MAINTENANCE MANUAL
CELLULAR HANDSETS
19A705860P1 & P2 (Basic)
19A705870P1 & P2 (Extended Features)

TABLE OF CONTENTS

SPECIFICATIONS

POWER SUPPLY

Nominal	12.5 Vdc
Range	10 to 16 Vdc
	No failure or lack of function within this range.

CURRENT DRAIN (CU Power)

On Hook, No Audio	Less than 25 mA
Rated Audio	100 mA

OPERATING TEMPERATURE RANGE

Nominal	24°C
Operating Range	-30°C to +60°C

VCC VOLTAGE

At 25°C	5.0 Vdc to 5.4 Vdc, typical
At 30°C	5.5 Vdc to 5.9 Vdc, typical
At 70°C	5.0 Vdc to 4.6 Vdc, typical

Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg Virginia 24502

Printed in U.S.A.

DESCRIPTION

The handsets, shown in Figure 1, consists of a single printed circuit board containing the following:

- Numerical and function keypad
- Liquid Crystal Display
- All audio and logic circuitry

The printed circuit board contains the microphone preamplifier, earpiece amplifier, speaker amplifier, keypad switches, a microcomputer and LCD driver, receive and transmit data buffers, a 5 volt regulator and backlight LED's and circuitry.

Although the Basic (19A705860P1) and Extended (19A705870P1) models of the handset differ in external appearance, they are the same electronically. The Extended model has one extra key "**A-Z**" and indicators for "**HORN**", "**LOCK**" and "**MUTE**".

Audio from the electret microphone (**B1**) is amplified by U1-A and passed to the transmit audio path of the radio.

Four bit microcomputer U5 (MB88543) scans the keypad and controls the LCD. The microcomputer also controls the LED backlighting of the display and keypad. When a key is pressed on the keypad, an ASCII code is generated by the microcomputer and serially transmitted to the mobile. The key release and a hookswitch change also send ASCII codes to the mobile. At power-up the handset sends a code to identify itself. The handset receives commands from the mobile to control the display (indicators, alpha and numeric characters) control the call timer, turn backlight on or off and interrogates status of handset or hookswitch.

TEST SPECIFICATIONS

MICROPHONE

1. **Sensitivity** - An input level of 97 dB SPL produces an output of 150 mV rms ± 5 dB. [**dB SP**L = **20 LOG 10 (P/Po)**: **P** is the rms sound pressure in Pascals and **Po** = **2 X 10**$^{-5}$ Pascal]

2. **Distortion** - For an input signal of less than 1% distortion, the output distortion does not exceed 3% from 300 Hz to 3000 Hz.

RECEIVER

1. **Off Hook Sensitivity** - A one (1) kHz, 100 mV rms input signal produces an output of 94 ± 3 dB SPL, measured at the artificial ear.

2. **Distortion** - For an input signal of 100 mV rms with less than 1% distortion, the output distortion is less than 5% as measured at the artificial ear from 300 Hz to 3000 Hz.

3. **Ear Protection** - An audio limiter is provided to ensure that the maximum acoustic output does not exceed 120 dB SPL.

4. **On Hook Sensitivity** - A 1 kHz tone, 100 mV rms input signal produces an output of 80 ± 6 dB SPL as measured in the free field.

SIDETONE LEVEL

The acoustic to acoustic sidetone response is such that a 1000 Hz, 97 dB SPL transmit audio input signal produces 85 ± 6 dB SPL at the artificial ear.

ON/OFF

There is a momentary switch in the handset that is sensed in the mobile to control the 12 V supply to the handset.

SERIAL DATA

The serial data format is a pseudo RS-232 format. Specifically, it is an asynchronous serial bus operating between Vcc and 0 volts.

Baud Rate	300 ±5%
Bit Pattern	One (1) start two (2) stop, eight (8) data and no parity.
Format	0 to Vcc inverted with Vcc being a no data condition.
Vcc	4.5 to 6.0 Vdc
Keypad Data	High-Open Collector drive less than 50 mA current drain.
Display Data	
High	Open Collector drive less than 50 mA current drain
Low	0.8 V maximum

Figure 1 - Basic (19A705860P1) And Extended (19A705870P1) Handsets

HANDSET TEST

HANDSET

To test the handset by itself, loop the keypad serial line to the Display serial line by connecting P1-1 to P1-3 on a test connector (refer to Figure 2). Apply nominal +12V to P1-5 and ground P1-2. Attach the connector on the handset cord to the test connector and turn the power on.

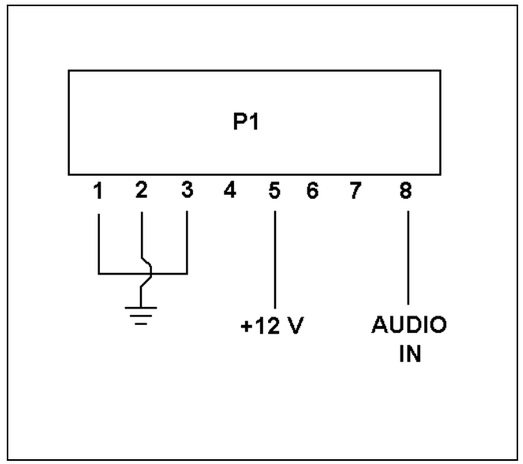


Figure 2 - Test Connection

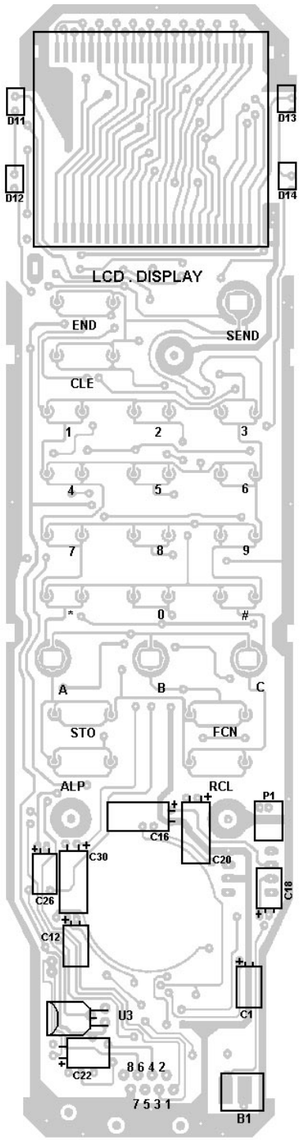
HANDSET SELFTEST

The handset test consists of tests of: **RAM**, display, backlight, call timer, keypad, hookswitch and serial communications.

The test sequence is as follows:

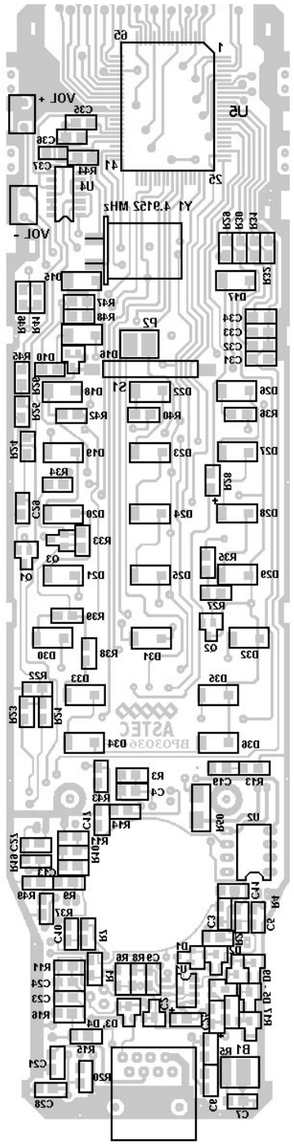
Step	Procedure	Display
1.	Power Up With Loopback connected.	**SELFTEST**
2.	After 1.6 seconds **RAM** test is complete	**RAM PASS** or **RAM FAIL**
3.	Start display test Step through Display	All segments and common 0
	After 1.6 seconds	All segments and common 2
	After 1.6 seconds	All segments and common 3
	After 1.6 seconds	All segments and common 1
	After 1.6 seconds	segments 2, 6, 10, 14, 18, 22, 26, 30 and all commons
	After 1.6 seconds	segments 0, 4, 8, 12, 16, 20, 24, 28 and all commons
	After 1.6 seconds	segments 3, 7, 11, 15, 19, 23, 27, 31 and all commons
	After 1.6 seconds	segments 1, 5, 9, 13, 17, 21, 25, 29 and all commons
4.	Backlight Test	BACKLITE
	After 1.6 seconds	LITE ON
	After 1.6 seconds	LITE OFF
5.	Call Timer Running Any key, except **END**, will stop the **CALL TIMER** and go to the keypad test.	000 00 0
6.	Keypad Test (Audio can be tested here) Any key can be pushed in any order:	
	Push 1	KEY 1
	Push 2	KEY 2
	.....	....
	Push 0	KEY 0
	Push END	End key pad test
	Push CLR	KEY CLR
	Push SND	KEY SND
	Push STO	KEY STO
	Push FCN	KEY FCN
	Push RCL	KEY RCL
	Push A-Z	KEY ALP
	Push VOL +	KEY VUP
	Push VOL -	KEY VDN
	On Hook to Off Hook	OFF HOOK
	Off Hook to On Hook	ON HOOK
	The **END** key ends the Keypad test	
7.	**RAM** status (70=pass, 71=fail) is sent on the key pad serial line	
8.	Serial communications test (Audio can be tested here)	
	Serial communication is tested by pushing keys and displaying as follows:	
	With entries scrolling across the display, as many keys as needed can be pushed (F is key release)	
		F
	KEY: 0	F0F
	1	F0F1F
	2	F0F1F2F
	3	0F1F2F3F
	4	1F2F3F4F
	5	2F3F4F5F
	6	3F4F5F6F
	7	4F5F6F7F
	8	5F6F7F8F
	9	6F7F8F9F
	VOL -	7F8F9FAF
	VOL +	**ROAM** Indicator Flash
	STORE	8F9FAFCF
	SEND	9FAFCF-F
	*	AFCF-FHF
	#	CF-FHF?F
	A-Z	-FHF?F*F
	FCN	HF?F*FAF
	A	?F*FAFBF
	B	*FAFBFCF
	C	AFBFCFDF
	PTT	BFCFDFEF
	PTT Released	CFDFEFGF
	On Hook	FDFEFGFH
	Off Hook	DFEFGFHI
	RCL	FEFGFHI F
	END	EFGFHI FF
	CLR	FGFHI FFF
9.	To complete the test, power down and remove the Loopback.	

KEYPAD SIDE



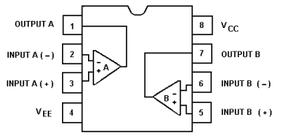
(BP0303645D, Sheet 5)
(BP0303645D, Sheet 1)

BACK SIDE

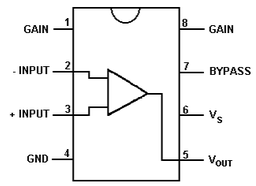


(BP0303645, Sheet 6)
(BP0303645, Sheet 2)

OPERATIONAL AMPLIFIER U1
A29/UL0303551A0145 (MC4558)

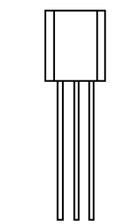


AUDIO POWER AMPLIFIER U2
A29/UL0303548A0149 (LM386)



Top View

VOLTAGE REGULATOR U3
A29/UL3031586A0149 (LM317)



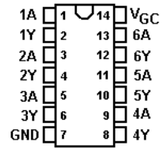
BOTTOM VIEW

PIN INDENTIFICATION

PIN 1 ADJUST
PIN 2 OUTPUT
PIN 3 INPUT

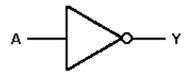
HEX INVERTERS U4
A29/UC0303549A0145 (74HC04)

(TOP VIEW)



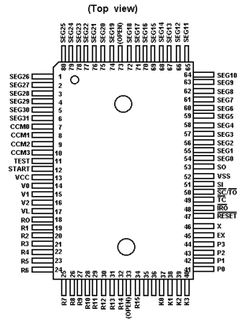
FUNCTION TABLE
(each inverter)

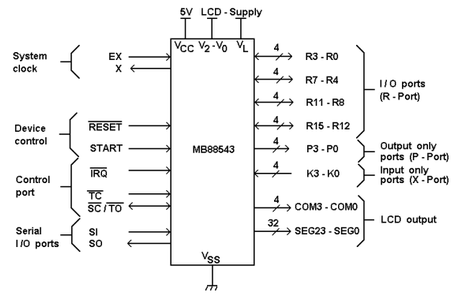
INPUT	OUTPUT
A	Y
H	L
L	H

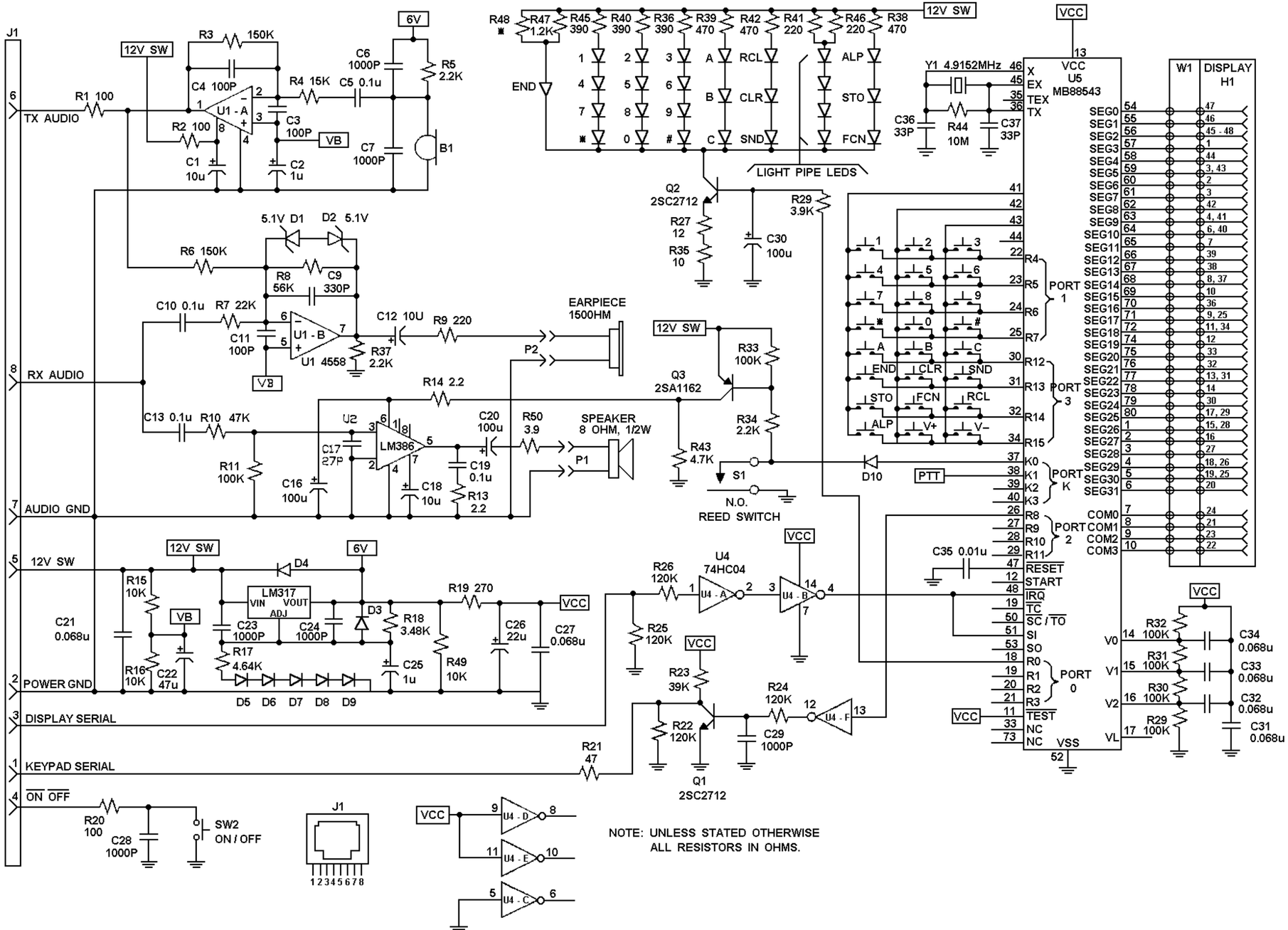


MICROCOMPUTER U5
A29/UL0303551A0145 (MB88543)

(Top view)







NOTE: UNLESS STATED OTHERWISE ALL RESISTORS IN OHMS.

(DX0303651, Sh. 1, Rev. B)

HANDSETS
19A705860P1,P2
19A705870P1,P2
ISSUE 3

SYMBOL	PART NO.	DESCRIPTION
		NOTE: WHEN ORDERING REPLACEMENT PARTS, ALL PART NUMBERS SHOULD BE PRECEDED BY THE FOLLOWING THREE DIGIT PREFIX: A29/.
		- - - - - - - - - - MICROPHONES - - - - - - - - - -
B1	XX0303646A0689	Microphone, condenser.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	CE7105717A0912	Electrolytic: 10 uF ±20%, 25 VDCW.
C2	CU6104670A0167	Tantalum: 1.0 uF ±10%, 16 VDCW.
C3 and C4	CR2104110A0111	Ceramic: 100 pF ±10%, 50 VDCW.
C5	CR5104310A0111	Ceramic: .1 uF ±20%, 50 VDCW.
C6 and C7	CR3104310A0111	Ceramic: 1000 pF ±10%, 50 VDCW.
C9	CR2334310A0111	Ceramic: 330 pF ±10%, 50 VDCW.
C10	CR5104310A0111	Ceramic: .1 uF ±20%, 50 VDCW.
C11	CR2104110A0111	Ceramic: 100 pF ±10%, 50 VDCW.
C12	CE7105717A0912	Electrolytic: 10 uF ±20%, 25 VDCW.
C13	CR5104310A0111	Ceramic: .1 uF ±20%, 50 VDCW.
C16	CX0303722A0600	Ceramic: 100 uF ±20%, 16 VDCW.
C17	CR1274110A0649	Ceramic: 27 pF ±10%, 50 VDCW.
C18	CE7105717A0912	Electrolytic: 10 uF ±20%, 25 VDCW.
C19	CR5104310A0111	Ceramic: .1 uF ±20%, 50 VDCW.
C20	CX0303722A0600	Ceramic: 100 uF ±20%, 16 VDCW.
C21	CR4684310A0111	Ceramic: .068 uF ±10%, 50 VDCW.
C22	CE7475637A0600	Electrolytic: 47 uF ±20%, 10 VDCW.
C23 and C24	CR3104310A0111	Ceramic: 1000 pF ±10%, 50 VDCW.
C25	CU6104670A0167	Tantalum: 1.0 uF ±10%, 16 VDCW.
C26	CE7225677A0912	Electrolytic: 22 uF ±20%, 16 VDCW.
C27	CR4684310A0111	Ceramic: .068 uF ±10%, 50 VDCW.
C28 and C29	CR3104310A0111	Ceramic: 1000 pF ±10%, 50 VDCW.
C30	CX0303722A0600	Ceramic: 100 uF ±20%, 16 VDCW.
C31 thru C34	CR4684310A0111	Ceramic: .068 uF ±10%, 50 VDCW.
C35	CR4104310A0111	Capacitor: .1 uF ±10%, 50 VDCW.
C36 and C37	CR1334110A0191	Ceramic: 33 pF ±10%, 50 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1 and D2	SA0513000A0148	Zenor diode: 5.1V, ±5%.
D3 thru 10	SD0301567A0152	Silicon, BAS19.
		- - - - - - - - - JACKS - - - - - - - - -
J1	NC0303557A1639	Telephone jack, 8 way.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	RR2103200A0137	Resistor: 100 ohms ±5%, 1/8 w.
R3	RR5153200A0137	Resistor: 150K ohms ±5%, 1/8 w.
R4	RR4153200A0137	Resistor: 15K ohms ±5%, 1/8 w.
R5	RR3223200A0137	Resistor: 2.2K ohms ±5%, 1/8 w.
R6	RR5153200A0137	Resistor: 150K ohms ±5%, 1/8 w.
R7	RR4223200A0137	Resistor: 22K ohms ±5%, 1/8 w.
R8	RR4563200A0137	Resistor: 56K ohms ±5%, 1/8 w.
R9	RR2223200A0137	Resistor: 220 ohms ±5%, 1/8 w.
R10	RR4473200A0137	Resistor: 47K ohms ±5%, 1/8 w.
R11	RR5103200A0137	Resistor: 100K ohms ±5%, 1/8 w.
R13 and R14	RR0223200A0137	Resistor: 2.2 ohms ±5%, 1/8 w.
R15 and R16	RR4103200A0137	Resistor: 10K ohms ±5%, 1/8 w.
R17	RX0303724A0137	Resistor: 4.64K ohms ±1%, 1/8 w.
R18	RX0303723A0137	Resistor: 3.48K ohms ±1%, 1/8 w.
R19	RR2273200A0137	Resistor: 270 ohms ±5%, 1/8 w.
R20	RR2103200A0137	Resistor: 100 ohms ±5%, 1/8 w.
R21	RR1473200A0137	Resistor: 47 ohms ±5%, 1/8 w.
R22	RR5123200A0137	Resistor: 120K ohms ±5%, 1/8 w.
R23	RR4393200A0137	Resistor: 39K ohms ±5%, 1/8 w.
R24 thru R26	RR5123200A0137	Resistor: 120K ohms ±5%, 1/8 w.
R27	RR1123200A0137	Resistor: 12 ohms ±5%, 1/8 w.
R28	RR3393200A0137	Resistor: 3.9K ohms ±5%, 1/8 w.
R29 thru R33	RR5103200A0137	Resistor: 100K ohms ±5%, 1/8 w.
R34	RR3223200A0137	Resistor: 2.2K ohms ±5%, 1/8 w.
R35	RR1103200A0137	Resistor: 10 ohms ±5%, 1/8 w.
R36	RR2393200A0137	Resistor: 390 ohms ±5%, 1/8 w.
R37	RR3223200A0137	Resistor: 2.2 ohms ±5%, 1/8 w.
R38	RR2393200A0137	Resistor: 390 ohms ±5%, 1/8 w.
R39	RR2473200A0137	Resistor: 470 ohms ±5%, 1/8 w.
R40	RR2393200A0137	Resistor: 390 ohms ±5%, 1/8 w.
R41	RR2223200A0137	Resistor: 220 ohms ±5%, 1/8 w.
R42	RR2473200A0137	Resistor: 470 ohms ±5%, 1/8 w.
R43	RR3473200A0137	Resistor: 4.7K ohms ±5%, 1/8 w.
R44	RR7103200A0137	Resistor: 10M ohms ±5%, 1/8 w.
R45	RR2393200A0137	Resistor: 390 ohms ±5%, 1/8 w.
R46	RR2223200A0137	Resistor: 220 ohms ±5%, 1/8 w.
R47	RR3123200A0137	Resistor: 1.2K ohms ±5%, 1/8 w.
R49	RR4103200A0137	Resistor: 10K ohms ±5%, 1/8 w.
R50	RR0393300A0137	Resistor: 3.9 ohms ±5%, 1/8 w.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	ST0301597A0301	NPN, 2SC2712Y.
Q3	ST0301598A0301	PNP, 2SA1162Y.
		- - - - - - - - - SWITCHES - - - - - - - - -
S1	VR0303523A3603	Reed switch, FR2S1520051700.
S2	VS0303784A3659	ON/OFF switch.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	UL0303551A0145	OP AMP, 4558.
U2	UL0303548A0149	POWER AMP, LM386 Dip.
U3	UL0301586A0149	REGULATOR, LM317LZ.
U4	UC0303549A0145	HEX INVERTOR,74HCO.
U5	UU0303550A2859	MICROPROCESSOR, 4-bit, HD88543.
		- - - - - - - - - CONNECTORS - - - - - - - - -
W1	NC0303557A3085	Zebra connector: 37.5 x 8.5 x 1.
		- - - - - - - - - CRYSTALS - - - - - - - - -
Y1	SR0303554A2089	Crystal, 4.9152 MHz, HC49U.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	SE0303562A2610	LED, red, LED-90-21HC.
	SE0303563A2610	LED, green, LED-90-21GC.
	SE0303721A2610	LED, yellow, Rtangle, DIF 2013YD.
	VS0303783A3659	Switch, toggle, MTS06-01.
		MECHANICAL PARTS BREAKDOWN 19A705860P1
3	LA0303640	LABEL, TEL NO.
4	LA0303725	LABEL, FREQ. USED TEL NO.
9	PP0303569	LIGHTPIPE (ACRYLIC).
10	PP0303570	COVER (LATCH) PC.
11	PP0303571	COVER (HOOK) RUBBER.
12	PP0303572	LABEL COVER (ACRYLIC).
13	PP0303573	VOLUME BUTTON SI RUBBER.
14	PP0303581	COVER PC.
15	PP0303582	BASE PC.
16	PP0303583	LCD COVER VER #2.
17	PP0303580	POWER BUTTON.
19	PP0303636	PAD SWITCH BC177.
		MECHANICAL PARTS BREAKDOWN 19A705870P1
3	LA0303640	LABEL, TEL NO.
4	LA0303725	LABEL, FREQUENTLY USED TEL NO.
9	PP0303569	LIGHTPIPE (ACRYLIC).
10	PP0303570	COVER (LATCH) PC.
11	PP0303571	COVER (HOOK) RUBBER.
12	PP0303572	LABEL COVER (ACRYLIC).
13	PP0303573	VOLUME BUTTON SI RUBBER.
14	PP0303576	COVER PC.
15	PP0303577	BASE PC.
17	PP0303669	LCD COVER VER #2.
18	PP0303584	POWER BUTTON.
20	PP0303636	PAD SWITCH BC177.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES