FERRITRONICS CCT
CTCSS Compatible Trunking

RPO3

CCT REPEATER CONTROLLER

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INTRODUCTION

The RPO3 is designed to convert a community repeater into a trunking repeater. It is part of the Ferritronics CTCSS Compatible Trunking equipment (CCT).

As trunking provides for increased numbers of users, it is likely that more than the normal 37 EIA CTCSS tones will be required. Therefore, the RPO3 can encode and decode an additional 240 CTCSS tone pairs. These pairs comprise a tone from a low frequency group and a tone from a high frequency group. The RPO3 can also encode and decode all 37 EIA CTCSS tones.

The RPO3 validates mobile radios equipped with Ferritronics mobile trunking units (MA10, MA11, etc). The validation process consists of decoding the mobile generated signal, validating the user, opening the repeat audio path, encoding the required signal to the receiving mobile and keying the transmitter. Transparent functions are the recording of the message length and the recording of the number of hits.

SPECIFICATIONS

GENERAL

Frequency Range

All 37 EIA specified CTCSS tone frequencies (67.0 Hz to 250.3 Hz) plus 1 non-EIA tone of 97.4 Hz.

LOCAL CONTROL

A front panel mounted keypad and 2 line x 40 character LCD display provide user-friendly interactive control of the following functions:

Programming Access Code (Site Address)

Entry to Local Control Mode is contingent upon a correct 5 digit numerical code. This code is entered via the keypad and is user-programmable. The site address may be selected from a possible 100,000 combinations.

Hit Accumulation per User Group

up to 65,535

Repeater Usage Time Accumulation per User Group

65,535 minutes (1,092 hours 15 minutes)

Dropout Delay Timer

Adjustable; 0 to 255 seconds (4.25 minutes),in 1 second steps.

Extended PTT Timer

Adjustable; 0 to 25.5 seconds, in 0.10 second steps.

Time Out Timer

Adjustable; currently fixed at 5 minutes.

Operating Temperature

-30°C to +60°C

Humidity

0 to 90% non-condensing

Dimensions

refer to outline drawing.

Weight

3.3 lbs. (1.5 Kg)

ENCODER

Frequency Accuracy $\quad$ ±0.3% of the tone frequency, at 25°C.

Frequency Stability $\quad$ ±0.05% over the temperature range.

Output Impedance $\quad$ 3.3K ohms.

Output Level $\quad$ 4Vpp maximum with no load.

Distortion $\quad$ ≤ 5% T.H.D.

DECODER

Sensitivity
as per
EIA RS220A method $\quad$ ≤ 14 dB SINAD

Bandwidth $\quad$ ± 1.0 Hz

Decode Time $\quad$ Dual Tones $\quad$ Adjustable; factory set at 300 mSec at 14 db SINAD.

$\quad$ Single Tones dependant on dual tone decode time, typically if dual tone is set for 300 mSec, then single tone decode time is 350 mSec.

Decode Dropout Time $\quad$ Adjustable; factory set at 300 mSec.

Input Impedance $\quad$ 100 K ohms

INPUT/OUTPUT CONNECTIONS

Via a rear panel removable terminal block type connector.

Tone Input $\quad$ Connects to the receiver discriminator.

Squelch Input
(C.O.S.) $\quad$ Connects to the output of the receiver's squelch circuit. This is a digital signal.

PTT Output $\quad$ A transistor pulls to ground to key the transmitter. (VCE ≤ 0.4VDC at 400 mA DC).

Audio Input
(High Pass
Filter Input) $\quad$ Connects to the receiver discriminator or to an audio input/output connection in series with the receive audio path, intended for insertion of a high pass filter.

Audio Output
(High Pass
Filter Output)

Connects to the input of the audio amplifier or to an audio input/output connection in series with the receive audio path intended for insertion of a high pass filter.

Tone Output

Connects to the transmitter tone input. The transmitter must be capable of transmitting CTCSS tone frequencies.

Power Supply

13.6 VDC ±20% relative to ground. There is a rear panel mounted ON/OFF switch. A fuse (1A fast) is mounted on the PCB.

Current Consumption

150 mA at 13.6 VDC in STANDBY
190 mA at 13.6 VDC in DECODE.

REPEAT AUDIO PROCESSING

Pass Band Ripple
(300 - 3 KHz)

±1.0 dB

Pass Band
Gain (1 KHz)

Adjustable up to 6.0 dB into no load.

Maximum Input Level

3.5 Vpp (1.25 Vrms) @ 1 KHz

Audio Input
Impedance

100K ohms

Audio Output
Impedance

3.3K ohms

Attenuation of
Signalling Tones

Greater than 30 dB for frequencies $\leq$ 250 Hz.

ADDITIONAL INFORMATION

Remote control/downloading of repeater functions/information is available by the addition of a 'Remote Control' board AB07, Ferritronics Part Number 01A0010735. An additional RP03 equipped with the AB07 functions as the remote control unit.

OUTLINE DRAWING

1.50"
17.00"
9.00"
18.31"
19.00"
.235"
1.25"
.345"
1.72"
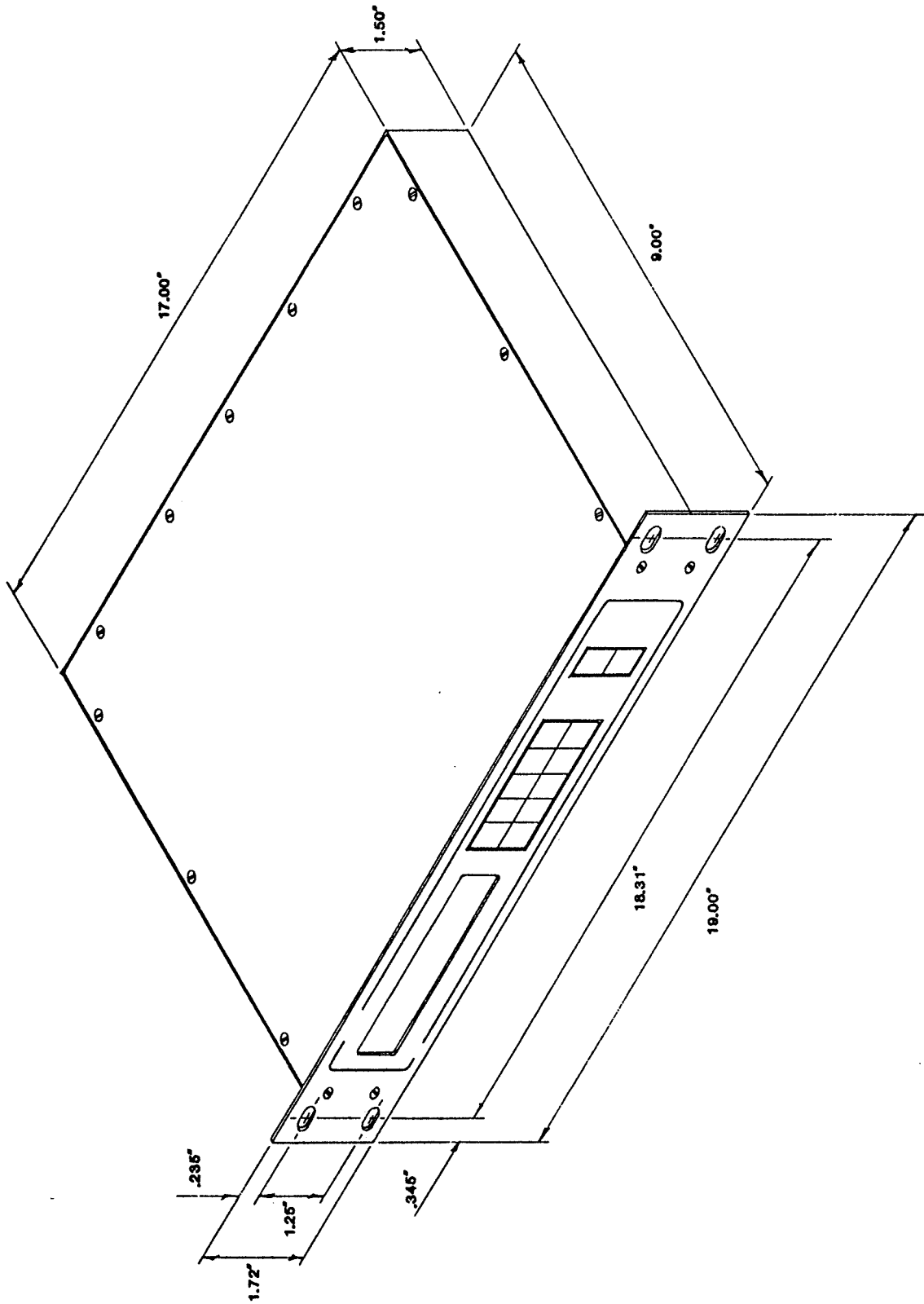
INSTALLATION PROCEDURES

There are three steps to be carried out to install the RPO3.
These are:

STEP 1) electrical connection of the RPO3 to the repeater via the
        rear connector block,
STEP 2) correct selection and level adjustment of the internal
        circuitry, and
STEP 3) programming of the RPO3.

The RPO3 is intended to be mounted into a 19" rack with other
repeater equipment.

Electrical hookup should be done by a qualified technician.

To facilitate hookup it is best to locate the RPO3 close to the
repeater, although using shielded cable, which is recommended for
some connections, will provide adequate shielding for cable
lengths up to 10 feet.

All connections can be made to the detachable portion of the
rear connector on the RPO3 before installation. Refer to STEP 1
for details.

Adjustments are required for input signal level, output tone level
(deviation), and repeat audio level. To do this the top cover of
the RPO3 will have to be removed and the unit turned on before
adjustment can proceed. This adjustment procedure is described
under STEP 2 - JUMPERS AND LEVEL ADJUSTMENT. Once the unit has
been aligned, the top cover must be replaced before final
installation.

INSTALLATION PROCEDURE

STEP 1 - REAR CONNECTOR BLOCK WIRING

Separate the rear connector block so that you are left with the terminal portion in hand. Refer to FIGURE 1. Proceed with the following connections:

CONNECTION	NAME	DESCRIPTION
TB1-1	TONE IN	Connect this to the de-emphasized discriminator output. All EIA tone frequencies must be passed to this input. Verify this by transmitting to the receiver using a communications monitor and varying the CTCSS tone frequency, making sure the encode deviation is the same for all tones. Use a shielded lead.
TB1-2	CHASSIS GROUND	TB1-2 and TB1-6 are both connected to chassis ground via JP3 2-3. TB1-2 or TB1-6 should have a ground wire connecting it to the rack.
TB1-3	AUDIO IN	This is the input to the repeat audio filter. This filter removes the signalling tones from the received audio. This should be connected to the de-emphasized discriminator output as the filter has a flat response between 300 Hz and 3.5 KHz. Some repeaters have a connection readily available for insertion of this high pass filter and should be used. The output of the filter is TB1-7. Refer to FIGURE 2 REPEAT AUDIO FILTER RESPONSE.
TB1-4	SQL IN	This digital signal is required from the repeater receiver to tell the RP03 when to decode. This eliminates 'falsing'. Adjust the receiver's squelch pot for normal threshold position. It does not matter which polarity indicates an active channel. Refer to the 'Set Parameters' section in the programming instructions.
TB1-5	TONE OUT	Connect this to the tone input of the transmitter. It may be necessary to use a shielded lead. The transmit tone deviation is set by R108 (high tone and mid tone) and R110 (low tone). Refer to STEP 2 'Alignment' section in the programming instructions.

REAR CONNECTOR BLOCK
(TERMINAL PORTION)
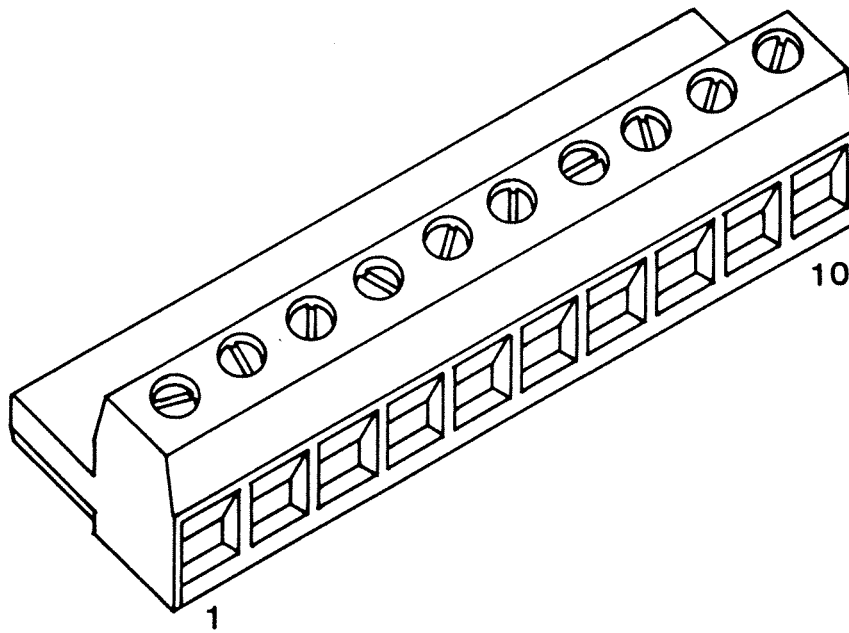
FIGURE 1

REPEAT AUDIO FILTER RESPONSE

FIGURE 2

TB1-6	CHASSIS GROUND	TB1-2 and TB1-6 are both connected to chassis ground via JP3 2-3. TB1-2 or TB1-6 should have a ground wire connecting it to the rack.
TB1-7	AUDIO OUT	This is the output of the repeat audio filter and should be connected to the voice audio input of the transmitter. Amplitude adjustment will likely be necessary, refer to STEP 2. Use a shielded lead.
TB1-8	PTT	This connection pulls to ground when a call is to be repeated. It must connect to the repeater's TX key line. The transistor switch can pull 200 mADC at a VCE of $\leq$ 0.4 VDC. Maximum sink current is 500 mADC.
		If a positive PTT is needed, a relay will have to be used. Refer to FIGURE 3 for hookup.
TB1-9	CIRCUIT GROUND	Connect this to the ground of the repeater. Do not connect this ground to the rack.
TB1-10	+VE SUPPLY	Connect this to 13.6 VDC $\pm$ 20%. The supply must be capable of delivering at least 200 mA.

STEP 2 - JUMPERS AND LEVEL ADJUSTMENTS

Remove the top cover of the RP03.

JP1   Install JP1 2-3 so that an audible tone (approx. 1kHz) will be heard when the RP03 approaches the end of its call time out cycle. If the audible signal is not desired, remove JP1.

A future function will be implemented using JP1 1-2 so do not install it in this position now.

JP2   When the RP03 is received from the factory it does not contain a 5-digit access code which is normally required to enter the programming mode.

By inserting JP2 and powering up or resetting the RP03, the programming mode will be entered directly without having to enter the access code. At this point, an access code can be entered. Refer to STEP 3 PROGRAMMING INSTRUCTIONS, to enter or change an access code.

JP3   JP3 2-3 makes a connection between TB1-2, TB1-6 and chassis. Make sure TB1-2 or TB1-6 are then connected to the rack via a ground wire.

POSITIVE PTT VIA RELAY

POSITIVE PTT
TO REPEATER

RELAY

PROTECTION
DIODE

TB1

8

10

C39
1K

D2

R83
1K

Q2
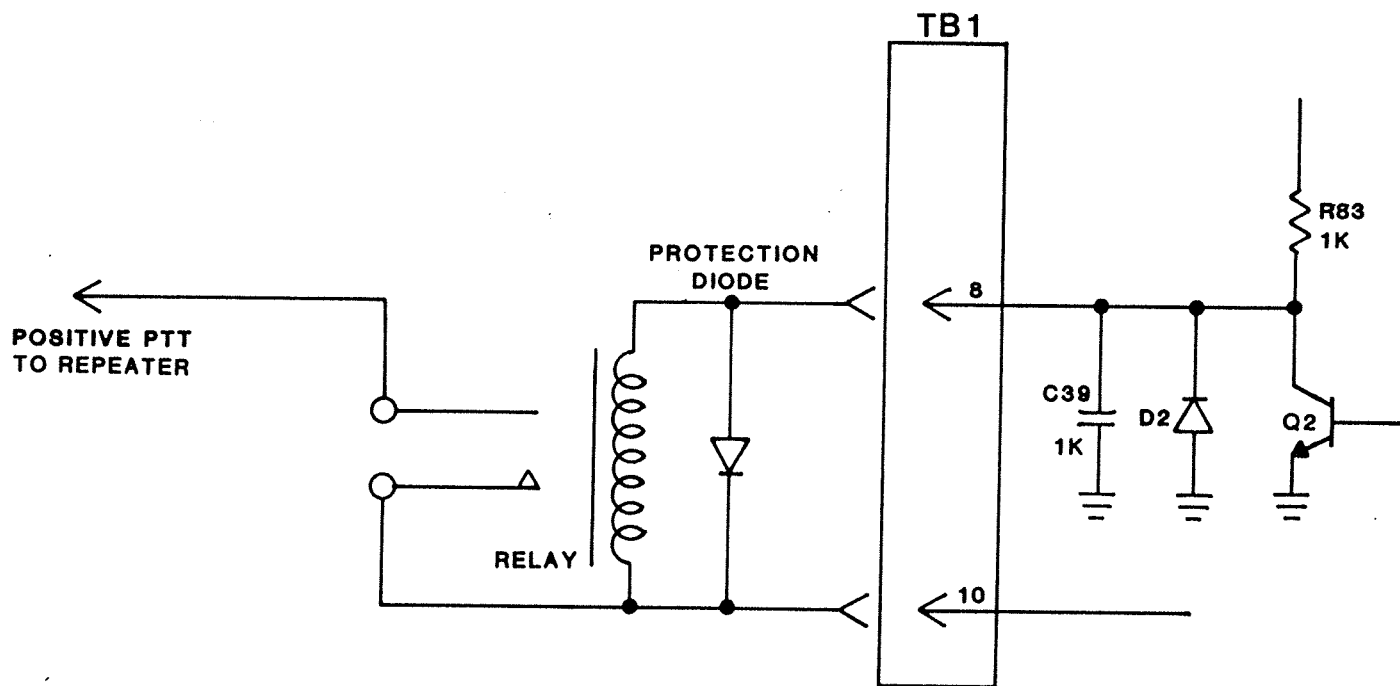
FIGURE 3

STEP 3 — PROGRAMMING INSTRUCTIONS

1.0   Introduction/Quick Look List

The RPO3 Local Control Repeater Panel can be programmed using its front panel keypad. There are 12 buttons, # 0-9, ENTER and RESET on this keypad.

There is one main list of functions which would be commonly used. This is the 'FUNCTION MENU'. It is available for use upon entering the Programming Mode.

FUNCTION MENU

KEY #1.   ADD USER — add a single or dual tone user.

KEY #2.   DELETE USERS — delete a single or dual user.

KEY #3.   VIEW USERS — display the single or dual tones already programmed.

KEY #4.   CLEAR TIME/HIT ACCUMULATORS — clear the accumulated TX time and hit values from an individual user in the memory .

KEY #5.   SET PARAMETERS — see detailed list below.

KEY #6.   INITIALIZE EEPROM — program default values into a new (blank) memory chip.

KEY #7.   not used

KEY #8.   not used

KEY #9.   ALIGNMENT — see detailed list below.

KEY #0.   EXIT PROGRAMMING MODE — restarts RPO3 in normal Repeater Control operating mode.

There are two other menus, 'SET PARAMETERS MENU' and 'ALIGNMENT MENU'. These are associated with 'SET PARAMETERS' and 'ALIGNMENT respectively.

SET PARAMETERS MENU

Detailed list of SET PARAMETERS (KEY #5) functions: - these parameters are normally set during the initial installation of the RP03.

KEY #1.   CONTROL BYTE
           a) Set active polarity of SQL input (COS).
           b) Set active polarity of PTT output lines.
           c) Set TX Override, (holds PTT output inactive for
              Repeater Panel testing).
           d) Enable Call Timeout feature.

KEY #2.   SQL (COS) VALID TIME   20 mSec
           Sets the length of time which the carrier-operated
           squelch must be continuously on before the RP03 begins
           tone decoding.

KEY #3.   EXTENDED PTT   0.3 Sec
           Sets the length of time which the RP03 keeps the TX
           keyed on after it switches off the CTCSS tones.

KEY #4.   DROPOUT TIMER   10 Sec
           Sets the length of time which the RP03 keeps the TX and
           CTCSS tones on after the received CTCSS tones fade or
           the COS input goes inactive. Received audio is not
           repeated during this interval.

KEY #5.   CALL TIMEOUT   5 mins
           Sets the maximum length of time which a single call is
           repeated before the RP03 interrupts the call. Three
           one-second tones are sent at ten-second intervals before
           the TX is switched off.

KEY #9.   CHANGE ACCESS CODE
           Allows the operator to change the five-digit access code
           stored in memory.

KEY #0.   Returns the operator to the main Programming Mode menu.

'ALIGNMENT MENU'

Detailed list of ALIGNMENT (KEY #9) functions: these are used to align the RP03 during initial installation, or realign its internal parameters for special (non-standard) applications.

KEY #1.   THRESHOLD/DROPOUT LEVELS
           Sets the tone detect and dropout levels for the high-,
           mid-, and low-tone bands.

KEY #2.   INCREMENT/DECREMENT PARAMETERS
           Sets the rate of tone detect and dropout for the high-,
           mid-, and low-tone bands.

KEY #3.   MAXIMUM READ TIME
           Sets the maximum length of time after COS is valid that
           the RP03 spends decoding tones (if any) before it
           attempts to validate them.

KEY #4.   CTCSS TONE LEVELS
            Allows the operator to adjust the output (transmitted)
            levels of the RPO3's CTCSS tone encoders.

KEY #5.   BEEP TONE LEVEL
            Allows the operator to adjust the output level of the
            1kHz Call Timeout 'beep' tone.

KEY #0.   Returns the operator to the main Programming Mode menu.

1.1   Accessing the Programming Mode

There are two ways to gain access to the programming mode of the
RPO3:

i. NORMAL ACCESS – VIA ENTER KEY

Once the RPO3 has been installed at the repeater site and is
operating, pressing the ENTER key on the front panel will
invoke the Programming Mode (as indicated on the front panel
LC display).

IMPORTANT

If the RPO3 is busy repeating a call (indicated on
the front panel display) OR if the RPO3 detects the
COS is active, the ENTER key will be ignored until
the call is completed and COS goes inactive.

(Once Programming Mode is active, however, the COS and tone
inputs are ignored, and the repeater is effectively 'down').

When the ENTER key is pressed, the display will prompt:

            *** PROGRAMMING MODE ***
            ENTER ACCESS CODE>

Enter the five-digit access code, followed by pressing the
ENTER key. If the password is not correct, the RPO3 will
display 'WRONG ACCESS CODE' and resume repeater operation. If
the password is correct, the RPO3 will prompt:

            Press Function Key or (ENTER) for HELP

ii. INSTALLATION ACCESS – VIA JP2

Initially, accessing of the Programming Mode, for alignment
or testing, is done using the JP2 jumper plug. On the main
printed circuit board near the microprocessor is a 2-pin
header labelled 'JP2'. Shorting these two pins (using the
jumper plug provided) will cause the RPO3 to automatically
enter Programming Mode on power-up or when reset. The jumper
plug MUST be removed for normal operation – the RPO3 cannot
be put into normal repeater control mode with the jumper plug
installed.

PROGRAMMING MODE

Pressing a valid function number (i.e. '1' for 'ADD USER') will select that function and display the appropriate prompts. Pressing ENTER will step you through the 'FUNCTION MENU', displaying a function title and its function number each time the ENTER key is pressed. For example, after pressing ENTER once, the RP03 will display:

PRESS (0) TO EXIT PROGRAMMING MODE>
or press (ENTER) to see next function

After pressing ENTER again, the display shows:

PRESS (1) TO ADD USER>
or press (ENTER) to see next function

At any point in the 'FUNCTION MENU', pressing ENTER displays the next function prompt and pressing a valid function number selects that function.

1.2 Quitting Programming Mode

To exit Programming Mode and resume normal repeater control operation, press '0' or 'RESET'.

The display will show:

****** REPEATER CONTROL MODE ******
------------   STANDBY   ------------

if COS is not active, or if COS is active but no valid tones are present.

1.3 Adding a User:

Once the RP03 is in Programming Mode, pressing '1' will start the ADD USER function.

The display will show:

ADD USER: PRESS (1) FOR SINGLE TONE,
(2) FOR DUAL, (ENTER) TO EXIT>

Adding a single or dual tone user follows the same basic
procedures, i.e., if you wish to add a single CTCSS tone user to
the memory, press (1).

The RP03 will display:

> ENTER SINGLE TONE (4 DIGITS)(ENT)>
> i.e. for 67.0 Hz. press (0670)(ENTER)

All tone frequencies must be entered into the RP03 as four
numbers, followed by pressing the ENTER key. Tone frequencies less
than 100.0 Hz. must have a leading '0' to make up four digits. For
example, when programming a single CTCSS tone of 88.5 Hz., press
'0885' and then ENTER. Be sure to put a 4-digit # in before
pressing ENTER or the program will restart the RP03 at the
beginning of the ADD USER function. Entering a valid single CTCSS
tone (such as 88.5 Hz.) will cause the RP03 to briefly display:

> CHECKING LOTONE: 88.5 HITONE: .

The RP03 checks that the entered tone does not already exist in
its memory as a valid sigle-tone user or as half of a valid dual
CTCSS tone user.

The RP03 will then display:

> CROSS TONES: (0) = YES, (ENT) = NO ?>

If cross tones are desired, press (0), but if no cross tones are
desired press (ENT). This will cause the RP03 to transmit the same
CTCSS tone as the one just entered.

The RP03 will briefly display:

> GRP: LTONE = 88.5/88.5 HRS = 0000:00
> 001: HTONE =   . / .   HITS = 00000

and then restart the ADD USER function.

The GROUP number ('GRP 001') shows how many entries there are in
the memory (users are always added to the end of the table). The
first tone display after 'LTONE =' is the received tone which the
RP03 will check to validate the user. The tone after the '/' is
the tone which will be transmitted when the call is repeated.

1.3.1 Cross Tone Encoding

When the RP03 displays:

        CROSS TONES: (0) = YES, (ENT) = NO ?>

pressing '0' will result in the prompt:

        CROSS TONES: PRESS (1) FOR SINGLE TONE,
        (2) FOR DUAL, (ENTER) TO EXIT>

For example, to translate a received CTCSS tone of 88.5 Hz. to a transmitted dual CTCSS tone pair of 100.0 Hz./151.4 Hz., press '2'.

The RP03 will display:

        ENTER LOW TONE (4 DIGITS) (ENT) >
        i.e. for 79.7 Hz. press (0797) (ENTER)

Enter the low tone (100.0) first.

The RP03 will display:

        ENTER HIGH TONE (4 DIGITS) (ENT) >
        i.e. for 146.2 Hz. press (1462) (ENTER)

Enter the high tone (151.4).

The RP03 will briefly display:

        CHECKING LOTONE: 100.0 HITONE 151.4

and then (briefly):

        GRP: LTONE = 88.5/100.0 HRS = 0000:00
        002: HTONE =   . /151.4 HITS = 00000

indicating that a call received with a single CTCSS tone of 88.5 Hz. will be repeated with a dual CTCSS tone pair of 100.0 Hz. and 151.4 Hz. The RP03 will then restart the ADD USER function.

1.3.2 Quitting the ADD USER Function

To return to the Programming Mode prompt, press the ENTER key when the ADD USER prompt appears.

1.3.3 ADD USER Error Messages:

'SINGLE/DUAL TONE CONFLICT' – the single CTCSS tone entered already exists in the memory as one tone in a dual CTCSS tone pair; OR, one tone of the dual CTCSS tone pair entered already exists in the memory as a single CTCSS tone user.
'USER ALREADY EXISTS...' – the single or dual CTCSS tone(s) entered already exist in the memory.

'* CAN'T USE MIDTONE WITH DUAL TONES *' – a midtone (118.8 Hz. to 141.3 Hz.) cannot be used as the high-tone half of a dual CTCSS tone pair.

1.4 Deleting a User:

To delete a user from the memory, press 2 while in Programming
Mode.

The RPO3 will dislpay:

        DELETE USER: PRESS (1) FOR SINGLE TONE,
        (2) FOR DUAL, (ENTER) TO EXIT>

Enter 1 if the user to be deleted is a single tone user; enter 2
if the user is a dual CTCSS tone user. For example, to delete the
dual CTCSS tone user whose tone pair is 88.5 Hz./ 162.2 Hz., press
2.

The RPO3 will display:

        ENTER LOW TONE (4 DIGITS)(ENT)>
        i.e. for 79.7 Hz. press (0797)(ENTER)

Enter the low-tone (88.5 Hz.).

The RPO3 will then prompt:

        ENTER HIGH TONE (4 DIGITS)(ENT)>
        i.e. for 146.2 Hz. press (1462)(ENTER)

Enter the high-tone (162.2 Hz.).

The RPO3 will briefly display:

        CHECKING LOTONE: 88.5 HITONE: 162.2

If the entered tones were found in the memory, the RPO3 will
prompt on the lower line of the display:

        Press (0) to delete, (ENTER) to Quit>

Press (0) to delete the displayed tones from the memory.
(Pressing ENTER restarts the Delete User Function). When '0' is
pressed, the RPO3 will display:

        ENTER ACCESS CODE>

Enter the five-digit access code and press ENTER.

The RPO3 will display:

        ****** USER DELETED******

and return to the start of the DELETE USER function. However, if
you simply press ENTER when the 'ENTER ACCESS CODE' prompt
appears, the user tones will not be deleted and the RP03 will
restart at the 'PROGRAMMING MODE' (function select) point of the
program.

1.4.1 Quitting the DELETE USER Function

To return to the PROGRAMMING MODE prompt, press the ENTER key when
the DELETE USER prompt appears.

1.4.2 DELETE USER Error Messages

'! USER NOT FOUND; CAN'T DELETE!' — the RP03 did not find the
entered tone(s) in the memory.

'!!! FATAL WRITE ERROR...' — the RP03 was unable to adjust the
memory data due to a faulty EEPROM memory chip.

1.5 View Users:

To display the contents of the memory, press 3 while in
Programming Mode.

The RP03 will display:

```
        VIEW USERS: PRESS (5) TO SCAN UP,
        (0) TO SCAN DOWN, (ENTER) TO QUIT
```

If you press '0', the RP03 will display the contents of the first
valid user's entry in the table, for example:

```
        GRP: LTONE = 67.0 / 67.0 HRS = 0001:08
        001: HTONE      .  /   .  HITS = 00029
```

If you press and hold the '0' key, the RP03 will 'scan' down
through the memory, displaying each entry for about one-half
second. If you scan past an entry of interest, use the '5' key to
scan up (backwards). To scan at a slower rate, use single key-
presses.

1.5.1 Quitting the VIEW USERS Function

To return to the PROGRAMMING MODE prompt, press and hold the ENTER
key until the prompt appears.

1.5.2 VIEW USERS Error Messages:

'User Memory is Empty (No Users)' — there are no entries in the
memory to display.

1.6   Clear Time and Hit Accumulators

To clear the accumulated time and hit values of a valid user
entry, press '4' while in Programming Mode.

The RP03 will display:

>   CLEAR TIME/HITS: PRESS (1) FOR SINGLE,
>   (2) FOR DUAL, (ENTER) TO EXIT>

To clear the accumulators of a 67.0 Hz. single tone user, for
example, press '1'.

The RP03 will display:

>   ENTER SINGLE TONE (4 DIGITS)(ENT)>
>   i.e. for 67.0 Hz. press (0670)(ENTER)

After entering the single tone, the RP03 will briefly display:

>   CHECKING LOTONE: 67.0 HITONE: .
>   PRESS (0) TO CLEAR, (ENTER) TO QUIT>

Press '0' to clear the accumulators. The RP03 will briefly
display the contents of the valid user entry showing the
accumulated time and hit values reset to zero, as follows:

>   GRP: LTONE = 67.0 / 67.0 HRS = 0000:00
>   001: HTONE =   . /   . HITS = 00000

The RP03 will then restart the CLEAR TIME/HITS function.

1.6.1 Quitting the CLEAR TIME/HITS Function

To return to the PROGRAMMING MODE prompt, press ENTER when the
CLEAR TIME/HITS prompt appears.

1.6.2 CLEAR TIME/HITS Error Messages

'User memory is empty (No Users)' — there are no single or dual
tones programmed into the RP03.

'*** USER NOT FOUND ***' — the RP03 could not find the entered
single or dual tone in its memory.

> '!!! FATAL WRITE ERROR...' — the RP03 was unable
> to adjust the memory due to a faulty EEPROM
> memory chip.

1.7   <u>Set Parameters</u>

The SET PARAMETERS function is normally used when the RPO3 is
first installed at the repeater site. This function allows the
operator to examine and change various programmable parameters
which are stored in memory and used by the RPO3 during normal
operation.   When shipped, the RPO3's memory is programmed with
default (typical) parameter values. However, it may be necessary
to change some of the parameters to suit the equipment at the
operator's repeater site.

To access the SET PARAMETERS function, press '5' while in
Programming Mode. The RPO3 will dislay:

> SET PARAMETERS: PRESS (ENTER) FOR HELP,
> PRESS (0) FOR PROGRAMMING MODE>

The SET PARAMETERS function has a 'help menu' feature similar to
the main Programming Mode. Pressing the ENTER key causes the RPO3
to display (on the bottom line) the various sub-functions and the
numbers which select them; for example, pressing '0' exits the SET
PARAMETERS function and returns you to Programming Mode.

1.7.1 Changing the CONTROL BYTE

Pressing '1' while in SET PARAMETERS mode allows the operator to examine and change the Control Byte. The Control Byte sets the active polarity of the COS input and PTT output lines, and enables (or disables) the TX Overide and Call Timeout features of the RPO3. This byte is stored in programmable memory. When the Control Byte option is selected, the RPO3 briefly displays:

        1] Reading Control Byte...

and then either:

        COS is HIGH when Busy...
        Press (0) to change, (ENTER) for next

or:

        COS is GROUND when Busy...
        Press (0) to change, (ENTER) for next

depending on the current active state of the COS input line control. The first case ("COS is High when Busy") means that the RPO3 will sense a call in progress from the repeater site's receiver when the RPO3's COS input line is greater than +4 Vdc. The second case ("COS is Ground when Busy") means that the RPO3 detects a received call in progress when COS is less than +3.5 Vdc. Pressing '0' will change the active COS level from one state to the other, as indicated on the display. Press ENTER when the required condition of the COS active state is displayed. The condition will be saved in temporary memory.

The RPO3 will display either:

        PTT is HIGH to Xmit...
        Press (0) to change, (ENTER) for next

or:

        PTT is GROUND to Xmit...
        Press (0) to change, (ENTER) for next

depending on the current state of the PTT output line control. The PTT output line will sink (switch to ground) a positive current of 400 milliamps (maximum). The first case means that the RPO3 will switch off (open) the current sink to key the repeater transmitter. The second case means that the RPO3 will switch on (close) the current sink to transmit. Press '0' to select the required active condition of the PTT output, and then press ENTER. The PTT active state will be saved in temporary memory.

The RP03 will display either:

TX Override is DISABLED (normal)...
Press (O) to change, (ENTER) for next

or:

TX Override is ENABLED, can't Xmit
Press (O) to change, (ENTER) for next

The TX Override feature allows the installed RP03 and repeater receiver to be tested without keying the transmitter each time a valid user's single or dual tone is detected. For normal repeater operation, the TX Override feature must be set to 'disabled'. Use the 'O' key to select the required TX Override condition and press ENTER.

The RP03 will now display either:

Call Timeout Disabled (normal)
Press (O) to change, (ENTER) for next

or:

Call Timeout Enabled
Press (O) to change, (ENTER) for next

The call timeout feature will terminate a call in progress if the deviation of the call exceeds the time limit set by the Maximum Call Time parameter. Use the 'O' key to enable or disable the call timeout feature, and press ENTER.

The RP03 will display:

---End of Control Byte---
Press (5) to re-do, (ENTER) to QUIT

Pressing (5) will restart the Control Byte examine and change function; for example, to quickly verify the status of the Control Byte options, press (5) to restart at 'COS...', and press ENTER to view the state of each option. If all options are correct, press ENTER when the 'End of Control Byte' prompt appears again.

The RP03 will display:

--- Writing Control Byte---

and will copy the modified control byte from temporary memory to programmable memory. The RP03 will then display the SET PARAMETERS prompt.

1.7.2 Changing the COS VALID TIME

Pressing '2' while in SET PARAMETERS mode allows the operator to examine and change the COS VALID TIME. This is the length of time that the RPO3 waits after it detects an active COS level before it begins checking for tones. This delay allows the receiver's audio output and the RPO3's filters to stabilize to prevent falsing. When the COS valid time option is selected, the RPO3 will briefly display:

                2] COS Valid Time is now 020 mSecond(s)
                   Press (0) to Change, (ENTER) to Quit>

When 'O' is pressed, the RPO3 will display:

                2] COS Valid Time is now 020 mSecond(s)
                   Press 3 digits (ENTER)>

To change the COS valid time to 60 milliseconds, for example, press '060' and ENTER. The RPO3 will display the entered time and prompt for a new time, or ENTER to quit. Pressing ENTER will restart the SET PARAMETERS function.

1.7.3 Changing the Extended PTT TIME

Pressing '3' while in SET PARAMETERS mode allows the operator to examine and change the extended PTT time. This is the length of time which the RPO3 keeps the transmitter keyed on after the RPO3 switches off the repeated CTCSS tones. This eliminates the 'squelch tail' heard in the mobile units. When this option is selected, the RPO3 will briefly display:

                3] Extended PTT Time is now 00.3 Seconds
                   Press (0) to Change, (ENTER) to Quit>

When 'O' is pressed, the RPO3 will display:

                3] Extended PTT Time is now 00.3 Seconds
                   Press 3 digits (ENTER)>

To change the extended PTT time to 0 seconds, for example, press '000' and ENTER. The RPO3 will display the entered time and prompt for a new time, or ENTER to quit. Pressing ENTER will restart the SET PARAMETERS function.

1.7.4 Changing the Dropout Timer

Pressing '4' while in SET PARAMETERS mode allows the operator to examine and change the dropout time. This is the length of time that the RP03 keeps the transmitter keyed on after the COS input goes inactive. When this option is selected, the RP03 will briefly display:

> 4] Dropout Delay Time is now 010 Sec(s)
> Press (0) to Change, (ENTER) to Quit>

When '0' is pressed, the RP03 will display:

> 4] Dropout Delay Time is now 010 Sec(s)
> Press 3 digits (ENTER)>

To change the dropout time to 2 seconds, for example, press '002' and ENTER. The RP03 will display the entered time, and prompt for a new time, or ENTER to quit. Pressing ENTER will restart the SET PARAMETERS function.

1.7.5 Changing the CALL TIMEOUT Time

Pressing '5' while in SET PARAMETERS mode allows the operator to examine and change the CALL TIMEOUT time. This is the maximum length of time allowed for a single call before the RP03 keys off the transmitter. The RP03 will send three one-second-duration warning beeps at ten-second intervals before terminating the call. (Note that the CALL TIMEOUT feature will only be active if it has been enabled with the CONTROL BYTE). When this option is selected, the RP03 will briefly display:

> 5] Maximum Call Time is now 005 Minutes
> Press (0) to Change, (ENTER) to Quit>

When '0' is pressed, the RP03 will display::

> 5] Maximum Call Time is now 005 Minutes
> Press 3 digits (ENTER)>

To change the CALL TIMEOUT time to 15 minutes, for example, press '015' and ENTER. The RP03 will display the entered time and prompt for a new time, or ENTER to quit. Pressing ENTER will restart the SET PARAMETERS function.

1.7.6 Changing the ACCESS CODE

Pressing '9' while in SET PARAMETERS mode allows the operator to examine and change the 5-digit access code. When this option is selected, the RPO3 will display:

> 9] Access Code is now: 12345
>   Press (0) to Change, (ENTER) to Quit>

To change the access code to 67890, for example, press (0).

The RPO3 will display:

> ENTER *NEW* ACCESS CODE>
> Press 5 digits (ENT), i.e. (12345)(ENT)

Now press '67890' and ENTER. The RPO3 will display:

> 9] Access Code is now: 67890
>   Press (0) to Change, (ENTER) to Quit>

Pressing ENTER will restart the SET PARAMETERS function.

1.7.7 Quitting the SET PARAMETERS Function

Pressing '0' while in SET PARAMETERS mode will return the RPO3 to PROGRAMMING MODE.

1.8   Initialize MEMORY

The INITIALIZE MEMORY function is normally used when a new EEPROM
memory chip has been installed in the RP03, or when an RP03 is
moved to a different repeater installation. The INITIALIZE MEMORY
function DELETES ALL USERS from MEMORY and resets all stored
parameters to their default (factory) values, but will not alter
the access code in a previously programmed MEMORY.

When initializing a new (blank) MEMORY, it is recommended that the
JP2 jumper be installed to access the Programming Mode.

To INITIALIZE MEMORY, press '6' while in Programming Mode. If the
EEPROM is a new (blank) part, the RP03 will display:

>   INITIALIZE EEPROM: Clears ALL users
>   and sets default parameter values
>
>   ENTER *NEW* ACCESS CODE>
>   Press 5 digits (ENT), i.e. (12345)(ENTER)

Pressing ENTER will quit the function and restart the RP03 in
Programming Mode.

Pressing five digits and ENTER will set the RP03's access code
number entered, and for verification the RP03 will display:

>   *NEW* ACCESS CODE IS> (number)

The RP03 will then initialize the memory and parameters, display:

>   ******* EEPROM INITIALIZED *******

and restart the RP03 in Programming Mode. The RP03 is now ready
for alignment, programming and installation.

1.8.1 Initializing a Previously Programmed EEPROM

When the INITIALIZE EEPROM function is selected and the RP03 determines (by the presence of an active access code stored in EEPROM) that the EEPROM has previously been initialized, the RP03 will display:

        INITIALIZE EEPROM: Clears ALL users
        and sets default parameter values

        --- CAUTION: DELETES ALL USERS ---
        Press (0) to INIT, (ENTER) to Quit>

Press '0' to initialize the EEPROM (pressing ENTER causes the RP03 to restart Programming Mode). When '0' is pressed, the RP03 will display:

        --- CAUTION: DELETES ALL USERS ---
        ENTER ACCESS CODE>

To initialize the EEPROM, enter the five-digit access code and press ENTER. If the access code was entered correctly, the RP03 will display:

        OK

and then:

        ******* EEPROM INITIALIZED *******

and automatically restart at Programming Mode. If the access code was incorrect, the RP03 will display:

        'WRONG ACCESS CODE'

and restart at Programming Mode without initializing the EEPROM. If the operator pressed ENTER to abort the function, the RP03 will also restart at Programming Mode without initializing the EEPROM.

1.9 Alignment Program

The ALIGNMENT Program is normally used at the factory to set
certain software parameters in EEPROM memory. [The operator must
use port 4 to set the levels of the CTCSS and 1kHz 'beep' tones.

The software parameters of ports 1, 2 and 3 should not be altered
by the operator, but the tone level adjustment functions are
useful when testing and installing the RPO3.

To select the ALIGNMENT Program, press '9' while in PROGRAMMIMG
MODE.

The RPO3 will display:

> ALIGNMENT: PRESS (ENT) FOR HELP, or
> PRESS (0) FOR PROGRAMMING MODE>

Each time the enter key is pressed, the RPO3 will display, in
sequence, each test function and the number-key which selects it.

1.9.1 Alignment Function 1: Threshold Dropout

This function is used at the factory to change the rate of tone
detect and dropout levels in the RPO3 software. The operator
should not alter these parameters.

1.9.2 Alignment Function 2: Charge/Discharge

This function is used at the factory to change the rate of tone
detect and dropout in the RPO3 software. The operator should not
alter these parameters.

1.9.3 Alignment Function 3: Max Read Time

This function is used at the factory to set the maximum time that
the RPO3 will spend decoding for a single tone user. The operator
should not alter this parameter.

1.9.4 Alignment Function 4: Set CTCSS Tone Levels

To set the CTCSS encode tone levels, press '4' while in ALIGNMENT mode.

The RP03 will briefly display:

> 4] SET CTCSS LEVELS: adjust R108 for
> HI/MIDTONES, adjust R110 for LOTONES

and then:

> SELECT TONES: PRESS (1) FOR SINGLE,
> (2) FOR DUAL, (ENTER) TO QUIT>

The procedure for entering a single or dual tone is the same as that for the ADD USER and DELETE USER functions. When the single or dual tone pair has been entered, (100Hz., for example), the RP03 will display:

> CHECKING LOTONE: 100.0 HITONE: .
> Press (5) for AUDIO ON, (0) for OFF>

This option allows the operator to switch the audio path (between AUDIO IN-TB1 pin 3 and AUDIO OUT-TB1 pin 7) on or off as required. Press '5' or '0' to select the AUDIO option. The RP03 will enable the tone encoders (in this case, the low-tone encoder will be programmed to generate 100.0 Hz. and the high-tone encoder will be disabled).

The display will read:

> CHECKING LOTONE: 100.0 HITONE:
> Press (0) to stop tones, (ENT) to Quit

The RP03 is now generating the programmed tone, and R110 can be adjusted to set the tone level. To stop the tone, press '0'.

The RP03 will display:

> CHECKING LOTONE: 100.0 HITONE:
> Press (5) to start tones, (ENT) to Quit

Note that although the tone has been disabled, the audio path will still be switched on or off as selected. To enable the tone again, press '5'. Before the RP03 enables the tone encoder, it will prompt:

> CHECKING LOTONE: 100.0 HITONE: .
> Press (5) for AUDIO ON, (0) for OFF>

Press '5' or '0' to enable or disable the audio path. This prompt
will appear each time before the tone encoders are enabled.

To quit the function and return to the ALIGNMENT prompt, press
ENTER when the "start tones" or "stop tones" prompts are
displayed. Quitting the function at the "Press '0' to stop tones"
prompt will leave the tone encoder(s) enabled and the audio path
option in effect; quitting the function at the "Press '5' to start
tones" prompt will leave the tone encoders off, but leave the
audio path option in effect. This allows the operator to select
the "SET BEEP TONE LEVEL" function with the CTCSS tones and audio
enabled or disabled as required.

1.9.5 Alignment Function 5: Set Beep Tone Level

To set the 1 kHz. beep tone level, press 5 while in TEST
FUNCTIONS mode.

The RP03 will display:

> 5) SET BEEP TONE LEVEL: adjust R127,
> Press and hold (ENT) to QUIT

it will then begin generating a 1 kHz tone at JP1 pin 2. A jumper
bar must be connected between JP1 pins 2 and 3 for the 1 kHz. tone
to appear at the AUDIO OUT terminal, TB1 pin 7. Adjust R127 to set
the 'beep' tone level. The 'beep tone' program checks the enter
key once every second (this is the 'tick' heard in the 1 kHz.
tone).

To quit the function, press and hold the ENTER key for a second
until the ALIGNMENT prompt appears.

1.9.6 Quitting the ALIGNMENT Program

To quit the ALIGNMENT program and restart PROGRAMMING MODE, press
'0' when the ALIGNMENT prompt appears. This will disable the tone
encoders and the audio path if left on by the "SET CTCSS TONE
LEVELS" function.

FINAL ASSEMBLY DRAWING

FOR REFERENCE ONLY

SEE DETAIL 'A'
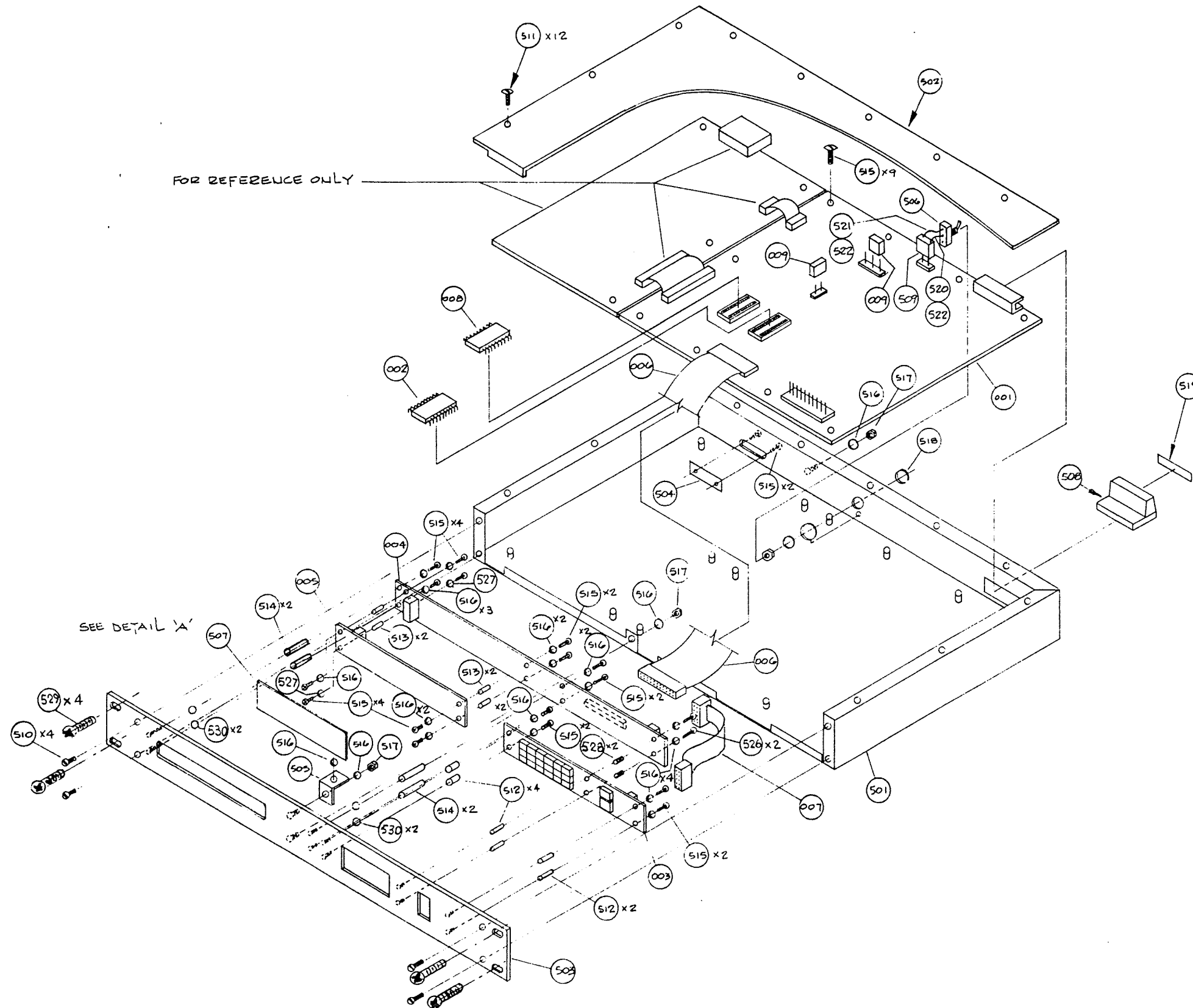
01A0010732   RP03 TRNKG REP. C/W LOCAL CONTROL

ITEM NO	PART NO	DESCRIPTION	QTY REQ	REMARKS
001	01A0010593	MAIN PCB ASS'Y	1.	
002	01A0010738	EPROM, PROGRAMMED, RP03	1.	01A0010593 – IC13
003	01A0010594	KEYBOARD ASS'Y	1.	
004	01A0010737	LCD/KEYBOARD BUFFER ASS'Y	1.	
005	01A0010736	LCD DISPLAY ASS'Y	1.	
006	85AK010715	RIBBON CABLE ASS'Y (RP03)	1.	(J5 – J6)
007	85AK010719	14 LINE RIBB. CABLE ASS'Y(RP03)	1.	(J2 – J3)
008	29A0010718	EEPROM, BLANK XICOR X2864API-45	1.	01A0010593 – IC12
009	70-3187	JUMPER BAR	2.	FOR JP1, 2
501	60D0010611	ENCLOSURE FOR TRUNKING	1.	
502	60B0010613	TOP COVER FOR TRUNKING	1.	
503	60C0010735	FRONT PLATE RP03	1.	
504	60A0010743	COVER PLATE FOR D HOLE	1.	
505	60A0010765	BRACKET, L	1	FRONT PLATE TO LID
506	41-2791	SWITCH TOGGLE SPDT	1.	SW1 (POWER)
507	35A0010740	WINDOW PLATE, ACRYLIC	1.	LCD
508	64A0010745	10 POS. TERMINAL BLOCK PLUG	1.	TB1
509	71A0002168	HOUSING 2 POSITION	1.	J4
510	74A0010720	SCREW 6-32X1/4 OHMS BLK OXIDE	4.	FRONT PLATE
511	74A0010564	SCREW 4-40 X 1/4 PHIL PHMS	12.	MOUNT LID
512	79-1593	SPACER 6/32 X 3/8 #1451B BRAHX	6.	MOUNT KEYBOARD
513	79-2730	SPACER-NYLON 6-32 X 1/2	4.	4 TO MT. LCD
514	79-1866	SPACER-ALUM HEX 1/4X3/4 X 6-32	4.	4 TO MT. BUFFER PCB
515	74A0010565	SCREW 6-32 X 1/4 PHIL PHMS	27.	2 TO MT. D PLATE 9 TO MT. MAIN PCB 16 TO MT. BUFFER ASS'Y
516	76-0562	WASHER #6 INTERNAL STAR	20.	
517	75-0559	NUT 6/32 4 BLANK	3.	1 GRND STUD
518	75A0003153	NUT JBT #W-NU-18B	1.	(SW1)
519	82A0010747	MARKING STRIP CARD 25 X (1-10)	.1	(TB1)
520	85A0003033	LEAD WIRE 24GA RED C/W CONN	1.	(J4 – 1)
521	85A0003034	LEAD WIRE 24GA ORANGE C/W CONN	1.	(J4 – 2)
522	96-2402	HEAT SHRINK TUBING BLK 3/32"	.1	2 X 1/2 (SW1)
524	83-0602	SILASTIC CLEAR 3 OZ TUBES		TO MT. WINDOW PLATE
525	59A0002383	LABEL SERIAL NUMBER	1.	
526	74A0010566	SCREW 6/32 X 5/8 PHIL PHMS	2.	TO MT. BUFFER ASS'Y
527	76-1569	WASHER 6 FLAT NYLON	2.	1 TO MT. LCD 1 TO MT. BUFFER ASSY
528	79A0010840	1/4 X 3/8 AL. SPACER RD. #6 HOLE	2.	KEYBOARD TO BUFFER ASS'Y
529	74A0010019	SCREW PHILL WASH HD 10-32X3/4	4.	SHIP LOOSE
530	76A0010366	WASHER LOCK SPLIT #6	4.	FRONT PLATE
701	9BA0010732	MANUAL, RP03	1.	
801	97B0010716	SHIPPING CARTON-TR01 REPEATER	1.	
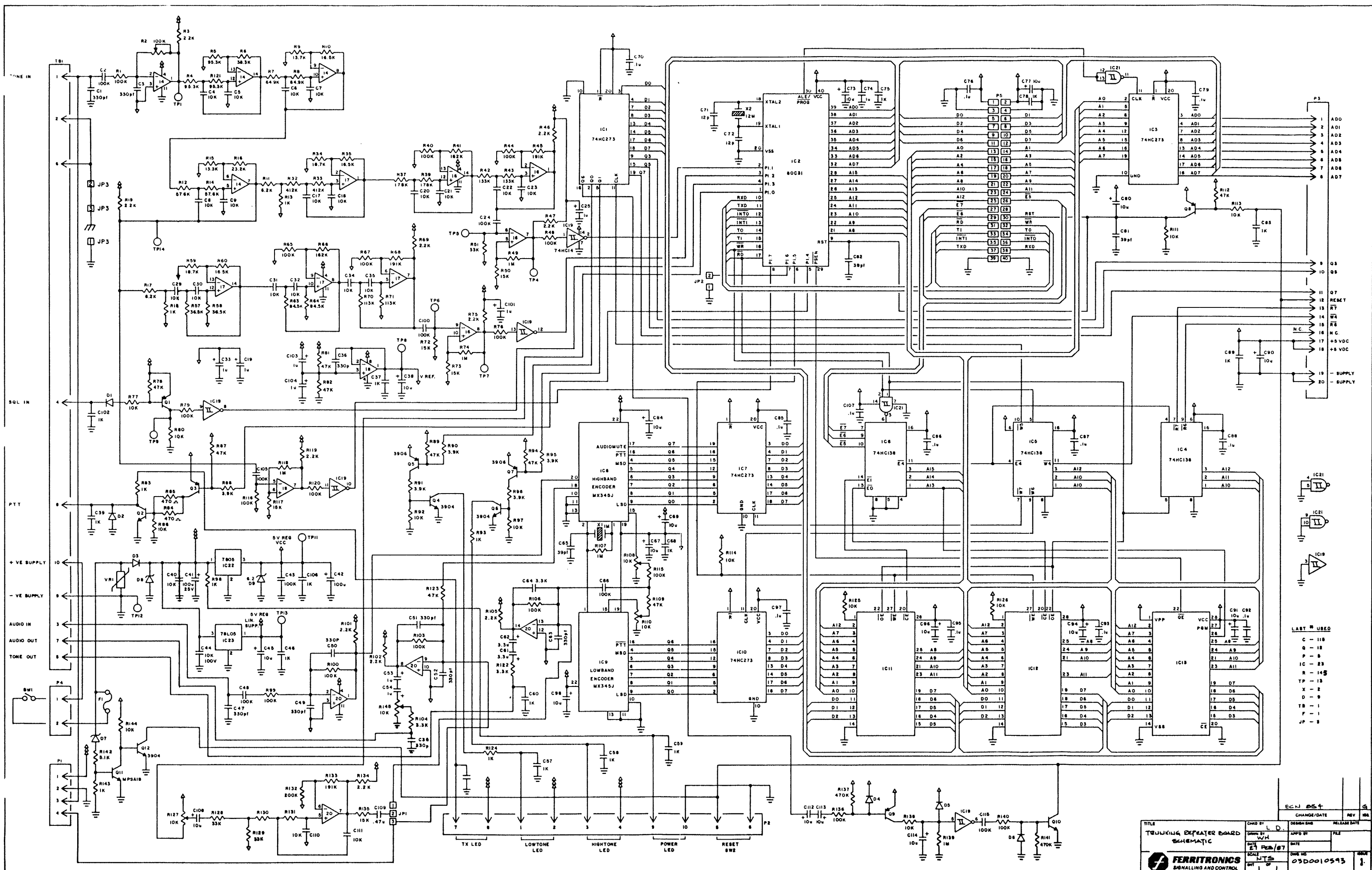
TITLE: TRUNKING REPEATER BOARD SCHEMATIC

FERRITRONICS SIGNALLING AND CONTROL

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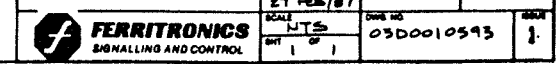
MAIN PCB COMPONENT LAYOUT

01A0010593   MAIN PCB ASSEMBLY
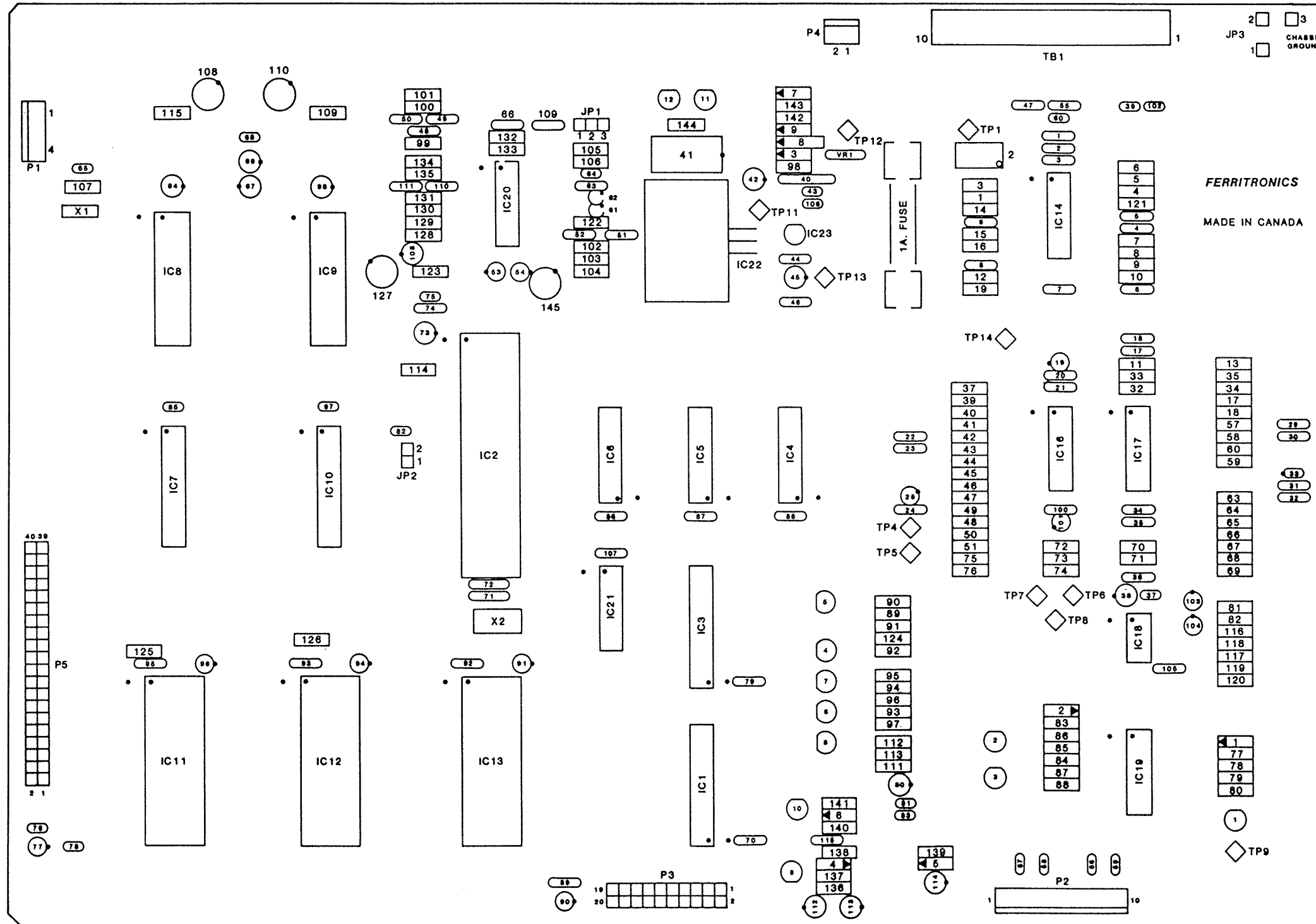
ITEM NO	PART NO	DESCRIPTION	QTY REQ	REMARKS
001	18A0010593	PCB FOR TRUNKING REPEATER	1.	R2
049	09-2266	TRIM POT 3/8 TOP ADJ 100 K	1.	R2
002	10-0192	CAP CER DISC NPO 12.0 PF 5%	2.	C71,72
003	10-2605	CAP CER. 39PF 1L8	3.	C65,81,82
004	10-2607	CAP CERAMIC 330 PF	10.	C1,3,36,47,49,50,51, 52,55,63,
005	10-2606	CAP CERAMIC 1 KPF 100V 10%	15.	C37,39,46,56,57,58, 59,60,68,75,78,83, 89,102,106
006	10-1986	CAP CER DIP NPO 3K3 PF 1%	1.	C64
007	10-2431	CAP CER. DISC .01MFD 1000V 10K	2.	C40,44
008	10-2213	CAP CER DIP NPO 10 K PF 5% 50V	20.	C4,5,6,7,8,9,17,18, 20,21,22,23,24,30, 31,32,34,35,110,111
009	10-3189	CAP CER DIP X7R 100 K PF 10 %	16.	C2,24,48,66,70,79, 86,87,88,92,93,95, 100,105,107,115
010	10-1473	CAP CER DIP Z5U 100 K PF 20%	5.	C43,74,76,85,97
011	11-1669	CAP TANT DIP 1 MFD 20% 35V	8.	C19,25,33,53,54,101, 103,104
093	120830474E	CAP CER X7R 50V 10% 470 K	1.	C109
012	11-1379	CAP TANT DIP 3.3 MFD 20% 16V	2.	C61,62
013	11-1380	CAP TANT DIP 10 MFD 20% 20V	17.	C38,45,67,69,73,77, 80,84,90,91,94,96, 98,108,112,113,114
014	11-3051	CAP ELECTRO PDA 100 MFD	1.	C42
015	11-2214	CAP ELECT. 25V AXIAL 100 MFD	1.	C41
016	20-1142	DIODE SIGNAL 1N414B	4.	D1,4,5,6
017	20-1105	DIODE SIGNAL 1N2070	2.	D2,3
090	21-1699	DIODE ZENER 6.2V 1N753A	2.	D7,9
018	26-2545	TRANS SIGNAL PNP 2N3906	6.	Q1,3,5,7,8,9
019	26-2546	TRANS. SIGNAL NPN 2N3904	4.	Q4,6,10,12
020	26A0010458	TRANS NPN MPS3704	1.	Q2
021	28-1780	OP AMP QUAD LM324N	4.	IC14,16,17,20
022	28-1868	OP AMP DUAL LM358N	1.	IC18
023	29A0010653	74HC273N D FLIP FLOP	4.	IC1,3,7,10
024	26-2252	TRANS SIGNAL NPN MPS-A18	1.	Q11
025	29A0010654	74HC132N QUAD NAND	1.	IC21
026	29A0010651	74HC14N HEX INVERTER	1.	IC19
027	28A0010699	MX345P ENC/DEC.	2.	IC8,9
028	29A0010652	74HC138N 1 OF 8 DECODER	3.	IC4,5,6
029	31A0010706	CPU 8 BIT 180C31BH, INTEL	1.	IC2
030	23-1955	VOLT SUPPRESSOR 20VRMS V33ZA1	1.	VR1
031	24-2152	VOLT REG +5V TO92 LM78L05ACZ	1.	IC23
032	24A0002005	VOLT REG +5 V TO220 LM340T5	1.	IC22
033	33A0002956	CRYSTAL 1MHZ UM-1 HOLDER	1.	X1
034	33A0010782	CRYSTAL 12.00 MEG HC49/U	1.	X2
035	23-3232	VOLT SUPPRESSOR 18 V TVS518	1.	D8
036	37006-1357	RES 1/4W 5% 470 OHMS	2.	R84,85
037	37006-1130	RES 1/4W 5% 1 K	7.	R13,18,83,93,98,124, 143
038	37006-1153	RES 1/4W 5% 2.2 K	11.	R3,19,46,47,69,75 101,102,105,119,134
039	37006-1506	RES 1/4W 5% 3.3 K	2.	R104,122
040	37006-0959	RES 1/4W 5% 3.9 K	5.	R88,90,91,95,96,
041	37006-0507	RES 1/4W 5% 10 K	12.	R77,80,86,92,97,111 113,114,125,126, 138,144
042	37006-0511	RES 1/4W 5% 15 K	5.	R50,72,73,117,135
089	37006-0535	RES 1/4W 5% 470 K	2.	R137,141
043	37006-1116	RES 1/4W 5% 5.1 K	1.	R142
044	37006-1509	RES 1/4W 5% 33 K	3.	R51,128,129
045	37006-0522	RES 1/4W 5% 47 K	9.	R78,81,82,87,89,94, 109,112,123
046	37006-0527	RES 1/4W 5% 100 K	13.	R1,48,76,79,99,100, 103,106,115,116, 120,136,140
047	37006-1402	RES 1/4W 5% 1 MEG	5.	R49,74,107,118,139
088	37006-1460	RES 1/4W 5% 6.2 K	2.	R11,17
048	38IA100103	TRIM POT 1/4 RD TOP ADJ 10 K	4.	R108,110,127,145
050	37005-1280	RES 1/4W 1% 16.5 K	3.	R10,35,60
051	37005-1160	RES 1/4W 1% 18.7 K	1.	R34,59
053	37005-1322	RES 1/4W 1% 36.5 K	2.	R57,58
054	37005-1231	RES 1/4W 1% 28.3 K	1.	R6
055	37005-1272	RES 1/4W 1% 13.3 K	1.	R15
056	37005-1273	RES 1/4W 1% 13.7 K	1.	R9
057	37005-1936	RES 1/4W 1% 84.5 K	2.	R63,64
058	37005-1880	RES 1/4W 1% 95.3 K	3.	R4,5,121
059	37005-1304	RES 1/4W 1% 100 K	4.	R40,44,65,67
060	3748111133	RES. 1/4W 1% 113K	2.	R70,71
061	3748111333	RES. 1/4W 1% 133K	2.	R42,43
062	37005-1937	RES 1/4W 1% 162 K	2.	R41,66
063	37005-1290	RES 1/4W 1% 23.2 K	1.	R16
064	37005-2291	RES 1/4W 1% 178 K	2.	R37,39
065	37005-1881	RES 1/4W 1% 191 K	3.	R45,68,133
092	37006-0708	RES 1/4W 5% 39 K	2.	R130,131
066	37005-1813	RES 1/4W 1% 200 K	1.	R32
067	3748114123	RES. 1/4W 1% 412K	2.	R32,33
068	37005-1413	RES 1/4W 1% 57.6 K	2.	R12,14
069	37005-1298	RES 1/4W 1% 64.9 K	2.	R7,8
070	42-2792	FUSE CLIP C.B. MOUNT	2.	(F1)
071	42-2958	FUSE 1 AMP BUSS AGC1	1.	F1
073	64A0010746	HEAT SINK 1 X .710 TO220 PKGE	1.	(IC22)
083	64A0010746	PHOENIX - 10 POS	1.	TB1
077	66-1954	SOCKET 40 PIN DIP	1.	(IC2)
078	66-2192	SOCKET 28 PIN DIP	3.	(IC11,12,13)
080	67A0010569	TEST PIN .025 SQ PHOS BRONZE	11.	
081	70-2026	WAFER DUAL ROW ON .100 CENTERS	31.	P3 - TEN JP2- ONE P5 - TWENTY
072	70-2135	WAFER PINS ON .100 CENTERS	3.	JP1
087	70-2170	WAFER POLARIZED 2 POSITION	1.	P4
082	70-3119	WAFER 4 POSITION	1.	P1
079	70A0010075	WAFER 10 POS.-FRICTION LOCK	1.	P2
074	74-1086	SCREW 6/32 X 5/16 BHMS	1.	(IC22)
075	75-0559	NUT 6/32 4 BLANK	1.	(IC22)
076	76-0562	WASHER #6 INTERNAL STAR	1.	(IC22)
091	33A0010722	HM 221 INSULATOR	1.	(X2)

FERRITRONICS

MADE IN CANADA

LCD/KEYBOARD BUFFER SCHEMATIC
DIAGRAM
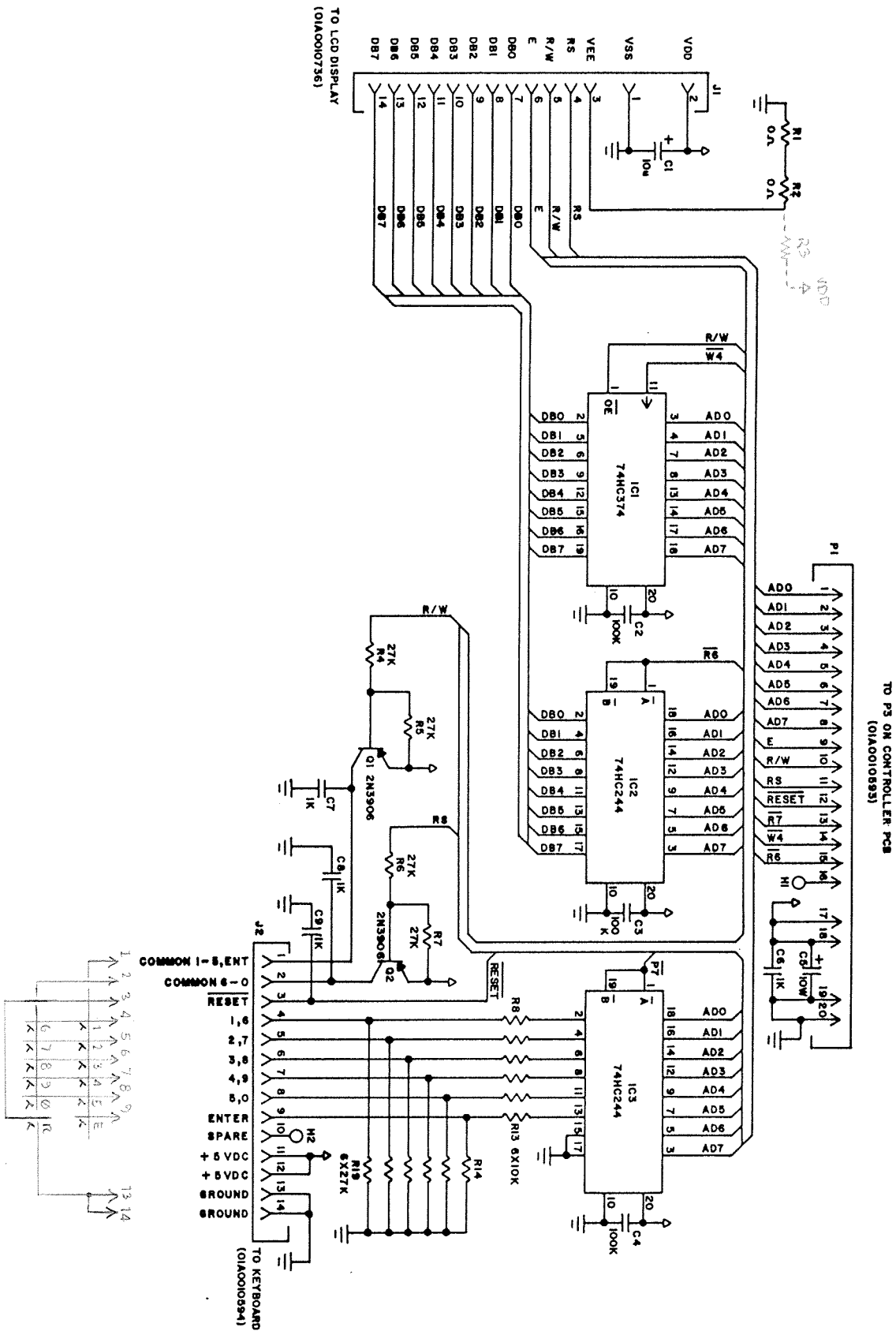
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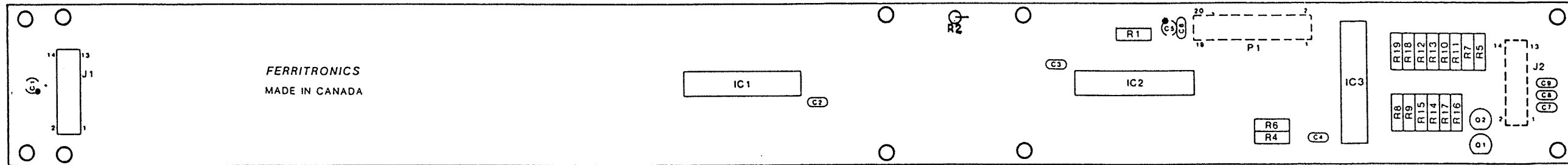
PARTS LIST

01A0010737   LCD/KEYBOARD BUFFER ASSEMBLY

ITEM NO	PART NO	DESCRIPTION	QTY REQ	REMARKS
100	18B0010737	PCB LCD/KEYB. BUFFER	1.	
301	29A0010764	OCTAL D FLIP-FLOP MC74HC374N	1.	IC 1
302	29A0010762	OCTAL BUFFER/DRIVER MC74HC244N	2.	IC 2, 3
303	26-2545	TRANS SIGNAL PNP 2N3906	2.	Q 1, 2
304	10-2606	CAP CERAMIC 1 KPF 100V 10%	4.	C 6, 7, 8, 9
305	10-1473	CAP CER DIP Z5U 100 K PF 20%	3.	C 2, 3, 4
306	11-1669	CAP TANT DIP 1 MFD 20% 35V	2.	C 1, 5
308	37006-0507	RES 1/4W 5% 10 K	6.	R 8, 9, 10, 11, 12, 13
309	37006-0516	RES 1/4W 5% 27 K	10.	R 4, 5, 6, 7, 14, 15, 16, 17, 18, 19
310	70A0010810	DUAL ROW HEADER NSH-20DB-S2-T	1.	P 1
311	66A0010767	BOX CONN. SOCKET 14 POS. DUALROW	1.	J 1
313	70A0010807	DUAL ROW HEADER NSH-14DB-S2-T	1.	J 2
314	37006-2917	RES. 1/4 W 0 OHMS	2.	R 1, 2

LCD DISPLAY ASSEMBLY
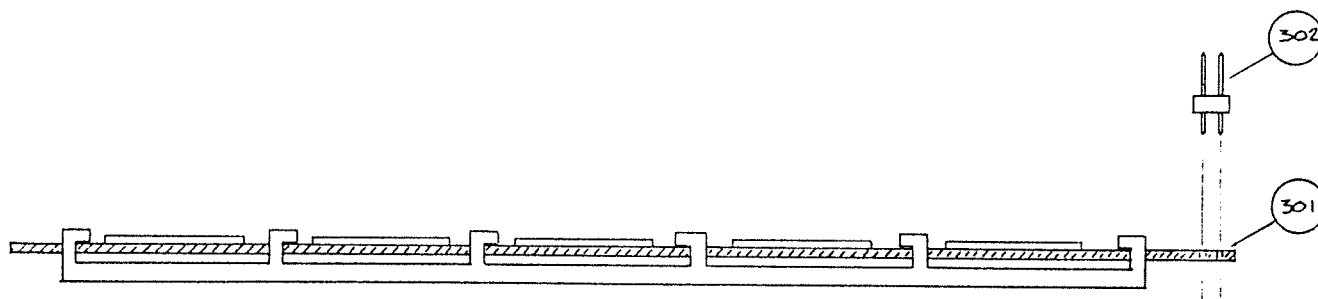
PARTS LIST

01A0010736   LCD DISPLAY ASSEMBLY

ITEM NO	PART NO	DESCRIPTION	QTY REQ	REMARKS
301	34A0010744	LCD DISPLAY(40 CHAR. X 2 LINES)	1.	
302	70A0010807	DUAL ROW HEADER NSH-14DB-S2-T	1.	P1

LIMITED TWO YEAR WARRANTY

All Ferritronics equipment is warranted to be free of defects in material and workmanship on date of shipment. Original purchaser's exclusive remedy for defective goods will be repair or replacement of such defective goods returned to the Vendor, or a refund of the purchase price. Any unauthorized alteration or modification of the equipment by the purchaser or damage caused by external sources will void the warranty.

Materials are warranted for a period of two (2) years from date of shipment. Workmanship is warranted for a period of one (1) year. Repairs to correct defects identified in the first twelve (12) months following date of shipment will be made by Ferritronics free of charge.

Purchaser is required to allow Vendor a reasonable opportunity to inspect, test, or sample goods prior to approval of their return by Vendor, and to give written notice of the defects to Vendor prior to expiration of warranty, and to include dated proof of purchase with equipment being returned under warranty.
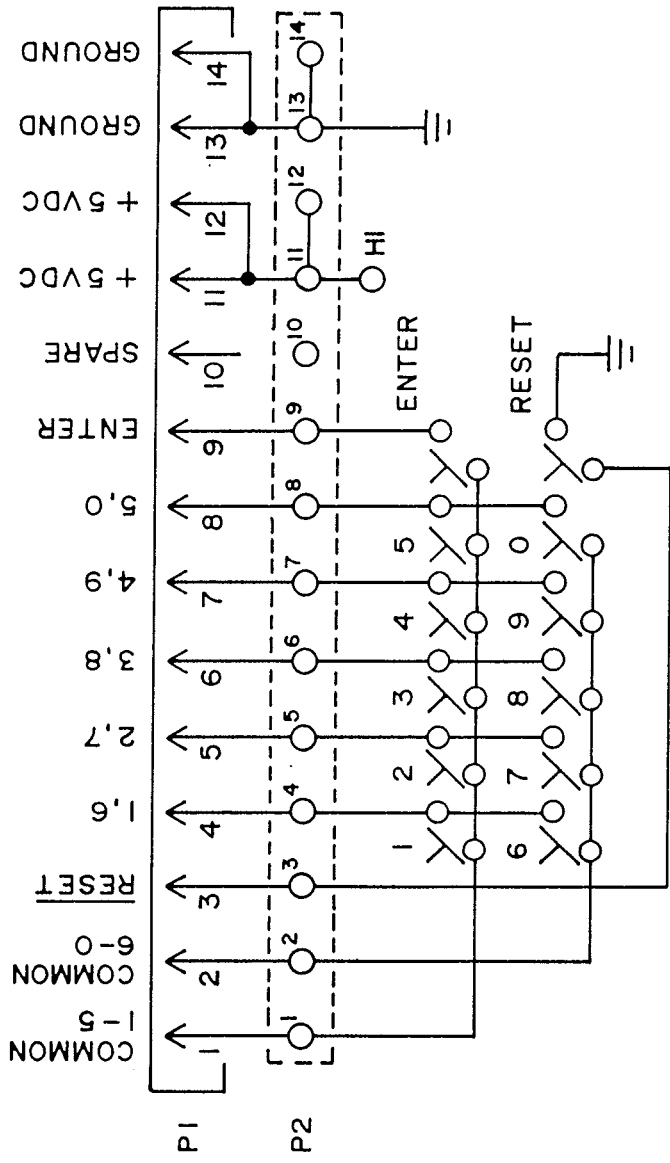
There are no other warranties expressed or implied which are applicable to Ferritronics equipment.

RETURN POLICY

Purchaser may return Ferritronics equipment for restocking and credit, provided notification has been given to the Vendor. All equipment returned will be subject to restocking charges.
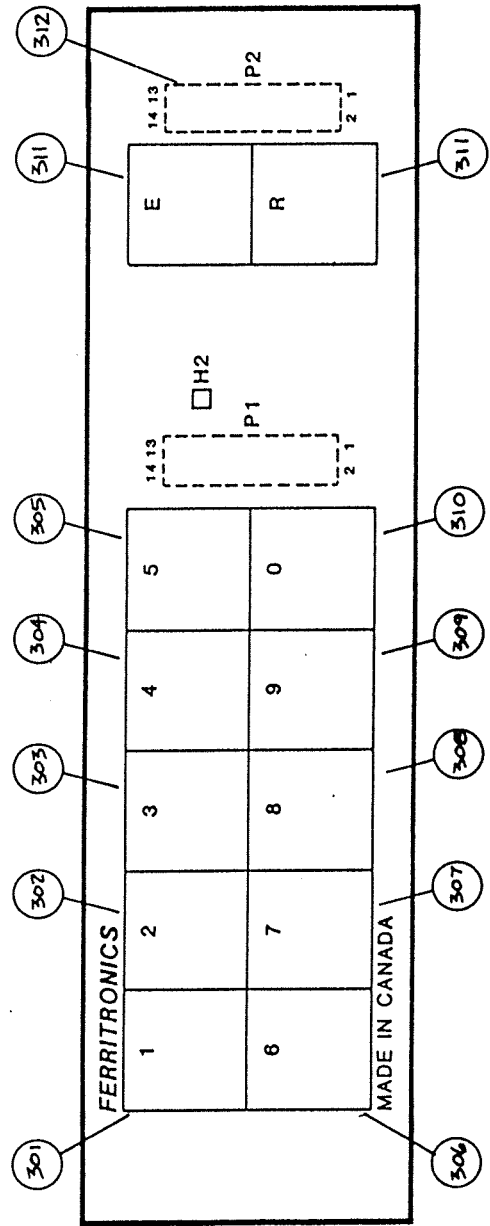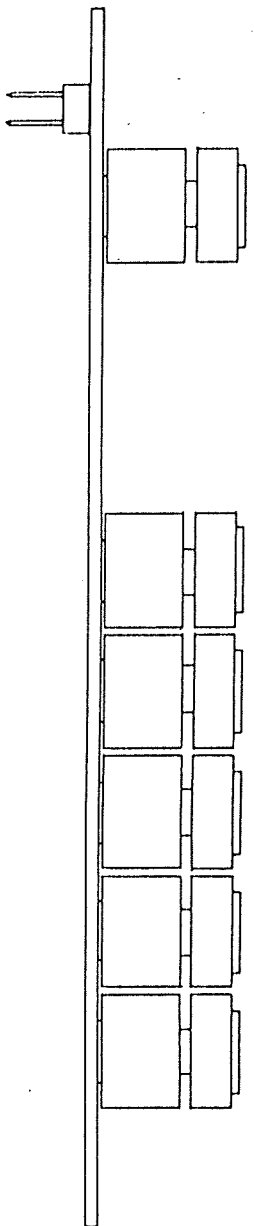
The restocking charge for Standard products in original condition and returned to the Vendor within 30 days of shipment is 20% of the purchase price.

Purchaser is to include a Return Authorization, provided by the Vendor, with equipment shipped to Ferritronics for restocking.

03A0010594

COMMON 1-5
COMMON 6-0
RESET
1,6
2,7
3,8
4,9
5,0
ENTER
SPARE
+5VDC
+5VDC
GROUND
GROUND

P1

P2

ENTER

RESET

HI

1   2   3   4   5
6   7   8   9   0

TITLE	CHKD. BY	L. D.	DESIGN ENG.	RELEASE DATE Mar 25/87	ISSUE
KEYBOARD FOR RPO3	DRWN. BY WH	APP'D BY		1
	DATE 9 MAR 87	FILE	
	SCALE NTS	DWG. NO. 03A0010594	
	SHT. 1 OF 1	

FERRITRONICS
SIGNALLING AND CONTROL

| CHANGE/DATE | REV. | ISS. |

| A | 05A0010504 |

312
311
P2
14 13   2 1
E
R
311

□H2
P1
14 13   2 1

305 304 303 302 301
5   4   3   2   1
FERRITRONICS
310 309 308 307 306
0   9   8   7   6
MADE IN CANADA

N TRANSTEX