

Chapter 4

Control Heads/Control Microphones Specific Information

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Chapter 4B

Control Head for Radio Model N3

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Chapter 4B.1

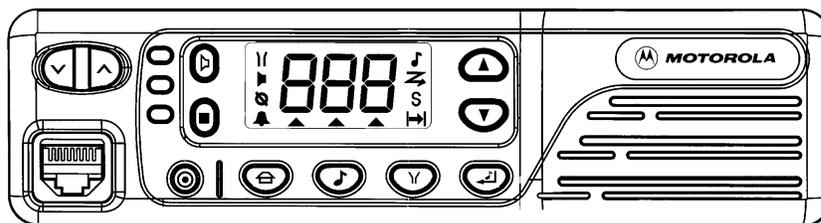
Introduction/Theory of Operation

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1.0 Overview

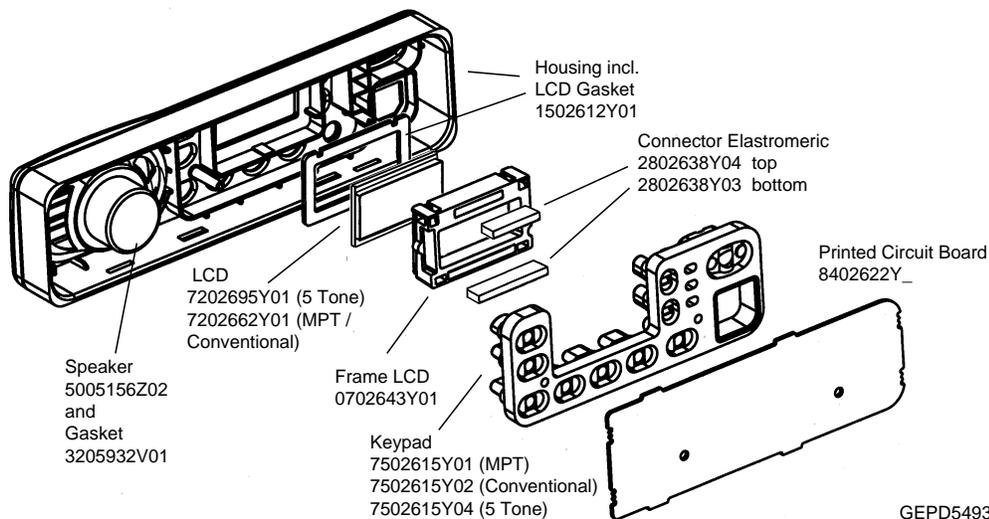
128 Channel, Radio Model N3 Control Head



The features of the N3 radio control head are as follows:

- On/Off Button
- Rocker Type Volume Up/Down Control
- 3 digit, 7 segment Backlit LCD display
- 8 LCD Annunciators/Icons
- 3 LEDs (Red, Yellow, Green)
- Up/Down keys for Channel Increment/Decrement
- 6 Dealer Programmable Option Buttons
- Internal 4W Loudspeaker

2.0 Exploded View Diagram



3.0 Theory of Operation

3.1 General

The Control Head contains the internal speaker, the microphone connector, several buttons to operate the radio, and several indicator Light Emitting Diodes (LED) to inform the user about the radio status.

Additionally, the control head uses a 3 digit / 7 segment Liquid Crystal Display (LCD) for the numerical information e.g. channel number, select code.

3.2 Power Supplies

The power supply to the Control Head is taken from the host radio's FLT A+ voltage via connector J0901 pin 2 and the regulated +5V via connector J0901 pin 10. The voltage FLT A+ is at battery level and is used for the LEDs, the back light and to power up the radio via the On / Off button. The stabilized +5 volt is used for the display, the display driver, the shiftregister and the keypad buttons.

3.3 Power On / Off

The On/Off button when pressed switches the radio's voltage regulators on by pulling ON OFF CONTROL to high via (D0925) and connects the base of (Q0925) to FLT A+. This transistor pulls the line ANALOG 3 to low to inform the μ P that the On/Off button is pressed. If the radio is switched off, the μ P will switch it on and vice versa. If the On/Off button is pressed and held while the radio is on, the software detects a low state on line ANALOG 3 and switches the radio off.

3.4 Keypad Keys

The Control Head keypad is an (11) - key keypad. All keys are configured as 3 analogue lines (ANALOG 1 2 3) to the radio. Lines ANALOG 1,2 each control four keys; line ANALOG 3 controls three keys. The voltage on the analogue lines varies between 0V and +5V depending on which key has been pressed. If a button is pressed, it will connect one of the 3 lines ANALOG 1,2,3 to a resistive voltage divider connected to +5V. The voltages of the lines are A/D converted inside the μ P and specify the pressed button.

3.5 Status LED and Back Light Circuit

All the indicator LEDs (4) and the back light LEDs (20) are driven by current sources (Q0942 - Q0944, Q0951, Q0952) and controlled by the μ P via SERIAL PERIPHERAL INTERFACE (SPI). The current is determined by the resistor at the emitter of the respective current source transistor. Shiftregister (U0941) stores the LED status. To update the LED status line LED CLCK BUF shifts the data of line SPI DATA BUF into the shiftregister. When all the data has been written, line LED CE is set to low for a few microseconds to update the output of the shiftregister with the new data.

3.6 Liquid Crystal Display (LCD)

The LCD display H0931 is a 3 digit / 7 segment display which incorporates (11) annunciators. Data is loaded serially into the display driver U0932 via the SPI interface. The display data of line SPI DATA BUF is shifted serially into the display driver by clock signal LCD CLCK BUF. When the last bit has been received, the LCD display is updated.

3.7 Microphone Connector

Signals BUS+, PTT, HOOK VPP, MIC HI, HANDSET AUDIO from the microphone connector (J0903) are fed to the radio's controller section via connector (J0901) .

3.8 Speaker

The Control Head contains a speaker for the receiver audio. The receiver audio signal from the differential audio output of the audio amplifier located on the radio's controller is fed via lines INT SPKR+, INT SPKR-, connector (J0901-18,17) to the speaker connector (J0902) pin 1 and pin 2. The speaker is connected to the connector (J0902) .

3.9 Electrostatic Transient Protection

Electrostatic transient protection is provided for the sensitive components in the Control Head by diodes (VR0901 - VR0909). The diodes limit any transient voltages to tolerable levels. The associated capacitors provide Radio Frequency Interference (RFI) protection.

3.10 Reversible Control Head

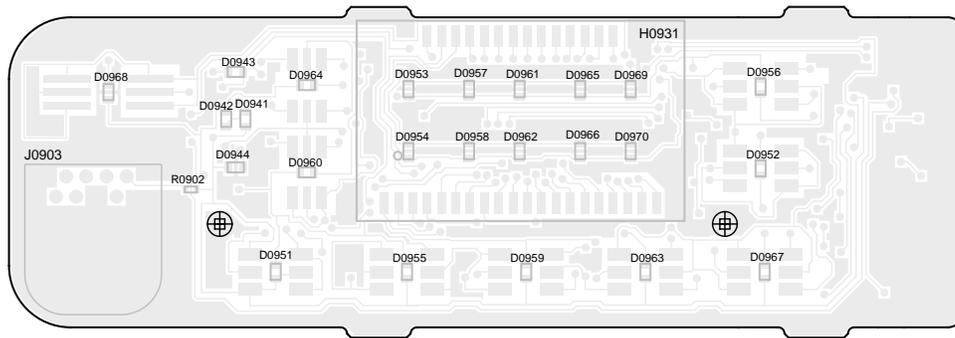
The control head is connected to the RF transceiver by means of a short flexible ribbon cable. This allows the control head to be mounted either way up in relation to the body of the transceiver. This means that the transceiver can be mounted in the most cosmetically pleasing and most efficient cooling orientation and still have the user interface the "right way" up.

Chapter 4B.2

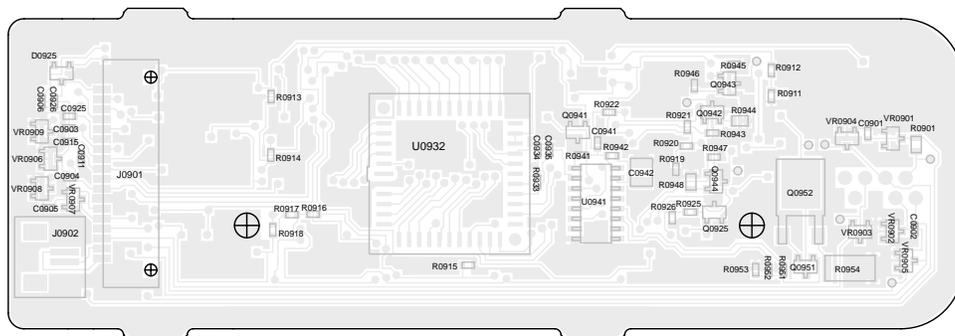
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Top Side



Bottom Side

Control Head (N3) Schematic Diagram

Control Head (N3)
Parts List

Circuit Ref	Motorola Part No.	Description
C0901	2113741F17	470pF 50V
C0902	2113741F17	470pF 50V
C0934	2113743K15	100nF 16V
C0935	2113741F49	10nF 50V
C0941	2113743K15	100nF 16V
C0942	2311049J23	TANT CP 10uF 10% 6V
D0925	4813833C02	DUAL SOT MMBD6100
D0941	4805729G73	LED SMT YEL
D0942	4805729G73	LED SMT YEL
D0943	4805729G74	LED SMT RED
D0944	4805729G75	LED SMT GREEN
D0951-D0970	4805729G75	LED SMT GREEN
H0931	7202631Y01	CNTL K DISPLAY
J0901	0902636Y01	CONN FLEX Side Entry
J0902	2809926G01	CONN 1.25MM CTR SUR
J0903	2805924V01	CONNECTOR MIC
Q0925	4880048M01	NPN DIG 47k/47k
Q0931	4805128M16	PNP SOT MMBT3906
Q0941	4880048M01	NPN DIG 47k/47k
Q0942	4813824A10	NPN 40V .2A B=50-150
Q0943	4813824A10	NPN 40V .2A B=50-150
Q0944	4813824A10	NPN 40V .2A B=50-150
Q0951	4813824A10	NPN 40V .2A B=50-150
Q0952	4813822A20	
R0901	0660076A35	270 5 1/8
R0902	0662057A49	1k 1/16W 5%
R0911-R0922	0662057A65	4k7 1/16W 5%
R0925	0662057A65	4k7 1/16W 5%
R0926	0662057A65	4k7 1/16W 5%
R0931	0662057A65	4k7 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R0932	0662057A73	10k 1/16W 5%
R0933	0662057A97	100k 1/16W
R0941	0662057A73	10k 1/16W 5%
R0942	0662057A89	47k 1/16W 5%
R0943	0662057A89	47k 1/16W 5%
R0944	0660076A35	270 5 1/8
R0945	0662057A89	47k 1/16W 5%
R0946	0662057A41	470 1/16W 5%
R0947	0662057A89	47k 1/16W 5%
R0948	0660076A35	270 5 1/8
R0952	0662057A80	20k 1/16W 5%
R0953	0662057A73	10k 1/16W 5%
R0954	0680194M01	10 1W 5%
U0932	5105625U61	LCD DRIVER 33 SEGMENT STATIC
U0941	5113806A35	MC14094, REG, 8-STAGE,SHIFT/STOREU
VR0901	4813830A14	5.1V 5% 225mW
VR0902	4813830A14	5.1V 5% 225mW
VR0903	4813830A27	14V 5% 225mW
VR0904	4813830A27	14V 5% 225mW
VR0905	4813830A27	14V 5% 225mW
VR0906	4813830A14	5.1V 5% 225mW
VR0907	4813830A14	5.1V 5% 225mW
VR0908	4813830A14	5.1V 5% 225mW