

**2m/FM TRANSCEIVER**

**MODEL HT-1200**

**INSTRUCTION MANUAL**







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## GENERAL INFORMATION

THE Santec Model HT-1200 hand held transceiver is a revolutionary design and is engineered employing the newest Micro Computer on a Chip technology to control the PLL frequency synthesizer circuit whose capabilities cover the Amateur 2m FM band of 1200 channels on transmit and 1400 on receive.

**AUTO MEMORY INITIALIZE** — The SANTEC HT-1200 initializes each of the 10 memories with a two-meter frequency upon the application of power to the microprocessor. This feature means that in many areas of the country the memory selection needs only to be modified slightly or not at all for immediate use, BACK-UP BATTERY DRAIN IS ZERO for this feature. The frequencies used are: 146.52, .76, .82, .88, .94; 147.00, .06, .12, .18, .51.

**10 MEMORY CAPACITY** — Because it is difficult to remember where more than ten frequencies are located in memory, Santec stopped at ten. The writing of user determined frequencies is done in the frequency and memory modes while the recall of any memory requires only ONE KEYSTROKE in the memory mode.

**16 TONE DTMF GENERATOR** — Santec recognizes that many applications for repeater autopatch require the use of all 16 of the DTMF tones. For this reason we have included all the tones in the capability of the unit. The level is independently adjustable with regard to mike audio or CTCSS audio.

**CTCSS CAPACITY FOR 32 TONE ENCODER or ENCODER/DECODER** — Santec has made provision inside the case of the HT-1200 for the latest synthesized CTCSS encoder to fit and be supplied power and a receiver audio line and a tone injection point for the TS-1JR single tone encoder/decoder.

**SCANNING FUNCTIONS** — Scan functions of the HT-1200 are available in both the Memory Mode and the Bandscan Mode. In the Memory Mode, all ten memories are scanned either in up or down sequence and an active channel causes the scan to pause while the channel is active and resume scan when the channel frequency again clears. In the Bandscan Mode the scan proceeds from the frequency on the dial and scans up or down, as selected by the user, to the end of the band at which time it returns to the frequency of origin.

**SEARCH FUNCTIONS** — In the Search Mode, the scanning proceeds as in the Scan Mode until a signal is found, it then stops on the frequency it found active and remains there. The memories are scanned in the Memory Mode and the Band is scanned in the Frequency Mode. This feature is particularly useful to the traveler who is moving along the highway or is in a strange city and does not know the frequencies in use. As each active frequency is found it can be inserted into memory and these can be "scanned" for activity and interest.

**SCAN STEP SELECTION** — The HT-1200 can scan in any multiple of 5kHz steps. This means 5kHz, 10kHz, 15kHz, and even up to 100kHz scan steps are available. These are set through the keyboard using the number keys to enter the step value and then pressing the STEP button.



**FREE SPLIT CAPACITY** — This facility is provided by using Memory "1" for transmitting whenever the offset switch is set to M1 and the SPX/DPX switch is set to DPX. Any frequency within the range of the radio is available.

**WIDE FREQUENCY RANGE OPERATION** — The HT-1200 has the capability of operating somewhat outside the amateur bands for the purpose of serving in the various MARS and CAP programs. The actual specifications are limited to the HAM Bands.

**TEXAS INSTRUMENTS MICROPROCESSOR** — The TMS-1000 microprocessor used in the HT-1200 is the most popular of the four bit micro- processors used today. The program a capacity of this device and direct LED drive makes it the most efficient choice for a battery operated device.

**HIGH POWER CAPABILITY** — Because nothing is more frustrating than unsuccessfully trying to access a repeater when you really need it, we built the HT-1200 to produce about four watts over the HAM BAND so that when you need the extra punch to get through you have it.

**LOW POWER CAPABILITY** — High power is great but its expensive in terms of battery life and how many hours you can carry your HT-1200 without recharge. The one watt position of the HT-1200 controls the driver stage of the transmitter which conserves as much current as possible.

**L.E.D. DISPLAY** — The L.E.D. display was chosen due to the capability of the TMS-1000 to drive them without intermediate circuitry and their reputation as the most rugged and long lived of the displays. The display in the HT-1200 is normally off and illuminates when a key is depressed for a few seconds and then turns off again. If desired the display can be locked on. By recessing the display sufficiently into the case, the numbers are readable when the unit is in direct sunlight. In lightlevels at or about the twilight level the LED is more readable than the LCD and lamp system and for lower levels the superiority increases.

**KEYBOARD ENTRY OF ALL FREQUENCIES** — The HT-1200 enters all the frequencies available from the keyboard without resorting to complicated tricks to get to the MARS frequencies. Also entered via the keyboard is the 5kHz information. This allows memorization of this information and scanning to the exact frequency (not 5kHz away) in both the bandscan and memory modes.

**MOBILE CHARGER AND POWER SUPPLY** — To operate from the vehicle 13.8 Vdc power source this unit regulates the auto voltage down to the level needed to charge the NiCd battery pack.

**50 WATT AMPLIFIER** — This amplifier was specifically mated to the HT-1200 capabilities. It is conservatively rated at 50 Watts and is actually capable of as much as 40% more dissipation. This allows you to install the HT-50L and forget its there.

**LEATHER CASE** — Nothing beats real leather for protecting your investment in radio gear. So we provide this optional top grain leather case for the HT-1200 in a matching brown tone. The case has a belt clip which fits the wide belts very snugly and allows for getting it safely on and off without removing your belt.

## SPECIFICATIONS

### General

Semi-Conductors .....	Transistors: 37
	FET: 5
	IC: 7
	Diodes: 43
Frequency Range .....	TX 143.000 to 148.995 MHz
	RX 143.000 to 149.995 MHz
Type of Emission .....	F3
Number of Channels .....	TX 1200 (5kHz step)
	RX 1400 (5kHz step)
Memory Channels .....	10 Channels
Antenna Impedance .....	50 ohms
Power Source & Voltage .....	9.6 VDC by Nickel Cadmium Battery Pack
DC Current .....	Approx. 40mA in receive with no input signal.
	Approx. 150mA in receive, full audio
	Approx. 900mA in transmit (at 4 watts RF output)
	Approx. 5mA in memory backup
Dimensions .....	68mm (W) x 170mm (H) x 47mm (D)
Weight .....	600 gr.

### Transmitter Section

RF Output Power .....	HI-Power Level: 4 Watts
	Low-Power Level: 1 Watt
Modulation .....	Variable Reactance Frequency Modulation
Maximum Frequency Deviation .....	±5kHz
Spurious Radiation .....	Less than -60dB
Microphone in Use .....	Condenser Microphone
TX & RX Frequency Shift .....	±600kHz (From the receiving frequency or on Memory Channel 1)
Telephone Tone Frequencies: As shown in the table.	

Freq. In		High Group			
kHz		1209	1336	1477	1633
Low Group	697	1	2	3	A
	770	4	5	6	B
	852	7	8	9	C
	941	*	0	#	D

### Receiving Section

Receiver Circuitry .....	Double Superhetrodyne
Intermediate Frequency .....	1st IF: 16.9 MHz
	2nd IF: 455kHz
Sensitivity .....	Less than 0.32μV
Squelch Sensitivity .....	Less than 0.32μV
Pass Band Width .....	±7.5kHz (6dB)
	±15kHz (70dB)
Audio Output .....	More than 300mW



## Accessories

HT-1200 is supplied with the following accessories

- |     |  |                              |
|-----|--|------------------------------|
| (1) | 9.6VDC Nickel Cadmium Battery Pack . . . . .                   | 8N-500AA 500mA-Hr capacity.  |
| (2) | Helical Antenna (Flexible Rubber) with BNC Connector . . . . . | 1 Piece                      |
| (3) | AC Battery Charger . . . . .                                   | QCK-1250A1 . . . . . 1 Piece |
| (4) | Earphone . . . . .   | 1 Piece                      |
| (5) | Strap Band . . . . .   | 1 Piece                      |
| (6) | Instruction Manual . . . . .                                   | 1 Copy                       |

Note: Circuit and rating may change without notice due to developments in technology.

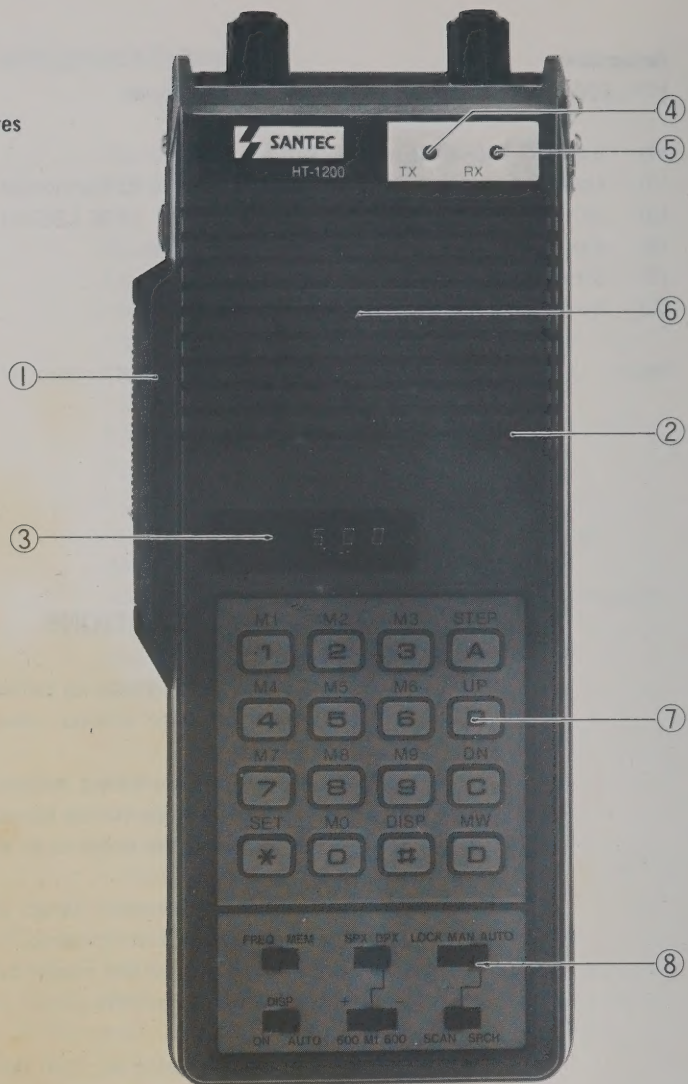
## CAUTIONS

1. Charge the batteries before using.  
Batteries are shipped without charge on them.
2. Don't use the transceiver without an antenna.  
It may cause damage to the transceiver finals.  
Please attach the antenna at all times.
3. Do not put the transceiver in intense, direct sunshine, high temperatures,  
high humidity or immerse in water.  
It may cause color changes of the plastic body of the transceiver  
or warping of the plastic parts.
4. Before loading or unloading batteries, turn the power switch off and turn  
the three step slide switch to "RESET"
5. Do not turn the power switch on with the PTT switch pushed.

FEATURES

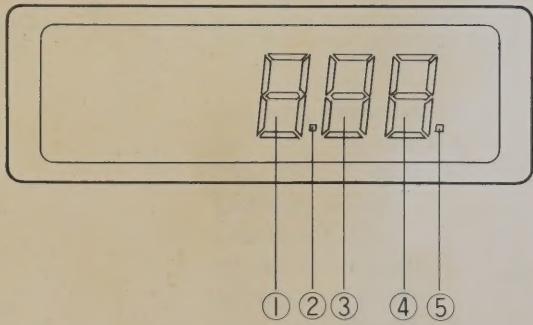
Section 1-1 Front Controls and Features

- (1) PTT Switch
- (2) Condenser Microphone
- (3) MICRO PROCESSOR  
LED Display
- (4) TX Indicator (LED)
- (5) RX Indicator (LED)
- (6) Speaker
- (7) 16 Key Keyboard
- (8) Slide Switch Area



(3) LED DISPLAY

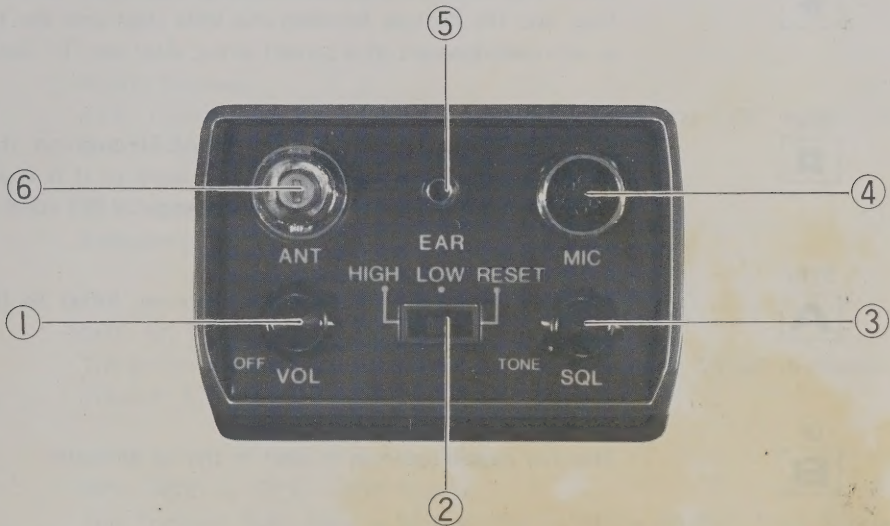
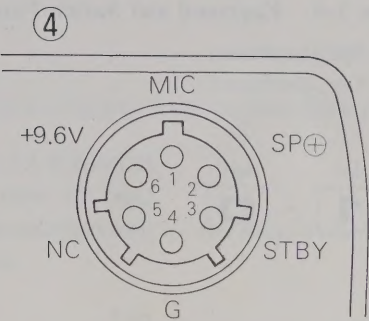
- 1. MHz indicator Digit
- 2. Decimal point & Frequency Set Status Indicator
- 3. 100 KHz Digit
- 4. 10 KHz Digit
- 5. 5 KHz Indicator





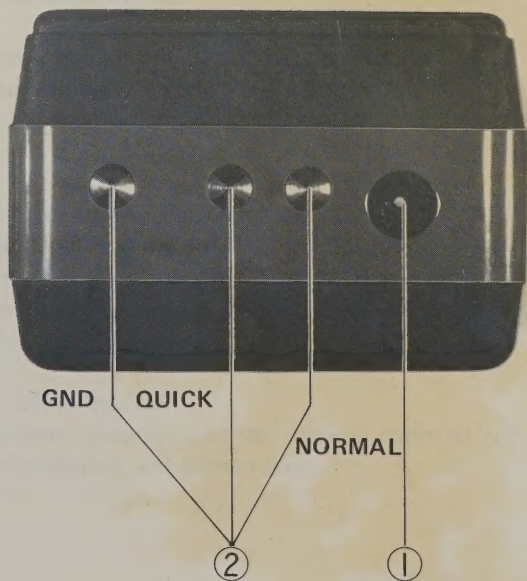
**Section 1-2 Top Controls and Functions**

- (1) Off/On, Volume Control
- (2) Power Level Switch  
High/Low/Reset
- (3) Squelch Control and CTCSS Power
- (4) Remote Mic/Speaker Jack
- (5) Earphone Plug
- (6) BNC Antenna Connector



**Section 1-3 Bottom Connections**

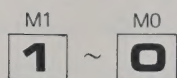
- 1. Wall Charger, Car Charger Jack
- 2. Drop-in Charger Connections



## Section 1-4 Keyboard and Switch Functions

In the Receive Mode:

16 Key, Keyboard



### NUMBER KEY:

Used to enter the digits of a frequency or to store operating frequencies into memory or to recall them after being memorized.



### SET:

When this key is pressed the entered digits are sent to the phase locked loop and the decimal between the MHz digit and the 100KHz digit lights as acknowledgement of a correct entry. Also see "E" indication section.



### DISPLAY KEY:

When the Display switch is set to the AUTO position, the Display will turn on for 5 seconds when this key is pressed or if it is already on this will cause it to go off. Except in the scan mode or ON condition.



### STEP KEY:

This key stores the step size for scanning, 5KHz to 100KHz per step in increments of 5KHz.



### UP KEY:

This key causes scanning to start in the up direction.



### DOWN KEY:

This key causes scanning to start in the down direction.



### MEMORY: MW KEY

This key is used to tell the microprocessor that the frequency on the dial is to be stored in the memory number of the next key.

In Transmit:

ALL KEYS

Each key is automatically one set of two tones of the standard 16 combinations of the DTMF System. The display also indicates which key is depressed.



## SLIDE SWITCH AREA

FREQ MEM



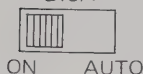
FREQ Position:

For frequency Setting, Frequency Scanning and Scanning Step Size Setting.

MEM Position:

For Writing a Frequency into a Memory Channel, for Recalling a Memorized Frequency and for Memory Scanning.

DISP:



ON Position:

LED Display is Continuously Illuminated.

AUTO Position:

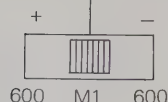
LED Display turns off after five seconds. Press the DISP button for another 5 seconds of display.

SPX DPX



SPX Position:

Frequency for Transmit is the same as for Receive.



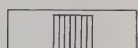
DPX- M1 Position:

Transmitting Frequency is Shifted to the Frequency Stored in Memory Channel 1.

DPX- +600 or DPX- -600 Position:

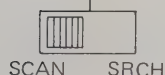
The Transmit Frequency is Shifted Plus or Minus 600KHz from Receive Frequency.

LOCK MAN AUTO



LOCK Position:

16 Key Buttons are locked and no operation can be made except DTMF tones while transmitting.



MAN Position:

The frequency scanning and memory scanning are to be manually stepped.

AUTO — SCAN Position:

The frequency scanning and the memory scanning will automatically stop anywhere there is an active channel on the air, and will start scanning again when the signal is gone.

AUTO — SRCH Position:

The frequency scanning and the memory scanning will automatically stop at an active channel and remain there.

## OPERATION

### 2-1 Installing Battery and Powering Up

#### 2-1-1 Installation of the Battery Pack

Remove the battery cover from the back of the unit with a coin in the slot of the large slotted screw head. Turn in the direction indicated on the cover as "OPEN". Lay the battery in the case with the leads on the same side as the 2 pin plug. CAREFULLY orient the plug on the battery pack so that it is properly polarized to the connector on the PC board. Insert the connector.

**WARNING:** REVERSED POLARITY OF THE CONNECTIONS WILL DAMAGE THE UNIT AND PACK

#### 2-1-2 Power Source

Turn the POWER ON/OFF switch clockwise to turn on. The power level (HIGH/LOW/RESET) should be set to either, High or Low. The LED Display will show 6.52, which is the frequency 146.520MHz. This is also stored in Memory Channel 1 (146.520MHz). When the power level switch is on other than "RESET" position, and the POWER ON/OFF is turned on, the frequency on the LED shows the previous frequency in use.

### 2-2 Entering A New Frequency

#### 2-2-1 Frequency Set

In the FREQ Position of the FREQ/MEM switch, key buttons (0 through 9) are pressed in order of; MHz, 100KHz, 10KHz and either 0 or 5KHz when required (press 5), at this time these numbers are indicated on the LED except for 5KHz. Now press the Key "SET". The decimal DOT of the MHz is turned on and the frequency set is completed. If a frequency ending in 5KHz was selected the display will indicate with a decimal DOT at the right end of the display.

#### 2-2-2 Trailing Zeroes are not Necessary to the Program

EXAMPLE: To set 147.00MHz

Ordinarily; press 700 SET Display is 7.00

Simplified; press 7 SET Display is also 7.00

You skip 2 steps.

#### 2-2-3 Incorrect Frequency Set

If you find that you have pushed an incorrect button during the frequency set, push the SET button once and re-enter the data. If you set the frequency outside the coverage of the radio or you set other than 0 or 5KHz for the KHz range when you push SET button, the error "E" indication will be shown on the LED display.

The "E" indication will be shown if you do not push the set button for five seconds after setting the frequency.

In either case, by setting the correct frequency again or by pushing DISP button to call former frequency, the "E" indication will be automatically cancelled without any other reaction.



## 2-3 Frequency Set on Memory Channel:

When you turn on the power switch and the back up switch has been in reset (RESET POSITION of HIGH/LOW/RESET switch), each memory channel will be loaded with the following frequencies. These frequencies are stored in the microcomputer software and are transferred to the memories when power is first applied.

CH 1	146.52 MHz	CH 6	147.00 MHz
CH 2	146.76 MHz	CH 7	147.06 MHz
CH 3	146.82 MHz	CH 8	147.12 MHz
CH 4	146.88 MHz	CH 9	147.18 MHz
CH 5	146.94 MHz	CH10	147.51 MHz

To set other frequencies into memory, first, set the Desired frequency using the FREQ position. Second, slide toward MEM position and push the MW button. Next, push the memory button you desire between M1 and M0.

To call a memorized frequency, simply push the memory channel button when in the MEM position.

To transfer the memorized frequency to another channel, use the following example.

Frequency of channel 1 to channel 2.

	Memory Recall	Write to	Memory No.
Push	M1	MW	M2

When the slide switch "DISP-ON/AUTO" is at the AUTO position, each action must be done during the LED ON TIME (5 seconds) or an ERROR will be shown.

## 2-4 Frequency Scanning

Put FREQ/MEM switch at FREQ position.

### 2-4-1 Scan

At MAN position of LOCK/MAN/AUTO switch, set the initial point to start the scanning and push the UP or DN button. The scanning starts upward or downward in 10KHz steps.

If the Keypress time on the UP or DN button is less than one second, the scan is one step. If it is more than one second, continuous scanning starts (0.1 second per step.) The scanning will only stop by pushing the UP or DN button again.

### 2-4-2 Automatic Scanning

At AUTO position of LOCK/MAN/AUTO switch.

#### a) SCAN Mode

At the SCAN position of SCAN/SRCH switch, Auto Scan begins by pushing the UP or DN button. Scanning stops automatically at an active frequency. The scanning starts again after 3 seconds of closed squelch.

#### b) SRCH Mode

At the SRCH position of the SCAN/SRCH switch, scanning stops at an active frequency but never scans again until the UP or DN button is pushed again.

### **2-4-3 Scan Step Size Change**

The initial scanning step has been set at 10KHz and to change this step move to the FREQ position of FREQ/MEM switch, set the desired step by using 1 ~ 0 buttons (In the case of 50KHz, 5 and 0) and then, push the STEP button. The desired step of 50KHz is now set. The possible Step sizes are multiple numbers of 5KHz and the range is from 5KHz to 100KHz. If the setting is made by other than multiple numbers of 5KHz an error indication will occur.

If the E indication will not turn off anymore as the result of an over 100KHz entry, please place the power level switch in the reset position and turn the power off at the volume control. This will reset the error and the microprocessor functions and status.

### **2-4-4 Lower and Upperlimit Frequencies for Scanning**

Scanning is done between 143.000 and 149.995MHz from the initial setting of the frequency to the upper or lower limit.

#### **Example:**

Initially set the frequency to 146.610 (661\*)

a) By pushing the UP button, scanning starts from 146.610 and goes up to 149.995. It then returns to 146.610MHz and begins to scan up again.

b) By pushing the DN button the scan goes down from 146.610MHz and resets to 146.61 after reaching 143.00MHz.

## **2-5 Memory Scan**

Set FREQ/MEM switch to the MEM position.

### **2-5-1 Manual Memory Scan**

In the MAN position of the LOCK/MAN/AUTO switch, push the UP switch momentarily for the memories to be sequenced up and the DN switch for the memories to be sequenced down. Due to the microprocessor program if the keyboard is depressed for more than one second in this mode the memories will be scanned continuously without stopping. Touch the UP or DN switch to stop again.

### **2-5-2 Auto Memory Scan**

In the AUTO position the memories are scanned in automatic sequence until a busy frequency is found. At this time the Scan is suspended and the channel monitored until the squelch has closed for approximately three seconds, at which time Scan will resume or not depending on the setting of the SCAN/SRCH switch. In the Scan Mode the display is continuously lit at all times. However, since the Scan Mode itself uses no more power than regular receive and the small (0.006A) drain of the display has very little effect on the battery life, this is not a problem.

## **2-6 Transmitter Frequency Shift (for repeater operation)**

With the SPX/DPX switch in the DPX position, and when in the M1 position of the +600/M1/-600 switch the transmitter will always transmit on the frequency in memory M1. This is the feature which allows MARS, CAP and oddball split repeater use.

At either the +600 or -600 position, the frequency will be either increased or decreased by 600KHz from the receive frequency.



## **2-7 Automatic Turn-Off of Digital Display**

When the DISP:ON/AUTO switch is in the ON position the display is on all the time the radio is turned on. Since the display only draws an average of 0.006A when on it has very little impact on battery life. It is infact equivalent to about 3 or 4 minutes of transmit time out of 10 hours battery life. However for those applications which need to stretch the battery life to the fullest, the display can be set to AUTO and the display will extinguish 5 seconds after the last keystroke.

If the display is in automatic and is on and you wish to turn it off before the 5 seconds are up, push the DISP button to turn it off early.

## **2-8 Telephone Dialing Tones**

While the PTT switch is pushed DTMF tones are transmitted from each of the 16 keys on the keyboard. These are the standard telephone DTMF signalling tones used. The buttons are labeled and positioned as a telephone dial would be.

## **2-9 Memory Backup**

At the HIGH or LOW position of the HIGH/LOW/RESET switch, memory channels are retained even though the power is turned off at the volume control. This function draws about 4 or 5 mils from the battery and from a full battery should last about 4 days. However, the memories are programmed to 10 popular frequencies on cold start of the microprocessor. This function does not require any current from the battery in back-up. (RESET position)

## **2-10 Squelch**

Turn the squelch knob counter clockwise until the rushing noise is heard and then clockwise until it just stops. This is the optimum squelch setting for this unit. Please note that the setting of the audio squelch has little effect on the scan function as the scan signal is not squelch derived.

## **2-11 Error "E" Indication in the Display**

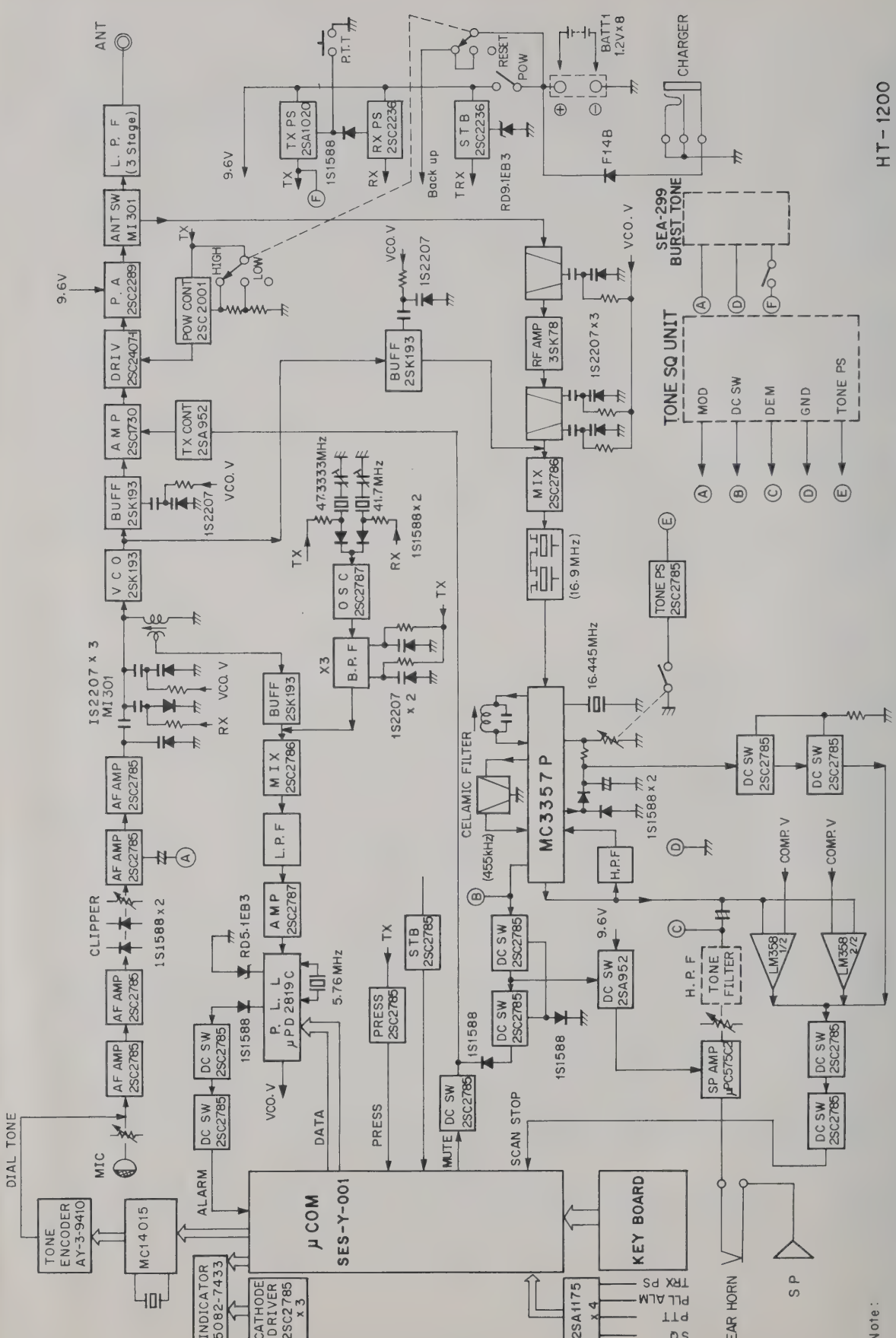
WHENEVER AN INCORRECT ENTRY IS MADE, AN "E" WILL APPEAR IN THE DISPLAY. TO MAKE IT GO AWAY, RE-ENTER THE DATA IN THE CORRECT FORM. IF NOT, THE ERROR DISPLAY WILL REMAIN UNTIL CORRECT DATA IS ENTERED.

## **3-1 NiCd Battery Pack**











The NiCd battery with this radio can be cycled from full charge to full discharge 300 times or more. Proper care of your battery will cause it to have a long life. While overcharging, undercharging and under-discharge of the pack will severely shorten its life. NiCd batteries like to be used to discharge and then recharged fully. They do not like to be slightly discharged and then recharged or discharged and ignored. The TX LED on the HT-1200 will not light if the battery is in need of a charge. The radio may operate in low power for a few more transmissions but at the full discharge point the entire radio will turn off and remain off until a fresh battery is inserted or the old one is recharged.

Quick charge of this pack is 150mA MAXIMUM for 5 Hrs. MAXIMUM. Or 100mA for 6.5 Hrs. or more up to 72 Hrs. Maximum. The charger supplied with the unit supplies 45mA for slow charge which takes 15 – 17 Hrs. but may be left on the unit with no damage or time limit.

## 4-1 Block Diagram



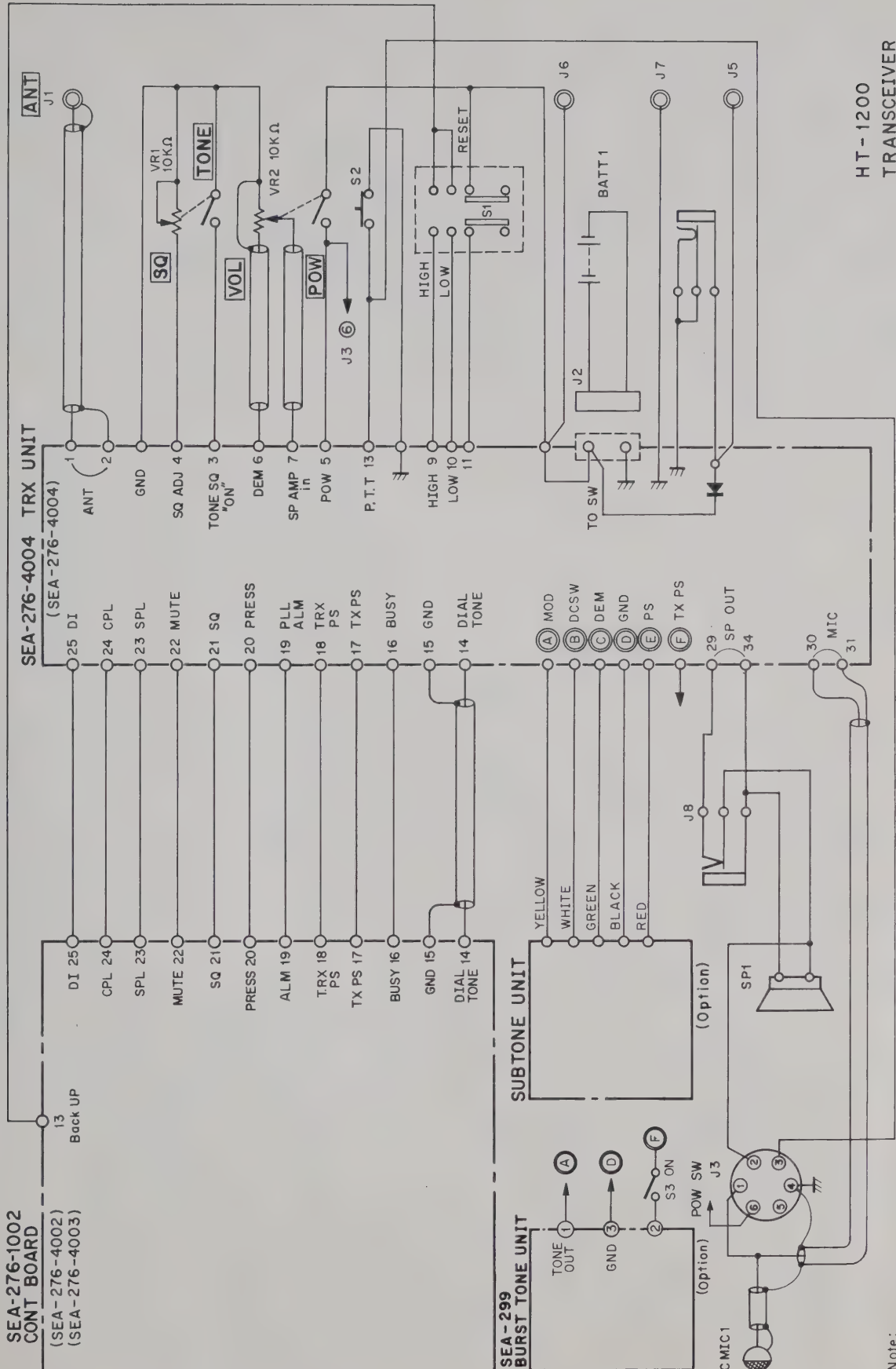
**Note:**

1. If the tone squelch is required as optional design, SUBTONE UNIT TS-1JR or equivalent must be connected      position.
2. If the burst tone is required as optional design, BURST TONE UNIT SEA-299 must be connected      position.

# HT-1200 TRANSCEIVER BLOCK DIAGRAM



4-2 Interconnection Diagram

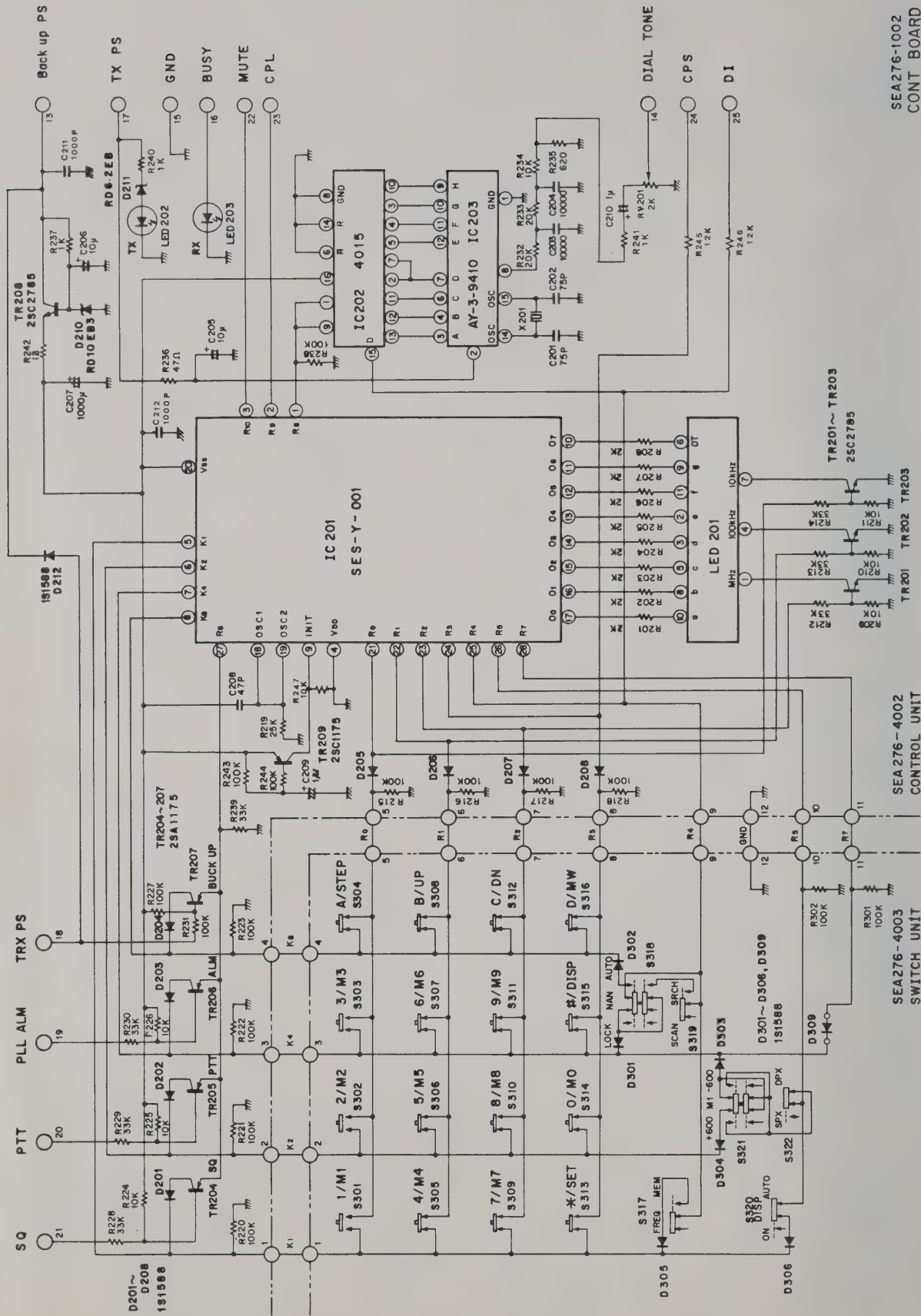


HT-1200  
TRANSCIVER

Note:

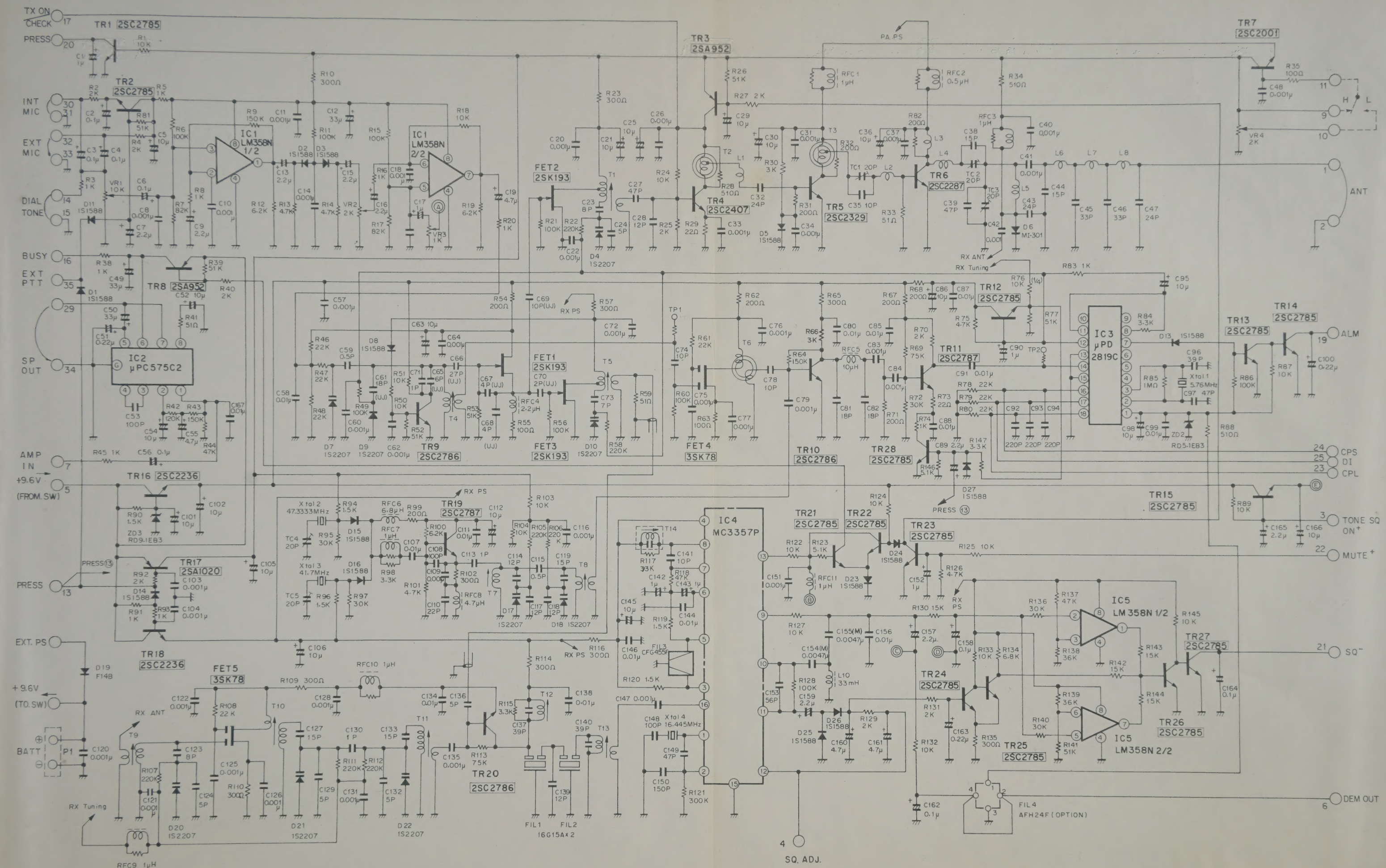
1. If the tone squelch is required as optional design, SUBTONE UNIT TS 1JR or equivalent must be connected **(A)** **(B)** **(C)** **(D)** **(E)** position.
2. If the burst tone is required as optional design, BURST TONE UNIT SEA-299 and S3 must be connected **(A)** **(D)** **(F)** position.

### 4-3 Micro Processor Controller Diagram



MEMO

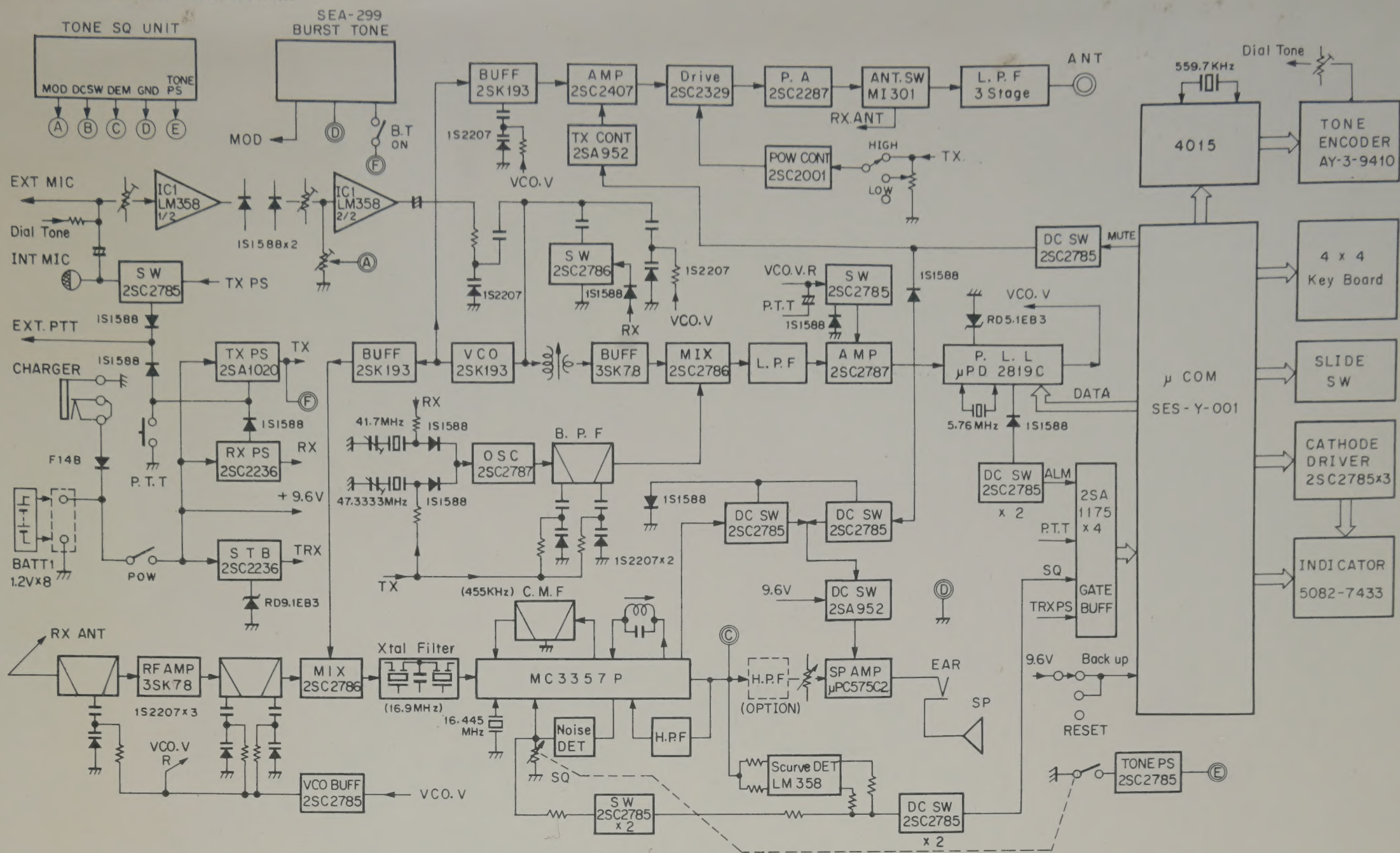




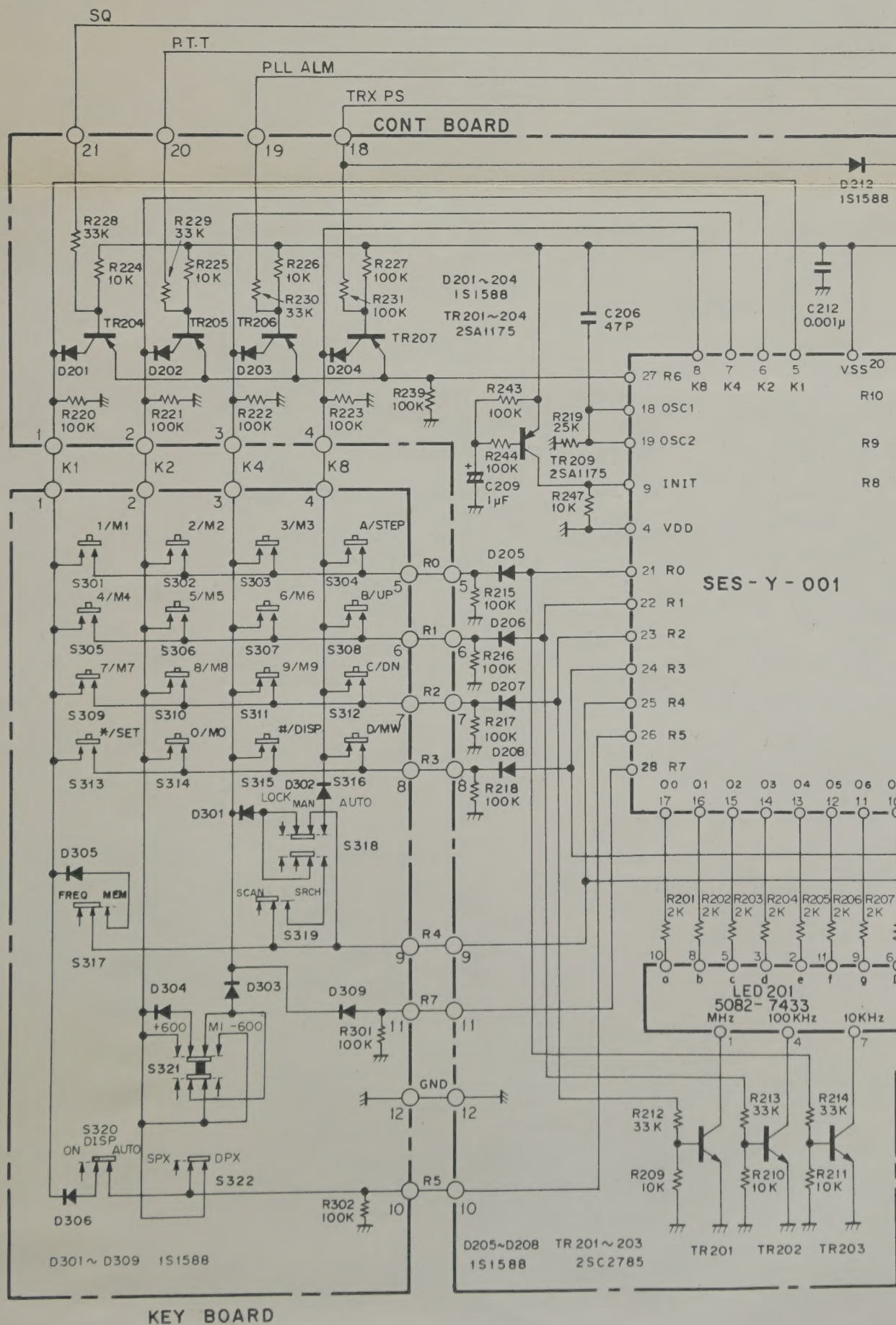
- Note ;
1. Standard design is not required FIL4 AFH24F, therefore, between pin No.2 and 4 must be strapped.
  2. If the tone squelch is required as optional design, remove the strap between pin No.2 and 4 then add FIL4 and also SUBTONE UNIT TS 1JR or equivalent must be connected (A)(B)(C)(D)(E) position.
  3. If the burst tone is required as optional design, BURST TONE UNIT SEA-299 must be connected (A)(D)(F) position.



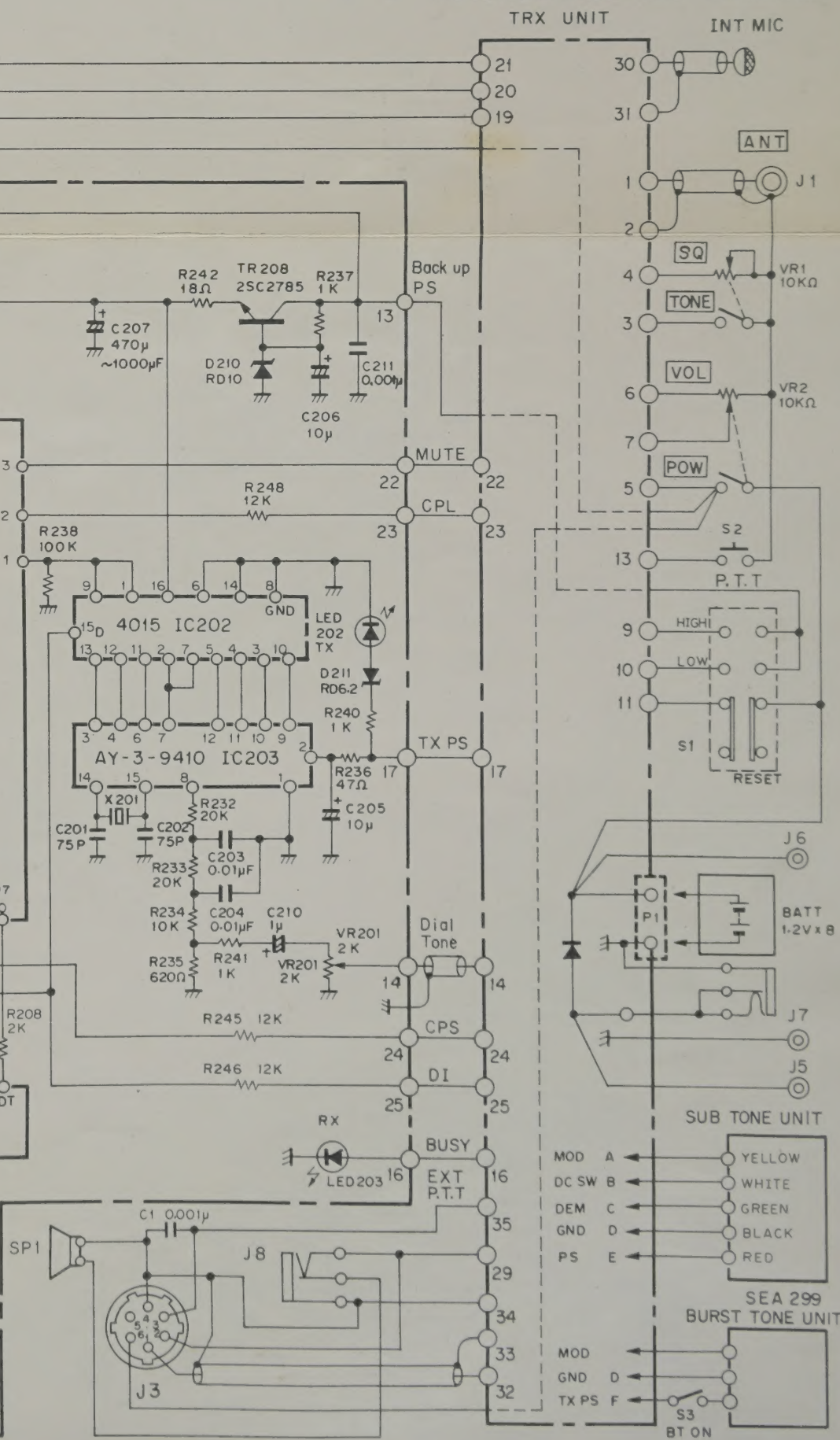
# 4-1 BLOCK DIAGRAM



## 4-3 MICRO PROCESSOR CONTROLLER DIAGRAM



## 4-2 INTERCONNECTION DIAGRAM



Note:

1. If the tone squelch is required as optional design, SUBTONE UNIT TS 1JR or equivalent must be connected (A) (B) (C) (D) (E) position.
2. If the burst tone is required as optional design, BURST TONE UNIT SEA-299 and S3 must be connected (A) (D) (F) position.



Note: 1. Standard design is not required FIL4 AFH24F, therefore, between pin No.2 and 4 must be strapped.

SEA-276-4006  
TRX UNIT



**ENCOMM inc.**

3331 TOWERWOOD DRIVE SUITE 304 DALLAS, TEXAS 75234 USA  
PHONE 214-620-2784

Printed in Japan