MOTOROLA

MITREK PLUS™

Two-Way FM Radio

Options B432 and B486

SUPPLEMENT to Instruction Manual

68P81045E65	Low Band
68P81045E70	High Band
68P81045E75	UHF Band

THIS MANUAL HAS BEEN
DISCONTINUED

68P81046E05-B

MITREK PLUS™

OPTIONS B432 AND B486

1. DESCRIPTION

1.1 The **MITREK PLUS** radio is a mobile radio intended for use in critical applications. It is similar to the basic **MITREK** radio with enhanced specifications in three categories, (1) reduced transmitter distortion, (2) increased receiver selectivity, (3) increased audio power output with reduced distortion. This supplement defines the specific differences between **MITREK PLUS** and the basic **MITREK** radio. For all other specific details not covered in this supplement, refer to the manual for the basic **MITREK** radio of the applicable band;

Low Band	68P81045E65
High Band	68P81045E70
UHF Band	68P81045E75

1.2 Section 2 of this supplement gives the model structure differences for the **MITREK PLUS** radios. First, it gives the new models applicable to all bands, then the model differences for each band, and finally the models established for options used with the **MITREK PLUS** radios. Section 3 gives the specific differences between the **MITREK PLUS** units and the comparable units described in the **MITREK** manual. Section 4 highlights the few differences in installation procedures and section 5 gives the single difference in alignment required for the **MITREK PLUS** radio.

1.3 The specifications for the **MITREK PLUS** radios are the same as those shown for the standard **MITREK** radios except as shown in Table 1.

Table 1. MITREK PLUS Specifications

	B432	B486
Transmitter Distortion	2%	2%
Receiver Selectivity		
Low Band	100 dB (20 kHz)	100 dB (20 kHz)
High Band	100 dB (30 kHz)	100 dB (30 kHz)
UHF Band	90 dB (25 kHz)	90 dB (25 kHz)
Audio Power	12 watts	10 watts
Receiver Distortion	3%	3%

1.4 Option B486 is a special purpose radio. All **MITREK PLUS** changes are made to the radio for B486 but it uses the conventional **MITREK** cable kits shown in the **MITREK** manual. A new speaker kit (HSN4009A with radio; HSN4010A with Systems 90) is used but this high power speaker uses a two-wire cable and connects in the same manner as the conventional **MITREK** speaker.

2. MODEL COMPLEMENT

2.1 ALL BANDS

The following models are applicable to all **MITREK PLUS** models.

Table 2. Changes Applicable to All Bands

Model	Description	Replaces
HSN4007A	Speaker (B432)	HSN4000A
HSN4009A	Speaker (B486)	HSN4000A
HKN4060A	Cable, Low Power, 4-Freq.	HKN4000 A/1A
HKN4056A	Cable, High Power, 4-Freq.	HKN4016A/7A

2.2 UHF BAND

The following models are used on **MITREK PLUS** models in the UHF band.

Table 3. Changes Applicable to UHF Models

Model	Description	Replaces
HUE1073B	Chassis, 30 W, 403-420 MHz	HUE1001B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1074B	Chassis, 30 W, 450-512 MHz	HUE1002B
HLE4122B	Main Board, 450-512 MHz	HLE4002C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1083B	Chassis, 50 W, 403-420 MHz	HUE1011B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1084B	Chassis, 50 W, 450-512 MHz	HUE1012B
HLE4122B	Main Board, 450-512 MHz	HLE4012C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1116B	Chassis, 75/100 W, 403-420 MHz	HUE1031B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4198B	Hardware Kit	HLN4036B
HUE1094B	Chassis, 75/100 W, 450-512 MHz	HUE1032B
HLE4122B	Main Board, 450-512 MHz	HLE4002C
HLN4192A	Interconnect Board	HLN4044A
HLN4198B	Hardware Kit	HLN4036B

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2.3 HIGH BAND

The following models are used on **MITREK PLUS** models in high band.

Table 4. Changes Applicable to High Band Models

Model	Description	Replaces
HUD1053B	Chassis, 40 W, 136-146 MHz	HUD1001B
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1054B	Chassis, 40 W, 146-174 MHz	HUD1002B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1063B	Chassis, 60 W, 136-146 MHz	HUD1011B
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1064B	Chassis, 60 W, 146-174 MHz	HUD1012B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1074B	Chassis, 75/110 W, 146-174 MHz	HUD1032B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4199A	Hardware Kit	HLN4037A
HUD1082B	Chassis, 75/110 W, 136-146 MHz	
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4199A	Hardware Kit	HLN4037A

2.4 LOW BAND

The following models are used on **MITREK PLUS** models in low band.

Table 5. Changes Applicable to Low Band Models

Model	Description	Replaces
HUB1043B	Chassis, 60 W, 29.7-39 MHz, Non-Extender	HUB1001B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1044B	Chassis, 60 W, 39-50 MHz, Non-Extender	HUB1002B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1053B	Chassis, 110 W, 29.7-39 MHz, Non-Extender	HUB1011B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4039A
HUB1054B	Chassis, 110 W, 39-50 MHz, Non-Extender	HUB1012B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4039A
HUB1063B	Chassis, 60 W, 29.7-39 MHz, Extender	HUB1021B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1064B	Chasis, 60 W, 39-50 MHz, Extender	HUB1022B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1073B	Chassis, 110 W, 29.7-39 MHz, Extender	HUB1031B
HLN4192A	Interconnect Board	HLN4044A
HLN4200A	Hardware Kit	HLN4039A
HUB1074B	Chassis, 110 W, 39-50 MHz, Extender	HUB1032B
HLN4192A	Interconnect Board	HLN4044A
HLN4200A	Hardware Kit	HLN4039A

2.5 OPTIONS

The following models were established to replace comparable models in the various **MITREK** option kits when used with the **MITREK PLUS** radios.

Table 6. Models Used with Options

Model	Description	Replaces
HSN4008A	Speaker, Systems 90, for B432	HSN4002A
HSN4010A	Speaker, Systems 90, for B486	HSN4002A
HKN4055A	Cable Kit, High Power, Positive Ground, 4-Freq., Control Head	HSN4022A
HKN4057A	Cable Kit, Low Power, Positive Ground, 4-Freq., Systems 90	HSN4009A
HKN4058A	Cable Kit, Low Power, Negative Ground, 4-Freq., Systems 90	HSN4008A
HKN4059A	Cable Kit, Low Power, Positive Ground, 4-Freq., Control Head	HSN4006A
HKN4061A	Cable Kit, High Power, Positive Ground, 4-Freq., Systems 90	HSN4024A
HKN4062A	Cable Kit, High Power, Negative Ground, 4-Freq., Systems 90	HSN4023A

3. SPECIFIC CHANGES

3.1 UHF RADIOS

3.1.1 The following parts shown in Table 7 have been added to the conventional UHF main boards to form the UHF main boards used with **MITREK PLUS** radios.

3.1.2 Part values are changed from the values used in the conventional UHF main boards to form the UHF main boards used in **MITREK PLUS**. The changed values are shown in Table 8.

3.1.3 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

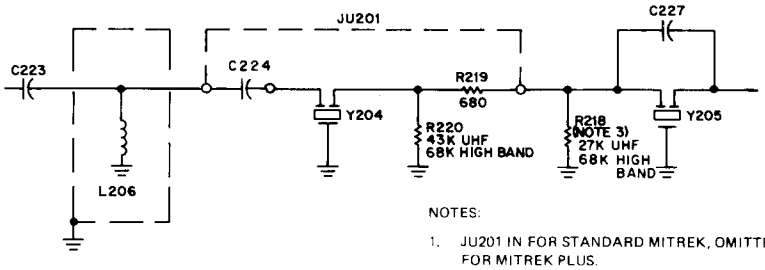
3.2 HIGH BAND RADIOS

3.2.1 The following parts shown in Table 9 have been added to the high band main boards to form the high band main boards used with **MITREK PLUS** radios.

3.2.2 The following part values are changed from the values used in the high band main boards for the high band main boards used in **MITREK PLUS**.

*Table 7. Added Parts for **MITREK PLUS** UHF Main Boards*

Reference Designation	Added		Motorola Part No.	Description
	From	To		
R219	See Figure 1		6-124A45	680 ohm ± 5%
R220	See Figure 1		6-124A88	43k ± 5%
Y204	See Figure 1		48-84396K02	Coupled Resonator; 10.7 MHz



NOTES:

1. JU201 IN FOR STANDARD MITREK, OMITTED FOR MITREK PLUS.
2. C224, Y204, R219, R220, IN FOR MITREK PLUS, OMITTED FOR STANDARD MITREK.
3. R218 IS 18K IN STANDARD MITREK.

*Figure 1. Simplified Schematic Diagram for Added I-F Filter for UHF and High Band **MITREK PLUS** Radios*

*Table 8. Values Changed for **MITREK PLUS** UHF Main Boards*

Reference Designation	Motorola Part No.	Description
R218	6-124A83	27k ± 5%
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401

*Table 9. Added Parts for **MITREK PLUS** High Band Main Boards*

Reference Designation	Added		Motorola Part No.	Description
	From	To		
R219	See Figure 1		6-124A45	680 ohm ± 5%
R220	See Figure 1		6-124A83	27k ± 5%
Y204	See Figure 1		48-84396K02	Coupled Resonator; 10.7 MHz

*Table 10. Values Changed for **MITREK PLUS** High Band Main Boards*

Reference Designation	Motorola Part No.	Description
C227	21-82450B20	0.68 pF
R218	6-124A93	68k ± 5%
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401
C208	21-84493B27	51 pF
C210	21-83406D68	24 pF
C213	21-82450B20	0.68 pF
C214	21-84493B31	57 pF, NP0
C215	21-84494B03	80 pF, NP0
C222	21-82610C71	90 pF, NP0
C223	21-84494B03	80 pF, NP0
C224	21-83406D56	24 pF
R207	6-124A93	68k ± 5%
R209	6-124A93	68k ± 5%

3.2.3 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

3.3 LOW BAND

3.3.1 The following part values shown in Table 11 are changed from the values used in the conventional low band **MITREK** main boards to form the low band main boards used in **MITREK PLUS**.

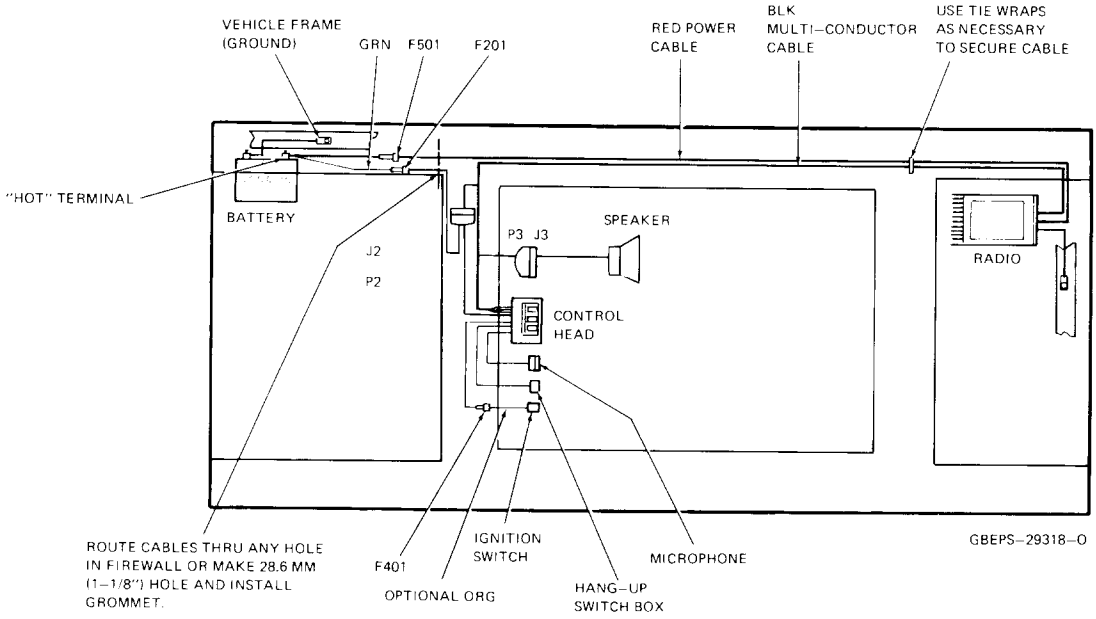


Figure 2. Power Connection Installation Details

*Table 11. Values Changed for **MITREK PLUS** Low Band Main Boards*

Reference Designation	Motorola Part No.	Description
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401

3.3.2 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

3.4 RADIO CABLES

A new set of cables have been established to connect the **MITREK PLUS** radio to the control head or the **SYSTEMS 90** Alternate Control Module. Cable connection details are given in instruction section 68P81044E34 located at the end of this section. **SYSTEMS 90** information appears in instruction section 68P81110E50.

3.5 SPEAKERS

New speakers have been established for use with the **MITREK PLUS** radios; the HSN4007A (B432) or HSN4009A (B486) Speaker is used with the standard control head and the HSN4008A (B432) or HSN4010A (B486) is used with the **SYSTEMS 90** options. Interconnect information for the speakers is shown in the radio cable instruction section 68P81044E34. **SYSTEMS 90** information appears in instruction section 68P81110E50.

CAUTION

Be careful not to connect a **MITREK PLUS** radio to standard **MITREK** speakers that are not capable of handling the high power of **MITREK PLUS**. Only speakers capable of handling 30 watts, with an impedance of 3.2 ohms, should be connected to **MITREK PLUS** or to the **MITREK PLUS SYSTEMS 90** public address option.

3.6 HANDSET HANGUP BOX

The **MITREK PLUS** radio uses either a Model HLN4196A or HLN4197A Handset Hangup Box for the Model TMN6057A Handset. For proper application, see Note 8 in the Radio Cable section, 68P81040E34. The HLN4196A and HLN4197A are the same as the standard **MITREK** handset hangup boxes, except they both use a different cable assembly (Motorola part number 1-80705T18) instead of those indicated in the standard **MITREK** instruction manual.

4. INSTALLATION

4.1 The **MITREK PLUS** radio is installed in the same manner as the standard **MITREK** radio described in the instruction manual except for cable installation and speaker installation. Use Figure 2 in place of the power connection detail on the **MITREK** installation sheet. If routing of cables is impossible due to the Molex connectors J2 and P3, the pins can be removed from these connectors using a ST-946 Extraction Tool available from the National Parts department.

4.2 When installing the speaker, use Figure 2 in place of Detail B of the Control Head, Speaker, and Accessories section of the standard **MITREK** Installation Procedure sheet 68P81109E32.

5. ALIGNMENT

The alignment procedure for **MITREK PLUS** radios is the same as that for the conventional **MITREK** radios except that less than 3% receiver audio distortion cannot be guaranteed using this test equipment. To improve audio distortion to less than 3%, a final receiver oscillator warp step (UHF-Step 15; High and Low bands-Step 13) may be necessary. For this step, an HP331A Distortion Analyzer (or similar equipment with floating input terminals) is connected across the speaker. Proceed as follows:

For each frequency, set the rf signal generator to the carrier frequency (±30 Hz for low band or ±100 Hz for high band or UHF) and adjust signal level for 1 mV into the radio. While measuring distortion with the signal generator set for 1 kHz modulation ±3 kHz deviation, warp each receiver oscillator for minimum distortion.

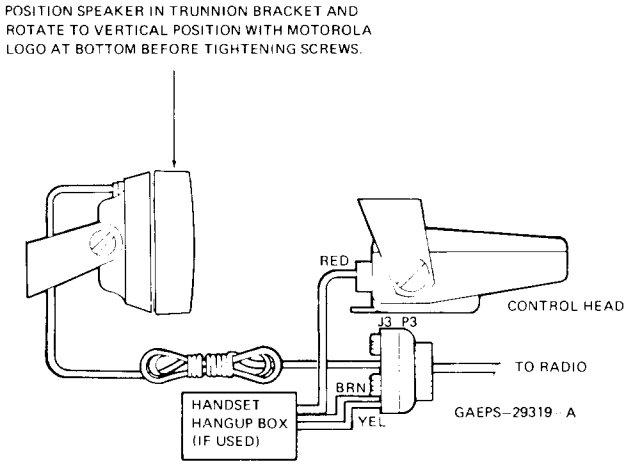


Figure 3. Control Head Connection Detail

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parts list

Power High	Power Low	
HKN4055A	HKN4059A	Positive Ground, Control Head
HKN4056A	HKN4060A	Negative Ground, Control Head
HKN4061A	HKN4057A	Positive Ground, Systems 90
HKN4062A	HKN4058A	Negative Ground, Systems 90 PL-6775-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F201	65-86099	7.5A; 32 V
F501	65-61682	25A; 32 V (HKN4057A-4060A)
		connector, receptacle:
J2	—	consists of:
	9-80008C01	5-pin
	29-82336A01	PIN, female; 5 used
J3	—	consists of:
	9-80008C02	15-pin
	29-82336C01	PIN, female; 15 used
		connector, plug:
P1	—	consists of:
	9-801050	CONNECTOR, female; 19-contact
	15-82075D04	HOUSING, connector; left half
	15-82075D05	HOUSING, connector; right half
	2-7019	NUT, hex: 4-40 x 3/32"; 2 used
	3-135198	SCREW, machine: 4-40 x 1-1/8"; 2 used
	3-132127	
	or 3-140049	SCREW, tapping: 6-20 x 3/4"; 2 used
	4-11722	WASHER, "C"
	4-800671	WASHER, flat
	4-82113D01	WASHER, flat
	1-80701T52	SCREW and KNOB, assembly
	42-80168A01	CLIP, strain relief
P2	—	consists of:
	28-80009C01	5-pin
	29-82335A01	PIN, male; 5 used
P3	—	consists of:
	28-80009C02	15-pin
	29-82335A01	PIN, male; 15 used
P101	29-82602P01	PIN, terminal; 15 used (control head models)
or P101		consists of:
	14-84556B01	HOUSING, connector; BLK, 22-position
	9-84151B03	CONTACT, receptacle; 20 used (Systems 90 models)
P102	—	consists of:
	14-84590B02	HOUSING, connector; BLU, 6-position
	9-84151B03	CONTACT, receptacle; 5 used (Systems 90 models)
		wire assembly:
W1	—	CABLE, multi-conductor includes ref item P3 and:
	30-84875E01	CABLE, 27-conductor; 17' (HKN4055A-4062A)
	37-82378B12	SLEEVING; GRY, 1-1/2"
	37-00061347	SLEEVING; GRY, 1" (low power only)
W2	—	LEAD and FUSE ASSEMBLY (GRN) includes ref. item F201, J2, and:
	30-10310D07	CABLE, battery; GRN, #14 ga. str.
	37-82603D04	SLEEVING, coded no. 4
	29-82602D01	TERMINAL, pin; 2 used
	37-82603D19	SLEEVING, coded no. 19
	29-136968	LUG, solder
	or 29-82607B03	LUG, ring tongue
	or 29-832914	LUG, ring tongue
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885A01	SPRING, fuse compression
W3	—	CABLE; includes ref item F501, W5 (on HKN4057A-4060A) and:
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885H01	SPRING, fuse compression
	29-84528B02	LUG, ring tongue
	30-858553	CABLE, battery: RED; 20' (HKN4058A, 4060A)
	or 30-858552	CABLE, battery: BLK; 20' (HKN4057A, 4059A)
	30-812505	CABLE, battery: RED; 18' (HKN4056A, 4062A)
	or 30-851875	CABLE, battery BLK; 18' (HKN4055A, 4061A)
W4	—	LEAD, ground consists of:
	30-858552	CABLE, battery BLK; 5-1/2' (HKN4058A, 4060A)
	or 30-851875	CABLE, battery BLK; 5-1/2' (HKN4056A, 4062A)
	or 30-858553	CABLE, battery RED; 5-1/2' (HKN4057A, 4059A)
	or 30-812505	CABLE, battery; RED; 5-1/2' (HKN4055A, 4061A)
	29-84528B05	LUG, ring tongue (HKN4055A, 4056A, 4061A, 4062A)
	or 29-84528B02	LUG, ring tongue (HKN4057A-4061A)

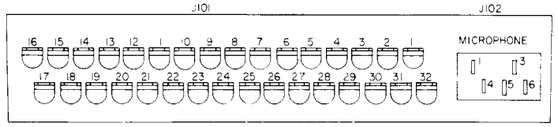
HKN4040A Fused Lead, Positive Ground
HKN4041A Fused Lead, Negative Ground PL-6245-A

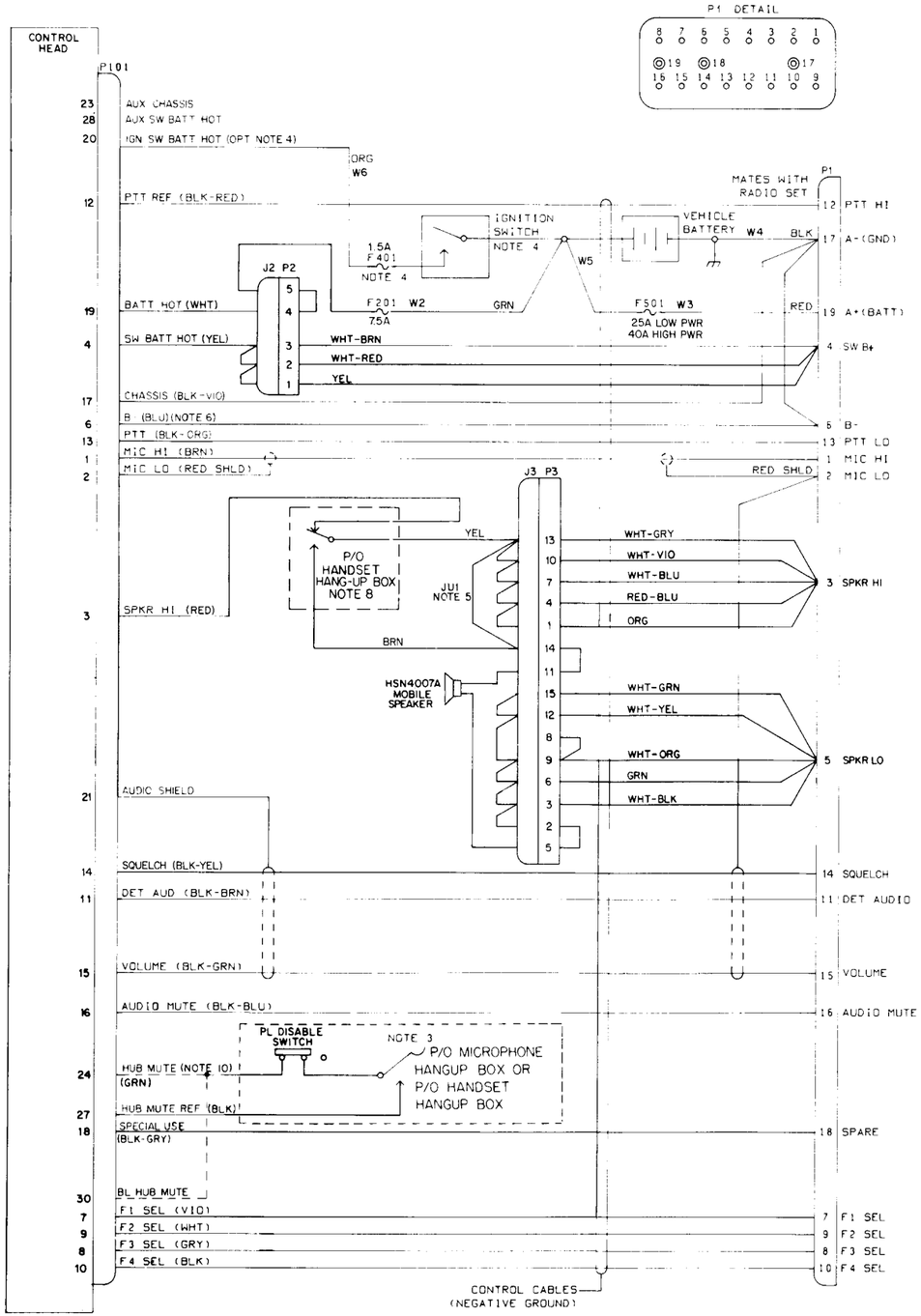
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F501	65-61683	FUSE: 40A; 32 V
W5	—	LEAD, fused; consists of:
	30-812505	CABLE, battery: RED; 2-1/2' (used on HKN4056A, 4062A)
	or 30-851875	CABLE, battery: BLK; 2-1/2' (used on HKN4055A, 4061A)
	29-84528B05	LUG, ring tongue
	9-84277B01	RECEPTACLE, fuse
	3-400465	SCREW, tapping
	42-84275B01	RETAINER, fuse
	38-84383D01	CAP, protection

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
W5	—	Part of W3 for low power radios (HKN4057A-4060A) HKN4041A for high power negative ground (used with HKN4056A, 4062A) HKN4040A for high power positive ground (used with HKN4055A, 4061A)
W6	—	p/o Ignition sense lead option. See Accessories section 68P81039E26 in the Servicing manual.

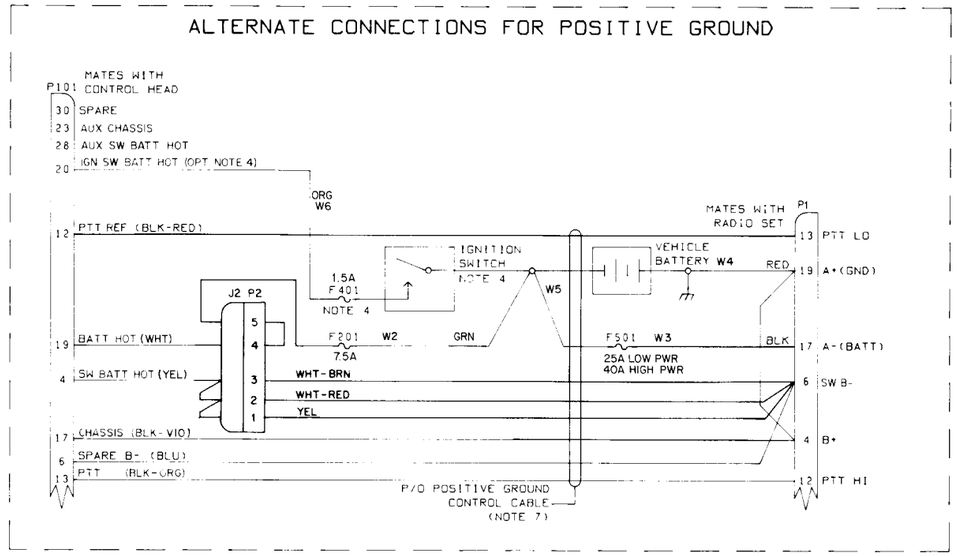
MITREK PLUS™ RADIO CABLES

MODELS HKN4055-62A





DETAIL A



NOTES:

1. Unless otherwise specified:
   Resistor values are in ohms.
   Capacitor values are in microfarads.

2. S103 is normally used for PL monitor. However, it may be used as a spare switch for special purpose. In this case JU104 is installed to complete audio mute path to hangup box.

3. Mic hangup box used for PL/DPL radios:
   Hangup box shown off-hook. If S103 is omitted or used for special purpose, a HLN4025A Hangup Box is used. This hangup box includes a slide switch for PL monitor.

4. Orange ignition switch wire is optional. When this option is installed, transmitter use requires ignition switch to be on; radio may be used in receive only mode with ignition switch off. JU101 must be omitted.

5. JU1 (J3-11 to J3-13) omitted when handset hangup box is used.

6. Omitted.

7. Detail A shows connection differences for positive ground cables. All other connections are identical to those shown for negative ground control cables at left.

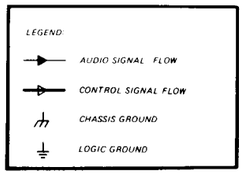
8. The HLN4197A Handset Hang-Up Box is normally used in handset applications (hookswitch shown in off-hook position). An HLN4196A Handset Hang-Up Box is used when S103 on the control head is not used for MONITOR.

9. Omitted.

10. When optional busy light circuit is used, hangup box mute lead (grn) is connected to pin 30 instead of pin 24.

Control Cable Model Chart

Model	Length (Feet)	No. of Channels (Note 8)	Ground Polarity (Note 7)	Power	Type
HKN4055A	17	4	+	High	Cont. Head
HKN4056A	17	4	—	High	Cont. Head
HKN4057A	17	4	+	Low	Sys. 90
HKN4058A	17	4	—	Low	Sys. 90
HKN4059A	17	4	+	Low	Cont. Head
HKN4060A	17	4	—	Low	Cont. Head
HKN4061A	17	4	+	High	Sys. 90
HKN4062A	17	4	—	High	Sys. 90



EEPS-29330-B

FUNCTION

The radio cable interconnects the control head or the Systems 90 Alternate Control Module and the mobile speaker to the **MITREK PLUS** radio. It includes the primary power connections.

END OF DOCUMENT

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