Standard Sign System

Maintenance Manual

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Chapter 1 — Preface and Overview

About This Maintenance Manual/Purpose

This maintenance manual contains information about the Aesys, Inc. Standard Sign System, which is manufactured by Aesys, Italy. The intended audiences for this manual include end user Maintenance Personnel, Aesys Field Support Personnel, Authorized Aesys Technicians, Product Evaluators and certified third-party personnel. It is particularly intended for personnel who are responsible for day-to-day operation and maintenance of the system and for unit system installation. In addition and as is appropriate, this manual may be used in customer training.

Information in this maintenance manual includes the following:

- Functional description of the product
- General maintenance information
- Troubleshooting guide
- Electrical information including schematics, and
- Software-related information.

Disclaimer

IMPORTANT:
This manual contains information about the Standard Sign System manufactured by Aesys, Inc. No representations or warranties are made as to the accuracy or completeness of the information and procedures contained herein. No representations or warranties are made as to the completeness and compliance of any installations, which are performed using this manual.

OSHA Compliance and Safety Guidelines

OSHA (the Occupational Safety & Health Administration of the United States Department of Labor) has established specific standards for Personal Protective Equipment (PPE). The standards are detailed in the document entitled *General Requirements 1910.132, (Standards - 29 CFR)* and should be reviewed by all personnel prior to working on Aesys, Inc. equipment and systems. Refer to **http://www.osha.gov/** for information about steps that must be taken to protect the eyes, face, ears, hands, and other body parts from potential harm. It is the responsibility of the technician or other service personnel to adhere to all OSHA guidelines as they concern PPE devices and their proper use.

Revision Information (English Version)

If it becomes necessary to revise this manual, Aesys will give the reasons for the revision in this section.

Table A — Manual Revision Information (English Version)

Revision	Description	Revised Date	Revised By	Approved By
1.0	Initial release based on Aesys Publication Number ASMM2009, Version 4.1.	04/01/2011	CW	SD, CM

Cautionary Symbols

Table B describes the various symbols that may be included in this manual and mounted on the equipment.

Table B — Manual and Equipment Safety Symbols

Symbols	Definitions
	WARNING/CAUTION: Risk of electric shock.
	WARNING/CAUTION: Refer to safety-related sections of this and any related manuals.

Cautionary and Symbol Terminology

The severity level of a potential hazard varies. Refer to Table C for descriptions of these levels.

Table C — Description of Cautionary Terms

Cautionary Term	Description
DANGER	Indicates the presence of an extreme hazard that will cause death or severe personal injury. Hazards of this kind MUST be avoided.
WARNING	Indicates the presence of a hazard that can cause death or severe personal injury. Hazards of this kind MUST be avoided.
CAUTION	Indicates the presence of a hazard that can or will cause minor personal injury or property damage if the hazard is not avoided. The Caution Indicator may be used to warn against potential equipment damage and service interruption.

Safety Summary and Cautions Concerning Servicing the Unit

The information that follows applies to general safety precautions and may not be reiterated elsewhere in this manual.

WARNING: Risk of Electric Shock.
Whenever possible or applicable, remove the cable from the negative terminal of vehicle's battery or power source first and then remove the cable from the positive terminal before performing any installation or service procedure. Only trained service personnel should perform the procedures outlined in this maintenance manual. These procedures may allow exposure to high electrical energy that could result in electric shock and injury to untrained personnel during servicing, maintenance, and installation of the unit.

Never perform maintenance or service to equipment with the power turned on. Always remove the power first. To avoid personal injury, always remove power from the equipment prior to performing any procedure. Circuits should also be discharged and grounded before beginning service procedures. Always work with another person who can render aid in the event of an accident.

CAUTION: Components is this system may be potentially damaged by electrostatic discharge. Always use a wrist grounding strap and/or a grounded antistatic floor mat when servicing the equipment.

All components that may be susceptible to damage by electrostatic discharge should be stored in suitable antistatic bags or other suitable containers.

In case of welding operations using welding systems with electrodes and other operations that may result in rapid battery discharge and recharge, the Standard Sign System MUST be disconnected from the power supply before any work is performed.

Maintenance Related Guidelines

Signs and the Central Control Units (CCUs) are made of components that normally do not require maintenance. During the installation phase of the system Aesys recommends that the mounting hardware used for the support stirrups include properly fitting washers that will not accidentally loosen and that the housing where the sign is located has enough ventilation to avoid the excessive accumulation of heat (for auto-heating solar light radiation heating).

Periodically verify the state of the stirrups and the tightness of the mounting screws, especially for the parts exposed to direct user contact.

Signs do not produce dangerous voltages internally and use voltages that are less than the vehicle's power supply voltages. In case of a damaged connector or connection cable or of accidental contact with external parts (the housing), the voltage is short-circuited to ground causing protection hazards.

We recommend that the user contact Aesys personnel if any anomalies with the display (sign) occur. Aesys cannot be responsible in the case of display system intervention by unauthorized personnel.

In the case of substitution of the internal circuit boards or spare parts, we recommend that the user refer to the electrical diagrams that are included later in this maintenance manual.

Firmware and Manual Versions and Revisions

Firmware Versions

The user can establish their current firmware version and a copy of the maintenance manual that was current at the time the firmware was installed.

Current Firmware Releases

The current firmware releases for the Standard Sign System are detailed below in Table D.

> **NOTE:** KC640 firmware used in certain system configurations may be different from the Standard Configuration depending upon the sign configuration and/or system integration.

Table D — Firmware Release Information for the KC640 Central Control Unit (CCU)

No.	Release Date	Reason for Change	Firmware No.	Revised By
1	02/07/2007	Standard Configuration (FW).	D7A10A.1	SD
2				
3				
4				

Manual Versions

Referring to Figure 1 that follows, the front cover page of the *Standard Sign System Maintenance Manual* is clearly marked with its publication number as well as information about its version number and approximate date of publication. The inside cover page also includes this information as does every page in the manual.

When troubleshooting a problem that may occur, Aesys Customer Service and Support Personnel may ask for this information in order to ensure that the user is referencing the proper version of the manual.

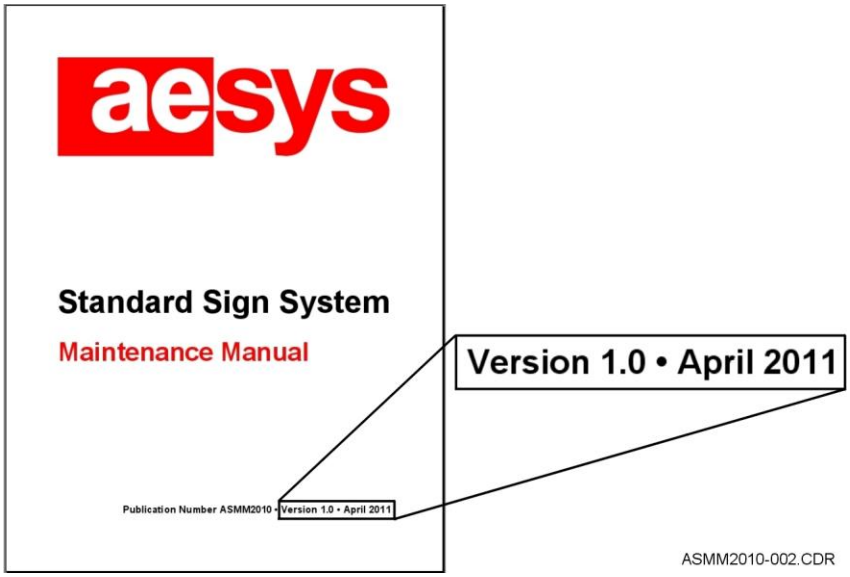

Figure 1 — Manual Version Information

Firmware and Manual Versions and Revisions

It is important to note that there is no direct correlation between the versions of both firmware and the maintenance manual. For example, at the time of this writing, the latest version of the *Standard Sign System Maintenance Manual* was Version 1.0 and the CCU firmware was Version D7A10A.1.

Aesys Customer Service and Support Personnel have the necessary information needed to establish whether your version of the maintenance manual is appropriate for the firmware version you are using.

Change Management

In the future Aesys, Inc. may offer future enhancements and changes to the Standard Sign System by releasing new firmware versions. If this occurs, existing Standard Sign System users will be offered the opportunity to update their software or firmware.

Aesys Terminology and Terms

The following terms include abbreviations and acronyms that may appear throughout this manual; however, they are terms with which a beginning user may not be familiar.

Term	Explanation/Definition/Description
°C	Degrees Celsius
°F	Degrees Fahrenheit
A	Ampere. A unit of electric current
AC	Alternating Current
Boot	Bootstrap, the process of starting or initiating a computer
Beep	An audible audio signal
CCU	Central Control Unit. In this case, the KC640 Control Unit
CL	The Clear Key on the CCU
CPU	Central Processor Unit or a microprocessor
DC	Direct Current
DIP Switch	Dual Inline Package (DIP). An electrical micro switch packaged in a single group.
EMI	Electro Magnetic Interference
<ENT> OR <Enter>	The Enter Key on the CCU control panel
EPROM	Erasable Programmable Read Only Memory. A non-volatile read only memory erasable by ultraviolet light
Firmware	Firmware is software that is embedded in a hardware device
IR	Infrared
IrDA	Infra Red Device Application. This defines physical specification communication protocol standards for short range exchange of data over infrared light
LCD	Liquid Crystal Display
LED	Light Emitting Diode
mA	Milliampere. A unit of current equal to one thousandth (10^{-3}) of an ampere.
PC	Personal Computer
PLD	Programmable Logic Device
POST	Power On Self Test
P/R	A Public Relations message
PWM	Pulse Width Modulation
Software	Computer code loaded into devices. Software contains a list of instructions for the various operational phases of the system
V	Volt. A unit of electric potential difference
W	Watt. A unit of power

Chapter 2 — System Overview

Introduction to the Standard Sign System

The full color Light Emitting Diode (LED) Standard Sign System is a high performance product with optimized visibility characteristics. It is designed to display destination, public relations information, and general messages that can be controlled manually by the KC640 on-board Central Control Unit (CCU).

Each bus is equipped with a CCU and a number of signs. In typical applications, these signs include a front sign, dash sign, route side sign, and a side sign that are controlled by manually entering code numbers on the CCU. The system is built using solid-state components to ensure long life and low maintenance. Figure 2 shows the Standard Sign System General System Diagram. The system is usually composed of the following components in each installation (per bus):

- KC640 Central Control Unit with microprocessor (This is the central element that manages all system components.)
- Display panels (signs) mentioned above
- Data/Power circuit wiring harness, and
- Power supply wiring harnesses.

Depending upon the unique design configuration of a bus, the Standard Sign System can have a different number of signs. Therefore, Figure 2 is representative of a general system only. All components in the system operate on 12 V DC ***OR*** 24 V DC. Any power fluctuations within 10 percent will not normally have an effect on the system. However, wider fluctuations must NOT continue for extended time periods, because this may result in blowing an internal fuse or possibly component failure.

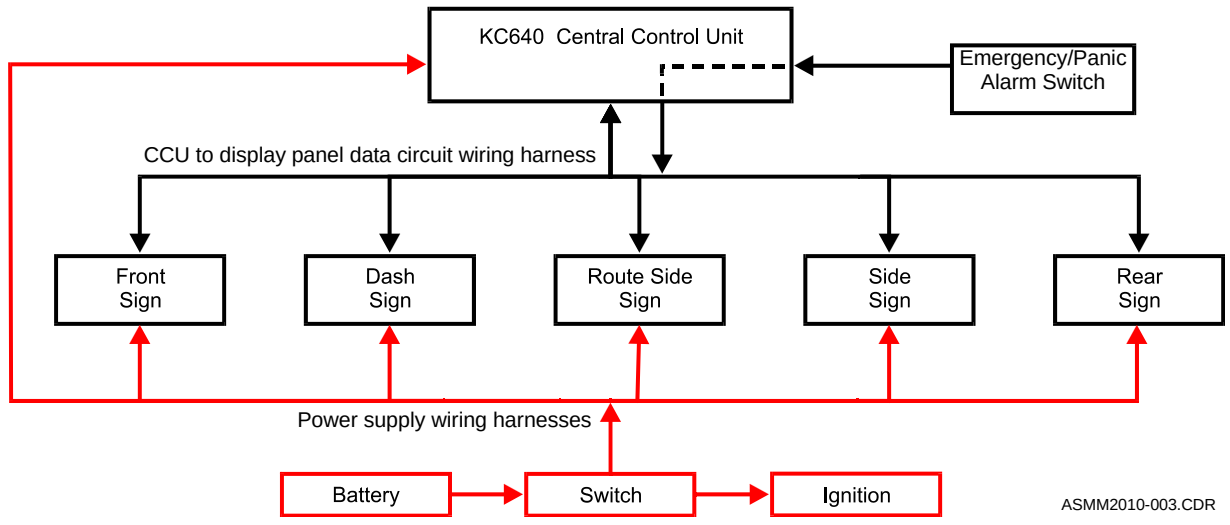

Figure 2 — Standard Sign System General System Diagram

Chapter 3 — KC640 CCU Operation

Introduction

The KC640 Central Control Unit (CCU) is the Aesys on-board controller device. Its primary function is to transmit messages and/or destinations to the destination sign system. It is responsible for the management of all communications with associated signs and provides a user-friendly interface. A front view of the CCU is shown in Figure 3.

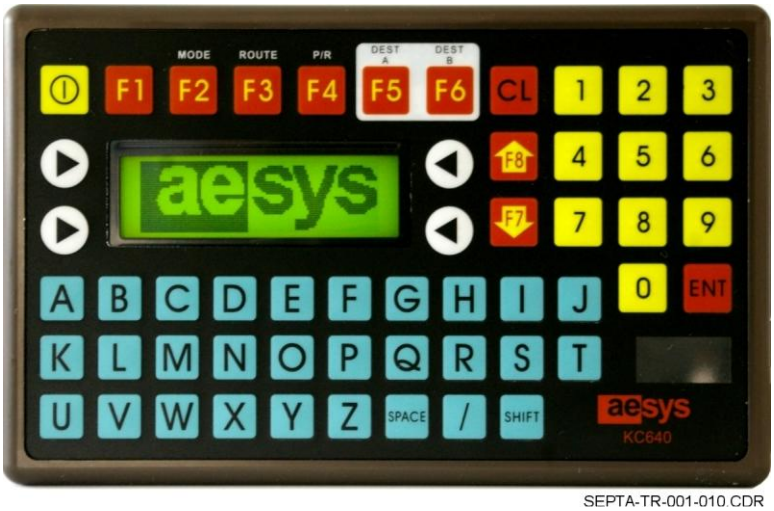

Figure 3 — KC640 Central Control Unit

Functionally, it is the on-board device for selecting the line code and/or the destination of the vehicle. Once a selection has been made, the CCU will start to transmit in three seconds, sending the destination information to the LED display panels (signs). The CCU also monitors system operation and provides the user with important diagnostic information.

The operator can use the CCU's LCD to verify that the destination message or code number selected with the keyboard is the one he wishes to display, before sending the command to actually display the message. It is also used in maintenance procedures to verify communication errors (Status 2). It is also used for troubleshooting.

Basic components of the user interface include an alphanumeric keyboard, to select functions, and an LCD display to receive confirmation of performed operations. Signals sent by the CCU are accompanied by audible alert (beep).

The KC640 CCU is normally supplied complete with operational firmware and a customer database (TRX file) containing the information to be displayed on the signs. Both functional firmware and customer database information can be updated using a SmartMedia[1] card. A special port for reading SmartMedia cards is located on the right side of the CCU (see Figure 8 on Page 19).

1 SmartMedia™ is a trademark of Toshiba Corporation.

KC640 Central Control Unit (CCU) Features

The major controls on the KC640 CCU are detailed below in Figure 4.

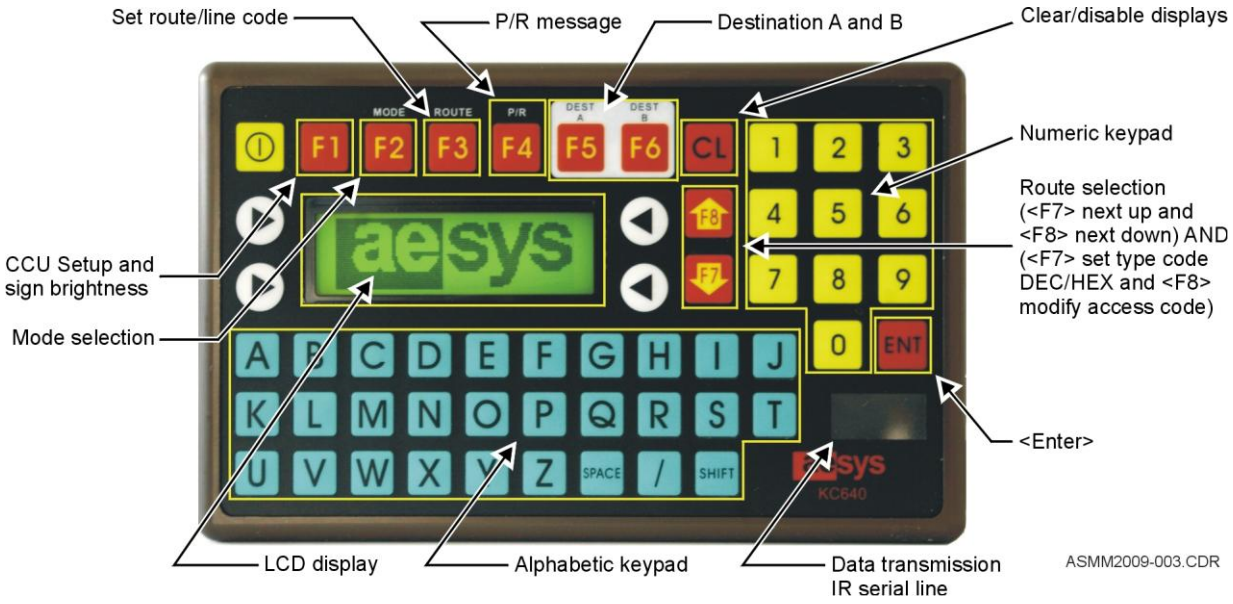

Figure 4 — KC640 Central Control Unit, Selected Features I

The CCU command system using the keyboard can be divided into two levels. The first level is for normal viewing and is the default screen. The second level is for CCU set-up.

In the first level the controls for normal display/default screen are as follows:

- <F1> — Press to switch to second level (CCU set-up)
- <F2> — Mode selection (internal message) “Disabled”
- <F3> — Press to set route (line) code “Disabled”
- <F4> — Press to set a public relation (P/R) message
- <F5> — Press to set destination “A”
- <F6> — Press to set destination “B”
- <ENT> — Panel information refresh (confirm performed selection), and
- <CL> — Press to make the signs blank. Pressing the <CL> button AND the <ENT> button will make all signs blank.

In the second level the controls for CCU setup are as follows:

- <F1> — View/edit display brightness. After selecting <F1> the user can vary the LCD displays brightness (0 to 8 with 8 being the brightest)
- <F2> — Enable/disable the internal display
- <F3> —View/edit P/R page duration
- <F4> — Enable/disable “Line+Terminus” mode
- <F5> — Enable/disable “power save” time

- <F6> — Disabled/No Function
- <F7> — Disabled/No Function, and
- <F8> — Modify access code.

Start-Up/Power On Self Test (POST)

At start-up when power is first applied, the CCU beeps twice and the information shown in Figure 5 will appear on the LCD for approximately three seconds. The “xxxxxx” represents the Boot Program Code (D3B19C) and may be different depending upon the date the KC640 CCU was purchased.

The boot program represents the first instructions at Power On Self Test (POST), then displays the Aesys logo (see Figure 6) for one second. Finally, during the last execution the customer’s firmware version (D7A10A.1) will appear on the LCD display for three seconds (see Figure 7).

NOTE: Your boot program code version may vary depending upon the latest version that has been updated and/or purchase date of your system.

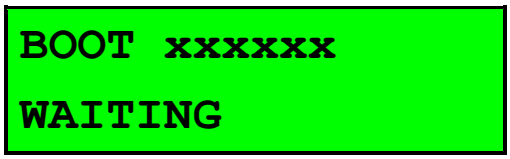

Figure 5 — Start-Up and Boot Program Code

Referring to Figure 6, at this point the Aesys logo will appear on the LCD for one second.

Figure 6 — Aesys Logo Briefly Appears

In the next message, “xxxxxx” represents the KC640 CCU firmware version number (D7A10A.1). This firmware version will appear on the LCD for two seconds (see Figure 7).

NOTE: The KC640 (CCU) firmware version may vary depending on the latest version updated or purchase date of system.

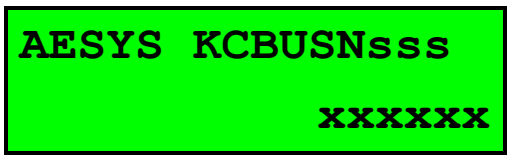

Figure 7 — Firmware Revision Number

At start-up completion, the CCU will emit a two-second beep. This indicates the CCU has booted successfully and is now ready for message programming.

NOTE: If the start-up process is successful, it should take approximately seven to ten seconds to complete.

SmartMedia Card (SMC) Installation

Referring to Figure 8, carefully install SmartMedia card into the right side slot of the CCU. Be-sure the SMC is properly aligned with the connector inside the slot.

IMPORTANT: Referring to Figure 8, the notched corner of the SmartMedia card MUST correspond to the notch shown on the label attached parallel to the slot.

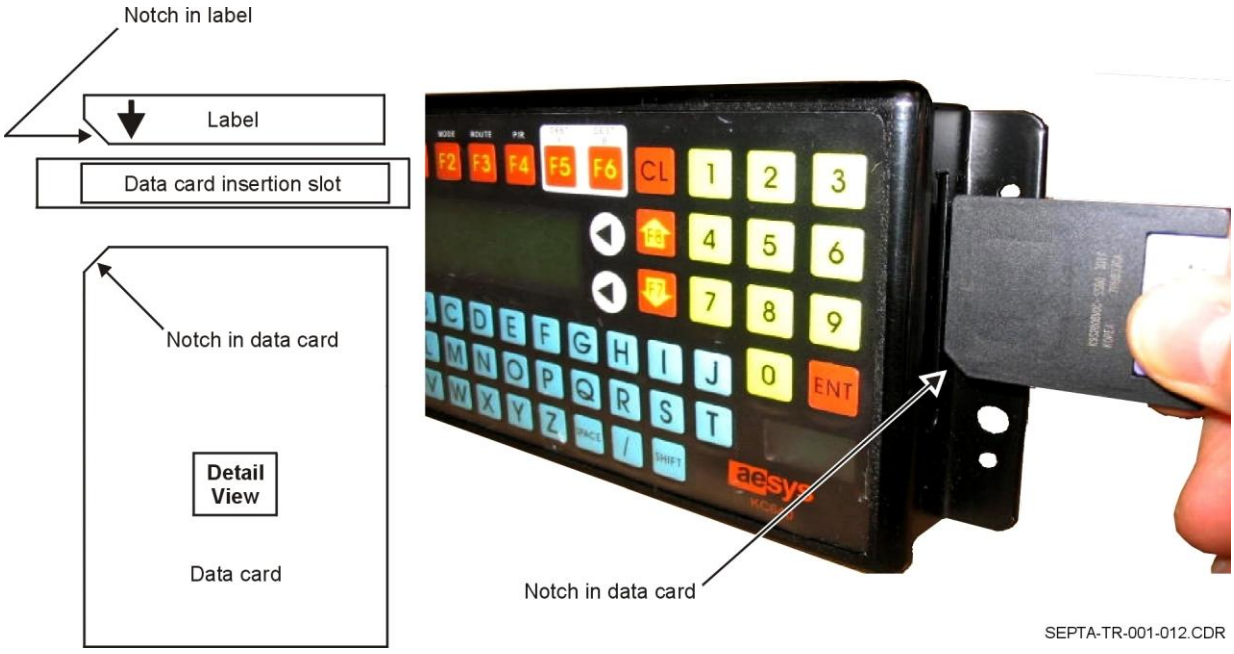

Figure 8 — KC640 SmartMedia Card and slot connector

Once the SMC is installed all the way into the slot, the CCU will beep three times indicating the card is present and the LCD will display the following messages:

- CARD PRESENT
- READING CARD
- CARD OK, and then
- DISABLED DISPLAYS.

After the program has been loaded successfully, the CCU will beep three times indicating the loading process is now complete. At the completion of the program loaded successfully, the CCU will clear all signs and read “DISABLED DISPLAYS.”

NOTE: Programming time will vary depending upon the size of the message listing/TRX file. If the message listing/TRX file is more than 100 listings, the CCU may display a percentage value when up-loading.

Selecting and Executing Destination/Message to Sign

Referring to Figure 9, after the program/TRX file has been successfully loaded, the user can start displaying messages or destinations on the sign by using the following keys:

- Numeric keypad — Type in the destination code number on the keypad
- <ENT>·key — Press the <ENT> key to send the message to sign
- <CL> key — Press <CL> key and press <ENT> to clear/disable all signs
- <F8> — This key starts the message list from the first message/destination entered, then counts down, and
- <F7> — This key starts the message list from last message/destination entered then counts up.

Figure 9 — KC640 Central Control Unit, Selected Features II

After you select the destination or message, you must press <ENT> to transmit that data to the sign. Figure 10 below shows the transmit message on the CCU when sending data to the sign. The "xxxx" reflects the code number associated with the destination or message transmitted to the sign.

Figure 10 — Transmission Message

NOTE: If the transmission time takes more than five seconds, there may be a communication error/Status 2 error. If so, refer to the next section.

CCU Transmission/Communication Error (Status 2)

This error represents a general communication error from the CCU to destination sign. If the “Status 2” error occurs, check the letter that is vertically above that number “2,” which would indicate the sign with the communication problem.

Shown in Figure 11 is an error on the letters A and C, indicating there is a communication problem with the front and rear sign. Shown in Figure 12 is a “Status 2” error with the letter B, indicating there is a communication problem with the side sign.

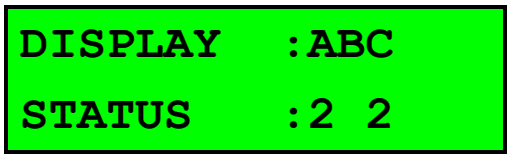

Figure 11 — Error on the Letters A and C

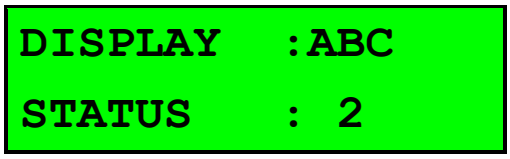

Figure 12 — Error with the Letter B

“Status 2” Error Troubleshooting Guide

To troubleshoot a “Status 2” error perform the following steps:

(1) Verify which sign has the “Status 2” error. If using a USP4-type sign, the problem may be internal so contact Aesys technical support for further assistance.

(2) Check to ensure the sign has power.

(3) Check to see if the sign has power and properly booted (four LEDs should be present in the right lower corner).

(4) Check data communication cable connection from the CCU to destination sign.

(5) Check the address configuration for the destination sign and CCU. Both addresses for the sign and the CCU should be the same. The sign address letter is located on the silver label mounted on the rear side of sign. The letters shown below represent the address for each sign as follows:

- A = Front
- B = Side (Optional)
- C = Rear (Optional)
- G = Dash (Optional)
- D = Internal (Optional)

NOTE: The sign address letter may vary depending on your sign type or configuration. If your configuration consists of two or more signs or a rainbow-type color sign, contact Aesys technical support to verify the configuration is correct.

CCU LCD/Message Display

After the message has been successfully sent to the signs, the CCU (LCD) will display the code number with destination/message. Figure 13 shows a sample code number and destination message. “0019” is the code number, “Norristown” is the top line destination message, and “Limited” is the bottom line destination message.

NOTE: The message formatting on the CCU (LCD) has no effect on the sign message. In other words, the CCU (LCD) and the sign message/formatting could look totally different.

Figure 13 — Sample Code Number and Destination Message

Dash/Run Number Sign Option

NOTE: The CCU firmware MUST be J1708 compatible in order to use this option and the dash sign must be enabled.

To enter dash sign information, perform the following steps:

(1) Press <F3> (the Route key) and the LCD will display “(Machine> <Turn).”

(2) Type in the dash sign information.

(3) Press <ENT> to send the information to destination sign.

NOTE: To clear/delete dash sign information use the <Space> key to clear data and then press <ENT>.

Selecting a Public Relations (P/R) Message

Referring to Figure 14 (which shows a P/R code number on the CCU LCD), to select a public relation message perform the following steps:

(1) Press <F4> (the P/R key).

(2) Type in a P/R code number using numerical and/or alphabetic keypads.

(3) Press the <ENT> key to send the P/R message to sign.

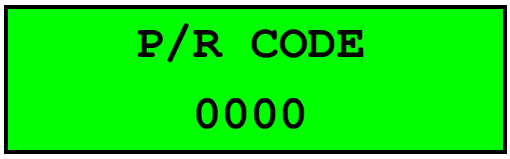

Figure 14 — Public Relations (P/R) Code Number on the LCD

NOTE: Public Relations (P/R) messages are defined as seasonal holiday-type messages (for example, “Happy Holidays” or “Happy New Year,” etc.).

Deleting a Public Relations (P/R) Message

To delete public relation messages, perform the following steps:

(1) Press <F4> (the P/R key).

(2) Press the number <0> on the numeric keypad until all four numbers are “0” (zero).

(3) Press the <ENT> key to disable the P/R message.

Non-existent Code

The warning message shown in Figure 15 will appear on the CCU display only if the code number entered does not exist in your message listing.

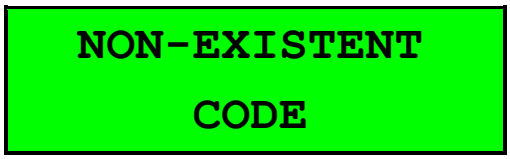

Figure 15 — Non-existent Code Message

Select Between Two Destinations (“DEST A” and “DEST B)”

Referring to Figure 16 and Figure 17, the “DEST A” (<F5>) and “DEST B” (<F6>) key functions are commonly used when a vehicle is traveling to and from the same location on a frequent basis. DEST A can be programmed by pressing the <F5> key then entering the destination code number and then pressing <ENT>. DEST B can be programmed by pressing <F6> then entering the code number and then pressing <ENT>. After entering the destination code numbers for both DEST A and DEST B functions, just press the <F5> or <F6> keys to select that specific destination and then press <ENT> to send the distinctive message to the sign.

Figure 16 — Select Destination “A”

Figure 17 — Select Destination “B”

Using the Scrolling Keys (<F7> and <F8>)

The <F7> and <F8> keys are used to scroll up or down throughout the entire destination list. When the desired code number or destination is selected, press the <ENT> key to send the information to the sign.

For example, with a starting destination of 0005, repeatedly pressing <F7> could result in a destination changes to 0004, 0003, 0002, and so on. With a starting destination of 0005, repeatedly pressing <F8> could result in a destination changes to 0006, 0007, 0008, and so on.

Blanking/Disabling the Sign

Referring to Figure 18 and Figure 19, to blank the signs (turn off all LEDs) press the <CL> key until the LCD shows “DISABLE DISPLAYS (ENT to confirm). When the <ENT> key is pressed, the message “DISABLED DISPLAYS” appears as shown in Figure 19 to confirm that the signs are disabled.

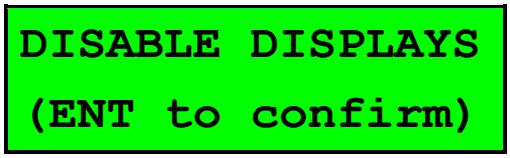

Figure 18 — Disable Displays Prompt

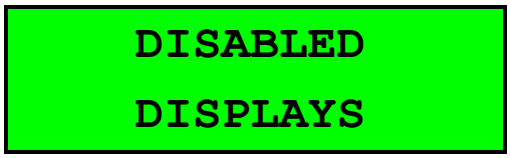

Figure 19 — Disabled Display Confirmation

Second Level Key Mode

IMPORTANT: Before entering into the Secondary Key Mode, be sure to NOT change the “internal” or “dash” sign setup!

Entering the second level key mode lets the user access/modify many configuration parameters within the CCU. To enter second level key mode, perform the following steps:

(1) Press <F1> and the “access mode” screen appears (see Figure 20).

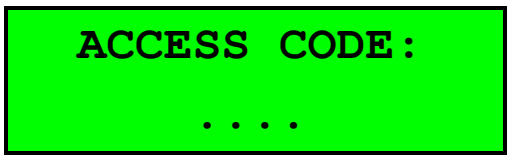

Figure 20 — Second Level Access Code Screen

(2) Using the numeric keypad enter access code number “1221” and if the access code is correct, the second level key mode screen will appear as shown in Figure 21.

(3) Once in the second level key mode, the user can select any of the function keys <F1> through <F8> to modify parameters. Refer to the *KC640 Central Control Unit (CCU) Features* section at the beginning of this chapter to learn about all available function key options.

NOTE: If the access code number entered does not work, contact your Aesys representative.

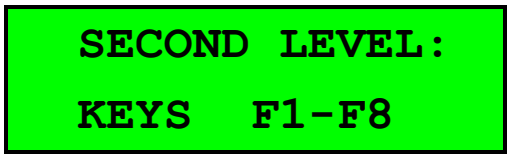

Figure 21 — Second Level Key Mode Screen

Sign Brightness Adjustment Feature (<F1>)

The default brightness setting is “0” (zero). This means the sign is set for automatic brightness adjustability and depending upon the ambient light directed to the sign, there are 16 possible brightness levels. To manually change the automatic brightness to another value, perform the following steps:

(1) Press <F1> and the second level access code screen will appear (see Figure 20).

(2) Using the numeric keypad enter access code number “1221” and if the access code is correct, the second level key mode screen will appear as shown in Figure 21.

(3) Referring to Figure 22, press <F1> again and the display selection screen will appear (depending of your current settings, different values may be shown).

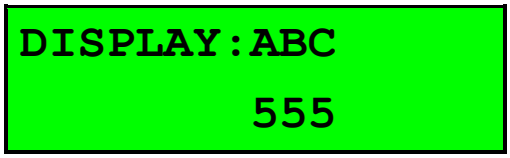

Figure 22 — Display Selection Screen

(4) Press the number of sign to be changed. Note that the numeric choices are equivalent to the alphabetical choices, so that, in this example 1 = (A-front sign), 2 = (B-side sign), 3 = (C-rear sign, etc.). The choices of your own particular system may be different from what is shown in Figure 22 and Figure 23. In Figure 22 the signs are A, B, and C and the corresponding existing values in this example are each “5” (the values are vertically below each sign letter designation).

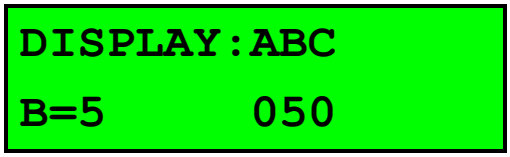

Figure 23 — Sign Selection Screen

(5) Using the numeric keypad, enter a number from one through eight, where 1 = minimum brightness and 8 = maximum brightness.

(6) Press <ENT> to save the new brightness level.

(7) Press the <CL> key to exit from the second level key mode.

(8) Press <ENT> again to send the new brightness setting to the sign.

IMPORTANT: When the brightness level is set to "0", the sign will automatically adjust depending on the surrounding ambient light condition.

Enabling/Disabling the Internal Sign (<F2>)

Referring to Figure 24, the <F2> key allows the user enable or disable the internal sign. After pressing the <F2> pressing "1" on the numeric keypad will enable the sign. Conversely, pressing <F2> and then pressing "2" on the numeric keypad will disable the sign. Figure 24 indicates that the sign is disabled since the selected value is "0" (zero). If the value was "1", the sign would be enabled.

NOTE: Referring to Figure 24, in the first line of the display ("INTERN. DISP.: 0"), the "0" (zero) is the "Value Number."

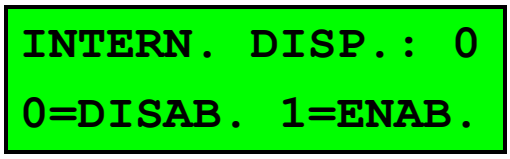

Figure 24 — Enabling the Internal Sign

Change Page Duration of P/R Message (<F3>)

This feature allows the user to select the Public Relations (P/R) message page duration for the selected message. The CCU number values and the corresponding duration in seconds appear below in Table E.

Table E — Public Relations (P/R) Message Page Duration Values and Durations

KC640 CCU Number Value:	1	2	3	4	5	6	7	8	9
Duration in Seconds:	1	2	3	4	7	10	18	29	40

To select the message page duration, refer to Table E, Figure 25, and Figure 26 and perform the following steps:

(1) Press <F3> and to view the existing duration. In the example shown in Figure 25, the P/R message page duration is two seconds.

Figure 25 — Public Relations (P/R) Message Page Duration Screen

(2) Select value from one through nine to change page duration (refer to Table E for the required value and duration in seconds). After the page duration has been entered, the LCD display "SET UP DONE" as shown in Figure 26.

NOTE: Value number two (2 seconds) is the default and is the suggested value number to use.

Figure 26 — Public Relations (P/R) Message Page Duration Set-up Completed

Line + Terminus Mode (<F4>)

IMPORTANT: Before using this feature contact Aesys technical support personnel for assistance. Changes to the main database file in the Aesys Verba Plus program are needed to use this function.

Enabling line terminus mode will let the user enter the line and/or route number and destination message independently. Since Aesys does not recommend users to perform this operation, specific steps are not included in this manual. However, the access screen is shown below in Figure 27. Referring to the end of the second line of this screen, a value of 1 = Enabled and a value of 0 = Disabled.

Figure 27 — Line + Terminus Mode (<F4>) Main Screen

Ignition/Engine Off — Disabling the Display Feature (<F5>)

This feature is used to disable messages on the signs to save battery power. After the vehicle motor power is turned off, depending on disabling time, the CCU will disable/clear the sign message to save battery power. Figure 28 shows the default time set screen.

NOTE: This value is adjustable only with Verba Plus software and cannot be changed by the CCU.

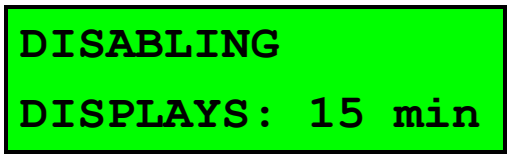

Figure 28 — Disabling Displays Screen

Dash Sign Enabled and Disabled Feature (<F6>)

NOTE: The CCU firmware MUST be J1708 compatible in order to use this option and the dash sign must be enabled.

The dash sign enabled and disabled feature access screen is shown below in Figure 29. Referring to the end of the second line of this screen, a value of 1 = Enabled and a value of 0 = Disabled.

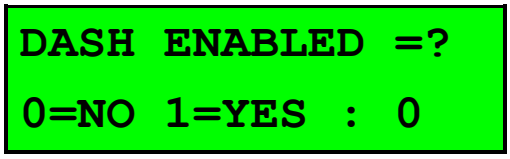

Figure 29 — Dash Sign Enabled and Disabled Feature Main Screen

Protocol (Decimal/Hexadecimal) Setup Feature (<F7>)

IMPORTANT: Before using this feature contact technical support for assistance.

This feature is used when receiving transmission/code from an on-board computer to receive data in decimal or hex-decimal mode. Referring to the end of the first line in Figure 30, 0 = Decimal and 1 = Hexadecimal.

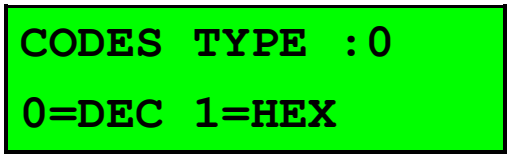

Figure 30 — Protocol (Decimal/Hexadecimal) Setup Feature Main Screen

Access Code Password Option (<F8>)

To modify access code, perform the following steps:

(1) Press <F8> and the screen in Figure 31 will appear.

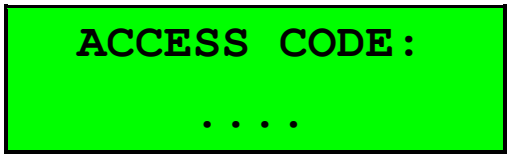

Figure 31 — Access Code Password Option Initial Screen

(2) Using the numeric keypad enter access code number “1221” and if the access code is correct, the screen shown in Figure 32 will appear.

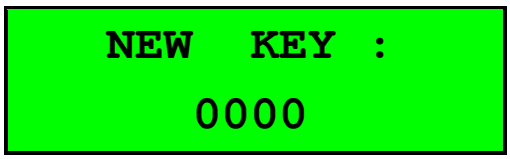

Figure 32 — Access Code Password Change Password Screen

(3) Enter the new access code numbers and then press <ENT> and the screen shown in Figure 33 will appear.

Figure 33 — Access Code Password Option Change Confirmation Screen

IMPORTANT: If the user sets the access code to “0000”, this will disable the password protection feature.

Reset Default Settings

IMPORTANT: Resetting your defaults will also delete your destination list/TRX file. Before performing this procedure and in order to ensure that you have the capability of reloading your destination messages, be sure you have a backup SmartMedia card with the latest destinations available.

To reset the default values on the CCU perform the following steps:

(1) Disable the power from the sign system.

(2) On the CCU, simultaneously press and hold the <F6> and <F7> keys.

(3) Enable the power to the sign system while still pressing and holding the function keys.

(4) After the CCU has booted up and defaults reset successfully, the message on the LCD should read “NO ROUTE IN MEMORY.”

(5) Release the <F6> and <F7> keys and reload your message listing/TRX file.

Alarm Reset/Disable

Once the alarm is enabled, press the <F6> key to disable and reset the alarm without removing the vehicle power.

Emergency Button Error

If an emergency button error occurs after the completion of start-up, an error message will be displayed as shown in Figure 34. This would indicate there is no emergency connector attached to CCU’s (DB-15

connector) or that the internal circuit has a problem. If you want to continue and override the alarm message, press the “Y” key and then enter the four-digit access code (1221) on the keyboard.

Figure 34 — Emergency Button Error Display

Emergency/Panic Alarm Feature

The Emergency/Panic Alarm option is available for all coach and transit vehicles. When activated, this alarm preempts the normal messages displayed on the vehicle’s exterior facing signs with an alert message that is pre-programmed by the customer. For example, the signs may flash “EMERGENCY” and/or “CALL POLICE 911” or some other approved message.

When the vehicle’s exterior facing signs display the alert message the display message on the sign controller, mounted inside the vehicle, will only display “Public Service” so as to not make anyone else on-board aware of the external message.

Emergency/Panic Alarm Feature capabilities are as follows:

- Existing installed systems already in service can be upgraded
- The alarm trigger can use an active high or low (12 or 24 Volt) signal, and
- There are different ways to cancel/reset the alarm.

This option provides a way to discreetly broadcast a critical message to people in the vicinity of the vehicle, thereby adding another level of awareness to an event occurring on-board the vehicle. The location of the Emergency/Panic Alarm Connector on the rear side of the KC640 is shown below in Figure 35.

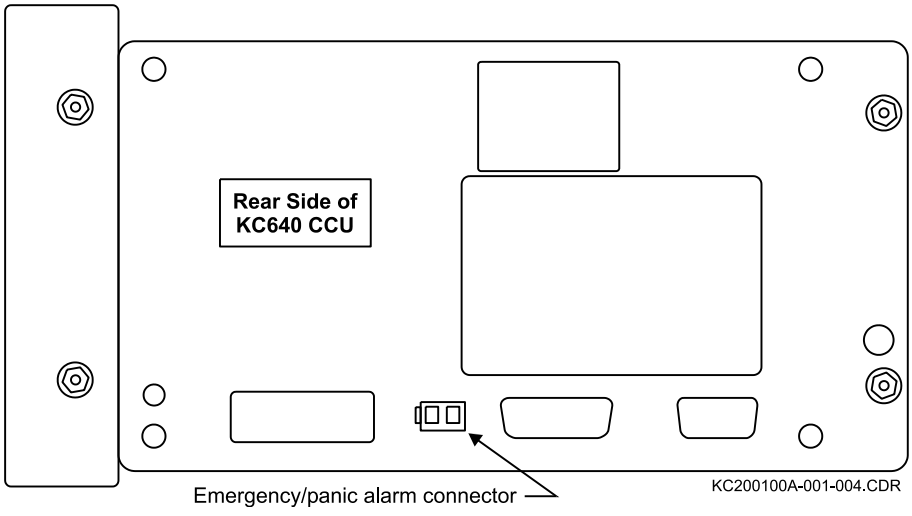

Figure 35 — Emergency/Panic Alarm Connector

Manual Input Messages (MIM)

The Manual Input Message (MIM) feature allows the end user to enter a text message using the KC640 keypads. MIM works with all standard internal and external sign types using the standard fonts. Text scrolling is also available at up to 200 characters.

IMPORTANT: To use this feature, the MIM message must be included in your message listing using the Verba Plus software program Version 5.1. This feature only applies to specific sign types so be sure to contact your Aesys representative to find out if the sign configuration applies. Refer to the Verba Plus user's manual for additional information.

Manual Input Message (MIM) Procedure

To enter a MIM message or destinations perform the following steps:

(1) Press the <F1> key.

(2) Type in the pass code number "1221."

(3) Press the <E> on the alphabetic keypad to activate the MIM feature.

(4) Enter the message or destination using the alphabetic and numeric keypads.

(5) Press the <ENT> key to send the MIM message to the sign.

(6) To return to your original destination or message, press the code number that corresponds to that destination and then press the <ENT> key.

Special MIM Feature Key Functions

The <F1> key is used to delete one character at a time. While entering a MIM message a mistake is made, the user can select the <F1> key to delete one character at a time. The <CL> key will erase the entire MIM message or the user can return to the main menu.

Use Keypad Arrow Keys to shift the cursor to the right or left

To clear the sign message, select the following:

- For the external sign type "CL", and
- For the internal sign, choose code "0000."

CCU Technical Information Supplement

The sections that follow are supplemental and include special features and operations as well as hardware-related information.

Viewing Other Destination Message Timeout

If scrolling through your destination list and no keys are pressed for approximately 30 seconds, the CCU will automatically revert to the current destination message on the sign. To revert to the original destination message manually, press the <CL> key one time.

Access Code/Password Recovery

It's suggested to keep the same access code/password number for all CCU units. To acquire the access code number contact supervisory personnel who are responsible for safeguarding this type of information.

Downloading Data (Destination/Message Listing)

There are various ways to down load data to the CCU. Data files can be loaded by Smart Media compatible card or by using a data loader (RS-232C) device or by IrDA communication or by PC. Refer to the Verba Plus software manual for further information regarding the data file TRX/message listing.

Uploading Firmware

The main process in uploading the firmware program to the CCU is using a Smart Media compatible card. Refer to the *SmartMedia Card (SMC) Installation* section on Page 19, or contact Aesys Technical Support for detailed information on this uploading process.

CCU Basic Operation-related Information

In the preceding sections, we have covered the CCU functions and operating modes. This section is devoted to providing some additional information about the CCU's composition and on how to operate various components that constitute the CCU in order to better understand the specific function of each component. The basic electronic component of the system is the CPU board. The CPU board is composed of the microprocessor, EPROM memory, and other accessory components. Taking into context the components just mentioned, the operation of the CCU can be explained as follows:

- Data and operation programs are stored in EPROM memories. At system start-up, activating programs (BOOT sequences) are uploaded into the RAM memory. In the RAM memory, these programs are used by the microprocessor for the activation of its internal components.
- Once the phase of start-up has passed, the data related to the information to be used is withdrawn by a specific EPROM memory once commanded by the microprocessor.
- The microprocessor sends this data to the output peripheral using the FIRMWARE program.
- This data reaches the signs and other system components.
- Data transmission between the CCU and the signs is performed by using typical standards for these systems. In our case, the standard used is the RS-485.
- The microprocessor is the component through which it is possible to transmit the data that allows the operation of both the CCU and signs.
- The CCU has two EPROM memories. One is specific for data information storage related to routes to be displayed and the other contains the boot program and operating software.
- At this point, the CCU is able to work autonomously on the basis of input received from the operator through the keypads.

Other accessory components present in the CCU are:

- The TIMEKEEPER is provided with its own internal power battery and it is able to keep the date and the time updated, also in the absence of main power;
- Special nine- and 15-pin connectors are used for the power thus allowing the data receipt coming from the input peripheral (if present) and the transfer of information packets addressed to the signs.
- The slot for the insertion of the SmartMedia card, from which the user can load the special EPROM memories with customer data and operation firmware.

Additional Software Considerations

Programs present in the CCU are:

- The start-up program (BOOT), which allows the startup of the KC640 CCU
- The FIRMWARE which allows operation of the CCU, and
- The TRX file format that contains the information list required to display on the signs.

Firmware can be updated as already specified by the SmartMedia card using the special slot in the side. It is always possible to introduce and to update TRX files by using the SmartMedia card. The use of EPROM memories for software storage has the principal advantage of being able to retain stored information, even when not powered so that it is immediately available to be loaded onto the RAM as soon as it is available. This characteristic results particularly advantageous for the BOOT and Firmware programs because they remain in the CPU board and are available for the microprocessor.

CCU Hardware-related Information

The front of the KC640 CCU circuit board is shown below in Figure 36.

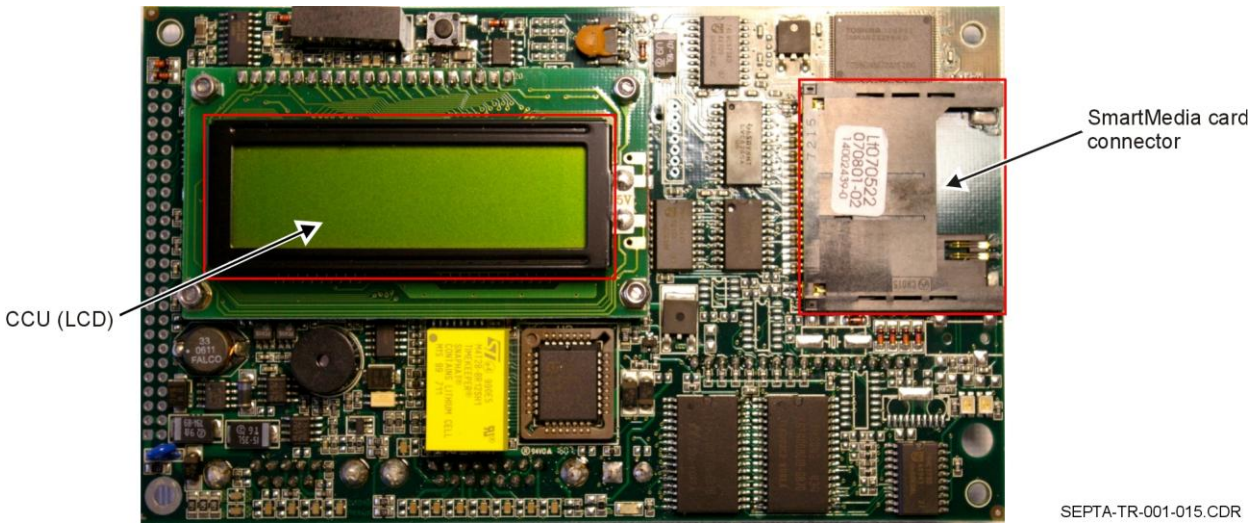

Figure 36 — KC640 CPU Board (Part Number 0404B, Front View)

Conversely, the rear side of the same KC640 CCU circuit board is shown below in Figure 37.

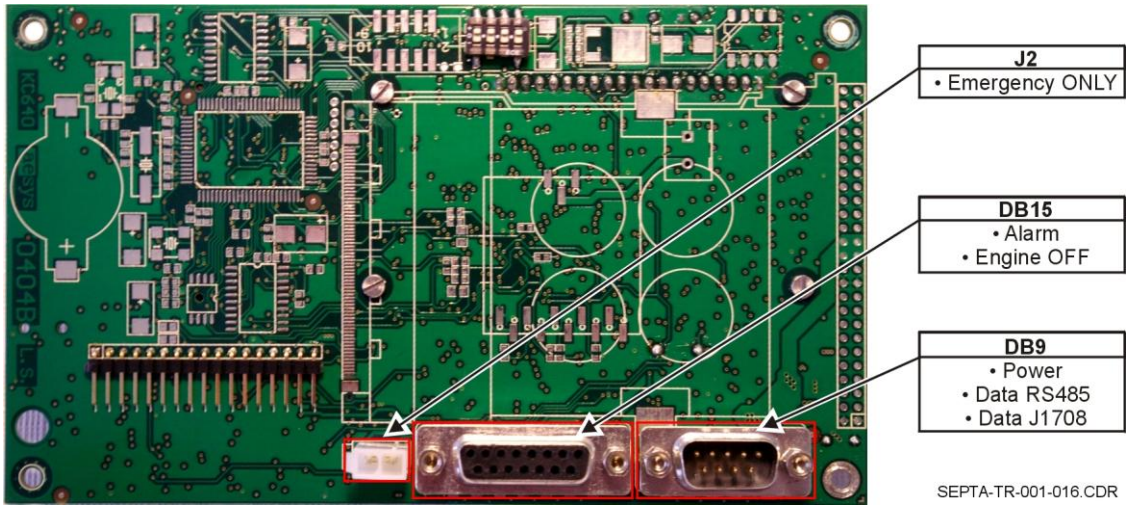

Figure 37 — KC640 CPU Board (Part Number 0404B, Rear View)

Technical Characteristics

The main technical characteristics of the KC640 CCU are the following:

- 32 Bit/16 MHz Microprocessor
- Flash memory capacity: 8 MB, upgradeable
- Memory board slot SmartMedia-type, 3.3V
- Internal clock and RAM with buffer
- Backlit LCD Display with 122 x 32 pixel graphic matrix
- Waterproof keyboard with numbers, letters, and function keys
- Four keys for direct selection from LCD display
- Four digital inputs ON/OFF
- Serial inputs:
- Serial line with infrared data transmission (in option to memory card)
- Two RS-485 lines can be settable as standard RS-422 lines
- One RS-232C line to communicate with on-board radio
- Approximate Dimensions: Length: 4.57 inches (167 mm), Height: 3.9 inches (100 mm), Width: 1.1 inches (28 mm). Measurements are exclusive of connectors.
- Weight: 1.1 pounds (0.5 Kg)
- Power voltage: 24 V DC nominal (12 - 24 V DC range permitted) and power consumption less than 70 mA at 24 V
- Protection against polarity inversion, and
- Operating and operative temperature: –22°F (–30°C) to 158°F (70°C).

Chapter 4 — Display Panels (Signs)

Introduction

The display panels or destination signs are the system components that display information and each sign may be located in different places inside the bus. A run dash sign may also be installed on the dashboard to provide display information to the driver. Each destination sign has a pixel matrix of full color light emitting diodes (LEDs) with each pixel a single LED providing full color.

Signs consist of a main housing and a front panel that houses the LED circuit board(s) and the sign front louvers. The internal layout of the components is as follows:

- Electronic LED board(s) mounted on the front panel. In the case of multiple circuit boards, one has a photocell to sense ambient light and the others do not. The LEDs appear through a series of opaque sign louvers. These have the function of preventing the reflection of ambient sunlight in order to maintain an elevated contrast value between the LED emitted light and the reflected sunlight. The result is high relative visibility and improved conspicuity.
- Other electronic boards (power supply, CPU board, transient suppressor, and EMC filter) are mounted in the main housing.

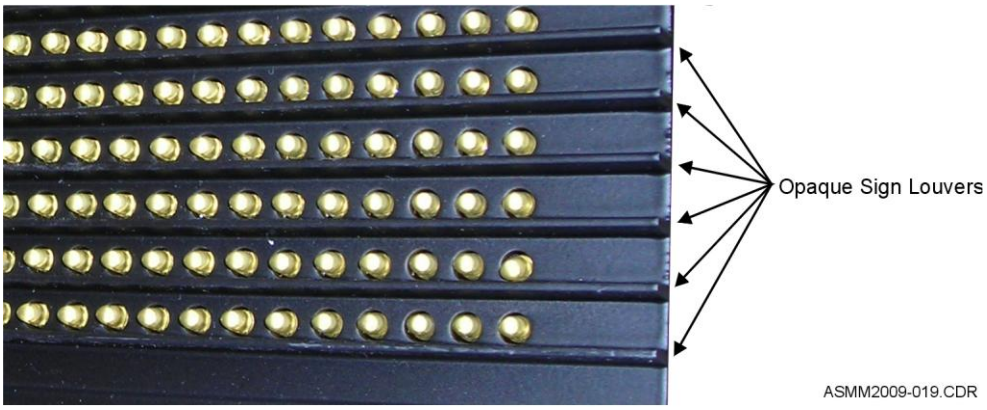

Figure 38 — Opaque Sign Louvers

Sign bodies are composed from two parts, the front, which includes the LED displays and the rear, which is the main housing of the sign. For every sign type, the LED circuit boards are located on the front panel. These two parts differ according to the model (Slim or Slim 2). The main housings are usually made of extruded aluminum since it is particularly light and strong. However, smaller signs are usually constructed of steel for the main housing and extruded aluminum for the front panel.

The types of signs (Front, Rear, Dash, Route Side, and Destination Side) and their actual use depend on a user's particular sign arrangement/configuration and requirements. For that reason, individual descriptions, matrix configurations, dimensions, and weights are not included in this manual. For this information, first establish which signs your system is using and then locate particular associated parts catalogs by number, based on the information that is given in *Table J — Destination Sign Identification Sorted by Model Group* on Page 53.

The sign housings have holes for power and data cables as well as holes for mounting brackets (refer to Figure 39). Wherever cables exit the housing, rubber gaskets are always used to protect the internal components.

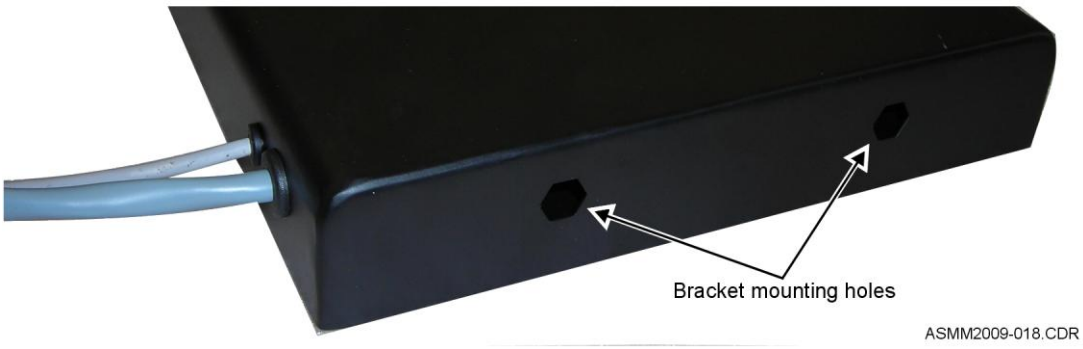

Figure 39 — Sign Bracket Mounting Holes

Referring to Figure 40, the figure illustrates the standard sign system general power and data circuits. Depending upon each unique installation, circuit may be composed of a different number of cables of different lengths. Although there are considerable variations in installations, the power and data each contain the same basic components that perform the same functions from application to application.

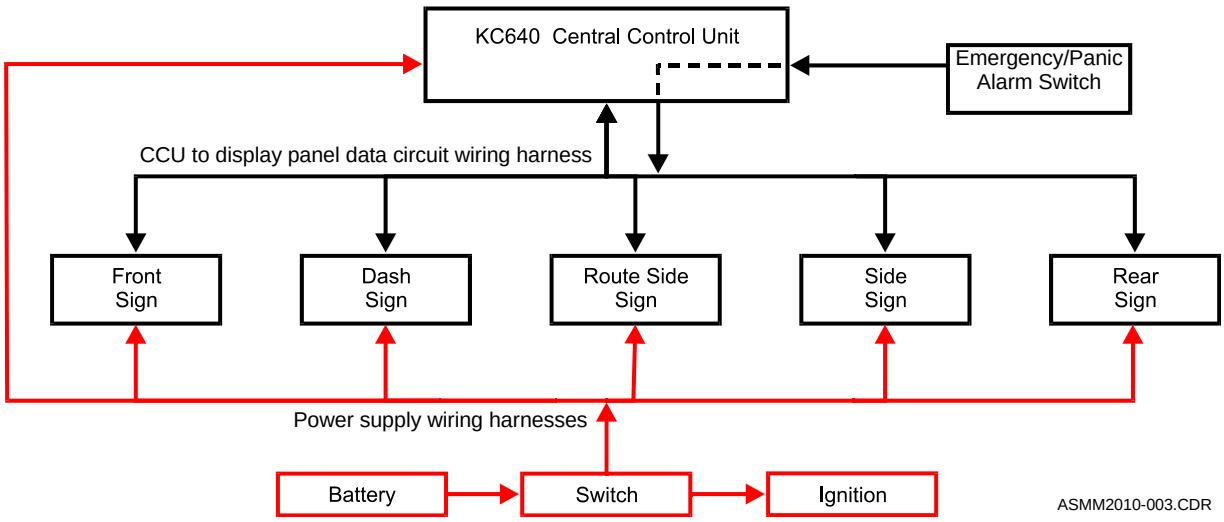

Figure 40 — Standard Sign System General System Diagram

Sign Components

The sign's circuit boards are all mounted in a similar fashion to the mounting nuts shown in Figure 41.

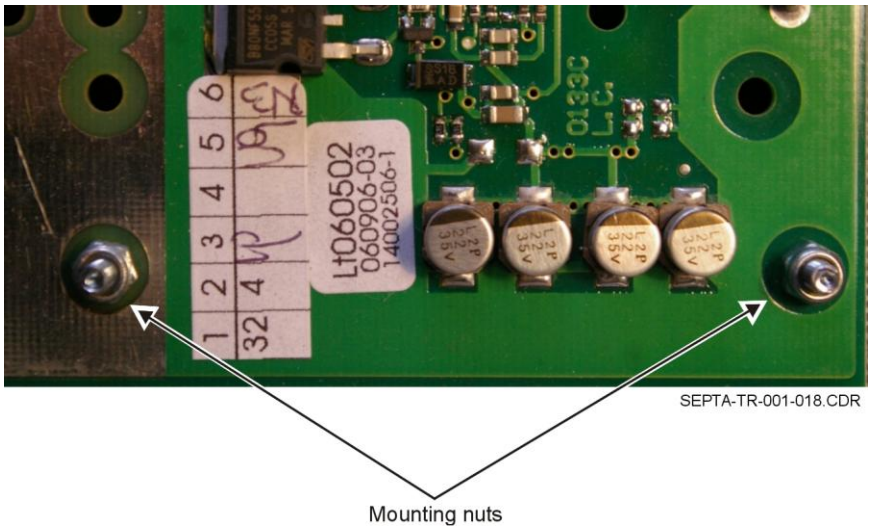

Figure 41 — Mounting Nuts

A CPU board checks the overall operation of the sign. In addition, a transient suppressor is included to protect the components through both the power supply and the data communication circuits. The main electronic components in each sign are as follows:

- Sign CPU circuit board (for example, a 0109A/0149A board)
- Power supply (for example, a 0133B/0133C/0616B board)
- Transient suppressor (for example, a 0318A/0107A board), and
- LED circuit board (for example, a 9929/etc board).

Note that in the sections that follow and describe the signs' electronic components, the information may not apply to every particular sign. It is only meant to give a general explanation of the components and their functions. This is especially true of the photographs used in the figures.

Sign CPU Circuit Board

This circuit board consists of a microprocessor, memory, and components and a program allowing start up and sign operation. Referring to Figure 42, the main features and components of this circuit board are:

- Microprocessor including EPROM memory
- PLD programming connector
- CPU reset switch
- Internal power supply
- Data in connector (for KC640 CCU incoming data)
- Interface circuits to CCU
- Picoflex connector for data transmission connector flat cables (from CPU to the LED boards)
- Filters
- DIP switches to select sign address, and
- A 24 V power supply connector. (On the left side two terminals (V out) are dedicated for logic circuit power, whereas on the right side two terminals come from the main system power.

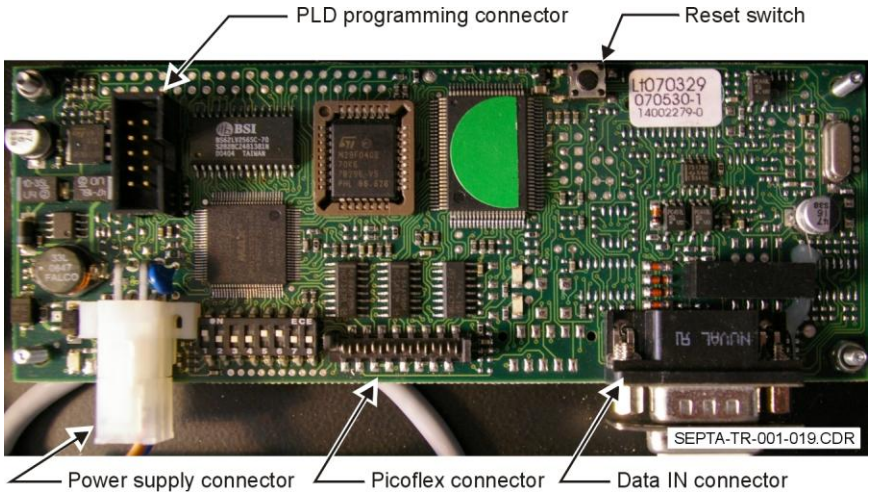

Figure 42 — Sign CPU Circuit Board

Microprocessor

The Microprocessor is the active part of the CPU board, it can start-up and activate hardware components on the signs because of specific programs (BOOT and FIRMWARE). The microprocessor can also receive data communications as input, coming from the CCU, interpret it and to turn it into a new data sequence for the LED board, allowing visualization of the desired information.

EPROM Memory

EPROM stands for Erasable Programmable Read-Only Memory. The CPU circuit board's EPROM memory is an electrically programmable and erasable memory that stores information and data that are not lost even without a power source. Unlike the KC640 CPU board, the CPU board sign has only one EPROM memory, where both FIRMWARE with the right dimension of the LED board active area and BOOT program, necessary for start up, reside. If the display information of the signs is not in the correct format, the FIRMWARE installed is not correct.

DIP SWITCH

This set of eight micro switches is shown in Figure 43. Before explaining the function of this device, it is important to understand how the KC 640 CCU operates. From the point of view of data transmission, all the information transmitted by the CCU on data line reaches all the components of the system. For every data packet sent, there is an associated address related to the specific component/sign to be reached. Each component/sign has a special device for setting its address to receive only the appropriate data. Controlling this function is the purpose of the DIP switches.

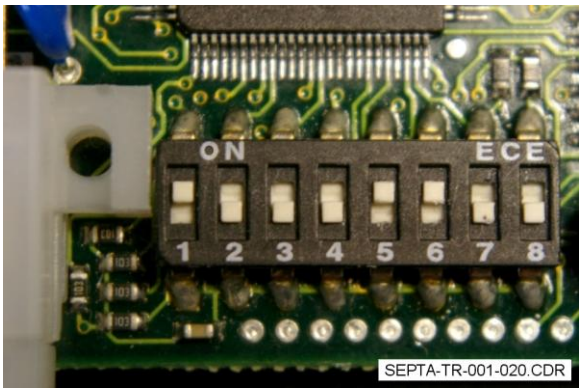

Figure 43 — DIP Switch (Detail)

Each of the eight micro-switches numbered from 1 to 8. Each micro switch can assume two states, “ON” and “OFF.” “ON” corresponds to logic 1 and “OFF” corresponds to logic 0. Referring to Figure 43, the up position is “ON” and the down position is “OFF.” Once assigned a combination of bits, giving the appropriate positions to the first five micro-switches, the component is also assigned an address.

Referring to Table F on Page 41, DIP switches one through five are used for address settings. Table F summarizes the micro switch positions to obtain the values of a desired address. Not shown in the table are switches six through eight. They are used as auxiliary contacts to develop different functions and in particular as follows:

- Switch 6 — Normally OFF. If ON it allows the firmware version to be seen on sign at boot up
- Switch 7 — Normally OFF. If it is ON, all LEDs on the sign light
- Switch 8 — Not used at this time.

NOTE: You must reset the CPU to activate the DIP Switch settings by using the CPU reset switch. Alternatively, the user can also remove and then return power to perform a reset.

Table F — Sign CPU Circuit Board DIP Switch Settings for Address Settings

	Function	DIP Switch Setting				
	Sign Address	**1**	**2**	**3**	**4**	**5**
Address	A	ON	OFF	OFF	OFF	OFF
	B	OFF	ON	OFF	OFF	OFF
	C	ON	ON	OFF	OFF	OFF
	D	OFF	OFF	ON	OFF	OFF
	E	ON	OFF	ON	OFF	OFF
	F	OFF	ON	ON	OFF	OFF
	G	ON	ON	ON	OFF	OFF
	H	OFF	OFF	OFF	ON	OFF
	I	ON	OFF	OFF	ON	OFF
	J	OFF	ON	OFF	ON	OFF
	K	ON	ON	OFF	ON	OFF
	L	OFF	OFF	ON	ON	OFF
	M	ON	OFF	ON	ON	OFF
	N	OFF	ON	ON	ON	OFF
	O	ON	ON	ON	ON	OFF
	P	OFF	OFF	OFF	OFF	ON
	Q	ON	OFF	OFF	OFF	ON
	R	OFF	ON	OFF	OFF	ON
	S	ON	ON	OFF	OFF	ON
	T	OFF	OFF	ON	OFF	ON
	U	ON	OFF	ON	OFF	ON
	V	OFF	ON	ON	OFF	ON
	W	ON	ON	ON	OFF	ON
	X	OFF	OFF	OFF	ON	ON
	Y	ON	OFF	OFF	ON	ON
	Z	OFF	ON	OFF	ON	ON
	[	ON	ON	OFF	ON	ON
	\	OFF	OFF	ON	ON	ON
	]	ON	OFF	ON	ON	ON
	^	OFF	ON	ON	ON	ON
	(Space)	ON	ON	ON	ON	ON

PLD (Programmable Logic Device)

The PLD contains the integrated circuits that perform auxiliary functions. The PLD performs particular programmed functions and the same PLD, programmed in a different way, can perform different operations, depending upon how it is programmed. This programming is carried out by Aesys personnel.

Internal Power Supply

The CPU board contains a dedicated power supply. The reason for using a dedicated power supply is to provide improved isolation from electrical noise.

A common power supply could generate other external component problems that could affect the CPU and cause it to work improperly. The internal power supply is designed to provide only 20 percent of the power used by the CPU; the remaining 80 percent of power generated is available for powering external logic circuits. For this reason, the connector used for a 24 V power supply input (V in) has two additional pins used for residual energy transfer to the logic LED circuit board logic circuits (5 VDC out).

Interface Circuits to the CCU

As already specified, the CCU can communicate with the system components using different standards. Once it has defined the standard to be used in designing phase, the CPU circuit board for each component is adjusted accordingly with the adoption of specific hardware. Once the standard is set, this cannot subsequently be varied in the working phase because it would be necessary to modify the hardware components of the CPU boards.

CCU Filters

They have the function of removing unwanted signal components on data communication and power lines. It prevents these unwanted signals from reaching internal circuits thus altering their operation.

Power Supply Circuit Board

Referring to Figure 44 that follows, the power supply is the component that generates low voltage levels from the main power line (12/24 V) that are used for LED circuit board operation. It is a PWM (Pulse Width Modulation) type device and it uses the modulation of its duty cycle to control the voltage level and the amount of power sent to a load. Components on this circuit board are as follows:

- Connector with power input conductors (brown and black) coming from the main power and two output conductors (red and black) to power LED boards
- DIP switch connector/setting allows you to select multiple voltage outputs for a particular LED panel. Voltage setting varies depending on the sign type.

NOTE: The power supply circuit board has multiple Voltage output settings, (2.5 V, 3.3 V, 5.0 V, 5.5 V). Switch #1 ON = 2.5 V, #2 ON = 3.3 V, #3 ON = 5.0 V, and #4 ON = 5.5 V (as shown in Figure 44). Only use one switch set in the ON position at one time.

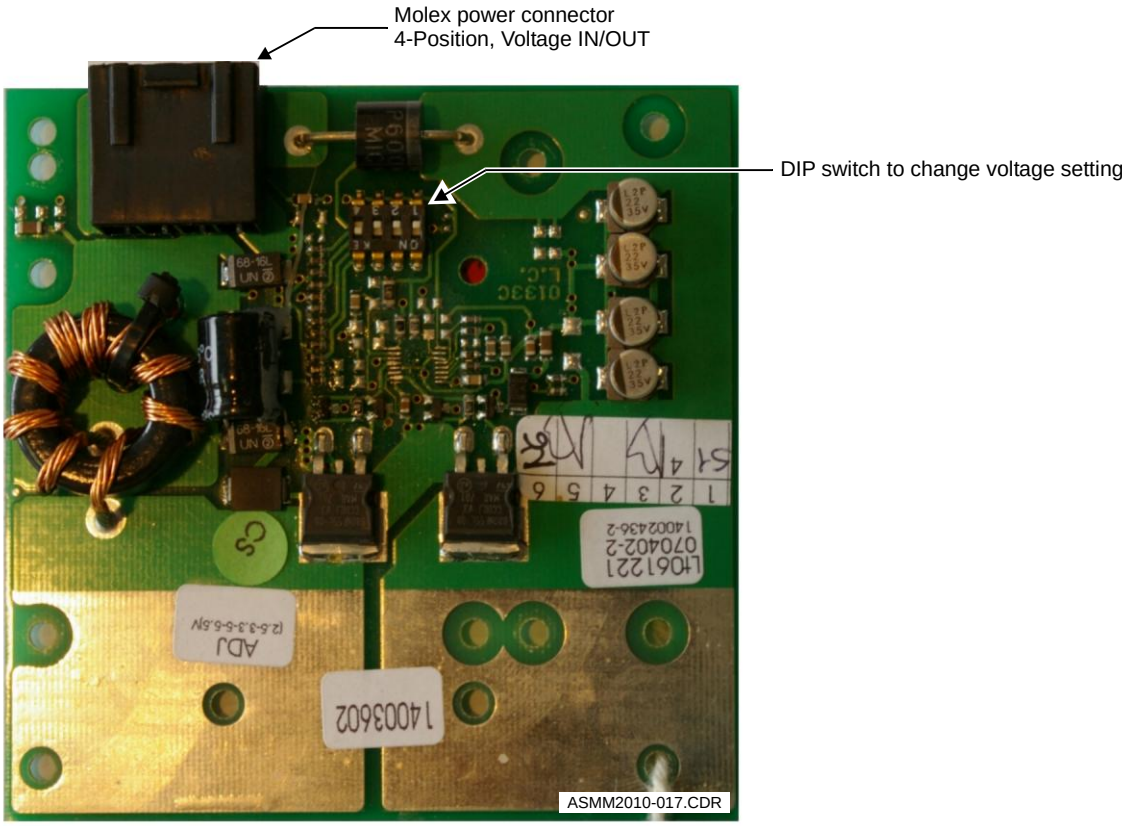

Figure 44 — Power Supply Circuit Board (Viewed from Front)

NOTE: Power supply board types (0133B/0133C/0616B) may vary depending on the date of purchase.

Transient Suppressor

Referring to Figure 45, the transient suppressor is an electronic circuit that protects the sign components from overvoltage and spikes. It can filter out possible spikes that often occur in normal operation. Components on this circuit board include the following:

- A protection fuse for excessive current consumption or short circuits
- Power supply connector uses main power source on the input and is filtered on the output (Both input/output cables are blue [POS] and brown [NEG].)
- Connector for input data communication cable coming from a KC640 CCU
- Connector for output data cable with filtered signals, and
- A yellow-green cable to ground connection.

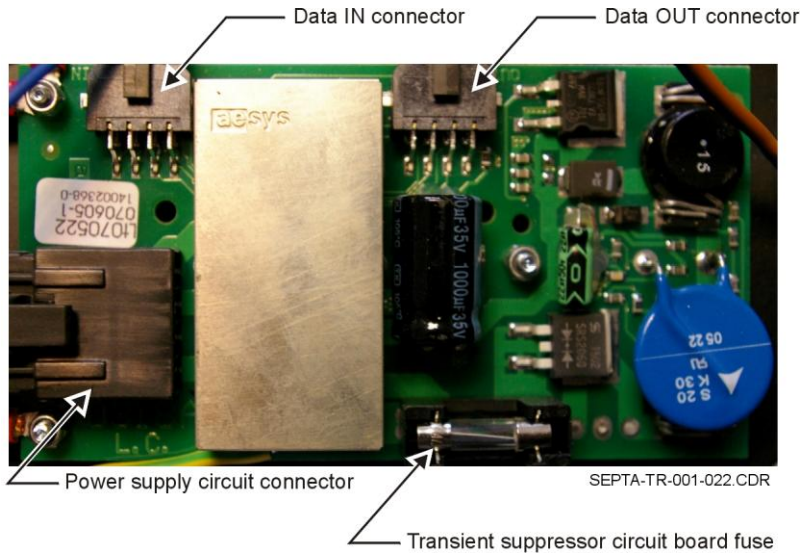

Figure 45 — Transient Suppressor Circuit Board (Viewed from Right Side)

Color Management Circuit Board (0305)

Aesys rainbow-type color signs include color management circuit boards. Referring to Figure 46, these circuit boards process signals coming from the CPU and then transmits them to the LED circuit boards (each of which has a dedicated color-check component). This circuit board manages the display of the messages on the LED cards, manages the tones of color of the messages represented, and supplies power to the logic circuits of the LED circuit boards.

Figure 46 — Color Management Circuit Board

LED Circuit Boards

Referring to Figure 47, each sign has one or more LED circuit boards. Some offer single color or monochrome LEDs and some offer rainbow-type color LEDs. These circuit boards have a 4-pin connector for the power supply. Two connectors are for LED power (red and black colored coming from the power supply). Two conductors are for the logic circuit power supply (white and black colored coming from CPU board).

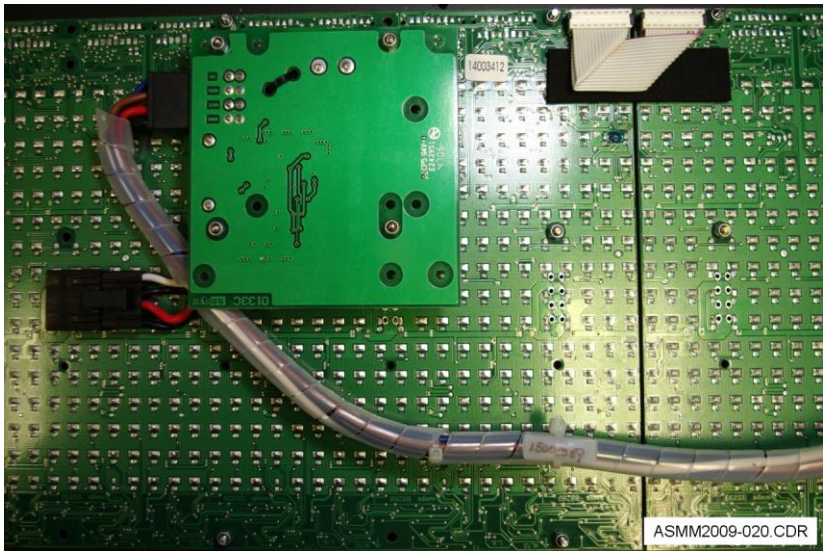

Figure 47 — LED Circuit Boards (Interior View)

The front side of the LED circuit boards is where information is displayed when one or more LED circuit boards are arranged side by side. From the point of view of data flow, the LED boards are connected in such a way that the data transmitted by the CPU circuit board arrives at the first LED circuit board and then goes to the subsequent circuit boards.

A poor or broken connection will result in downstream circuit boards not receiving the data and not illuminating. The possibility of this occurring is remote however, because the Picoflex connectors are provided with two shock resistant supports that prevent separation once the flat conductor is placed into the connector.

From the functional point of view, the LEDs are driven by special integrated circuits, known as shift registers. The system used to drive the LEDs uses three types of sign. As a result, there is a static sign, a semi static sign, and a dynamic sign.

As previously mentioned, on the first LED circuit board there is a photocell for detecting external brightness that affects the brightness levels of the LEDs. This photocell has the function of converting the ambient light that strikes it with a suitable variable frequency signal. The greater the intensity of the external brightness that strikes the photocell, the greater the frequency of the output signal sent to the CPU.

At regular intervals of approximately 30 seconds, the signal is analyzed and converted into a new variable signal, which has 16 levels corresponding to as many levels of the brightness intensity of the light emitted by the sign. The function of the photocell is to increase or decrease the light output of the LEDs in proportion to the ambient light, measured by the photocell, that strikes the sign.

As an option to the system, there is an eight brightness level adjustment available that is manually loadable through the KC640 CCU. In this case, the brightness of the LED is maintained to other conditions of external brightness. Alternatively, the light level of the sign can be manually set to one of eight levels via the CCU.

Sign Access

IMPORTANT: All servicing of the signs must ONLY be performed by trained personnel. Normally the sign should not be opened unless directed by Aesys representatives.

In some cases, problems with the signs can be resolved by using the diagnostic capabilities of the KC640 CCU. If the sign must be opened for servicing or troubleshooting, Aesys recommends that you contact our technical support department.

Referring to Figure 48, to access the internal components of an HG 320.200X24/1 YW **Slim 2**-type Front Sign and other similar signs, place the sign on its back and then carefully remove the aluminum panel from the front panel before carefully lifting the panel towards the back of the housing.

Referring to Figure 49, for **Slim**-type signs, the internal components can be accessed by removing the mounting screws from the front panel/extrusion and lifting the panel towards the rear of the housing.

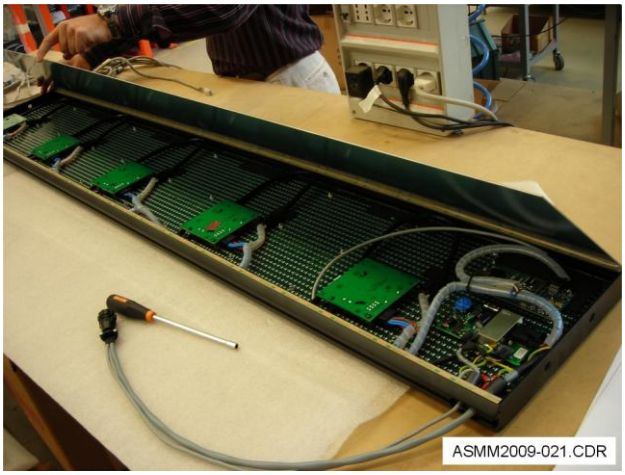

Figure 48 — Accessing HG 320.200X24/1 YW Slim 2-type Front Sign Components

Figure 49 — Accessing Slim-type Sign Components

Chapter 5 — Software Considerations

Overview

The software necessary for operating the system can be subdivided into two parts:

- Software for the central control unit (CCU), and
- Software for the displays (signs).

Software for the KC640 CCU

The KC640 CCU includes non-volatile memory for memorizing and storing the following:

- BOOT — Which contains the initial instructions for the correct start-up of the Central Control Unit (CCU)
- FIRMWARE — Which supplies the instructions to execute the functions requested by CCU, and
- TRX File — Contains the messages to be visualized on the displays.

Firmware and the TRX file can be loaded using a SmartMedia card. Boot file and font data must be loaded by AESYS technical personnel via RS232C/RS485. Associated procedures are covered in the CCU chapter of this maintenance manual.

Software for the Signs (Via Processor Circuit Board)

The following are necessary for the operation of the sign:

- FIRMWARE — Which defines operation of the sign in accordance with the data and the input signals in from the peripherals
- FONT — Which is needed for defining in which format messages should be presented on the sign, and
- PLD — Which is the software used for programming the PLD on the display's CPU circuit board.

The software relative to FIRMWARE and FONT is loaded via the signs logic circuit. Concerning the PLD procedure, this requires opening the sign and using a suitable cable with the dedicated connector located on the display CPU circuit board.

Chapter 6 — Troubleshooting and Repair

Introduction

IMPORTANT: To avoid possible damage to the equipment, do NOT disconnect or connect the signs without first disconnecting the power supply. These procedures must only be carried out by authorized personnel.

Never perform maintenance or service to equipment with the power turned on. Always remove the power first. To avoid personal injury, always remove power from the equipment prior to performing any procedure. Circuits should also be discharged and grounded before beginning service procedures. Always work with another person who can render aid in the event of an accident.

CAUTION: Before handling the signs, take all the necessary precautions against the risk of static electricity discharges from clothing, footwear, etc.

Components is this system may be potentially damaged by electrostatic discharge. Always use a wrist grounding strap and/or a grounded antistatic floor mat when servicing the equipment.

All components that may be susceptible to damage by electrostatic discharge should be stored in suitable antistatic bags or other suitable containers.

This chapter provides troubleshooting instructions to diagnose and locate problems or damage to the sign system. Knowledge of the normal operation and the functions of the system, as explained throughout the balance of this manual, is essential. The troubleshooting categories covered are as follows:

- Hardware-related troubleshooting
- CCU troubleshooting, and
- Sign troubleshooting.

Table G — Hardware-related Troubleshooting

Symptom	Possible Cause	Corrective Action
Hardware anomalies	Damaged hardware component.	Contact Aesys for repair or replacement.

Table H — KC640 CCU Troubleshooting

Symptom	Possible Cause	Corrective Action
Not powering on/booting up.	■ Check power supply to CCU for correct voltage (12 – 24 V DC). ■ Check power supply connection to CCU. ■ Verify the correct polarity from power source to CCU. ■ Possible water damage.	■ Replace the power supply to the CCU. ■ Replace the cable harness from the power supply to the CCU (J2). ■ Reload new firmware (via SmartMedia card). ■ If CCU has water damage, replace the CCU.
Transmission Error/Status “2”.	■ Data cable from CCU to sign is disconnected. ■ Address configuration setup for CCU and sign is not compatible. ■ Internal display is enabled on the CCU (status 2/D).	■ Check the data cable connection at J1 for loose connection. ■ Remove DB9 shell and inspect wire/solder connections. ■ Replace the data cable. ■ Be sure to check the sign address and ensure that it is compatible with customer message listing address. ■ If all actions above are checked and the problem still exists, replace the KC640 CCU or return to Aesys for repair. ■ Perform a hard reset to the CCU to reset the default settings.
Non-existent Code.	■ Code number entered does not exist in your message listing/TRX file.	■ Update the message listing with new code number and destination, OR ■ Enter a valid code number.
Emergency Alarm Sounding.	■ DB15 loop back connector is missing. ■ Alarm signal enabled.	■ Install DB15 loop back connector. ■ Enter pass code to disable (Contact Aesys Technical Support). ■ If alarm cannot be disabled, contact Aesys Technical Support for further instructions.

Table I — Sign Troubleshooting

Symptom	Possible Cause	Corrective Action
Sign not powering on.	■ Bus power supply to sign is off or not working properly. ■ Power supply connection to sign is open. ■ Sign has internal problem.	Verify the following in the order presented below: ■ Bus power supply switch in ON position. ■ Check/replace bus line fuses. ■ Correct power supply to signs (verify the correct cable polarity). ■ Check to ensure that the KC640 is not reading Disabled Displays. If so, on the KC640, select any code number and then select <ENT> to send the message to the sign. ■ Check/replace the data/power line connection, connectors, and cable harness. ■ Check/replace voltage level to sign. ■ Check/replace sign internal suppressor fuse. **IMPORTANT: You MUST obtain approval from Aesys prior to performing this operation!**
Sign is not displaying message after transmission.	■ Data cable from sign to CCU is open. ■ Sign/CCU address is not compatible.	Verify the following in the order presented below: ■ Check/replace data/serial cable connection from CCU to sign. ■ Check/replace data connection at the sign. ■ Verify the sign serial address is compatible with CCU configuration. Contact Aesys Inc for technical support.
One segment of the sign is not illuminating / functioning correctly.	■ Internal power supply failure. ■ Internal ribbon cable dislodged.	■ Reseat power connection/connector to power supply board. ■ Replace power supply board for that segment with a new replacement. ■ Reseat and/or replace flat ribbon cable on LED panel segment.

Chapter 7 — Spare Parts/ Electrical Information

Sign Parts Catalog Overview

Sign parts catalogs include replacement part information with indexed figures/illustrations and parts list tables. A guide to the various signs and their respective publication numbers appears in Table J on Page 53. Whenever possible, only order parts by referencing their respective part numbers. Also included in the table are enclosure and display dimensions including width (W) and height (H) measurements given in inches. The numbers of pixels specified in the table are for horizontal pixels.

> **NOTE:** Again referring to Table J, a sign's part number is the same as its respective Parts Catalog Publication Number.

Electrical/Cable Harness Information Overview

Standard sign system and cables are identified in the pages that follow. The illustrations of those figures also include detailed information about their connectors and pin-out locations.

> **NOTE:** The cable/connector types and sizes may vary depending on each bus type installation/application.

Although an overall schematic and a general wiring diagram have been included, in order to make the information easier to read and interpret, the user will note that these illustrations have been divided into quadrants or simply divided in half. Each quadrant or half has then been enlarged in the "detail" figures that follow the overall view.

> **NOTE:** To easily locate a cable harness or wiring diagram, refer to this manual's List of Figures and List of Tables that follows the manual's Table of Contents located at the beginning of this manual. Also refer to Table K on Page 54.

Sign Mounting Brackets Identification

Sign mounting brackets are specific to any and all applications and will vary depending on the sign type used and bus manufacturer/model. Contact Aesys Technical Support to confirm bracket design, before installing signs.

Printed Circuit Boards

The wide varieties of printed circuit boards, which are available for each sign type, are identified in the respective parts catalogs.

Destination Sign Parts Catalog Listings

Referring to Table J, first locate your particular sign models in the Display Model column and then note its corresponding Publication/Part Number as listed in the second column. To secure copies of the appropriate parts catalogs by Publication Number, please contact Aesys Technical Support.

Table J — Destination Sign Identification Sorted by Model Group

Display Model	Publication/ Part Number	Enclosure		Hor. Pixels	Display	
		W	H		W	H
3/10 MODELS: Horizontal Pixel Pitch = 7.62 mm • Vertical Pixel Pitch = 9.375 mm						
HG 3/10.160x16/1 YW Slim	992100401400	49.25	8.75	160	48.00	6.00
HG 3/10.120x16/1 YW Slim	992100300600	37.40	8.75	120	36.00	6.00
HG 3/10.120x16/1 YW Slim+usp4	992100400900	37.40	8.75	120	36.00	6.00
HG 3/10.48x16/1 YW Mark II	992100501000	22.00	12.25	48	14.50	6.00
HG 3/10.48x16/1 YW Slim	992100300800	15.50	8.75	48	14.50	6.00
HG 3/10.40x16/1 YW Slim	992100500900	13.00	8.75	40	12.00	6.00
300 MODELS: Horizontal Pixel Pitch = 7.62 mm • Vertical Pixel Pitch = 7.62 mm						
HG 300.40x24/1RGB+120x24/1 Slim	992100701400	49.20	8.75	160	48.00	7.25
HG 300.80x16/1 YW Slim	992100500401	26.00	5.75	80	24.00	5.00
HG 300.40x24/1 FC Slim	992100701500	14.50	8.75	40	12.00	7.25
320 MODELS: Horizontal Pixel Pitch = 8.1 mm • Vertical Pixel Pitch = 10 mm						
HG 320.40x24/3RGB+160x24/1 YW Slim 2	992100301000	72.75	11.80	200	69.00	9.60
HG 320.40x24/3RGB+144x24/1 YW Slim 2	992100700301	67.75	11.80	184	64.00	9.60
HG 320.200x24/1 YW Slim 2	992100300701	65.00	11.80	200	63.50	9.60
375 MODELS: Horizontal Pixel Pitch = 9.5 mm • Vertical Pixel Pitch = 9.25 mm						
HG 375.120x16/1 YW Slim	992100401300	46.00	8.00	120	44.80	6.00
HG 375.120x16/1 YW Slim+usp4	992100701800	46.00	8.00	120	44.80	6.00
HG 375.80x16/1 YW Slim	992100300900	31.50	8.00	80	29.80	6.00
HG 375.80x16/1 YW Slim+usp4	992100401000	31.50	8.00	80	29.80	6.00
4/10 MODELS: Horizontal Pixel Pitch = 10 mm • Vertical Pixel Pitch = 12.5 mm						
HG 4/10.160x16/1 YW Slim	992100900202	65.00	10.60	160	63.75	7.70
HG 4/10.160x16/1 YW Slim 2	992100401100	65.00	9.00	160	63.75	8.25
HG 4/10.160x19/1 YW Slim 2	992100401500	65.00	10.70	160	64.00	9.50
HG 4/10.120x16/1 YW Slim 2	992100400203	49.25	9.00	120	48.00	8.25

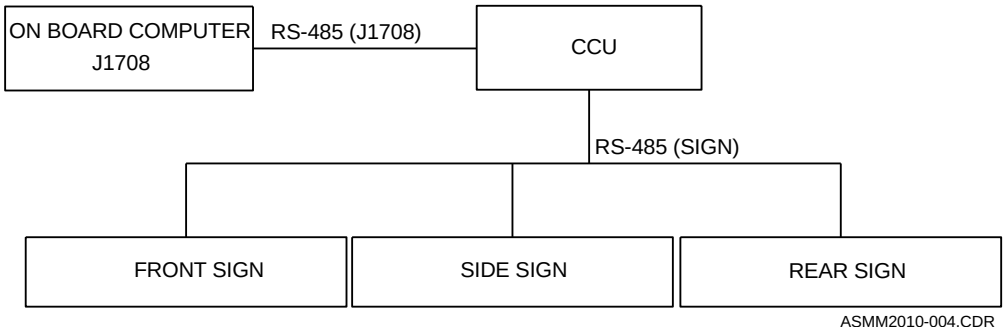

Figure 50 — Sign Electrical/Cable Harness Interconnection Block Diagram

Table K — Guide to Electrical Information Illustrations and Parts List

Figure Number or Initial Figure Number or Table and Description	Pages
Figure 50 — Sign Electrical/Cable Harness Interconnection Block Diagram	Above
Figure 51 — Electrical Schematic Electrical Connections, Full View and Detailed Views	55 - 59
Figure 56 — General Connection Diagram, Full View and Detailed Views	60 - 66
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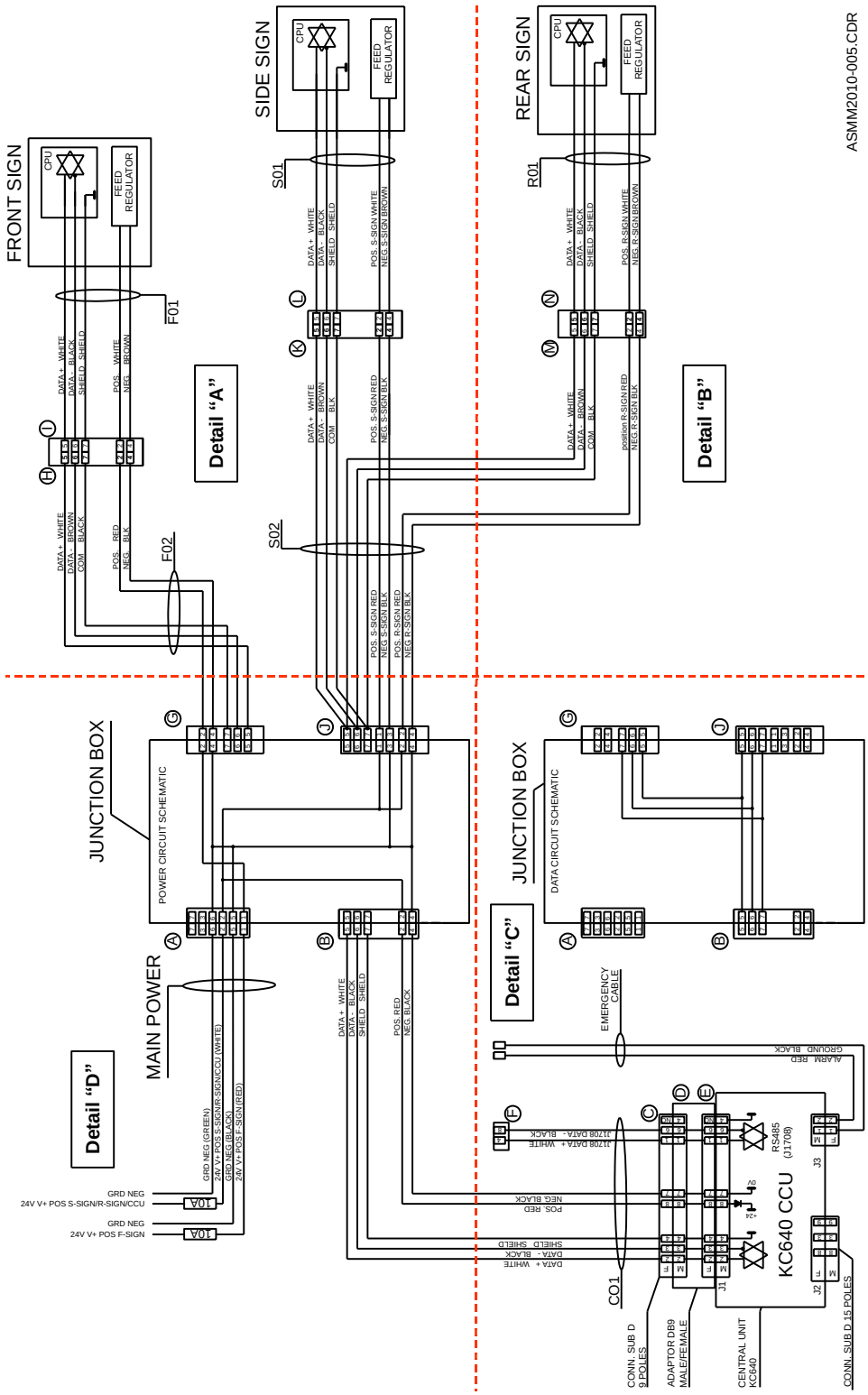


Figure 51 — Electrical Schematic Electrical Connections, Full View

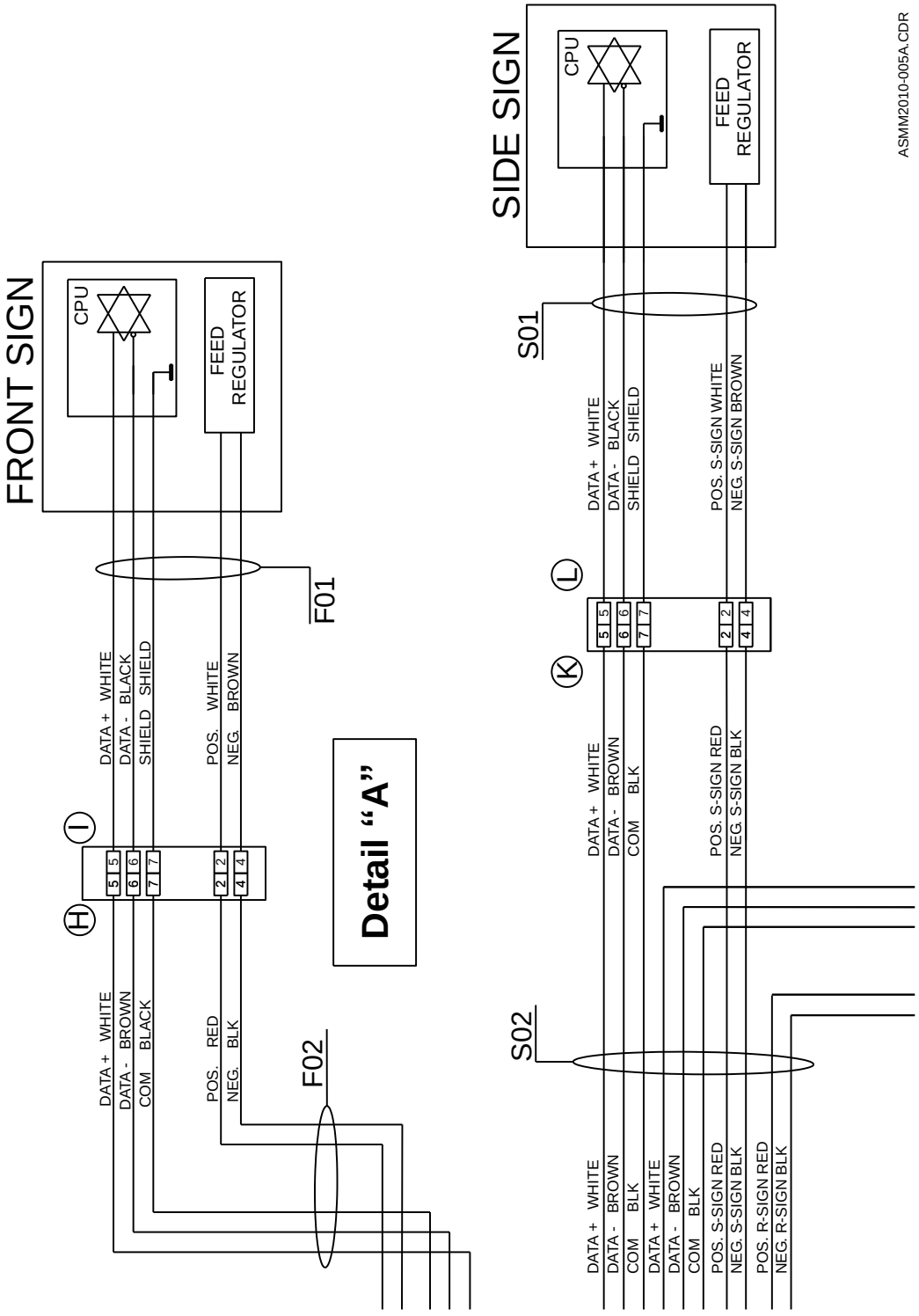


Figure 52 — Electrical Schematic Electrical Connections, Detail "A"

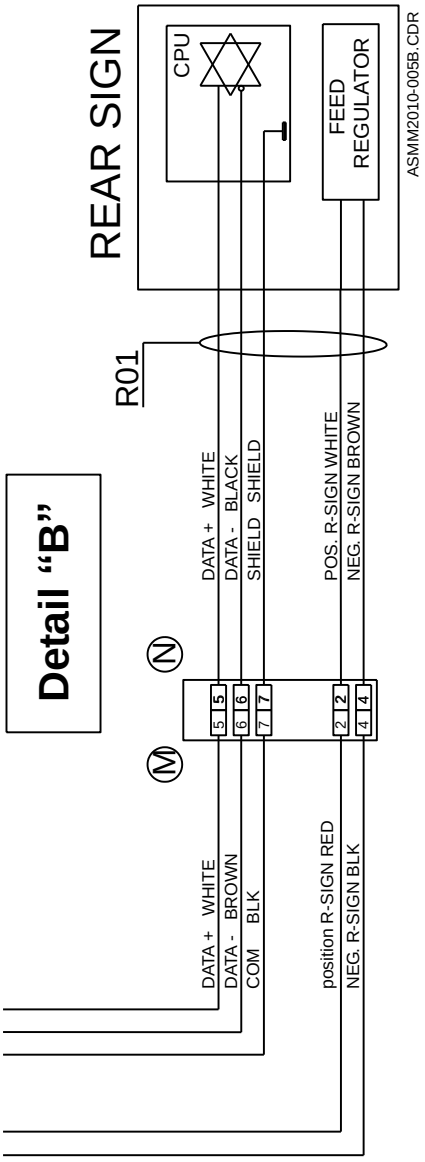


Figure 53 — Electrical Schematic Electrical Connections, Detail "B"

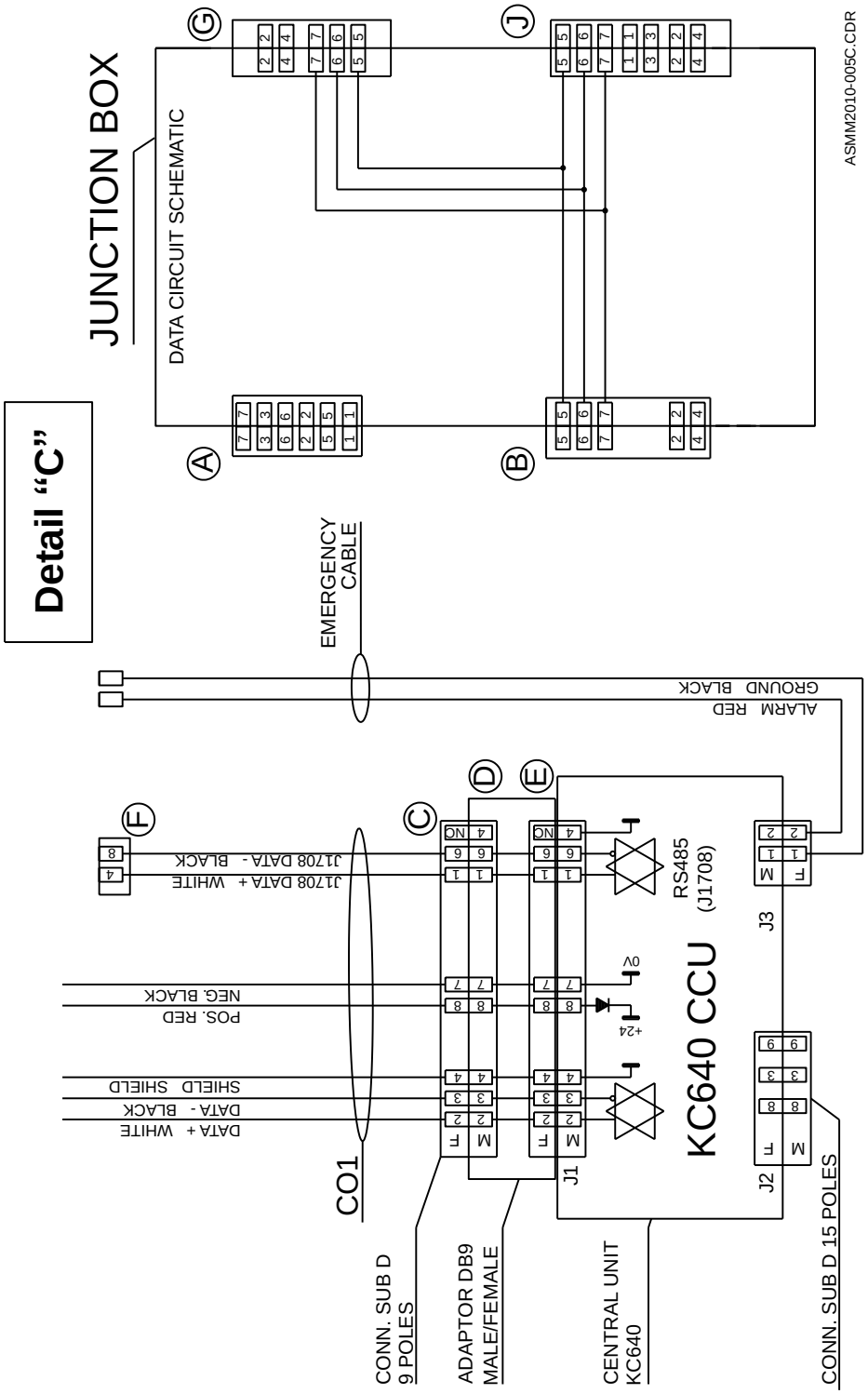


Figure 54 — Electrical Schematic Electrical Connections, Detail "C"

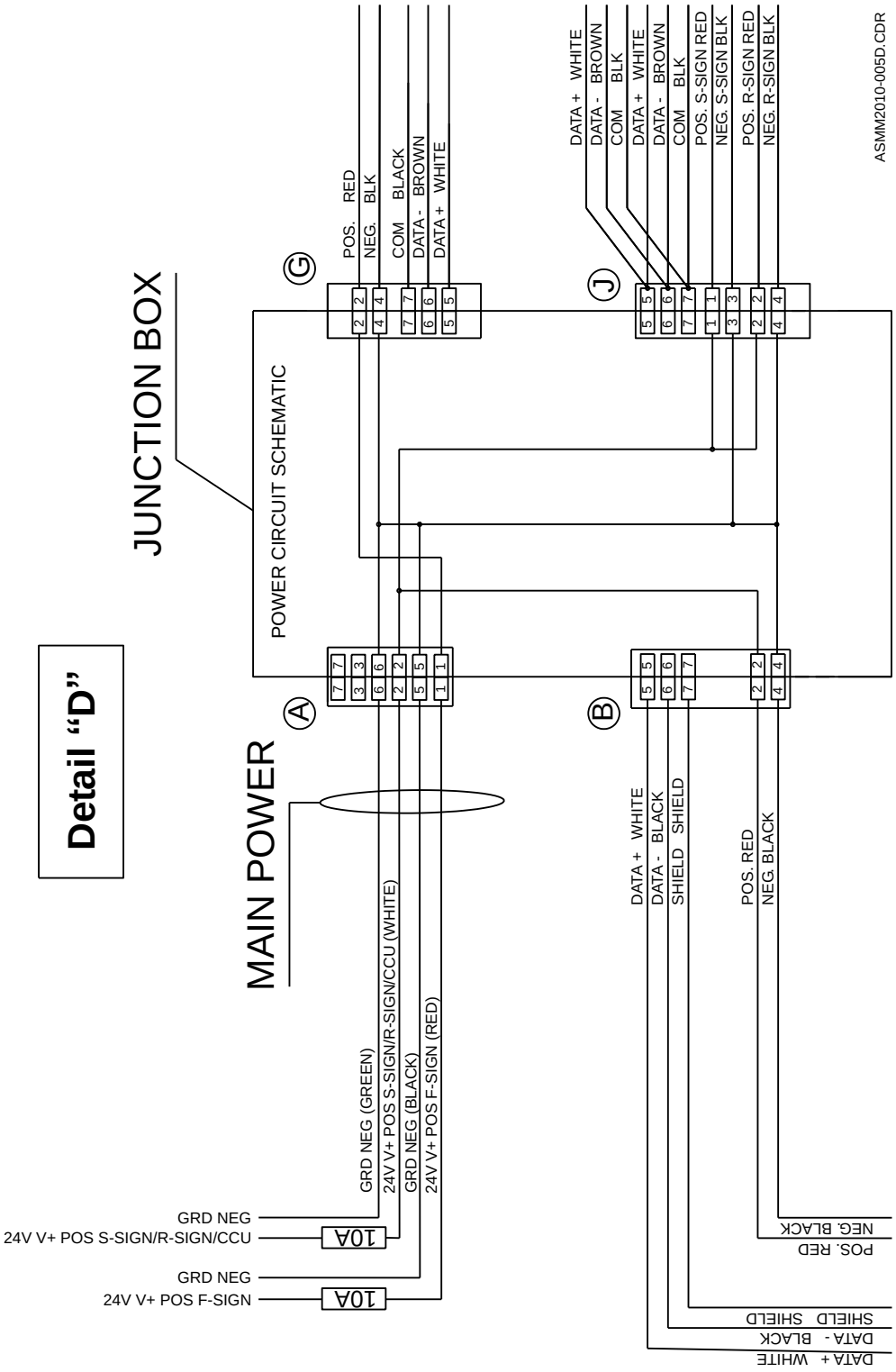


Figure 55 — Electrical Schematic Electrical Connections, Detail "D"

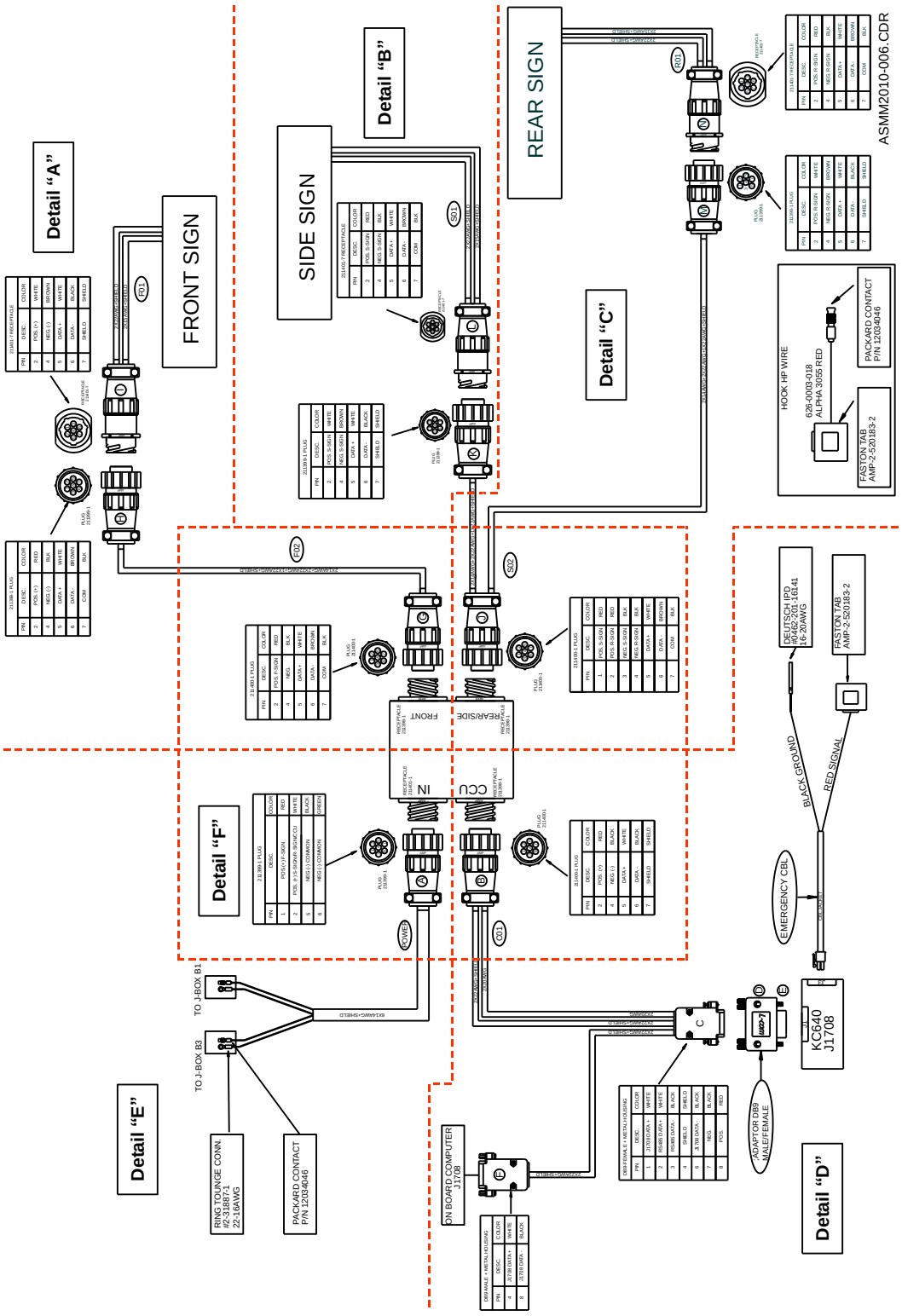
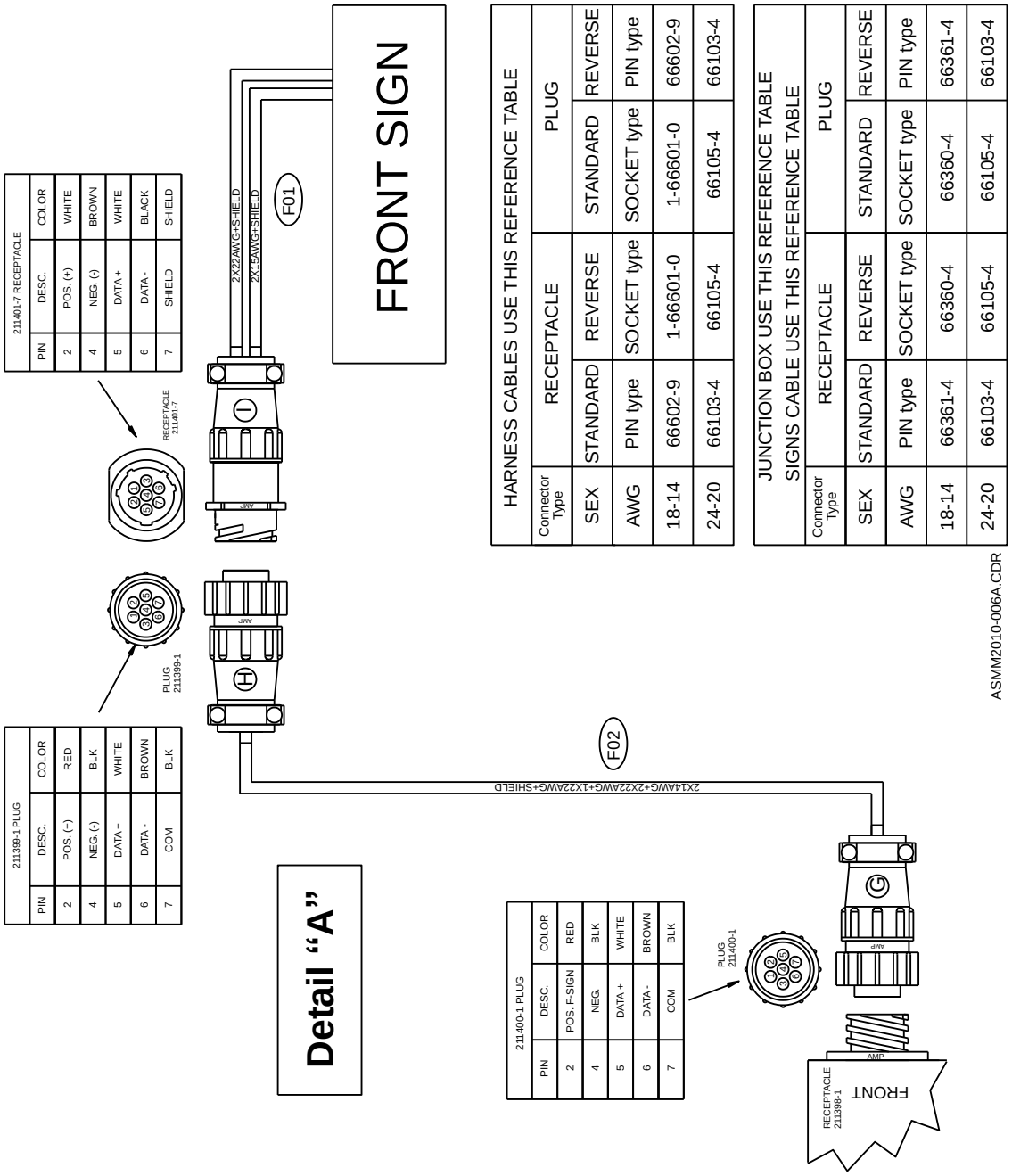


Figure 56 — General Connection Diagram, Full View



211401-7 RECEPTACLE		
PIN	DESC.	COLOR
2	POS. (+)	WHITE
4	NEG. (-)	BROWN
5	DATA +	WHITE
6	DATA -	BLACK
7	SHIELD	SHIELD

211399-1 PLUG		
PIN	DESC.	COLOR
2	POS. (+)	RED
4	NEG. (-)	BLK
5	DATA +	WHITE
6	DATA -	BROWN
7	COM	BLK

211400-1 PLUG		
PIN	DESC.	COLOR
2	POS. F-SIGN	RED
4	NEG.	BLK
5	DATA +	WHITE
6	DATA -	BROWN
7	COM	BLK

HARNESS CABLES USE THIS REFERENCE TABLE				
Connector Type	RECEPTACLE		PLUG	
SEX	STANDARD	REVERSE	STANDARD	REVERSE
AWG	PIN type	SOCKET type	SOCKET type	PIN type
18-14	66602-9	1-66601-0	1-66601-0	66602-9
24-20	66103-4	66105-4	66105-4	66103-4

JUNCTION BOX USE THIS REFERENCE TABLE SIGNS CABLE USE THIS REFERENCE TABLE				
Connector Type	RECEPTACLE		PLUG	
SEX	STANDARD	REVERSE	STANDARD	REVERSE
AWG	PIN type	SOCKET type	SOCKET type	PIN type
18-14	66361-4	66360-4	66360-4	66361-4
24-20	66103-4	66105-4	66105-4	66103-4

Figure 57 — General Connection Diagram, Detail "A"

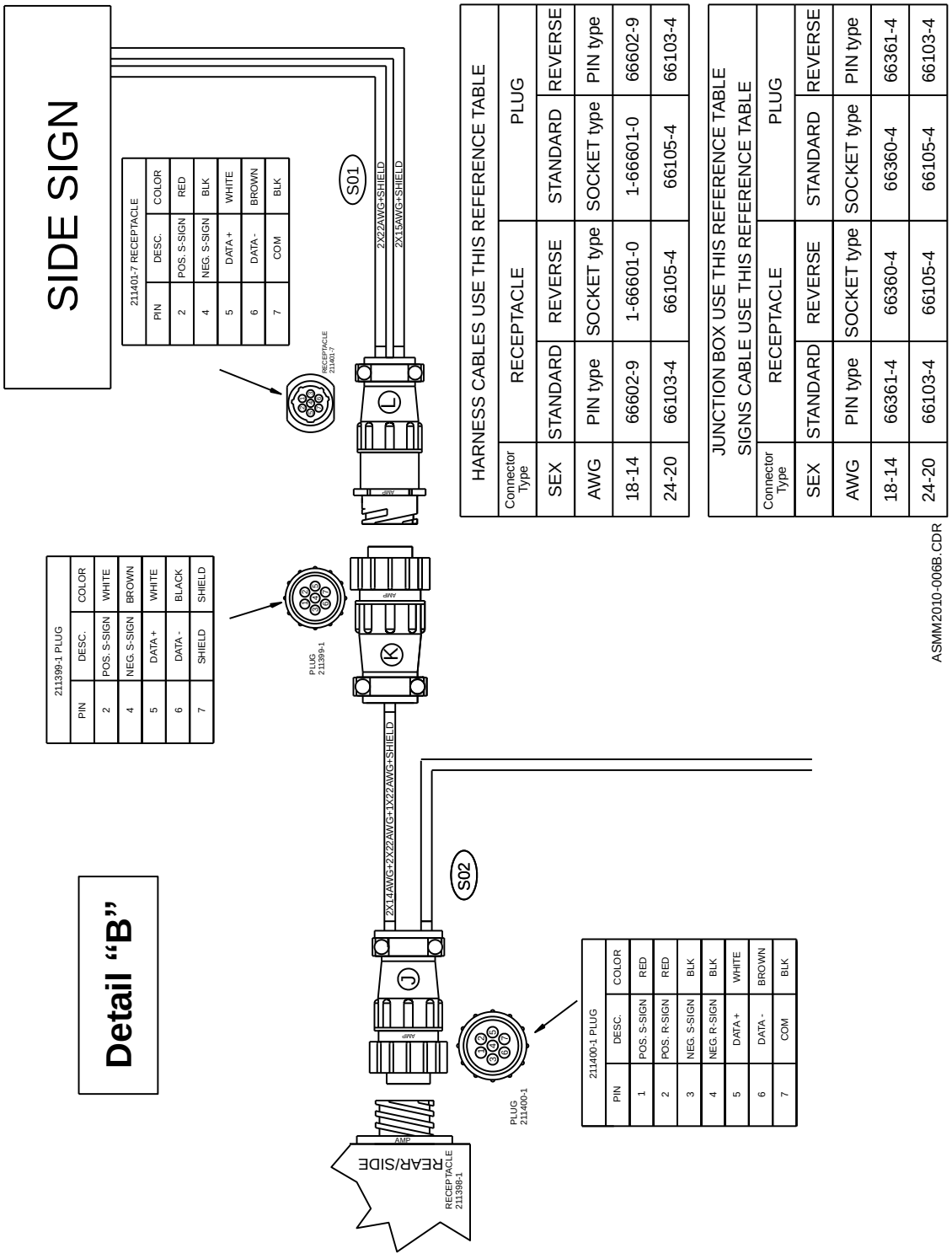
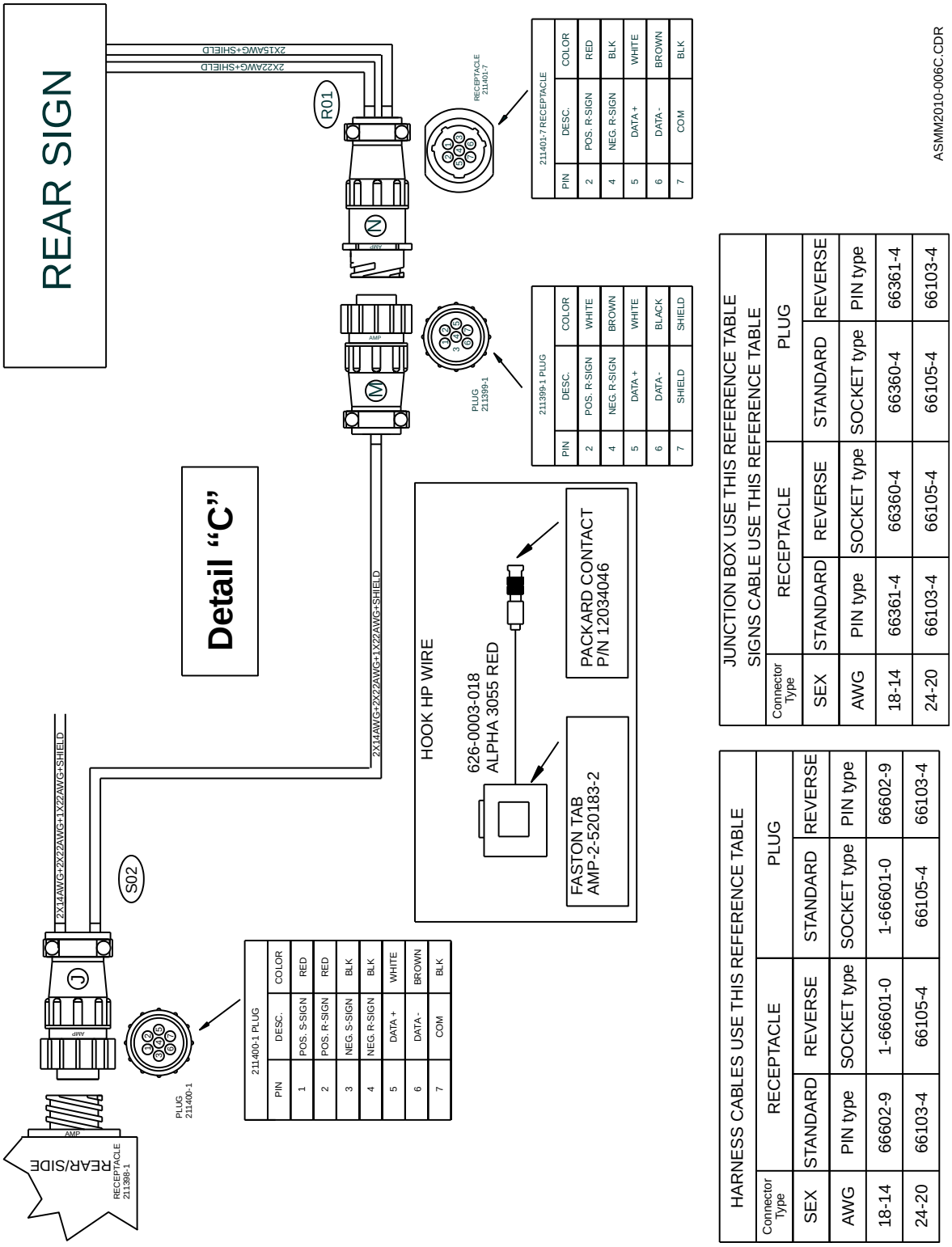


Figure 58 — General Connection Diagram, Detail "B"



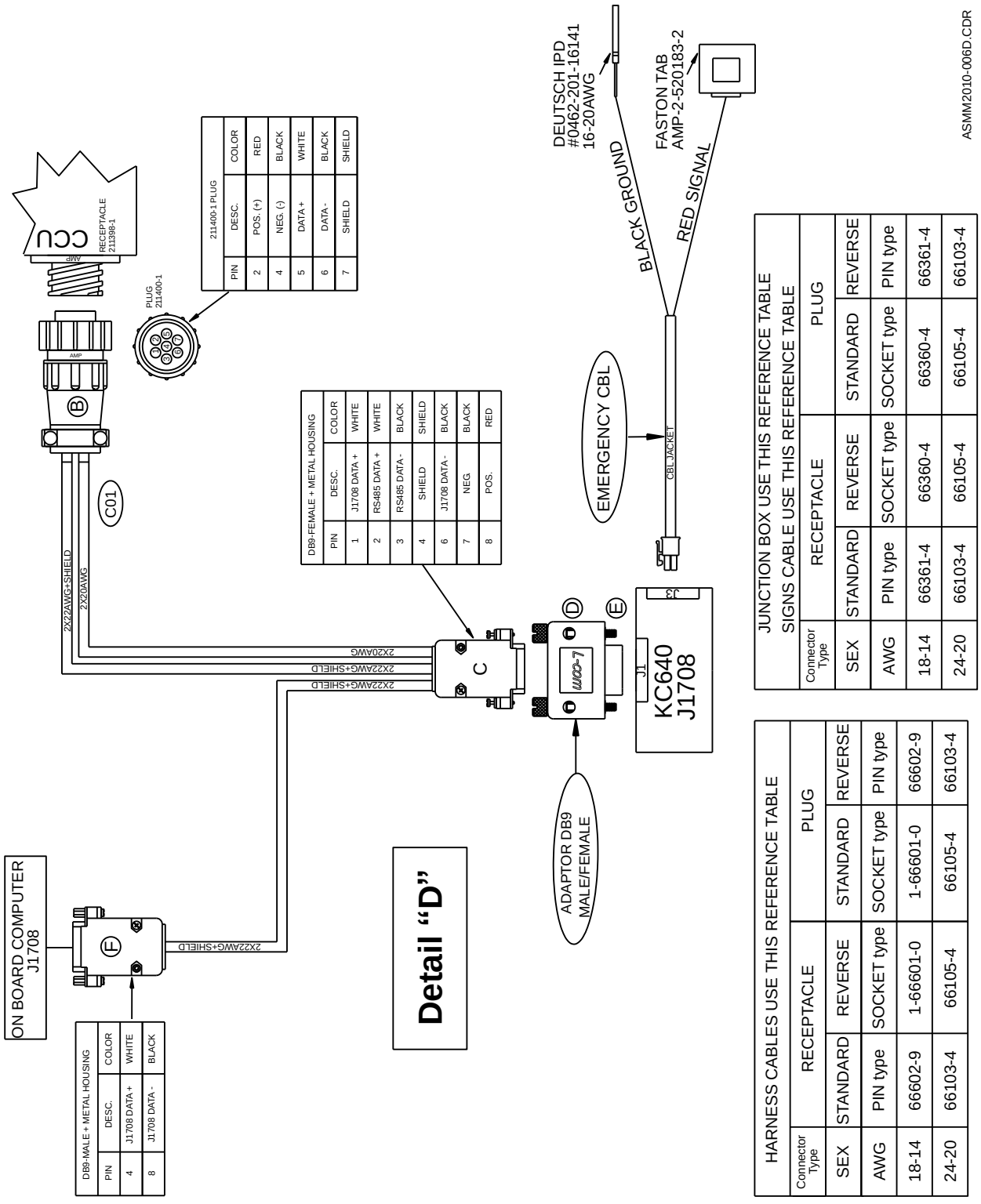
JUNCTION BOX USE THIS REFERENCE TABLE
SIGNS CABLE USE THIS REFERENCE TABLE

Connector Type	RECEPTACLE			PLUG		
SEX	STANDARD	REVERSE		STANDARD	REVERSE	
AWG	PIN type	SOCKET type		SOCKET type	PIN type	
18-14	66361-4	66360-4		66360-4	66361-4	
24-20	66103-4	66105-4		66105-4	66103-4	

HARNESS CABLES USE THIS REFERENCE TABLE

Connector Type	RECEPTACLE			PLUG		
SEX	STANDARD	REVERSE		STANDARD	REVERSE	
AWG	PIN type	SOCKET type		SOCKET type	PIN type	
18-14	66602-9	1-66601-0		1-66601-0	66602-9	
24-20	66103-4	66105-4		66105-4	66103-4	

Figure 59 — General Connection Diagram, Detail "C"



JUNCTION BOX USE THIS REFERENCE TABLE
SIGNS CABLE USE THIS REFERENCE TABLE

Connector Type	RECEPTACLE			PLUG		
SEX	STANDARD	REVERSE		STANDARD	REVERSE	
AWG	PIN type	SOCKET type		SOCKET type	PIN type	
18-14	66361-4	66360-4		66360-4	66361-4	
24-20	66103-4	66105-4		66105-4	66103-4	

HARNESS CABLES USE THIS REFERENCE TABLE

Connector Type	RECEPTACLE			PLUG		
SEX	STANDARD	REVERSE		STANDARD	REVERSE	
AWG	PIN type	SOCKET type		SOCKET type	PIN type	
18-14	66602-9	1-66601-0		1-66601-0	66602-9	
24-20	66103-4	66105-4		66105-4	66103-4	

Figure 60 — General Connection Diagram, Detail "D"

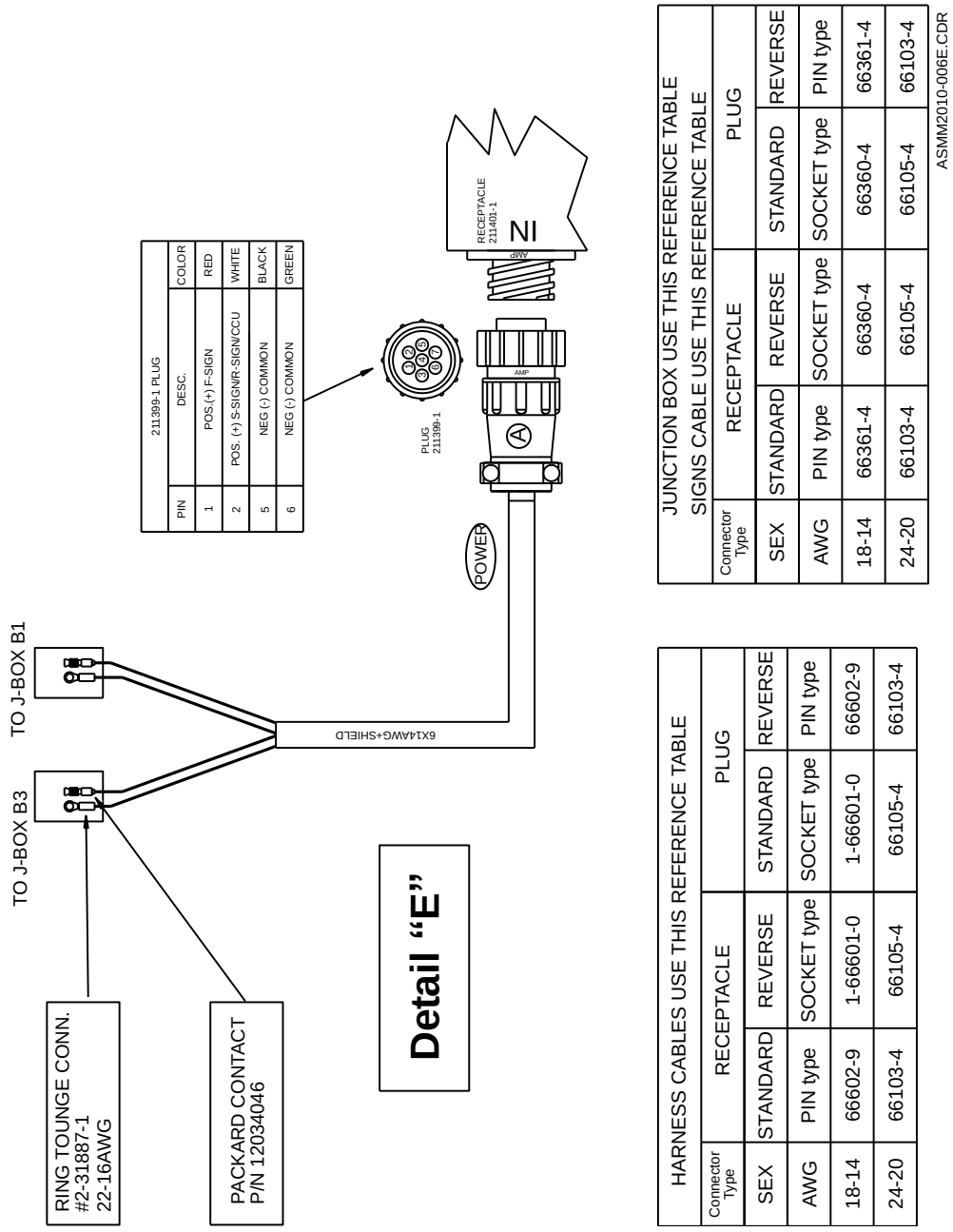


Figure 61 — General Connection Diagram, Detail "E"

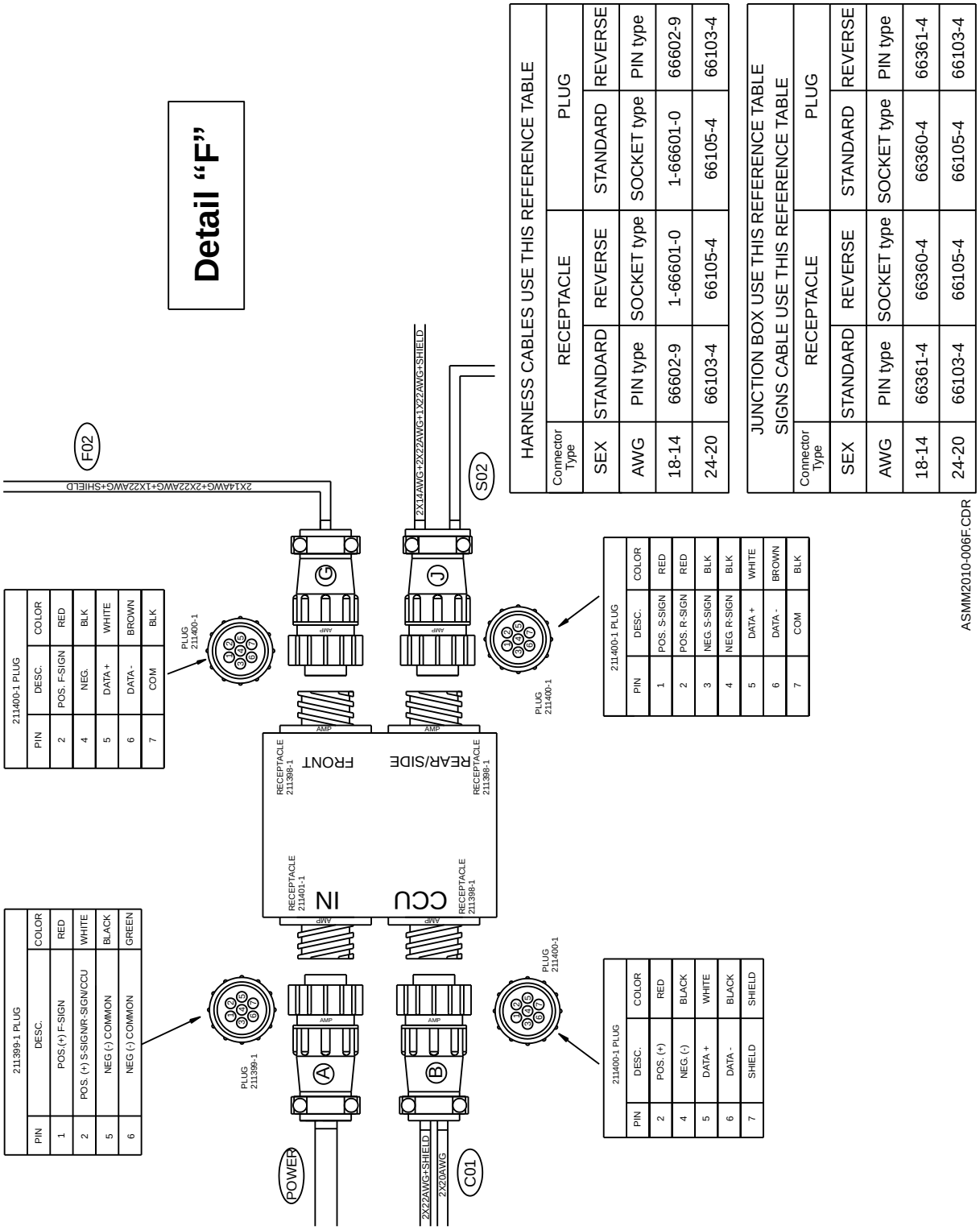


Figure 62 — General Connection Diagram, Detail "F"

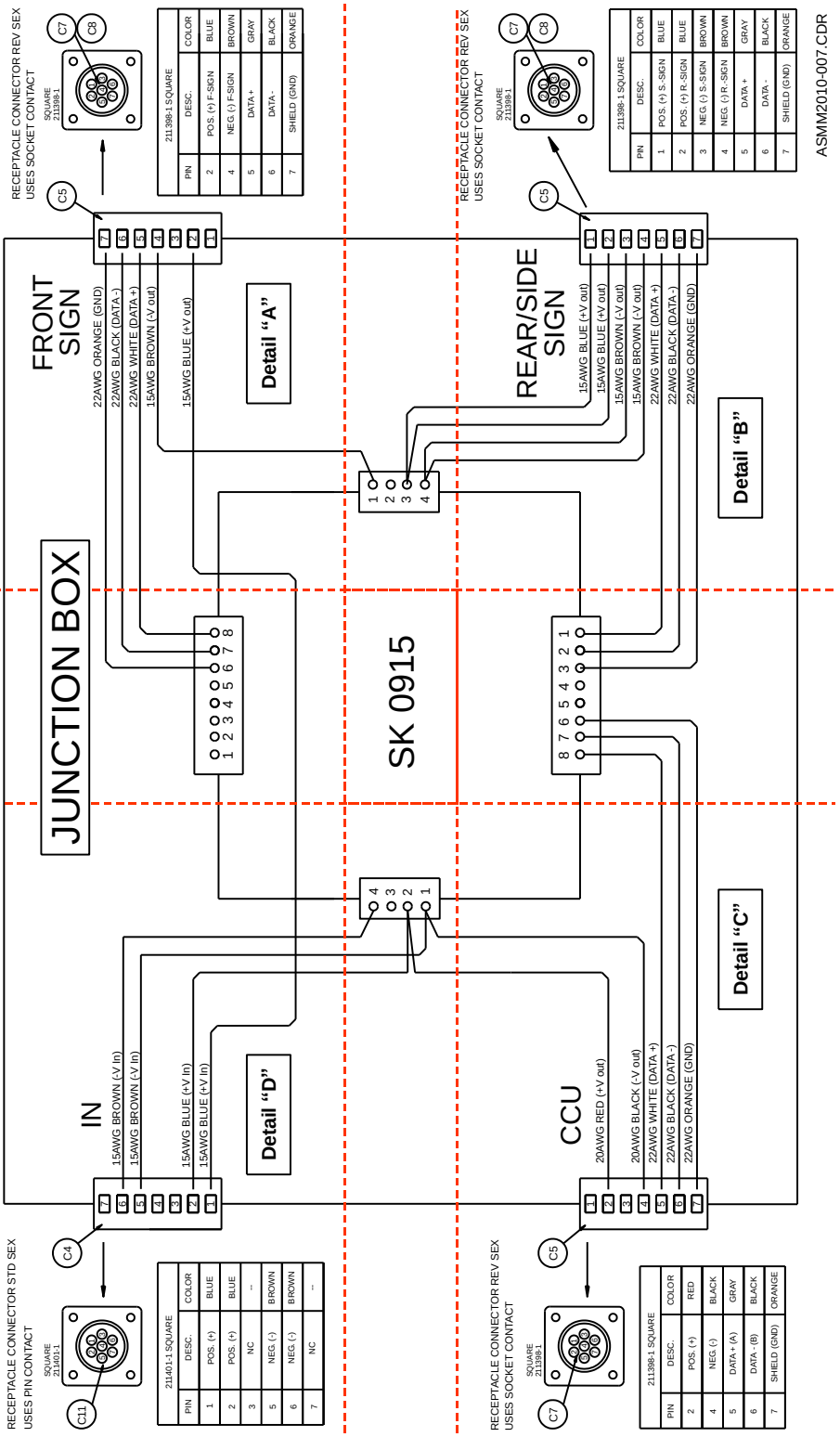


Figure 63 — Standard Junction Box, Full View

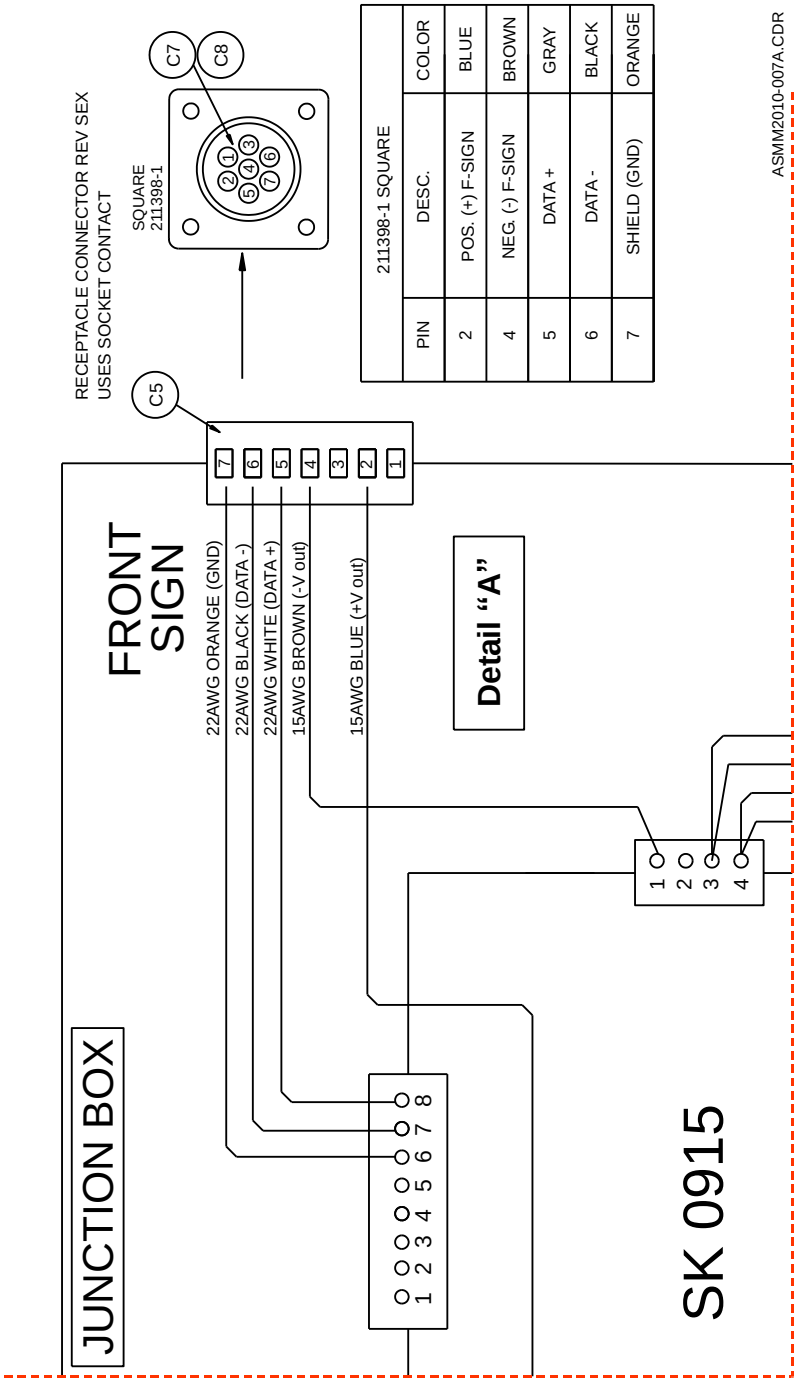


Figure 64 — Standard Junction Box, Detail "A"

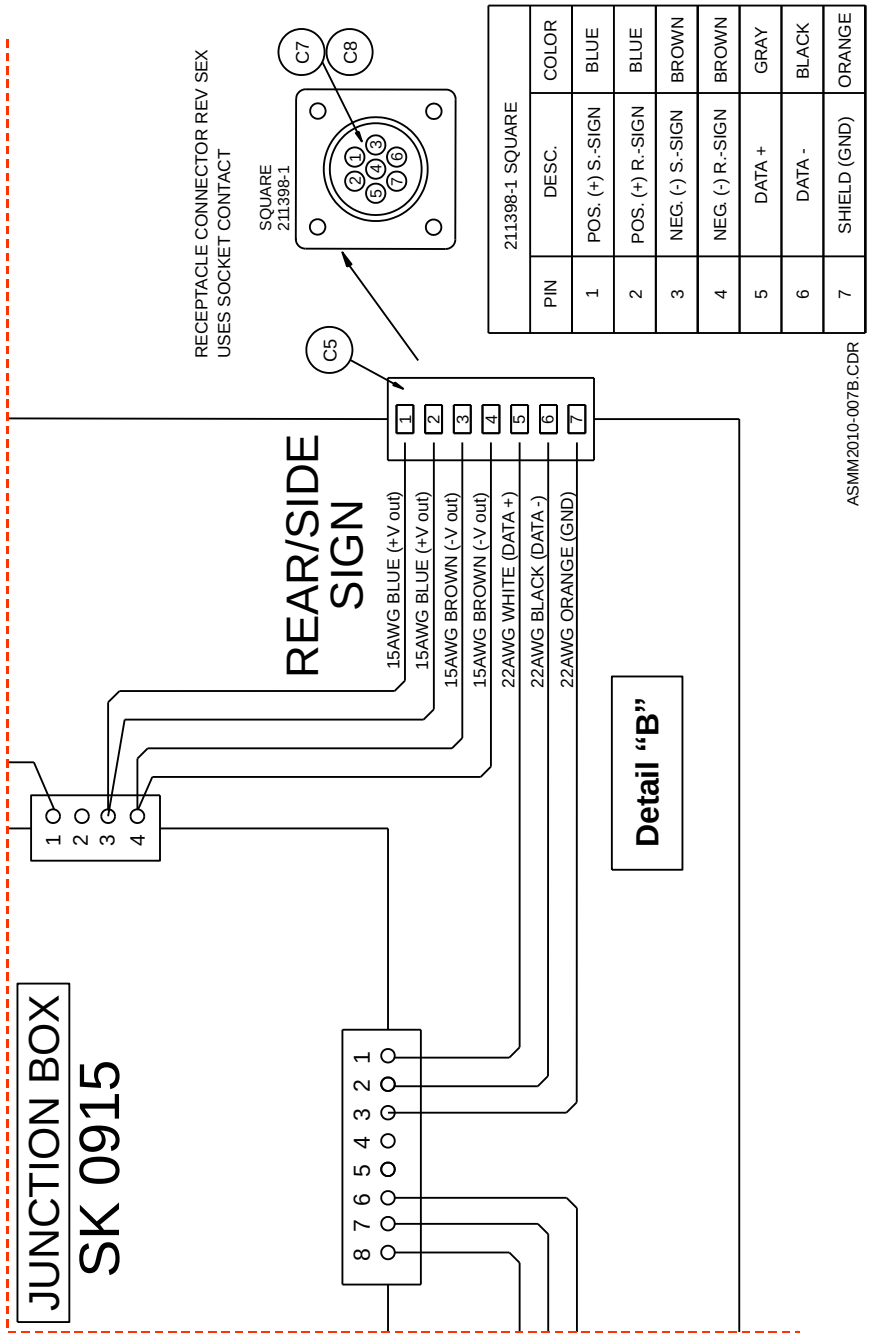


Figure 65 — Standard Junction Box, Detail "B"

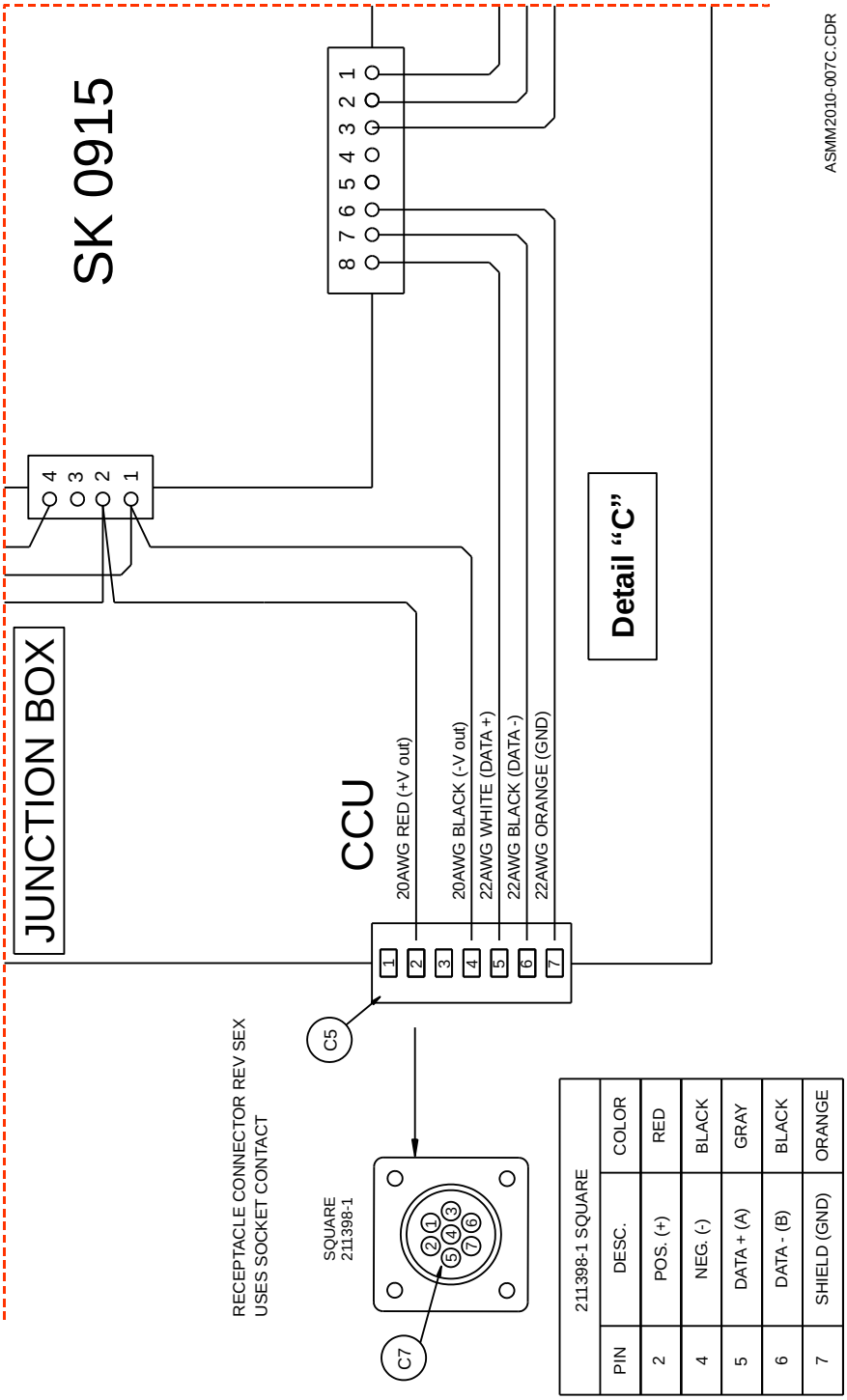


Figure 66 — Standard Junction Box, Detail "C"

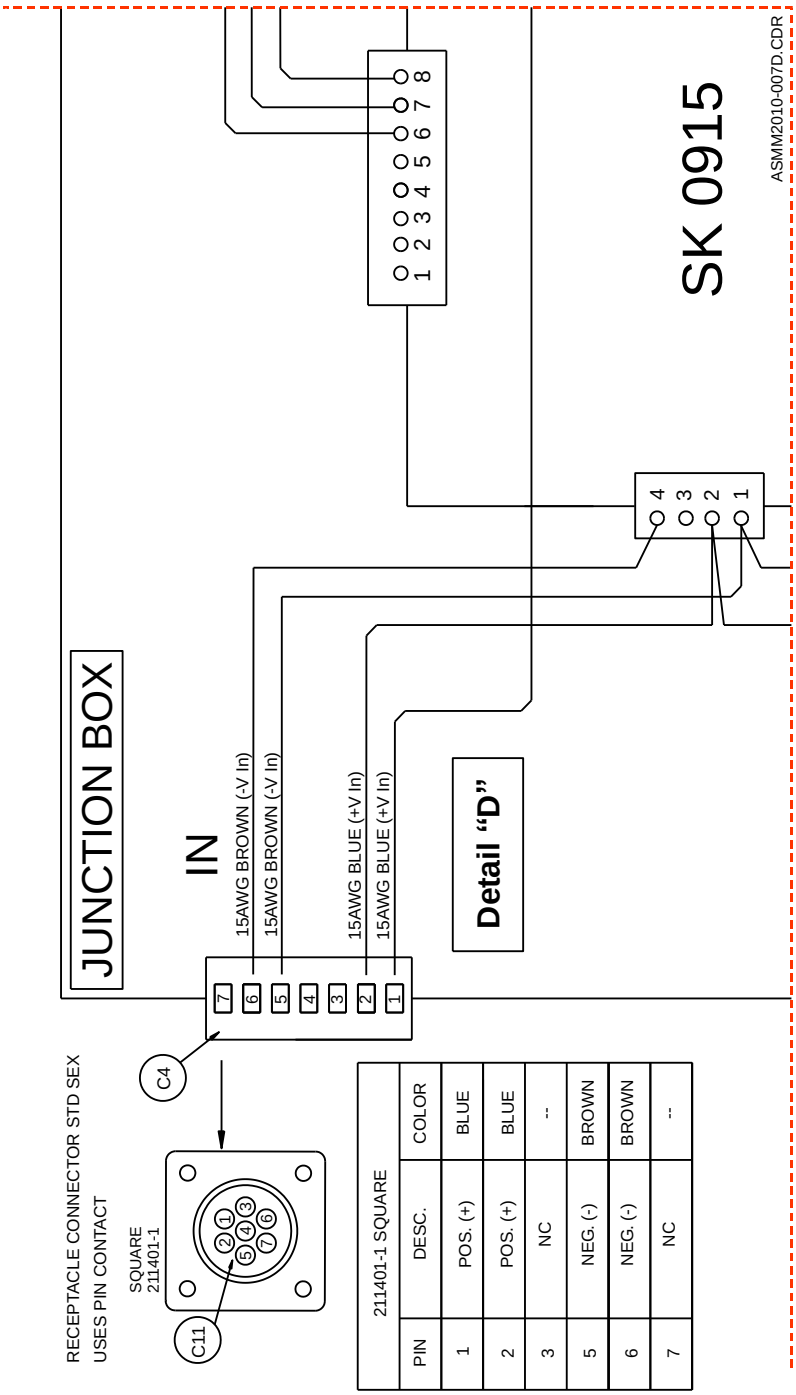


Figure 67 — Standard Junction Box, Detail "D"

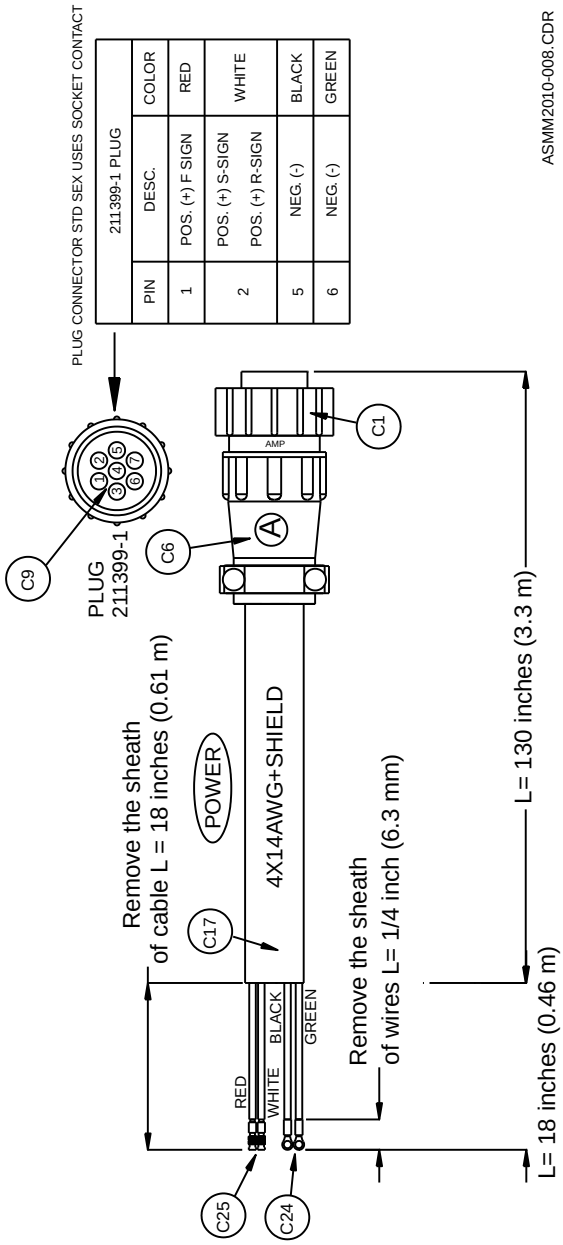


Figure 68 — Main Power Cable

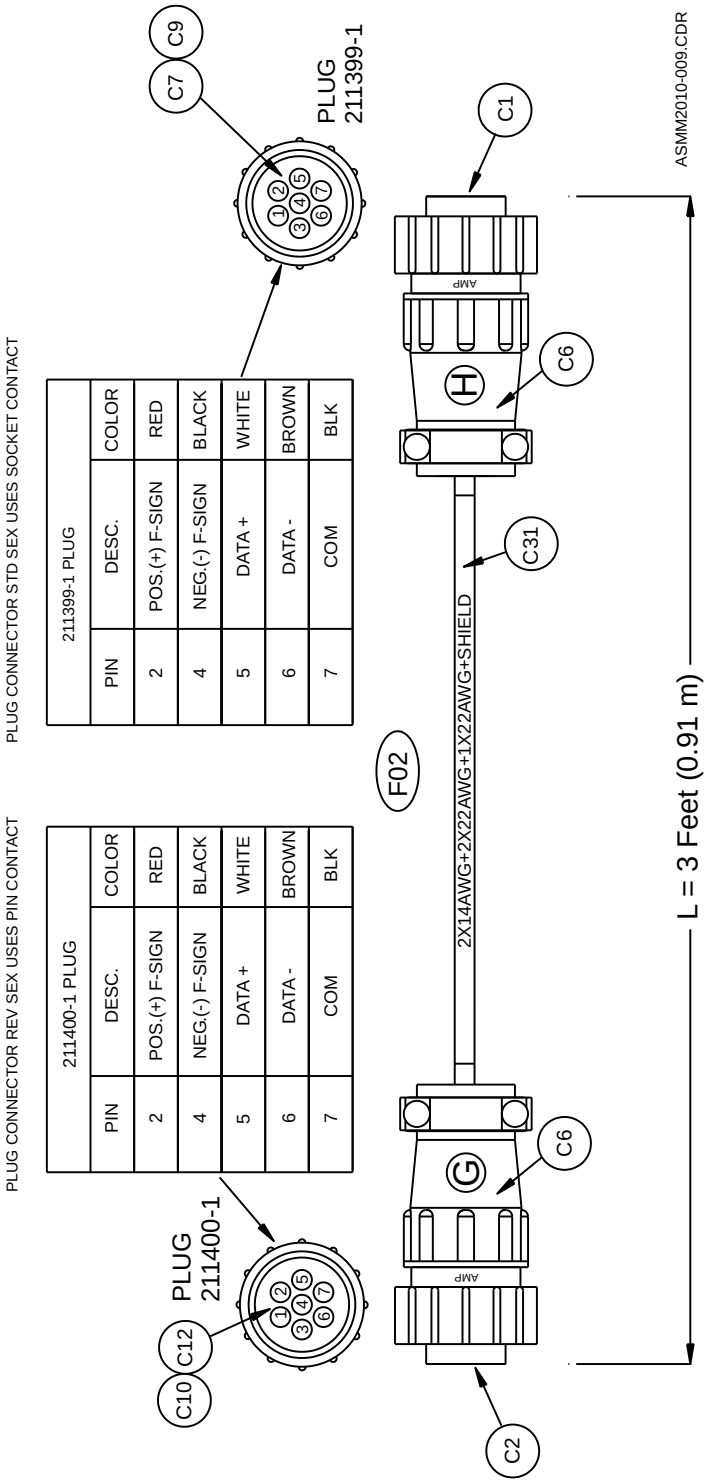


Figure 69 — F02 Front Sign Extension Cable

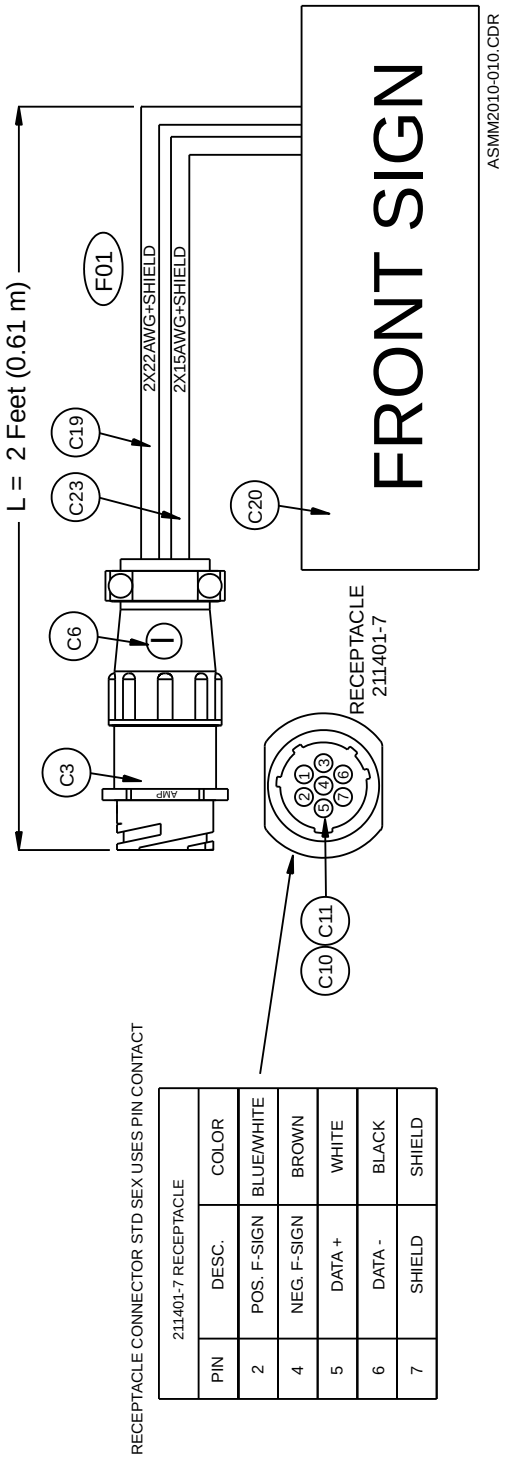


Figure 70 — Front Sign

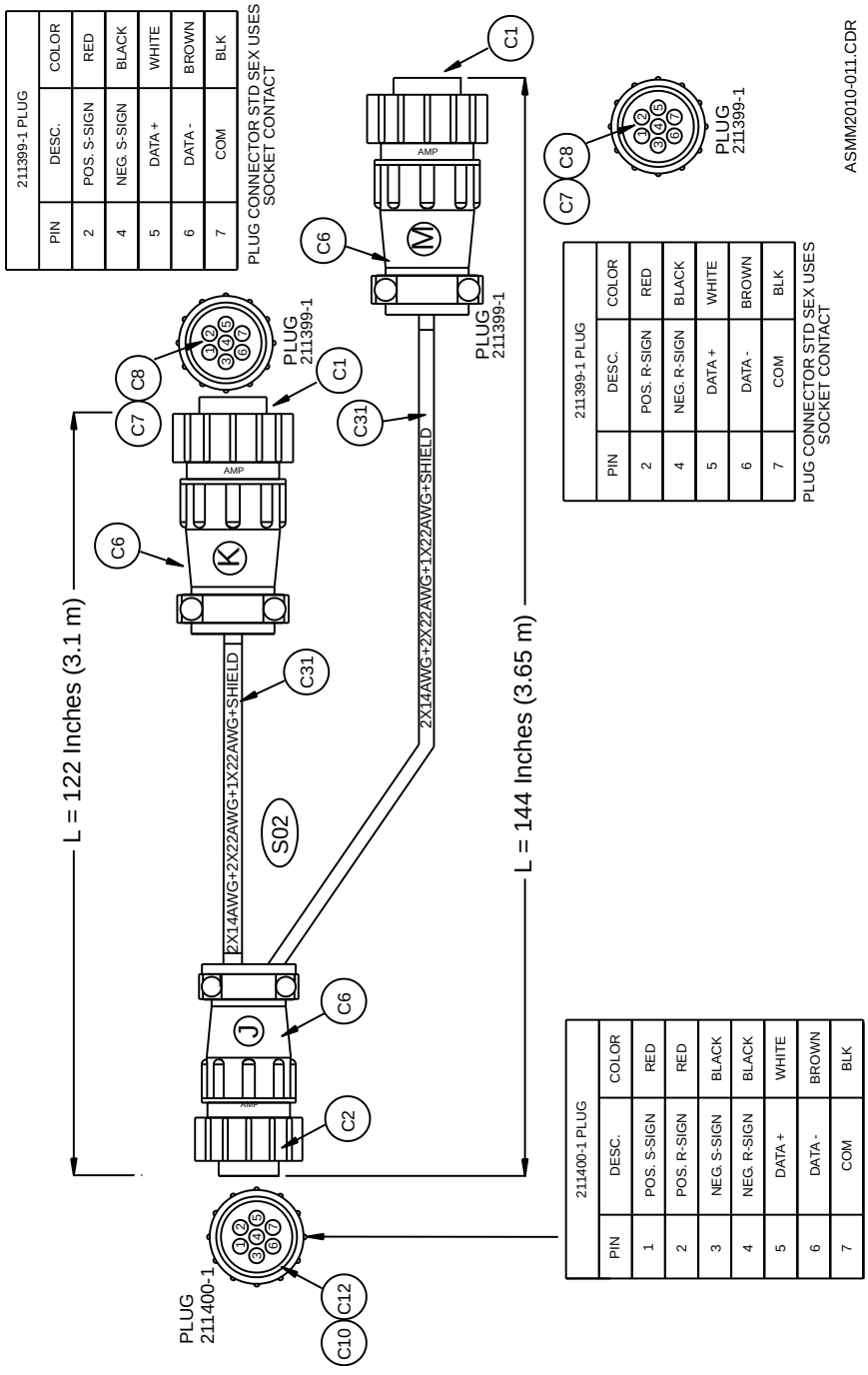


Figure 71 — S02 Side Sign and Rear Sign Extension Cable

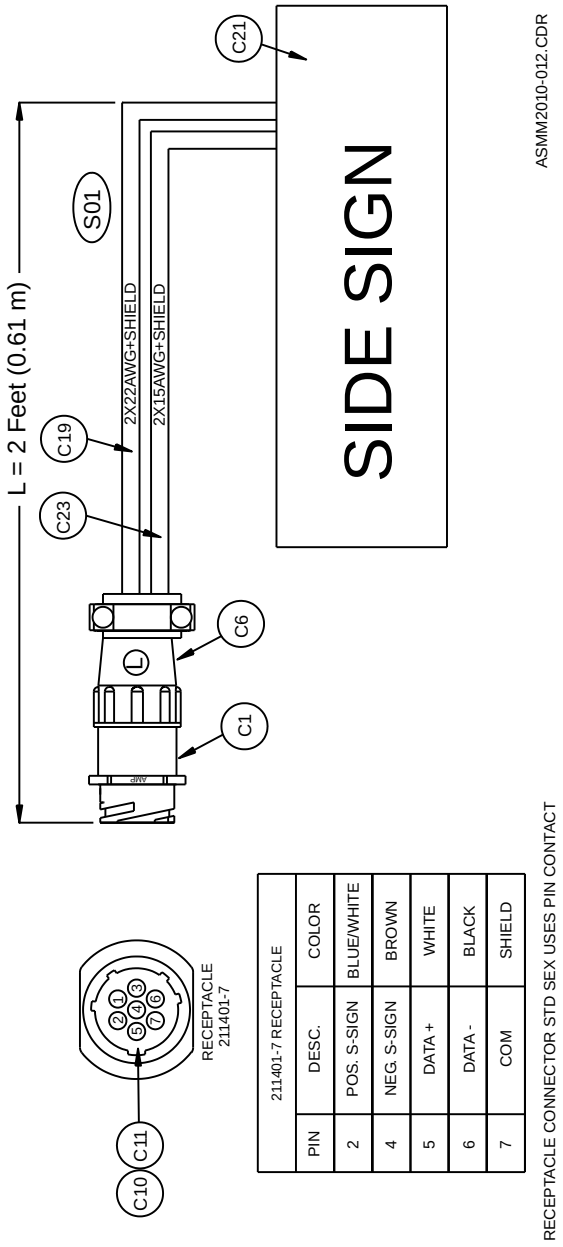


Figure 72 — Side Sign

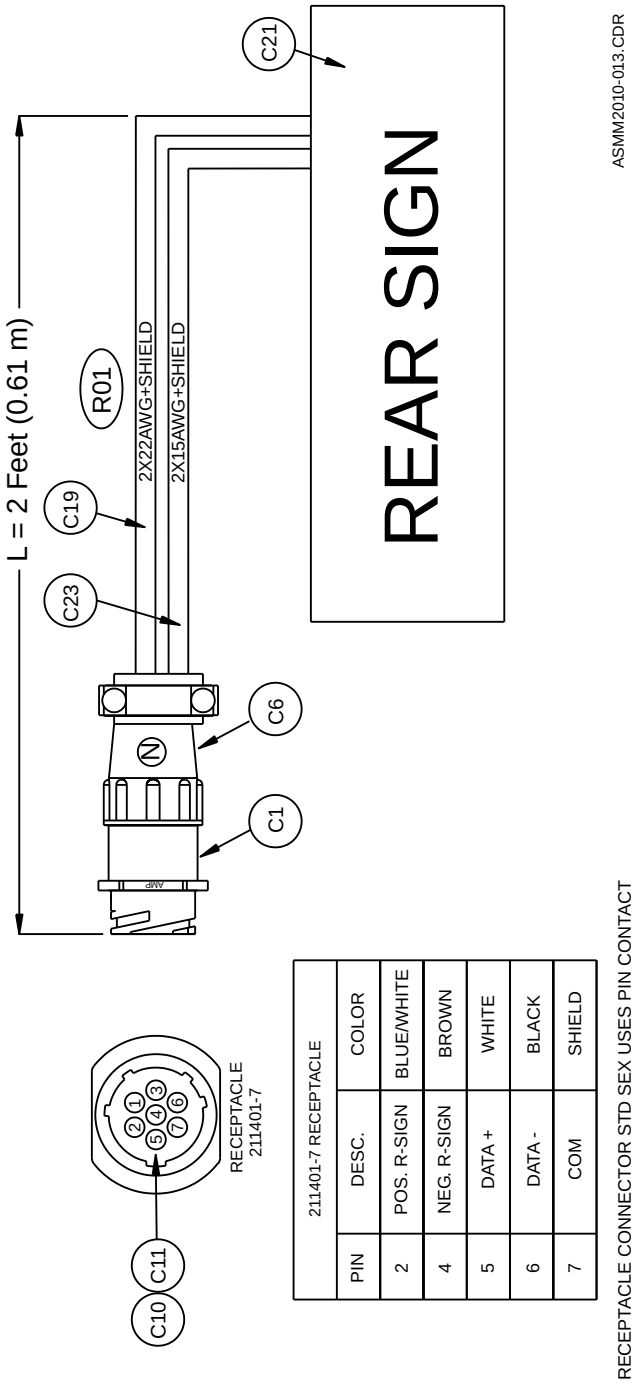


Figure 73 — Rear Sign

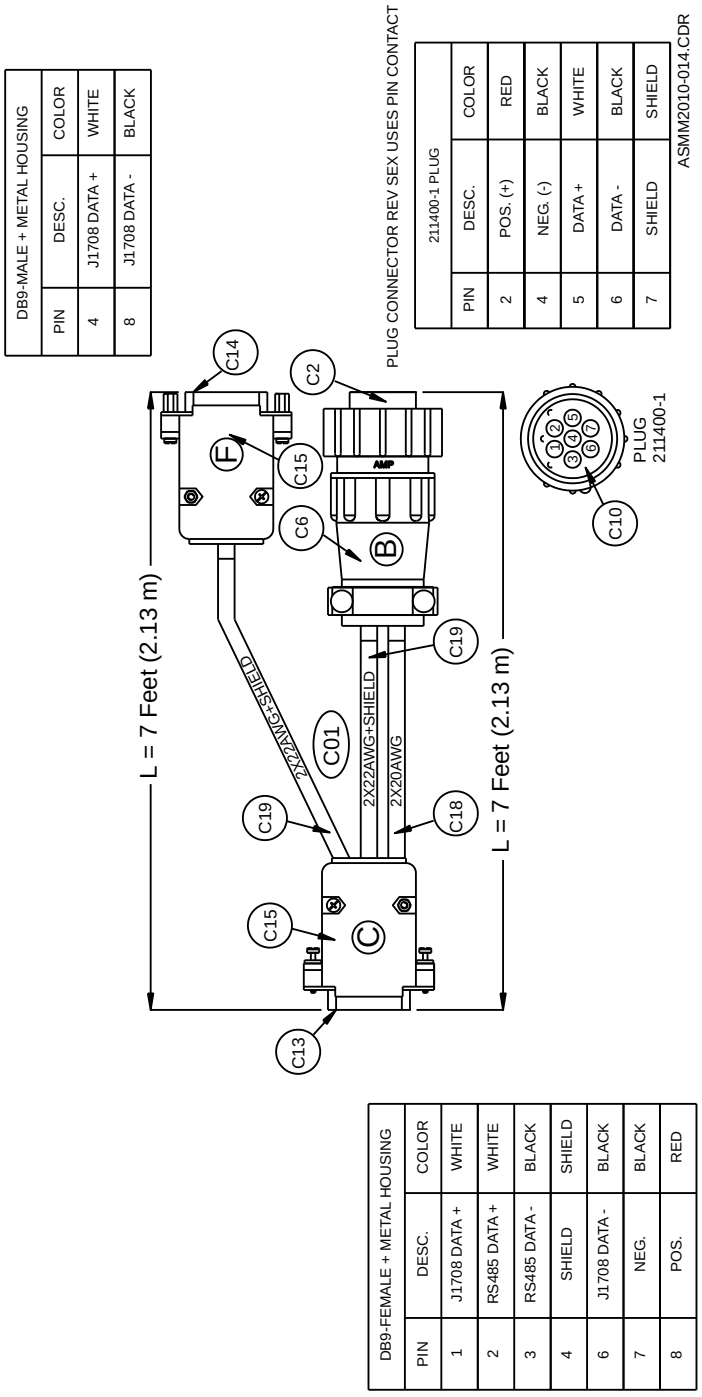


Figure 74 — C01 KC640 Data and Power Cable

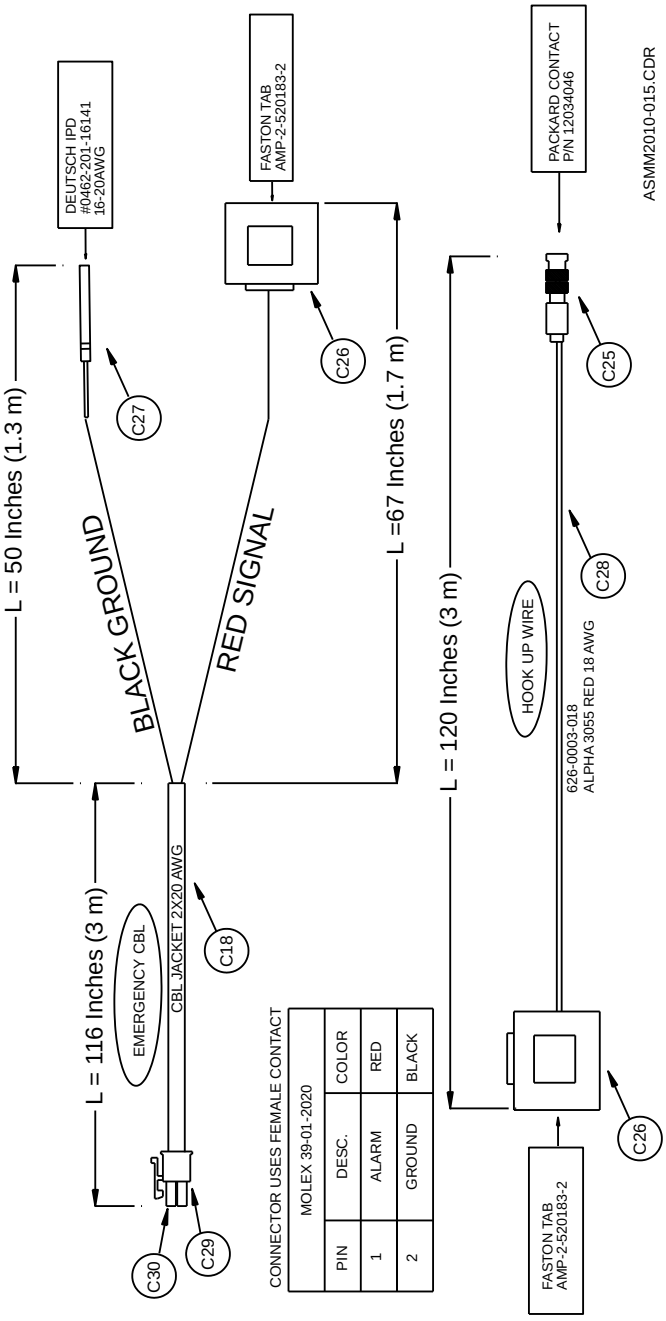


Figure 75 — Alarm Cable Hook-up Wire

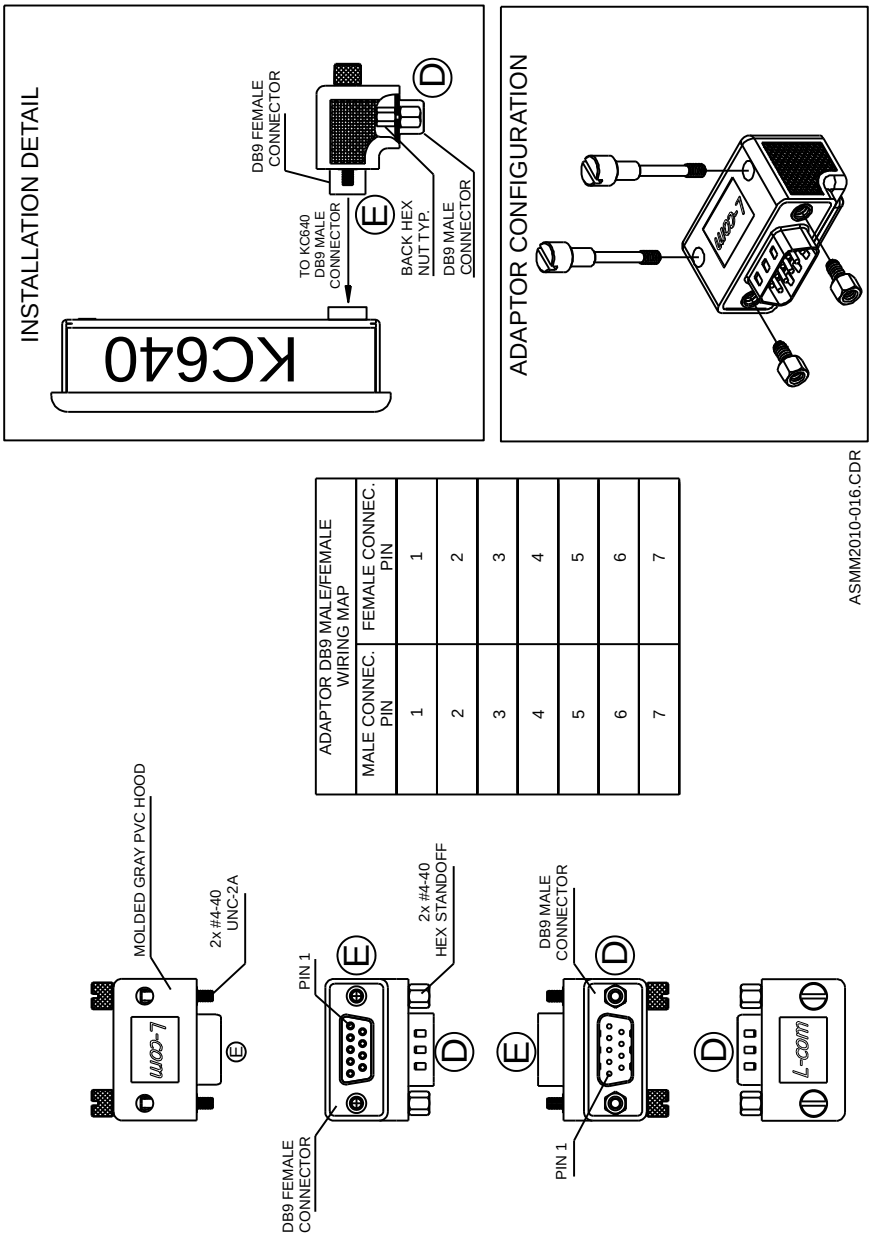


Figure 76 — Adaptor DB9 Male/Female

Table L — Standard Parts List

Item	Qty.	Description	Aesys Part #	Vendor Part #
C01	4	AMP CPC Plug size 13, standard sex, 7 positions	11039301	211399-1
C02	3	AMP CPC Plug size 13, standard sex, 7 positions	11039496	211401-1
C03	3	AMP CPC Receptacle in Line, Size 13, Standard Sex, 7 positions	11039504	211401-7
C04	1	AMP CPC Receptacle Flanged, Size 13, Standard Sex, 7 positions	11039303	211401-1
C05	3	AMP CPC Receptacle Flanged, Size 13, Standard Sex, 7 positions	11039495	211398-1
C06	10	AMP CPC 13 Cable Clamp	11039336	206966-1
C07	20	AMP contact socket type wire range: 0.20-0.50 mm (24-20 AWG)	11051092	66105-4
C08	6	AMP contact socket type wire range: 0.80-2.00 mm (18-14 AWG) Installation diameter: 2.03-2.54 mm	11051093	66360-4
C09	10	AMP contact socket type wire range: 0.80-2.00 mm (18-14 AWG) Installation diameter: 2.79-3.81 mm	11051161	1-66601-0
C10	20	AMP contact Pin type wire range: 0.20-0.60 mm (24-20 AWG)	11051043	66103-4
C11	10	AMP contact Pin type wire range: 0.80-2.00 mm (18-14 AWG) Installation diameter: 2.03-2.54 mm	11051094	66361-4
C12	6	AMP contact Pin type wire range: 0.80-2.00 mm (18-14 AWG) Installation diameter: 2.79-3.81 mm	11051162	66602-9
C13	1	Female Sub-D 9P	11039028	171510
C14	1	Male Sub-D 9P	11039027	171610
C15	2	Sub-D Metal Housing	11039168	203009
C16	7.1 mt	Power Data cable UL20549 2x14AWG+2x22 AWG+ 1x22 AWG	12013039	IDE2/501
C17	4 mt	Shielded cable 4x14 AWG	N/A	N/A
C18	5.5 mt	FROR Cable 2x0.5 mm Red - Black	12010021	N/A
C19	13.1 mt	Shielded data cable Rev2y(St)Y 1x2x AWG22/7	12013001	N/A
C20	1	Front Sign	N/A	N/A
C21	1	Side Sign	N/A	N/A
C22	1	Rear Sign	N/A	N/A
C23	2 mt	Power cable 2x1.5 mm (15 AWG) - Blue (or White) - Brown	12010037	N/A
C24	2	Ring Tongue Terminal size 22-16 AWG	11039512	2-31887-1

Table L — Standard Parts List (Continued)

Item	Qty.	Description	Aesys Part #	Vendor Part #
C25	3	Metri Pack Packard Contact	11051163	12034046
C26	2	Faston Tab Receptacle 22-18 AWG	11039513	2-520183-2
C27	1	Deutsch Pin Solid 16-20 AWG	11051164	DE-0460-202-16141
C28	3 mt	Hook up wire (HUW) 626-0003-018 Alpha 3055 RED	N/A	N/A
C29	1	Molex connector Mini-Fit Receptacle housing	11051016	39-01-2020
C30	2	Molex Female contact Mini-Fit	1105002	39-00-0077
C31	7.7 mt	Power Data cable UL20549 2x14 AWG+2x22 AWG+ 1x22 AWG	12013039	IDE2/501
C32	1	Adaptor DB9 Male/Female	N/A	43321

NOTES:

NOTES: