



INSTRUCTION MANUAL

HEAD OF TRAIN DEVICE, MODELS Q3452/R2 & V3452/R2

SEPTEMBER 2024

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SIEMENS MOBILITY, INC. RAIL AUTOMATION 2400 NELSON MILLER PARKWAY LOUISVILLE, KENTUCKY 40223	SIEMENS MOBILITY, INC. RAIL AUTOMATION 939 S. MAIN STREET MARION, KENTUCKY 42064
TELEPHONE: (502) 618-8800	TELEPHONE: (270) 918-7800
FAX: (502) 618-8810	CUSTOMER SERVICE: (800) 626-2710
SALES & SERVICE: (800) 626-2710	TECHNICAL SUPPORT: (800) 793-7233
WEB SITE: USA Rail Automation Site	FAX: (270) 918-7830

FCC RULES COMPLIANCE

The equipment covered in this manual has been tested and found to comply with the limits for Class A digital devices, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

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CHANGE NOTICE:

Rev.	Date	Author	Description
A	3/2/2005	JS	Original Quantum Document.
A1	3/22/2012	SO	Branding change to Invensys Rail. The following changes were made to QSM-3452: Quantum P/N Q3452/R on page 3 was revised to P/N Q3452R2 due to a circuit board revision. <ol style="list-style-type: none"> 1.) Drawings list was revised to correct C3452-WIR from revision A to revision B. 2.) All references to Quantum and Quantum Engineering were changed to Invensys Rail. 3.) General document formatting was updated to the current Invensys Rail format. 4.) Drawings were updated to Invensys Format.
A2	4/2013	DLW	Updated company address, added V3451/R2 part number, changed font to Verdana
A3	3/2016	TP	Rebrand content
A4	3/25/2016	TP	Add text Page 7 Radio Tests - Transmitting
B	11/15/2016	TP	Page 7 Changed deviation levels Page 7 Changed SINAD meter connection points SECTION 7 Updated Drawings Add Appendix C
B.1	09/30/2024	MM	Updates to company name and contact information throughout. Proprietary information page updated.

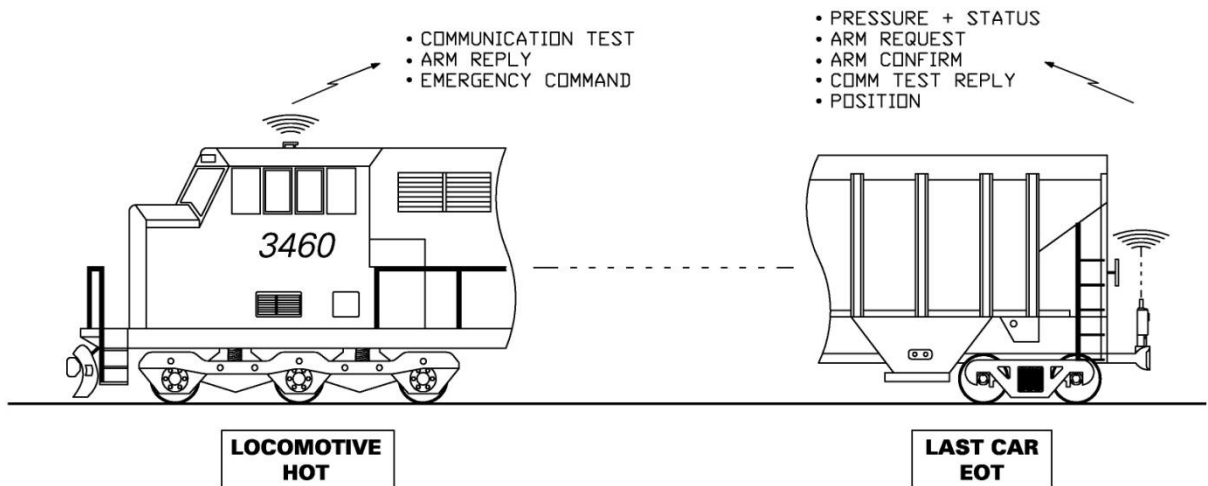
SECTION 1 - INTRODUCTION

INTRODUCTION AND PRODUCT FEATURES

The Siemens Q3452/V3452 Head-of-Train Device (HOT or HTD), when used with an End-of-Train Device (EOT or ETD), provides the Locomotive Engineer with information regarding conditions that are important to the operation of the train. These conditions include brake pipe pressure (PSI) and various status conditions. The status indications include:

- Arming status [emergency feature enabled/disabled]
- Communication status [good/comm-loss, rear-to-front or front-to-rear]
- Motion detection [moving/stopped]
- Highly visible marker (HVM) [on/off/defective]
- Brake valve [normal/emergency/defective]
- Battery status [good/low/dead]
- Battery charge [percent depleted, in charge units]

The Q3452/V3452 also processes EOT/HOT communications tests, Arm requests, and emergency brake commands resulting from an Emergency switch activation or external Emergency input.



The Siemens Head-of-Train device is a single band unit intended for application to integrated cab electronics locomotives such as General Electric's IFC systems or EMD/Rockwell's ICE or FIRE systems. The unit supports the AAR standard protocol on the frequency pairs of 457.9375 MHz and 452.9375 MHz. Mode selection between EMD and GE is accomplished via a jumper in the power cable.

Features of the Q3452/V3452 Head-of-Train Device

- Interchangeability – The Q3452/V3452 is a direct mechanical and electrical replacement for HOT equipment from other manufacturers.
- Modular Design – The Q3452/V3452 is designed using modular components that allow maintenance personnel to quickly make routine inspections, test the radio, and effect repairs.
- The V3452 is functionally and mechanically identical to the Q3452 but is based on new hardware architecture.



Q3452/V3452 Head-of-Train Telemetry Device

PARTS LIST

The following lists all components available from Siemens for the installation, interconnection, and servicing of the Q3452/V3452 Head-of-Train Device.

Siemens Part Number	Description
Q3452/R2 or V3452/R2	Head-of-Train Device
Q9199	Test Cable
QP-16371	PUMP® Software Update Host Program
QP-16373	HOTCOMM Software Program
QP-36053	Enclosure handle
QP-59019/RIT	UHF Radio module
OBE-00-12-01	Service Manual (this manual)

SECTION 2 – INSTALLATION

Installation is dependent on the locomotive configuration. Commonly, the unit is either mounted on the electrical cabinet door (IFC) or in the electronics rack (ICE) in the nose of the locomotive. Power and communication to the locomotive computer is supplied by a single connector. Connections are made to the UHF antenna via a type-N connector.

The unit has three LED indicators: a green "OK" LED, a yellow "Push-to-Talk" (PTT) LED, and a red "Fault" LED. Approximately 5 seconds after power is applied, all the LED's should come on for 3 seconds. At this point, the green OK LED should remain on dimly. The Fault and PTT LED's should not be lit.

In operation, the OK LED will blink brightly when a transmission is received, the PTT LED will light when the unit is transmitting, and the Fault LED should remain out. In the event of a systems failure, the Fault LED will light. In order to aid troubleshooting, the Fault LED can flash to indicate the detected fault. The LED will flash once a second and will pause for two seconds between patterns. See Table 1 for the fault codes.

Number of Flashes	Detected Fault	Possible Cause
1	No Host Communication	No communication from ICE or IFC
2	Bad EOT ID Code	Corrupted memory; rearm
3	Bad Link Code	Corrupted memory; rearm
4	Bad EOT Flags	Corrupted memory; rearm
Solid On	All other faults	HOT defective
Solid Off	No faults detected	Normal Status

Table 1 – Red LED Fault Codes

An additional fault code involves the use of the green OK LED. A Front-to-Rear communication fault will cause the LED to be on for 5 seconds and then go off for 1 second. This fault can be caused by poor communication at either end.

Number of Flashes	Condition	Possible Cause
1	F>R No Communication	Poor HOT Tx, or Poor EOT Rx
Bright LED	RF Message Received	Message from EOT
Dim LED	Power On	Normal Status
Solid Off	No Power	Check 12 volt supply

Table 2 – Green LED Conditions

SECTION 3 – FUNCTIONAL TESTING

Familiarity with IFC and ICE display screens is required for these tests, as well as a functional EOT.

ON THE LOCOMOTIVE

- Set up the EOT unit.
- Check the LED status lights on the Q3452/V3452 HOT. The OK (green) LED should be lit dimly with possible bright flashes now and again. The Fault (red) LED should be off. The PTT (yellow) LED should be off most of the time and lit no more than a few seconds at any time.
- Using the locomotive control screens, enter the EOT number.
- Arm to the EOT. The EOT “ARM” button must be pressed to start the arming sequence. Once the “Arm Now” indicator is illuminated on the control screen, press the ARM button on the screen to complete the arming process.
- When the EOT is armed, the locomotive control screens should display “ARMED” for the EOT Status, as well as “Emergency Enabled”.
- Information transmitted by the EOT will be displayed on the HOT. There is no need to test all the display combinations. The Q3452/V3452 communicates digitally with the IFC or ICE computer. The appropriate display will light when an EOT status message is received by the unit.
- If possible, verify that the locomotive is receiving the EOT pressure. Vary the air pressure to the EOT and compare that pressure to the pressure displayed on the locomotive screen.
- With the EOT now armed to the Q3452/V3452, activate an **EMERGENCY**. Verify that the EOT opens the exhaust valve. After the EOT system recovers from this emergency application, test the external EIM input to the Q3452/V3452, if used. Usually, the EIM input can be tested by placing the train brake handle in the EMERGENCY position.
- Using the locomotive control screens, enter EOT code 00000, or use the “disarm” key.

BENCH TEST

Required Equipment

- A 15 VDC power supply
- A radio service monitor with SINAD meter
- Siemens program QPN 16373 (HOTCOMM)
- Siemens test cable Q9199 or similar
- Desktop or laptop computer running Windows® with an available serial port
- A functional EOT unit or EOT simulator

Test Procedure

- Connect the Q9199 test cable to 15 VDC power and then connect the test cable to the unit under test. Connect a suitable antenna to the unit.
- Apply power and note the action of the LED's on the unit under test. Approximately 5 seconds after power is applied, all LED's should light for 3 seconds. The PTT LED should go out and the OK LED should remain lit dimly. In the Bench mode, the FAULT LED may occasionally blink.
- Connect the test cable serial connector to the computer and start the HOTCOMM program. The HOTCOMM screen will be displayed as shown in Figure 9.

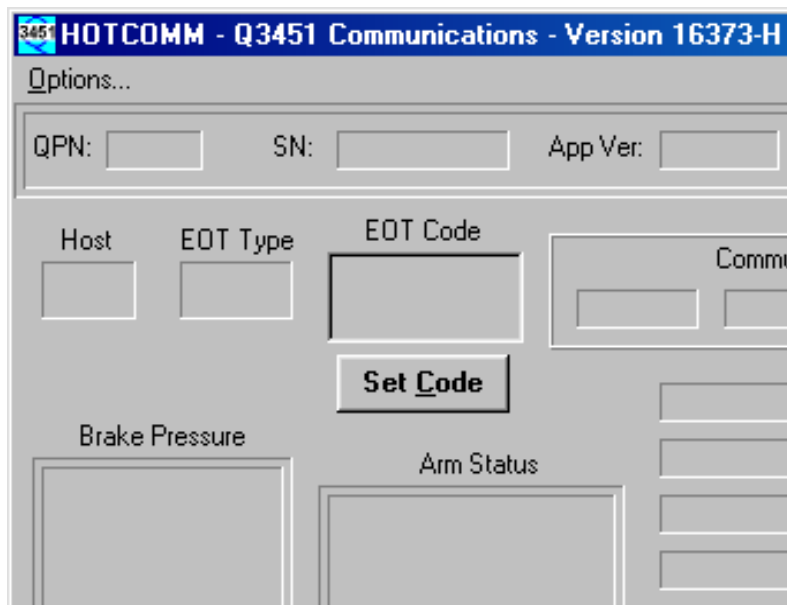


Figure 9 - HOTCOMM Screen

- If required by first time use, set the COM port used by the HOTCOMM program to match the computer's available serial port. The COM Port setting is configurable under the *Options...* menu item.
- Click the **RUN** button in the lower left of the screen to connect the HOTCOMM program to the unit under test. When the connection is made, HOTCOMM will display the Siemens part number (QPN), serial number (SN), Application Version (App Ver), and ROM version (ROM Ver) at the top of the window, similar to that shown in Figure 10. Verify that the application version is the current intended version. If a newer application is required, upload the new application as described in Appendix A.

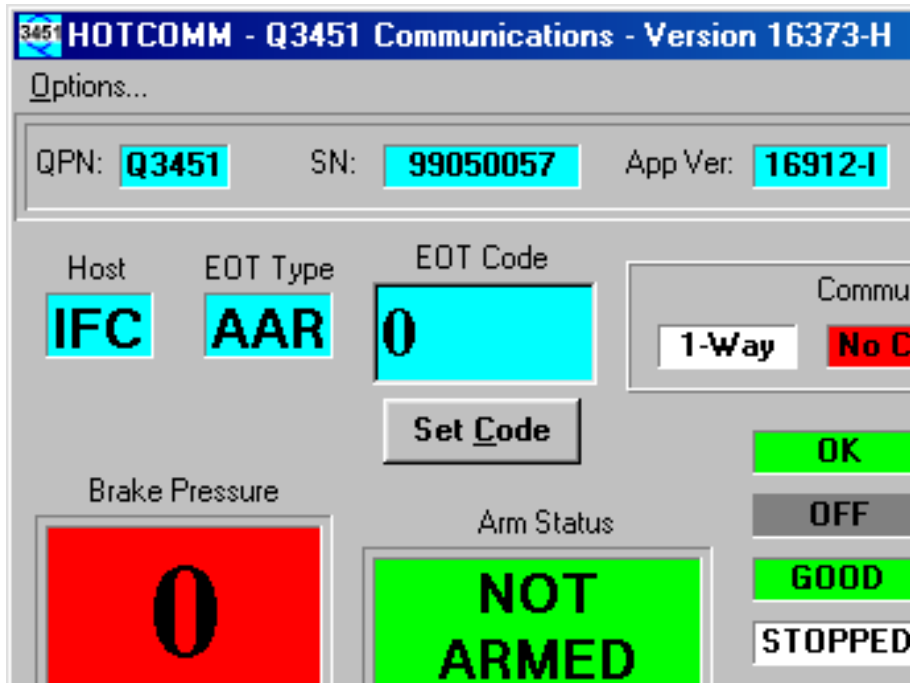


Figure 10 - HOTCOMM - Connected State

- Setup the EOT unit you are using as a test unit.
- Using HOTCOMM, click the mouse cursor in the **EOT Code** box and enter the EOT number you are using.
- Click the **Set Code** button once the EOT number has been entered.
- The unit should receive the next EOT transmission, which will occur within 60 seconds. You can force this transmission to occur sooner by changing the EOT pressure by more than 2 PSI or by pressing the EOT button. Verify that the HOTCOMM display receives the correct EOT signal and pressure.
- Arm to the EOT. The "ARM" button on the EOT must be pressed to start the arming sequence. Once the "Arm Now" indicator is illuminated on the screen, click the "ARM" button on the screen to complete the arming process.
- Click the **COMM Test** button and verify the success of the test by the HOTCOMM display.

RADIO TESTS

Transmitting

Connect the Radio Service Monitor to the UHF antenna connector on the unit under test. Set the Service Monitor to 452.9375 MHz and prepare it to measure power, frequency error, and deviation.

Perform the following checks:

1. Select Tone 1 (1800 Hz) from the **Tone** drop-down list on the HOTCOMM window.
 - a) Click on the **Start Tx Test** button.
 - b) Verify the unit is transmitting on 452.9375 MHz, +/-100 Hz
 - c) Verify the transmit deviation is 2.4 KHz +/- 100 Hz
 - d) Verify transmit power is a minimum of 1.9W. (Note: The V3452/R2 operates in high power only.)
 - e) Click on the **Stop Tx Test** button.
 - f) Allow the radio to cool for 2 minutes. (Note: The radio has a built-in 20-second timeout for transmit duration.)
 - g) Click on the **High Pwr** checkbox. (Note: The V3452/R2 operates in high power only. Checking the **High Pwr** checkbox has no effect on output power.)
 - h) Click on the **Start Tx Test** button.
 - i) Verify a power measurement of 7.0 Watts nominal, not to exceed 9 Watts.
 - j) Click on the **Stop Tx Test** button.
 - k) Allow the radio to cool for 2 minutes.
2. Select Tone 2 (1200 Hz) from the **Tone** drop-down list.
 - a) Click on the **Start Tx Test** button.
 - b) Verify the unit is transmitting on 452.9375 MHz, +/-100 Hz
 - c) Verify the transmit deviation is 2.4 KHz +/- 100 Hz
 - d) Verify transmit power is a minimum of 1.9W. (Note: The V3452/R2 operates in high power only.)
 - e) Click on the **Stop Tx Test** button.
 - f) Allow the radio to cool for 2 minutes.
 - g) Click on the **High Pwr** checkbox. (Note: The V3452/R2 operates in high power only. Checking the **High Pwr** checkbox has no effect on output power.)
 - h) Click on the **Start Tx Test** button.
 - i) Verify a power measurement of 7.0 Watts nominal, not to exceed 9 Watts.
 - j) Click on the **Stop Tx Test** button.
 - k) Allow the radio to cool for 2 minutes.

Transmit deviation can be set by adjusting a potentiometer:

- For the Q3452/R2 – R43 on the 60235/R PCB
- For the V3452/R2 – R9 on the 90400 PCB

If any parameters do not pass, perform radio alignment (see Appendix C).

Receiving

- For the Q3452/R2, Connect the SINAD meter to TP1 (radio Rx Audio) as shown on drawing C60235, found in the Drawings Section of this manual.
- For the V3452/R2, connect the SINAD meter to C5 (radio RX audio) as shown on drawing A90400, found in the Drawings Section of this manual.
- Set the Service Monitor to transmit on 457.9375 MHz using an internal tone of 1 kHz with 2.5 kHz modulation. Set the generator level to -116 dBm (0.35 μ V).
- Verify that the SINAD reads >12dB.
- Verify the RX audio level is 354 mV RMS \pm 5%.
- If any parameters do not pass, perform radio alignment (see Appendix C).

SECTION 4 – SERVICING

REQUIRED EQUIPMENT

The following equipment will be necessary for proper servicing of the Q3452/V3452.

- A 15 VDC power supply, capable of 2 amp or higher output
- A radio service monitor with SINAD meter
- Bird Watt meter, or equivalent
- Signal generator
- Oscilloscope
- A multi-meter for both ohms and volts
- Siemens program QPN 16373 (HOTCOMM)
- Siemens program QPN 16371 (PUMP)
- Siemens test cable Q9199 or similar
- The maintenance manual for the Ritron radio model used in the product
- The programming kit for the Ritron radio model used in the product
- Desktop or laptop computer running Windows® with an available serial port
- A functional EOT unit or EOT simulator

CIRCUIT DESCRIPTION

Refer to the schematics and assembly drawings available in Section 7.

TESTING

If replacing the main circuit board or any other major component of the Q3452/V3452 (such as a radio module), the unit must be retested to insure it will function properly.

If installing a new circuit board, you must upload the application program into the unit. New application software can be loaded into the Q3452/V3452 through the use of the Siemens software utility QP-16371 (PUMP). Software updates may be distributed in response to customer requests for new features. Likewise, if board level repairs have been made, it may be necessary to reload the application software. See the Appendix A for the operation of the PUMP software. For the Q3452, the application software P/N is 16973. For the V3452, the application software P/N is 9VC20, and the bootloader P/N is 9VC19. If bootloader installation is required, consult the factory.

- Connect the Q3452/V3452 to a 15 VDC power supply using the Siemens Q9199 cable.
- If installing a new circuit board, the radio module should not be connected to the circuit until the power supplies are checked.
- Apply 15 VDC to the unit.
- For the Q3452/R2:
 - Measure +5.00 VDC (+/- 0.25 V) at TP3 to ground.
 - Measure +12.0 VDC (+/- 0.6 V) at TP5 to ground.
 - Measure +5.00 VDC (+/- 0.25 V) between TP6 (+) and TP7 (-).
- For the V3452/R2:
 - Measure +12.0 VDC (+/- 0.25 V) at the screw holding U17 to the heat sink, with reference on any mounting screw.
 - Measure +5.00 VDC (+/- 0.25 V) across C46.
 - Measure +3.30 VDC (+/- 0.25 V) across C57.
 - Measure +5.00 VDC (+/- 0.1 V) - across C37.
- If installing a new circuit board, you must upload the application program into the unit at this time.
- Remove power from the unit and connect the radio module if required.

RITRON TELEMETRY RADIOS

The radio used in the Q3452/V3452 is a DTX-Plus radio transceiver (original part number DTX-454-0BN9L, or 2nd generation radio part number DTX-460-0BN9L) manufactured by Ritron, Inc. Ritron may be reached at:

Ritron Inc.
Attn: sales department
505 West Carmel Drive
Carmel, IN 46032
Phone: 800-872-1872
Fax: 800-251-7329
Website: www.ritron.com

The DTX-Plus radio is a synthesized telemetry radio. Frequency settings are made through the use of a software program and cable which are available from Ritron.

SECTION 5 –MAINTENANCE

There are no components in the Q3452/V3452 which require annual calibration. Radio modules themselves are subject to FCC requirements, but do not explicitly require annual inspection. Additionally, the Ritron radio transceiver inside this product was granted an FRA waiver (FRA-2009-0015), and is therefore exempt from the requirements of 49CFR232.409 (d).

Verification of radio transceiver performance may be done on-locomotive with the use of an Siemens Q3430, Q3431 or Q3433 tester. This verification does not need to be performed by an electronics technician. Failure of any verification step, as indicated on the Q3430 or Q3431 tester, requires that the Q3452/V3452 HOT be serviced by a qualified technician.

SECTION 6 – WARRANTY AND REPAIR

To obtain expedited warranty claim service, expedited repair service, or if special shipping arrangements are required for the return of any Siemens product, please contact Siemens to obtain a Return Material Authorization (RMA#).

WARRANTY POLICY

All Siemens equipment, excluding credit card memory or other similar devices that already carry a manufacturer's warranty, is warranted against failure due to materials or workmanship, for a period of two (2) years commencing on the month of manufacture. Replacement parts are warranted for a period of one (1) year, excluding customer-supplied material. Siemens will repair or replace, at our discretion, all defective material returned prepaid to our factory in Marion, Kentucky. The equipment will be fully repaired and tested to the original equipment specifications. Equipment will be returned at the equipment owners' expense with the existing warranty in effect.

To determine the duration of the warranty period for Siemens equipment, refer to the warranty sticker on the product, or consult the factory.

REPAIR POLICY

Equipment must be shipped to the address provided below. Equipment which has exceeded the warranty period must be shipped freight pre-paid to our factory, unless other arrangements have been previously negotiated. Repair charges will be estimated and charged upon determination of the extent of damage, current costs of parts, and labor. Return shipping is the responsibility of the equipment owner and will be charged accordingly.

Return all equipment to:

Siemens Mobility, Inc.
Field Repair Department
939 S. Main St
Marion, KY 42064, USA

SECTION 7 – DRAWINGS

The following lists all applicable Siemens drawings and their corresponding revision levels for the Siemens Q3452/V3452 Head-of-Train Device. These drawings are included in this manual.

For Q3452:

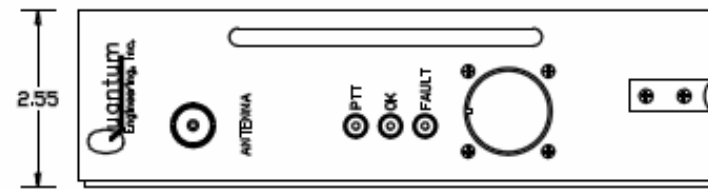
Drawing	Description	Revision
C3452	HTD Installation	B
C3452-WIR	Chassis Wiring	B
C60235/R	PCB Assembly	A
CS1235	Schematic	F
C62127R	Chassis Assembly	A

For the V3452 the following additional drawings apply:

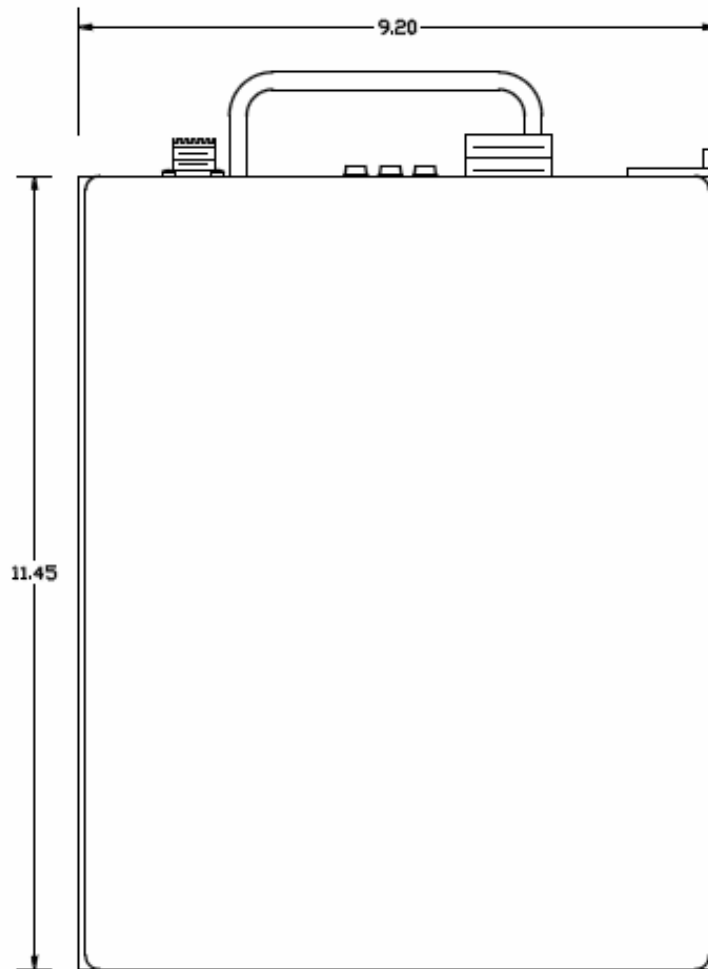
Drawing	Description	Revision
62127	Chassis Assembly	L
A90400	PCB Assembly	B1
S90400	Schematic	B1
A90410	PCB Assembly	A1
S90410	Schematic	A1

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REV	DATE	ECO	DESCRIPTION	DRN	CHKD	P.ENG	APPD
B	2/21/01	2743	ADD EXTERNAL SWITCH	GOB			



TOP VIEW



FRONT VIEW

Q3452 MODULE



SIDE VIEW

NOTES:

1) LED'S OPERATE AS FOLLOWS:

PTT (YELLOW) - WHEN UHF TRANSMITTER IS KEYED.

OK (GREEN) - ON (DIM) - UNIT POWERED.
ON (BRIGHT) - RECEIVED VALID MESSAGE.
BLINKING - FRONT TO REAR COMM LOSS.

FAULT (RED) - 1 BLINK - NO COMMUNICATION WITH IFC
2 BLINKS - INTERNAL FAILURE.

2) GE PART NUMBER 84A212691P4

DRAWN BY :	KEH	DO NOT SCALE
DATE :	9/1/00	TOLERANCES
CHECKED :	JE	.XX = .030"
APPROVED :	JFS	.XXX = .005"



MODULAR HOTD

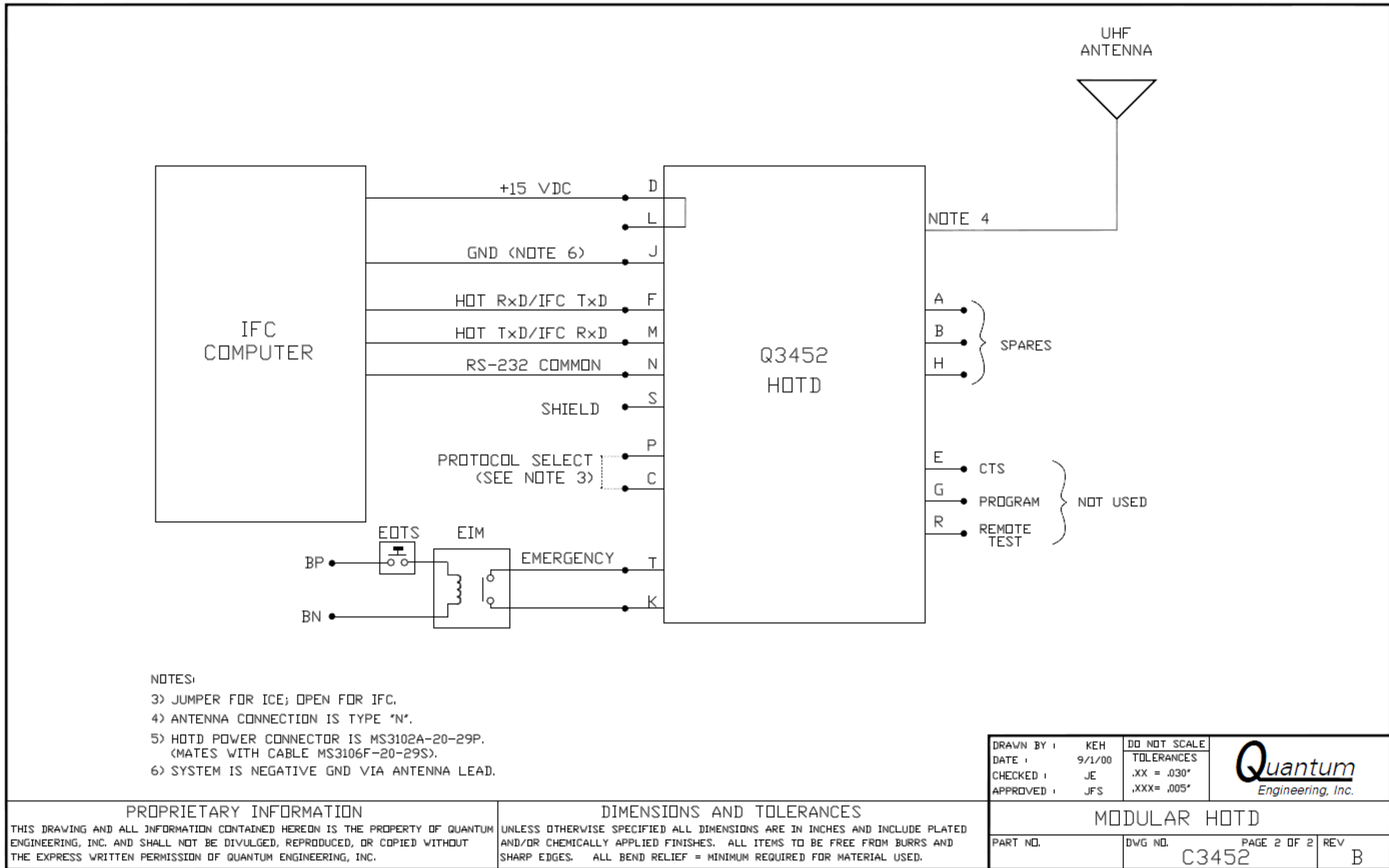
PART NO.	DWG NO.	PAGE 1 OF 2	REV
	C3452		B

PROPRIETARY INFORMATION

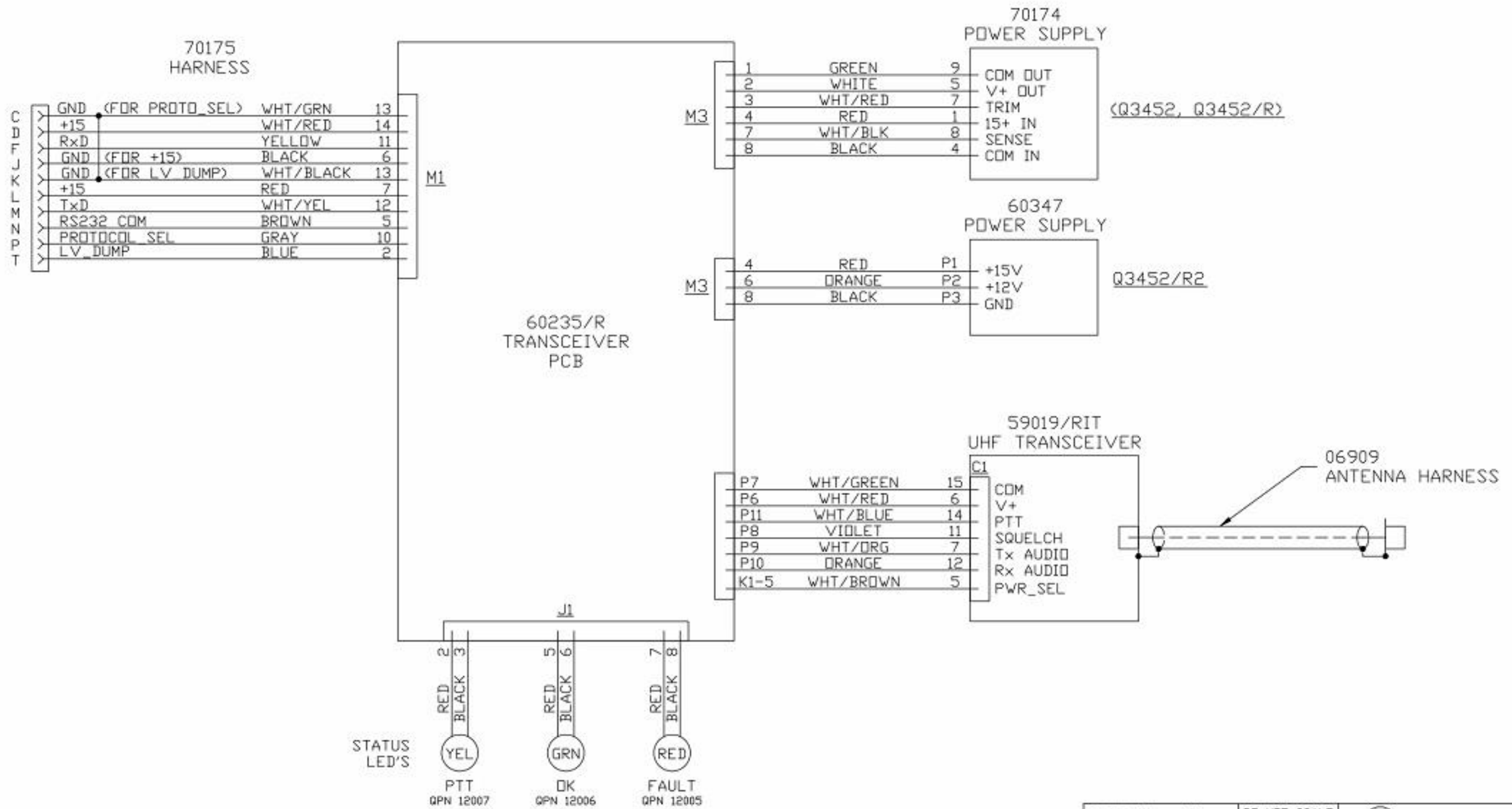
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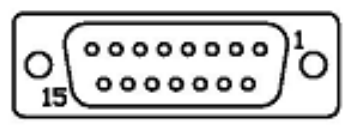
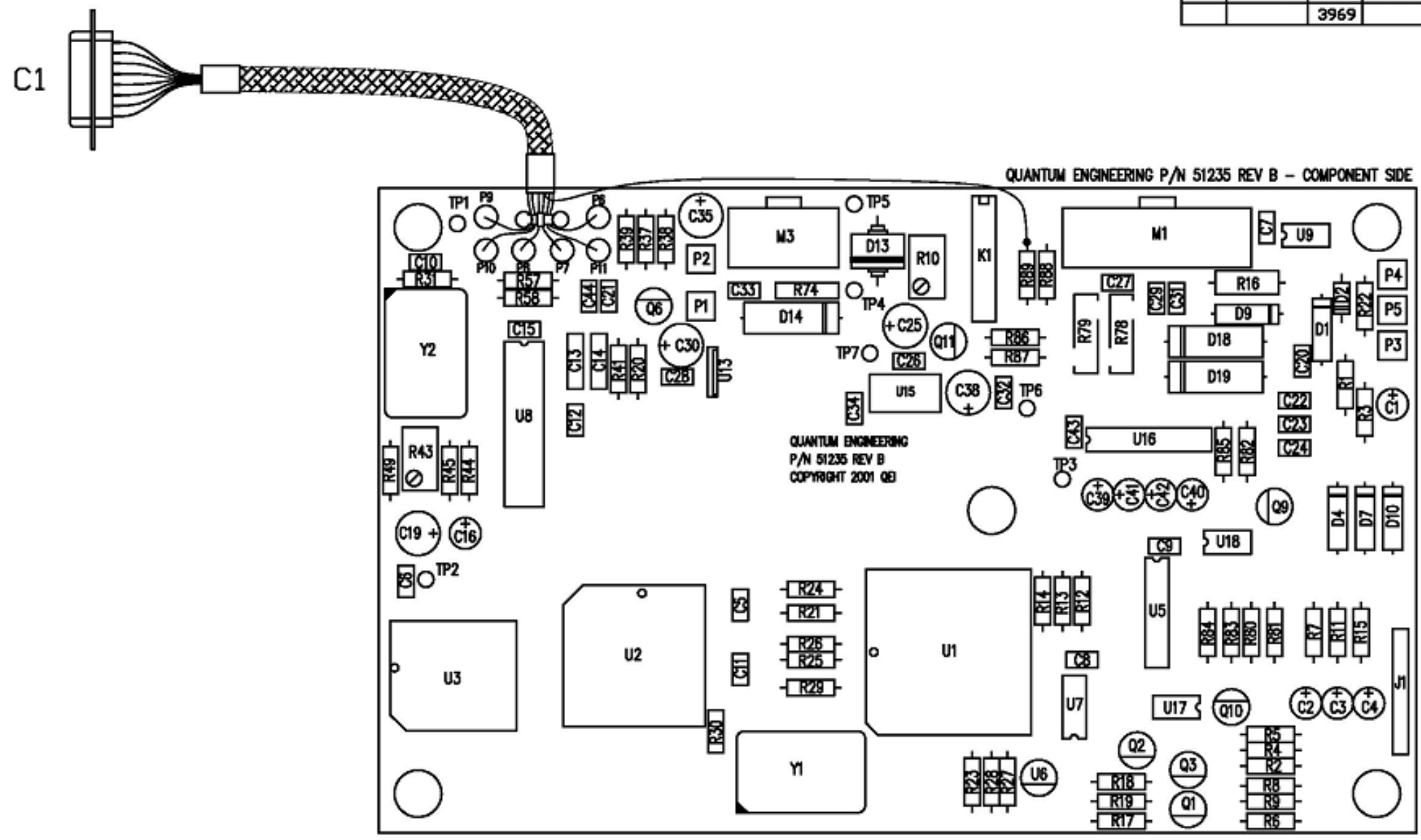
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DRAWN BY : GOB	DO NOT SCALE	
DATE : 2/22/05	TOLERANCES	
CHECKED : JE	.XX = .030"	
APPROVED : JE	.XXX = .005"	
HOTD CHASSIS WIRING		
PART NO.	DWG NO. C3452-WIR	REV B

REV	DATE	ECO	DESCRIPTION	DRN	CHKD	P.ENG	APPD
		3969					



C1
WIRE SIDE VIEW

WIRING HARNESS CHART			
FROM	TO	FUNCTION	COLOR
C1-5	K1-5	PWR SELECT	WHT/BROWN
C1-6	P6	B+	WHT/RED
C1-7	P9	Tx	WHT/DRG
C1-11	P8	SQUELCH DISABLE	VIDLET
C1-12	P10	Rx	DRANGE
C1-14	P11	PTT	WHT/BLU
C1-15	P7	GND	WHT/GREEN

DRAWN BY : GDB
DATE : 2/18/05
CHECKED :
APPROVED :

DO NOT SCALE
TOLERANCES
.XX = .030"
.XXX = .005"

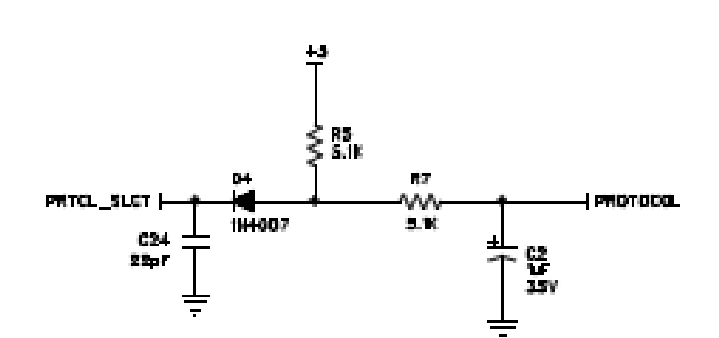
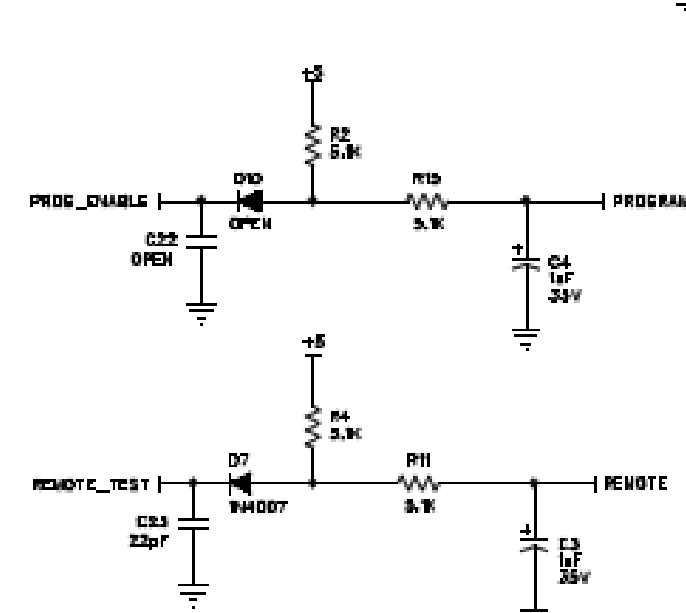
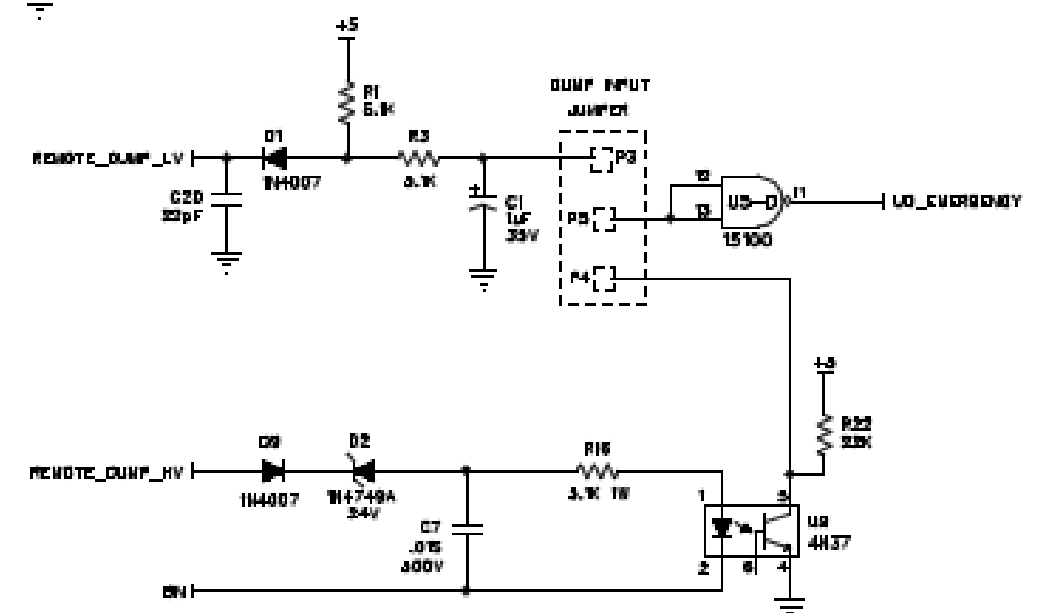
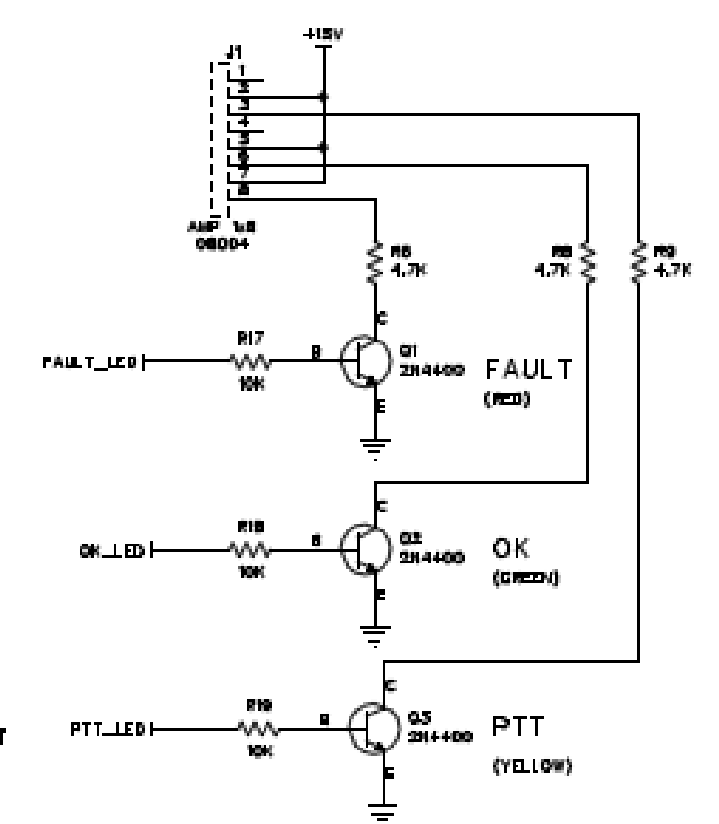
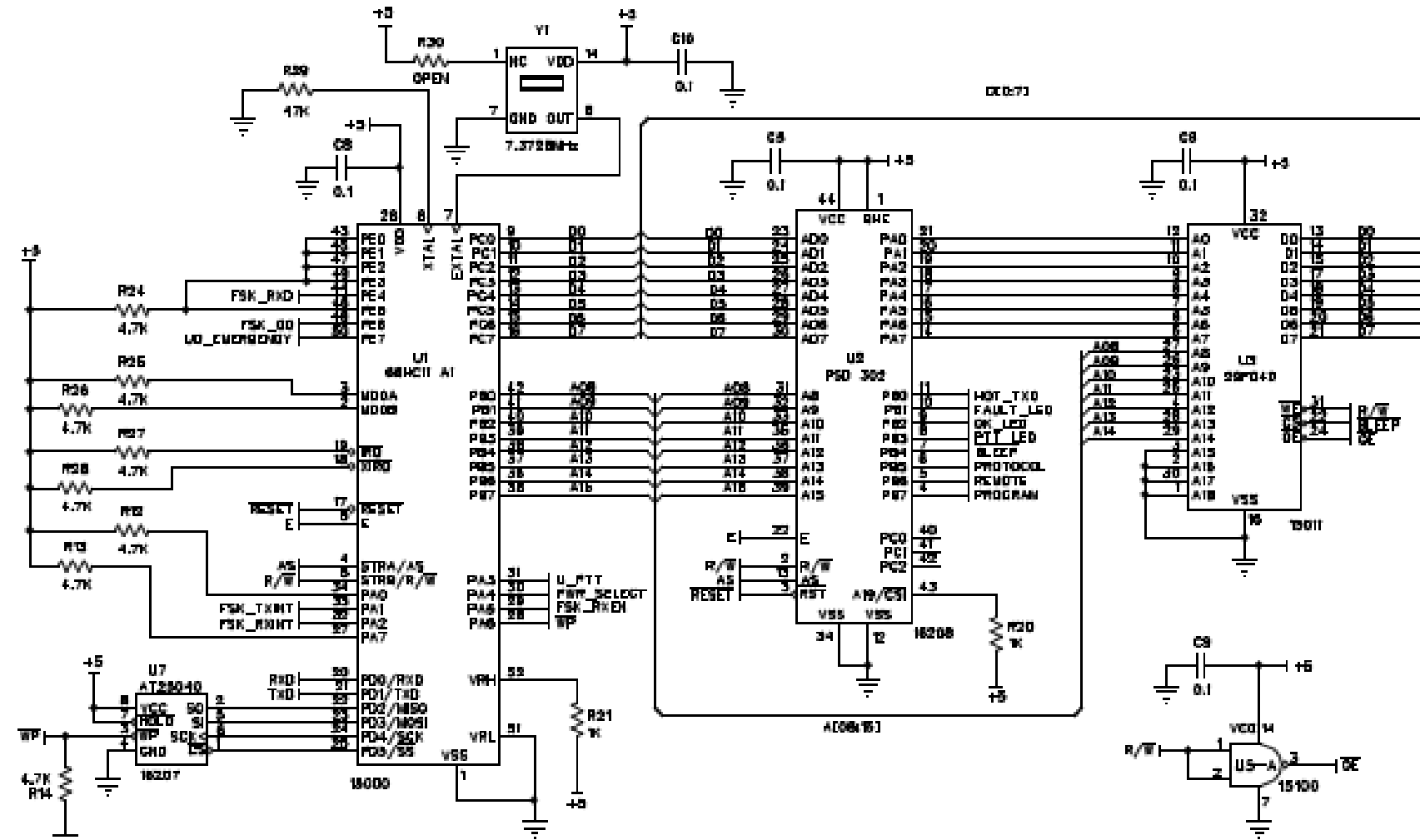


ASY PCB - HOTD uP

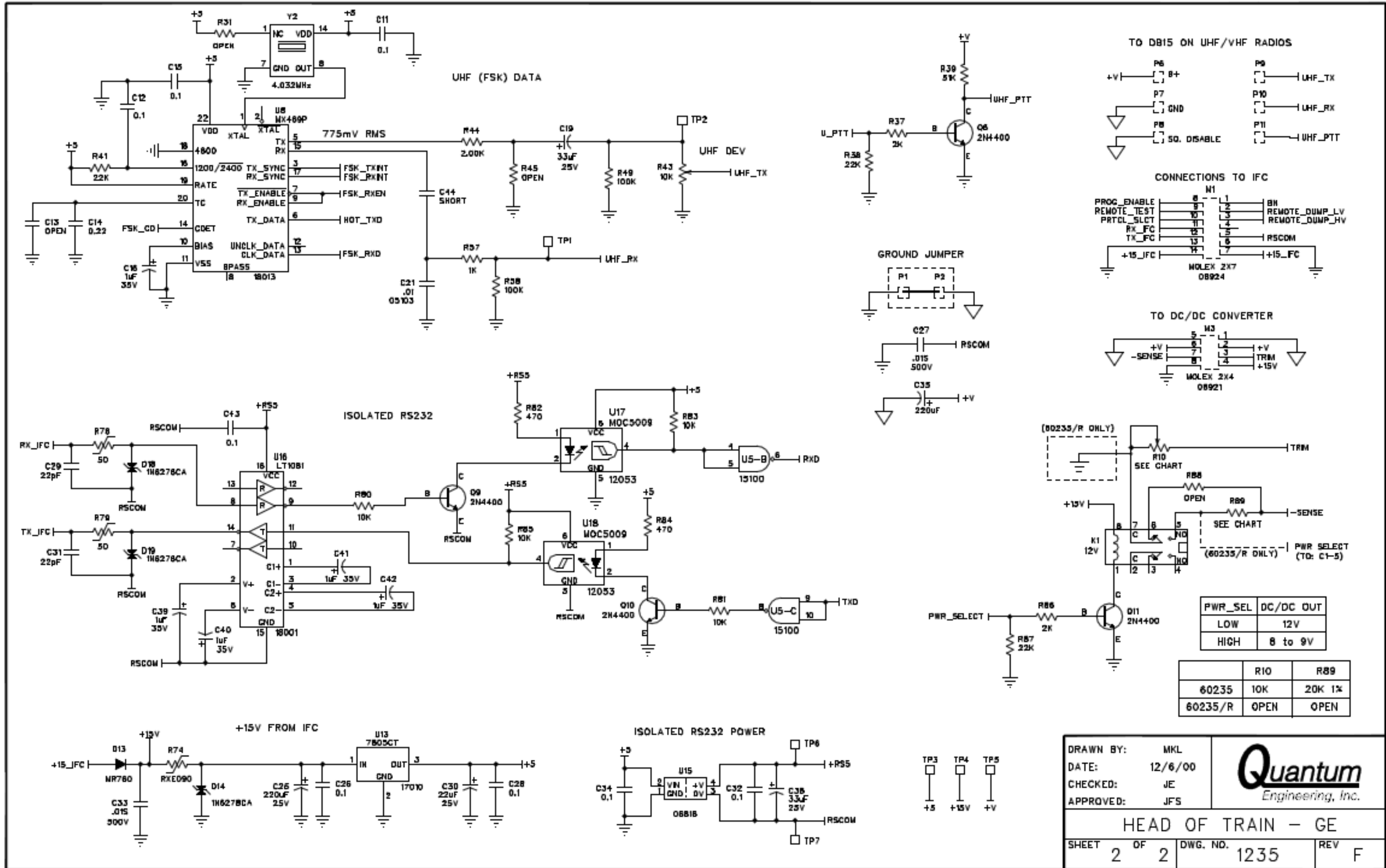
PART NO. 60235/R	DWG NO. C60235/R	REV A
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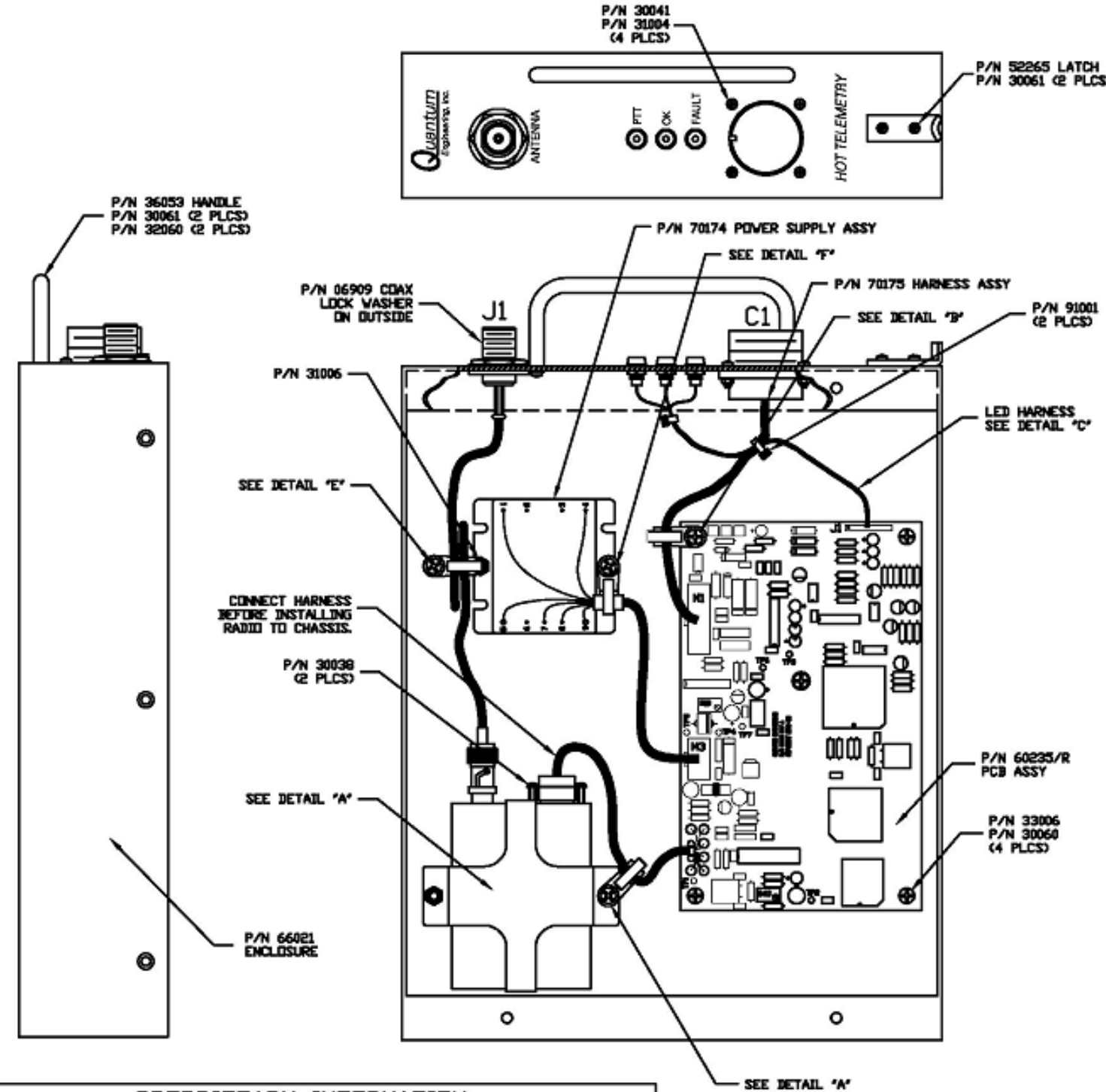
REV	DATE	ECO	DESCRIPTION	DRN	CHKD	P.ENG	APPD
F	1/23/08	5151	CHG U13 TO P/N 17010	COB			



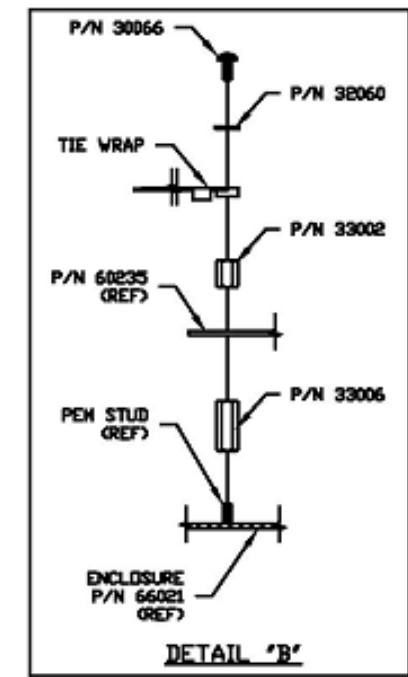
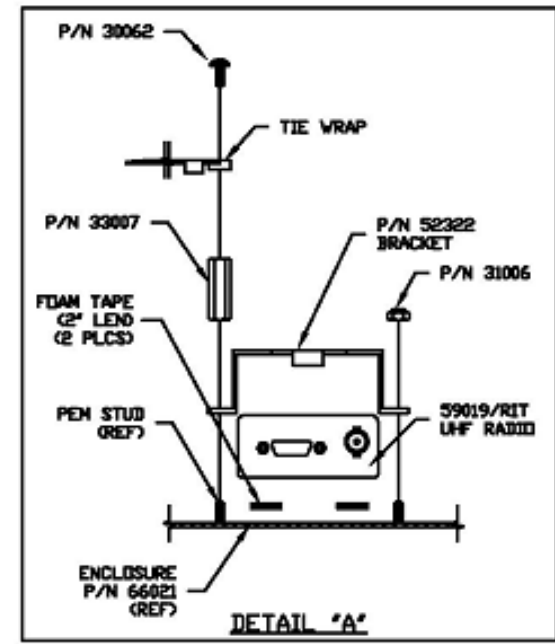
DRAWN BY:	MKL	Quantum Engineering, Inc.
DATE:	12/6/00	
CHECKED:	JE	
APPROVED:	JFS	
HEAD OF TRAIN - GE		
SHEET	1 OF 2	DWG. NO. 1235
		REV F



REV	DATE	ECD	DESCRIPTION	DRN	CHKD	P.ENG	APPD
		3969					

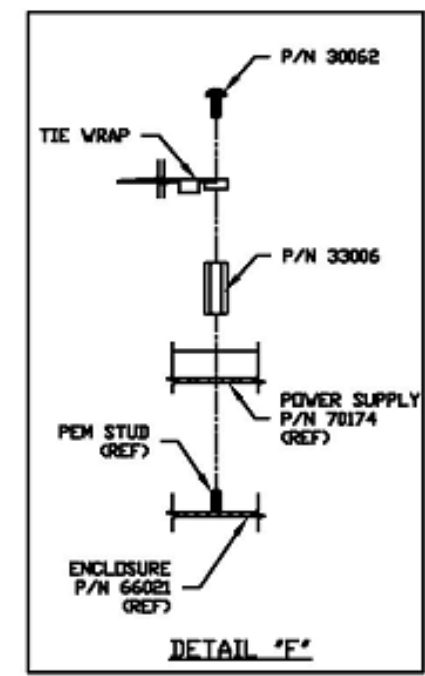
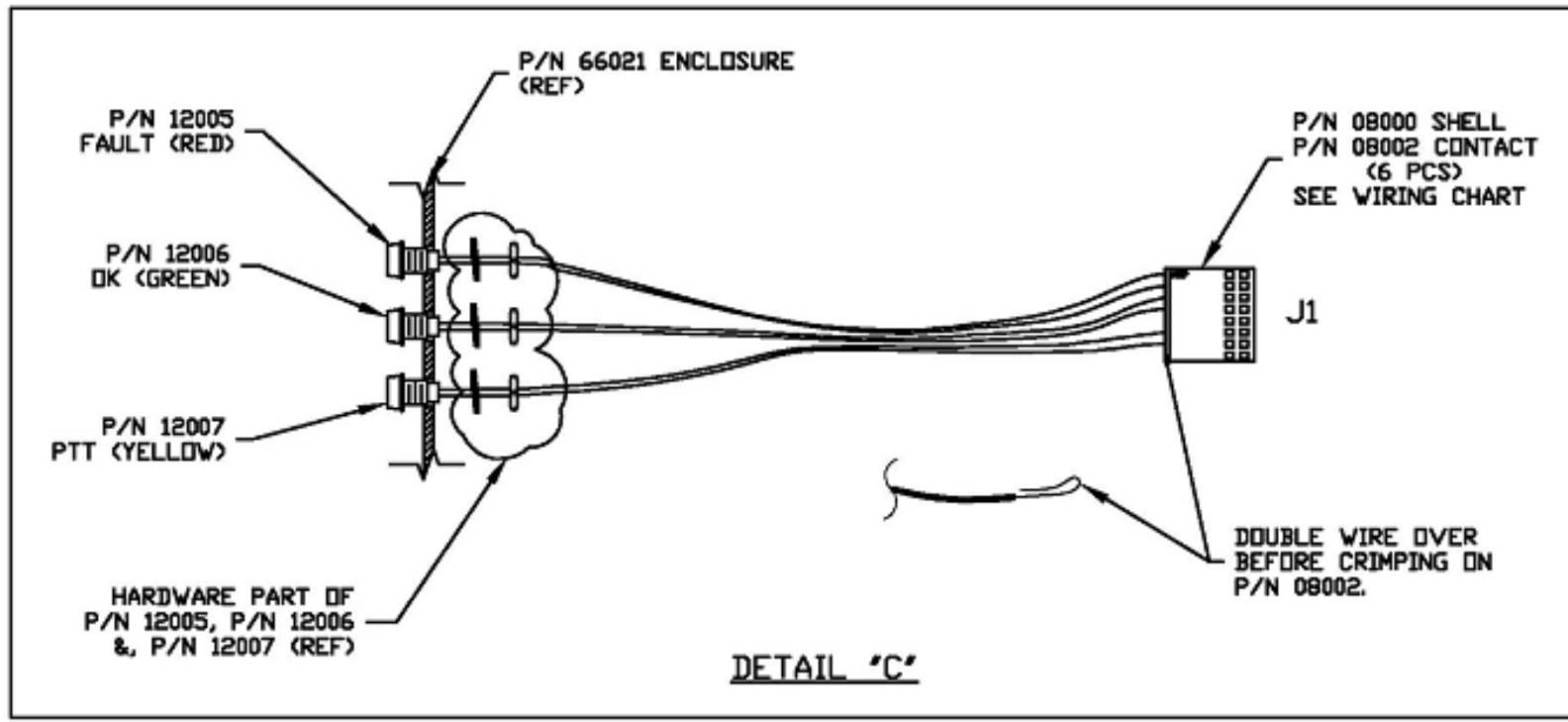


HARDWARE LIST		
P/N	QTY	DESCRIPTION
30038	2	#4-40 x 3/16", SCREW PAN
30041	4	#4-40 x 3/8", SCREW PAN
30060	4	#6-32 x 1/4", SCREW PAN
30061	4	#6-32 x 3/8", SCREW PAN
30062	3	#6-32 x 1/2", SCREW PAN
30066	1	#6-32 x 3/4", SCREW PAN
31004	4	#4-40, LOCKNUT
31006	2	#6-32, LOCKNUT
32060	3	#6, FLAT WASHER
33002	1	#6-32 x 1/4", STANDOFF
33006	6	#6 x .75", STANDOFF
33007	1	#6 X 1.0" STANDOFF
33010	1	#6-32 x 1-1/2", STANDOFF
36053	1	HANDLE, CARRY

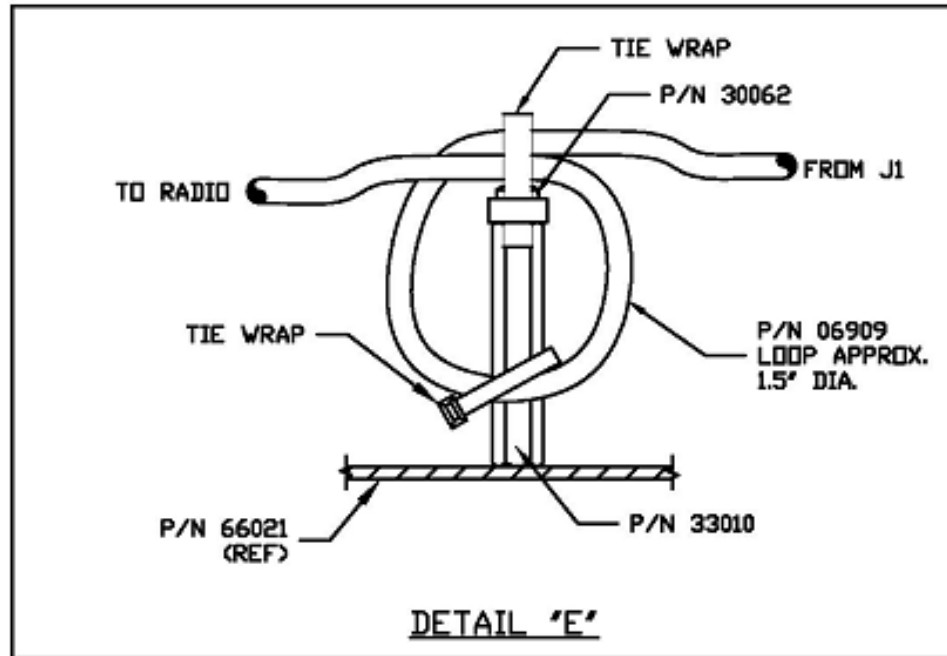


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DRAWN BY : GOB	DO NOT SCALE	
DATE : 2/18/05	TOLERANCES	
CHECKED :	.XX = .030"	
APPROVED :	.XXX = .005"	
ASY CHASSIS - Q3452 HOTD		
PART NO. 62127/R	DWG NO. C62127/R	PAGE 1 OF 2 REV A



LED WIRING HARNESS CHART			
FROM	TO	FUNCTION	COLOR
J1-1	---	---	---
J1-2	YELLOW LED	PTT +V	RED
J1-3		PTT -V	BLACK
J1-4		---	---
J1-5	GREEN LED	OK +V	RED
J1-6		OK V-	BLACK
J1-7	RED LED	FAULT +V	RED
J1-8		FAULT -V	BLACK



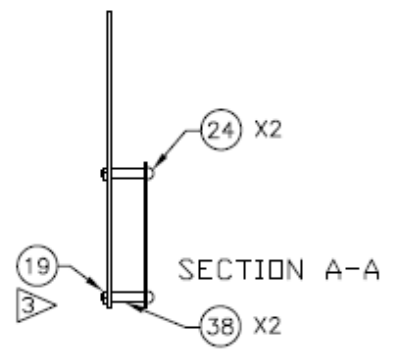
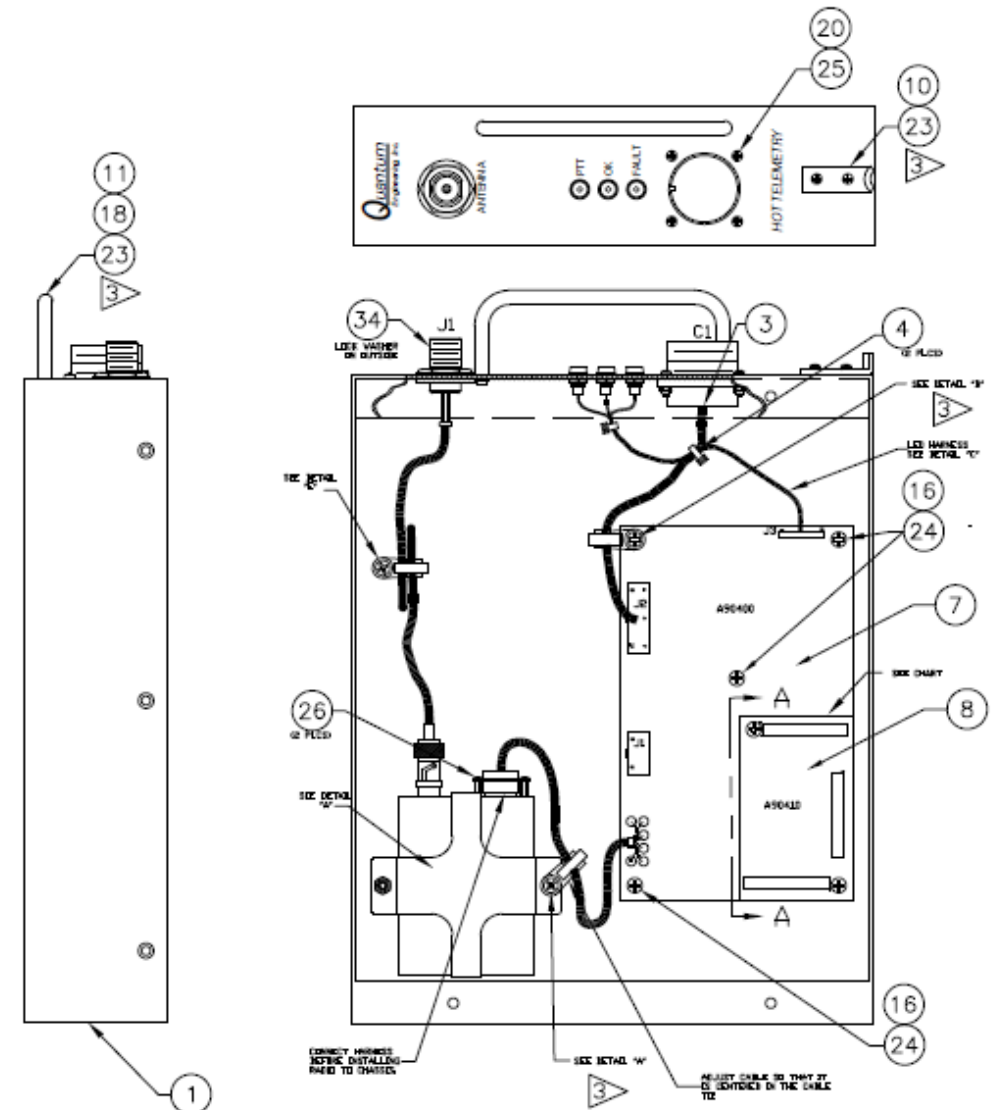
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DRAWN BY : GOB	DO NOT SCALE	
DATE : 2/18/05	TOLERANCES	
CHECKED :	.XX = .030"	
APPROVED :	.XXX = .005"	
ASY CHASSIS - Q3452 HOTD		
PART NO. 62127/R	DWG NO. C62127/R	PAGE 2 OF 2 REV A

SIEMENS RAIL SYSTEMS DISCLAIMS ANY LIABILITY OR OBLIGATION FOR ITS PRODUCTS WHICH HAVE BEEN ALTERED, REPAIRED OR TESTED BY PERSONS OTHER THAN SIEMENS RAIL PERSONNEL.

REVISIONS						
ZONE	REV	DESCRIPTION	DATE	OP'D	APPR'D	DSGN AUTH
	K	CN28101	9-4-12	R	FRASER	M GREK
	L	CN28771 INC EC28373				

62127/CSX	66021/CSX
62127/R2	66021



2	2	38	F/S	STANDOFF #6	F/S	S/S	#6 X 9/16 M/F STANDOFF
1	1	37	Z224-9VC19-AD10	V3452 BOOT LOADER	9VC19-AD1X		SOFTWARE
1	1	36	59019/RIT	UHF RADIO ASSY	59019/RIT		
		35					
1	1	34	06909	ANT CABLE	06909		TYPE N TO BNC (12)
1	1	33	08000	CONN CABLE 8 PIN	08000		AMP
6	6	32	08002	CONN PINS 87124-1	08002		AMP
1	1	31	08003	CONN 87179-1	08003		AMP
1	1	30	12005	LED RED	12005		
1	1	29	12006	LED GREEN	12006		
1	1	28	12007	LED YELLOW	12007		
1	1	27	Z224-9VC20-AD10	V3452 APPLICATION	9VC20-AD1X		SOFTWARE
2	2	26	30038	SCREW PAN PH	30038	S/S	4-40 3/16L
4	4	25	30041	SCREW PAN PH	30041	S/S	4-40 3/8L
5	5	24	30060	SCREW PAN PH	30060	S/S	6-32 1/4L
4	4	23	30061	SCREW PAN PH	30061	S/S	6-32 3/8L
2	2	22	30062	SCREW PAN PH	30062	S/S	6-32 1/2L
1	1	21	30066	SCREW PAN PH	30066	S/S	6-32 3/4L
4	4	20	31004	LK NUT NYLON	31004	S/S	4-40
3	3	19	31006	LK NUT NYLON	31006	S/S	6-32 1/4
3	3	18	32060	WASHER FL #6	32060	S/S	3/8 OD
1	1	17	33002	STANDOFF #6	33002	S/S	0.25X1/4
5	5	16	33006	STANDOFF #6	33006	S/S	0.75X1/4
1	1	15	33007	STANDOFF #6	33007		1.0X1/4
1	1	14	33010	STANDOFF #6	33010		1.5X1/4
1	1	13	037976-01	I.D. PLATE	2630-37976-0001	LABEL	
		12					
1	1	11	36053	HANDLE CARRY	36053		4.25X1.5 RAF
1	1	10	52265	LATCH BRACKET	52265		
1	1	9	52322	BRACKET RADIO	52322		
1	1	8	A90410-01	CPU COMMON MOD	9000-90410-0001		A2
1	1	7	A90400-01	HOT CARRIER BD	9000-90400-0001		A1
4	A/R	A/R	6	91201	TAPE FOAM #110	91201	1/16X1 3M
3	3	5	91002	PLC2S-S6	91002		PANDUIT
2	2	4	91001	PLT1M CABLE TIE	91001		PANDUIT
1	1	3	70175	ASSY HARNESS HOTD	70175		
1	0	2	66021/CSX	SCREENED ENC FC	66021/CSX		
0	1	1	66021	SCREENED ENC FC	66021		

NOTES: UNLESS OTHERWISE SPECIFIED.

- 1. LIST SUB ASSEMBLY P/N'S AND REVISIONS.
- 2. SEE CONFIGURATION.
- 3. USE BLUE LOCTITE 90001 OR EQUIV.
- 4. DO NOT REMOVE PAPER BACKING FROM TAPE.
- 5. CRIMP PINS (P/N 08002) ONTO LED WIRES BEFORE MOUNTING LED TO ENCLOSURE.
- 6. APPLY WORK ORDER STICKER INSIDE ENCLOSURE.
- 7. APPLY ACCEPTANCE STICKER AFTER FINAL T/I.
- 8. USE LATEST REVISION.

APPLICATION			SIGNATURES		DATE
NEXT ASSY	USED ON	DRAWN	R GONZALES		9-4-12
TOP	HOTD	CHECK	R FRASER		9-4-12
		DESIGNER	M GREK		9-4-12
		REL DATE			9-5-12

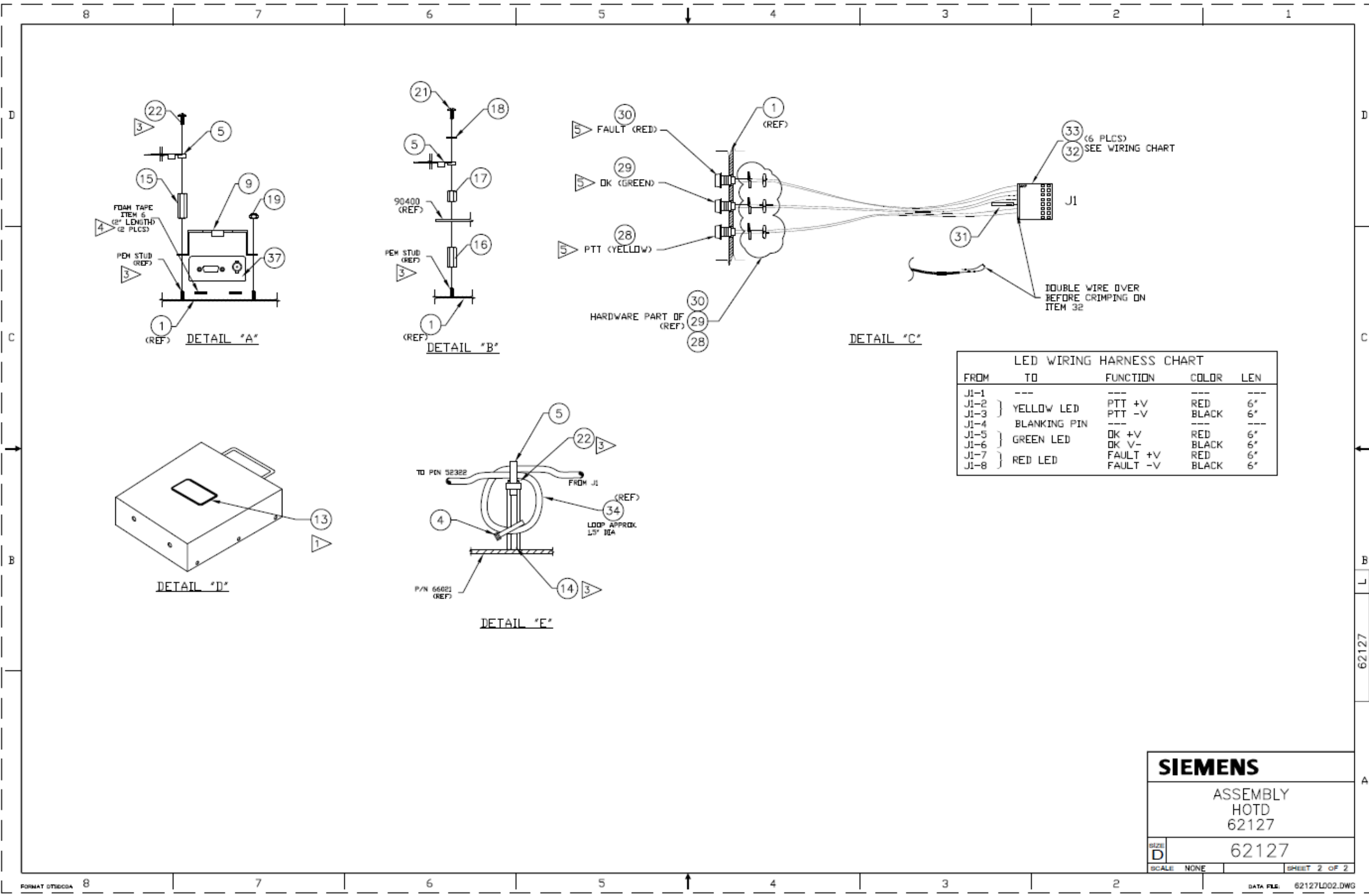
SIEMENS
ASSEMBLY CHASSIS V3452
HOTD
62127
62127

SIEMENS RAIL SYSTEMS DIVISION
9588 ARCHBOLD AVE
RANCHO CUCAMONGA, CA 91730

SCALE NONE SHEET 1 OF 2

FORMAT: DTAMETRIC

DATA FILE: 62127L001.DWG



LED WIRING HARNESS CHART					
FROM	TO	FUNCTION	COLOR	LEN	
J1-1	---	---	---	---	
J1-2	}	YELLOW LED	PTT +V	RED	6"
J1-3		PTT -V	BLACK	6"	
J1-4		BLANKING PIN	---	---	
J1-5	}	GREEN LED	OK +V	RED	6"
J1-6		OK -V	BLACK	6"	
J1-7	}	RED LED	FAULT +V	RED	6"
J1-8		FAULT -V	BLACK	6"	

SIEMENS

ASSEMBLY
HOTD
62127

SIZE
D

SCALE NONE

SHEET 2 OF 2

FORMAT DTSC00A

DATA FILE: 62127L002.DWG

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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY: APPL DESIGN AUTH
A		PRODUCTION RELEASE	2012-06-25	R GONZALES M GREK
B		CN26144		

QTY. REQD.	ITEM NO.	EDP NO.	PART OR IDENTIFYING NO.	MATERIAL	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, SIZE, NOTES, VENDORS.
1	1	Z149-90400-0000	D90400-00 LVL B		BARE BOARD	
1	2	08004	87220-B		CONNECTOR	J3
0	3	08921	39-29-0083		CONNECTOR	(J1 N/U)
1	4	08924	39-29-0143		CONNECTOR	J2
5	5	Z241-00035-0000	NDS7002A		TRANSISTOR	Q1 Q2 (Q3 N/U) Q4 Q5 Q6
1	6	Z243-00136-0000	SFH690BT		IC, OPTO	U14
6	7	Z243-00191-0000	NC7S14MSX		IC	U1 U4 U5 U6 U7 U13
1	8	Z243-00410-0000	CMX469AD3		IC	U3
1	9	Z243-00492-0000	SN74LVC16T245DCGR		IC	U15
1	10	Z243-00467-0000	MIC5233-3.3YM5		IC	U9
2	11	Z243-01135-0000	LM2937ESX-5.0		IC	UB U16
2	12	Z243-01166-0000	HCPL-0630-50D		IC, OPTO	U11 U12
1	13	Z243-01248-0000	MAX3232ESE		IC	U2
1	14	Z247-00157-0000	1SM85937BT3	33V	DIODE	CR16
4	15	Z247-00162-0000	BA5416T/R		DIODE	CR1 CR8 CR9 CR11
5	16	Z247-00192-0000	SIW-E3/61T	1000V	DIODE	CR4 CR5 (CR6 N/U) CR7 CR10 CR12
1	17	Z247-00193-0000	SBWC-13-F	8A, 1000V	DIODE	CR14
2	18	Z249-00001-0000	SMBJ16CA-E3/52	16V	TVS, BIDIR	CR2 CR3
1	19	Z249-00036-0000	SMBJ45A	45V	TVS	CR15
1	20	Z249-00046-0000	1.5SMC24CA	24V	TVS, BIDIR	CR13
2	21	Z341-0.01U-0394	GRM31BR7J103KW01L	0.01uF, 10%, 630V	CAPACITOR	C22 C26
24	22	Z341-00.1U-0264	C0805C104K5RACTU	0.1uF, 10%, 50V	CAPACITOR	C4 (C5 N/U) C9 C11 C12 C15 C16 C19 C21 C31 C32 C35 C38 C39 C41 C42 C43 C51 C52 C53 C54 C55 C56 C57 C58
8	23	Z341-0001U-0224	C0805C105K4RACTU	1uF, 10%, 16V	CAPACITOR	C3 C7 C13 C14 C27 C28 C29 C30
1	24	Z341-2700P-0594	1812CG272KAT2E	2700pF, 10%, 2000V	CAPACITOR	C50
7	25	Z342-0033P-0163	GRM39CGG330J050AD	33pF, 5%, 50V	CAPACITOR	C2 C10 C17 C18 C20 C23 C24
1	26	Z343-0330U-0C55	EEE-FP1V331AP	330uF, 20%, 35V	CAPACITOR	C25
11	27	Z347-0010U-0454	GMK325BJ106KN-T	10uF, 20%, 35V	CAPACITOR	(C6 N/U) C8 C33 C34 C36 C37 C40 C46 C47 C48 C49 C59
2	28	Z347-02.2U-0124	0603D225KAT2A	2.2uF, 10%, 10V	CAPACITOR	C44 C45
3	29	Z442-0000R-0222	CJ21-000-T	0, 5%, 100mW	RESISTOR	R18 R31 R62
7	30	Z442-0001K-0121	CRCW06031K00FKEA	1K, 1%, 0.063W	RESISTOR	R7 R13 R14 R15 R29 R42 R45
1	31	Z442-0001M-0221	CRCW0805-1004FT	100K, 1%, 100mW	RESISTOR	R32 (R63 N/U)
1	32	Z442-0002K-0221	CRCW08052K00FKEA	2K, 1%, 100mW	RESISTOR	R19
15	33	Z442-0010K-0111	CRCW0603-1002FRT1	10K, 1%, 0.063W	RESISTOR	R1 (R2 N/U) R3 R10 (R11 N/U) R16 R17 R21 (R22 N/U) R23 R24 R25 R26 R27 R28 R47 R58 R59
0	34	Z442-0020K-0221	CRCW080520K0FKEA	20K, 1%, 100mW	RESISTOR	(R4 R5 N/U)
17	35	Z442-0033R-0121	CRCW060333R0FKEA	33, 1%, 100mW	RESISTOR	R20 R33 R34 R35 R36 (R37 N/U) R38 (R39 N/U) R43 R44 R49 R50 R51 R52 R53 R54 R55 R56 R57
2	36	Z442-0100K-0111	CRCW0603-1003FRT1	100K, 1%, 0.063W	RESISTOR	R8 R30
1	37	Z442-0100R-0861	CRCW2512-1000FT	100, 1%, 1W	RESISTOR	R40
2	38	Z442-0301R-0221	CRCW08053010FRT1	301, 1%, 100mW	RESISTOR	R41 R46
3	39	Z442-4.75K-0221	CR21-4751-F-T	4.75K, 1%, 100mW	RESISTOR	R48 R60 R61
1	40	Z464-0010K-0001	RS2B-10K1%	10K, 1%, 3W	RESISTOR	R12
1	41	Z479-0010K-0003	3296W-1-1Q3-LF	10K, 10%, 500mW	RESISTOR	(R6 N/U) R9
9	42	Z541-00009-0000	BLM41PG102SN1L	1K*100MHZ	INDUCTOR	L1 L2 L3 L4 L5 L6 L8 L9 L10
1	43	Z541-00015-0969	SWB2.5R-2	100-OHM*10MHZ	INDUCTOR	L7
1	44	Z545-00026-0000	HCM49 4.032MABJ	4.032MHz	CRYSTAL	Y1
3	45	Z741-00025-0030	SSM-115-S-DV-LC		CONNECTOR	J4 J5 J6
0	46	Z814-00113-0000	G6RN-1-DC12		RELAY	(K1 N/U)
1	47	Z843-00004-N003	SWD100-2		POLY SWITCH FUSE	F1
1	48	Z932-01010-0509	NMVO509SC		POWER SUPPLY	U10
1	49	70268			CABLE ASSY	

QTY. REQD.	ITEM NO.	EDP NO.	PART OR IDENTIFYING NO.	MATERIAL	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, SIZE, NOTES, VENDORS.
1	50	91001	PLT1M-W		TIE WRAP	PANDUIT
1	51	17022	LT10851T-12		IC	U17
1	52	Z343-001KU-0965	EEVFK1H102M	1000uF, 20%, 50V	CAPACITOR	C60
1	53	Z801-01102-0004	3223-07FR-35		MISC INSULATOR	XU17A
1	54	Z801-02217-0000	581002B02500		HEATSINK	XU17B
1	55	F/S	6-32 X 3/8 ZN PL PHIL PAN		SCREW, PAN	
1	56	F/S	#6 ZN PL FLAT WASHER		WASHER, FLAT	
1	57	F/S	#6 ZN PL LOCK WASHER		WASHER, LOCK	

REF DES.	ITEM NO.	REF DES.	ITEM NO.	REF DES.	ITEM NO.	REF DES.	ITEM NO.
C2	25	CR4	16	R26	33	U14	6
C3	23	CR5	16	R27	33	U15	9
C4	22	CR6	16	R28	33	U16	11
C5	22	CR7	16	R29	30	U17	51
C6	27	CR8	15	R30	36	Y1	44
C7	23	CR9	15	R31	29	XU17A	53
C8	27	CR10	16	R32	31	XU17B	54
C9	22	CR11	15	R33	35		
C10	25	CR12	16	R34	35		
C11	22	CR13	20	R35	35		
C12	22	CR14	17	R36	35		
C13	23	CR15	19	R37	35		
C14	23	CR16	14	R38	35		
C15	22	F1	47	R39	35		
C16	22	J1	3	R40	37		
C17	25	J2	4	R41	38		
C18	25	J3	2	R42	30		
C19	22	J4	45	R43	35		
C20	25	J5	45	R44	35		
C21	22	J6	45	R45	30		
C22	21	K1	46	R46	38		
C23	25	L1	42	R47	33		
C24	25	L2	42	R48	39		
C25	26	L3	42	R49	35		
C26	21	L4	42	R50	35		
C27	23	L5	42	R51	35		
C28	23	L6	42	R52	35		
C29	23	L7	43	R53	35		
C30	23	L8	42	R54	35		
C31	22	L9	42	R55	35		
C32	22	L10	42	R56	35		
C33	27	Q1	5	R57	35		
C34	27	Q2	5	R58	33		
C35	22	Q3	5	R59	33		
C36	27	Q4	5	R60	39		
C37	27	Q5	5	R61	39		
C38	22	Q6	5	R62	29		
C39	22	R1	33	R63	31		
C40	27	R2	33	U1	7		
C41	22	R3	33	U2	13		
C42	22	R4	34	U3	8		
C43	22	R5	34	U4	7		
C44	28	R6	41	U5	7		
C45	28	R7	30	U6	7		
C46	27	R8	36	U7	7		
C47	27	R9	41	U8	11		
C48	27	R10	33	U9	10		
C49	27	R11	33	U10	48		
C50	24	R12	40	U11	12		
C51	22	R13	30	U12	12		
C52	22	R14	30	U13	7		
C53	22	R15	30				
C54	22	R16	33				
C55	22	R17	33				
C56	22	R18	29				
C57	22	R19	32				
C58	22	R20	35				
C59	27	R21	33				
C60	52	R22	33				
CR1	15	R23	33				
CR2	18	R24	33				
CR3	18	R25	33				

- NOTES: UNLESS OTHERWISE SPECIFIED:
- ▷ APPLY REMAINING PORTION OF PART NUMBER AND ASSY DRAWING REVISION LETTER OR APPLY BARCODE LABEL.
 - ▷ USE DYMEX 984 OR EQUIVALENT AS SHOWN. CONFORMAL COAT BETWEEN 1-3 MILS IN THICKNESS. EXCEPT WHERE NOTED.
 - ▷ NO CONFORMAL COATING ON J1-J6 AND ALL MOUNTING HOLES.
 - ▷ BEAD OF RTV 162 OR EQUIVALENT AS SHOWN.
 - ▷ SOLDER WIRES USING WIRING HARNESS CHART (SEE SHEET 2).

APPLICATION		SIGNATURES		DATE
NEXT ASSY	USED ON	DRAWN	A SAKAIE	2012-06-25
A90400	V3452	CHECK	R GONZALES	2012-06-25
		DESIGNER	M GREK	2012-06-26
		REL DATE		2012-06-27

**ASSEMBLY
HOT CARRIER BOARD**

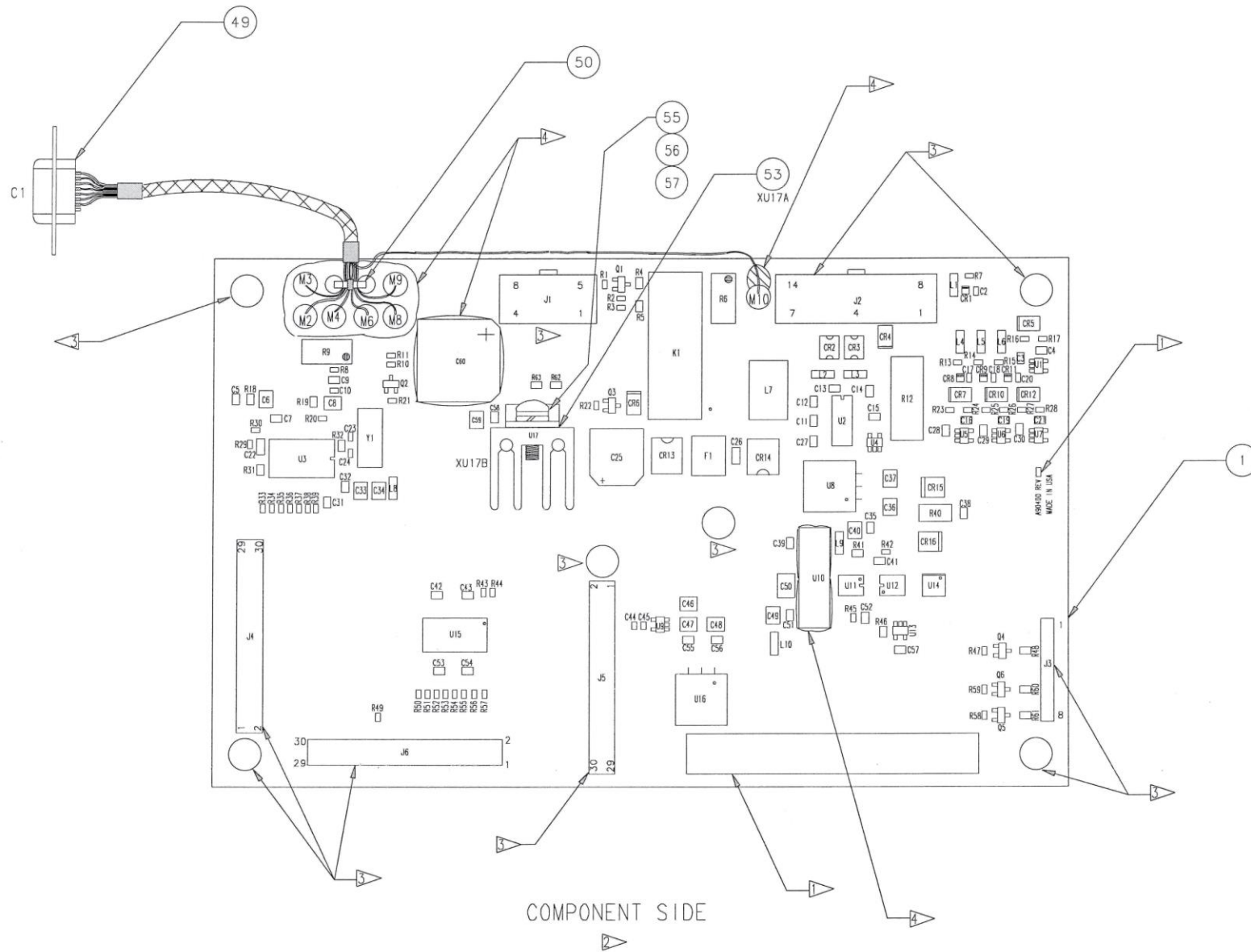
9000-90400-0001

A90400

10655 7TH STREET
CUCAMONGA, CA 91730

SCALE NONE SHEET 1 OF 2

CORPORATION DISCLAIMS ANY LIABILITY
OR OBLIGATION FOR ITS PRODUCTS WHICH HAVE BEEN ALTERED,
REPAIRED OR TESTED BY PERSONS OTHER THAN
PERSONNEL.



WIRING HARNESS CHART

FROM	TO	FUNCTION	COLOR	LENGTH
C1-5	M10	PWR SELECT	WHT/BRN	11"
C1-6	M9	B+	WHT/RED	8"
C1-7	M3	TX	WHT/ORG	8"
C1-11	M4	SQUELCH DISABLE	VIO	8"
C1-12	M2	RX	ORG	8"
C1-14	M8	PTT	WHT/BLU	8"
C1-15	M6	GND	WHT/GRN	8"

ASSEMBLY
HOT CARRIER BOARD

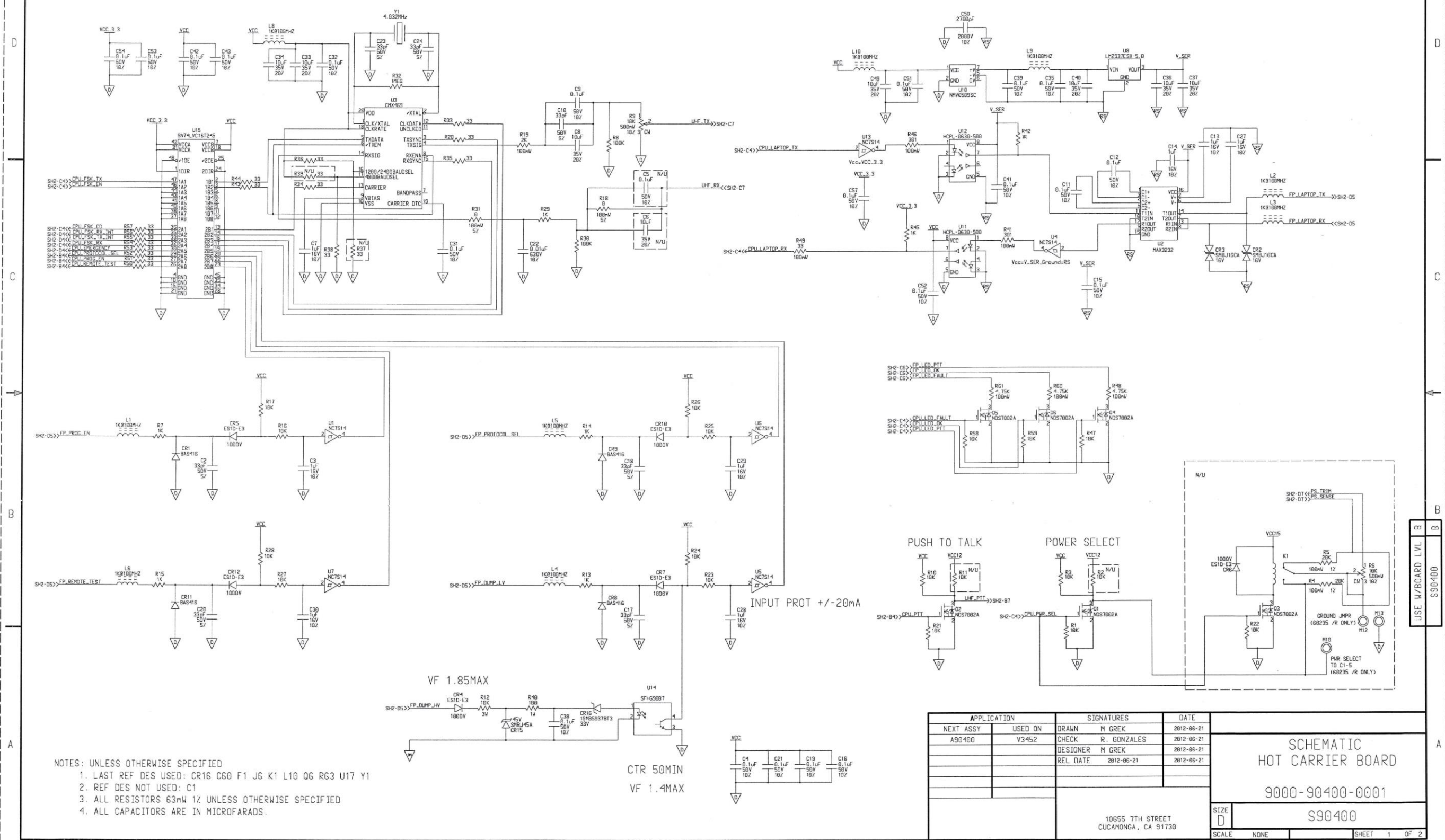
SIZE
D

A90400

SCALE 2:1 SHEET 2 OF 2

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REVISIONS					
ZONE	REV	DESCRIPTION	DATE	DFTG APPVL	DSGN AUTH
A		PRODUCTION RELEASE	2012-06-21	R. GONZALES	T. WICKENLOOPER
B		CN26144			



- NOTES: UNLESS OTHERWISE SPECIFIED
1. LAST REF DES USED: CR16 C60 F1 J6 K1 L10 Q6 R63 U17 Y1
 2. REF DES NOT USED: C1
 3. ALL RESISTORS 63mW 1% UNLESS OTHERWISE SPECIFIED
 4. ALL CAPACITORS ARE IN MICROFARADS.

APPLICATION	SIGNATURES	DATE
NEXT ASSY	USED ON	DRAWN
A90400	V3452	M GREK
	CHECK	R. GONZALES
	DESIGNER	M GREK
	REL DATE	2012-06-21
		2012-06-21

**SCHEMATIC
HOT CARRIER BOARD**

9000-90400-0001

SIZE
D

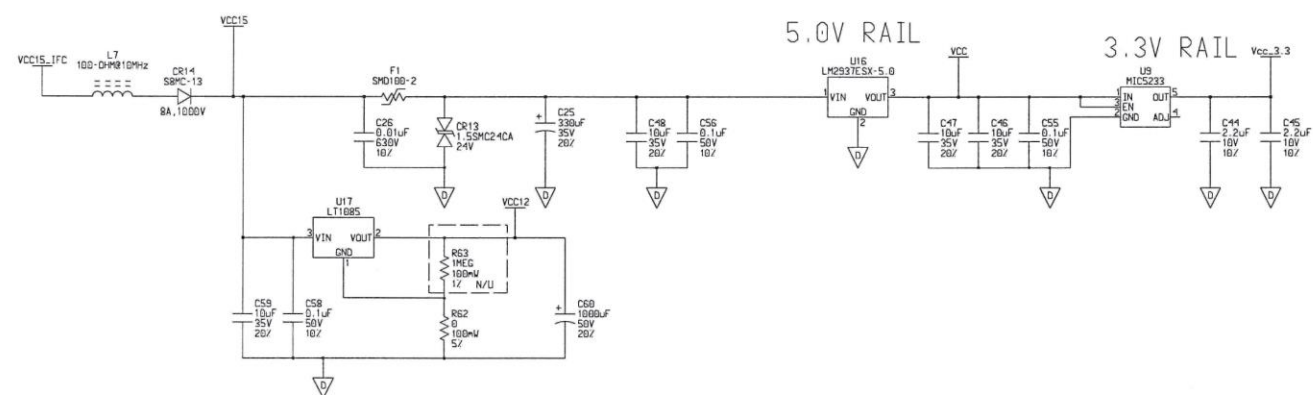
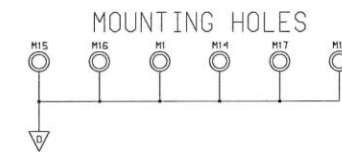
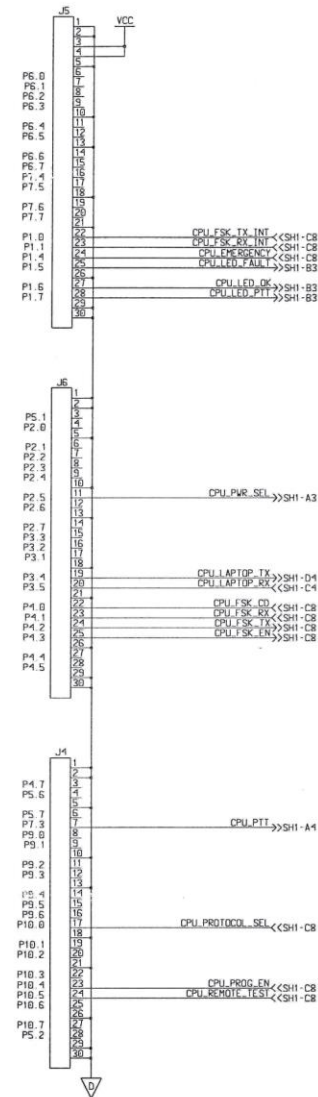
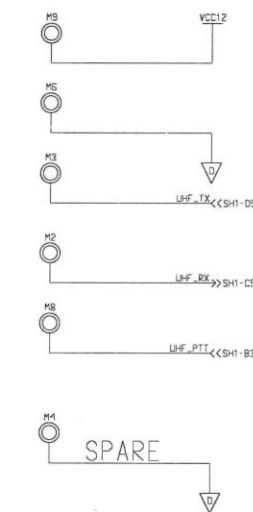
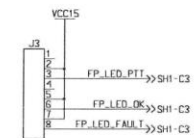
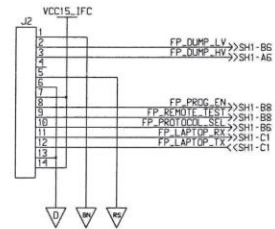
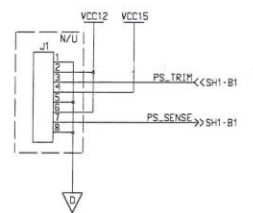
S90400

SCALE NONE SHEET 1 OF 2

10655 7TH STREET
CUCAMONGA, CA 91730

USE W/BOARD LVL B S90400

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SCHEMATIC
HOT CARRIER BOARD

SIZE D S90400

SCALE NONE SHEET 2 OF 2

USE W/BOARD LVL B B S90400

DRAWING CHANGE HISTORY

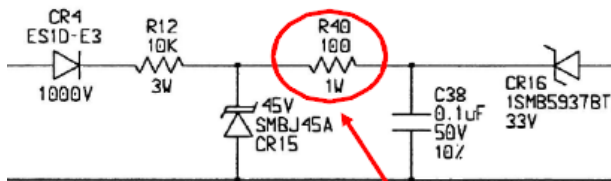
Drawing Name:	HOT Carrier Board, A90400
Drawing Number:	A/S90400
Revision:	B1
Reason For Change:	1. Reduce bias current through optocoupler 2. Add Test Point to facilitate manufacturing test
Drawing Changes:	See below for details

IS:

QTY REQD	ITEM NO	EDP NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, ETC.
1	37	Z442-0100R-0861	CRCW2512-1000FT	RESISTOR	R40
24	22	Z341-00.1U-0264	C0805C104K5RACTU	CAPACITOR	C4 (C5 N/U) C9 C11 C12 C15 C16 C19 C21 C31 C32 C35 C38 C39 C41 C42 C43 C51 C52 C53 C54 C55 C56 C57 C58

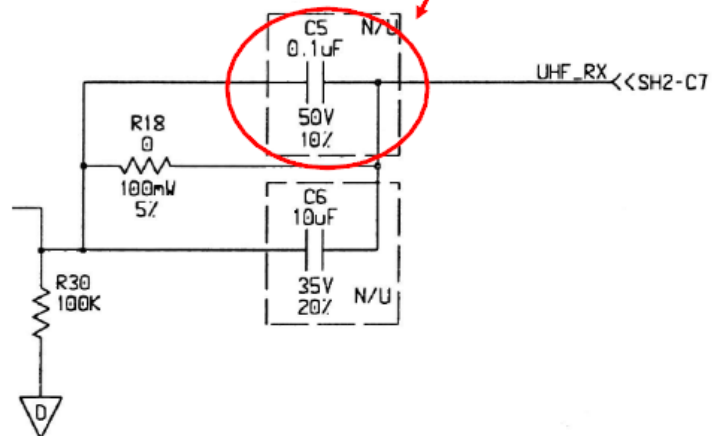
CHANGE TO:

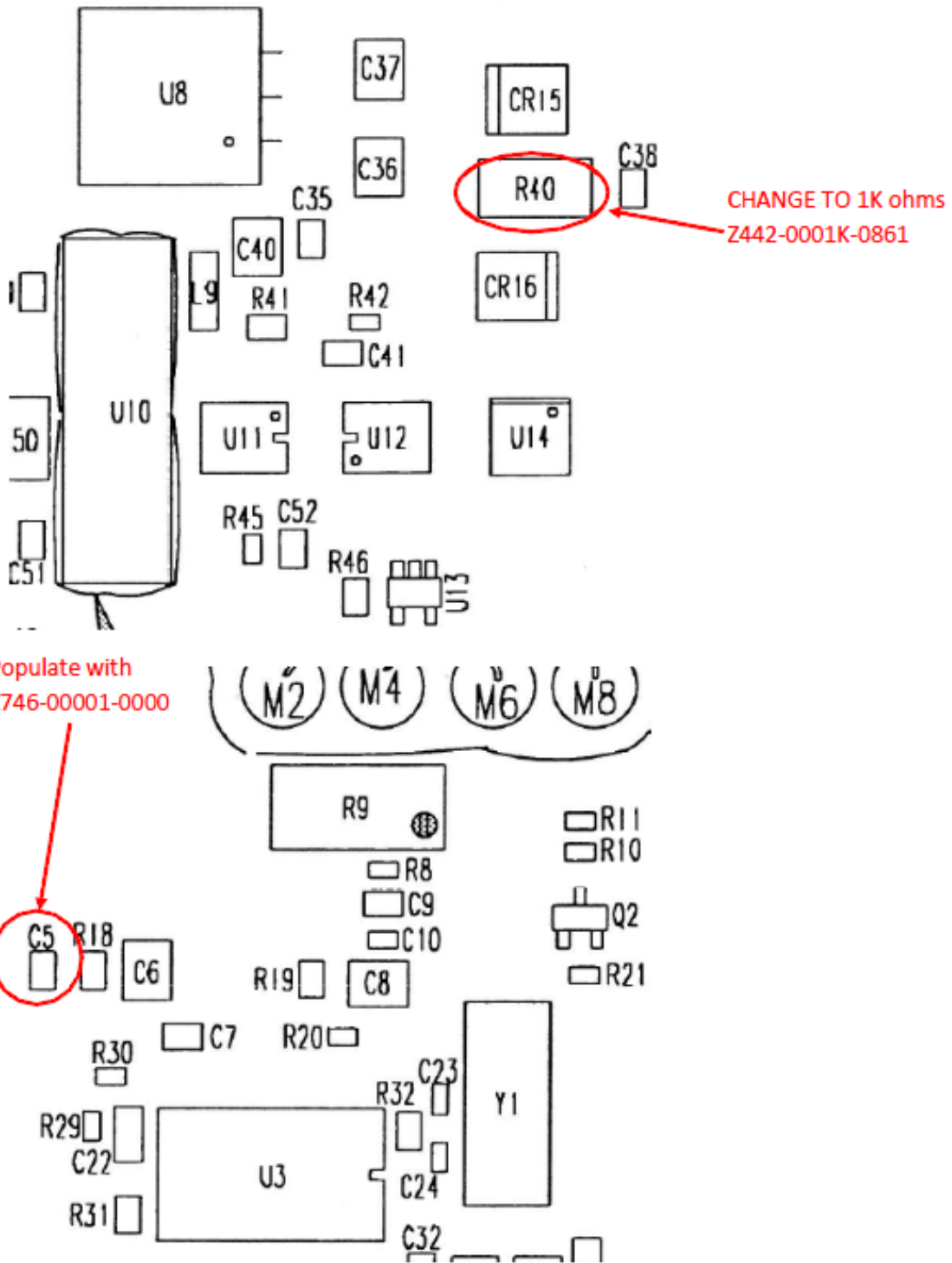
QTY REQD	ITEM NO	EDP NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, ETC.
1	37	Z442-0001K-0861	CRCW25121K00FKEG	RESISTOR	R40
24	22	Z341-00.1U-0264	C0805C104K5RACTU	CAPACITOR	C4 C9 C11 C12 C15 C16 C19 C21 C31 C32 C35 C38 C39 C41 C42 C43 C51 C52 C53 C54 C55 C56 C57 C58
1	58	Z746-00001-0000	5015	TEST POINT	C5



CHANGE TO 1K ohms
Z442-0001K-0861

Populate with
Z746-00001-0000





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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	DATE APPL
A		PRODUCTION RELEASE		

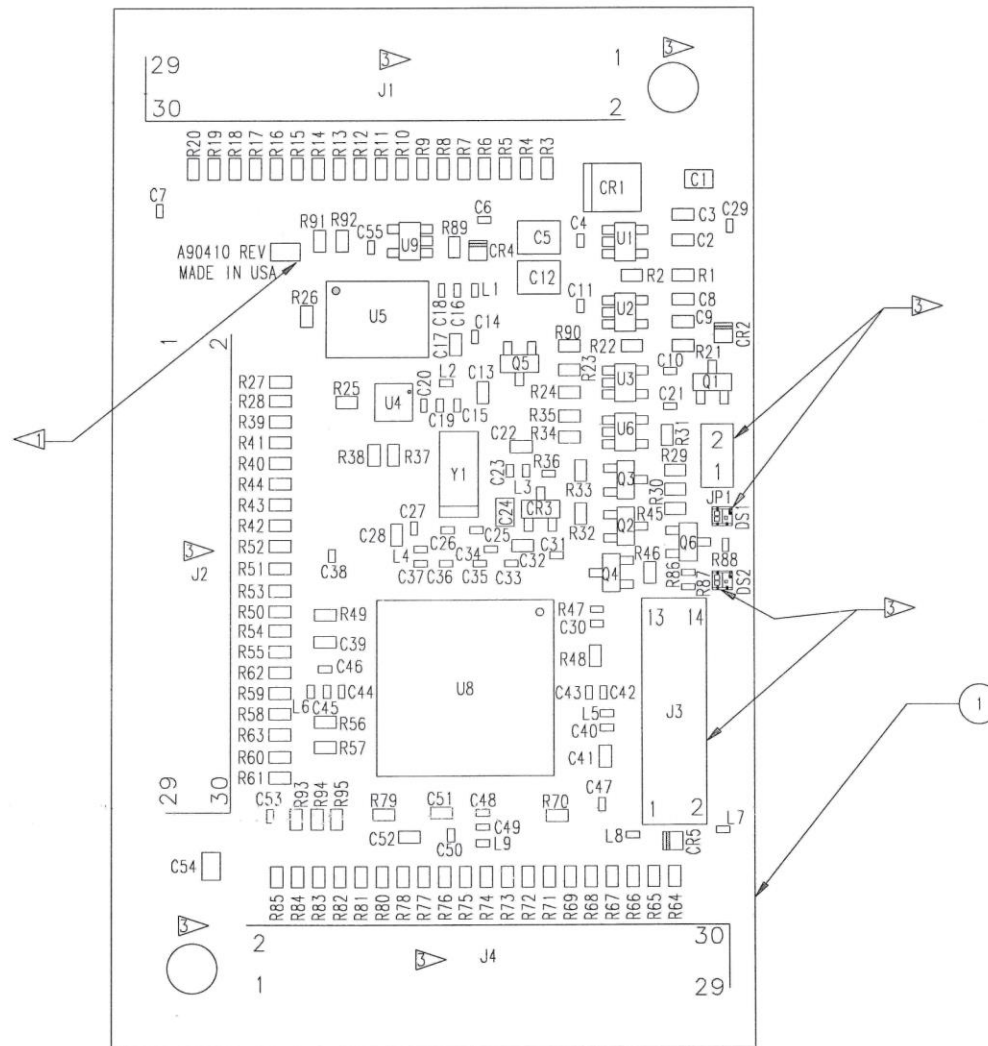
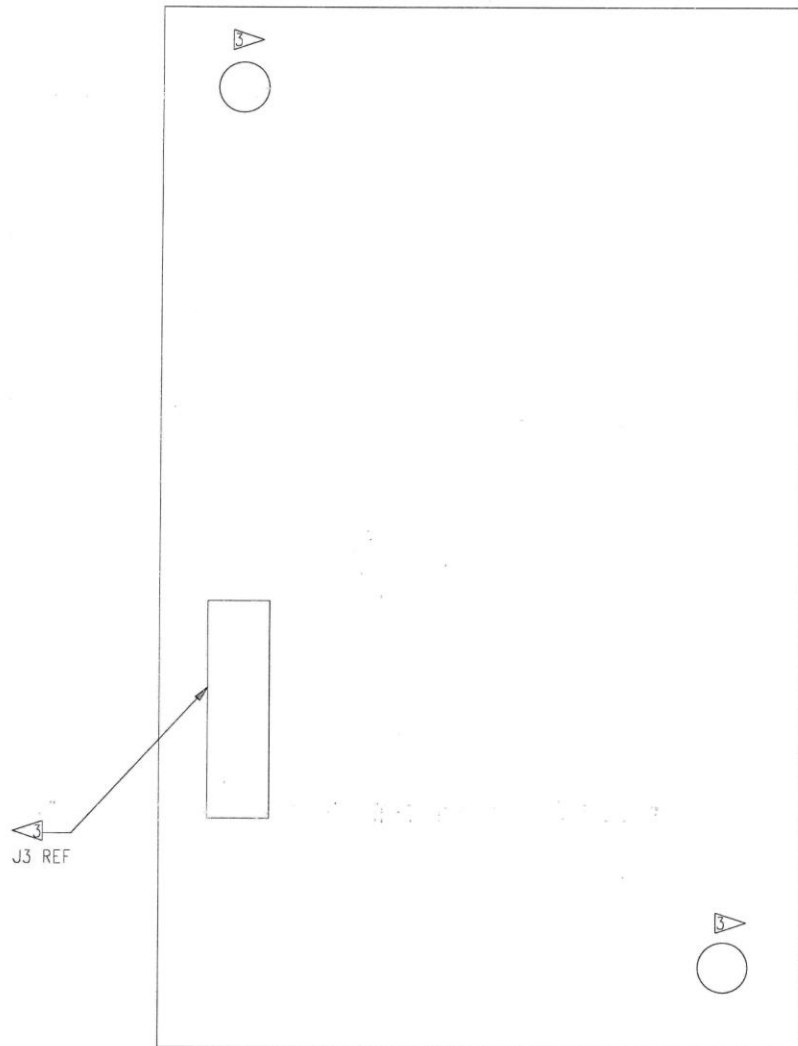
QTY. REQD.	ITEM NO.	EDP NO.	PART OR IDENTIFYING NO.	MATERIAL	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, SIZE, NOTES, VENDORS.
1	1	Z149-90410-0000	D90410-00 LVL A		BARE BOARD	
6	2	Z241-00035-0000	NDS7002A		TRANSISTOR	Q1 Q2 Q3 Q4 Q5 Q6
2	3	Z243-00316-0000	NC7SZ125M5X		IC	U6 U9
1	4	Z243-00446-0000	LIS3DHTR		ACCELEROMETER	U4
2	5	Z243-00467-0000	MICS233-3 3YM5		IC	U1 U2
1	6	Z243-00486-0000	TPS3824-33DBVR		IC	U3
1	7	Z243-01270-0000	LM4040AIM3X-2.5	2.5V	IC	CR3
1	8	Z244-00147-0000	SST25VF064C-80-41-02AE		IC PROGRAMMABLE	U5
1	9	Z244-00148-0000	MSP430F5438A1PZ		IC	U8
3	10	Z247-00162-0000	BA54161/R		DIODE	CR2 CR4 CR5
1	11	Z249-00003-0000	15M85.0AT3G	5V	TVS	CR1
1	12	Z341-0.01U-0044	Q4023C103KAT2A	0.01uF, 10%, 25V	CAPACITOR	C30
1	13	Z341-0.47U-0124	GRM188R71C474KA88D	0.47uF, 10%, 16V	CAPACITOR	C51
2	14	Z341-04.7U-0464	GRM32ER71H475KA88L	4.7uF, 10%, 50V	CAPACITOR	C5 C12
7	15	Z341-1500P-0064	CD402C152K5RACTU	1500pF, 10%, 50V	CAPACITOR	C18 C20 C35 C36 C43 C44 C49
0	16	Z342-0015P-0063	Q4025A150JAT2A	15pF, 5%, 50V	CAPACITOR	(C25 C26 N/U)
25	17	Z347-00.1U-0024	Q4022D104KAT2A	0.1uF, 10%, 10V	CAPACITOR	C6 C7 C10 C14 C15 C16 C19 C21 C23 C27 C29 C31 C33 C34 C37 C38 C40 C42 C45 C46 C47 C48 C50 C53 C55
2	18	Z347-00.1U-0064	C1005X5R1H104KT	0.1uF, 10%, 50V	CAPACITOR	C4 C11
8	19	Z347-0010U-0115	06036D106MAT2A	10uF, 20%, 6.3V	CAPACITOR	C13 C17 C22 C28 C32 C39 C41 C52
3	20	Z347-0022U-0225	LMK212B226MG-T	22uF, 20%, 10V	CAPACITOR	C1 C24 C54
4	21	Z347-02.2U-0124	0603ZD225KAT2A	2.2uF, 10%, 10V	CAPACITOR	C2 C3 C8 C9
6	22	Z442-0001K-0121	CRCW06031K00FKEA	1K, 1%, 0.063W	RESISTOR	R34 R89 R91 R92 R93 R94 (R95 N/U)
10	23	Z442-0010K-0111	CRCW0603-1002FRT1	10K, 1%, 0.063W	RESISTOR	(R1 R2 R21 R22 N/U) R24 R29 R30 R31 R32 R33 R35 R45 R46 R90
69	24	Z442-0033R-0121	CRCW060333R0FKEA	33, 1%, 100mW	RESISTOR	R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R23 R25 R26 R27 R28 R37 R38 R39 R40 R41 R42 R43 R44 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85
1	25	Z442-0047K-0011	CRCW040247K0FKED	47K, 1%, 0.063W	RESISTOR	R47
4	26	Z442-4.99K-0011	CRCW0402-4991FRT7	4.99K, 1%, 0.063W	RESISTOR	R36 R86 R87 R88
8	27	Z541-00014-0000	BLM15HG102SN1D	1400#1000MHZ	INDUCTOR	L1 L2 L3 L4 L5 L6 (L7 N/U) L8 L9
1	28	Z545-00019-0000	CM155-32.768K0ZFTF	32.768KHZ	CRYSTAL	Y1
1	29	Z715-03323-0002	CA-S02-24C-44		CONNECTOR	JP1
1	30	Z741-00053-0014	CLH-107-L-DBE-K		CONNECTOR	J3
3	31	Z742-00012-0030	HW-15-08-G-D-272-SM-A		CONNECTOR	J1 J2 J4
2	32	Z842-00013-0256	HSMF-C114	RED, GREEN, BLUE	LED	DS1 DS2

REF DES.	ITEM NO.	REF DES.	ITEM NO.	REF DES.	ITEM NO.
C1	20	Q1	2	R71	24
C2	21	Q2	2	R72	24
C3	21	Q3	2	R73	24
C4	18	Q4	2	R74	24
C5	14	Q5	2	R75	24
C6	17	Q6	2	R76	24
C7	17	R1	23	R77	24
C8	21	R2	23	R78	24
C9	21	R3	24	R79	24
C10	17	R4	24	R80	24
C11	18	R5	24	R81	24
C12	14	R6	24	R82	24
C13	19	R7	24	R83	24
C14	17	R8	24	R84	24
C15	17	R9	24	R85	24
C16	17	R10	24	R86	26
C17	19	R11	24	R87	26
C18	15	R12	24	R88	26
C19	17	R13	24	R89	22
C20	15	R14	24	R90	23
C21	17	R15	24	R91	22
C22	19	R16	24	R92	22
C23	17	R17	24	R93	22
C24	20	R18	24	R94	22
C25	16	R19	24	R95	22
C26	16	R20	24	U1	5
C27	17	R21	23	U2	5
C28	19	R22	23	U3	6
C29	17	R23	24	U4	4
C30	12	R24	23	U5	8
C31	17	R25	24	U6	3
C32	19	R26	24	U8	9
C33	17	R27	24	U9	3
C34	17	R28	24	Y1	28
C35	15	R29	23		
C36	15	R30	23		
C37	17	R31	23		
C38	17	R32	23		
C39	19	R33	23		
C40	17	R34	22		
C41	19	R35	23		
C42	17	R36	26		
C43	15	R37	24		
C44	15	R38	24		
C45	17	R39	24		
C46	17	R40	24		
C47	17	R41	24		
C48	17	R42	24		
C49	15	R43	24		
C50	17	R44	24		
C51	13	R45	23		
C52	19	R46	23		
C53	17	R47	25		
C54	20	R48	24		
C55	17	R49	24		
CR1	11	R50	24		
CR2	10	R51	24		
CR3	7	R52	24		
CR4	10	R53	24		
CR5	10	R54	24		
DS1	32	R55	24		
DS2	32	R56	24		
J1	31	R57	24		
J2	31	R58	24		
J3	30	R59	24		
J4	31	R60	24		
JP1	29	R61	24		
L1	27	R62	24		
L2	27	R63	24		
L3	27	R64	24		
L4	27	R65	24		
L5	27	R66	24		
L6	27	R67	24		
L7	27	R68	24		
L8	27	R69	24		
L9	27	R70	24		

NOTES: UNLESS OTHERWISE SPECIFIED:
 ▷ APPLY REMAINING PORTION OF PART NUMBER AND ASSY DRAWING REVISION LETTER
 ▷ USE DYMAX 984 OR EQUIVALENT AS SHOWN. CONFORMAL COAT BETWEEN 1-3 MILS IN THICKNESS. EXCEPT WHERE NOTED.
 ▷ NO CONFORMAL COATING ON DS1, DS2, J1-J4, JP1, AND ALL MOUNTING HOLES.

APPLICATION		SIGNATURES		DATE
NEXT ASSY	USED ON	DRAWN	CHECK	
A90410	V3452	DESIGNER	REL DATE	
ASSEMBLY INTERGRATED LOCOMOTIVE CPU COMMON MODULE 9000-90410-0001				
10655 7TH STREET CUCAMONGA, CA 91730				SIZE D
SCALE NONE				SHEET 1 OF 2

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J3 REF

ASSEMBLY
 INTERGRATED LOCOMOTIVE CPU
 COMMON MODULE

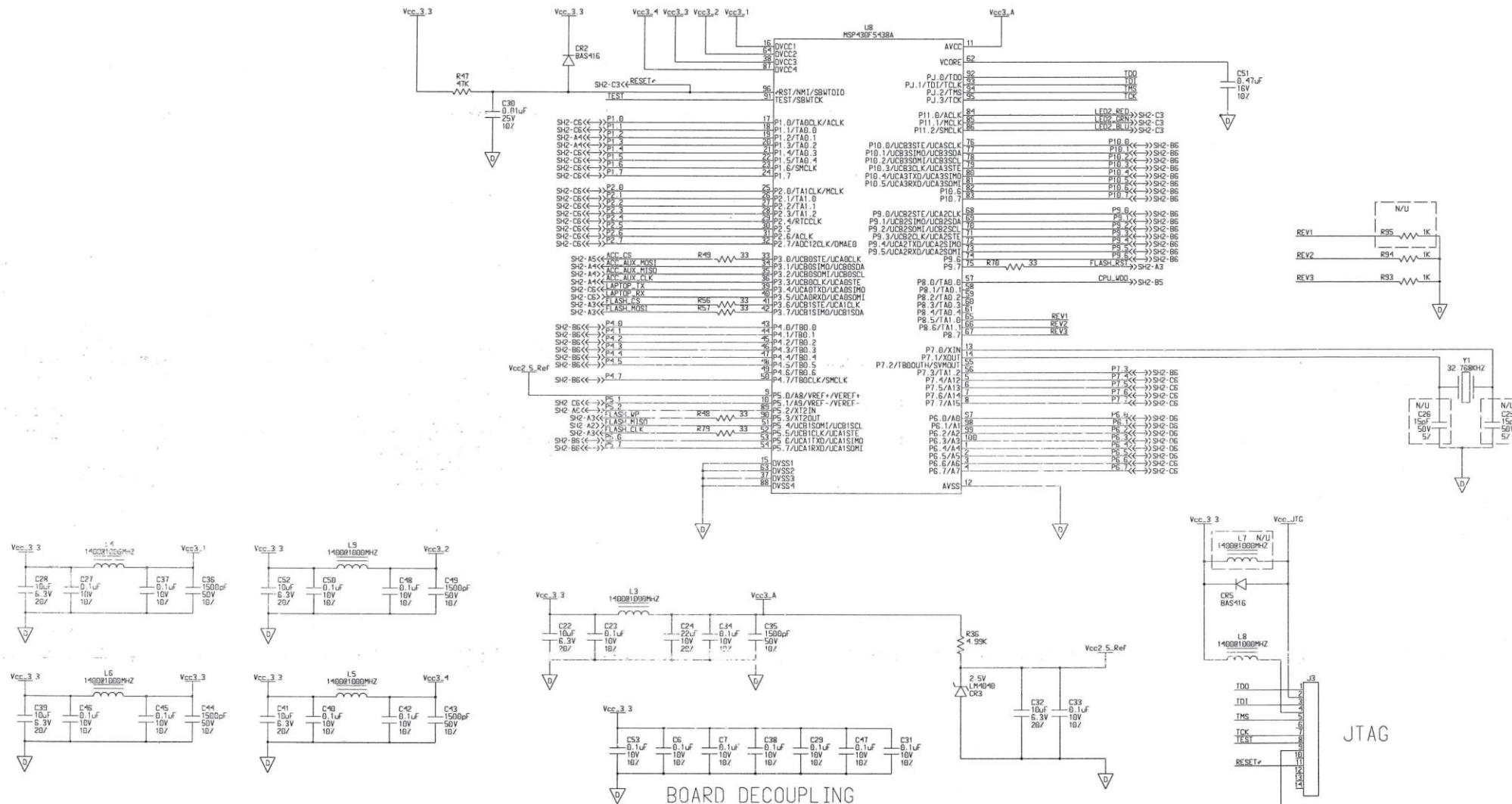
SIZE
 D

A90410

SCALE 4:1 SHEET 2 OF 2

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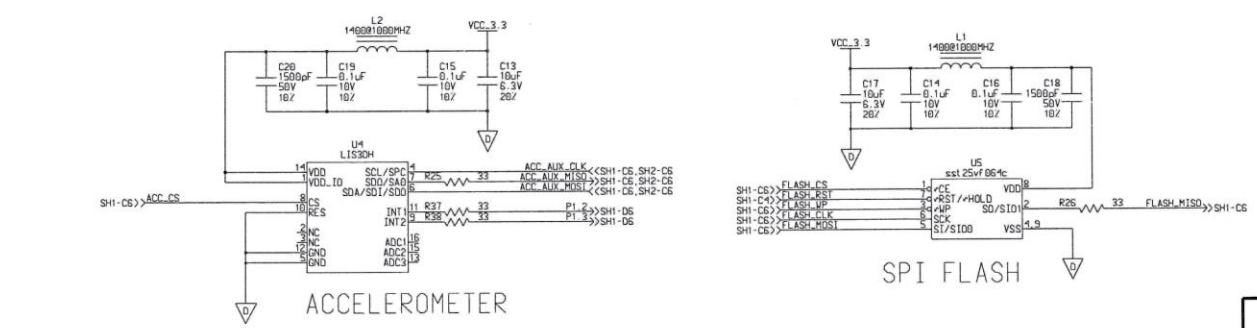
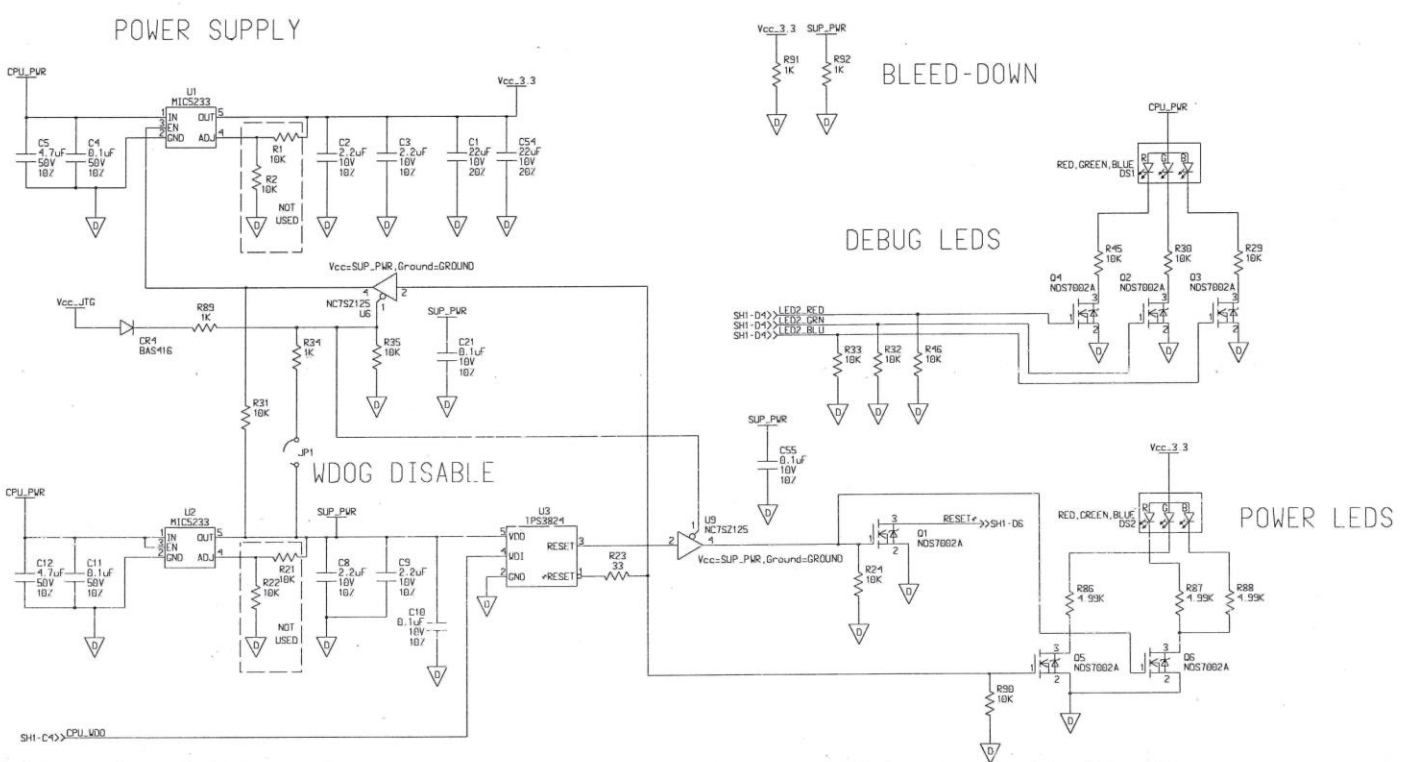
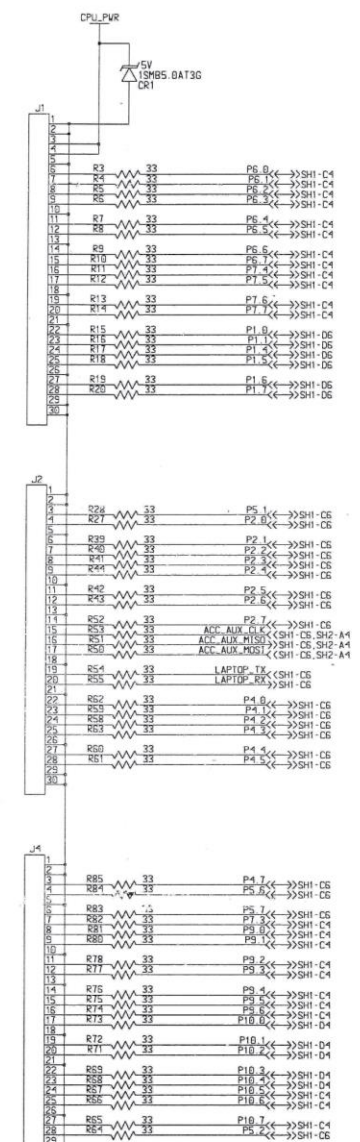
REVISIONS					
ZONE	REV	DESCRIPTION	DATE	DFTG APPVL	DSGN AUTH
A		PRODUCTION RELEASE			



- NOTES: UNLESS OTHERWISE SPECIFIED
1. LAST REF DES CR5 JP1 C55 DS2 J4 L9 Q6 R95 U9 Y1
 2. REF DES NOT USED: U7
 3. ALL RESISTORS 63mW 1/2 UNLESS OTHERWISE SPECIFIED
 4. ALL CAPACITORS ARE IN MICROFARADS.

APPLICATION		SIGNATURES		DATE
NEXT ASSY	USED ON	DRAWN	CHECK	
A90410	V3452	CHEK	DESIGNER	
		REL DATE		
<p>10655 7TH STREET CUCAMONGA, CA 91730</p>				
SIZE	S90410			
SCALE	NONE		SHEET 1 OF 2	

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SCHEMATIC
INTEGRATED LOCOMOTIVE CPU
COMMON MODULE

SIZE D S90410

SCALE NONE SHEET 2 OF 2

USE W/BOARD LVL A S90410

DRAWING CHANGE HISTORY

Drawing Name:	Integrated Locomotive CPU Common Module, A90410
Drawing Number:	A/S90410
Revision:	A1
Reason For Change:	Remove pull-down resistor R90 (10 K) on pin 1 of Q5 (not necessary)
Drawing Changes:	See below for details

IS:

QTY REQD	ITEM NO	EDP NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, ETC.
10	23	Z442-0010K-0111	CRCW0603-1002FRT1	RESISTOR	(R1 R2 R21 R22 N/U) R24 R29 R30 R31 R32 R33 R35 R45 R46 R90

CHANGE TO:

QTY REQD	ITEM NO	EDP NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA: SPECS, REF DES, ETC.
9	23	Z442-0010K-0111	CRCW0603-1002FRT1	RESISTOR	(R1 R2 R21 R22 N/U) R24 R29 R30 R31 R32 R33 R35 R45 R46 (R90 N/U)

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APPENDIX A – PUMP PROGRAM

INSTALLATION

The PUMP program is installed by running the SETUP.EXE application found on Disk 1. Using the installation defaults is recommended.

OPERATION

If default installation is used, the program will appear as *PUMP* in the *Start Menu* under *Quantum*. Upon execution, the program screen will appear as shown in Figure 2.

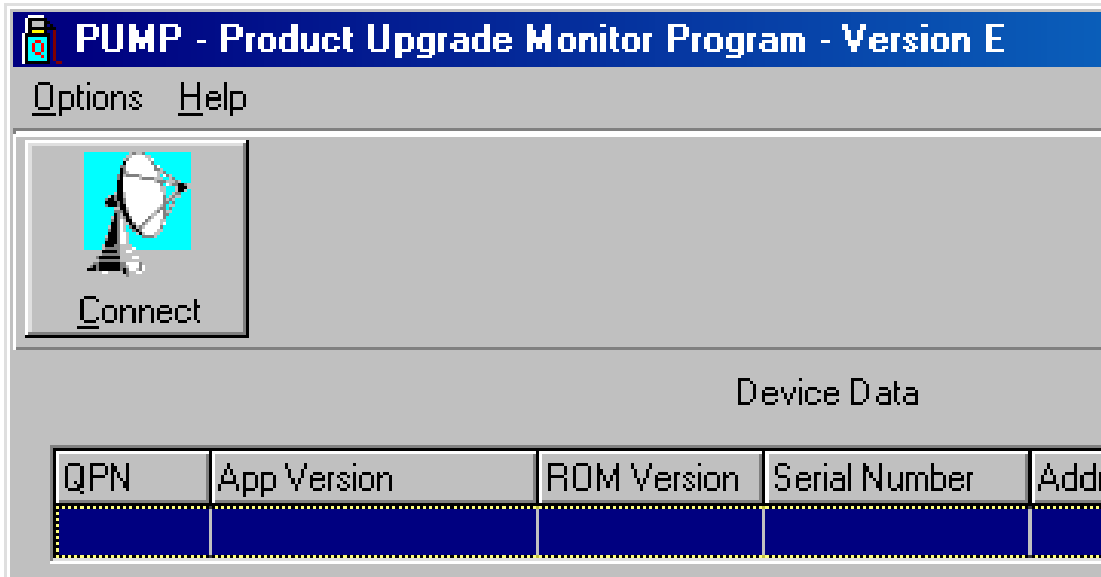


Figure 2 - PUMP

If this is the first time that you have run this program, use the *Options* menu choice and check the *Communications Setup* for the correct settings. The COM Port will depend upon your computer configuration, *Baud Rate* should be **9600** and the program should be set to *Connect to 1 Device*.

Make connections to the device you wish to PUMP and power up the device. After the device has powered up, click the *Connect* button on the PUMP screen. A dialog, as shown in Figure 3, will appear while the program is attempting to connect to the unit.



Figure 3 – Connecting

Once connected to the device, PUMP will display the device data as shown in Figure 4 and display the *Upload* button.

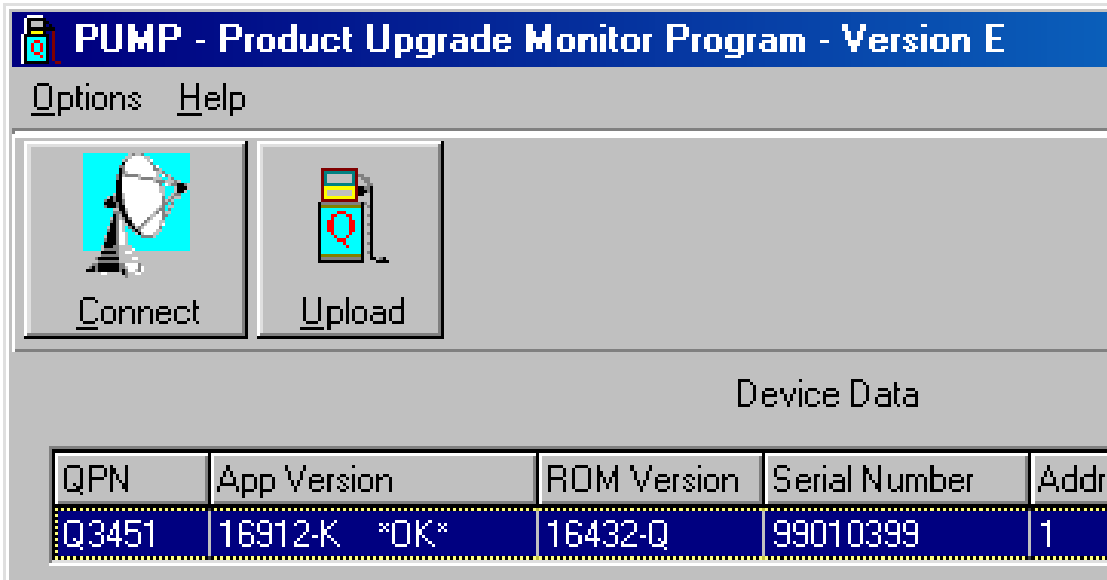


Figure 4 - PUMP connected

To upload the new application, select the *Upload* button. A standard Windows™ file load dialog will appear. Select the application file supplied to you by Siemens and click the *Open* button. The dialog box as shown in Figure 5 will appear showing the selected file.

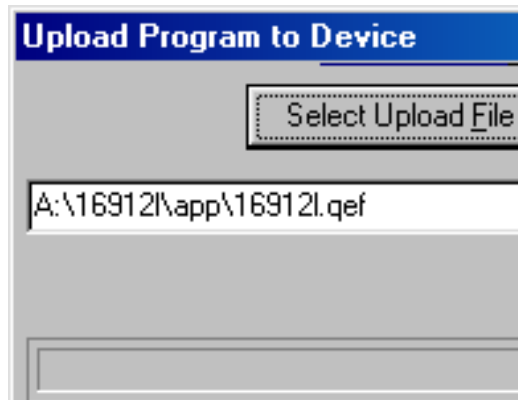


Figure 5 - PUMP file selected

Click the *Upload* button to begin the application update. PUMP will upload the application and, when completed, will display a dialog similar to Figure 6.

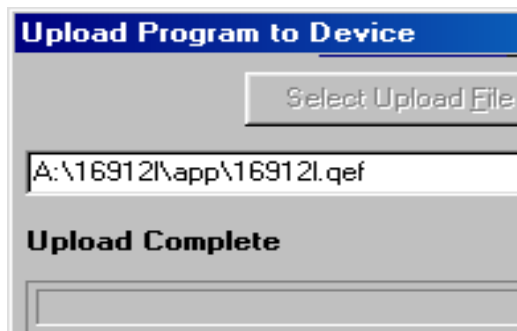


Figure 6 - PUMP Complete

Select the *Exit* button and then *Exit* on the main screen to end the program.

APPENDIX B – HOTCOMM PROGRAM

INSTALLATION

The QP-16373 HOTCOMM program is installed by running the SETUP.EXE application found on the program disk.

OPERATION

If the user did not change the default installation, the program will appear as *HOTCOMM* in the *Start Menu* under *Quantum*.

Connect the Q3452/V3452 unit to your computer and power up the unit. Wait for the unit to "boot up" before starting the HOTCOMM program. Once started, the HOTCOMM program will display its main screen as shown in Figure 7.

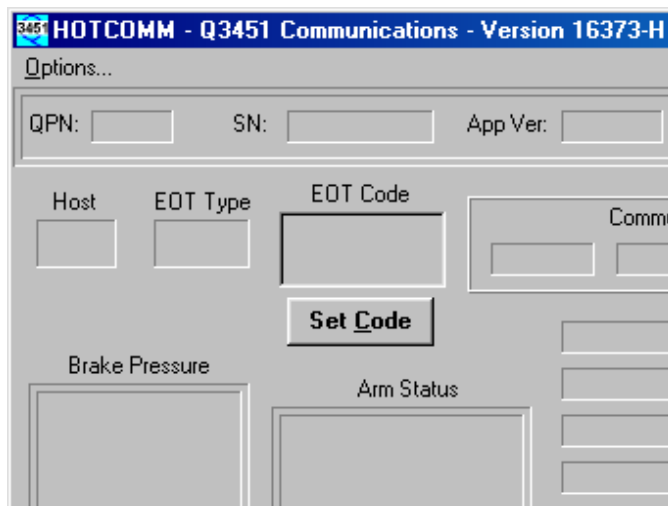


Figure 7 – HOTCOMM

If this is the first time you have run this program, check the *Comm Setup* under the *Options* menu and select the correct COM Port for your computer connection. Click the *Run* button to connect to the unit under test. When HOTCOMM establishes communication with the unit, the screen will display unit information similar to that as shown in Figure 8.

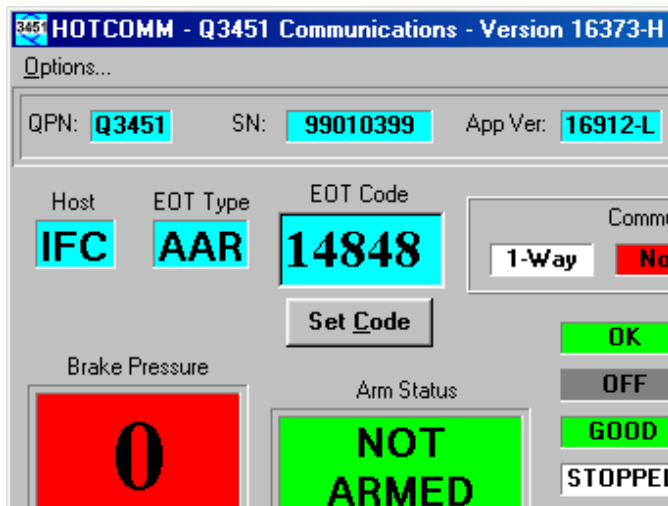


Figure 8 - HOTCOMM with unit communication

At this point, HOTCOMM can be used to simulate the locomotive communication that the unit would normally receive in service. The following is a list of the fields and functions on the HOTCOMM screen:

Field		Function
QPN:		Siemens Part Number
SN:		Serial Number of the connected unit
App Ver:		Application version
ROM Ver:		Boot ROM version
Host		Host mode of the unit
EOT Type		Position of EOT protocol switch
Communications Status	1-Way	Shows COM mode 1-Way or 2-Way
	No RTF	Shows COM errors
	Emerg N/A	Shows if emergency is enabled
EOT Code		Enter the EOT code to be received here then click the <i>Set Code</i> button
Set Code		Button to click to set the entered EOT code
Brake Pressure		Brake Pressure from EOT
Arm Status		Armed status of EOT
Battery		Battery status of EOT
HVM		Marker status of EOT
Valve		EOT Valve status
Motion		Motion status of EOT
Ext Inputs	Proto	External input for ICE or IFC
	Prog	Unused external input
	Rem	Unused external input
	UDE	
Arm		Arm button
Brake		Emergency brake button
Disarm		Disarm button
COMM Test		COM Test button
Run / Stop		Starts and stops HOTCOMM
Tone		Selects the transmitted tone
High Pwr.		Check this box to transmit high power in AAR mode
NS FSK		
Start TX Test / Stop Tx Test		Starts and stops the transmit test
Error List		List of current errors from Q3452 unit
Quit		Quits the HOTCOMM program

Table 3 - HOTCOMM Fields

APPENDIX C – ALIGNMENT



WARNING

ALIGNMENT MUST ONLY BE PERFORMED BY QUALIFIED AND TRAINED SERVICE PERSONNEL.

The DTX module is aligned at the factory before shipment and should need no further adjustment. It is possible that the gain settings for the audio input and output signal paths may need optimized. The frequency trim, deviation, and balance should not need adjustment. The procedure for performing all of the alignment steps is detailed below. The unit should not be opened for alignment; all adjustments are electronic and effected through the programmer software.

REQUIRED TEST EQUIPMENT

Depending upon which alignment steps are to be performed, some or all of the following pieces of test equipment may be required:

DC Power Supply -capable of operating at the correct voltage for the module and capable of 2.5 Ampere minimum current.

RF Signal Generator-capable of operating at the carrier frequency of the module with an output level adjustment and able to be frequency modulated.

FM Demodulator/Deviation Meter-capable of operating at the carrier frequency of the module.

RF Frequency Counter-must operate at the RF frequency of the unit with a resolution of 10 Hz or better and an accuracy of +/-1 ppm (+/-150 Hz at VHF, +/-450 Hz at UHF) or better.

Audio Oscillator-must have sine wave output allow for output frequency and amplitude adjustment.

Oscilloscope

RF Power Attenuator or Dummy Load with coupled output-must be 50 ohms impedance at the operating frequency and rated for the output power of the module and have an output which can drive the FM demodulator at the correct level and the frequency counter.

RF Power Meter-capable of accurately indicating the RF output power of the module.

NOTE

NOTE

Except for the power supply, a two-way radio test set may include most, if not all, of the required equipment.

ALIGNMENT PROCEDURE

It is not absolutely necessary to perform all of the alignment steps detailed below. However, some adjustments interact with others e.g. balance affects deviation, deviation affects AUX IN gain, and the output power AUX IN gain have a slight effect on TX frequency trim. It may be prudent to spot check all of the adjustments which interact. These will be indicated in the particular alignment step.

The programmer must be connected to the unit via the programming interface cable and the alignment screen selected. During alignment, the channel may be selected via the channeling control lines on the module or through the programmer. A channel pull-down menu allows for the selection. Also, the unit can be keyed through the programmer, if desired.

NOTE

NOTE

Interrupting the power supply to the unit while the programmer software is open will require exiting the software and re-opening it.

RX FREQUENCY TRIM

The RX Frequency Trim trims the unit frequency during receive. This setting, if incorrect, may degrade receive sensitivity, distortion, and possible recovered audio level, which in turn affects AUX OUT (RX) Gain and Audio PA Gain. The receive frequency trim is not affected by any other alignment step.

To determine if the receiver is correctly trimmed to frequency, the 1st local oscillator frequency must be measured.

WARNING

WARNING

DO NOT KEY THE UNIT DURING THIS PROCEDURE AS SERIOUS DAMAGE TO THE COUNTER MAY RESULT!

A channel with a receive frequency programmed into it should be selected. The correct local oscillator will be displayed on the programmer channel box. The frequency on the counter should be observed and the RX Frequency Trim value adjusted for least error. Because of the very low local oscillator level at the antenna terminals, the frequency counter may not be able to read the frequency. If so, perform the TX Frequency Trim adjustment detailed later and set the RX Frequency Trim value to match that of the proper TX Frequency Trim value.

AUX OUT GAIN

To set the AUX OUT gain, an RF signal generator must be connected to the DTX module. Its frequency should be set to that of a programmed channel. The generator should be modulated at the desired deviation, typically 60 % of maximum, with a 1 kHz tone. The RF output level is not critical, but should be above any squelch threshold which may have been set. -70 dBm should be sufficient. If not, squelch can be disabled via the settings menu of the programmer for this procedure.

With an oscilloscope connected to the AUX OUT output, the AUX OUT Gain setting should be set to value which produces the desired output level.

NOTE

NOTE

The output impedance of the AUX OUT is about 600 ohms. If the load impedance of the load that will be connected to this output is less than 10 k Ω or so, a resistor of a value equal to the load impedance should be connected to the AUX OUT output when making the adjustment.

AUDIO PA GAIN

To set the Audio PA gain, an RF signal generator must be connected to the DTX module. Its frequency should be set to that of a programmed channel. The generator should be modulated at the desired deviation, typically 60 % of maximum, with a 1 kHz tone. The RF output level is not critical, but should be above any squelch threshold which may have been set. A -70 dBm level should be sufficient. If not, squelch operation can be disabled via the settings menu of the programmer.

With an oscilloscope connected to the AUDIO OUT output, the AUDIO OUT Gain setting should be set to value which produces the desired output level.

CARRIER DETECT ON AND CARRIER DETECT OFF

The Carrier Detect On and Carrier Detect Off settings control the RF level (or Signal-to-noise ratio) at which the DCD output goes true and what level at which it goes false. To prevent chattering on noise, these two settings are not normally the same. 3 to 5 dB of hysteresis is usually provided i.e. if the RF signal level is increased from zero, at some point, the DCD output will go from false to true. The RF level may then have to be decreased by several dB before the DCD output goes false again. This prevents chattering with signal levels near the carrier detect level. If squelch is enabled, the receive audio muting will follow the DCD output. The desired carrier detect levels can be directly entered via the alignment screen in dBm and then fine-tuned with a high quality signal generator, if necessary.

To determine the state of the DCD output, connect a DC coupled oscilloscope or DVM to the DCD output. It may help to disable the squelch via the Monitor input or Monitor button on the programmer so that the receive audio signal can be continuously observed i.e. not squelched when DCD is false.

TX LOW POWER AND HIGH POWER

The transmitter output power level can be programmed on a per channel basis via the alignment page of the programmer. If RNet Compatibility has not been programmed on the settings page, both the low and high power levels can be set. If RNet Compatibility has been programmed, only high power can be set. The TX High Power and TX Low Power settings in the TX Power box act to select a common value for all channels. Individual values for each channel can be entered in the per channel boxes at the bottom of the screen. Power is set in watts with a resolution of 0.1 watt. The power level can be confirmed and fine-tuned, if desired, by connecting the radio to an accurate wattmeter.

AUX IN GAIN

To set the Aux In gain, an audio oscillator or appropriate signal source (e.g. modem) should be connected to the Aux In input at the desired input level. An FM deviation meter should be connected to the antenna connector through a suitable attenuator or coupler. The unit should be keyed for transmit and the Aux In gain should be adjusted for the desired deviation, typically 60% of rated deviation.

TX FREQUENCY TRIM

This setting is used to trim the transmitter to frequency. This value should not normally need adjustment. However, as the unit ages and/or if the transmitter power or the Aux In gain is changed significantly, slight corrections may be prudent.

NOTE

NOTE

Any adjustments must be made at a unit temperature of 25 ± 2 °C (77 ± 1.8 °F). Due to internal heating, this adjustment must not be made after the unit has been transmitting unless it has been allowed to cool to the correct temperature. Likewise, the adjustment itself should be made as quickly as possible.

The unit should be set to a channel which is at an output power which is close to what will be used the majority of the time. The RF output of the unit should be coupled to a frequency counter through a suitable attenuator or coupler. Ensure that no modulation source is connected to the MIC IN or AUX IN. The PTT should be activated and the TX Frequency Trim value adjusted for the correct frequency. The value can be changed while the unit is transmitting.

DEVIATION AND BALANCE

The deviation adjustments are used to set the maximum limiting deviation of the transmitter. This must be set properly to ensure that the unit will meet the regulatory spurious emissions requirements, in particular, occupied bandwidth. The balance adjustment is used to ensure a proper relationship between the modulating signal to the reference and to the VCO. If the ratio i.e. balance is not correct, the transmit audio frequency response will not be correct which could result in a distorted data waveform.

The optimum values for deviation and balance vary in a predictable manner as a function of carrier frequency. In order to relieve the user of having to adjust deviation and balance each time a transmit frequency is entered or changed the radio calculates the required values based upon the correct values for two special alignment frequencies. These required values have already been determined at the factory and are stored in the unit. As transmit frequencies are entered or changed, new calculated values will appear in the per channel boxes at the bottom of the screen. These values can be changed on a channel by channel basis, if desired.

The procedure detailed here is for setting the deviation and balance at the special alignment frequencies so that the deviation and balance will be correct at any programmed frequency. This same procedure can be used to set any given channel values in the per channel boxes.

An FM demodulator should be connected to the RF output of the module through a suitable power attenuator or coupler. The demodulator filters should be set for no de-emphasis, as low a high pass cutoff as possible (<50 Hz, preferably down to DC), and a low pass cutoff of approximately 15 kHz. The demodulator output should be connected to an oscilloscope so that it can be observed.

An audio oscillator should be connected to the AUX IN input. The output waveform should be sine, the level at zero, and at a frequency of 500 Hz. Confirm that the Aux In Gain value is at least 10.

On the channel drop-down menu, select lower band edge. Activate the PTT, and while observing the demodulated waveform on the oscilloscope, begin increasing the audio oscillator's output level or the Aux In setting. The waveform should begin as a sine wave and at some point show clipping. The clipped portion may not necessarily be flat. The audio oscillator level should be set so that a substantial portion of the waveform is clipped, at least 50 %. Adjust the balance value so that the clipped portion is flat i.e. horizontal rather than tilted. Although the programmer can change values while transmitting, it is better to unkey between value entries. After the balance is set, the deviation should be set to a value of 1.2 kHz for a very narrow channel, 2.3 kHz for a 12.5 kHz channel or 4.6 kHz for a 25/30 kHz channel. Select the upper band edge on the channel menu and repeat. As a result of this procedure, the per channel balance and deviation values may have changed.

NOTES

NOTES

SIEMENS

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