

Programmes After Market Services NHE –8/9 Series Transceivers

Chapter 4

Uif Module

CONTENTS

	Page No
Introduction	4 – 5
Functional Circuit description	4 – 5
Power on/off key	4 – 5
Keypad switch matrix	4 – 6
Liquid crystal display module	4 – 7
Back light	4 – 7
Keypad back light	4 – 7
LCD back light	4 – 7
Buzzer driver circuitry	4 – 8
Microphone and speaker connection	4 – 8
Board to board connection	4 – 8
Technical Specifications	4 – 9
DC Characteristics	4 – 9
External Signals and Connections	4 – 9
Parts List	4–12
Uif Module – GU9 _08	4–12
Uif Module – GU9_10	4–14
Uif Module – GU9_11	4–16

List of Figures

	Page No
Figure 1. Power Distribution	4-5
Figure 2. Keypad switches – Simplex or Flat-J	4-6
Figure 3. System board connection pads, order of numbering.	4-10
Figure 4. LCD module identification	4-11

Note: In printed manuals all A3 drawings are located at the back of the binder.

GU9_08

Figure 5 UIF Schematic	4-A1
Figure 6 UIF Component Layout	4-A2

GU9_10

Figure 7 UIF Component Layout	4-A3
Figure 8 UIF Circuit Diagram	4-A4

GU9_11

Figure 9 UIF Component Layout	4-A5
Figure 10 UIF Circuit Diagram	4-A6

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Introduction

This document describes the User Interface Module GU9.

The GU9 module is intended for use in the GSM and PCN version of the NHE–8/9 product, that is FLAT–J and Simplex versions.

Functional Circuit description

The following sections of circuitry are included on the PCB:

- Power on/off key.
- Keypad switch matrix.
- Liquid Crystal Display Module and peripheral circuitry
- Keyboard & Display back light circuits
- Buzzer driver circuit and connection pads
- Pads for microphone and speaker connection
- A method of connection between the user interface PCB and the main system board

The functions are described in details below. See *UIF Schematic* on page NO TAG for further information.

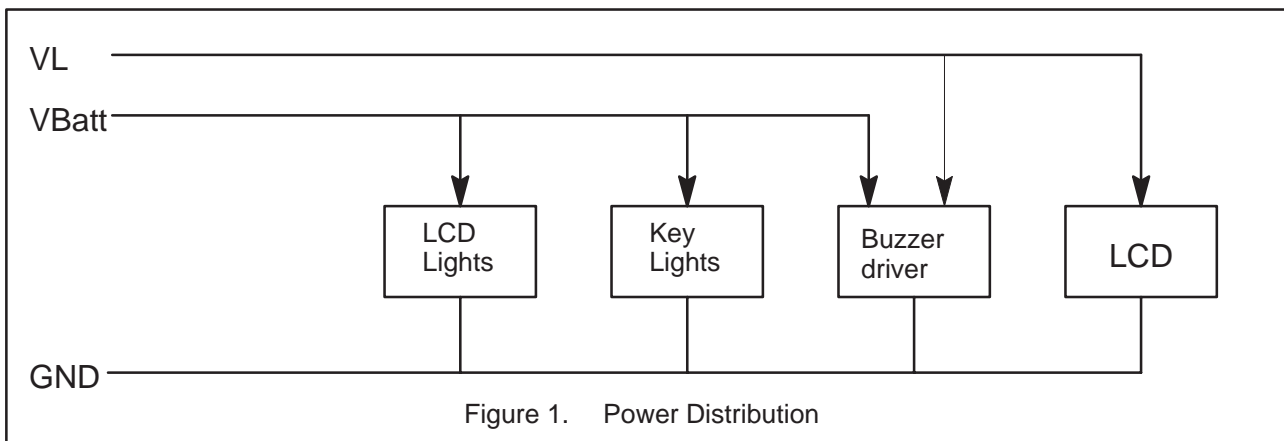


Figure 1. Power Distribution

Power on/off key

The power key, S422, is connected directly to the PSCLD via the line 'XPWRON' and to 'ROW0' through the diode V418. When activated both lines are pulled low.

When the key is pressed, its row will go low, but the value of the row will not be changed when the column outputs are set high at the start of the scanning process. This fact uniquely identifies the key. A diode is necessary to prevent key presses on any switches connected to ROW0 from turning on/off the phone. This also protect the 3V baseband against the pull up of XPWRON to VBATT inside PSCLD

The power key, S422, is handled as any other SMD component, and is placed in the reflow process.

Keypad switch matrix

The keypad consists of a matrix of 20 switch domes, in the keypad array (0 – 9, #, *, SEND, END, UP, DOWN, CLEAR, ALPHA, SOFTLEFT and SOFTRIGHT). These are the references on the schematics. The functionality of the keys are determined via software and is different from the 3810 version (HD844 MCUSW) and the 3110 version (HD845 MCUSW). The schematics description corresponds to the key pad functionality in 3810 version.

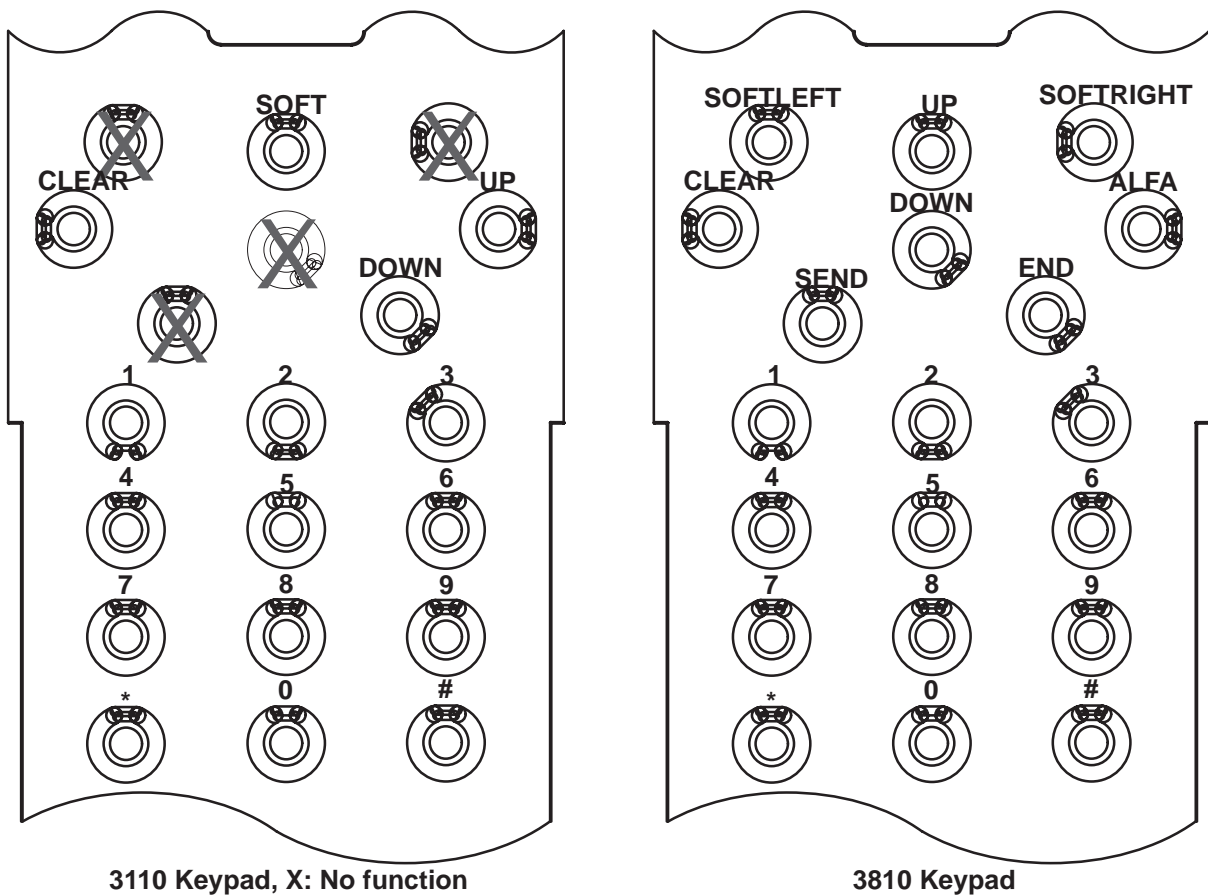


Figure 2. Keypad switches

The keypad keys are connected in a 6 by 4 matrix. The 4 outputs (columns) are normally held at 0V by the ASIC. The 5 rows are also connected to the ASIC – when any of these inputs goes low (there are pull-ups inside the ASIC) the ASIC interrupts the MCU, which then commences scanning. This involves taking all the columns high then taking each individual column low in turn. When a low is received on a row input, it can be deduced which key is pressed from the row input number and the column output which is currently low.

ROW5 is also used as an output for the command/data selection on the LCD driver. A resistor, R406, is necessary to prevent excess current flow from the row output in case a key is pressed during the time that the LCD is being accessed.

The keypad consists of gold flashed PCB tracks above which are placed metal keydomes. The keydomes themselves are supplied attached to a tape – all the domes in the key array are therefore placed in one operation.

Liquid crystal display module

The display driver is connected to the system board with a serial data bus. Data input is enabled when CS1 (LCDENX) is LOW. A0 (ROW5) is control/display data flag input. Incoming data is control data when A0 is LOW, and display data when A0 is HIGH. Serial data is read on the rising edge of SCL. On every eight clock pulse, the data is transferred from the shift register and processed as 8-bit parallel data. A0 is read on the rising edge of every eight clock signal.

Back light

LEDs are used as backlights for the keymat and LCD, and are driven by constant current sources. Constant current sources ensure constant brightness from the LEDs over the full range of battery voltages (the LEDs are powered straight from VBatt to lighten the load on the regulated supply).

Keypad back light

The drive circuits for the keypad LEDs consist of 2 constant current sources, using two BCX19 transistors wired as simple constant current sinks. Both transistors supply six LED's, so the keyboard is illuminated with 12 LED's. The bases of the two transistor are wired together and controlled by MCU via the line 'KEYLIGHT'. The led current is fixed by the values of R401 and R402 and the ratio of R411 to R413.

LCD back light

The display illumination operates in a similar way as the keyboard drivers, but only one transistor (V402) is used to drive six leds. The current in this case is defined by the value of R414 and the ratio of R412 to R404. The constant current source is controlled from an MCU output port via the line 'LCDLIGHT'.

The PCB is gold plated under the LEDs to improve reflection of light emitted towards the PCB.

Buzzer driver circuitry

The buzzer is mounted in the A cover, and connected to the UI PCB using spring contacts mounted on the transducer. When the phone is assembled the springs press upon pads placed on the UI PCB .

The buzzer is a Citizen CB–09AS–01 device. It is driven from NPN transistors V403, V425 by a PWM output from the CODEC via the signal line 'BUZZER'. The ringing volume is controlled by pulse width modulation.

The diode V413 prevents damage to the transistors when they switch off, absorbing the stored energy in the buzzer inductance and suppressing large positive going spikes on the transistor collectors.

The buzzer is driven directly from VBatt in order to have sufficient voltage to drive sufficient current through the buzzer.

Microphone and speaker connection

The microphone and earpiece are mounted in the A cover, and connected to the UI PCB using spring contacts mounted on the transducers which press upon pads placed on the UI PCB when the phone is assembled.

The connections are routed directly to the board to board connector pins 19 and 20.

The microphone connections are routed directly to the board to board connector pins 2 and 3.

EMC filtering is provided using ceramic capacitors.

Board to board connection

A 32 pin spring connector placed on the system board mates with 32 gold plated pads on the lower side on the UI–PCB. Refer to Table 4 for pin numbers and signal names.

Technical Specifications

Table 1. List of Connectors

Connector Name	Notes
H400 Display Module Connector	FPC footprint for LCD Module
X400 UIF Connector	B to B connector . 32 connection pads.

DC Characteristics

Table 2. Supply Voltages

Pin / Conn.	Symbol	Minimum	Typical / Nominal	Maximum	Unit	Notes
5 / X400	VL	3.0	3.16	3.3	V	
				1	mA	TBV
15 / X400	VBatt	5.3	6.0	9.3	V	
				200	mA	TBV

Table 3. Current consumption @ VBatt

VBatt (V)	Keylight (mA)	LCDlight (mA)	Buzzer (mAac)	Notes
5.3	49.5	22.4	103	Buzzer current measured with pulse ratio 50/50
6.5	52.4	23.3	123	
8.8	58.5	24.9	163	

External Signals and Connections

Table 4. UI Module Main Connector X400

Pin / Conn.	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit	Notes
2 / X400	MICP	0	2	12.5	mVAC	Positive Mic terminal
3 / X400	MICN (AGND)	0	2	12.5	mVAC	Negative Mic terminal
4,7,11,31/X400	GND		0		V	Digital Ground
5 / X400	VL	3.0	3.16	3.3	V	Logic voltage
6 / X400	SYSRESET X	0	0	0.9	V	Reset for display driver
		2.4	3.16	3.3	V	
8 / X400	KEYLIGHT	0	0	0.2	V	Keymat backlights OFF
		2.8	3.16	3.3	V	Keymat backlights ON
9 / X400	LCDLIGHT	0	0	0.2	V	LCD backlights OFF
		2.8	3.16	3.3	V	LCD backlights ON

Table 4. UI Module Main Connector X400 (continued)

Pin / Conn.	Line Symbol	Minimum	Typical / Nominal	Maximum	Unit	Notes
10 / X400	BUZZER	0	0	0.6	V	PWM signal for Buzzer-LOW
		2.4	3.16	3.3	V	PWM signal for Buzzer-HIGH
12 / X400	GENSCLK	0	0	0.6	V	Display data clk LOW
		2.4	3.16	3.3	V	Display data clk HIGH
13 / X400	GENSD	0	0	0.6	V	Display data line LOW
		2.4	3.16	3.3	V	Display data line HIGH
14 / X400	LCDENX	0	0	0.9	V	Display driver Enable
		2.4	3.16	3.3	V	Display driver Disable
15 / X400	VBatt	5.3	6.0	9.3	V	Battery voltage
18 / X400	XPWRON	5.3	6.0	9.3	V	Power key free, pullup in PSCLD
		0		0.4	V	Power key pressed
19 / X400	EARN	0	14	220	mVAC	Negative Earpiece Terminal
20 / X400	EARP	0	14	220	mVAC	Positive Earpiece Terminal
20–25 / X400	ROW(0:5)	0	0	0.5	V	LCD driving and keyboard ROW reading
		2.4	3.16	3.3	V	
26–29 / X400	COL(0:3)	0	0	0.5	V	Column scan for key matrix
		2.4	3.16	3.3	V	

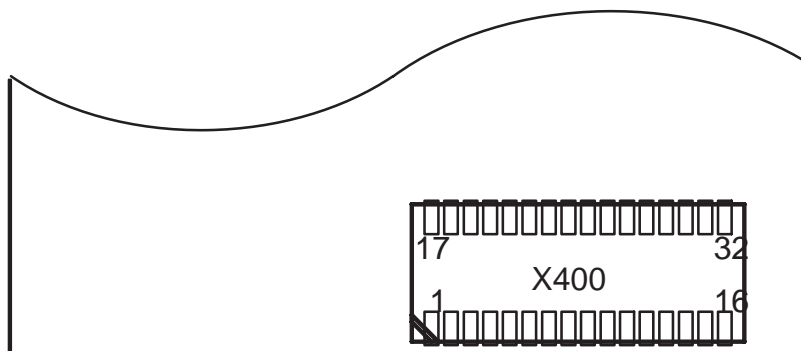


Figure 3. System board connection pads, order of numbering.

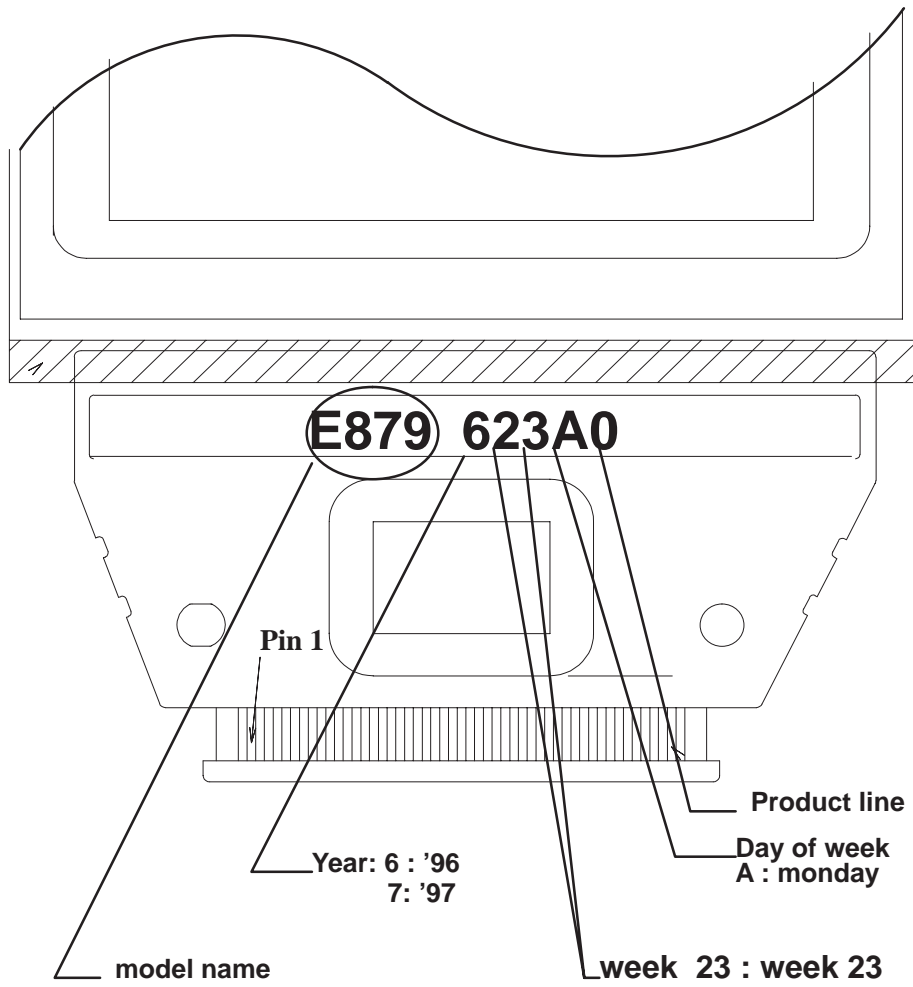


Figure 4. LCD module identification

Parts List

Uif Module – GU9 _08

EDMS pn 0200886 Issue 3.6

Item	Code	Description	Value	Type
R424	1430015	Chip resistor	470	5 % 0.063 W 0603
R404	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R411	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R412	1430043	Chip resistor	2.2 k	5 % 0.063 W 0603
R413	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R406	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R421	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R425	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R407	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R415	1430111	Chip resistor	1.0 M	5 % 0.063 W 0603
R419	1430131	Chip resistor	464 k	1 % 0.063 W 0603
R401	1430163	Chip resistor	33	5 % 0.063 W 0603
R402	1430163	Chip resistor	33	5 % 0.063 W 0603
R414	1430163	Chip resistor	33	5 % 0.063 W 0603
R416	1430296	Chip resistor	560 k	2 % 0.063 W 0603
C400	2310408	Ceramic cap.		Y5 V 1206
C401	2310408	Ceramic cap.		Y5 V 1206
C402	2310408	Ceramic cap.		Y5 V 1206
C403	2310408	Ceramic cap.		Y5 V 1206
C404	2310408	Ceramic cap.		Y5 V 1206
C409	2312293	Ceramic cap.		Y5 V 1206
C420	2312293	Ceramic cap.		Y5 V 1206
C421	2312293	Ceramic cap.		Y5 V 1206
C432	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C433	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C410	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C411	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C412	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C413	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C414	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C415	2320546	Ceramic cap.	27 p	5 % 50 V 0402
L401	3645125	Chip coil	12 n	5 % Q=8/100M 0603
L402	3645125	Chip coil	12 n	5 % Q=8/100M 0603
V413	4110070	DiodeBAS16W	75 V 0.25 A	SOT323
V418	4110070	DiodeBAS16W	75 V 0.25 A	SOT323
V402	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V404	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V405	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23

V425	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V403	4207461	Transistor	BC868-25	npn V SOT89
H400	4850029	LCD display module 83x41+driver+tab+icon		
V401	4860005	Led	Green	0603
V410	4860005	Led	Green	0603
V411	4860005	Led	Green	0603
V412	4860005	Led	Green	0603
V419	4860005	Led	Green	0603
V420	4860005	Led	Green	0603
V406	4864389	Led		0603
V408	4864389	Led		0603
V409	4864389	Led		0603
V414	4864389	Led		0603
V416	4864389	Led		0603
V417	4864389	Led		0603
V421	4864389	Led		0603
V422	4864389	Led		0603
V423	4864389	Led		0603
V424	4864389	Led		0603
V427	4864389	Led		0603
V428	4864389	Led		0603
S422	5200120	Push button switch 6.4x5.2 smd		
	9467014	Lightguide assy dmc00787		
	9854161	PCB GU9 154.8X135.9X0.8 D 3/PA		

Uif Module – GU9_10

EDMS pn 0200886 Issue 3.8

Item	Code	Description	Value	Type
R401	1430163	Chip resistor	33	5 % 0.063 W 0603
R402	1430163	Chip resistor	33	5 % 0.063 W 0603
R406	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R407	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R411	1430041	Chip resistor	1.8 k	5 % 0.063 W 0603
R412	1430041	Chip resistor	1.8 k	5 % 0.063 W 0603
R413	1430023	Chip resistor	820	5 % 0.063 W 0603
R414	1430163	Chip resistor	33	5 % 0.063 W 0603
R415	1430111	Chip resistor	1.0 M	5 % 0.063 W 0603
R416	1430296	Chip resistor	560 k	2 % 0.063 W 0603
R419	1430131	Chip resistor	464 k	1 % 0.063 W 0603
R425	1430065	Chip resistor	10 k	5 % 0.063 W 0603
C400	2310408	Ceramic cap.		Y5 V 1206
C401	2310408	Ceramic cap.		Y5 V 1206
C402	2310408	Ceramic cap.		Y5 V 1206
C403	2310408	Ceramic cap.		Y5 V 1206
C404	2310408	Ceramic cap.		Y5 V 1206
C409	2312293	Ceramic cap.		Y5 V 1206
C412	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C413	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C414	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C420	2312293	Ceramic cap.		Y5 V 1206
C421	2312293	Ceramic cap.		Y5 V 1206
H400	4850029	LCD display module		
V401	4860005	Led Green	0603	
V402	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V404	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V405	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V406	4864389	Led	0603	
V408	4864389	Led	0603	
V409	4864389	Led	0603	
V410	4860005	Led Green	0603	
V411	4860005	Led Green	0603	
V412	4860005	Led Green	0603	
V413	4110070	DiodeBAS16W	75 V 0.25 A	SOT323
V414	4864389	Led	0603	
V416	4864389	Led	0603	
V417	4864389	Led	0603	
V418	4110070	DiodeBAS16W	75 V 0.25 A	SOT323

V419	4860005	Led	Green	0603	
V420	4860005	Led	Green	0603	
V421	4864389	Led		0603	
V422	4864389	Led		0603	
V423	4864389	Led		0603	
V424	4864389	Led		0603	
V425	4200836	Transistor		BCX19	npn 50V 0.5A
V427	4864389	Led		0603	
V428	4864389	Led		0603	
S422	5200120	Push button switch			
P001	9854161	PC board			
	9467014	Lightguide assy			

Uif Module – GU9_11

EDMS pn 0200886 Issue 5.0

Item	Code	Description	Value	Type
R401	1430163	Chip resistor	33	5 % 0.063 W 0603
R402	1430163	Chip resistor	33	5 % 0.063 W 0603
R406	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R407	1430047	Chip resistor	3.3 k	5 % 0.063 W 0603
R411	1430041	Chip resistor	1.8 k	5 % 0.063 W 0603
R412	1430039	Chip resistor	1.5 k	5 % 0.063 W 0603
R413	1430023	Chip resistor	820	5 % 0.063 W 0603
R414	1430163	Chip resistor	33	5 % 0.063 W 0603
R415	1430111	Chip resistor	1.0 M	5 % 0.063 W 0603
R416	1430296	Chip resistor	560 k	2 % 0.063 W 0603
R419	1430131	Chip resistor	464 k	1 % 0.063 W 0603
R425	1430023	Chip resistor	820	5 % 0.063 W 0603
C400	2310408	Ceramic cap.		Y5 V 1206
C401	2310408	Ceramic cap.		Y5 V 1206
C402	2310408	Ceramic cap.		Y5 V 1206
C403	2310408	Ceramic cap.		Y5 V 1206
C404	2310408	Ceramic cap.		Y5 V 1206
C409	2312293	Ceramic cap.		Y5 V 1206
C412	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C413	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C414	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C420	2312293	Ceramic cap.		Y5 V 1206
C421	2312293	Ceramic cap.		Y5 V 1206
H400	4850029	LCD display module 83x41+driver+tab+icon		
V401	4860005	Led Green	0603	
V402	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V403	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V404	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V405	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V406	4864389	Led	0603	
V408	4864389	Led	0603	
V409	4864389	Led	0603	
V410	4860005	Led Green	0603	
V411	4860005	Led Green	0603	
V412	4860005	Led Green	0603	
V413	4110070	DiodeBAS16W	75 V 0.25 A	SOT323
V414	4864389	Led	0603	
V416	4864389	Led	0603	
V417	4864389	Led	0603	

V418	4110070	Diode	BAS16W	75 V	0.25 A	SOT323
V419	4860005	Led	Green		0603	
V420	4860005	Led	Green		0603	
V421	4864389	Led			0603	
V422	4864389	Led			0603	
V423	4864389	Led			0603	
V424	4864389	Led			0603	
V427	4864389	Led			0603	
V428	4864389	Led			0603	
S422	5200120	Push button switch		6.4x5.2	smd	
P001	9854161	PC board	GU9	154.8x135.9x0.8	d 3/pa	
	9467014	Lightguide assy	dmc00787	hd844		HD844

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