

Radio Metering Panel Model TLN2418A Diagnostic Metering Panel

Model TLN2419A

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Model Complement Chart

These charts break down each model number into their respective kit numbers.

TLN2418A Radio Metering Panel

Kit Number	Description
THN6485A	Radio Metering Panel Hardware
TRN5173B	Radio Metering Panel Circuit Board
TKN8914A	Diagnostic Cabling

TLN2419A Diagnostic Metering Panel

Kit Number	Description
THN6486A	Diagnostic Metering Panel Hardware
TRN5174B	Diagnostic Metering Panel Circuit Board
TKN8914A	Diagnostic Cabling



Radio Metering Panel Model TLN2418A Diagnostic Metering Panel

Model TLN2419A

Manual Overview

A quality installation and maintenance program is the key to trouble-free system operation. To provide this type of program, you also need the necessary tools to maintain each component of the system. The Radio Metering Panel (RMP) and the Diagnostic Metering Panel (DMP) are installation and maintenance tools for the MSF 5000 ™ series base and repeater stations.

Table 1 outlines the topics covered in this manual.

Table 1. Manual Topics

Section Title	This Section Describes
Components of the Metering Panel	the individual components of the RMP/DMP.
Theory of Operation	how the RMP/DMP interfaces with the station to provide service and diagnostics.

Scope of the Manual

This manual is intended for trained technicians experienced with Motorola SMARTNET™ trunked radio equipment or similar types of equipment. Read the entire manual before beginning an installation or optimization using the RMP or DMP.

Components of the Metering Panel

The Radio Metering Panel (RMP) and Diagnostic Metering Panel (DMP) provide several service and diagnostic functions for the *MSF* 5000 base or repeater stations. By using the panel with the proper set of cables, you can monitor station activity and easily service the station.

The RMP and DMP perform the same basic functions for the *MSF 5000* station. The DMP has additional digital capabilities to perform diagnostics using the MUXbus bits.

Each RMP/DMP kit contains the following:

- Cables
- Metering Panel

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Cables

Three separate cables are included with each RMP/DMP. Table 2 lists these cables along with a functional description.

Table 2. Cables Included with the RMP/DMP

Part	Motorola Part Number	Function
40-conductor interface cable	308391N02	This cable connects the RMP/DMP to the station control module through the EXPANSION connector (J800).
8-conductor metering cable	3084225N02	This cable connects the RMP/DMP meter to one of the following station metering jacks: Transmitter (J413) Receiver (J210) Power Amplifier (J503)
a set of two voltage probes	• 0180766D47 Red • 0180766D48 Black	The set includes a red and a black probe. Each probe comes with a reversible blunt or pointed tip.

Metering Panel Description

The RMP and DMP use the same panel design and contain similar components. There are two additional DMP sections to interface the MUXbus bits. The panel design includes the following sections:

- Housing Rods
- Speaker
- Meter
- Channel Display (DMP Only)
- Status Display Matrix (DMP Only)

Figure 1 shows the Radio Metering Panel.

Figure 2 shows the Diagnostic Metering Panel.

Housing Rods

The housing rods are attached to the sides of the panel. By inserting the rods into the rails of the station cabinet or rack, you can hang the RMP/DMP above the station. The rods extend out from the panel to fit different rack widths.

Speaker

The RMP/DMP contains an audio power amplifier and speaker. The audio power amplifier circuit provides 5 watts of local service audio from the Select Audio signal on the Secure Station Control Board (SSCB). This audio is passed to the 4-ohm speaker. The SPEAKER ON/OFF switch (S1210) is on the front of the RMP/DM. It enables and disables the audio power amplifier circuit and speaker.

An optional microphone (HMN1001) or headset connects into the CONTROL jack (J812) on the front panel of the Station Control tray. This option lets you key and modulate the transmitter locally or communicated with a remote console operator by intercom. Receive audio is heard in the RMP/DMP speaker.

Metering Panel Description (continued)

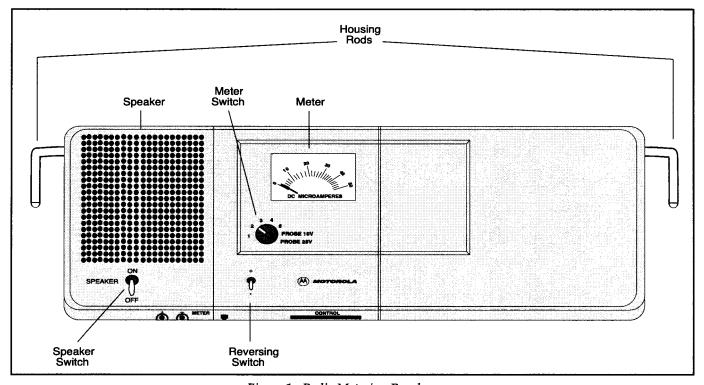


Figure 1. Radio Metering Panel

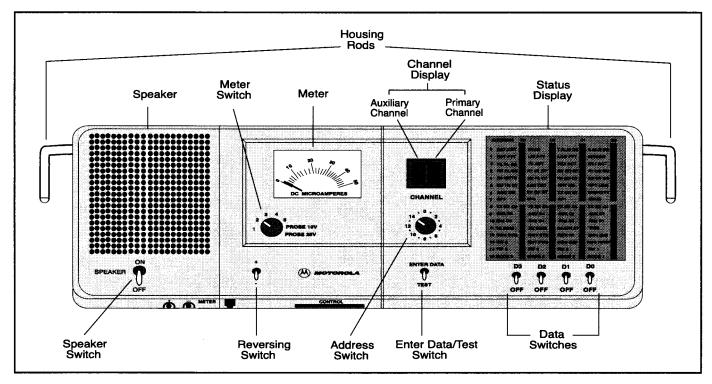


Figure 2. Diagnostic Metering Panel

Meter

The RMP/DMP has a 0—50 μ A, full-scale meter to measure signals as indicated in Table 3.

Table 3. RMP/DMP Meter Cable Interface

Meter Cable Pin-out	Meter Switch Setting	From TX Meter (J413)	From RX Meter (J210)	From PA Meter (J503)
1	Meter 1	Forward Voltage	Quadrature Detector	Final Stage 1
2	Meter 2	Not Used	I-F Level	Final Stage 2
3	Meter 3	Control Voltage	Mixer Output	Final Stage 3
4	Meter 4	Not Used	Reference Oscillator	Predriver Stage
5	Meter 5	XMTR Synthesizer Steering Line	RCVR Synthesizer Steering Line	Driver Stage
6	Not Used	GND	GND	Factory Test
7	Meter Common	GND	GND	A+ Meter Reference
8	Not Used	GND	GND	Factory Test

How to Use the Meter

- Step 1. Locate the following points on the RMP/DMP before setting up the meter:
 - 8 pin meter connector (J1202)
 - Meter Switch (S1208)
 - Meter
 - Reversing Switch (S1209) for positive and negative settings
 - Voltage probe connectors for Probe 10V and Probe 25V switch settings (J1203 and J1204)

Refer to Figure 1 and Figure 2 to locate these components.

- Step 2. Plug the proper cables into the RMP/DMP. These connections are:
 - 8 pin RJ45 meter cable into the Meter connector (J1202)
 - Red voltage probe into the "+" (J1203) jack
 - Black voltage probe into the "-" (J1204) jack

Refer to Figure 3 for the location of these connections.

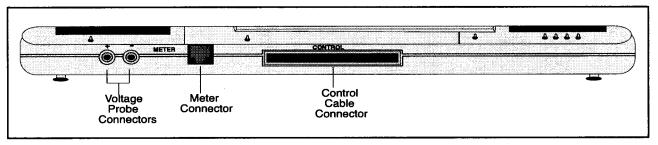


Figure 3. RMP/DMP Cable Connections

How to Use the Meter (continued)

- Step 3. Plug the other end of the meter cable into the desired location for measurement.
- Step 4. Be sure the Reversing Switch (S1209) is in the positive (+) position.

This is the normal position for the switch.

IMPORTANT

When measuring the power amplifier circuit, use the negative (-) position on the Reversing Switch.

- Step 5. Set the Meter Switch (S1208) to the desired setting.Refer to Table 3 for the list of meter settings and indications.
- Step 6. Read the meter for the measured level.

Make the required adjustments, according the *MSF* 5000 Instruction Manual.

NOTE

When the Meter Switch is in the PROBE 10V or the PROBE 25V position, the meter monitors the voltage probes and reads full-scale voltage instead of full-scale μA .

Channel Display (DMP Only)

The Channel Display uses two 7-segment LED packages to display the station's current operating channel. This display changes each time the station switches operating channels or the channel select switch is used.

The window displays the channel address in hexadecimal notation (\$#). The notations \$1 through \$F indicate Channel 1 through Channel 15. The tuning channel is noted with \$0.

The station has two operating channels. These are:

Table 4. Operating Channels for the MSF 5000 Station

Operating Channel	Location	This Channel Indicates
Primary	Right digit display	the current selected channel for the station transmitter and primary receiver.
Auxiliary	Left digit display	several possible functions, including the selected channel for the secondary receiver in a two receiver station.

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Status Display Matrix (DMP Only)

The Status Display Matrix is the recessed panel on the right side of the DMP. This matrix indicates a large portion of the main control activities of the station. These activities include:

- push-to-talk signals
- state of squelch circuits
- · coded squelch signals
- station-level alarms
- wild card functions

The matrix contains 64 MUXbus bits arranged in four columns with 16 addresses per column. Each column has four sets of 4-element LEDs. The LED lights when the indicated MUXbus bit is active.

Table 5 lists the mnemonics silk screened on the matrix for each MUXbus bit.

Table 5	. MUXbus	Bit M	ap
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Address (A)	D3	D2	D1	D0
0	DAT PTT	SCAN	T ALM DS	S ALM DS
1	RPT PTT**	LIN PTT	LOC PTT	INTCOM
2	TX PL DS	TX ACT**	RX2 ACT	RX1 ACT
3	RX PL DS	R1 PL DT	RX CD DT	R1 UN SQ
4	R2 MUTE	R2 PL DT	R2 CD DT	R2 UN SQ
5	GD TN DT	AUX DET	RPT KD	RPT UNSQ
6	ACC DIS	EX DA DT	TX CD DT	ENCRYPT
7	SP 3	SP 2	SP 1	BAUD
8	TX RX C8	TX RX C4	TX RX C2	TX RX C1
9	AUX C8	AUX C4	AUX C2	AUX C1
10	RX2 C8	RX2 C4	RX2 C2	RX2 C1
11	TX INHB	RX INHB	R2 AUX DT	DOS
12	RW4 OVG	RW3 SYN	RW2 PA	RW1 BAT
13	RW 8	RW7 FWD	RW6 REF	RW5 TSTAT
14	FW 4	FW 3	FW 2	FW 1
15	MODE 8	MODE 4	MODE 2	MODE 1
** Status Only bits				

How to Test the Status Display Matrix

Use this procedure to verify the operation of the DMP and proper connection.

Step 1. Press the ENTER DATA—TEST Switch (S1211) into the Test position for a moment.

Step 2. Check to be sure:

- all 64 LEDs in the matrix screen light
- the two-digit CHANNEL display reads \$FF

How to Address the Status Display Matrix

To activate a MUXbus bit in the Status Display Matrix, use the following steps:

- Step 1. Connect the 40 pin ribbon control cable between the RMP/DMP and the station control tray.
 - Plug one end into the CONTROL connector (J1201) on the RMP/DMP.
 - Plug the other end of the cable into the port on top of the station control tray.
- Step 2. Turn the Address Switch (S1201) to indicate the row containing the desired address.
- Step 3. Toggle up the data switch (D3-D0) corresponding with the correct column.
- Step 4. Toggle up the ENTER DATA—TEST switch (S1211) to the ENTER DATA position.

The appropriate MUXbus bit LED in the Status Display Matrix lights to indicate an active bit.

How to clear the Status Display Matrix

To clear an active MUXbus bit,

- Step 1. Toggle all the data switches (D3-D0) to the OFF position.
- Step 2. Toggle the ENTER DATA—TEST switch (S1211) to the ENTER DATA position.

The MUXbus bit LED goes out and remains off.

Description of MUXbus Bits

Table 6 lists the MUXbus bits and their addresses along with a description of their functions. Addresses are given with row number first (A#), and then the column number (D#).

A STATUS-ONLY bit is an indicator. It does not change the state of the station. For example, the DMP can activate the Transmitter Activity (TX ACT) bit. While the bit is active, the transmitter does not key. All STATUS-ONLY bits are marked in Table 5 and 6 by a double asterisk (**).

Some of the MUXbus bits are set with the Field Programmer. Purchasable options are indicated with the bit description.

Table 6. Description of MUXbus Bits

MUXBus	Address	This Bit
DAT PTT Data Push-to-Talk	A0,D3	indicates an active Data PTT request. When this signal is active, the request is arbitrated against all other active PTT requests.
		Use the Field Programmer or Option C672 to set the PTT priorities.
SCAN	A0, D2	indicates when scan is active for scanning receiver stations.
Scan Enable		
T ALM DS	A0,D1	unconditionally mutes all alarm tones generated by the active reverse wildcard bits on
Total Alarm Disable		addresses 12 and 13.
	1	NOTE: Also refer to S ALM DS.

Table 6. Description of MUXbus Bits (continued)

MUXBus	Address	This Bit
S ALM DS Selective Alarm Disable	A0, D0	mutes repetitive alarm tones generated by active reverse wildcard bits on addresses 12 and 13. These alarms are only sent once.
		This bit uses two modes of operation:
		Mode A
		In this mode, the bit is set and driven active. The SSCB generates an alarm tone only once until the reverse wildcard bit changes states. You hear one full set of alarm tones whenever the alarm changes status.
		NOTE: You do not hear the full set of alarm tones when all alarms are cleared.
		• Mode B
		This mode sets the bit for 20 msec and then stops driving it active. The SSCB uses this mode to latch the bit active until the reverse wildcard bit changes states. This stops the alarm tones completely until the alarm status changes. Then normal alarm status tones are generated every 10 seconds.
		NOTE: The SSCB stops holding this bit active when the T ALM DS bit is active.
RPT PTT** Repeater Push-to-Talk	A1, D3	is a STATUS-ONLY bit. It indicates an active repeater PTT or trunking PTT. The SSCB activates this bit when it sees qualified repeater activity on Receiver 1.
		Programming of the station's repeater unsquelch qualifier fields determine the qualified repeater activity. Any combination of MUXbus bits RX PL DS, R1 PL DT, RPT USQ, AUX DET indicate this activity.
		With this bit active, the audio is not gated nor is the station keyed. If this PTT is the highest level, the audio gating path is set for in-cabinet repeat.
		This bit changes when:
		the PTT time-out timer (TOT) times out or the request is removed.
		 repeater knockdown (RPT KD) is activated to dekey the transmitter and/or PL Reverse Burst/Termination of Code (RB/TOC) is encoded.
		Use the Field Programmer or Option C672 to set the PTT priorities for this bit.
LIN PTT Line Push-to-Talk	A1, D2	keys the transmitter, modulated with TX Audio without a higher priority PTT. The TTRC module sends this MUXbus bit when a console keys the station.
		The bit is deactivated when RB/TOC is decoded and/or the Line PTT timer times-out.
	İ	Use the Field Programmer or Option C672 to set the PTT priorities for this bit.
LOC PTT Local Push-to-Talk	A1, D1	keys the transmitter, modulated with TX Audio without a higher priority PTT. The SSCB module sends this MUXbus bit when a local microphone keys the station. A local microphone plugs into CONTROL (J812) on the front panel of the station control tray.
		It also activates with the PTT switch on the front panel of the station control tray.
		The bit is deactivated when RB/TOC is decoded and/or Local PTT timer times-out.
INTCOM Intercom	A1, D0	allows you to communicate with the console site using the local microphone (LOC PTT) without keying the station. The TTRC sends this MUXbus bit when the front panel INTERCOM switch is activated.
TX PL DS	A2, D3	strips PL, DPL, or Trunking Data from the transmitted signal. This bit is activated in
Transmit PL/DPL Disable		two ways:
		With the Transmit PL Strip wireline option C63
		The XMIT switch on the front panel of the station control module
TX ACT** Transmitter Activity	A2,D2	is a STATUS-ONLY bit indicating that the transmitter is actually on. The PA ON LED on the front panel of the station control module is also activated.
· · · y		This bit does not key the transmitter.
RX2 ACT	A2, D1	indicates qualified activity on Receiver 2.
Receiver 2 Activity		This bit is used only with stations equipped with the second receiver option. There are no consequence if the bit is active.

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Table 6. Description of MUXbus Bits (continued)

MUXBus	Address	This Bit
RX1 ACT	A2, D0	signals the SSCB to open the RX1 audio gate. This allows line audio and select audio
Receiver 1 Activity		for the local speaker lines to be gated. RX1 audio is also gated to the SSCB repeater audio gate. With the RX1 ACT bit set,
		RPT PTT can open the repeater audio gate.
		Qualified repeater activity is determined by any combination of MUXbus bits—RX PL DS, R1 PL DT, RPT UNSQ, and AUX DET.
		Use the Field Programmer or Option C674 to set the qualifiers for receiver audio activity.
RX PL DS Receiver PL/DPL Disable	A3, D3	indicates the station is in carrier squelch only receiver operation to determine the status of RX1 ACT and RX2 ACT. This bit is used by the Monitor and Receiver Squelch On/Off wireline functions.
		The PL Disable switch on the station control module front panel also activates RX PL DS.
R1 PL DT	A3, D2	indicates PL, DPL, and CT coded squelch detected on Receiver 1.
Receiver 1 PL DPL Detect		
RX CD DT	A3, D1	indicates a Receiver Code Detect signal due to Secure (12 kbit) data on Receiver 1.
Receiver 1 Code Detect		
R1 UN SQ	A3, D0	indicates when Receiver 1 audio carrier squelch circuit detects on-channel RF activity.
Receiver 1 Unsquelch		This bit is used for audio gating only.
R2 MUTE	A4, D3	mutes or attenuates the second receiver audio.
Receiver 2 Mute	:	This bit is used only with the second receiver option. There are no consequences if the bit is active.
R2 PL DT	A4, D2	indicates PL, DPL, and CT coded squelch detected on Receiver 2.
Receiver 2 PL/DPL Detect		
R2 CD DT	A4, D1	indicates a Receiver Code Detect signal due to Secure (12 kbit) data on Receiver 2.
Receiver 2 Code Detect		
R2 UN SQ	A4, D0	indicates when Receiver 2 audio carrier squelch circuit detects on-channel RF activity.
Receiver 2 Unsquelched		This bit is used for audio gating only.
GD TN DT	A5, D2	indicates High Level Guard Tone (HLGT) detected from the Tx Audio signal.
Guard Tone Detect		While GD TN DT is active, the Tx Audio signal mutes to prevent the transmission of remote control tones over the air.
		This bit is not active during low level guard tone detect.
AUX DET	A5, D2	indicates activity on an optional decoder.
Auxiliary Detect		AUX DET can activate RX1 ACT, RX2 ACT, AND RPT PTT similar to R1 PL DT and R1 UN SQ qualifiers.
RPT KD	A5, D1	disables the repeater PTT. This bit prevents repeater activity, but the receiver is
Repeater Knockdown		operational.
RPT USQ	A5, D0	indicates activity on the Receiver 1 repeater carrier squelch circuit.
Repeater Unsquelch		This bit is required to key the repeater and to gate repeater audio to the transmitter.
ACC DIS	A6, D3	indicates the Access Disable switch on the front panel of the station control module is
Access Disable		activated. This bit prevents Line and Repeater PTTs from keying the station.
EX DA DT External Data Detect	A6, D2	indication is active during an external data detect so the SSCB can mute Tx, Local, RX1 (repeater) and MRTI audio from the transmitter, unless enabled through Field Programming or option C678.
		NOTE: Tx Data Audio path is always routed to the transmitter, even when this bit is active.
TX CD DT	A6, D1	indicates a Wireline Code Detect signal due to Secure (12 kbit) data on the wireline.
Transmit Code Detect		

Table 6. Description of MUXbus Bits (continued)

MUXBus	Address	This Bit
ENCRYPT Digital Voice Encryption	A6, D0	enables the encryption function of the optional encrypt/decrypt secure module to transmit coded voice on encryption capable stations.
Digital voice Entryption		When inactive, voice transmissions are clear.
		NOTE: The decryption function is always active and not affected by this bit.
SP3, SP2, SP1 Special Purpose 3—1	A7, D3 through A7, D1	are reserved for customer specific use and future applications
BAUD	A7, D0	is active when the alternate rate of 300 baud is used on the IPCB bus.
IPCB Baud Rate		Default is 1200 baud.
TX RX C8, TX RX C4, TX RX C2, TX RX C1 Transmitter/Receiver 1/Channel	A8, D3 through A8, D0	represents the requested operating channel, which is also displayed by the Status Display on the front panel. Channel numbers 0 through 15 are shown in binary format.
Hanshutter/Receiver 1/Channel		These bits control the channel of the transmitter and Receiver 1 with parameters defined by the programmed SSCB module codeplug.
		See Auxiliary Channel (AUX C8—AUX C1) for channels higher than 15.
		NOTE: If a discrepancy occurs between the two channel indicators when an undefined channel is requested, the SSCB selects channel number 1.
AUX C8, AUX C4, AUX C2, AUX C1 Auxiliary Channel	A9, D3 through A9, D0	represents overflow bits to indicate channel, mode or Receiver 2 channel, depending on the application.
RX2 C8 RX2 C4, RX2 C2, RX2 C1 Second Receiver Channel	A10, D3 through A10, D0	represents the requested operating channel, which is also displayed by the Status Display on the front panel. Channel numbers 0 through 15 are shown in binary format.
		These bits control the channel of the transmitter and Receiver 2 with parameters defined by the programmed SSCB module codeplug.
		See Auxiliary Channel (AUX C8—AUX C1) for channels higher than 15.
		NOTE: In MCS stations, these bits indicate the four least significant bits of the active MCS user number.
TX INHB	A11, D3	inhibits the station transmitter when activated.
Transmit Inhibit		
RX INHB	A11, D2	inhibits receiver audio, excluding status tone, from being gated to Line 2 or Line 4.
Receiver 1 Inhibit		
R2 AUX DT	A11, D1	indicates activity on an optional decoder on Receiver 2.
Second Receiver Auxiliary Detect		In MCS stations, this bit indicates the most significant bit of the active MCS user number.
DOS	A11, D0	is not supported at this time for the Repeater Access Controller option. There are no
Data Operated Squelch		consequences if the bit is active.
RW4 OVG	A12, D3	is active when the station battery charger power supply indicates too much voltage
Reverse Wildcard 4 —Battery Overvoltage		from the customer supplied station emergency batteries. The SSCB generates 4 alarm tones and routes them to the local speaker, wireline, and over the air.
RW3 SYN	A12, D2	is an alarm indicating the transmit, primary receive, or both synthesizers are out of
Reverse Wild Card 3 —Synthesizer Unlock		lock. The SSCB generates 3 alarm tones and routes them to the local speaker, wireline and over the air.

Table 6. Description of MUXbus Bits (continued)

MUXBus	Address	This Bit
RW2 PA Reverse Wild Card 2 —Power Amplifier Fail	A12, D1	is an alarm indicating a PA Fail from one or both of the station control module PA status lines (PA On or PA Full Power). The module registers a failure from an inactive PA status line for 30-45 msec:
•		after the start of a key-up
		continuously during key-up.
		The SSCB generates 2 alarm tones and routes them to the local speaker, wireline and over the air.
		RW2 PA is activated, if the station control module service jumper (JU01) is installed and regardless of the PA status lines. This indicates a non-standard operating mode on older analog stations.
		RW2 PA is not activated by the station control module if the PA is not keyed at full power due to the station control module personality EPROM RF power cut option.
RW1 BAT Reverse Wild Card 1—Battery Revert	A12, D0	is an alarm indicating the station has lost AC power and switched to emergency battery backup.
		This bit is inactive after restoring proper AC power to the station.
		The SSCB generates 1 alarm tone and routes it to the local speaker, wireline, and over the air.
RW8	A13, D3	indicates a problem with the main/standby system.
Reverse Wild Card 8—Main Standby		The SSCB generates 8 alarm tones and routes them to the local speaker, wireline and over the air.
RW7	A13, D2	indicates a high reflected power condition.
Reverse Wild Card 7		The SSCB generates 7 alarm tones and routes them to the local speaker, wireline, and
(Trunked Models Only)		over the air. This bit requires a directional coupler.
RW6	A13, D1	indicates a low forward power condition.
Reverse Wild Card 6 (Trunked Models Only)		The SSCB generates 6 alarm tones and routes them to the local speaker, wireline, and over the air. This bit requires a directional coupler.
RW5	A13, D0	indicates a TSTAT failure. Possible causes are:
Reverse Wild Card 5		high reflected power
(Trunked Models Only)		low forward power
		receiver synthesizer out of lock
		• loss of TDATA detection
		The SSCB generates 5 alarm tones and routes them to the local speaker, wireline and over the air.
FW4, FW3, FW2, FW1	A14, D3	allows a console to activate or signal external equipment through a wild card and
Forward Wild Card 4 through 1	through A14, D0	expansion tray on the station. These bits are driven from the TTRC module.
MODE 8, MODE 4, MODE 2, MODE 1	A15 D3 through	represents the requested operating mode, which is also displayed by the Status Display on the front panel. Mode numbers 0 through 15 are shown in binary format.
Station Modes	A15, D0	These bits control the mode of the station with parameters defined by the programmed SSCB module codeplug.
		See Auxiliary Channel bits (AUX C8—AUX C1) for modes higher than 15.
		NOTE: If a discrepancy occurs between the two mode indicators when an undefined mode is requested, the SSCB selects mode number 1.

Theory of Operation

The RMP and DMP takes signals from the *MSF 5000* station to drive indicators and perform diagnostic functions. The 40-conductor interface cable connects power, audio and digital signals between the SSCB, other control modules within the station and the RMP/DMP.

The interface cable connects four types of signal lines. These are:

- Power and ground lines
- Audio line
- Dedicated Logic Line (DMP Only)
- Multiplexed logic (MUXbus) lines (DMP Only)

Audio Line

The audio line comes from the station control module through the Select Audio line on Pin 32 of the interface cable. When properly gated by the control circuit of the station, this line can contain any one of the following audio signals:

- primary receiver audio
- secondary receiver audio
- transmit audio from the remote wireline
- automatic station I.D.
- alarm tone audio

The Select Audio line connects to the wiper of the VOLUME control knob on the front panel of the control tray. Both the dc bias level and the ac level can vary on this line due to the position of the VOLUME control.

Dedicated Logic Line

This line is only on the DMP. The dedicated logic line, or EXPANSION RESET line, is a shared logic line on pin 12 of the connector. It coordinates a clean start up of the station control module, other interconnected module, or external equipment (such as the DMP).

The EXPANSION RESET line is an active low when:

- a power up is performed
- the station control module ACC DIS/RESET switch is toggled to the RESET position
- the station control module is reset by the watchdog timer
- another control module receives a command to reset the station

While the watchdog timer circuit RESET signal is an active low, the station suspends normal MUXbus operations. This holds the MUXbus data strobe DS line (pin 22) inactive. The MUXbus address and data lines do not follow normal patterns.

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Dedicate Logic Line

(continued)

IMPORTANT

While the EXPANSION RESET line is active low, only the station control module writes to the MUXbus data lines. Otherwise, the station fails its self diagnostic tests and stays in the reset mode indefinitely.

Multiplexed Logic (MUXbus) Lines

The multiplexed logic (MUXbus) lines consist of the following signals:

- Four Address lines (BA0-BA3) on pins 13 through 16
- Four Data lines (BD0 -BD3) on pins 17 through 20
- Data strobe (DS) on pin 22

NOTE

All DMP MUXbus lines are referenced to audio ground. Logic ground is not used.

The data strobe and the four address lines are driven by the station control module. The four address and the four data lines define 16 words of 4 bits each, or 64 total bits as shown in Table 5.

The 64 bits form a multi-directional digital communications bus. This bus is multiplexed to reduce the interconnections from 64 to 9. This conserves the number of connections and increases future expansion capability.

The data lines are inverted and open collector driven in both the station control module and the DMP. This allows the station control module and the DMP to drive the same bit in a nondestructive, wired OR fashion.

The MUXbus timing diagram is shown in Figure 4. The address lines are incremented once, approximately every 310 microseconds. The address changes when data strobe is inactive ($\overline{DS} = 1$). The data must be valid for 1 microsecond before the rising edge of \overline{DS} and valid for 15 microseconds after the rising edge of \overline{DS} .

Multiplexed Logic (MUXbus) Lines (continued)

At certain times, the MUXbus momentarily halts (e.g. during Channel-Scan™). The halt is an extended period of inactive data strobe. The address lines remain at the last MUXbus address just prior to the halt. The data lines are in a "don't care" state during a halt and may occur randomly.

Table 7. MUXbus Timing Diagram Notations

Notation	Description
^t DS	This notation stands for Date Set Up Time.
	Data must be valid at least 1 microsecond prior to DS rising edge.
^t DH	This notation stands for Data Hold Time.
	Data must be valid at least 15 microseconds after the rising edge of DS.
At ₀	This notation indicates any address.
At ₁	This notation indicates the next address following At ₀ .
Dt ₀	This notation indicates any data.
Dt ₁	This notation indicates the next data following Dt ₀ .

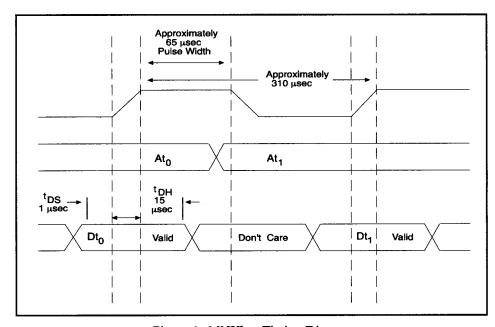


Figure 4. MUXbus Timing Diagram

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Parts List

This section describes the individual components of the Radio Metering Panel (RMP) and the Diagnostic Metering Panel (DMP) boards. These lists provide the reference symbol, Motorola part number and a description of the component. Use this list when replacing faulty parts.

NOTE

For optimum performance, diodes, transistors, and integrated circuits must be ordered by a Motorola part number.

Radio Metering Panel

THN6485A Radio Metering Panel Hardware

Reference Symbol	Part Number	Description		
	Panel Co	omponents		
LS1201	5084450N01	3" dynamic, 4 ohm, pm speaker		
M1201	7283319G01	0—50 μA dc meter		
	Cable A	Assembly		
W1201	3083941N02	flat, 40-conductor with two connectors		
W1201	3084225N02	8-conductor with two connectors		
	Mechanical Components			
	0210101A91	NUT, spring push-on (4 used)		
	0310907A10	SCREW, machine: M2.5 X 0.45 X 6 (2 used)		
	0310943M17	SCREW, tapping: TT3.5 x 0.6 x 13 (4 used)		
	0383498N12	SCREW, tapping: M3 x 0.5 x 12 (2 used)		
	0383938N01	SCREW, machine: 10-32 x 1-1/8" (2 used)		

THN6485A Radio Metering Panel Hardware (continued)

Reference Symbol	Part Number	Description
	0484180C01	WASHER, shoulder (nylon) (6 used)
	0783830N01	BRACKET, meter mtg
	1483022P01	INSULATOR: 0.25" thk (mylar)
	1484268A01	INSULATOR; transistor (2 used)
	1583826N01	HOUSING, top: (blk plastic)
	1583827N02	HOUSING, bottom
	4210128A14	RING, retaining: 1.5" ID (rubber) (2 used)
	4210217A02	STRAP, tie: .091 x 3.62" lg (2 used)
	4282143C05	CLAMP, cable
	4784568N01	ROD, mtg RH
	4784568N02	ROD, mtg LH
	7582230B14	PAD, rubber (2 used)
	7584215A03	BUMPER, recessed (4 used)

Radio Metering Panel (continued)

TRN5173B Radio Metering Panel Circuit Board

Reference	Part Number	Description			
Symbol		•			
	Capacit	tor, fixed			
C1203	0811051A13	0.1 μF, ±5%; 63 v			
C1204	2113740B57	220 pF, ±5%; 50 v			
C1205	2384568T01	2200 μF, +100 -10%			
C1206, 1207	2313748G25	333 μF, ±20%; 35 v			
C1208	0811051A13	0.1 μF, ±5%; 63 v			
C1209, 1210	2313748G04	1 μF, ±20%; 50 v			
C1211	2113741B25	1500 pF, ±5%; 50 v			
C1212 through 1214	0811051A13	0.1 μF, ±5%; 63 v			
C1215, 1216	2113740B57	220 pF, ±5%; 50 v			
C1219	2313748G18	47 μF, ±20%; 25 v			
C1221	2384568T02	1000 μF, 20 v			
C1222	2313748G18	47 μF, ±20%; 25 v			
C1242	2113740B57	220 pF, ±5%; 50 v			
C1244	2113740B32	20 pF, ±5%; 50 v			
C1245	0811051A08	0.015 μF, ±5%; 63 v			
C1246	2113740B32	20 pF, ±5%; 50 v			
C1247	2113740B65	470 pF, ±5%; 50 v			
	Diode (See Note)			
CR1203	4882290T01	Schottky type			
CR1204	4813833C10	0.1 A 70 v			
	F	use			
F1201	6582408R01	3A, 125 v			
	Con	nector			
J1201	2883935N01	plug: 40-contact			
J1202	0983112N02	receptacle: 8-contact			
J1203	0988254C03	receptacle: test (red)			
J1204	0988254C01	receptacle: test (black)			
J1205	2813922A04	plug: 4-contact			
-	Inductor				
L1201	2582786N02	620 UH			
	Transisto	r (See Note)			
Q1221	4800869653	type JFET			
Resistor, fixed					
R1229	0611077B39	470K, ±5%; 1/8W			

TRN5173B Radio Metering Panel Circuit Board (continued)

(continued)		
Reference Symbol	Part Number	Description
R1232	0611009A42	510 ohms, ±5%; 1/4W
R1233	0611077B10	30K, ±5%; 1/8W
R1234	0611077A87	3.6K, ±5%; 1/8W
R1235	0611077B23	100K, ±5%; 1/8W
R1236	0611077A81	2K, ±5%; 1/8W
R1237	0611009A34	240 ohms, ±5%; 1/4W
R1238, 1239	0611009A10	24 ohms, ±5%; 1/4W
R1240	0611009A42	510 ohms, ±5%; 1/4W
R1241, 1242	0683962T01	1 ohm, ±5%; 1W
R1243	0611077F56	4.32K, ±1%; 1/8W
R1244	0611077F53	4.02K, ±1%; 1/8W
R1245, 1246	0611077B39	470K, ±5%; 1/8W
R1247	0611077B30	200K, ±5%; 1/8W
R1248	0611077B39	470K, ±5%; 1/8W
R1250	0611077B02	13K, ±5%; 1/8W
R1251	0611077A94	6.8K, ±5%; 1/8W
R1252	0611009A23	82 ohms, ±5%; 1/4W
R1293	0611077B10	30K, ±5%; 1/8W
R1294	0611077A74	1K, ±5%; 1/8W
	Sv	vitch
S1208	4084449N01	rotary: 7-position
S1209	4083685N06	toggle, DPDT
S1210	4083685N04	toggle, SPDT
	Integrated Ci	rcuit (See Note)
U1213, 1214	5183222M57	Class B Audio Power Amplifier
U1215	5113819D04	General Purpose Differential Operational Amplifier
U1218	5113816J01	+5V Voltage Regulator
	Mechai	nical Parts
	0982425R01	FUSEHOLDER (used with F1201)
	3683144N01	KNOB, control
	5483865R01	LABEL, bar code: 1/4" wide, white
	5484960T01	LABEL, bar code: 6.3 x 12.7 MM, white

Diagnostic Metering Panel

THN6486A Diagnostic Metering Panel Hardware

Reference Symbol	Part Number	Description		
Panel Components				
LS1201	5084450N01	3" dynamic, 4 ohm, pm speaker		
M1201	7283319G01	0—50 μA dc meter		
	Cable As	ssembly		
W1201	3083941N02	flat, 40-conductor with two connectors		
W1202	3084225N02	8-conductor with two connectors		
	Mechanical (Components		
	0210101A91	NUT, spring push-on (4 used)		
	0310907A10	SCREW, machine: M2.5 X 0.45 X 6 (2 used)		
	0310943M17	SCREW, tapping: TT3.5 X 0.6 X 13 (4 used)		
	0383498N12	SCREW, tapping: M3 X 0.5 X 12 (3 used)		
	0383938N01	SCREW, machine: 10-32 x 1- 1/8 (2 used)		
	0484180C01	WASHER, shoulder (nylon) (7 used)		
	0783830N01	BRACKET, meter mtg		
	1483022P01	INSULATOR: 0.25" thk (mylar)		
	1484268A01	INSULATOR, transistor (3 used)		
	1583826N01	HOUSING, top		
	1583827N02	HOUSING, bottom		
	4210128A14	RING, retaining: 1.5" ID (rubber) (2 used)		
	4210217A02	STRAP, tie: .091 x 3.62" lg (2 used)		
	4282143C05	CLAMP, cable		
	4784568N01	ROD, mtg RH		
	4784568N02	ROD, mtg LH		
	7584215A03	BUMPER, recessed (4 used)		
	7582230B14	PAD, rubber (2 used)		

TKN8914A Diagnostic Cabling

Reference Symbol	Part Number	Description
	Conn	ector
P1203	2884751N01	PROBE, phone (red)
P1204	2884751N02	PROBE, phone (black)
Connector Co	omponents	
P1205	1583142M08	HOUSING, connector: 4-contact
	3982717M01	CONTACT, receptacle (4 used)
	Mechanical (Components
	0180766D37	CABLE ASSEMBLY, 4- conductor including P1205
	0180766D47 including:	VOLTAGE PROBE ASSEMBLY (red) includes:
	• (see above)	• P1203
	• 2982676C02	• PROBE, test (red)
	0180766D48 including:	VOLTAGE PROBE ASSEMBLY (black) includes:
	• (see above)	• P1204
	• 2982676C01	PROBE, test (black)

Diagnostic Metering Panel (continued)

TRN5174B Diagnostic Metering Panel Circuit Board

Reference	Part Number	Description
Symbol		-
	Capacito	or, fixed
C1201	2113741B25	1500 pF, ±5%; 50 v
C1202, 1203	0811051A13	0.1 μF, ±5%; 63 v
C1204	2113740B57	220 pF, ±5%; 50 v
C1205	2384568T01	2200 μF, +100 -10%
C1206, 1207	2313748G25	333 μF, ±20%; 35 v
C1208	0811051A13	0.1 μF, ±5%; 63 v
C1209, 1210	2313748G04	1 μF, ±20%; 50 v
C1211	2113741B25	1500 pF, ±5%; 50 v
C1212 through 1214	0811051A13	0.1 μF, ±5%; 63 v
C1215, 1216	2113740B57	220 pF, ±5%; 50 v
C1217	2113741B25	1500 pF, ±5%; 50 v
C1219	2313748G18	47 μF, ±20%; 25 v
C1221	2384568T02	1000 μF, 20 v
C1222	2313748G18	47 μF, ±20%; 25 v
C1223 through 1228	2113741B45	0.01 μF, ±5%; 50 v
C1230 through 1235	2113741B45	0.01 μF, ±5%; 50 v
C1236	0811051A16	0.33 μF, ±5%; 63 v
C1240, 1241	2113741B45	0.01 μF, ±5%; 50 v
C1242	2113740B57	220 pF, ±5%; 50 v
C1244	2113740B32	20 pF, ±5%; 50 v
C1245	0811051A08	0.015 μF, ±5%; 63 v
C1246	2113740B32	20 pF, ±5%; 50 v
C1247	2113740B65	470 pF, ±5%; 50 v
C1250	2113741B45	0.01 μF, ±5%; 50 v
	Diode (S	ee Note)
CR1201, 1202	4813833C10	0.1 A, 70 V
CR1203	4882290T01	Schottky type
CR1204 through 1216	4813833C10	0.1 A, 70 v
	Light Emitting I	Diode (See Note)
DS1201 through 1216	4885142U03	4-element array
DS1217, 1218	4882771L03	7-segment display (red)

TRN5174B Diagnostic Metering Panel Circuit Board (continued)

Reference Symbol	Part Number	Description
<u> </u>	Fu	se
F1201	6582408R01	3A, 125 v
	Conn	ector
J1201	2883935N01	plug: 40-contact
J1202	0983112N02	receptacle: 8-contact
J1203	0988254C03	receptacle: test (red)
J1204	0988254C01	receptacle: test (black)
J1205	2813922A04	plug: 4-contact
	Indu	ıctor
L1201	2582786N02	620 UH
	Transistor	(See Note)
Q1201 through 1204	4813824A22	PNP
Q1205 through 1220	4813824A06	NPN
Q1221	4800869653	type JFET
	Resisto	or, fixed
R1201 through 1204	0611077B15	47K, ±5%; 1/8W
R1205	0611077A87	3.6K, ±5%; 1/8W
R1206 through 1212	0611077B15	47K, ±5%; 1/8W
R1217, 1218	0611077B15	47K, ±5%; 1/8W
R1219 through 1222	0611077A81	2K, ±5%; 1/8W
R1223 through 1226	0611009A23	82 ohms, ±5%; 1/4W
R1227	0611077A81	2K, ±5%; 1/8W
R1228	0611077B30	200K, ±5%; 1/8W
R1229	0611077B39	470K, ±5%; 1/8W
R1232	0611009A42	510 ohms, ±5%; 1/4W
R1233	0611077B10	30K, ±5%; 1/8W
R1234	0611077A87	3.6K, ±5%; 1/8W
R1235	0611077B23	100K, ±5%; 1/8W
R1236	0611077A81	2K, ±5%; 1/8W
R1237	0611009A34	240 ohms, ±5%; 1/4W
R1238, 1239	0611009A10	24 ohms, ±5%; 1/4W
R1240	0611009A42	510 ohms, ±5%; 1/4W

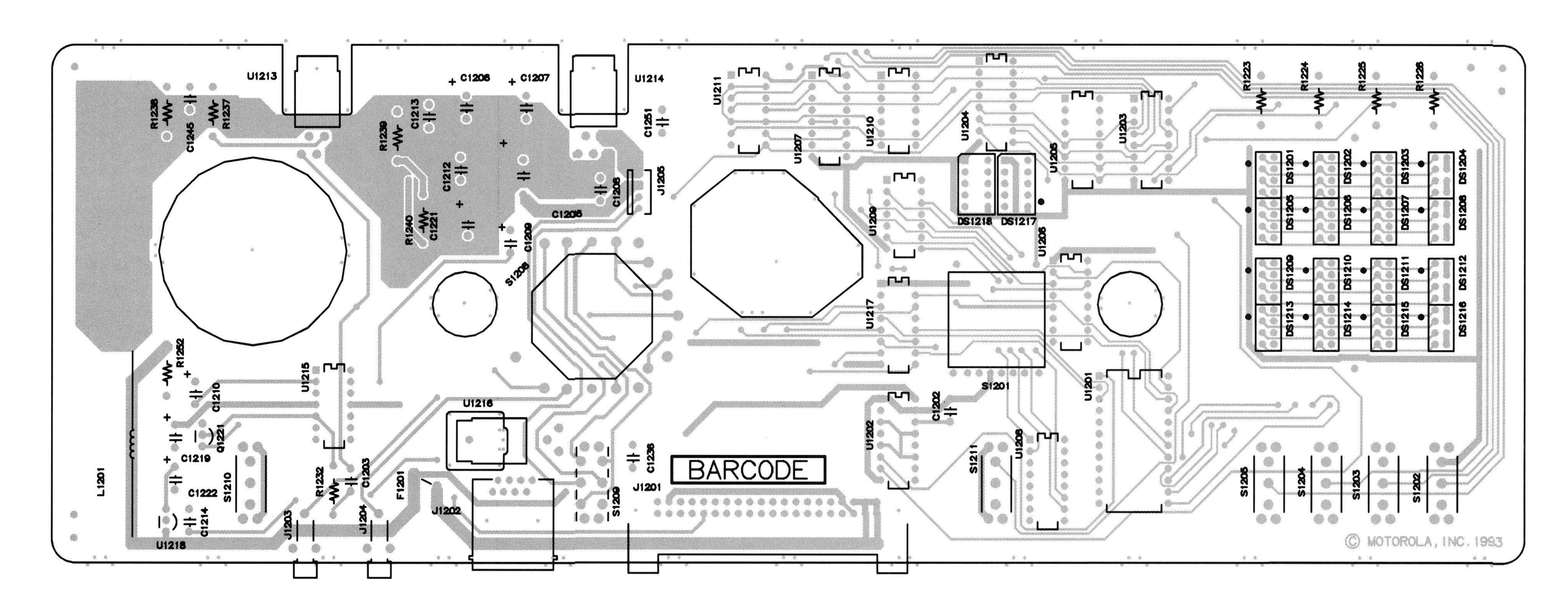
Diagnostic Metering Panel (continued)

TRN5174B Diagnostic Metering Panel Circuit Board (continued)

(continued)				
Reference Symbol	Part Number	Description		
R1241, 1242	0683962T01	1 ohm, ±5%; 1W		
R1243	0611077F56	4.32K, ±1%; 1/8W		
R1244	0611077F53	4.02K, ±1%; 1/8W		
R1245, 1246	0611077B39	470K, ±5%; 1/8W		
R1247	06110 77B 30	200K, ±5%; 1/8W		
R1248	0611077B39	470K, ±5%; 1/8W		
R1250	0611077B02	13K, ±5%; 1/8W		
R1251	06110 77 A94	6.8K, ±5%; 1/8W		
R1252	0611009A23	82 ohms, ±5%; 1/4W		
R1253 through 1268	0611077B02	13K, ±5%; 1/8W		
R1286 through 1289	0611077B15 47K, ±5%; 1/8W			
R1290, 1291	0611077B02	13K, ±5%; 1/8W		
R1293	0611077B10	30K, ±5%; 1/8W		
R1294	0611077A74	1K, ±5%; 1/8W		
	Swi	itch		
S1201	4084226N01	rotary: 16-position		
S1202 through 1205	4083685N04	toggle, SPDT		
S1208	4084449N01	rotary: 7-position		
S1209	4083685N06	toggle, DPDT		
S1210	4083685N04	toggle, SPDT		
S1211	4083685N08	toggle, SPDT, center off		
	Integrated Circ	cuit (See Note)		
U1201	5184887K47	4-Bit Latch/4-to-16 Line Decoder		
U1202	5184887K43	Dual Monostable Multivibrator		
U1203	5184118K25	Quad Type D Flip-Flop		
U1204, 1205	5184704M28	BCD to Hex 7-segment Latch/Decoder/Driver		
U1206	5184887K01	Inverting Hex Buffer		
U1207, 1208	5113806D15	Latch, 4-Bit Bi-Stable		
U1209	5113806D24	Quad 2-Input OR Gate		
U1210	5184118K84	Dual 5-Input NOR Gate		
U1211	5184118K28	Quad 2-input Positive NAND Gate with Open Collector Outputs		
U1213, 1214	5183222M57	Class B audio power amplifier		

TRN5174B Diagnostic Metering Panel Circuit Board (continued)

Reference Symbol	Part Number	Description
U1215	5113819D04	General Purpose Differential Operational Amplifier
U1216	5184320A47	+5V Voltage Regulator
U1217	5184704M19	Hex Level Shifter/Logic Level Converter
U1218	5113816J01	+5V Voltage Regulator
	Mechani	cal Parts
	0982425R01	FUSEHOLDER (used with F1201)
	3683144N01	KNOB, control (2 used)
	5483865R01	LABEL, bar code: 1/4" wide, white
	5484960T01	LABEL, bar code: 6.3 x 12.7 MM, white

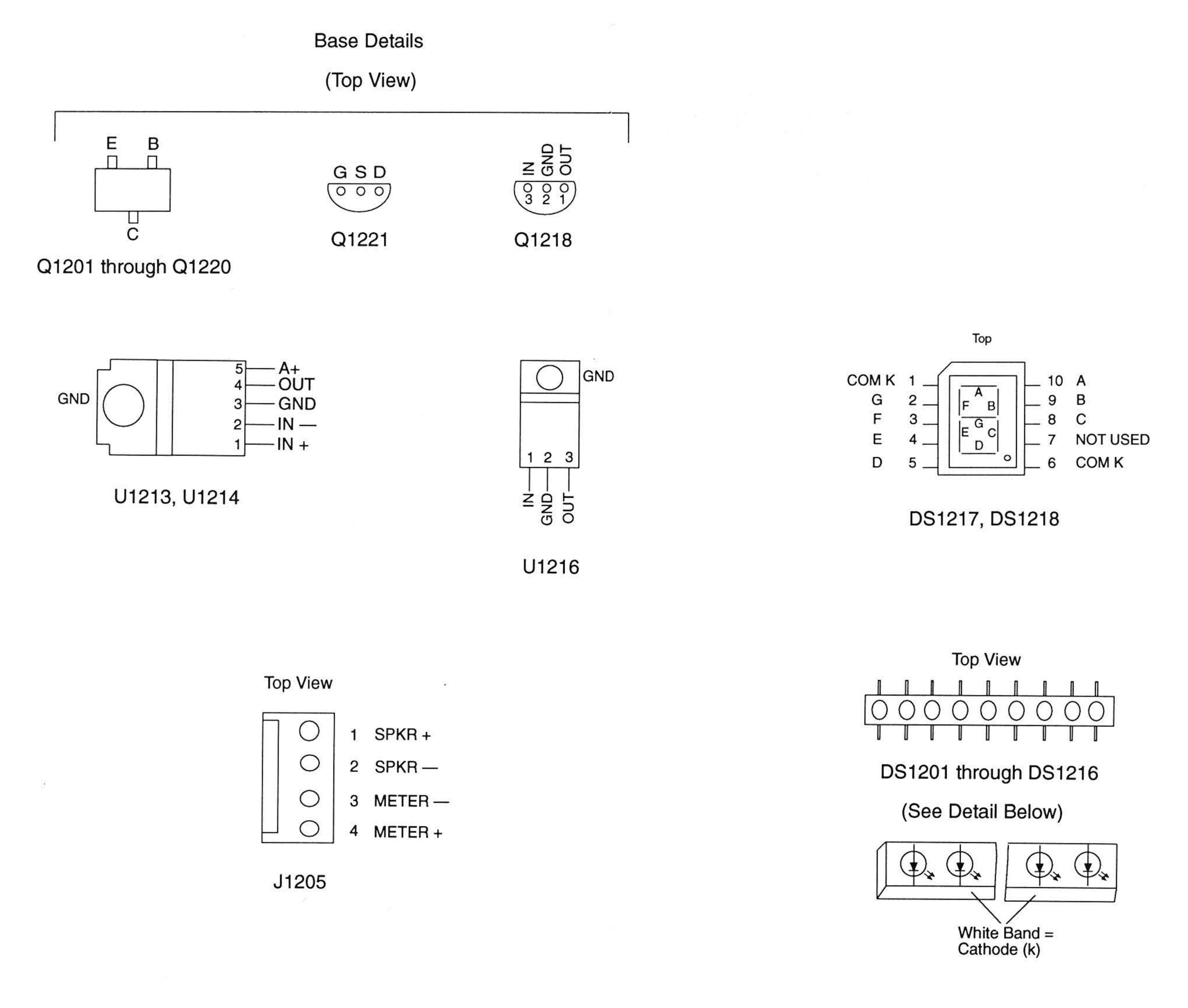


Shown from Component Side

BD—EEPS-36182-C
 OL—EEPS-35184-C

TLN2418A Radio Metering Panel TLN2419A Diagnostic Metering Panel

Circuit Board Detail

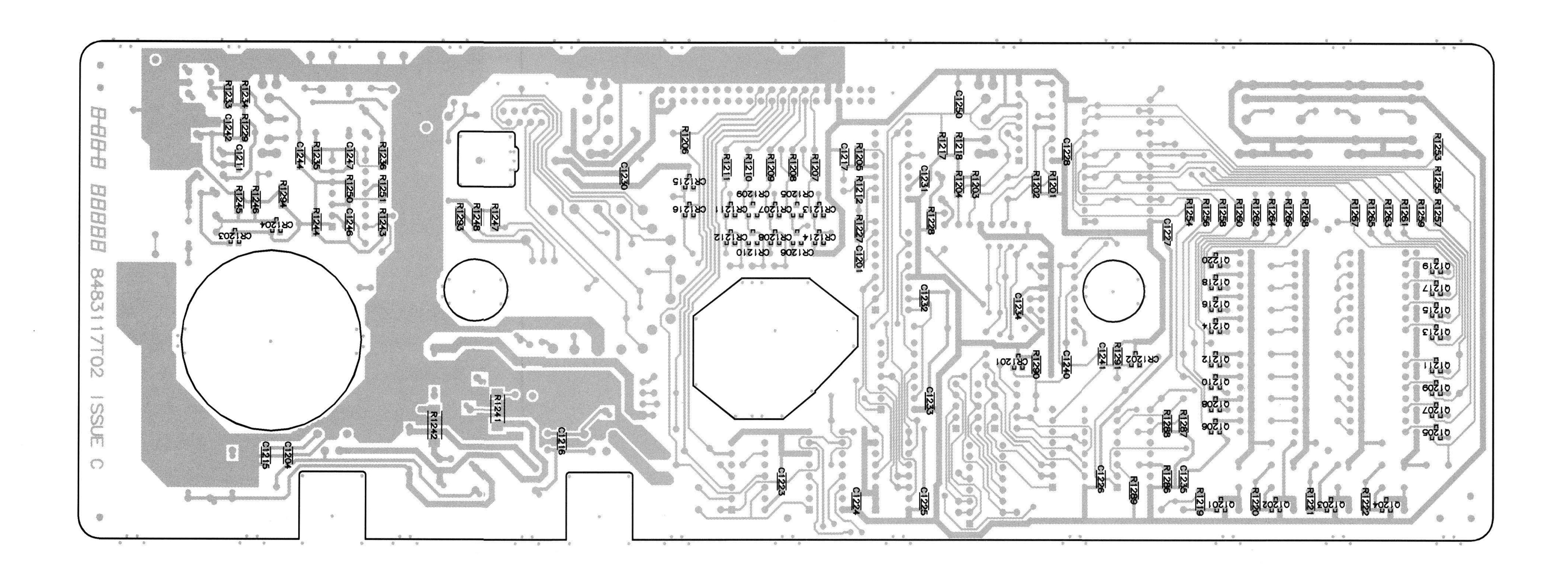


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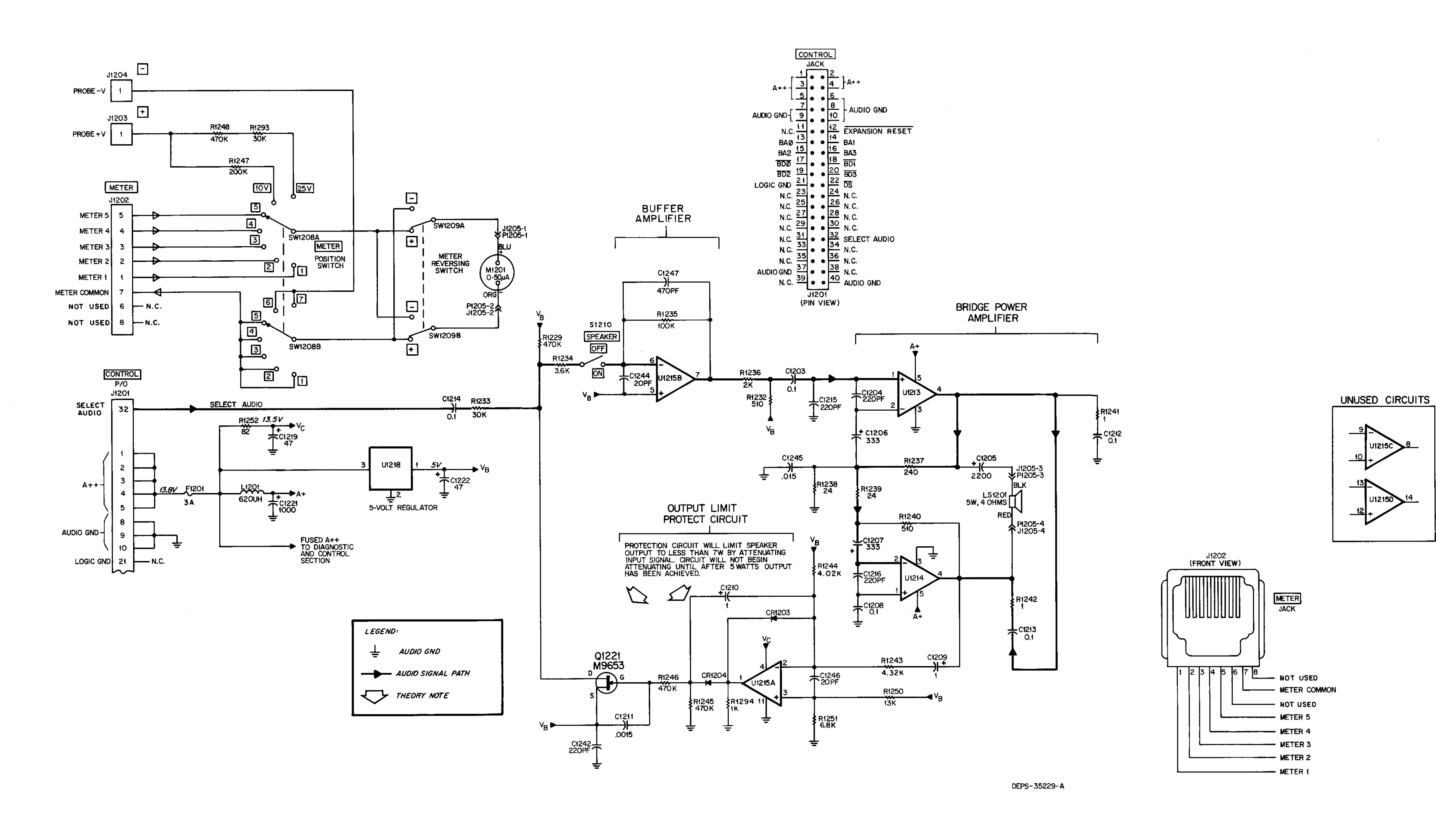
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TLN2418A Radio Metering Panel TLN2419A Diagnostic Metering Panel

Circuit Board Detail



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TLN2418A Radio Metering Panel TLN2419A Diagnostic Metering Panel

Schematic Diagram

Note:

 Unless otherwise specified, all resistor values are in ohms and all capacitor values are in microfarads.

Integrated Circuit Data Chart

Reference Designator	A+	Audio Ground	Description
U1213	5	3	Power Amplifier
U1214	5	3	Power Amplifier
U1215	Vc=4	11	Quad Differential-Input Operational Amplifier
U1218			5-Volt Regulator: Pin 1 = 5 V Pin 2 = Audio Gnd Pin 3 = Fixed A+

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