge Way
Vista, California 92081

Input Drivers

A

B

C

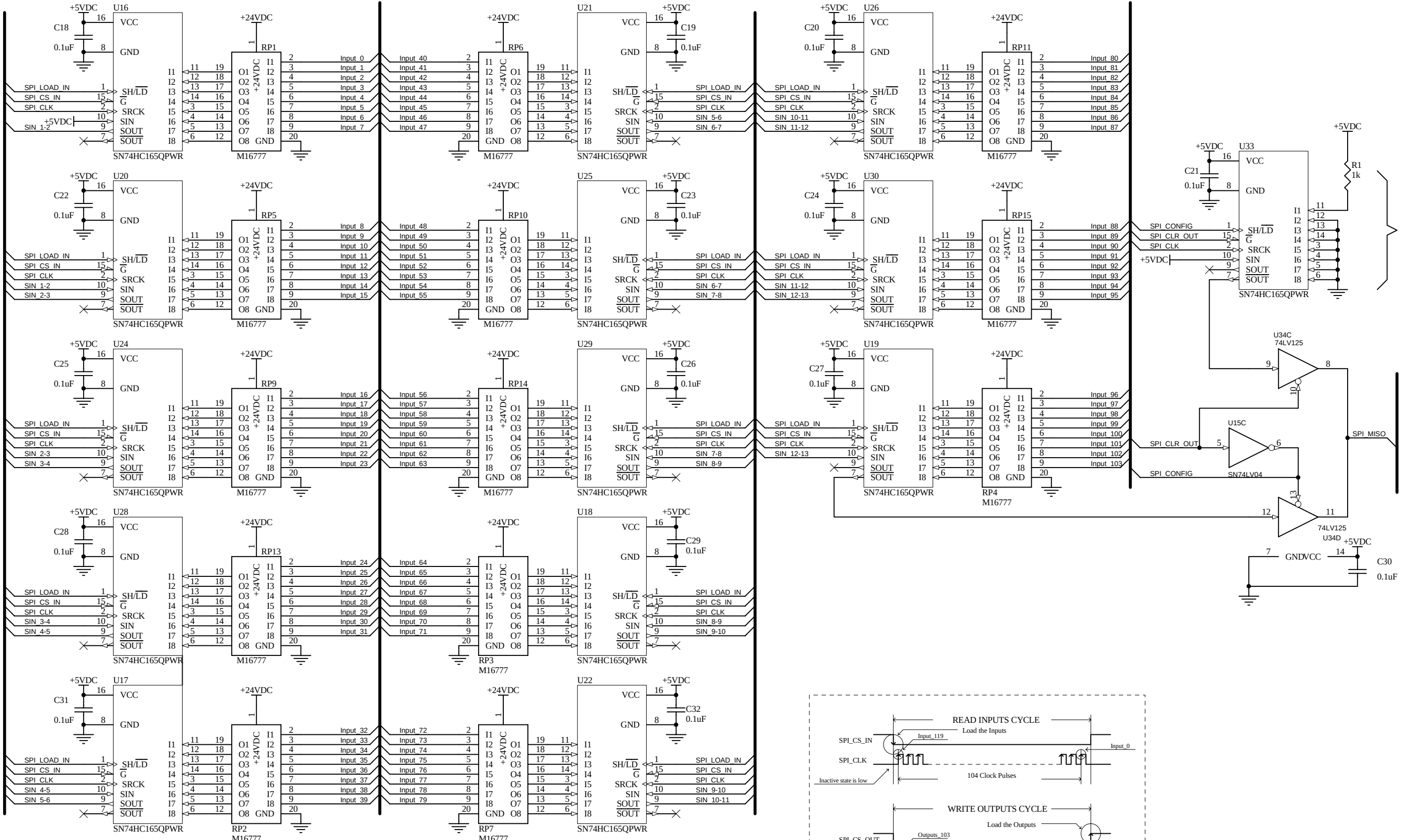
D

A

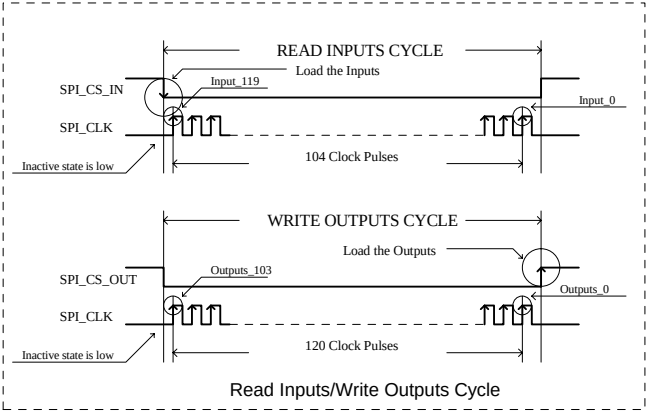
B

C

D



Input Interface



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

Input Drivers			
Title: CONNECTOR BOX TRACONEX			
Size: Tabloid	McNum: M44647	Revision: A	
Designed By: M Guerrero		Sheet 2	of 3
Printed Date: 10/5/2010		Printed Time: 11:59:46 AM	
File: C:\Documents and Settings\obeltran\My Documents\obeltran\CONNECTOR BOX(D CONN)\CAD FILES\NEMABox_2_Connector_2.SCHDOC			



ABCD Connectors

P1		A-A	FaultMonitor
Fault Monitor		A-B	+24VDC
+24VDC External		A-C	VoltageMonitor
Voltage Monitor		A-D	Output 0
Phase 1 Red		A-E	Output 24
Phase 1 Don't Walk		A-F	Output 1
Phase 2 Red		A-G	Output 25
Phase 2 Don't Walk		A-H	Output 33
Phase 2 Ped Clear		A-J	Output 41
Phase 2 Walk		A-K	Input 1
Phase 2 Veh Detect		A-L	Input 9
Phase 2 Ped Detect		A-M	Input 17
Phase 2 Hold		A-N	Input 41
Stop Timing - Rng1		A-P	Input 42
Inh Max Term - Rng1		A-R	Input 56
External Start		A-S	Input 57
Internal Advance		A-T	Input 58
Indicator Lamp Ctrl		A-U	110VAC NTRL
110VAC Neutral		A-V	110VAC CHASSIS
110VAC/Chassis Gnd		A-W	DGND
2070N DC Gnd		A-X	Output 86
Flashing Logic Out		A-Y	Output 90
Coded Stat BitC Rng1		A-Z	Output 8
Phase 1 Yellow		A-a'	Output 32
Phase 1 Ped Clear		A-b'	Output 9
Phase 2 Yellow		A-c'	Output 17
Phase 2 Green		A-d'	Output 49
Phase 2 Check		A-e'	Output 65
Phase 2 On		A-f'	Input 0
Phase 1 Veh Detect		A-g'	Input 8
Phase 1 Ped Detect		A-h'	Input 16
Phase 1 Hold		A-i'	Input 40
Force Off Rng1		A-j'	Input 59
Min Recall All Phases		A-k'	Input 60
Manual Control En		A-m'	Input 47
Call Non-Actuated I		A-n'	Input 64
Test Input A		A-p'	110VAC HOT
110VAC Hot		A-q'	Input 61
I/O Mode BitA		A-r'	Output 89
Coded Stat BitB Rng1		A-s'	Output 16
Phase 1 Green		A-t'	Output 40
Phase 1 Walk		A-u'	Output 48
Phase 1 Check		A-v'	Input 25
Phase 1 Ped Omit		A-w'	Input 46
Omit All Red Clr Ph 1		A-x'	Input 43
Red Rest Mode Rng1		A-y'	Input 62
I/O Mode BitB		A-z'	Input 55
Call Non-Actuated II		A-AA	Input 65
Test Input B		A-BB	Input 67
Walk Rest Modifier		A-CC	Output 88
Coded Stat BitA Rng1		A-DD	Output 64
Phase 1 On		A-EE	Input 24
Phase 1 Ped Omit		A-FF	Input 44
Ped Recycle Rng1		A-GG	Input 45
Max II Sel Rng1		A-HH	Input 63
I/O Mode BitC			

CONN A

P2		B-A	Output 56
Phase 1 Next		B-B	Input 68
Reserved		B-C	Output 57
Phase 2 Next		B-D	Output 18
Phase 3 Green		B-E	Output 10
Phase 3 Yellow		B-F	Output 2
Phase 3 Red		B-G	Output 3
Phase 4 Red		B-H	Output 35
Phase 4 Ped Clear		B-J	Output 27
Phase 4 Don't Walk		B-K	Output 51
Phase 4 Check		B-L	Input 3
Phase 4 Veh Detect		B-M	Input 11
Phase 4 Ped Detect		B-N	Input 2
Phase 3 Veh Detect		B-P	Input 10
Phase 3 Ped Detect		B-R	Input 34
Phase 3 Omit		B-S	Input 33
Phase 2 Omit		B-T	Input 28
Phase 5 Ped Omit		B-U	Input 32
Phase 1 Omit		B-V	Input 52
Ped Recycle Rng2		B-W	Input 69
Reserved		B-X	Input 70
Reserved		B-Y	Output 42
Phase 3 Walk		B-Z	Output 34
Phase 3 Ped Clear		B-a'	Output 26
Phase 3 Don't Walk		B-b'	Output 19
Phase 4 Green		B-c'	Output 11
Phase 4 Yellow		B-d'	Output 43
Phase 4 Walk		B-e'	Output 67
Phase 4 On		B-f'	Output 59
Phase 4 Next		B-g'	Input 35
Phase 4 Omit		B-h'	Input 19
Phase 4 Hold		B-i'	Input 18
Phase 3 Hold		B-j'	Input 26
Phase 3 Ped Omit		B-k'	Input 29
Phase 6 Ped Omit		B-m'	Input 30
Phase 7 Ped Omit		B-n'	Input 31
Phase 8 Ped Omit		B-p'	Output 73
Overlap A Yellow		B-q'	Output 74
Overlap A Red		B-r'	Output 50
Phase 3 Check		B-s'	Output 66
Phase 3 On		B-t'	Output 58
Phase 3 Next		B-u'	Input 85
Overlap D Red		B-v'	Input 71
Reserved		B-w'	Input 83
Overlap D Green		B-x'	Input 27
Phase 4 Ped Omit		B-y'	Input 53
Not Assigned		B-z'	Input 53
Max II Select Rng2		B-AA	Output 72
Overlap A Green		B-BB	Output 76
Overlap B Yellow		B-CC	Output 77
Overlap B Red		B-DD	Output 82
Overlap C Red		B-EE	Output 84
Overlap D Yellow		B-FF	Output 80
Overlap C Green		B-GG	Output 75
Overlap B Green		B-HH	Output 81
Overlap C Yellow			

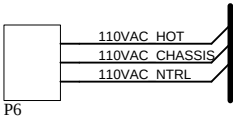
CONN B

P3		C-A	Output 91
Coded St BitA Rng2		C-B	Output 92
Coded St BitB Rng2		C-C	Output 31
Phase 8 Don't Walk		C-D	Output 7
Phase 7 Yellow		C-E	Output 14
Phase 7 Red		C-F	Output 6
Phase 6 Red		C-G	Output 5
Phase 5 Red		C-H	Output 4
Phase 5 Yellow		C-J	Output 12
Phase 5 Ped Clear		C-K	Output 36
Phase 5 Don't Walk		C-L	Output 28
Phase 5 Next		C-M	Output 60
Phase 5 On		C-N	Output 68
Phase 5 Veh Detect		C-P	Input 4
Phase 5 Ped Detect		C-R	Input 12
Phase 6 Veh Detect		C-S	Input 5
Phase 6 Ped Detect		C-T	Input 13
Phase 7 Ped Detect		C-U	Input 14
Phase 7 Veh Detect		C-V	Input 6
Phase 8 Ped Detect		C-W	Input 15
Phase 8 Hold		C-X	Input 23
Force Off Rng2		C-Y	Input 48
Stop Timing Rng2		C-Z	Input 49
Inh Max Timing Rng2		C-a'	Input 50
Test Input C		C-b'	Input 66
Coded Stat BitC Rng2		C-c'	Output 93
Phase 8 Walk		C-d'	Output 47
Phase 8 Yellow		C-e'	Output 15
Phase 7 Green		C-f'	Output 22
Phase 6 Green		C-g'	Output 21
Phase 5 Yellow		C-h'	Output 13
Phase 5 Green		C-i'	Output 20
Phase 5 Check		C-j'	Output 44
Phase 5 Hold		C-k'	Output 52
Phase 5 Omit		C-m'	Input 20
Phase 6 Hold		C-n'	Input 36
Phase 6 Omit		C-p'	Input 21
Phase 7 Omit		C-q'	Input 37
Phase 8 Omit		C-r'	Input 38
Phase 8 Veh Detect		C-s'	Input 39
Red Rest Mode Rng2		C-t'	Input 7
Omit All Red Rng2		C-u'	Input 51
Phase 8 Ped Clear		C-v'	Input 54
Phase 8 Green		C-w'	Output 39
Phase 7 Don't Walk		C-x'	Output 23
Phase 6 Don't Walk		C-y'	Output 30
Phase 6 Ped Clear		C-z'	Output 29
Phase 6 Check		C-AA	Output 37
Phase 6 On		C-BB	Output 53
Phase 6 Next		C-CC	Output 69
Phase 7 Hold		C-DD	Output 61
Phase 8 Check		C-EE	Input 22
Phase 8 On		C-FF	Output 55
Phase 8 Next		C-GG	Output 71
Phase 7 Walk		C-HH	Output 63
Phase 7 Ped Clear		C-JJ	Output 46
Phase 6 Walk		C-KK	Output 38
Phase 7 Check		C-LL	Output 45
Phase 7 On		C-MM	Output 54
Phase 7 Next		C-NN	Output 70
		C-PP	Output 62

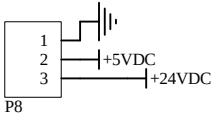
CONN C

P4		D01	Output 115
Emerg Pr 4 Out		D02	Output 106
Offset 3 Out		D03	Input 83
Offset 4 (add bit 3)		D04	Input 85
Online		D05	Output 119
Spare		D06	Input 75
Dial (cycle plan) 4 Input		D07	Input 77
Dial (cycle plan) 6 Input		D08	Output 110
Special Function 2		D09	Input 79
Split 3		D10	Input 81
Offset 2 (add bit 1)		D11	Output 118
Flash Out		D12	Input 80
Offset 1 (add bit 0)		D13	Input 103
Syst DET 8		D14	Input 76
Dial (cycle plan) 5 Input		D15	Output 111
Special Function 3		D16	Input 78
Split 2		D17	Input 96
Syst Det 1 <SEQ 1>		D18	Input 99
Syst Det 4 <SEQ 4>		D19	Input 86
System Enable		D20	Input 87
Dimming		D21	Output 102
Spit 2 Out		D22	Output 113
Emerg Pr 2 Out		D23	Output 116
Railroad PR Out		D24	Output 117
Spare		D25	Input 73
Dial (cycle plan) 2 Input		D26	Input 72
FREE/CORD (spec F 1)		D27	Output 96
FREE/CORD Out		D28	Output 109
Special Function 1		D29	Output 99
Dial (cycle plan) 4 Out		D30	Input 100
Syst DET 5		D31	Input 98
Syst Det 3 <SEQ 3>		D32	Output 112
Emerg Pr 1 Out		D33	Output 104
Offset 1 Out		D34	Output 114
Emerg Pr 3 Out		D35	Input 74
Dial (cycle plan) 3 Input		D36	Input 82
Offset 3 (add bit 2)		D37	Input 95
Flash status		D38	Input 84
Offset 5 (add bit 4)		D39	Input 101
Syst DET 6		D40	Input 102
Syst DET 7		D41	Output 107
Offset 4 Out		D42	Output 105
Offset 2 Out		D43	Output 97
Dial (cycle plan) 2 Out		D44	Output 98
Dial (cycle plan) 3 Out		D45	Output 108
Offset 5 Out		D46	Output 103
Split 3 Out		D47	Input 97
Syst Det 2 {SEQ > 2}		D48	Input 88
GND		D49	Input 89
Emerg PREEMPT 1		D50	Output 100
Emerg PREEMPT 2		D51	Output 101
Dial (cycle plan) 5 Out		D52	Output 101
Dial (cycle plan) 6 Out		D53	Input 94
GND		D54	Input 90
GND		D55	Input 91
Emerg PREEMPT 3		D56	Input 92
Emerg PREEMPT 4		D57	Input 93
Railroad PREEMPT		D58	Input 93
Conflict		D59	Input 94
Reserved		D60	Input 94
MUTCD Flash		D61	Input 94
Reserved		D62	Input 94
Reserved		D63	Input 94
ChassisGND			

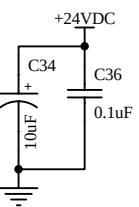
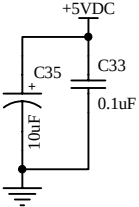
CONN D



110VAC CONNECTOR



POWER CONNECTOR



PROPRIETARY AND CONFIDENTIAL:
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
TO MCCAIN INC. AND MAY NOT BE USED, REPRODUCED OR
DISCLOSED BY OR TO ANY OTHER PARTY WITHOUT THE
WRITTEN CONSENT OF MCCAIN INC.

ABCD(61 pins) Connectors

Title: **CONNECTOR BOX TRACONEX**

Size: Tabloid | McNum: M44647 | Revision: A

Designed By: M Guerrero | Sheet 3 of 3

Printed Date: 10/5/2010 | Printed Time: 12:00:07 PM

File: C:\Documents and Settings\obeltran\My Documents\obeltran\CONNECTOR BOX(D CONN)\CAD FILES\NEMABox_2_Connector_3.SCHDOC

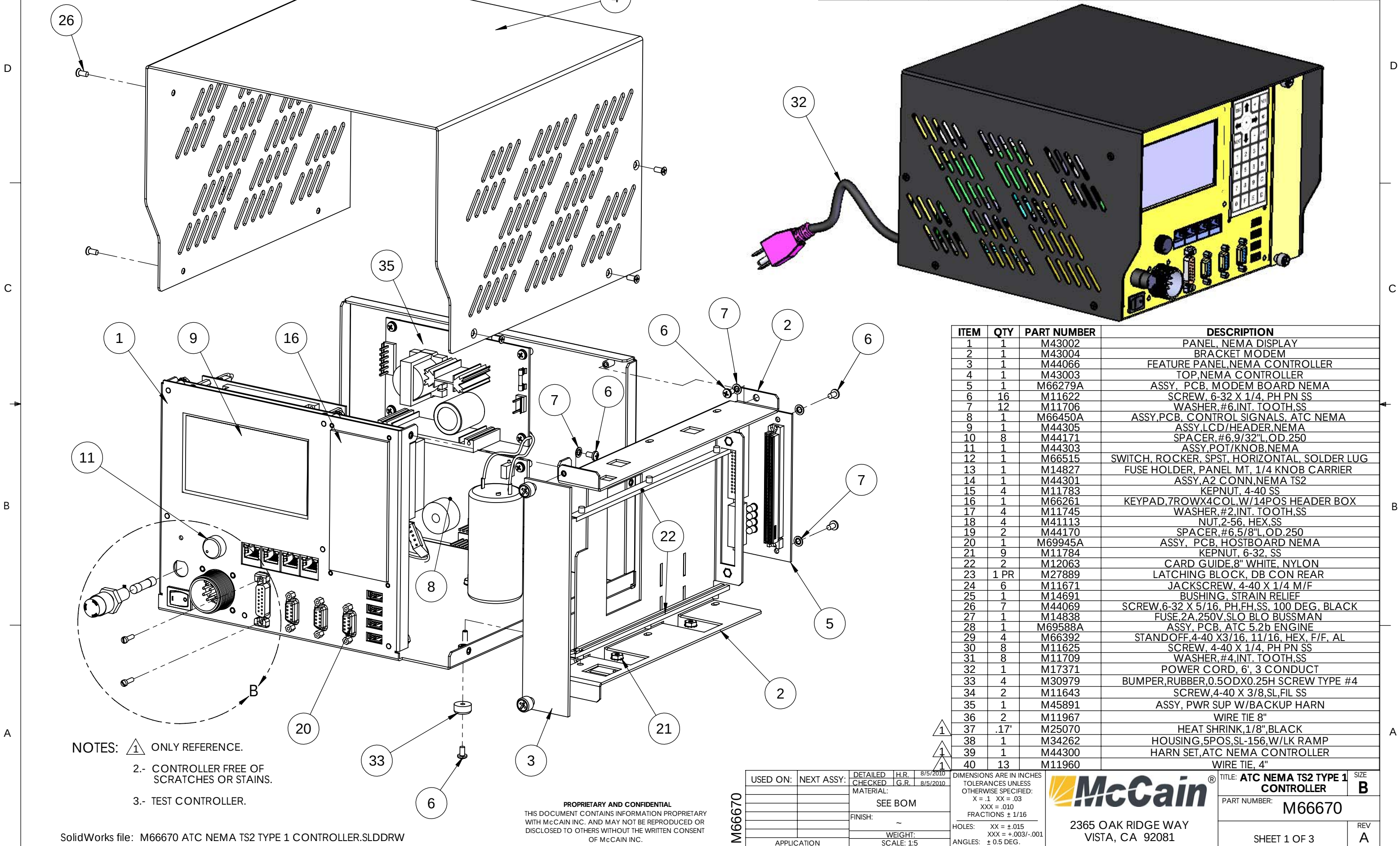


APPENDIX B: ASSEMBLY DRAWINGS

DRAWING	TITLE
M66670	ATC NEMA CONTROLLER
M66671	CONNECTOR BOX, ATC NEMA
M44646	CONNECTOR BOX, ATC NEMA, TRACONEX COMPATIBLE

DRAWING	TITLE
M66670	ATC NEMA CONTROLLER

REVISONS					
REV.	ECN	DATE	ZONE	DESCRIPTION	DET
A	EC-090129	08/05/2010		INITIAL RELEASE	H.R.



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	M43002	PANEL, NEMA DISPLAY
2	1	M43004	BRACKET MODEM
3	1	M44066	FEATURE PANEL,NEMA CONTROLLER
4	1	M43003	TOP,NEMA CONTROLLER
5	1	M66279A	ASSY, PCB, MODEM BOARD NEMA
6	16	M11622	SCREW, 6-32 X 1/4, PH PN SS
7	12	M11706	WASHER, #6,INT. TOOTH,SS
8	1	M66450A	ASSY,PCB, CONTROL SIGNALS, ATC NEMA
9	1	M44305	ASSY,LCD/HEADER,NEMA
10	8	M44171	SPACER, #6,9/32"L, OD.250
11	1	M44303	ASSY,POT/KNOB,NEMA
12	1	M66515	SWITCH, ROCKER, SPST, HORIZONTAL, SOLDER LUG
13	1	M14827	FUSE HOLDER, PANEL MT, 1/4 KNOB CARRIER
14	1	M44301	ASSY,A2 CONN,NEMA TS2
15	4	M11783	KEPNUT, 4-40 SS
16	1	M66261	KEYPAD,7ROWX4COL,W/14POS HEADER BOX
17	4	M11745	WASHER, #2,INT. TOOTH,SS
18	4	M41113	NUT,2-56, HEX,SS
19	2	M44170	SPACER, #6,5/8"L, OD.250
20	1	M69945A	ASSY, PCB, HOSTBOARD NEMA
21	9	M11784	KEPNUT, 6-32, SS
22	2	M12063	CARD GUIDE,8" WHITE, NYLON
23	1 PR	M27889	LATCHING BLOCK, DB CON REAR
24	6	M11671	JACKSCREW, 4-40 X 1/4 M/F
25	1	M14691	BUSHING, STRAIN RELIEF
26	7	M44069	SCREW,6-32 X 5/16, PH,FH,SS, 100 DEG, BLACK
27	1	M14838	FUSE,2A,250V,SLO BLO BUSSMAN
28	1	M69588A	ASSY, PCB, ATC 5.2b ENGINE
29	4	M66392	STANDOFF, 4-40 X3/16, 11/16, HEX, F/F, AL
30	8	M11625	SCREW, 4-40 X 1/4, PH PN SS
31	8	M11709	WASHER, #4,INT. TOOTH,SS
32	1	M17371	POWER CORD, 6', 3 CONDUCT
33	4	M30979	BUMPER,RUBBER,0.5ODX0.25H SCREW TYPE #4
34	2	M11643	SCREW,4-40 X 3/8,SL,FIL SS
35	1	M45891	ASSY, PWR SUP W/BACKUP HARN
36	2	M11967	WIRE TIE 8"
37	.17'	M25070	HEAT SHRINK,1/8",BLACK
38	1	M34262	HOUSING,5POS,SL-156,W/LK RAMP
39	1	M44300	HARN SET,ATC NEMA CONTROLLER
40	13	M11960	WIRE TIE, 4"

- NOTES: 1- ONLY REFERENCE.
- 2.- CONTROLLER FREE OF SCRATCHES OR STAINS.
- 3.- TEST CONTROLLER.

SolidWorks file: M66670 ATC NEMA TS2 TYPE 1 CONTROLLER.SLDDRW

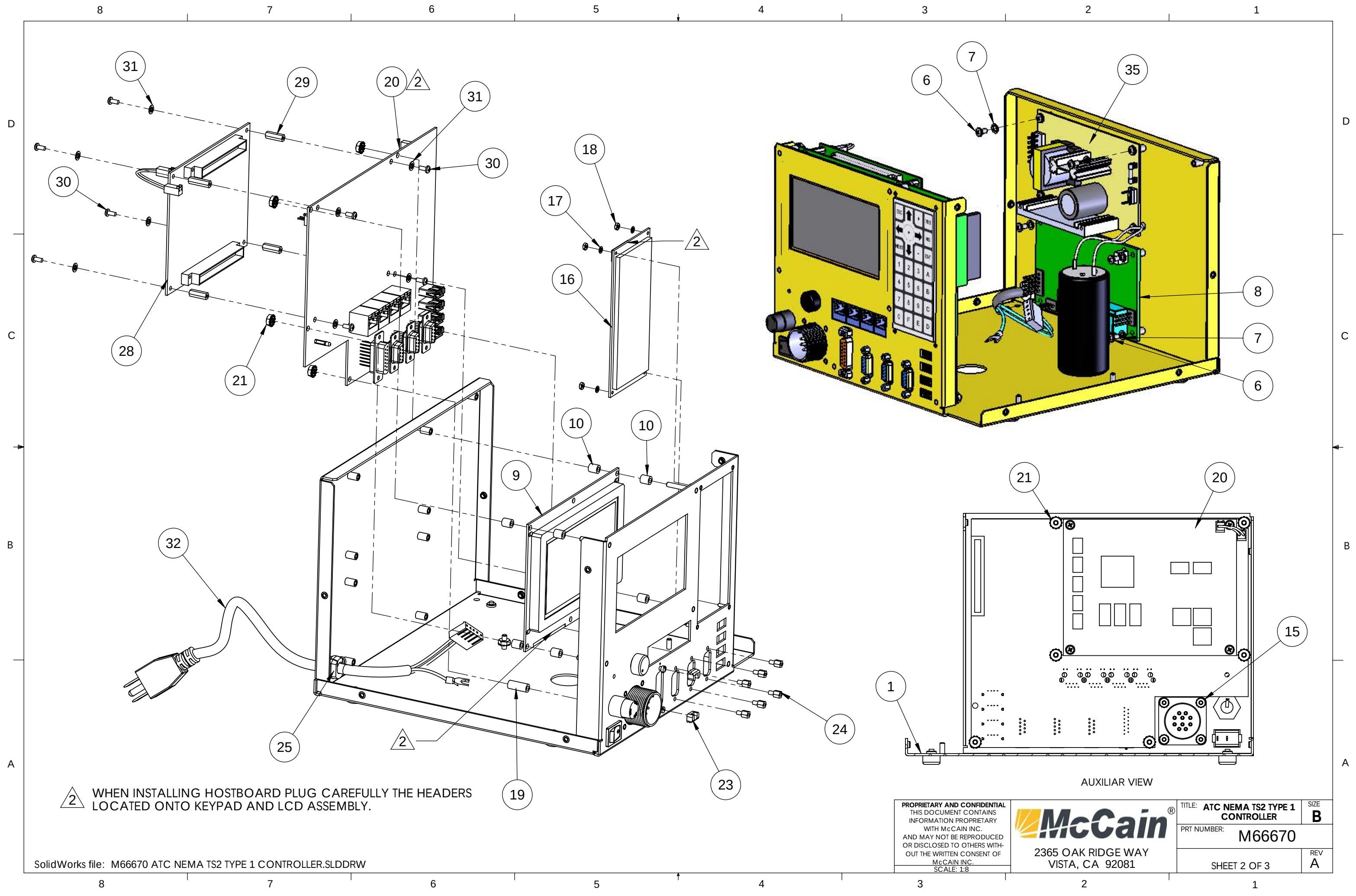
PROPRIETARY AND CONFIDENTIAL
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
WITH MCCAIN INC. AND MAY NOT BE REPRODUCED OR
DISCLOSED TO OTHERS WITHOUT THE WRITTEN CONSENT
OF MCCAIN INC.

USED ON:	NEXT ASSY:	DETAILED CHECKED	H.R.	8/5/2010
		MATERIAL:		8/5/2010
		SEE BOM		
		FINISH:		
		WEIGHT:		
		SCALE: 1:5		
		APPLICATION		

DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS
OTHERWISE SPECIFIED:
X = .1 XX = .03
XXX = .010
FRACTIONS ± 1/16
HOLES: XX = ±.015
XXX = +.003/-.001
ANGLES: ± 0.5 DEG.

McCain
2365 OAK RIDGE WAY
VISTA, CA 92081

TITLE: ATC NEMA TS2 TYPE 1 CONTROLLER	SIZE B
PART NUMBER: M66670	
SHEET 1 OF 3	REV A



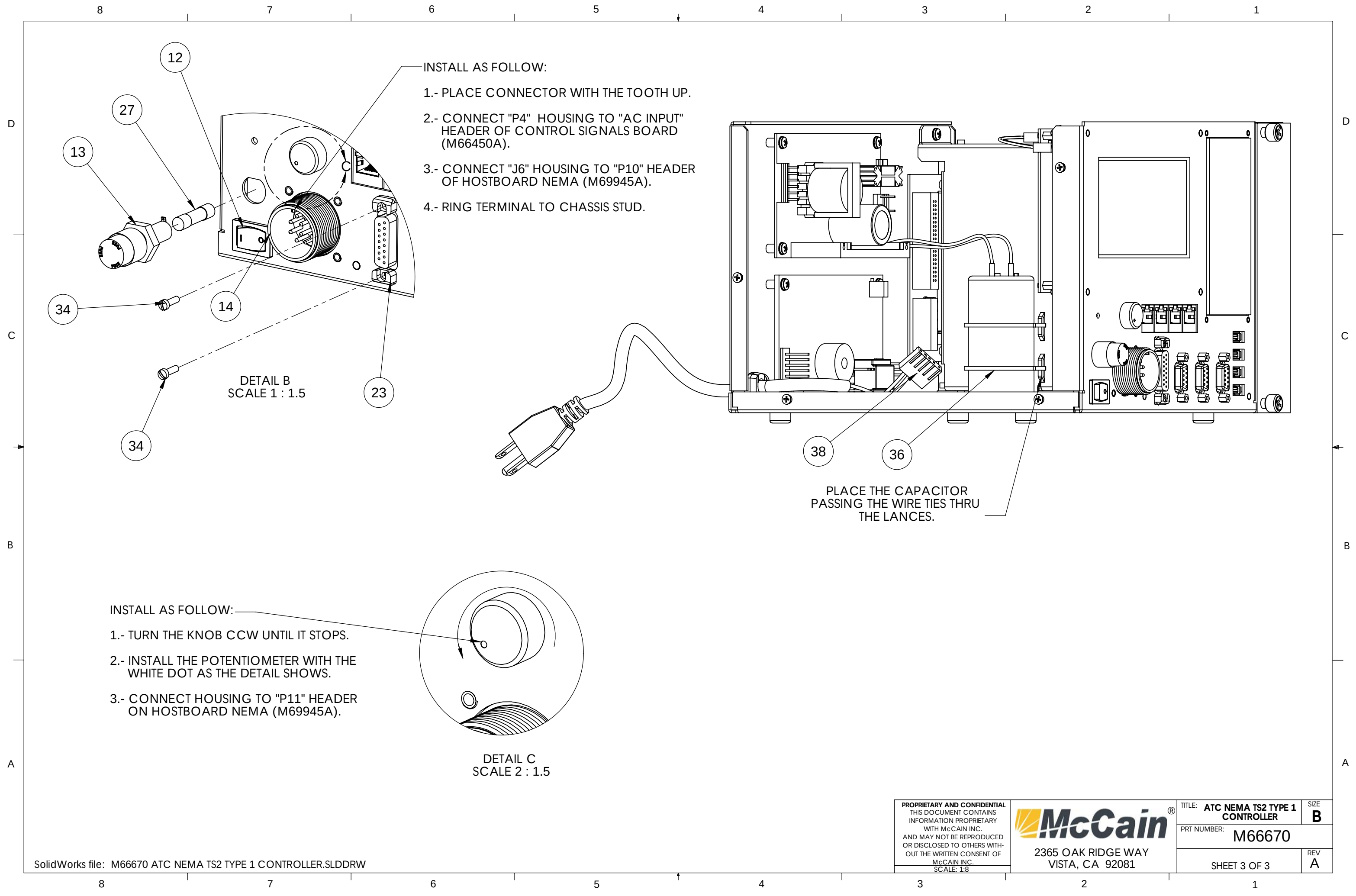
2 WHEN INSTALLING HOSTBOARD PLUG CAREFULLY THE HEADERS LOCATED ONTO KEYPAD AND LCD ASSEMBLY.

SolidWorks file: M66670 ATC NEMA TS2 TYPE 1 CONTROLLER.SLDDRW

PROPRIETARY AND CONFIDENTIAL
THIS DOCUMENT CONTAINS
INFORMATION PROPRIETARY
WITH MCCAIN INC.
AND MAY NOT BE REPRODUCED
OR DISCLOSED TO OTHERS WITH-
OUT THE WRITTEN CONSENT OF
MCCAIN INC.
SCALE: 1:8

McCain
2365 OAK RIDGE WAY
VISTA, CA 92081

TITLE: ATC NEMA TS2 TYPE 1 CONTROLLER		SIZE B
PRT NUMBER: M66670		REV A
SHEET 2 OF 3		



- INSTALL AS FOLLOW:
- 1.- PLACE CONNECTOR WITH THE TOOTH UP.
 - 2.- CONNECT "P4" HOUSING TO "AC INPUT" HEADER OF CONTROL SIGNALS BOARD (M66450A).
 - 3.- CONNECT "J6" HOUSING TO "P10" HEADER OF HOSTBOARD NEMA (M69945A).
 - 4.- RING TERMINAL TO CHASSIS STUD.

DETAIL B
SCALE 1 : 1.5

- INSTALL AS FOLLOW:
- 1.- TURN THE KNOB CCW UNTIL IT STOPS.
 - 2.- INSTALL THE POTENTIOMETER WITH THE WHITE DOT AS THE DETAIL SHOWS.
 - 3.- CONNECT HOUSING TO "P11" HEADER ON HOSTBOARD NEMA (M69945A).

DETAIL C
SCALE 2 : 1.5

PLACE THE CAPACITOR
PASSING THE WIRE TIES THRU
THE LANCES.

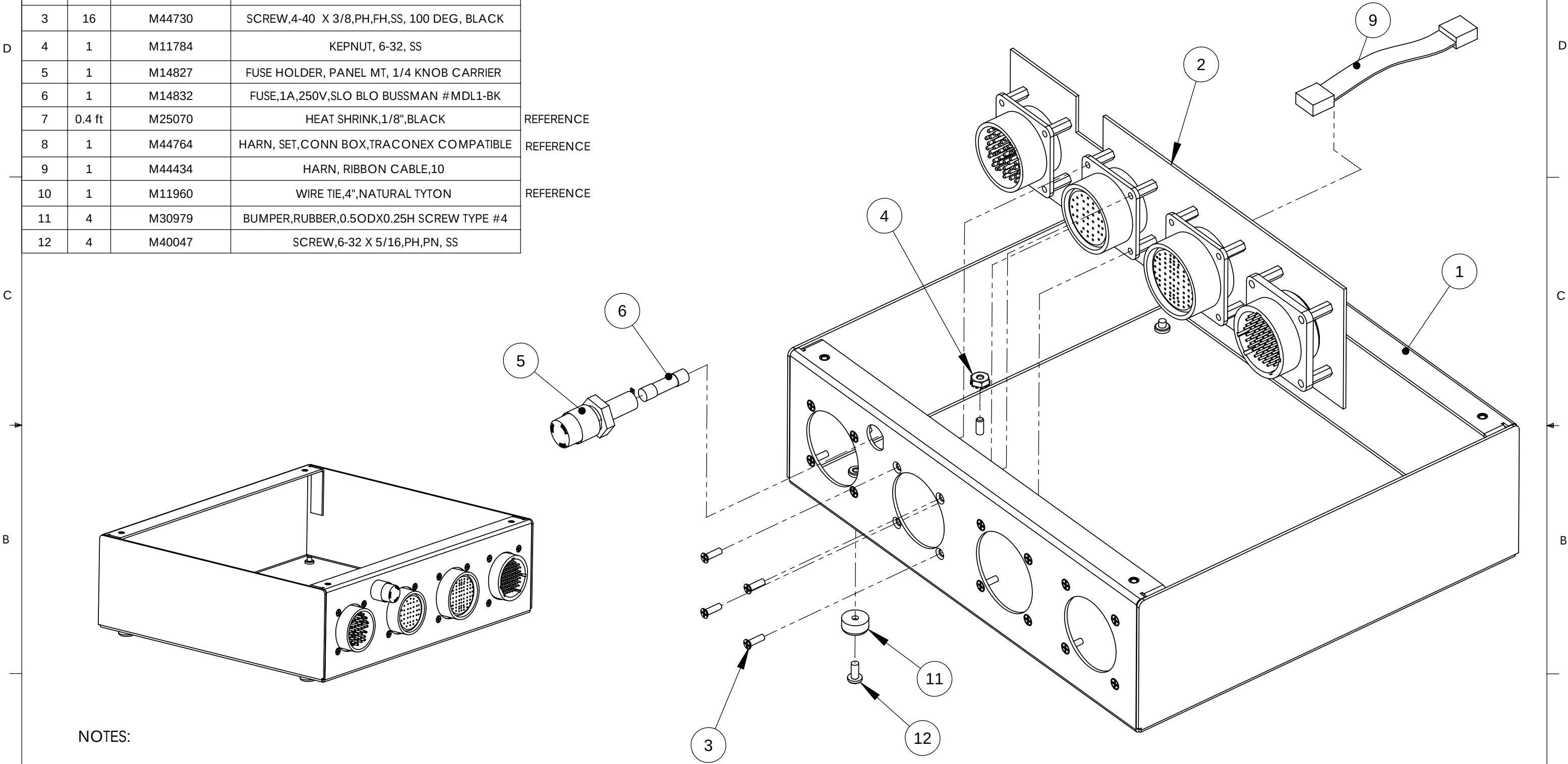
DRAWING	TITLE
M66671	CONNECTOR BOX, ATC NEMA, STD MCCAIN

DRAWING	TITLE
M44646	CONNECTOR BOX, NEMA, TRACONEX COMPATIBLE

ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	M44561	CHASSIS,CONN BOX, TRACONEX
2	1	M44647A	ASSY,PCB, ATC NEMA, CONN BOX,TRACONEX
3	16	M44730	SCREW,4-40 X 3/8,PH,FH,SS, 100 DEG, BLACK
4	1	M11784	KEPNUT, 6-32, SS
5	1	M14827	FUSE HOLDER, PANEL MT, 1/4 KNOB CARRIER
6	1	M14832	FUSE,1A,250V,SLO BLO BUSSMAN #MDL1-BK
7	0.4 ft	M25070	HEAT SHRINK,1/8",BLACK
8	1	M44764	HARN, SET,CONN BOX,TRACONEX COMPATIBLE
9	1	M44434	HARN, RIBBON CABLE,10
10	1	M11960	WIRE TIE,4",NATURAL TYTON
11	4	M30979	BUMPER,RUBBER,0.5ODX0.25H SCREW TYPE #4
12	4	M40047	SCREW,6-32 X 5/16,PH,PN, SS

REFERENCE
REFERENCE
REFERENCE

REVISIONS				
REV.	ECN	DATE	DESCRIPTION	DET
A	EC-090203	08/07/10	INITIAL RELEASE	H.R.



NOTES:

1. INSTALL HARN M44764 ACCORDING TO WIRE LIST
USE HEATSHRINK ON FUSE'S CONNECTIONS.
2. SECURE CONNECTIONS TO CHASSIS BY USING A KEPNUT P/N
M11784.
3. KEEP HARNESS' WIRES TOGETHER BY USING A WIRE TIE P/N M11960

SolidWorks file: M44646 NEMA CONNECTOR BOX, TRACONEX COMPATIBLE.SLDDRW

PROPRIETARY AND CONFIDENTIAL
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY
WITH McCAIN INC. AND MAY NOT BE REPRODUCED OR
DISCLOSED TO OTHERS WITHOUT THE WRITTEN CONSENT
OF McCAIN INC.

M44646

USED ON:	NEXT ASSY:	DETAILED CHECKED	H.R. 12/3/2009
		G.R. 12/3/2009	
		MATERIAL: SEE BOM	
		FINISH:	
		WEIGHT:	
		SCALE: 9:16	
APPLICATION			

DIMENSIONS ARE IN INCHES
TOLERANCES UNLESS
OTHERWISE SPECIFIED:
X = .1 XX = .03
XXX = .010
FRACTIONS ± 1/16
HOLES: XX = ±.015
XXX = +.003/- .001
ANGLES: ± 0.5 DEG.

McCain
2365 OAK RIDGE WAY
VISTA, CA 92081

TITLE: NEMA CONNECTOR BOX, TRACONEX COMPATIBLE	SIZE B
PART NUMBER: M44646	REV A
SHEET 1 OF 1	

APPENDIX C: BILL OF MATERIALS

BILL OF MATERIALS	DESCRIPTION
M66670	ATC NEMA CONTROLLER
M66671	CONNECTOR BOX, ATC NEMA, STD MCCAIN
M44646	CONNECTOR BOX, ATC NEMA, TRACONEX COMPATIBLE

BILL OF MATERIALS	DESCRIPTION
M66670	ATC NEMA CONTROLLER

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
0	A	M66670	ATC NEMA CONTROLLER, TS2 TYPE 1		1.00	EA		
1		M11622	SCREW,6-32 X 1/4,PH,PN,SS		16.00	EA		
1		M11625	SCREW,4-40 X 1/4,PH,PN,SS		8.00	EA		
1		M11643	SCREW,4-40 X 3/8,SL,FIL SS		2.00	EA		
1		M11671	JACKSCREW,4-40 X 1/4,M/F TAP		6.00	EA	KEYSTONE	7228
1		M11706	WASHER,#6,INT. TOOTH,SS		12.00	EA		
1		M11709	WASHER,#4,INT. TOOTH,SS		8.00	EA		
1		M11745	WASHER,#2,INT. TOOTH,SS		4.00	EA		
1		M11783	NUT,4-40,KEPNUT,SS		4.00	EA		
1		M11784	NUT,6-32,KEPNUT,SS		9.00	EA		
1		M11960	WIRE TIE,4",NATURAL TYTON #T18R9M4		13.00	EA	PANDUIT CORP.	PLT1M-M
1		M11967	WIRE TIE,8",NATURAL, TYTON #T50R9M4		2.00	EA		
1		M12063	CARD GUIDE,8",WHITE,NYLON		2.00	EA	SAE	1800F
1		M14691	BUSHING,STRAIN RELIEF - HEYCO #HEY1210		1.00	EA	HEYCO MOUSER	HEY1210 561MP6P4SPC SRR-10
1		M14827	FUSE HOLDER,PANEL MT,1/4 KNOB CARRIER		1.00	EA	COOPER BUSSMA. COOPER BUSSMA.	BK/HTB-44I-R HTB-44I
1		M14838	FUSE,2A,250V,SLO BLO BUSSMAN #MDL2		1.00	EA	BUSSMAN BUSSMAN BUSSMAN	BK/MDL-2-R MDL-2/BK MDL2
1		M25070	HEAT SHRINK,1/8",BLACK		0.17	FT		
1		M27889	LATCHING BLOCK,DB CON REAR PANEL		1.00	PR	TYCO	747080-2
1		M30979	BUMPER,RUBBER,0.5ODX0.25H SCREW		4.00	EA	KEYSTONE	720
1		M34262	HOUSING,5POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-5
1		M41113	NUT, 2-56, HEX,SS		4.00	EA		
1	A	M43002	PANEL, NEMA DISPLAY		1.00	EA		
2		M11886	STUD,PEM FHS-632-6 ST,6-32, .137, .375,SS		2.00	EA		
2		M11892	NUT,SELF CLINC CLS-632-2 S/S		4.00	EA		
2		M11958	STUD,PEM FHS-440-8 ST,4-40, .111, .500,SS		4.00	EA		
2		M11982	STUD,PEM FHS-632-8 ST,6-32, .137, .500,SS		1.00	EA		
2		M11984	NUT,SELF CLINC FEX-632 S/S		8.00	EA		

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M12098	STANDOFF,PEM BSOS-632-12 SO,6-32,.213,		9.00	EA		
2		M19332	AL SHT,5052,.063X48X120 0.8798#/SQ. FT.		2.20	LB		
2		M19617	POWDER,YELLOW,SPRAYLAT #PPL930001		0.15	LB		
2		M43006	STUD,PEM FHLS 632-16		6.00	EA	PEM	FHLS-632-16
2		M69437	STUD, PEM FHS-256-6,THREADED,		4.00	EA		
1	A	M43003	TOP, NEMA CONTROLLER		1.00	EA		
2		M19335	AL SHT,5052,.063X48X96 0.880#/SQ. FT.		2.01	LB		
2		M43007	POWDER COAT, SILVER VEIN		0.15	LB	SPRAYLAT	PEBS 98802
1	A	M43004	BRACKET, MODEM		1.00	EA		
2		M12033	NUT,SELF CLINC FEX-M3 METRIC		2.00	EA		
2		M12132	STANDOFF,PEM BSOS-632-10 SO,6-32,.213,		2.00	EA		
2		M19332	AL SHT,5052,.063X48X120 0.8798#/SQ. FT.		0.73	LB		
2		M19617	POWDER,YELLOW,SPRAYLAT #PPL930001		0.06	LB		
1	A	M44066	FEATURE PANEL,NEMA CONTROLLER		1.00	EA		
2		M19466	AL SHT,5052,.100X48X144 1.397#/SQ. FT.		0.21	LB		
2		M19617	POWDER,YELLOW,SPRAYLAT #PPL930001		0.01	LB		
2		M68509	SCREW,CAPT. COMBO, 47-80-183-10		2.00	EA	SOUTHCO	47-80-183-10
1		M44069	SCREW,6-32 X 5/16,PH,FH,SS, 100 DEG		7.00	EA		
1		M44170	SPACER,#6,5/8"L,OD.250		2.00	EA	ABBATRON HH RAF ELECTRONIC	4025 1130-6-N
1		M44171	SPACER,#6,9/32"L,OD.250		8.00	EA	RAF ELECTRONIC	1124T-6-N
1	P	M44300	HARN SET,ATC NEMA CONTROLLER		1.00	EA		
2		M13844	WIRE,22,BLK,19STR MIL-W-16878/2		0.21	FT	NATIONAL WIR WHITMORE	MIL-W-16878/2 CU2219340
2		M13846	WIRE,20,BLK,19STR MIL-W-16878/2		2.60	FT	NATIONAL WIRE	NC1932U-0
2		M13848	WIRE,18,WHT/BLU,19STR MIL-W-16878/2		0.60	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13860	WIRE,20,BLU,19STR MIL-W-16878/2		1.50	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13867	WIRE,22,BLU,19STR MIL-W-16878/2		0.21	FT	NATIONAL WIRE	NC1934U-6
2		M13890	WIRE,20,WHT,19STR NC1932U-9		0.50	FT	NATIONAL WIRE	NC1932U-9
2		M13891	WIRE,20,WHT/RD,19STR MIL-W-16878/2		2.67	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13892	WIRE,20,RD,19STR NB1932N-2		2.10	FT	NATIONAL WIRE	NB1932N-2
2		M13906	WIRE,20,ORG,19STR		1.34	FT	NATIONAL WIRE	MIL-W-16878-3
2		M13945	WIRE,20,YEL,19STR		0.75	FT	NATIONAL WIRE	NB1932N4

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M13946	WIRE,20,GRN,19STR MIL-W-16878/2		1.80	FT	NATIONAL WIRE	MIL-W-16878/2
2		M24636	TERM,#6,RD,RING TONGUE		5.00	EA	TYCO	51863-1
2		M24666	HOUSING,3POS,SL-156,W/LK RAMP;NO TAB		3.00	EA	TYCO	640250-3
2		M24669	HOUSING,6POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-6
2		M24670	HOUSING,8POS,SL-156,W/LK RAMP		1.00	EA	TYCO	TAMP640250-8
2		M24773	CONTACT,CRIMP FOR MTA SL GOLD		25.00	EA	TYCO	770476-2
2		M24775	CONN,12POS,2ROW,PN-LOK		2.00	EA	TYCO	TAMP770581-1
2		M30384	CONN,2POS,.1C W/LOCK RAMP POLARIZING		2.00	EA	MOLEX	22-01-3027
2		M30398	CONN.CONTACTS		4.00	EA	MOLEX	08-50-0114
2		M34262	HOUSING,5POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-5
2		M40009	WIRE,20,BRN,19STR		1.50	FT		
2		M40010	WIRE,20,PUR,19STR		1.50	FT	NATIONAL WIRE	NB1932N-7
2		M44048	CONTACT,SOCKET 22-18AWG, GOLD 30u"		15.00	EA	TYCO TYCO	1-770904-0 770904-3
1	A	M44301	ASSY,A2 CONN,NEMA		1.00	EA		
2		M23021	CONN,18-10,SQ.FL.RECEPT W		1.00	EA	AMPHENOL	MS3102A18-1P
2		M25070	HEAT SHRINK,1/8",BLACK		0.13	FT		
2	P	M44302	HARN,A2 CONN,NEMA		1.00	EA		
3		M13846	WIRE,20,BLK,19STR MIL-W-16878/2		0.92	FT	NATIONAL WIRE	NC1932U-0
3		M13890	WIRE,20,WHT,19STR NC1932U-9		0.92	FT	NATIONAL WIRE	NC1932U-9
3		M13891	WIRE,20,WHT/RD,19STR MIL-W-16878/2		0.33	FT	NATIONAL WIRE	MIL-W-16878/2
3		M13946	WIRE,20,GRN,19STR MIL-W-16878/2		0.92	FT	NATIONAL WIRE	MIL-W-16878/2
3		M24636	TERM,#6,RD,RING TONGUE		1.00	EA	TYCO	51863-1
3		M24666	HOUSING,3POS,SL-156,W/LK RAMP;NO TAB		1.00	EA	TYCO	640250-3
3		M24773	CONTACT,CRIMP FOR MTA SL GOLD		4.00	EA	TYCO	770476-2
3		M34262	HOUSING,5POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-5
3		M40010	WIRE,20,PUR,19STR		0.33	FT	NATIONAL WIRE	NB1932N-7
1	A	M44303	ASSY,POT/KNOB, PANEL MOUNT		1.00	EA		
2		M25070	HEAT SHRINK,1/8",BLACK		0.13	FT		
2		M44256	RES,POT,10K,20%,PNL MNT,W/KNOB		1.00	EA	VISHAY	P16NP103MAB15
2	P	M44304	HARN,POT/KNOB,PNL MOUNT		1.00	EA		
3		M13951	WIRE,24,BLK,19STR MIL-W-16878/2		0.33	FT	NATIONAL WIRE	MIL-W-16878/2

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M13958	WIRE,24,RD,19STR		0.33	FT	NATIONAL WIRE	NB1936N-2
3		M13959	WIRE,24,WHT,19STR		0.33	FT		
3		M69866	CONN, 3PIN, 24 AWG, .1C, IDC STD, LOCK		1.00	EA	TYCO TYCO	3-641238-3 641238-3
1	A	M44305	ASSY,LCD/HEADER,NEMA		1.00	EA		
2		M35171	LCD,240X128DOTS,WHITE BKLT,W/EXTD T		1.00	EA	DENSITRON	LM42315BW240G128HF
2		M44298	HEADER,20 POS, VERTICAL, 0.100 15U" GOLD		1.00	EA	OUPIN SAMTEC	2011-1X20G15SA034 MTSW-120-06-S-S-110
1	A	M45891	ASSY, PWR SUP, W/BACKUP CAPACITOR		1.00	EA		
2		M25070	HEAT SHRINK,1/8",BLACK		0.50	FT		
2		M45724	CAP,1200uf, 400V, 20%, SNAP-IN, ELEC.		1.00	EA	PANASONIC	ECET2GA122FA
2	P	M45996	HARN, PWR SUP W/ BKP CAPACITOR		1.00	EA		
3		M13891	WIRE,20,WHT/RD,19STR MIL-W-16878/2		0.58	FT	NATIONAL WIRE	MIL-W-16878/2
3		M13892	WIRE,20,RD,19STR NB1932N-2		0.58	FT	NATIONAL WIRE	NB1932N-2
2		M66514	POWER SUPPLY, DC: 24V, 12V, 5V		1.00	EA	MEANWELL	PT-65D
1		M66261	KEYPAD,7ROWX4COL,W/14POS HEADER		1.00	EA	INPLAY TECH.	CUSTOM MADE FOR MCCAIN
1	A	M66279A	ASSY, PCB, MODEM BOARD NEMA		1.00	EA		
2		M16831	CAP,10MF,25V,10%,TANT,RAD		4.00	EA	AVX KEMET	TAP106K025SCS RT T350E106K025AS
2		M24655	CONN,96PIN,VERT,RECEPT,3R PCB MT,		1.00	EA	T&B TYCO	162-99630-7058 5535043-4
2		M44378	HEADER,8POS,MTA,156C,.045 SQ POST		1.00	EA	TYCO	3-644766-8
2		M66279	PCB, MODEM BOARD NEMA Rev. A		1.00	EA		
2	P	M66372	HARN, MODEM, 40 COND. RIBBON CABLE		1.00	EA		
3		M24753	CONN, 40 POS, IDC RIBBON CABLE		1.00	EA	T&B TYCO	622-4030 1658622-9
3		M24793	RIBBON CABLE,40 CONDUCTOR 28 AWG		0.75	FT	TYCO TYCO	971111-5 TAMP86901-5
3		M33524	CONN,40 COND,RIBBON DIP PLUG, .1X.1 C		1.00	EA	TYCO	746610-9
1		M66392	STANDOFF,4-40 X3/16, 11/16, HEX, F/F, AL		4.00	EA	FASCOMP	FC2060-440-A
1	A	M66450A	ASSY,PCB, CONTROL SIGNALS, ATC NEMA		1.00	EA		
2		M13784	RES,10K,1/4W,5%,CF	R9, R12, R13, R15, R17, R18, R20, R22, R23	9.00	EA	SEI	CF 1/4 10K 5% TR

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M16217	IC,74HC74,DUAL D FLIPFLOP W/SET&RESET	U5	1.00	EA	MOTOROLA	74HC74AN
							PHILLIPS	74HC74N
2		M16419	DIODE,1N5822,3A,40V SCHOTTKY	ZD3	1.00	EA	DIODES INC	1N5822
							MOTOROLA	1N5822
							MOTOROLA	1N5822G
2		M16571	RES,182K,1/4W,1%,MF	R7	1.00	EA	NIC COMPONENT	NMR25F1823TRF
							VISHAY DALE	CCF-50-182F
2		M16579	RES,2.2K,1/4W,5%,CF	R16, R19, R21	3.00	EA	SEI	CF 1/4 2.2K 5% TR
2		M16709	RES,100 OHM,1/4W,5%,CF	R14	1.00	EA	SEI	CF1/4 100 5% TR
2		M16714	RES,13K,1/4W,5%,CF	R6	1.00	EA	DIGI KEY	CF1/413KJRCT-ND
							SEI	CF 1/4 13K 5% R
2		M16864	CAP,10MF,16V,20%,TANT,RAD	C6, C7	2.00	EA	NEMCO	TB10/16M1
							SPRAGUE	199D106X0016C
2		M16870	CAP,.001MF,200V,CER,RAD 1000PF	C1, C2	2.00	EA	KEMET	CK05BX102K
2		M16914	CAP,470MF,50V,20%,ALEL RADIAL	C3, C8, C9	3.00	EA	CDE	226H471P050SP
							NIC COMP. CORP	NRWA471M50V12.5X20F
							NICHICON	UVZ1H471MHD
							NIPPON	NRWA471M50V12.5X20F
							THOMPSON	KMR471M1HJ21
2		M16932	CAP,.1MF,50V,10%,CER,RAD	C4, C5, C10	3.00	EA	AVX	SR205C104KAA
							AVX	SR205C104KAR
							AVX	SR205C104KARTR1
2		M16963	TRANSISTOR,2N7000,TMOS F	Q1, Q2, Q3, Q4, Q5, Q6, Q7	7.00	EA	FAIRCHILD SEMI.	2N7000
							MOTOROLA	2N7000
							SILICONIX	2N7000
2		M17207	RES,POT,50K,3/8" SIDE ADJUST	POT1	1.00	EA	BECKMAN	67XR50K
							BI TECHNOLOGY	67XR50KLF
2		M23473	RES,220K,1/4W,5%,CF	R8	1.00	EA	RG ALLEN	220KQ
							SEI	CF1/4 220K 5% TR
							YAGEO	CFR--25JB-52-220K
2		M24682	HEADER,3POS,MTA.156C,.045 SQ POST	AC OUTPUT, CONN BOX, FUSE/SWITCH	3.00	EA	TYCO	640445-3

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M24684	HEADER,5POS,MTA.156C,.045 SQ POST	AC INPUT, DC INPUT	2.00	EA	TYCO	640445-5
2		M27941	IC,33161 DUAL UNDERVOLT DETECTOR	U2	1.00	EA	ON SEMI.	MC33161PG
2		M32495	RES,255K,1/4W,1%,MF	R1, R2	2.00	EA	YAGEO	MFR-25FBB-255K
2		M32781	RES,2.2K,1W,5%,MF	R10, R11	2.00	EA	BC COMPONENTS	5073NW2K200J12AFX
							VISHAY	PR01000102201JR500
2		M32828	DIODE,ZEN 1N5233B,6V,.5W	ZD1, ZD2, ZD4	3.00	EA	FAIRCHILD	1N5233B
							MICRO SEMI.	1N5233B
2		M33976	IC,MOC8102,PHOTO TRANSIST OR,6-DIP	U3, U4	2.00	EA	FAIRCHILD SEMI.	MOC8102
							VISHAY (VOP)	MOC8102
2		M33978	RES,499K,1/4W,1%,MF	R3, R4	2.00	EA	YAGEO	MFR-25FBB-499K
							YAGEO	MFR-25FRF52499K
2		M33979	RES,511K,1/4W,1%,MF	R5	1.00	EA	YAGEO	MFR-25FBB-511K
							YAGEO	MFR-25FRF52511K
2		M34214	INDUCTOR,100MH C&D INDUCTOR	L1	1.00	EA	C&D / MURATA	1410454C
							C&D TECH.	1410454
2	A	M45762	IC, BACKPLANE, ATC/NEMA, PGM, REV X1	U1	1.00	EA		
3		M15603	LABEL,BLANK,1/4" X 3/4" ROLL OF 10,000		1.00	EA	TYCO	WP-229064-10-9
3		M69114	IC,MC9S08QG8CPBE, MCU, DIP-16		1.00	EA	FREESCALE	MC9S08QG8CPBE
2		M65090	OSCILLATOR,CRYS,15.36MHZ THRU-HOLE	OSC1	1.00	EA	FOX	351LF-15.36MHZ
2		M65101	TRANSFORMER,2 X 6VAC/42MA	T1	1.00	EA	PULSE	020-5376.0
2		M66291	HEADER, 12 POS, 2R, VERTICAL	P1	1.00	EA	TYCO	1-770621-1
							TYCO	770621-2
2	A	M66450S	ASSY,PCB, CONTROL SIGNALS, NEMA,SMT		1.00	EA		
3		M34577	DIODE BRIDGE,HDO4-T,FW,SM .8A	DB1	1.00	EA	DIODES INC	HD04-T
3		M34668	REGULATOR,LM1117IMP-3.3 SOT-223	LR1	1.00	EA	NATIONAL SEMI.	LM1117IMP-3.3
							NATIONAL SEMI.	LM1117IMPX-3.3
3		M65168	REGULATOR,LM2596S-12 3A,12V,SWITCHING	U6	1.00	EA	NATIONAL SEMI.	LM2596S-12
							NATIONAL SEMI.	LM2596S-12/NOPB
3		M66450	PCB, CONTROL SIGNALS, NEMA Rev. A		1.00	EA		
1		M66515	SWITCH, ROCKER, SPST, HORIZONTAL		1.00	EA	NKK	CWSA11AAN1S
1	A	M69588A	ASSY, PCB, ATC 5.2b ENGINE		1.00	EA		
2		M24689	HEADER,2POS,MTA,100C,.025 FRICTION LOCK		1.00	EA	MOLEX	22-23-2021
							TYCO	640456-2

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M27914	HEADER,8/16,.1C,VER,BKWAY .025		1.00	EA	TYCO	103186-8
2		M34641	RES,2.2K,1/10W,5%,0603 SM RESISTOR CHIP		1.00	EA	PANASONIC	ERJ-3GEYJ222V
2	A	M44530	IC, ENGINE CONFIG PROGRAM		1.00	EA		
3		M15603	LABEL,BLANK,1/4" X 3/4" ROLL OF 10,000		1.00	EA	TYCO	WP-229064-10-9
3		M66130	IC,AT24C256B-PU,256K EEPROM,SERIAL	U29	1.00	EA	ATMEL	AT24C256B-PU
2	A	M69588S	ASSY, PCB, ATC 5.2b ENGINE, SMT		1.00	EA		
3		M30323	TRANSISTOR,FET SWITCHING, 2N7002	Q1, Q2, Q3	3.00	EA	DIODES INC.	2N7002-7-F
							ON SEMI.	2N7002LT1G
							PHILIPS	2N7002 T/R
3		M34624	IC,FERRITE CHIP 100 OHM 4A, 0805	FB2, FB3	2.00	EA	TDK	MPZ2012S101A
3		M34633	IC,SN74LVC08 14-TSSOP QUAD 2-IN AND GATE	U21	1.00	EA	NXP	74LVC08APW-T
							TEXAS INSTR.	SN74LVC08APWR
3		M34636	IC,N16L163WC2CT1,SRAM 3V 1MX16, TSOPI-48	SRAM1	1.00	EA	CYPRESS	CY62167DV30LL-55ZXI
							HITACHI	HM62851ALFP-7
3		M34639	RES,1K,1/10W,5%,0603 SM RESISTOR CHIP	R17, R24, R26, R29, R118, R120, R122, R123, R127, R194	10.00	EA	PANASONIC	ERJ-3GEYJ102V

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M34640	CAP,.1MF,25V SURFACE MT 0603 CERAMIC	C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C53, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C162, C165, C170, C171, C172, C173, C174, C175, C176, C177, C178, C179, C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C192, C193, C194, C195, C196, C197, C198, C199, C200, C201, C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213, C214, C215, C216, C217, C218, C219, C220, C221, C222, C223, C224, C225, C226, C227, C228, C229, C230, C231, C232, C233, C234, C235, C236, C237, C238, C239, C240, C241, C242, C243, C244, C245, C246, C247, C248, C249, C250, C251, C252, C253, C254, C255, C256, C257, C258, C259, C260, C261, C262, C263, C264, C265, C266, C267, C268, C275, C277, C278, C279, C280, C281, C282, C283, C284, C287, C290, C293, C294, C295, C296, C297, C298, C299, C300, C303, C304, C305, C306, C307, C308, C319, C325, C340, C341, C342	210.0	EA	PANASONIC	ECJ-1VB1E104K

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M34642	RES,4.7K,1/10W,5%,0603 SM RESISTOR CHIP	R20, R90, R142, R144, R157, R158	6.00	EA	PANASONIC	ERJ-3GEYJ472V
3		M34645	RES,10K,1/10W,5%,0603 SM RESISTOR CHIP	R2, R3, R5, R6, R8, R15, R25, R27, R28, R30, R32, R33, R34, R35, R48, R59, R63, R116, R117, R119, R121, R124, R125, R129, R131, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R156, R159, R161, R162, R163, R164, R195, R200, R201, R202, R203, R204, R205, R206, R207, R208, R209, R210, R211, R212, R213, R214, R215, R216, R217, R225, R226	63.0	EA	DALE	CRCW060310K0JNEA
							PANASONIC	ERJ-3GEYJ103V
3		M34646	CAP,.01MF,50V,10% CER SM 0603 10000PF	C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C52, C54, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C112, C309, C327, C329, C331	70.0	EA	PANASONIC	ECJ-1VB1H103K
							VISHAY DALE	VJ0603Y103KXACW1BC
3		M34648	CAP,10MF,35V TANT,20% SM CAPACITOR	C55, C56, C57, C288, C289, C291, C313, C320, C333	9.00	EA	NICHICON	F911V106MNC
3		M34652	RES,100 OHM,1/4W, 5% SM 1206 RESISTOR	R167, R169, R179, R182	4.00	EA	PANASONIC	ERJ-8GEYJ101V
3		M34657	RES,330 OHM, 1/8W, 5%, SM 0805 RESISTOR	R69, R70, R71, R72, R94, R95, R96, R97	8.00	EA	PANASONIC	ERJ-6GEYJ331V
3		M34668	REGULATOR,LM1117IM P-3.3 SOT-223	LR2	1.00	EA	NATIONAL SEMI.	LM1117IMP-3.3
							NATIONAL SEMI.	LM1117IMPX-3.3
3		M34676	OSCILLATOR,CRYS 32.768KHZ SM, MC-306	Y5	1.00	EA	EPSON	SE2417CT-ND
							EPSON	MC-306 32.768K-E3

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3	A	M44311	IC, PROGRAM, LINUX 32MB		2.00	EA		
4		M34637	IC,TC58FVM6B2AFT-65 48-TSOP 64M 3V	FLASH MEM 1,	2.00	EA	TOSHIBA	TC58FVM6B2AFT-65
				FLASH MEM 2			TOSHIBA	TC58FVM6B5BTG-65
3		M65138	RES,0 OHMS,1/4W,1206 SM	R135, R188, R190, R218	4.00	EA	PANASONIC	ERJ-8GEY0R00V
3		M65192	CAP,.0001MF,50V,CER,0603 SMT, (100PF)	C310, C317, C330, C334	4.00	EA	PANASONIC	ECJ-1VC1H101J
3		M65398	CAP,.000018MF, 50V, SM 0603	C285, C286, C301, C302	4.00	EA	VISHAY	VJ0603A180JXACW1BC
3		M65400	CAP,.001MF, 2KV, 10%, SM 1206 (1000pF)	C276, C292	2.00	EA	AVX	1206GC102KAT1A
3		M65401	IC,KS8721BLI,10/100BASE-TX/FX	U24, U25	2.00	EA	MICREL	KS8721BLI
							MICREL	KSZ8721BLI
3		M65402	IC,L4931,Voltage Regulator,2.5V,NSOIC-8	LR1	1.00	EA	ST	L4931ABD25
3		M65410	IC,SN74LVC541A,OCTAL BUFFER/DRIVER	U2, U4, U6, U7	4.00	EA	TEXAS	SN74LVC541APWR
							TEXAS INSTR.	SN74LVC541APW
3		M65416	INDUCTOR, 10 uH, .8A, SMD	L2, L3	2.00	EA	SUMIDA	CDPH4D19FNP-100MC
3		M65419	RES,22 OHMS, 1/8W, 1%, SMD 0805	R73, R74, R75, R76, R77, R79, R80, R81, R83, R92, R98, R99, R100, R101, R102, R104, R105, R106, R108,R16, R192	21.00	EA	PANASONIC	ERJ-6ENF22R0V
							YAGEO	RC0805FR-0722RL
3		M65421	RES, 49.9 OHMS, 1/8W, 1%, SMD 0805	R85, R86, R87, R88, R110, R111, R112, R113	8.00	EA	PANASONIC	ERJ-6ENF49R9V
3		M65422	RES, 6.49K, 1/8W, 1%, SMD 0805	R84, R109	2.00	EA	PANASONIC	ERJ-6ENF6491V
3		M65423	RES,68 OHMS, 1/8W, 1%, SMD 0805	R68, R93	2.00	EA	PANASONIC	ERJ-6ENF68R0V
							YAGEO	RC0805FR-0768RL
3		M65424	RES, 75 OHMS, 1/8W, 1%, SMD 0805	R78, R82, R103, R107	4.00	EA	PANASONIC	ERJ-6ENF75R0V
3		M65425	TRANSFORMER,HX1188,SINGLE PORT	XFMR1, XFMR2	2.00	EA	PULSE	HX1188

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M65428	OSCILLATOR,CRYST, 25MHZ ,SMD	Y3, Y4	2.00	EA	ECS	ECS-250-20-5PDN
3		M65436	RES,15K,1/8W,1%,SMD 0805	R126, R133	2.00	EA	PANASONIC	ERJ-6ENF1502V
3		M65479	IC,DS1390,REAL TIME CLOCK DALLAS	U28	1.00	EA	DALLAS SEMI.	DS1390U-33
3		M65498	RES, 10 OHMS, 1/8W, 1%, SMD 0805	R128	1.00	EA	DALE	CRCW080510R0FKTA
							PANASONIC	ERJ-6ENF10R0V
3		M65632	RES,100 OHM 1/10 W 5% 0603, SM RESISTOR	R4, R7, R39, R40, R41, R42, R47	7.00	EA	PANASONIC	ERJ-3GEYJ101V
3		M66100	RES,24.3 OHMS,1/8W, 1%, SMD 0603	R130, R132	2.00	EA	DIGI KEY	P24.3HTR-ND
							PANASONIC	ERJ3EKF24R3V
3		M66101	RES,316K,1/8W, 1%, SMD 0805	RA	1.00	EA	DIGI KEY	P316KCTR-ND
							PANASONIC	ERJ6ENF3163V
3		M66102	RES,2.0 OHM,1/8W,1%,SMD 0805	R165	1.00	EA	PANASONIC	ERJ6RQF2R0V
3		M66103	IC,MIC6315-29D2U, MICROPROCESSOR	U12	1.00	EA	MICREL	MIC6315-29D2U
3		M66104	RES,3.57K,1/8W,1%,SMD 0805	R173	1.00	EA	PANASONIC	ERJ6ENF3571V
3		M66113	CAP,.18MF,25V,0805 SMT	C323	1.00	EA	VISHAY	VJ0805Y184KXXA
							VISHAY	VJ0805Y184KXXMT
3		M66114	CAP,.47MF,25V,0603 SMT	C316	1.00	EA	MURATA	GRM188R71E474KA12D
3		M66115	CAP,2.2MF,10V,0603 SMT	C58, C59, C60, C61, C62, C63, C64, C65	8.00	EA	MURATA	GRM188R71A225KE15D
3		M66116	CAP,4.7MF,16V,0805 SMT	C338	1.00	EA	MURATA	GRM21BR71C475KA73L
3		M66117	CAP,.000056MF,50V,0603 SMT	C326	1.00	EA	VISHAY	VJ0603A560KXAA
3		M66118	CAP,470MF,4V,D3L SMT	C321	1.00	EA	SANYO	4TPE470MFL
3		M66120	CAP,330MF,6.3V,D4 SMT	C314, C324, C339	3.00	EA	SANYO	6TPD330M
3		M66121	CAP,22MF,8V,B1 SMT	C315	1.00	EA	SANYO	8TPC22M
3		M66123	INDUCTOR, 1.5 uH, 13A, 2.9mOHMS, SM	L4	1.00	EA	COOPER BUSSMA.	DR125-1R5
3		M66126	OSCILLATOR,33.333MHZ,	OSC1	1.00	EA	ABRACON	ASFL1-33.333MHZ-L-K-T
3		M66127	IC,LM5642MH, High Voltage, Dual Synchronous	U31	1.00	EA	NATIONAL SEMI.	LM5642MH/NOPB
							NATIONAL SEMI.	LM5642MH
3		M66128	IC,MPC8360ECVVAJDGA,CPU 32BITS,500MHZ	U1	1.00	EA	FREESCALE	MPC8360ECVVAJDGA
3		M66129	IC,USB1T11AMTCX, USB TRANSCEIVER	U26	1.00	EA	FAIRCHILD	USB1T11AMTCX
3		M66131	IC,SHUNT VOLTAGE REFERENCE	ZA, ZB	2.00	EA	TEXAS INSTR.	REF1112

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M66132	IC,SN74LVC74APWT,FLIP-FLOPS	U11	1.00	EA	TEXAS INSTR.	SN74LVC74APWT
3		M66133	LED,R,1.6X0.8MM,SMD, KINGSBRIGHT	COL1, COL2, DUP1, DUP2, LNK1, LNK2, SPD1, SPD2	8.00	EA	KINGSBRIGHT	APHK1608SURCK
3		M66134	RES,10 OHM,1/10W,1%,0603 SMT	R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R9, R10, R11, R12	14.00	EA	PANASONIC	ERJ3EKF10R0V
3		M66135	RES,1.5K,1/10W,5%,SMD 0603	R141, R143	2.00	EA	PANASONIC	ERJ3GEYJ152V
3		M66136	RES,18.2 OHMS ,1/10W,1%,0603 SM	R44, R46	2.00	EA	PANASONIC	ERJ3EKF18R2V
3		M66411	IC,SN74HC21PWR, DUAL 4-IN POS-AND GATE	U20	1.00	EA	TEXAS INSTR.	SN74HC21PWR
3		M66412	RES,4.7 OHM,1/4W,1%,1206 SMT	R181, R187	2.00	EA	VISHAY DALE	CRCW12064R70FNEA
3		M66413	RES,8.25K,1/4W,1%,SMT 1206	R183	1.00	EA	VISHAY DALE	CRCW12068K25FKEA
3		M66862	IC, MAX795TESA, SUPERVISORY CIRCUITS	U33	1.00	EA	MAXIM	MAX795TESA-T
3		M69588	PCB, ATC 5.2b ENGINE, rev A		1.00	EA		
3		M69597	IC,SN74LVTH245, QUAD BUS TRANSCEIVER	U14, U16	2.00	EA	TEXAS INSTR.	SN74LVTH245APWR
3		M69598	IC,SN74LVTH573DB, OCTALI	U17, U18, U19	3.00	EA	TEXAS INSTR.	SN74LVTH573PWR
3		M69600	IC,SN74LV541AT, OCTAL BUFFER/DRIVER	U3, U5, U8	3.00	EA	TEXAS INSTR.	SN74LV541ATPWT
3		M69601	IC,SN74LVC125, QUAD BUS BUF 3SO	U9, U34	2.00	EA	TEXAS INSTR.	74LVC125APWT
3		M69602	CAP,.0022MF,50V,10%,CER, SM 0603	C322	1.00	EA	PANASONIC	ECJ1VB1H222K
3		M69604	RES,12K,1/4W,5%,SM 1206	R166	1.00	EA	PANASONIC	ERJ8GEYJ123V
3		M69605	RES,0.01 OHM, 1W,1%,SM 2512	R168, R180	2.00	EA	PANASONIC	ERJM1WSF10MU
3		M69606	RES,1.78K,1/8W,1%,SMD 0805	R170	1.00	EA	PANASONIC	ERJ6ENF1781V
3		M69607	RES,10K,1/8W,1%,SMD 0805	R171	1.00	EA	PANASONIC	ERJ6ENF1002V
3		M69608	RES,2.26K,1/4W,1%,SM 1206	R172	1.00	EA	PANASONIC	ERJ8ENF2261V
3		M69610	RES,220K,1/4W,5%,SM 1206	R174	1.00	EA	PANASONIC	ERJ8GEYJ224V
3		M69611	RES,4.99K,1/4W,1%,SMD 1206	R175, R186	2.00	EA	PANASONIC	ERJ8ENF4991V
3		M69612	RES,22.6K,1/8W,1%,SM 0805	R176	1.00	EA	PANASONIC	ERJ6ENF2262V
3		M69613	RES,20K,1/8W,1%,SM 0805	R177	1.00	EA	PANASONIC	ERJ6ENF2002V
3		M69614	RES,6.8K,1/4W,5%,SM 1206	R178	1.00	EA	PANASONIC	ERJ8GEYJ682V
3		M69615	RES,8.45K,1/4W,1%,SM 1206	R184	1.00	EA	PANASONIC	ERJ8ENF8451V
3		M69616	RES,13.7K,1/4W,1%,SM 1206	R185	1.00	EA	PANASONIC	ERJ8ENF1372V

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M69677	OSCILLATOR, 48MHZ ,SMD	OSC2	1.00	EA	ABRACON CORP	ASFL1-48.000MHZ-LC-T
							ABRACON CORP	ASFL1-48.000MHZ-LCS-T
3		M69678	IC,SN74LV138A,DEC/DEMUX 3 TO 8,TSSOP-16	U27	1.00	EA	TEXAS INSTR.	SN74LV138ATPWR
							TEXAS INSTR.	SN74LV138ATPWT
3		M69679	IC,SN74LVC04APWR, HEX INVERTER	U10	1.00	EA	TEXAS INSTR.	SN74LVC04APWR
3		M69954	IC,LM3743MM-300,DC-DC V. MODE PWM BUCK	U32	1.00	EA	NATIONAL SEMI.	LM3743MM-300
3		M69956	IC,DDR2, 16Mx16, FBG-84, MEMORY	DDR1, DDR2, DDR3, DDR4, DDR5	5.00	EA	MICRON	MT47H16M16BG-3 IT:B TR
3		M69974	CAP,1MF,10V,0603 SMT	C311, C312, C318, C332, C337	5.00	EA	PANASONIC	ECJ1VB1A105K
3		M69975	CAP,.015MF,25V,0603 SMT	C336	1.00	EA	PANASONIC	ECJ1VB1E153K
3		M69976	CAP,.0015MF,50V,0603 SMT	C328	1.00	EA	PANASONIC	ECJ1VB1H152K
3		M69977	CAP,.0082MF,50V,0603 SMT	C335	1.00	EA	PANASONIC	ECJ1VB1H822K
3		M69987	INDUCTOR, 4.2 uH, 10A, 7mOHMS	L5	1.00	EA	TDK	RLF12560T-4R2N100
3		M69988	INDUCTOR, 10 uH, 5.1A, 12mOHMS, SM	L6	1.00	EA	TDK	RLF12545T-100M5R1-PF
3		M69989	DIODE,MBR0520LT1, SCHOTTKY,SM	D1	1.00	EA	ON SEMI.ES	MBR052LT1
							SCHOTTKY	MBR0520LT1
3		M69990	DIODE,BAT54A, SCHOTTKY, SMT	D2	1.00	EA	FAIRCHILD	BAT54A
							SCHOTTKY	BAT54A
3		M69991	TRANSISTOR,MOSFET,N-CHANNEL POWER	Q5, Q8	2.00	EA	VISHAY	SI4850EY-T1-E3
3		M69992	TRANSISTOR,MOSFET,N-CHANNEL POWER	Q7, Q9	2.00	EA	VISHAY	SI4840DY-T1-E3
3		M69993	TRANSISTOR,MOSFET,N-CHANNEL POWER	Q4, Q6	2.00	EA	VISHAY	SI7882DP
3		M69994	RES,4.75K,1/8W,1%,0805 SM	R43, R45	2.00	EA	PANASONIC	ERJ6ENF4751V
2		M69617	HEADER,50POS,2R,STRAIGHT, TYPE		2.00	EA	HIROSE	PCN10-50P-2.54DSA
							HIROSE	PCN10-50P-2.54DSA(72)
1	A	M69945A	ASSY, PCB, HOSTBOARD NEMA		1.00	EA		
2		M10197	RES,10 OHM,2W,5%,CF,AXIAL	R203	1.00	EA	YAGEO	RSF200JB-10R
2		M11635	SCREW,4-40 X 3/8,PH,PN,SS		1.00	EA		
2		M11783	NUT,4-40,KEPNUT,SS		1.00	EA		

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M24682	HEADER,3POS,MTA.156C,.045 SQ POST,VERT	P10	1.00	EA	TYCO	640445-3
2		M24689	HEADER,2POS,MTA,100C,.025 FRICTION LOCK	CON1	1.00	EA	MOLEX TYCO	22-23-2021 640456-2
2		M30367	TRANSISTOR,MOSFET P CHANN TO-220	Q4	1.00	EA	ON SEMI ON SEMI.	MTP23P06VG MTP23P06V
2		M31030	HEADER,12POS,100C,2R	P7	1.00	Unit	MOLEX MOLEX MOLEX	10-89-1121 10-89-7122 10-96-7126
2		M33163	BUZZER, 4-7 VDC	BZZ1	1.00	EA	MALLORY SON. MALLORY SON.	PB-12N23P-05 PB-12N23P-05Q
2		M33223	HEADER,40POS,2R,PCB MT SHROUDED	P3, P4	2.00	EA	TYCO	103308-8
2		M33647	DC TO DC CONVERTER 5V INPUT,15V OUTP	DC-DC1	1.00	EA	C&D TECH. C&D TECH.	NMR102 NMR102C
2		M34258	LED,R;3MM;34DEG;CLEAR	LD6	1.00	EA	KINGBRIGHT	L7104EC
2		M34635	CAP,SUPER CAP 2.2F 5.5V	C87	1.00	EA	NEC NEC	FT0H225Z FT0H225ZF
2		M41077	LED SPACER "T1" KEYSTONE 7373		1.00	EA	KEYSTONE	7373
2		M44290	HEADER,3POS,VERTICAL,100C 25SQ 15U"G	P11	1.00	EA	TYCO	3-641126-3
2		M44643	HEADER, 5/10, 2R, BLUE	P9	1.00	EA	AMP	2-1761603-3
2	A	M45297	IC,NEMA HOSTBOARD, VM/FM PGM, REV A	U29	1.00	EA		
3		M15603	LABEL,BLANK,1/4" X 3/4" ROLL OF 10,000		1.00	EA	TYCO	WP-229064-10-9
3		M34264	IC,MC68HC908QT2CP,MCU 1.5K FLASH W/ADC		1.00	EA	FREESCALE MOTOROLA MOTOROLA	MC68HC908QT2CPE MC68HC908QT2CP MC68HC908QT2CPE
2		M66287	CONN,RJ45, VERT, SINGLE, WITH LEDS	RJ1, RJ2, RJ3, RJ4	4.00	EA	TYCO	1734577-3
2		M66288	CONN,USB,VERT, SINGLE	USB1, USB2, USB3, USB4	4.00	EA	TYCO	1734366-1
2		M66291	HEADER, 12 POS, 2R, VERTICAL	P1, P2	1.00	EA	TYCO TYCO	1-770621-1 770621-2
2		M66536	CONN, DB9, MALE, WIRE WRAP TIN	CN3,CN4, CN5	3.00	EA	NORTCOMP INC	172-009-142R011
2		M66537	CONN, DB15, FEMALE, WIRE WRAP TIN	CN2	1.00	EA	NORTCOMP INC	172-015-242R011

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
2		M66538	CONN, 20 POS, 1 ROW,.1C, RECEPTACLE	P6	1.00	EA	OUPIN	2041-1X20G15SA
							SAMTEC	SLW-120-01-G-S
2		M66539	CONN, 7/14, 2 ROW,.1C, SOCKET STRIP	P5	1.00	EA	SAMTEC	SSW-107-01-G-D
2		M66691	RECEPTACLE, 50 POS,2 ROW,STRAIGHT	P8	2.00	EA	HIROSE	PCN10C-50S-2.54DSA(72)
2	A	M69945S	ASSY, PCB, HOSTBOARD NEMA, SMT		1.00	EA		
3		M27826	CAP,4.7MF,16V,TANT,1206SM	C67, C127	2.00	EA	NICHICON	F931C475MAA
							PANASONIC	ECS-T1CY475R
3		M27849	DIODE,1N4148,100V,SMT DL-35 PKG(LL4148)	D11, D12	2.00	EA	DIODES INC	LL4148
							FAIRCHILD SEMI.	FDLL4148
3		M27866	IC,74HC02,QUAD 2INPUT NOR SO-14	U30	1.00	EA	FAIRCHILD SEMI.	MM74HC02M
							MOTOROLA	MC74HC02D
3		M30294	CAP,.001MF,50V,10%,CER SM 0805 (1000PF)	C68, C128	2.00	EA	PANASONIC	ECJ2VC1H102J
							PANASONIC	ECU-V1H102JCX
3		M30323	TRANSISTOR,FET SWITCHING, 2N7002	Q3	1.00	EA	DIODES INC.	2N7002-7-F
							ON SEMI.	2N7002LT1G
3		M34624	IC,FERRITE CHIP 100 OHM 4A, 0805	FB5, FB6, FB7, FB8, FB9, FB10, FB11, FB12	8.00	EA	TDK	MPZ2012S101A
3		M34630	IC,SN74LV04 14-TSSOP HEX INVERTER	U18	1.00	EA	TEXAS INSTR.	SN74LV04APW
							TEXAS INSTR.	SN74LV04APWR
3		M34639	RES,1K,1/10W,5%,0603 SM RESISTOR CHIP	R1a, R1c, R1d, R1e, R1f, R1g, R2a, R2c, R2d, R2e, R2f, R2g, R15, R16, R20, R33, R34, R60, R61, R124, R129, R130, R143, R144, R215	25.00	EA	PANASONIC	ERJ-3GEYJ102V

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M34640	CAP,.1MF,25V SURFACE MT 0603	C2, C8, C11, C12, C15, C16, C17, C18, C19, C20, C22, C23, C26, C34, C35, C37, C38, C39, C40, C41, C42, C43, C44, C54, C55, C59, C60, C63, C64, C69, C70, C71, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C89, C90, C91, C92, C93, C94, C95, C96, C99, C100, C102, C109, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C126, C130, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C149, C154, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C169, C170, C171, C172, C173, C174, C175, C178, C179, C180, C184, C185, C186, C187, C188, C189, C190, C191, C192, C193, C194, C195, C196, C197, C198, C199, C200, C201, C202, C203, C204	123.0	EA	PANASONIC	ECJ-1VB1E104K

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M34641	RES,2.2K,1/10W,5%,0603 SM RESISTOR CHIP	R27, R28, R202, R220, R222	5.00	EA	PANASONIC	ERJ-3GEYJ222V
3		M34642	RES,4.7K,1/10W,5%,0603 SM RESISTOR CHIP	R1, R199	2.00	EA	PANASONIC	ERJ-3GEYJ472V
3		M34645	RES,10K,1/10W,5%,0603 SM RESISTOR CHIP	R31, R32, R64, R127, R128, R149, R201, R204, R214, R218, R176, R180, R181, R194,R197, R223	16.00	EA	DALE	CRCW060310K0JNEA
							PANASONIC	ERJ-3GEYJ103V
3		M34648	CAP,10MF,35V TANT,20% SM CAPACITOR CHIP	C10, C21, C25, C28, C30, C32, C33, C36, C86, C98, C106, C108, C110, C129, C131, C132, C155, C167, C168	19.00	EA	NICHICON	F911V106MNC
3		M34651	IC,SN74LV125A,SM,QUAD,BUS BUFF 14-TSSOP	U28	1.00	EA	TEXAS INSTR.	SN74LV125APW
							TEXAS INSTR.	SN74LV125APWR
							TEXAS INSTR.	SN74LV125APWT
3		M34652	RES,100 OHM,1/4W, 5% SM 1206 RESISTOR	R74, R75, R77, R78, R81, R82, R85, R86, R89, R90, R216, R217	12.00	EA	PANASONIC	ERJ-8GEYJ101V
3		M34654	RES,100K,1/10W,5% 0603 SM RESISTOR CHIP	R3, R177, R178, R179, R192, R195, R196,	7.00	EA	PANASONIC	ERJ-3GEYJ104V
3		M34655	RES,150 OHM,1/4W, 5% SM 1206 RESISTOR	R11	1.00	EA	DALE	CRCW1206150RJNEA
							PANASONIC	ERJ-8GEYJ151V
3		M34657	RES,330 OHM, 1/8W, 5%, SM 0805 RESISTOR	R5, R10, R17, R30, R37, R38, R39, R44, R45, R125, R135, R139, R142	13.00	EA	PANASONIC	ERJ-6GEYJ331V

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M34660	DIODE,DUAL SW 75V,SM 350MW SOT-23	D1, D2, D3,D4	4.00	EA	DIODES INC	BAV70-7
							DIODES INC	BAV70-7F
3		M34662	TRANSISTOR,BC847B,NPN,50V 100MA, SOT-23	Q1, Q2	2.00	EA	NXP	BC847B
							ST MICRO	BC847B
3		M34668	REGULATOR,LM1117IMP-3.3 SOT-223	LR3, LR5, LR6	3.00	EA	NATIONAL SEMI.	LM1117IMP-3.3
							NATIONAL SEMI.	LM1117IMPX-3.3
3		M65035	TRANSISTOR MMBT2222A, SMT NPN	Q5, Q7	2.00	EA	ST MICRO	MMBT2222A
3		M65138	RES,0 OHMS,1/4W,1206 SM	R219	1.00	EA	PANASONIC	ERJ-8GEY0R00V
3		M65398	CAP,.000018MF, 50V, SM 0603	C176, C177	2.00	EA	VISHAY	VJ0603A180JXACW1BC
3		M65402	IC,L4931,Voltage Regulator,2.5V	LR1, LR4	2.00	EA	ST	L4931ABD25
3		M65403	IC,MAX3387E, RS-232 TRANSCEIVER	U25, U26, U27	3.00	EA	MAXIM	MAX3387EEUG
							MAXIM	MAX3387EEUG+
3		M65414	IC,SP2526-2,USB POWER CONTROL SWITCH	U5, U6, U9	3.00	EA	SIPEX	SP2526-2EN
							SIPEX	SP2526-2EN-L
							SIPEX	SP2526A-2EN-L
3		M65417	INDUCTOR, 1 uH, 2.56A, SMD	L1, L2, L3, L4, L5, L6, L7, L8	8.00	EA	SUMIDA	CR43-1R0MC
							SUMIDA	CR43NP-1R0MC
3		M65421	RES, 49.9 OHMS, 1/8W, 1%, SMD 0805	R101, R102, R103, R104, R105, R106, R107, R108, R109, R110, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121, R156, R157, R158, R159, R160, R161, R162, R163, R164, R165, R166, R167, R168, R169, R170, R171, R172, R173, R174, R175	40.00	EA	PANASONIC	ERJ-6ENF49R9V

Level	Assy	Part Number	Description	Reference	Qty	U/ M	Manufacturer	Manufacturer's P/N
3		M65424	RES, 75 OHMS, 1/8W, 1%, SMD 0805	R59, R63, R65, R93, R94, R95, R96, R97, R98, R99, R100, R122, R123, R126, R131, R132, R136, R137, R138, R145, R146, R147, R150, R151, R152, R153, R154, R155	28.00	EA	PANASONIC	ERJ-6ENF75R0V
3		M65425	TRANSFORMER,HX1188,SINGLE PORT	XFMR1, XFMR4	2.00	EA	PULSE	HX1188
							PULSE	HX1188NL
3		M65428	OSCILLATOR,CRYS, 25MHZ ,SMD	Y1, Y2	2.00	EA	ECS	ECS-250-20-5PDN
3		M65436	RES,15K,1/8W,1%,SMD 0805	R190, R198	2.00	EA	PANASONIC	ERJ-6ENF1502V
3		M66133	LED,R,1.6X0.8MM,SMD	LD1, LD2, LD3, LED4, LED5	5.00	EA	KINGSBRIGHT	APHK1608SURCK
3		M66155	RES,1.96K,1/8W, 1%, SMD 0805	R62, R148	2.00	EA	PANASONIC	ERJ-6ENF1961V
3		M66351	CAP,.0000027MF,50V,5%, SMD 0603, 27PF	C27, C29, C104, C105	4.00	EA	PANASONIC	ECJ1VC1H270J
3		M66352	IC, CY7C65630, USB HUB CONTROLLER	U8	1.00	EA	CYPRESS	CY7C65630-56LFXC
							CYPRESS	CY7C65630-56LTXC
3		M66353	FILTER, COMMON MODE, 90 OHMS 100 MHZ	T1, T2, T3, T4, T5	5.00	EA	MURATA	DLW31SN900SQ2
3		M66354	TRANSFORMER,QUAD PORT,10/100 BASE-T	XFMR2, XFMR3	2.00	EA	PULSE	HX1234
							PULSE	HX1234NL
3		M66355	IC, RTL8305SB, 10/100MBPS SW CONT.	U2, U3	2.00	EA	REALTEK	RTL8305SB
							REALTEK	RTL8305SB-VD-LF
3		M66356	DIODE,PRTR5V0U2X, ESD PROTECTION	D5, D6, D7, D8, D9, D10	6.00	EA	NXP	PRTR5V0U2X
3		M66357	CAP,2.2MF,35V, 20%, ELEC, SMD	C148	1.00	EA	PANASONIC	EEV-FC1V2R2R

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M66358	CAP,.000056MF,2kV,5%, SMD 1206, (56PF)	C24, C31, C45, C72, C75, C97, C101, C103, C107, C123	10.00	EA	AVX	1206GA560JAT1A
3		M66359	RES,680 OHM, .1W, 5%, SMD 0603	R191, R193	2.00	EA	PANASONIC	ERJ-3GEYJ681V
3		M66360	CAP,100MF, 10V,20 %, ELEC, SMD	C145, C146, C147, C152, C153	5.00	EA	PANASONIC	EEV-FC1A101P
3		M66377	OSCILLATOR,CRYS, 24MHZ ,SMD	Y3	1.00	EA	ECS	ECS-240-20-5PDN
3		M66378	CAP,.0000012MF,50V,5%, SMD 0603	C150, C151	2.00	EA	PANASONIC	ECJ-1VC1H120J
3		M66540	CRYSTAL, 29.4912MHZ, SMD	Y4	1.00	EA	ABRACON CORP	ABLS2-29.4912MHZ-D4YF-T
3		M66541	RES,15M,1/10W, 10+/-, 0603	R200	1.00	EA	PANASONIC	ERJ3GEYK156V
3		M66542	IC,SP490, FULL DUPLEX RS-485, 8-PIN NSOIC	U22	1.00	EA	SIPEX	SP490CN-L
							SIPEX	SP490N
3		M66543	IC, SP491, FULL DUPLEX RS-485, 14-PIN NSOIC	U23, U24	2.00	EA	SIPEX	SP491CN
3		M66544	IC,SN65LBC174A,QUAD. RS485 DIFF.	DV7, DV10	2.00	EA	TEXAS INSTR.	SN65LBC174A16DW
3		M66545	IC,SN65LBC173A,QUAD. RS485 DIFF.	DV1, DV3, DV4	3.00	EA	TEXAS INSTR.	SN65LBC173AD
3		M66732	IC, AT25020AN, 2K 2.7V, SERIAL EEPROM	U4	1.00	EA	ATMEL	AT25020AN-10SU-2.7
3	A	M69455	IC, FRONT PANEL, 2070-3B, PROGRAM		1.00	EA		
4		M15603	LABEL,BLANK,1/4" X 3/4" ROLL OF 10,000		1.00	EA	TYCO	WP-229064-10-9
4		M65041	IC,MC9S12E64CFU,MCU, SMT	U11	1.00	EA	MOTOROLA	MC9S12E64CFU
							MOTOROLA	MC9S12E64CFUE
3		M69945	PCB, HOSTBOARD NEMA, REV A1		1.00	EA		

BILL OF MATERIALS	DESCRIPTION
M66671	ATC NEMA, CONNECTORS BOX, STD MCCAIN

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
0		M66671	ATC NEMA, CONN BOX, STD MCCAIN		1.00	EA	PANDUIT CORP.	PLT1M-M
1		M11784	NUT,6-32,KEPNUT,SS		1.00	EA	TYTON	T18R9M4NAT
1		M11960	WIRE TIE,4",NATURAL TYTON #T18R9M4		2.00	EA		
1		M14827	FUSE HOLDER,PANEL MT,1/4 KNOB CARRIER		1.00	EA	COOPER BUSSMA.	BK/HTB-44I-R
							COOPER BUSSMA.	HTB-44I
							COOPER BUSSMA.	HTB-44I/BK
1		M14832	FUSE,1A,250V,SLO BLO BUSSMAN #MDL1-BK		1.00	EA	BUSSMAN	MDL1-BK
							LITTLEFUSE	313001
1		M25070	HEAT SHRINK,1/8",BLACK		0.08	FT		
1		M30979	BUMPER,RUBBER,0.50DX0.25H SCREW		4.00	EA	KEYSTONE	720
1		M40047	SCREW,6-32 X 5/16,PH,PN, SS		4.00	EA		
1		M43005	CHASSIS, NEMA CONTROLLER		1.00	EA		
2		M11886	STUD,PEM FHS-632-6 ST,6-32, .137, .375,SS,HX		1.00	EA		
2		M11892	NUT,SELF CLINC CLS-632-2 S/S		8.00	EA		
2		M19333	AL SHT,5052,.063X36X96 0.880#/SQ. FT.		2.11	LB		
2		M43007	POWDER COAT, SILVER VEIN		0.15	LB	SPRAYLAT	PEBS 98802
1		M44068	SCREW,4-40 X 7/16,PH,FH,SS, 100 DEG, BLACK		16.00	EA		
1		M44306	HARN, SET,CONN BOX,NEMA		1.00	EA		
2		M13846	WIRE,20,BLK,19STR MIL-W-16878/2		1.25	FT	NATIONAL WIRE	NC1932U-0
2		M13848	WIRE,18,WHT/BLU,19STR MIL-W-16878/2		1.25	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13890	WIRE,20,WHT,19STR NC1932U-9		1.25	FT	NATIONAL WIRE	NC1932U-9
2		M13891	WIRE,20,WHT/RD,19STR MIL-W-16878/2		2.50	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13892	WIRE,20,RD,19STR NB1932N-2		1.25	FT	NATIONAL WIRE	NB1932N-2
2		M13945	WIRE,20,YEL,19STR		1.25	FT	NATIONAL WIRE	NB1932N4
2		M13946	WIRE,20,GRN,19STR MIL-W-16878/2		1.50	FT	NATIONAL WIRE	MIL-W-16878/2
2		M24636	TERM,#6,RD,RING TONGUE TAPE MOUNTE.		3.00	EA	TYCO	51863-1
2		M24666	HOUSING,3POS,SL-156,W/LK RAMP;NO TAB		2.00	EA	TYCO	640250-3
2		M24773	CONTACT,CRIMP FOR MTA SL GOLD PLAT.		9.00	EA	TYCO	770476-2
2		M34262	HOUSING,5POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-5
2		M40010	WIRE,20,PUR,19STR		1.25	FT	NATIONAL WIRE	NB1932N-7
1		M44434	HARN, RIBBON CABLE,10 POS,12",CONN BOX		1.00	EA		

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M13917	RIBBON CABLE,10COND,28AWG .050" PITCH		1.08	FT	BELDEN/VOLEX	9L28010
							HITACHI	23100-010/10IDC-G
							T&B	171-10
2		M17089	CONN,10POS,RIBBON CABLE .050" PITCH		2.00	EA	ADAMTECH	FCS10SG
							AVX	0082900010001011
							HARTING	09185105813
							HARTING	0918510581309
							T&B	622-1041
1		M66449A	ASSY,PCB, ATC NEMA, CONN BOX		1.00	EA		
2		M11625	SCREW,4-40 X 1/4,PH,PN,SS		16.00	EA		
2		M11709	WASHER,#4,INT. TOOTH,SS		16.00	EA		
2		M14990	CONN,NEMA A,55PIN,MALE, PC MT	P1	1.00	EA	CONNECTOR TEC.	851-02E22-55P50-A30
							CONNECTOR TEC.	851-02E22-55P50-A7
2		M14991	CONN,NEMA B,55PIN,FEMALE, PC MT	P2	1.00	EA	CONNECTOR TEC.	851-02E22-55S50-A30
							CONNECTOR TEC.	851-02E22-55S50-A7
2		M14992	CONN,NEMA C,61PIN,FEMALE, PC MT	P3	1.00	EA	CONNECTOR TEC.	851-02E24-61S50-A30
							CONNECTOR TEC.	851-02E24-61S50-A72
2		M33663	CONN,NEMA D,61PIN,MALE, PC MT	P4	1.00	EA	CONNECTOR TEC.	851-02E24-61P50-A30
2		M33697	STANDOFF,4-40 X 9/16,AL 3/16 HX,F/F,RAF		16.00	EA	RAF	2058-440-A
2		M44643	HEADER, 5/10, 2R, BLUE	P7	1.00	EA	AMP	2-1761603-3
2		M66449S	ASSY,PCB, ATC NEMA, CONN BOX, SMT		1.00	EA		
3		M16777	RES,SIP,56K/220K/10K REV B, 8 NETS, SOP20	RP1, RP2, RP3, RP4, RP5, RP6, RP7, RP8, RP9, RP10, RP11, RP12, RP13, RP14, RP15	15.00	EA	CTS	1878-1 REV A
							CTS	BM30301P-REV B
3		M34630	IC,SN74LV04 14-TSSOP HEX INVERTER	U15	1.00	EA	TEXAS INSTRUME.	SN74LV04APW
							TEXAS INSTRUME.	SN74LV04APWR
3		M34631	IC,SN74LV08 14-TSSOP QUAD 2-IN AND GATE	U14	1.00	EA	TEXAS INSTRUME.	296-3770-2-ND
							TEXAS INSTRUME.	SN74LV08APWR

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
3		M34640	CAP,.1MF,25V SURFACE MT 0603 CERAMIC10%	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32	32.00	EA	PANASONIC	ECJ-1VB1E104K
3		M34648	CAP,10MF,35V TANT,20% SM CAPACITOR CHIP	C33,C34	2.00	EA	NICHICON	F911V106MNC
3		M66449	PCB, ATC NEMA, CONN BOX Rev. A		1.00	EA		
3		M66525	IC, TPIC6B596DW, POWER LOGIC 8-BIT	U1, U2, U3, U4, U5, U6, U7, U8, U9, U10, U11, U12, U13	13.00	EA	TEXAS INSTRUMEN.	TPIC6B596DWR
3		M66526	IC,SN74HC165QPWR, 8-BIT PARALLEL LOAD	U16, U17, U18, U19, U20, U21, U22, U23, U24, U25, U26, U27, U28, U29, U30	15.00	EA	TEXAS INSTRUMEN.	SN74HC165QPWR
							TEXAS INSTRUMEN.	SN74HC165QPWREP

BILL OF MATERIALS	DESCRIPTION
M44646	ATC NEMA, TRACONEX COMPATIBLE BOX

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
0	A	M44646	ATC NEMA, TRACONEX COMPATIBLE BOX		1.00	EA		
1		M11784	NUT,6-32,KEPNUT,SS		1.00	EA		
1		M11960	WIRE TIE,4",NATURAL TYTON #T18R9M4		2.00	EA	PANDUIT CORP. TYTON	PLT1M-M T18R9M4NAT
1		M14827	FUSE HOLDER,PANEL MT,1/4 KNOB CARRIER		1.00	EA	COOPER BUSSMA COOPER BUSSMA COOPER BUSSMA	BK/HTB-44I-R HTB-44I HTB-44I/BK
1		M14832	FUSE,1A,250V,SLO BLO BUSSMAN #MDL1-BK		1.00	EA	BUSSMAN LITTLEFUSE	MDL1-BK 313001
1		M25070	HEAT SHRINK,1/8",BLACK		0.08	FT		
1		M30979	BUMPER,RUBBER,0.5ODX0.25H SCREW		4.00	EA	KEYSTONE	720
1		M40047	SCREW,6-32 X 5/16,PH,PN, SS		4.00	EA		
1	P	M44434	HARN, RIBBON CABLE,10 POS,12",CONN BOX		1.00	EA		
2		M13917	RIBBON CABLE,10COND,28AWG .050" PITCH		1.08	FT	BELDEN/VOLEX HITACHI T&B	9L28010 23100-010/10IDC-G 171-10
2		M17089	CONN,10POS,RIBBON CABLE .050" PITCH		2.00	EA	ADAMTECH AVX HARTING	FCS10SG 0082900010001011 09185105813
1	A	M44561	CHASSIS, CONN BOX, TRACONEX COMPATIBLE		1.00	EA		
2		M11886	STUD,PEM FHS-632-6 ST,6-32, .137, .375,SS,HX		1.00	EA		
2		M11892	NUT,SELF CLINC CLS-632-2 S/S		8.00	EA		
2		M19333	AL SHT,5052,.063X36X96 0.880#/SQ. FT.		2.11	LB		
2		M43007	POWDER COAT, SILVER VEIN		0.15	LB	SPRAYLAT	PEBS 98802
1	A	M44647A	ASSY,PCB, CONN BOX, TRACONEX COMPATIBLE		1.00	EA		
2		M11625	SCREW,4-40 X 1/4,PH,PN,SS		16.00	EA		
2		M11709	WASHER,#4,INT. TOOTH,SS		16.00	EA		
2		M14990	CONN,NEMA A,55PIN,MALE, PC MT	P1	1.00	EA	CONNECTOR TEC. CONNECTOR TEC.	851-02E22-55P50-A30 851-02E22-55P50-A7
2		M14991	CONN,NEMA B,55PIN,FEMALE, PC MT	P2	1.00	EA	CONNECTOR TEC. CONNECTOR TEC.	851-02E22-55S50-A30 851-02E22-55S50-A7
2		M14992	CONN,NEMA C,61PIN,FEMALE, PC MT	P3	1.00	EA	CONNECTOR TEC. CONNECTOR TEC.	851-02E24-61S50-A30 851-02E24-61S50-A72
2		M24571	CONN,CPC 23-63 RECEPT PRELOADED	P4	1.00	EA	TYCO	206455-2

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M44643	HEADER, 5/10, 2R, BLUE	P7	1.00	EA	AMP	2-1761603-3
2	A	M44647S	ASSY, PCB, CONN BOX, TRACONEX COMP		1.00	EA		
3		M16777	RES,SIP,56K/220K/10K REV B, 8 NETS, SOP20	RP1, RP2, RP3, RP4, RP5, RP6, RP7, RP9, RP10, RP11, RP13, RP14, RP15	13.00	EA	CTS	1878-1 REV A
							CTS	BM30301P-REV B
3		M34630	IC,SN74LV04 14-TSSOP HEX INVERTER	U15	1.00	EA	TEXAS INSTR.	SN74LV04APW
							TEXAS INSTR.	SN74LV04APWR
3		M34631	IC,SN74LV08 14-TSSOP QUAD 2-IN AND GATE	U14	1.00	EA	TEXAS INSTR.	296-3770-2-ND
							TEXAS INSTR.	SN74LV08APWR
3		M34639	RES,1K,1/10W,5%,0603 SM RESISTOR CHIP	R1	1.00	EA	PANASONIC	ERJ-3GEYJ102V
3		M34640	CAP,.1MF,25V SURFACE MT 0603 CERAMIC	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C36	34.00	EA	PANASONIC	ECJ-1VB1E104K
3		M34648	CAP,10MF,35V TANT,20% SM CAPACITOR CHIP	C34, C35	2.00	EA	NICHICON	F911V106MNC
3		M34651	IC,SN74LV125A,SM,QUAD,BUS BUFF 14-TSSOP	U34	1.00	EA	TEXAS INSTR.	SN74LV125APW
							TEXAS INSTR.	SN74LV125APWR
3		M44647	PCB, CONN BOX, TRACONEX COMP REV A		1.00	EA		
3		M66525	IC, TPIC6B596DW, POWER LOGIC 8-BIT	U1, U2, U3, U4, U5, U6, U7, U8, U9, U10, U11, U12, U13, U31, U32	15.00	EA	TEXAS INSTR.	TPIC6B596DWR
3		M66526	IC,SN74HC165QPWR, 8-BIT PARALLEL LOAD	U16, U17, U18, U19, U20, U21, U22, U24, U25, U26, U28, U29, U30, U33	14.00	EA	TEXAS INSTR.	SN74HC165QPWR
							TEXAS INSTR.	SN74HC165QPWREP

Level	Assy	Part Number	Description	Reference	Qty	U/M	Manufacturer	Manufacturer's P/N
2		M44650	STANDOFF,4-40 X 7/16,AL 3/16 HX,F/F		4.00	EA	RAF	2056-440AL
2		M44651	STANDOFF,4-40 X 1/2,AL 3/16 HX,F/F		12.00	EA	RAF	2057-440AL
1		M44730	SCREW,4-40 X 3/8,PH,FH,SS, 100 DEG, BLACK		16.00	EA		
1	P	M44764	HARN, SET, CONN BOX, TRACONEX COMP		1.00	EA		
2		M13846	WIRE,20,BLK,19STR MIL-W-16878/2		1.25	FT	NATIONAL WIRE	NC1932U-0
2		M13848	WIRE,18,WHT/BLU,19STR MIL-W-16878/2		1.25	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13890	WIRE,20,WHT,19STR NC1932U-9		1.25	FT	NATIONAL WIRE	NC1932U-9
2		M13891	WIRE,20,WHT/RD,19STR MIL-W-16878/2		2.50	FT	NATIONAL WIRE	MIL-W-16878/2
2		M13892	WIRE,20,RD,19STR NB1932N-2		1.25	FT	NATIONAL WIRE	NB1932N-2
2		M13945	WIRE,20,YEL,19STR		1.25	FT	NATIONAL WIRE	NB1932N4
2		M13946	WIRE,20,GRN,19STR MIL-W-16878/2		2.25	FT	NATIONAL WIRE	MIL-W-16878/2
2		M24636	TERM,#6,RD,RING TONGUE TAPE MOUNTED		5.00	EA	TYCO	51863-1
2		M24666	HOUSING,3POS,SL-156,W/LK RAMP;NO TAB		2.00	EA	TYCO	640250-3
2		M24773	CONTACT,CRIMP FOR MTA SL GOLD PLATED		9.00	EA	TYCO	770476-2
2		M34262	HOUSING,5POS,SL-156,W/LK RAMP		1.00	EA	TYCO	640250-5
2		M40010	WIRE,20,PUR,19STR		1.25	FT	NATIONAL WIRE	NB1932N-7

APPENDIX D: CONNECTORS' DETAILS, FRONT PANEL.

Pin assignments for the ATC NEMA's communication ports.

All ATC NEMA communication ports are accessible from the front panel.

An SDLC port is designated to synchronous communications to cabinet's serial bus, it is a RS-485 serial communication port with software selectable speed from 19.2Kbps to 614Kbps available over a DB-15 female connector.

a) Pin assignment of the SDLC port (DB-15 position connector).

DLC Port, DB-15 pin out	
PIN	SIGNAL
1	TxD+
2	GND
3	TxCLKO+
4	GND
5	RxD+
6	GND
7	RxCLK+
8	GND
9	TxD
10	ENABLE/DISABLE
11	TxCLKO
12	CHASSIS GND
13	RxD
14	NC
15	RxCLK

The unit has three RS-232 asynchronous serial communication ports with software selectable speed from 1.2Kbps to 115.2Kbps, these ports are available over DB-9 male connectors. PORT 2 is used primarily for connecting a terminal computer, or as a general purpose port. SP-5 and SP-8 are general purpose ports but only SP-8 has modem control lines (RTS, CTS, DCD).

b) Pin assignment of the PORT 2 (DB-9 position connector).

Port 2, DB-9 pin out	
PIN	SIGNAL
1	NC
2	RxD
3	TxD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

c) Pin assignment of the SP-5 Port (DB-9 position connector).

SP-5 , DB-9 pin out	
PIN	SIGNAL
1	NC
2	RxD
3	TxD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

d) Pin assignment of the SP-8 Port (DB-9 position connector).

SP-8 , DB-9 pin out	
PIN	SIGNAL
1	DCD
2	RxD
3	TxD
4	NC
5	GND
6	NC
7	RTS
8	CTS
9	NC

A 2070 compatible modem or expansion slot is available to use SP-1 and SP-2 serial ports. This slot works similar to 2070 controller slot A2.

d) Pin assignment of the SP-1 and SP-2 Ports (DIN-96 receptacle connector).

SP-1	
DIN96	SIGNAL
1A	TxD+
2A	TxD-
3A	RxD+
4A	RxD-
5A	RTS+
6A	RTS-
7A	CTS+
8A	CTS-
9A	DCD+
10A	DCD-
5B	TxCLKO+
6B	TxCLKO-
7B	TxCLKI+
8B	TxCLKI-
9B	RxCLK+
10B	RxCLK-

SP-2	
DIN96	SIGNAL
11A	TxD+
12A	TxD-
13A	RxD+
14A	RxD-
15A	RTS+
16A	RTS-
17A	CTS+
18A	CTS-
19A	DCD+
20A	DCD-
15B	TxCLKO+
16B	TxCLKO-
17B	TxCLKI+
18B	TxCLKI-
19B	RxCLK+
20B	RxCLK-

e) Control signals at communication slot (DIN-96 receptacle connector).

Communications slot	
DIN96	SIGNAL
23B	A2INSTALL
24B	LINESYNC
25B	POWERUP
26B	POWERDN

APPENDIX E: CONNECTOR'S DETAILS, OPTIONAL CONNECTOR BOXES

The ATC NEMA controller is a TS2 Type 1 controller that can be converted to a TS2 Type two controller by adding an optional connector box in order to support the functionality of the A, B, C connectors of the TS1 standard plus the special configuration D connector.

Currently there are two optional boxes, the Standard McCain connector Box and the Traconex compatible box. The only one difference between them is the special configuration D connector.

Below is listed the pin assignment for each connector.

Connector A

It is a round keyed male pin MilSpec connector of 55 pins with the following pin assignment:

Connector A		
Pin	Function	I/O
A	Fault Monitor	--
B	+24VDC (EXTERNAL)	O
C	Voltage Monitor	O
D	Phase 1 Red	O
E	Phase 1 Don't Walk	O
F	Phase 2 Red	O
G	Phase 2 Don't Walk	O
H	Phase 2 Pedestrian Clear	O
J	Phase 2 Walk	O
K	Phase 2 Vehicle Detector	I
L	Phase 2 Pedestrian Detector	I
M	Phase 2 Hold	I
N	Stop Time, Ring 1	I
P	Inh Max Term, Ring 1	I
R	External Start	I
S	Interval Advance	I
T	Indicator Lamp Control	I
U	110VAC Neutral	AC -
V	110VAC/Chassis Ground	Cgnd
W	2070N DC GND, Logic Ground	Lgnd
X	Flashing Logic Out	O
Y	Coded Stat Bit C Ring 1	O
Z	Phase 1 Yellow	O
a	Phase 1 Pedestrian Clear	O
b	Phase 2 Yellow	O
c	Phase 2 Green	O
d	Phase 2 Check	O
e	Phase 2 On	O
f	Phase 1 Vehicle Detector	I
g	Phase 1 Pedestrian Detector	I
h	Phase 1 Hold	I
i	Force Off Ring 1	I
j	Min Recall All Phases	I
k	Manual Control Enable	I
m	Call Non-Actuated I	I
n	Test Input A	I

p	110VAC Hot	AC +
q	I/O Mode Bit A	I
r	Coded Stat Bit B Ring 1	O
s	Vehicle 1 Green	O
t	Phase 1 Walk	O
u	Phase 1 Check	O
v	Phase 1 Pedestrian Omit	I
w	Phase 1 Omit All Red Clear	I
x	Red Rest Mode Ring 1	I
y	Call Non-Actuated II	I
z	I/O Mode B	I
AA	Test Input B	I
BB	Walk Rest Modifier	I
CC	Coded Stat Bit A Ring 1	O
DD	Phase 1 On	O
EE	Phase 1 Pedestrian Omit	I
FF	Pedestrian Recycle Ring 1	I
GG	Max II Sel Ring 1	I
HH	I/O Mode Bit C	I

Connector B

It is a round keyed male pin MilSpec connector of 55 pins with the following pin assignment:

Connector B		
Pin	Function	I/O
A	Phase 1 Next	O
B	Reserved	I
C	Phase 2 Next	O
D	Phase 3 Green	O
E	Phase 3 Yellow	O
F	Phase 3 Red	O
G	Phase 4 Red	O
H	Phase 4 Pedestrian Clear	O
J	Phase 4 Don't Walk	O
K	Phase 4 Check	O
L	Phase 34 Vehicle Detector	I
M	Phase 4 Pedestrian Detector	I
N	Phase 3 Vehicle Detector	I
P	Phase 3 Pedestrian Detector	I
R	Phase 3 Omit	I
S	Phase 2 Omit	I
T	Phase 5 Pedestrian Omit	I
U	Phase 1 Omit	I
V	Pedestrian Recycle Ring 2	I
W	Reserved	I
X	Reserved	I
Y	Phase 3 Walk	O
Z	Phase 3 Pedestrian Clear	O
a	Phase 3 Don't Walk	O
b	Phase 4 Green	O
c	Phase 4 Yellow	O
d	Phase 4 Walk	O
e	Phase 4 On	O
f	Phase 4 Next	O
g	Phase 4 Omit	I
h	Phase 4 Hold	I
i	Phase 3 Hold	I
j	Phase 3 Pedestrian Omit	I
k	Phase 6 Pedestrian Omit	I
m	Phase 7 Pedestrian Omit	I
n	Phase 8 Pedestrian Omit	I
p	Overlap A Yellow	O
q	Overlap A Red	O
r	Phase 3 Check	O
s	Phase 3 On	O
t	Phase 3 Next	O
u	Overlap D Red	O
v	Reserved	I
w	Overlap D Green	O
x	Phase 4 Pedestrian Omit	I
y	Not Assigned	--
z	Max II Select Ring 2	I
AA	Overlap A Green	O

BB	Overlap B Yellow	O
CC	Overlap B Red	O
DD	Overlap C Red	O
EE	Overlap D Yellow	O
FF	Overlap C Green	O
GG	Overlap B Green	O
HH	Overlap C Yellow	O

Connector C

It is a round keyed male pin MilSpec connector of 61 pins with the following pin assignment:

Connector C		
Pin	Function	I/O
A	Coded St Bit A Ring 2	O
B	Coded St Bit B Ring 2	O
C	Phase 8 Don't Walk	O
D	Phase 8 Red	O
E	Phase 7 Yellow	O
F	Phase 7 Red	O
G	Phase 6 Red	O
H	Phase 5 Red	O
J	Phase 5 Yellow	O
K	Phase 5 Pedestrian Clear	O
L	Phase 5 Don't Walk	O
M	Phase 5 Next	O
N	Phase 5 On	O
P	Phase 5 Vehicle Detector	I
R	Phase 5 Pedestrian Detector	I
S	Phase 6 Vehicle Detector	I
T	Phase 6 Pedestrian Detector	I
U	Phase 7 Pedestrian Detector	I
V	Phase 7 Vehicle Detector	I
W	Phase 8 Pedestrian Detector	I
X	Phase 8 Hold	I
Y	Force Off Ring 2	I
Z	Stop Time Ring 2	I
a	Inh Max Timing Ring 2	I
b	Test Input C	I
c	Coded St Bit C Ring 2	O
d	Phase 8 Walk	O
e	Phase 8 Yellow	O
f	Phase 7 Green	O
g	Phase 6 Green	O
h	Phase 6 Yellow	O
i	Phase 5 Green	O
j	Phase 5 Walk	O
k	Phase 5 Check	O
m	Phase 5 Hold	I
n	Phase 5 Omit	I
p	Phase 6 Hold	I
q	Phase 6 Omit	I
r	Phase 7 Omit	I
s	Phase 8 Omit	I
t	Phase 8 Vehicle Detector	I
u	Red Rest Mode Ring 2	I
v	Omit All Red Ring 2	I
w	Phase 8 Pedestrian Clear	O
x	Phase 8 Green	O
y	Phase 7 Don't Walk	O
z	Phase 6 Don't Walk	O
AA	Phase 6 Pedestrian Clear	O

BB	Phase 6 Check	O
CC	Phase 6 On	O
DD	Phase 6 Next	O
EE	Phase 7 Hold	I
FF	Phase 8 Check	O
GG	Phase 8 On	O
HH	Phase 8 Next	O
JJ	Phase 7 Walk	O
KK	Phase 7 Pedestrian Clear	O
LL	Phase 6 Walk	O
MM	Phase 7 Check	O
NN	Phase 7 On	O
PP	Phase 7 Next	O

Connector D, Standard McCain Option.

This is a special configuration connector and not part of the standard.

It is a round keyed male pin MilSpec connector of 61 pins with the following pin assignment:

Connector D, Standard McCain Option.		
Pin	Function	I/O
A	Detector 9	I
B	Detector 10	I
C	Detector 11	I
D	Detector 12	I
E	Detector 13	I
F	Detector 14	I
G	Detector 15	I
H	Detector 16	I
J	Detector 17	I
K	Detector 18	I
L	Detector 19	I
M	Detector 20	I
N	Detector 21	I
P	Detector 22	I
R	Detector 23	I
S	Detector 24	I
T	Clock Update	I
U	Hardware Control	I
V	Cycle Advance	I
W	Max 3 Selection	I
X	Max 4 Selection	I
Y	Free	I
Z	Not Assigned	I
a	Not Assigned	I
b	Alarm 1	I
c	Alarm 2	I
d	Alarm 3	I
e	Alarm 4	I
f	Alarm 5	I
g	Flash In	I
h	Conflict Monitor Status	I
i	Door Ajar	I
j	Special Function 1	I
k	Special Function 2	I
m	Special Function 3	I
n	Special Function 4	I
p	Special Function 5	I
q	Special Function 6	I
r	Special Function 7	I
s	Special Function 8	I
t	Preemption 1 In	I
u	Preemption 2 In	I
v	Preemption 3 In	I
w	Preemption 4 In	I
x	Preemption 5 In	I
y	Preemption 6 In	I

Z	Alarm 1 Out	O
AA	Alarm 2 Out	O
BB	Special Function 1 Out	O
CC	Special Function 2 Out	O
DD	Special Function 3 Out	O
EE	Special Function 4 Out	O
FF	Special Function 5 Out	O
GG	Special Function 6 Out	O
HH	Special Function 7 Out	O
JJ	Special Function 8 Out	O
KK	Not Assigned	I
LL	Detector Reset	O
MM	Not Assigned	I
NN	+24VDC	--
PP	2070N DC Ground	--

Connector D, Traconex Compatible Option.

This is a special configuration connector and not part of the standard.

It is a round keyed CPC connector of 63 male pin contacts with the following pin assignment:

Connector D, Traconex Compatible Option		
Pin	Function	I/O
D01	Emergency Pr 4 Out	
D02	Offset 3 out	
D03	Offset 4 (add bit 3)	
D04	Online	
D05	Spare	
D06	Dial (Cycle plan) 4 Input	
D07	Dial (Cycle plan) 6 Input	
D08	Special Function 2	
D09	Split 3	
D10	Offset 2 (add bit 1)	
D11	Flash Out	
D12	Offset 1 (add bit 0)	
D13	Sys DET 8	
D14	Dial (Cycle plan) 5 Input	
D15	Special Function 3	
D16	Split 2	
D17	Syst Det 1 <SEQ 1>	
D18	Syst Det 4 <SEQ 4>	
D19	System Enable	
D20	Dimming	
D21	Spit 2 Out	
D22	Emergency Pr 2 Out	
D23	Railroad PR Out	
D24	Spare	
D25	Dial (Cycle plan) 2 Input	
D26	FREE/CORD (Spec F 1)	
D27	FREE/CORD Out	
D28	Special Function 1	
D29	Dial (Cycle plan) 4 Out	
D30	Syst DET 5	
D31	Syst Det 3 <SEQ 3>	
D32	Emergency Pr 1 Out	
D33	Offset 1 Out	
D34	Emergency Pr 3 Out	
D35	Dial (Cycle plan) 3 Input	
D36	Offset 3 (Add bit 2)	
D37	Flash Status	
D38	Offset 5 (Add bit 4)	
D39	Syst DET 6	
D40	Syst DET 7	
D41	Offset 4 Out	
D42	Offset 2 Out	
D43	Dial (Cycle plan) 2 Out	
D44	Dial (Cycle plan) 3 Out	
D45	Offset 5 Out	
D46	Split 3 Out	

D47	Syst Det 2 {SEQ>2}	
D48	GND	
D49	Emergency PREEMT 1	
D50	Emergency PREEMT 2	
D51	Dial (Cycle plan) 5 Out	
D52	Dial (Cycle plan) 6 Out	
D53	GND	
D54	GND	
D55	Emergency PREEMT 3	
D56	Emergency PREEMT 4	
D57	Railroad PREEMT	
D58	Conflict	
D59	Reserved	
D60	MUTCD Flash	
D61	Reserved	
D62	Reserved	
D63	CHASSIS GND	

APPENDIX F: UPDATING KERNEL AND UBOOT

Requirements to update the Linux Kernel and U-Boot:

- Latest binary files of Linux Kernel, U-Boot, rootfilesystem and the DTB file
- A computer with an installed terminal program (Such Hyperterminal for windows or ProComm).
- An installed TFTP program (Such SolarWinds.Net TFTP server for Windows)
- ATC eX NEMA Controller
- ATC eX NEMA terminal cable (for port 2).

Note: Please perform a controller backup before update.

Warning: performing the following steps incorrectly could cause controller malfunctions or permanent damage.

Follow the next steps to update the ATC eX NEMA controller Linux Kernel and U-Boot:

- Install the computer and the controller together in a Local Area Network.
- Configure the TFTP program to point the folder where the binaries are stored (such c:\latest kernel binaries\).
- Get the IP number of the computer (i.e. 192.168.2.254)
- Connect the terminal cable between the computer and the controller (port 2).
- Turn ON the controller and press any key in the computer to abort kernel boot. You will get a similar output:

```
U-Boot 1.3.0-rc2 (Jul 26 2010 - 07:17:39) McCainEngineBoard
```

```
Reset Status:
```

```
CPU:    e300c1, MPC8360E, Rev: 21 at 399.999 MHz, CSB:  266 MHz
Unit:    McCain ATC2008 Engine Board
I2C:     ready
DRAM:    128 MB
FLASH:   16 MB
In:      serial
Out:     serial
Err:     serial
Net:     UEC: PHY is Generic MII (0)
UEC: PHY is Generic MII (0)
FSL UEC0, FSL UEC1
Hit any key to stop autoboot:  0
=> █
```

- Setup controller network settings by typing the following:

```
=> set ipaddr 192.168.2.234
=> set ip1addr 192.168.2.235
=> set serverip 192.168.2.254
=> set gatewayip 192.168.2.1
=> set netmask 255.255.254.0
=> █
```

Please note: *ipaddr*, *ip1addr* are the IP addresses for Ethernet Port 1 and Port 2. *serverip* is the computer IP address (where the TFTP server program is), *gatewayip* and *netmask* are part of the network parameters and must be configured.

- Proceed to test the computer and controller connectivity by typing the following:

```
=> ping 192.168.2.254
Using FSL UEC0 device
host 192.168.2.254 is alive
=>
```

Pinging the computer and having a response from it is the best way to test the link.

- Proceed to update the U-Boot (u-boot.bin). Be careful to not turn OFF the controller or interrupting the network link between the controller and computer. Type the following to update the U-Boot:

```
protect off bank 1
```

```
erase 0xFE000000 0xFE02FFFF
```

```
tftp 0x400000 u-boot.bin
```

```
cp.b 0x400000 0xFE000000 $filesize
```

This causes to get the following output:

```
=> protect off bank 1
Un-Protect Flash Bank # 1
=> erase 0xFE000000 0xFE02FFFF

..... done
Erased 10 sectors
=> tftp 0x400000 u-boot.bin
Using FSL UEC0 device
TFTP from server 192.168.2.254; our IP address is 192.168.2.234
Filename 'u-boot.bin'.
Load address: 0x400000
Loading: #####
done
Bytes transferred = 176044 (2afac hex)
=> cp.b 0x400000 0xFE000000 $filesize
Copy to Flash... done
=> █
```

- Proceed to update the kernel (LinuxEBd2_uImage) by typing the following:

```
erase 0xFE050000 0xFE1FFFFFFF

tftp 0x400000 LinuxEBd2_uImage

cp.b 0x400000 0xFE050000 $filesize
```

This causes to get the following output:

```
=> erase 0xFE050000 0xFE1FFFFFFF

..... done
Erased 27 sectors
=> tftp 0x400000 LinuxEBd2_uImage
Using FSL UEC0 device
TFTP from server 192.168.2.254; our IP address is 192.168.2.234
Filename 'LinuxEBd2_uImage'.
Load address: 0x400000
Loading: #####
#####
#####
#####
#####
done
Bytes transferred = 1527993 (1750b9 hex)
=> cp.b 0x400000 0xFE050000 $filesize
Copy to Flash... done
=>
```

- Proceed to update the DTB (atc_engine.dtb) by typing the following:

```
erase 0xFE040000 0xFE04FFFF

tftp 0x400000 atc_engine.dtb

cp.b 0x400000 0xFE040000 $filesize
```

This causes to get the following output:

```
=> erase 0xFE040000 0xFE04FFFF

. done
Erased 1 sectors
=> tftp 0x400000 atc_engine.dtb
Using FSL UEC0 device
TFTP from server 192.168.2.254; our IP address is 192.168.2.234
Filename 'atc_engine.dtb'.
Load address: 0x400000
Loading: ###
done
Bytes transferred = 12288 (3000 hex)
=> cp.b 0x400000 0xFE040000 $filesize
Copy to Flash... done
=>
```

- Proceed to update the root file system (LinuxEBd2_rootfsjffs2) by typing the following:

```
erase 0xFE200000 0xFE7FFFFFFF

tftp 0x1000000 LinuxEBd2_rootfsjffs2

cp.b 0x1000000 0xFE200000 $filesize
```

This causes to get the following output:


```
..... done  
Erased 96 sectors  
=> tftp 0x1000000 LinuxEBd2_rootfsjffs2  
Using FSL UEC0 device  
TFTP from server 192.168.2.254; our IP address is 192.168.2.234  
Filename 'LinuxEBd2_rootfsjffs2'.  
Load address: 0x1000000  
Loading: #####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
#####  
done  
Bytes transferred = 4259840 (410000 hex)  
=> cp.b 0x1000000 0xFE200000 $filesize  
Copy to Flash... done  
=>
```