MOBILE RADIO

INSTRUCTIONS

FOR

TYPE 90 DECODER REPEATER CONTROL

OPTION 9512

(for MASTR II Stations)

CONTENTS

SPECIFICATIONS*

DF-5046

Power Input:	+10 VDC @ 25 mA +12.6 VDC @ 15 mA
Tone Frequencies:	1050 to 2550 Hz
Channel Spacing:	150 Hz
Response Time:	500 m sec. MAX
Temperature Range:	-30°C to +60°C
Bandwidth:	±1.5%

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate specification sheet for the complete specification.

DESCRIPTION

The General Electric Type 90 Tone Decoder 19D416924G1 is a completely solidstate pulse tone decoder for station application. The decoder uses a Frequency switchable Selective Amplifier (F.S.S.A.) hybrid circuit, which has excellent stability and reliability requiring no frequency adjustment. The decoder will operate with virtually any pulse tone encoder in the 1050 to 2550 Hz range. In repeater stations, the decoder detects the pulse-tone and locks up the five-second delay timer which keys the station transmitter. The delay circuit remains locked-up until there is a five second delay in the transmissions or until the transmission is complete. The decoder mounts in the control rack in the station repeater.

INSTALLATION

Refer to the Modification and Installation Diagram 19D417479 for the modification of the Control Shelf and the Repeater Control Board.

CIRCUIT ANALYSIS

Amplifier-Limiter

Audio from the audio coupler Hi is amplified by Q1 and Q2 which drives a limiter composed of CR2 and CR3. The decoder will decode with signals from 120 mV to 6 V rms.

Selective Amplifier (F.S.S.A.)

Selective Amp U1 is a very selective band-pass filter, which attenuates all frequencies except the tone frequency and provides approximately 25 dB gain to the proper tone frequency. Q3 operates as an emitter follower.

Detector Circuit

Transistors Q4, Q5 and Q6 make up a differential detector circuit. When an AC signal is present at the emitter of Q3, detector CR4 and C11 develop a DC voltage and Q4 begins to turn on, pulling the base voltage of Q6 down. Q6 turns on, charging C13 through R26. After approximately 300 milliseconds, Q7 will turn on. Q7 turns on Q8 and Q9. Q9 enables the tone switch in the five second delay timer. An output from the timer (repeater latch) is fed into the base of Q7 via R30 and CR7 to lock-up the system until the 5 second delay timer drops out.

Components R27, R28, R29 and CR5 provide a fast discharge path for C13. If Q6 turns OFF, this circuit will discharge C13 rapidly minimizing short on-frequency voice messages from falsing the decoder. Q5 sets the threshold point of the differential detector with the bias on its base provided by the voltage divider R24 and R25.

Q3 derives its feed back through base resistor R16, which is connected to the base of Q5. As Q4 turns on, the base of Q5 goes higher, which raises the DC voltage at Q3 emitter, providing a regenerative switch.

Optional Relay

Provision is made for adding a single contact form "C" Relay (19C307010P1), a (19A115889P1) transistor and a 10 K ohm base resistor (C3R152P103J). A diode (19A115250P1) is connected across the relay coil for spike suppression. The relay provides contacts for external functions. The operation of the relay is momentary but can be latched by a high input on the repeater latch lead. The relay circuit is shown in dotted lines on the Schematic Diagram 19D416925. Connections can be made to the relay contacts at J1214 on the Back Plane of the Control Shelf. This is a customer supplied option. This relay circuit must be used if any function other than Repeater Control is required.

Adjustments

No adjustments are necessary due to the high stability of (F.S.S.A.) U1.

Power Requirements

A 7.5 Volt Zener Regulator and a 5.4 Volt Zener Regulator are provided from the 10 Volt 15 mA source. Voltage for three stages on the board is provided from a 12.6 Volt 25 mA source.

Tone Frequency Change

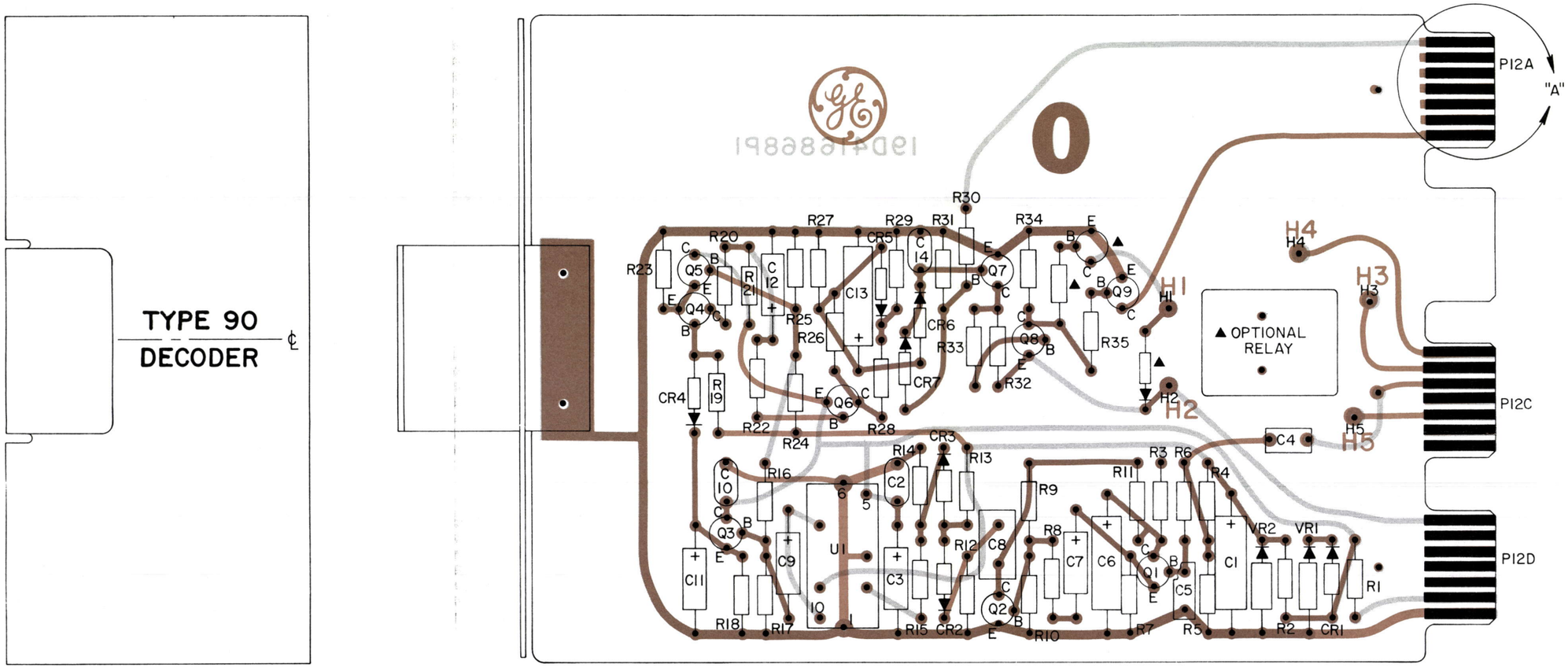
To change the Tone Frequency on the decoder it is necessary only to change the Selective Amplifier U1. To order Selective Amplifier U1, specify the part number and the new tone frequency.

MAINTENANCE

To troubleshoot the decoder board check for proper voltage listed on Wiring Diagram.

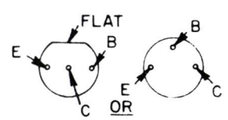
MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY
LYNCHBURG, VIRGINIA 24502

Printed in U.S.A.

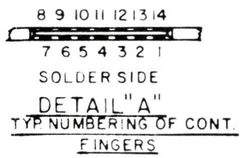


(19D417652, Rev. 0)
(19D416868, Sh. 2, Rev. 0)
(19D416868, Sh. 3, Rev. 0)

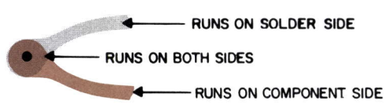
LEAD IDENTIFICATION
FOR Q1-Q9



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION



▲ CUSTOMER SUPPLIED OPTIONAL RELAY AND ASSOCIATED CKTS.



OUTLINE DIAGRAM

TYPE 90 DECODER REPEATER CONTROL

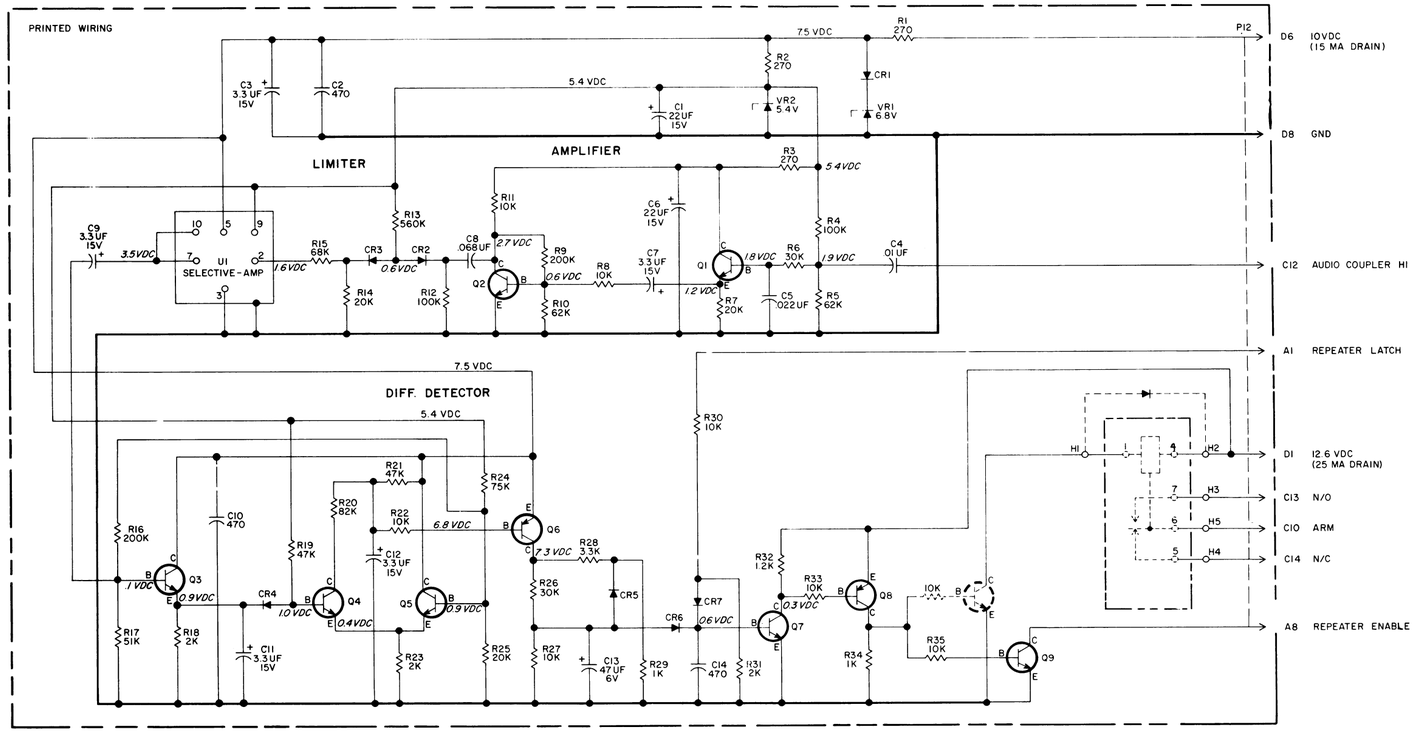
PARTS LIST

LBI-4574

TYPE 90 DECODER
19D416924G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C4	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C5	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C6	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C7	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C8	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C9	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C10	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C11 and C12	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	5496267P402	Tantalum: 47 µf ±5%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR7	19A115250P1	Silicon.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P12		(Part of printed wiring board 19D416868P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q5	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q7	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q8	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q9	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R3	3R152P271J	Composition: 270 ohms ±5%, 1/4 w.
R4	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R5	3R152P623J	Composition: 62,000 ohms ±5%, 1/4 w.
R6	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R7	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R8	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R9	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R10	3R152P523J	Composition: 62,000 ohms ±5%, 1/4 w.
R11	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R12	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R13	3R152P564J	Composition: 0.56 megohm ±5%, 1/4 w.
R14	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R15	3R152P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R16	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R17	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R18	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R19	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R20	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R21	3R159P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R22	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R23	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R24	3R152P753J	Composition: 75,000 ohms ±5%, 1/4 w.
R25	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R26	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R27	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R28	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R29	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R31	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R32	3R152P122J	Composition: 1200 ohms ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R35	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
		NOTE: When reordering specify Tone Frequency.
U1	19D413245G2	Selective Amplifier.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P48	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO — REV LETTER

PL19D416924G1

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

NOTES:

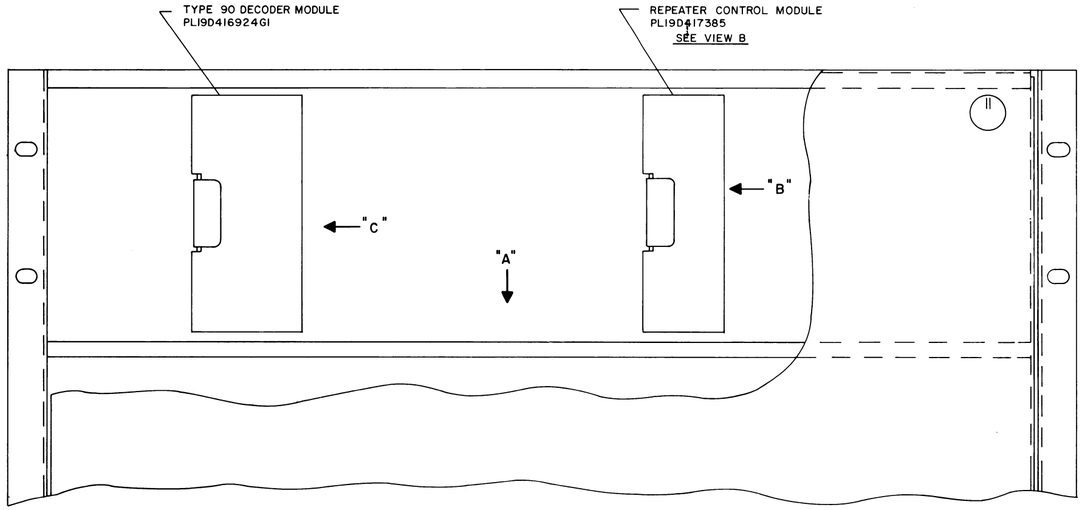
1. COMPONENTS SHOWN DOTTED ARE CUSTOMER SUPPLIED FOR USE WHEN A RELAY CLOSURE IS DESIRED. CONSULT INSTRUCTION BOOK FOR DETAILS AND PARTS DISCRIPTION.
2. VOLTAGES NOTED ARE FOR THE DECODED STATE.

(19D416925, Rev. 3)

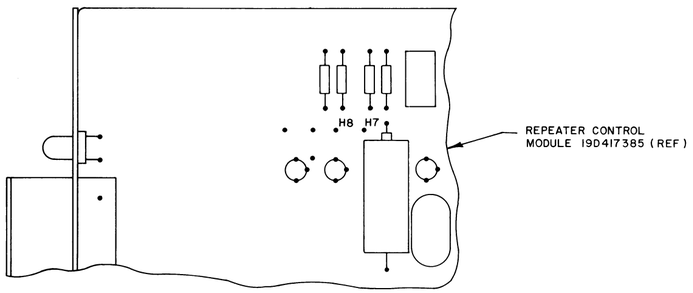
SCHEMATIC DIAGRAM & PARTS LIST

TYPE 90 DECODER REPEATER CONTROL

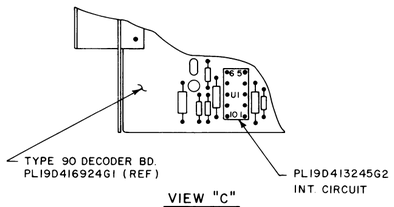
Issue 1



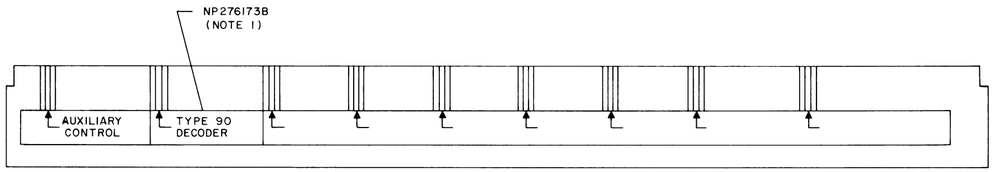
FRONT VIEW
CONTROL SHELF



VIEW "B"



VIEW "C"



VIEW "A"

TYPE 90 DECODER REPEATER CONTROL

THESE INSTRUCTIONS COVER THE MODIFICATION OF THE CONTROL SHELF & REPEATER CONTROL BOARD FOR TYPE 90 REPEATER CONTROL APPLICATIONS.

INSTRUCTION FOR MODIFICATION OF REPEATER CONTROL BOARD I9D417385

INSTRUCTIONS:

1. REMOVE REPEATER BOARD FROM SHELF.
2. REMOVE JUMPER BETWEEN HOLE 7 AND HOLE 8.
3. REPLACE REPEATER CONTROL BOARD IN SHELF.

INSTRUCTIONS FOR MODIFICATION OF CONTROL SHELF I9C320703GI

INSTRUCTIONS:

1. AFFIX NAMEPLATE NP2761738 TO SHELF AS SHOWN, IN FRONT OF SLOT IN WHICH TYPE 90 DECODER IS TO BE INSTALLED.
2. INSTALL TYPE 90 DECODER BD. IN SHELF AFTER INSTALLING PLI9D413245G2 I.C. TO DECODER BOARD PER VIEW 'C' MODULE SHOULD BE INSTALLED IN 2ND SLOT FROM LEFT, UNLESS THAT SLOT IS FILLED, IN WHICH CASE TYPE 90 DECODER SHOULD BE INSTALLED IN FIRST SLOT ON LEFT IN SHELF.
3. TEST PER I9A129945.

NOTES:

1. MOUNT NP2761738 OVER AUXILIARY CONTROL PORTION OF EXISTING NP. ALIGN ARROW WITH CENTER OF GUIDE WITHIN .060.

(19D417479, Rev. 2)

MODIFICATION & INSTALLATION