MicroLoop MK8 Service Manual

105-45 Issue. 1.0 August 2007

Micro Medical

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MicroLoop - System Overview

MicroLoop MK8 System

The Micro Medical MicroLoop is a data recording spirometer consisting of a hand held microcomputer unit incorporating a high resolution, colour touch screen, USB interface and transducer ports.

Supplied with the microcomputer is a Cradle base unit, Bi-directional transducer, disposable mouthpieces, mains adapter, nose clip and USB cables.

The MicroLoop is powered by internal Nickel Metal Hydride cells or by the mains adapter supplied, either connected to the cradle or directly to the MicroLoop unit.

When testing a subject, the Bi-directional transducer is plugged into the microcomputer unit. The Bi-directional transducer is used to measure the subjects expired flow and volume in accordance with the operating manual.

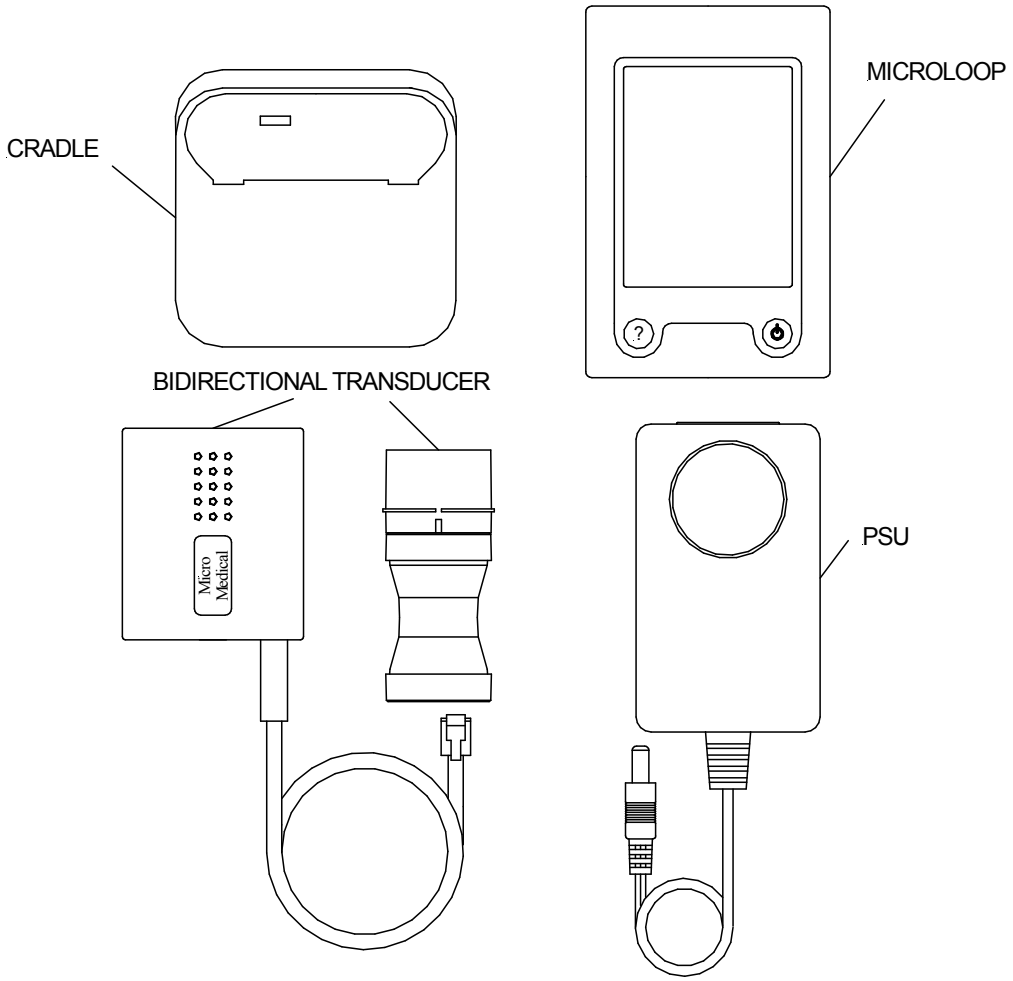


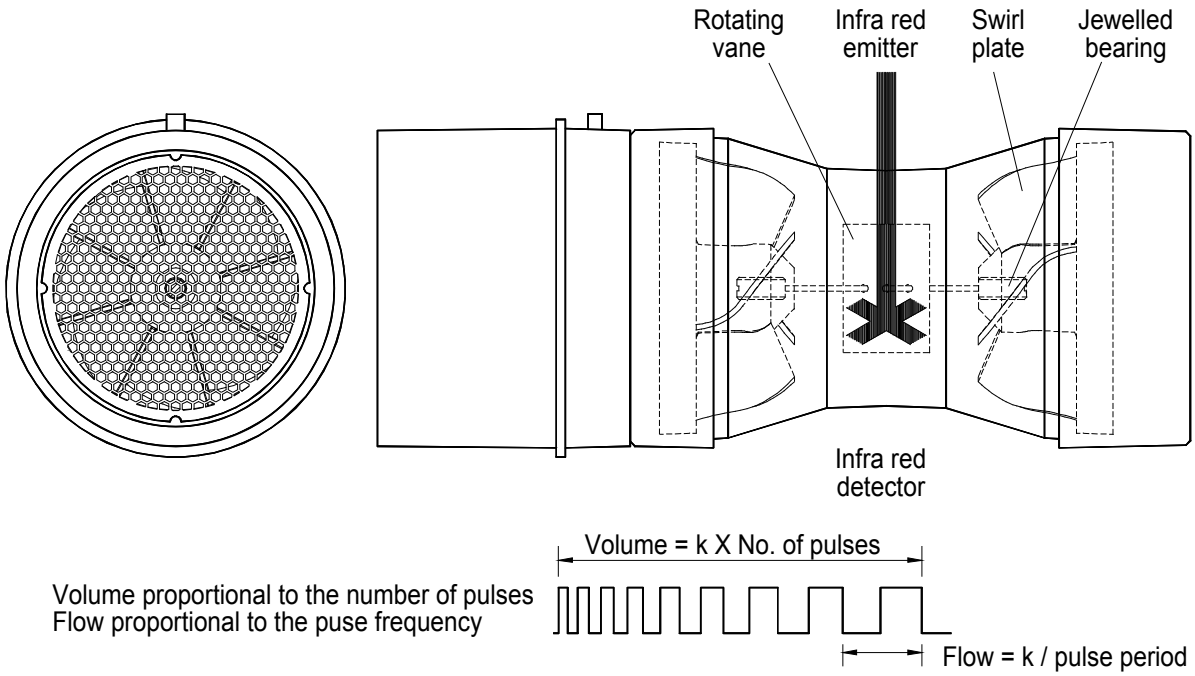
Figure 1 MicroLoop System Components

Bidirectional Transducer

The Micro Medical digital volume transducer consists of an acrylic tube with a vane positioned between two swirl plates. The low inertia vane is attached to a stainless steel pivot that is free to rotate on two jewelled bearings mounted at the centre of the swirl plates. As air is passed through the transducer a vortex is created by the swirl plates that causes the vane to rotate in a direction dependant upon the direction of airflow. The number of rotations is proportional to the volume of air passed through the transducer and the frequency of rotation is proportional to the flow rate. The transducer housing consists of a main body that contains a pair of light emitting diodes (LED's) and phototransistors. The transducer is fixed to the mouthpiece holder that pushes into the main body and is captured by an "O" ring seal. The LED's produce infrared beams, which are interrupted by the vane twice per revolution. This interruption is sensed by the phototransistors. The output from the collector of each phototransistor will be a square wave with a phase difference between the two of + or - 90 degrees depending upon the direction of flow. The square waves are detected by a microprocessor that measures the period of each pulse and transmits that information to the main unit via a high-speed asynchronous serial link.

There is no routine maintenance required for the transducer other than cleaning according to the instructions in the operating manual.

Micro Medical Digital Volume Transducer



MicroLoop Mk8 Repair

Disassembling the MicroLoop Mk8 for Repairs

1. Disconnect the mains power supply

	**We recommend that you use a Pozidriv No. 1 screwdriver for the following instruction.**

2. Place the MicroLoop Mk8 face down on a soft surface. Remove the four screws in the lower moulding. Put the screws to one side.

3. Turn the unit face up before easing the upper and lower mouldings apart.

4. Taking all precautions against static damage, lift the MicroLoop PCB and display out of the bottom moulding and place on an antistatic work surface. Note that the battery is secured to the bottom moulding by an adhesive pad.

5. Reconnect the power supply to the MicroLoop Mk8 charging socket

6. The MicroLoop is now ready for fault finding.

Reassembling the MicroLoop after repairs

1. Disconnect all mains power supplies.

2. Place the MicroLoop PCB and display assembly into the MicroLoop bottom moulding.

3. Insert the top and bottom end panels into the bottom moulding. It may be necessary to lift the PCB slightly in order to fit the connectors through both end panels.

4. Ensuring that the keys do not fall out, position the top moulding over the bottom moulding and ensure that they both mate correctly.

	**We recommend that you use a Pozidriv No. 1 screwdriver for the following instruction.**

5. Place the MicroLoop Mk8 face down on a soft surface and replace the four screws in the lower moulding.

6. The MicroLoop Mk8 is now ready for operation.

Circuit Descriptions

Microcomputer Unit

Overview (105-01) and Micro controller (105-02).

The drawing 105-01 is a hierarchical block diagram showing the connections of the sub-sections. The rest of the drawings are sub-sections and are described in detail below.

U1 is a Sharp LH79520 32 bit microprocessor with 32K of Cache Ram, and no internal flash memory. The system clock is supplied by 14.7456MHz crystal (X1).

J1 is the JTAG interface for programming the unit.

JP1 is the jumper that must be in place for programming, and removed for normal use.

Power Supply (105-03)

Battery Charger and Voltage Regulators

U6 serves as the battery charger and voltage regulators. The capacity of the battery is 1600mAh, and the voltage can vary between 3 and 4.2V.

When powered from mains, the charging current is set at 500mA. When powered by USB, the unit can initially draw 100mA. When switched on, the unit can request up to 500mA from the USB host

The 3.3V rail is used for the microcontroller, the reset circuit, jtag interface, buttons, rtc, eeprom, lcd display, touch screen, lcd backlight, sound driver, usb, flash, sram.

The 1.8V rail is used for the microcontroller, flash, and the lcd backlight.

U8 is used to generate the 5V rail. This rail is used for Micro Medical Transducers, sound driver, and USB hosting.

Fuel-Gauge

U7 is a fuel gauge which is powered by the battery pack. The fuel gauge estimates the remaining battery capacity.

Microloop8 Sensor Interface (105-04)

2 Sensor ports are available on the unit.

U10 is used to translate the levels from 3.3 to 5V.

TR7 is used to switch the power on for MM Sensor 1.
TR8 is used to switch the power on for MM Sensor 2.

Keypad, EEPROM, RTC (105-05)

Two buttons are available on the unit.

KEY0 is the ON/OFF button.
KEY1 is the HELP button

U13 is used to generate an interrupt to the microcontroller if either the on/off or help button is pushed.

BAT2 is a lithium coin cell to give the RTC power for up to 10 years. U10 is the RTC and is clocked by a 32.768kHz xtal. D2 enables power to be drawn from the main 3.3V regulator when the unit is on.

U25 is a 32Kbyte EEPROM. This is used to store general settings and calibrations.

Display Driver (105-07)

The 3.5" TFT LCD Display is driven directly by the main microcontroller. The display has a built in touch screen and LED backlight, all on the same connector (J8).

U16, and U17 are used to invert 2 lines from the processor.
U18 is the touch screen controller.
U21 controls a constant current through the LED backlight of the display.
U20 can adjust the current to which U16 has to control.
U19 is a step-up switching regulator used to create the appropriate voltages for the display (AVDD approx 8V, VGH approx 15V, VGL approx –8V).

Sounder (105-08)

The sound driver includes a digital potentiometer and an amplifier. The digital potentiometer (U22) is used to adjust the volume, and the amplifier (U23) is used to drive the 16ohm speaker with the final signal.

USB Driver (105-09)

The cypress SL811HST (U24) is a host/slave USB controller, which can be used for communicating with a PC or an external printer.

In host mode 5V power is supplied through TR13, and switched on with TR14.

The chip has is clocked by a 12MHz crystal (X4).

Memory (105-10)

U28 is a 32Mbyte FLASH 28F256P30 used to store all program code, and the files/filing system.

U29 is a 2Mbyte SRAM CY62167DV30 used to store all volatile memory, such as video memory, and program memory.

MicroLoop Mk8 Parts List

Designation	Dwg/Manufacturers Part No. (F=Farnell)	JDE part no.	Description.
	105-17	**36-ASS1235**	**PCB ASSEMBLY**
U1	LH79520	36-IC1175	Sharp ARM7 Microcontroller, LQFP176 package
U2	DS3231SN	36-IC1203	Maxim Extremely Accurate I2C-Integrated Real Time Clock, SO-16
U3,U5,U11,U12	BU4S81	36-IC1044	Rohm individual CMOS AND gate, SOT23-5 package
U4	INC-4093	36-IC1020	CMOS Quad NAND Schmitt input gate, SO-14 package
U6	LTC3455EUF	36-IC1198	Linear Technology Power Manager and Battery Charger, 24pin QFN package
U7	DS2782	36-IC1199	Maxim Fuel Gauge IC, TSSOP-8 package
U8	TPS61032RSA	36-IC1200	Texas Instruments 5V boost converter, 16-pin QFN
U9	ICM7555	36-IC1201	Low Power 555 Timer IC, 8-pin SOIC package
U10	***MIC2026-1YM***	***36-IC1228***	***Dual channel power distribution switch, farnell 1287939***
U15, U30	***MAX3373EEKA+***	***36-IC1229***	***MAXIM Dual Low-Voltage Level Translators***
U13	BU4S11	36-IC1042	Rohm individual CMOS NAND gate, SOT23-5 package
U14	24LC256I/SN	36-IC1187	Microchip 256K EEPROM, SO-8 package
U16,U17	BU4S584	36-IC1043	Rohm individual CMOS Schmitt invertor, SOT23-5 package
U18	ADS7846E	36-IC1040	Texas Instruments Touch screen controller TSSOP16 package
U19	LT1615ES5#TRPBF	36-IC1182	Linear Technology DC/DC convertor, SOT23-5 package
U20,U22	MAX5465EXT+	36-IC1179	Maxim digital Potentiometer, SC70 package
U21	LT3465ES6#TRPBF	36-IC1181	Linear Technology White LED Driver, SOT23-6 package
U23	LM4864MM	36-IC1136	Audio Power Amplifier, MMSOP package
U24	SL811HST-AXC	36-IC1123	Cypress USB controller TQFP48 package
U25,U26	MAX4544EUT+T	36-IC1100	Maxim SPDT analogue switch, SOT23-6 package
U27	BU4S01	36-IC1005	Rohm individual CMOS NOR gate, SOT23-5 package
U28	JS28F256P30B95	36-IC1184	Intel NOR Flash, TSOP56_14X20 package 95ns 256Mb(16M*16)
U29	CY62167DV30LL-45ZXI	36-IC1215	Cypress 16Mbit SRAM, TSOP48_12X20 package 45ns
U29 Alt.	CY62167DV30LL-55ZXI		Cypress 16Mbit SRAM, TSOP48_12X20 package 55ns
U29 Alt.	CY62167DV30LL-70ZXI	36-IC1185	Cypress 16Mbit SRAM, TSOP48_12X20 package 70ns
U31,U32	FPF2110	36-IC1206	400mA load management FAIRCHILD, Farnell 1084445
TR1,TR2,TR3,TR12	DTC114EK	36-TRA1020	High speed switching NPN transistor, size SOT23
TR4	FMMT491A	36-TRA1023	Zetex NPN transistor, size SOT-23
TR11	FDN360P	36-TRA1040	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR15	FDN361AN	36-TRA1041	Fairchild Semiconducter N-channel Mosfet, size SOT-23
TR15 alt.	***FDN361BN***	***36-TRA1041***	***Fairchild Semiconducter N-channel Mosfet, size SOT-23***
R79	5.6K0603	36-RES1217	5.6K Surface mount resistor 0.063 watt 1% size 0603
R2, R3, R4, R5, R6, R7, R8, R10, R11, R14, R17, R31, R38, R40, R41, R57, R58, R60, R80, R81, R82, R99, R108	10K0603	36-RES1051	10K Surface mount resistor 0.063 watt 1% size 0603
R9	1M0603	36-RES1043	1M Surface mount resistor 0.063 watt 1% size 0603
R84	22R0603	36-RES1210	RES 22R 1% 0603 0.06W
R12,R34,R45,R46	100R0603	36-RES1233	100R Surface mount resistor 0.063 watt 1% size 0603
R13,R64,R107	0R0603	36-RES1256	0R Surface mount resistor 0.063 watt 1% size 0603
R15,R43,R44,R59,R76	1K0603	36-RES1086	1K Surface mount resistor 0.063 watt 1% size 0603
R16, R21, R32, R33, R37, R51, R61, R62, R63, R66, R67, R68, R69, R70, R85, R86, R93, R95, R96, R102, R103, R105, R106, R110	100K0603	36-RES1044	100K Surface mount resistor 0.063 watt 1% size 0603
R18	2.49K0603	36-RES1257	2.49K Surface mount resistor 0.063 watt 1% size 0603
R19,R20,R25,R27,R35,R47,R48,R55,R65,R104	0.1R0805	36-RES1246	0.1R Surface mount resistor 0.125 watt 1% size 0805
R22,R24	80.6K0603	36-RES1258	80.6K Surface mount resistor 0.063 watt 1% size 0603
R23	249K0603	36-RES1259	249K Surface mount resistor 0.063 watt 1% size 0603

R26	1R0805	36-RES1093	1R Surface mount resistor 0.125 watt 1% size 0805
R28	0R0805	36-RES1041	RES 0R 1% 0805 0.125W
R29	3.32K0603	36-RES1260	3.32K Surface mount resistor 0.063 watt 1% size 0603
R30	1.24K0603	36-RES1261	1.24K Surface mount resistor 0.063 watt 1% size 0603
R36	10M0603	36-RES1262	10M Surface mount resistor 0.063 watt 1% size 0603
R39	***20K0603***	***36-RES1267***	***20K Surface mount resistor 0.063 watt 1% size 0603***
R49	0.022R0805	36-RES1263	0.022R Surface mount resistor 0.125 watt 1% size 0805
R50	2.2M0603	36-RES1251	2.2M Surface mount resistor 0.063 watt 1% size 0603
R52	330R0603	36-RES1271	330R Surface mount resistor 0.063 watt 1% size 0603
R72	8.2R0805	36-RES1250	8.2R Surface mount resistor 0.125 watt 1% size 0805
R73	91K0603	36-RES1242	91K Surface mount resistor 0.063 watt 1% size 0603
R74,R90,R91,R109	15K0603	36-RES1212	15K Surface mount resistor 0.063 watt 1% size 0603
R75	51K0603	36-RES1218	51K Surface mount resistor 0.063 watt 1% size 0603
R77	47K0603	36-RES1216	47K Surface mount resistor 0.063 watt 1% size 0603
R78	7.5K0603	36-RES1219	7.5K Surface mount resistor 0.063 watt 1% size 0603
R87	1.5K0603	36-RES1071	1.5K Surface mount resistor 0.063 watt 1% size 0603
R88,R89	33R0603	36-RES1237	33R Surface mount resistor 0.063 watt 1% size 0603
R92	3.3K0603	36-RES1235	RES 3K3 1% 0603 0.06W
R111	1K0805	36-RES1087	1K Surface mount resistor 0.125 watt 1% size 0805
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C14, C20, C22, C24, C33, C37, C42, C47, C51, C52, C53, C54, C59, C60, C65, C72, C74, C77, C78, C79, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97,C98, C99, C100, C101,C106, C107, C110, C111, C112,C13, C15, C18, C19, C40, C41,C117	0.1UF0603	36-CAP1009	0.1uF 25V ceramic capacitor size 0603
C11, C12, C25, C29	10PF0603	36-CAP1113	10pF ceramic capacitor size 0603
C16, C17, C23, C105	10UF0805	36-CAP1122	10uF 10V ceramic capacitor size 0805. Farnell 9402136
C21, C38, C69, C70, C71, C81	1UF0805	36-CAP1006	1uF 25V ceramic capacitor size 0805
C26, C28, C30, C32, C34, C35, C31	10UF1206	36-CAP1110	10uF 10V ceramic capacitor size 1206
C27, C73	4.7UF1206	36-CAP1047	4.7uF 16V ceramic capacitor size 1206
C75	***22uF1210***	***36-CAP1130***	***22uF 16V X5R ceramic capacitor size 1210, 20%***
C36,C50	TAJD107K016R	36-CAP1067	AVX 100uF/16v Surface mount Tantalum size D. Farnell 197-348
C116	not populate		
C39, C61, C62, C63, C64	10NF0603	36-CAP1109	10nF ceramic capacitor size 0603
C49, C55, C56, C57, C84	10NF0603	36-CAP1109	10nF ceramic capacitor size 0603
C43, C44, C45, C46, C48, C58, C68, C103, C114, C115, C113, C85	2.2uF10V 0603	36-CAP1126	2.2UF10V X5R 0603 10%, Farnell:1108322
C66, C76, C86	2.2UF0805	36-CAP1031	2.2uF 25V ceramic capacitor size 0805
C67	0.47uF1206	36-CAP1128	0.47uF 50V 1206 ceramic 10%, RS 500-2348
C80	1UF0805	36-CAP1006	1uF 25V ceramic capacitor size 0805
C82	don't populate		
C83, C104, C108, C109	1UF10V-0603	36-CAP1125	1uF 10V X5R 0603 10%,farnell: 9402080,9227776
C102	not populate		
D1	BAT54C	36-DIO1008	General purpose Dual Schottky diode SOT-23, Common Cathode
D2, D3, D4, D5, D13, D14, D15	BAS21	36-DIO1006	General purpose diode SOT-23
D6, D11	ZHCS1000	36-DIO1020	Zetex Schottky diode, SOT-23 package
D7	L-934ND	36-DIO1051	Kingbright 3mm orange LED, pitch 2.54mm. Farnell 329-9478
D8	BAT54C	36-DIO1008	DIO BAT54C DUAL SCHOTTKY SOT23
D9, D10	BAT54S	36-DIO1052	General purpose Dual Schottky diode in Series SOT-23
L1, L2, L8	BLM41PG471SN1	36-IND1030	muRata inductor, 470ohm@100Mhz, 1806 package.
L1,L2 Alt	BLM41PG750SN1L	36-IND1020	muRata inductor, 750ohm@100Mhz, 1806 package.
L3, L6	LQH32CN100K33L	36-IND1013	muRata 10uH inductor, 1210 package, Farnell 9522204
L4***, L5***	B82462-G4103-M	36-IND1024	Epcos 10uH Power Inductor size 6x6, Farnell 7430027
L7	LQH32CN220K23L	36-IND1014	muRata 22uH inductor, 1210 package
L7 Alt.	LQH32MN220J23L		muRata 22uH inductor, 1210 package, Farnell 9522069

L9	***BLM18TG102TN1***	***36-IND1032***	***muRata Ferrite Bead, 1000R at 100Mhz, DC 100mA 0603 package.***
X1	ABM7-14.7456MHZ	36-XTL1022	ABM7 14.7456MHz MINI CRYSTALS, Farnell 7941481
X3	***OSC-CSX750FJ-48M***	***36-XTL1023***	***CSX750FJ 48MHz Oscillators crystal citizen, Farnell 1019173***
F2	MINISMDC110F-2	36-IC1204	tyco 1.1A surface mount Polyswitch. Farnell 1175842
BAT1	S-2B-PH-K-S	36-CON1170	JST 2 way side entry PCB socket
BAT2	CR2016-IF2	36-BAT1039	Panasonic 3V 90mA-hr Lithium PCB mounted coin cell battery
J1	IL-Z-10P-S125T3-E	36-CON1179	JAE 1.25mm 10 way Header, Farnell 3887224
J2	RP34L-5R-2PD(71)	36-CON1172	Hirose 2-way connector
J3, J4	MQ172X-4PA(55)	36-CON1143	Hirose 4-way connector
J5	FH12-50S-0.5SH(55)	36-CON1180	CON SKT 50W 0.5mm PITCH R/ANG, Hirose
J6	not populate		2.54*4 Header, for test only
J7	ST60-10P	36-CON1173	Hirose 10-way cradle connector
KEY0, KEY1	TSS644R	36-MEC1356	Knitter-switch switch
VR1	3150W203P	36-RES1243	Tyco Electronics 20K surface mount pot. Farnell 4631869
SPK1	PKLCS1212E4001-R1	36-MEC1390	Murata SMD Buzzer 4kHz. Farnell 1192551
	TX09D70VM1CEA	36-DIS1023	Hitachi 1/4 VGA colour TFT display
Alt. Part	TX09D70Vm1CAA	36-DIS1023	Hitachi 1/4 VGA colour TFT display
	105-11	36-PCB1042	PCB issue 0.4

	105-25	36-BAT1040	Microloop Battery Pack Issue 1.0

			CASE COMPONENTS
		36-MLD1533	**MOULDING SET**
	1072-79487 (MM ref:105-33)	36-MLD1534	MicroLoop - Case Upper
	1072-79486 (MM ref:105-32)	36-MLD1535	MicroLoop - Case Lower
	1072-79483 (MM ref:105-29)	36-MLD1536	MicroLoop - Case bezel
	1072-79482 (MM ref:105-28)	36-MLD1537	MicroLoop - Case Button
	1072-79481 (MM ref:105-27)	36-MLD1538	MicroLoop - Stylus Keeper
	1072-79484 (MM ref:105-30)	36-MLD1539	MicroLoop - Case End Panel Bottom
	1072-79485 (MM ref:105-31)	36-MLD1540	MicroLoop - Case End Panel Top
	1072-79480 (MM ref:105-26)	36-MLD1541	4 off MicroLoop - Case Foot
	1008-73698 (MM ref:085-29)	36-MLD1542	MicroLab/Loop - LCD gasket
	105-23	36-LAB1171	Serial Number label
	W/3.0/8/PRST30/ZC1D	36-FIX1088	4 off TR fastenings, polymate 30 panhead screw, posidrive, 3x8mm zinc & clear finish

			SUNDRY ITEMS
	MW117RA0503Fxx (TBA)	36-PSU1013	Ault universal 5 volt mains adapter supplied by Craftec
		36-CAB1098	USB lead - Unit to PC
		36-CAB1099	USB lead - Unit to Printer
	ML5530SI	36-CAB1057	MORVAN Three pole mains cable for UK
	ZT41U	36-MEC1283	2 off Maplin PDA stylus

	101-08	**36-TDX1048**	**TURBINE ASSEMBLY**
	101-00	**36-ASS1206**	**BI-DIRECTIONAL TURBINE HOUSING**

Technical Support

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Fault Analysis

The following analysis is only a guideline and should be carried out in a logical sequence. If the fault is still apparent after the following suggestions then the unit should be fault found using the circuit descriptions and circuit diagrams provided.

When the unit is turned on there is no display present

-Ensure charger is turned on at the mains.

FVC readings are low

-Remove turbine from transducer housing. Taking the turbine, move it slowly through the air and check that the vane is not sticking.

The unit does not recognise that the transducer is connected

-Ensure that the Bi-directional transducer is correctly plugged into the MicroLoop.
-Inspect the Bi-directional transducer cable and connector for damage.

The unit does not record any blows

-Inspect Bi-directional transducer cable and connector for damage.
-Ensure that the Bi-directional transducer is correctly plugged into the MicroLoop.
-Remove turbine from the Bi-directional transducer housing. Taking the turbine, move it slowly through the air and check that the vane is not sticking.

Specifications

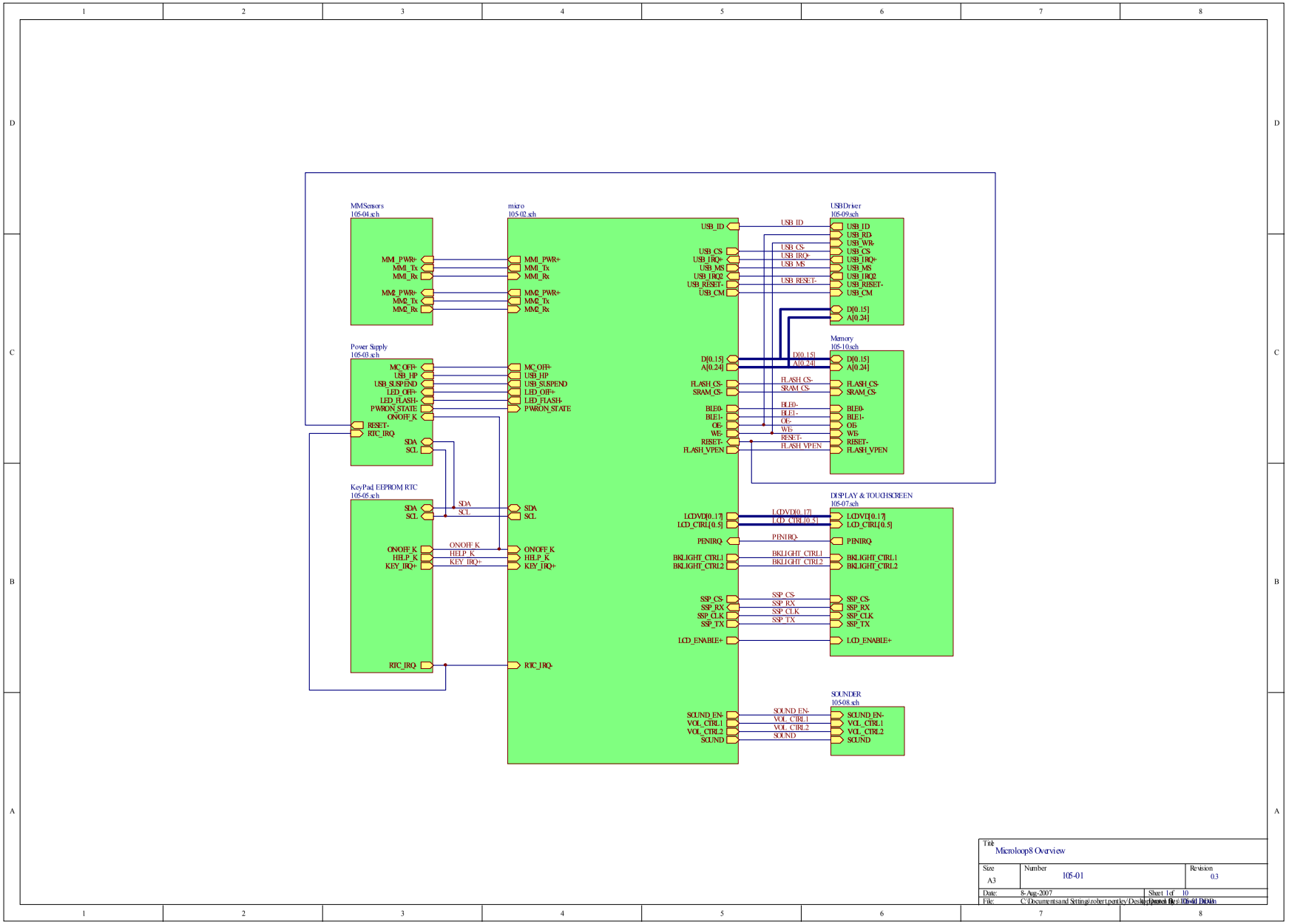
Spirometry

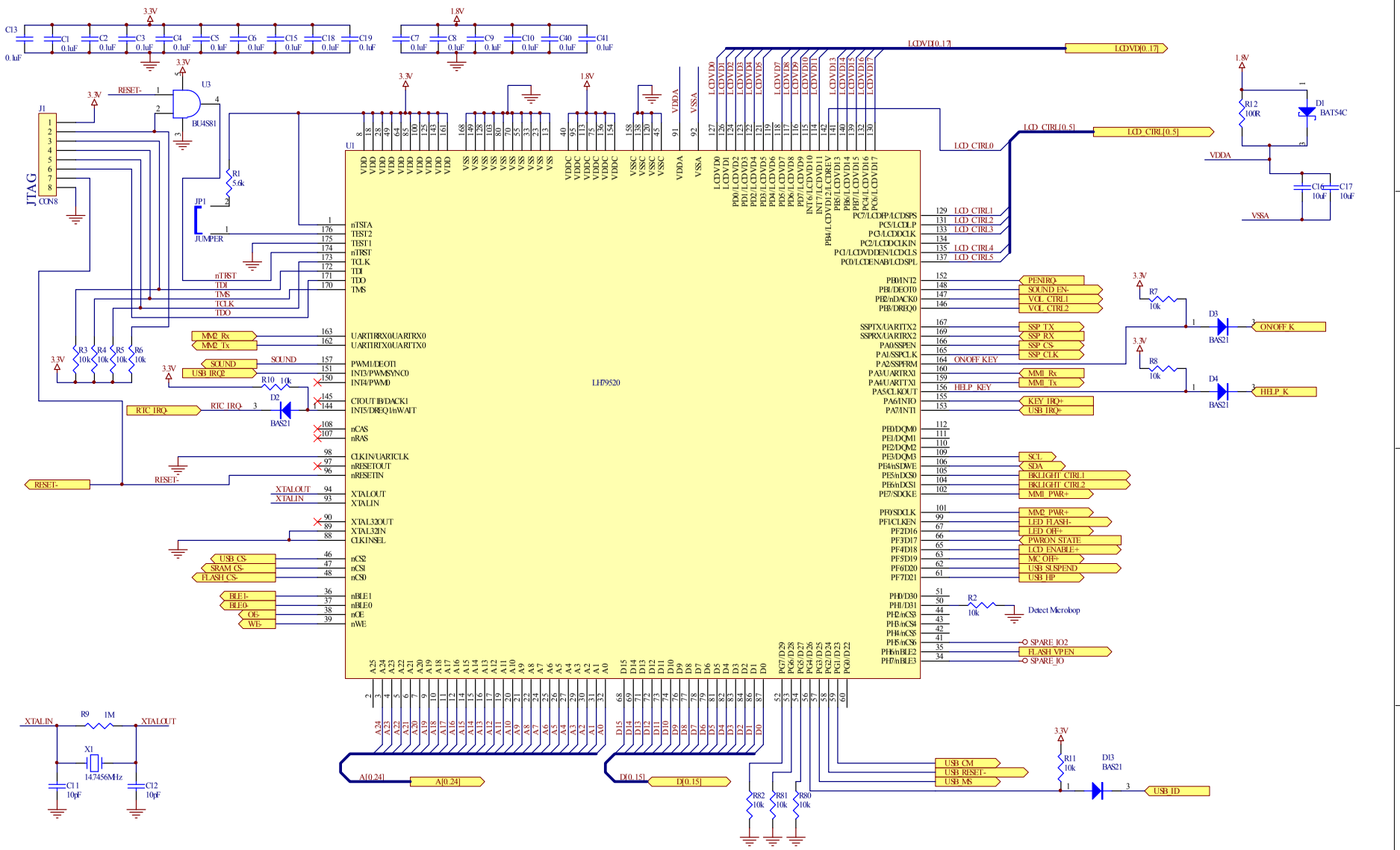
Measurements, (Forced)	VC, FEV.75, FEV1, FEV3, FEV6, FVC, PEF, FEV.75/VC, FEV.75/FVC, FEV1/VC, FEV1/FVC (FER), FEV3/VC, FEV3/FVC, FEV.75/FEV6, FEV1/FEV6, FEF25 (MEF75), FEF50 (MEF50), FEF75 (MEF25), FEF25-75 (MMEF), FEF50/VC, FEF50/FVC, MMEF/FVC (FEF25-75/FVC), FIV1, FIVC, PIF, FIV1/FIVC (FIR), FIF25 (MIF75), FIF50 (MIF50), FIF75 (MIF25), R50 (FEF50/FIF50), MET25-75, FET, MVV (ind)
Measurements, (relaxed)	EVC, IVC, IC,VT (TV), ,Ti,Te,Ti/Ttot.,VT/Ti (TV/Ti), IRV, ERV, FR
Test Per Subject	5 relaxed VC manoeuvres and 8 forced manoeuvres for each baseline and two post examinations
Predicted Values	Various - depends upon national preference (including NHANESIII)
Transducer Resolution	Micro Medical Gold Standard Bi-Directional Digital Volume 10ml volume 0.03l/s flow
Accuracy	+/- 3% to ATS recommendations - Standardisation of Spirometry 1994 update for flows and volumes

General

Storage graphs	2000 patients with tests including Flow/Volume loops and Volume/Time
Printer Output (External Printers)	For the latest listing of compatible Hewlett Packard printers visit Micro Medical Website at www.micromedical.co.uk
Power Supply	Input: 100-240V AC 50-60Hz Output: 5V 2.0A
Battery Pack	Rechargeable Lithium Polymer 3.7V 1600mAh
Dimensions	123mm x 82mm x 23mm Transducer 50 x 60 x 90mm
Weight	Excluding Transducer : 191g, Docking Station 124g
Operating Temperature direct sunlight	The instrument will operate in a uniform environment of 0°C - 40°C, out of
Operating Humidity	30-90% non-condensing.
Storage Temperature	-20°C to +70°C
Storage humidity	10% to 90% RH
Connectivity	USB 1.1

Circuit Diagrams



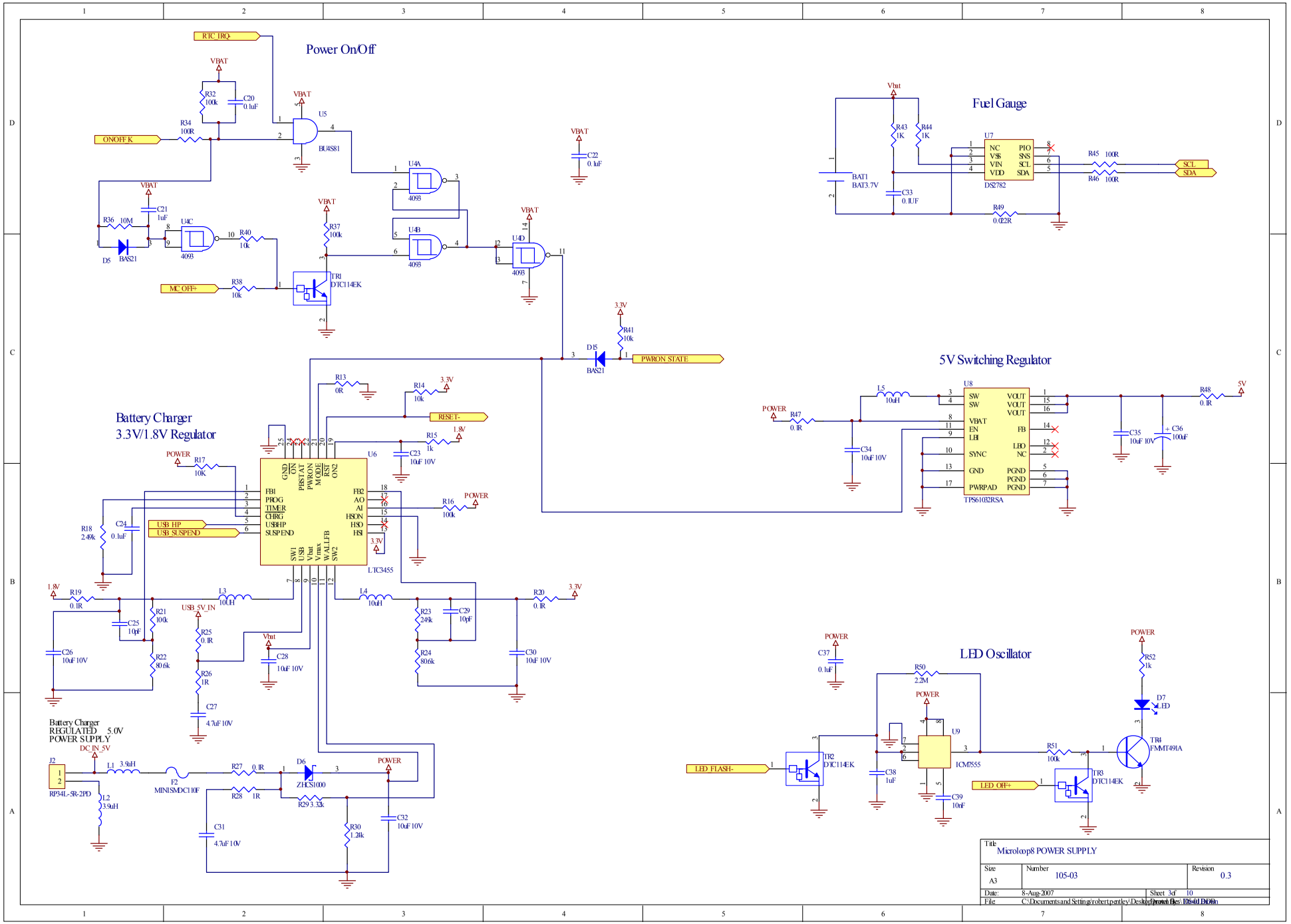


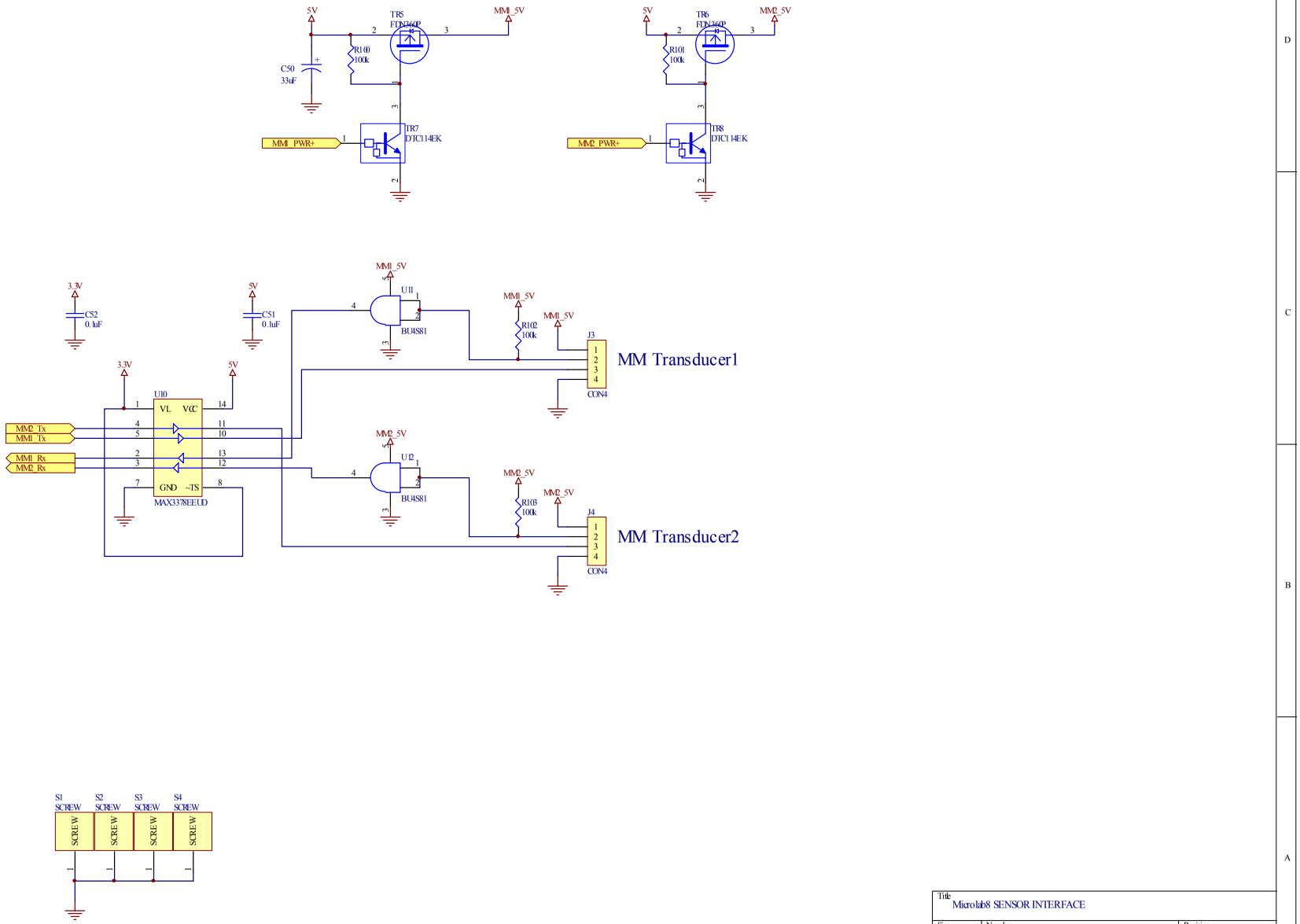
Title: Microloop8 MicroController

Size	Number	Revision
A3	105-02	0.3

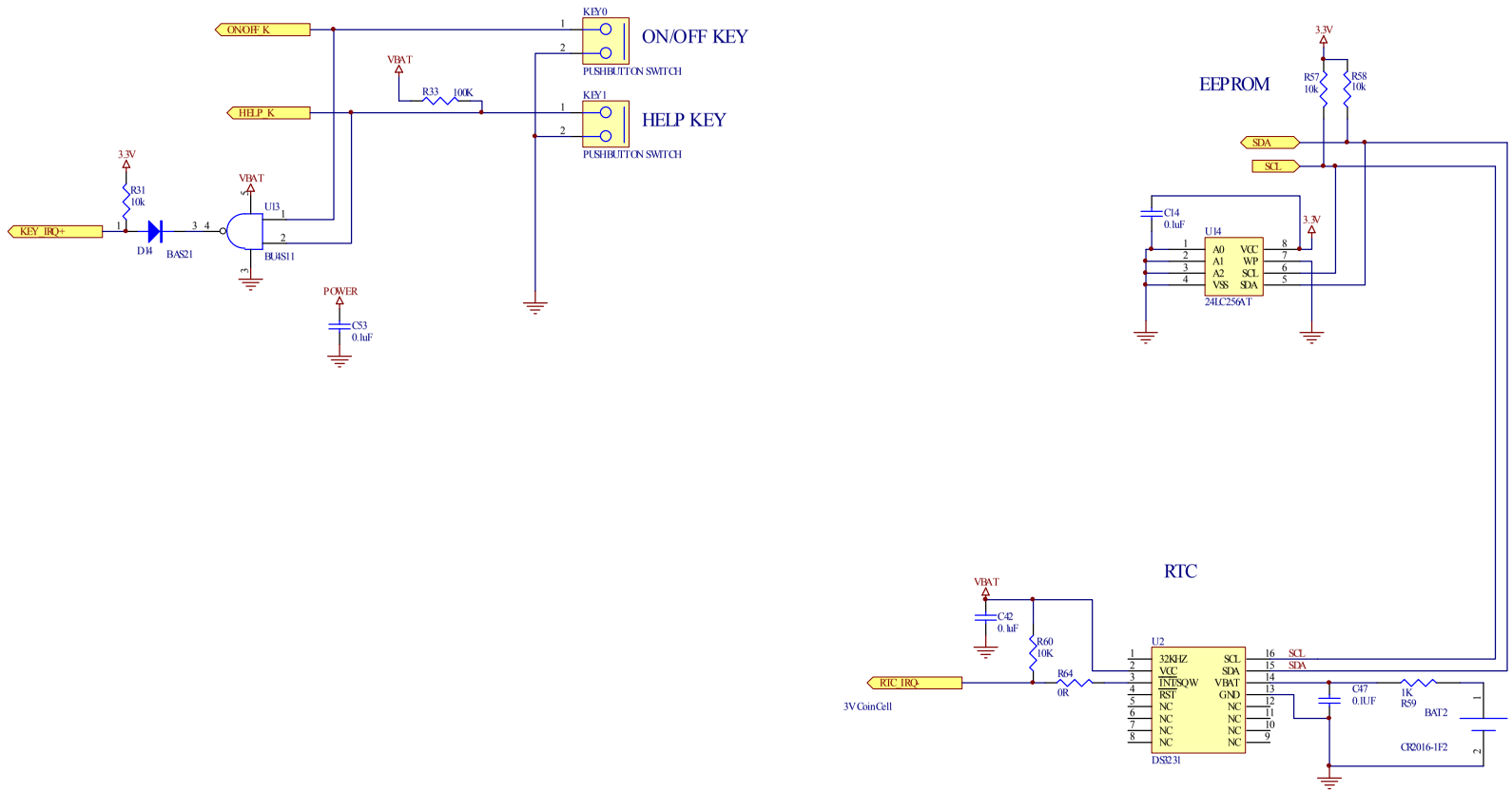
Date: 8-Aug-2007 Sheet 2of 10

File: C:\Documents and Settings\robert.gantley\Desktop\Protel Files\105-02\DB\Down

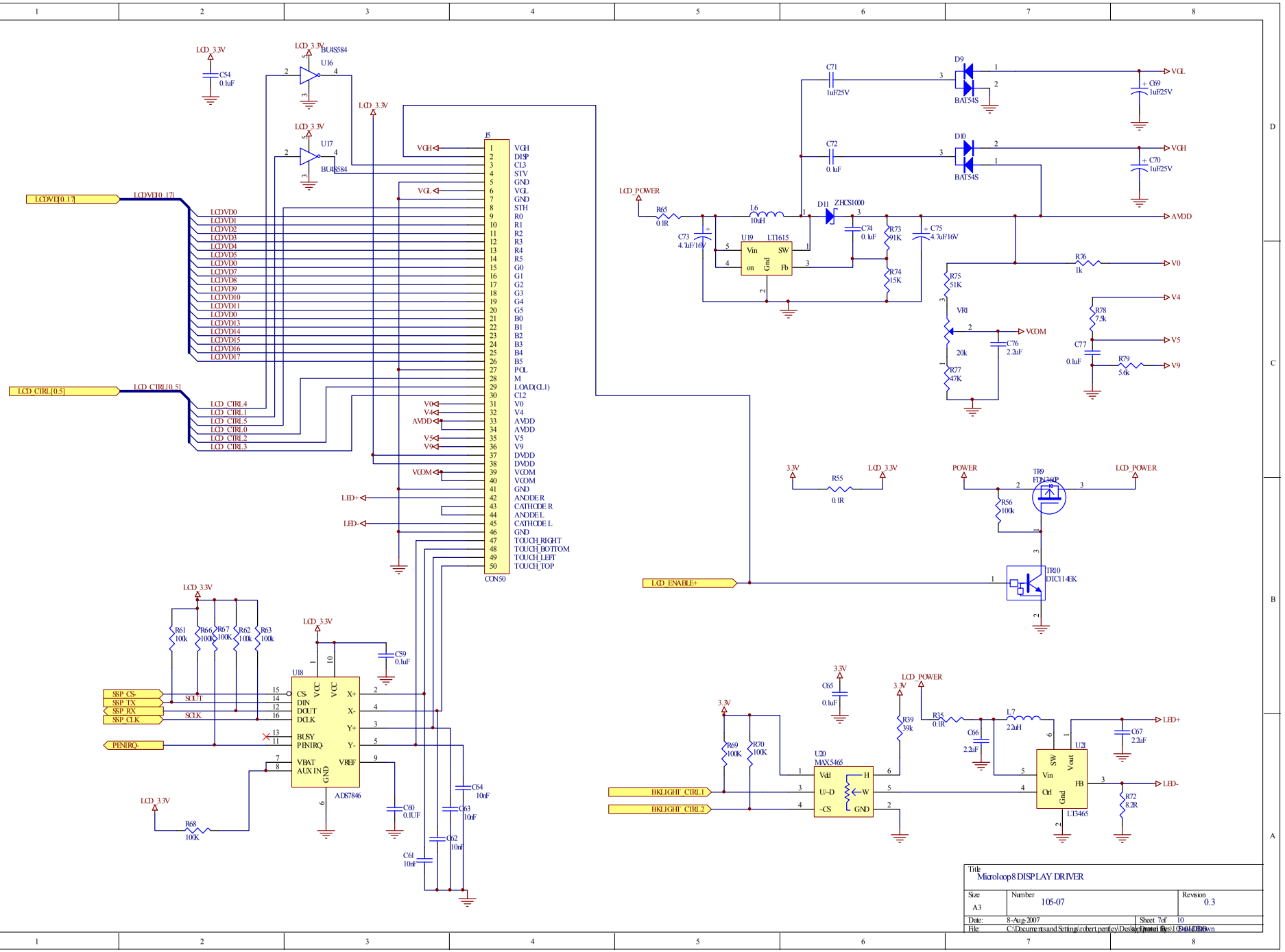

Power On/Off
Fuel Gauge
5V Switching Regulator
Battery Charger
3.3V/1.8V Regulator
LED Oscillator
Battery Charger
REGULATED 5.0V
POWER SUPPLY
RTC_IRQ-
VBAT
ON/OFF-K
MC_OFF+
PWRON_STATE
RESET-
USB_HP
USB_SUSPEND
USB_5V_IN
DC_IN_5V
POWER
Vbat
3.3V
1.8V
5V
SCL
SDA
LED_FLASH-
LED_OFF+
U5
BU4S81
U4A
U4B
U4C
U4D
4093
TR1
DTC114EK
D5
BAS21
D15
BAS21
U6
LTC3455
U7
DS2782
BAT1
BAT3.7V
U8
TPS61032RSA
U9
ICM7555
TR2
DTC114EK
TR3
DTC114EK
TR4
FMMT491A
D6
ZHCS1000
D7
LED
F2
MINISMDC110F
J2
RP34L-5R-2PD
Title
Microloop8 POWER SUPPLY
Size
A3
Number
105-03
Revision
0.3
Date:
8-Aug-2007
Sheet 3of 10
File
C:\Documents and Settings\robert.pantley\Desktop\Protel Files\105-01 D08.ddb

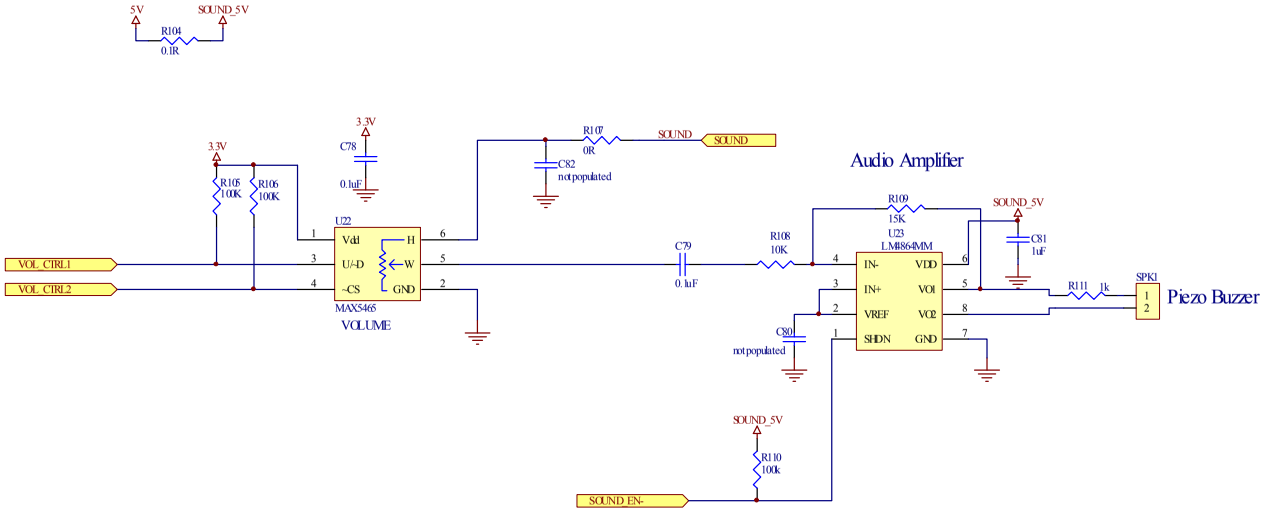


Title: Microlab8 SENSOR INTERFACE		
Size: A3	Number: 105-04	Revision: 0.3
Date: 8-Aug-2007	Sheet 4of 10	
File: C:\Documents and Settings\robert.pentley\Desktop\[illegible]		

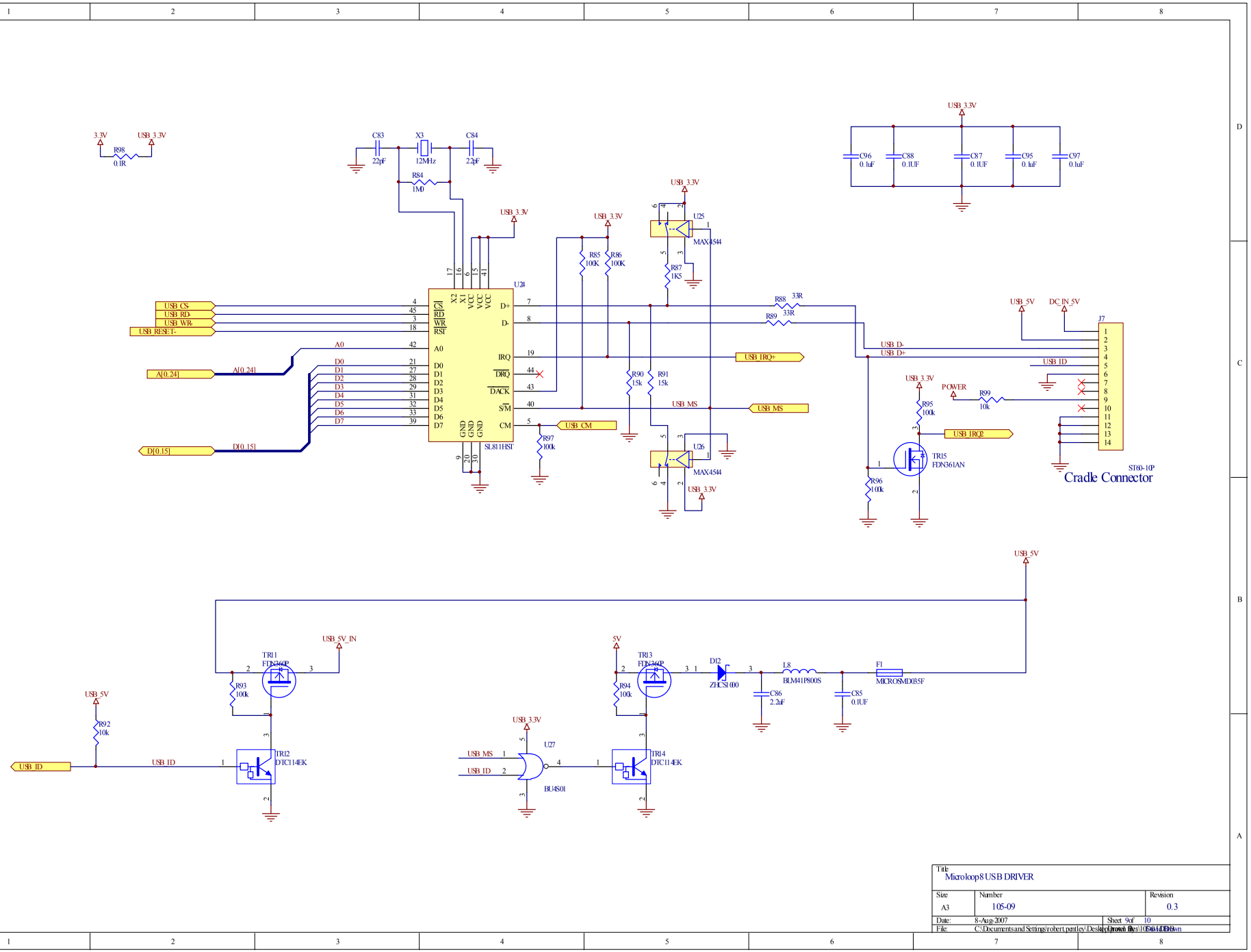


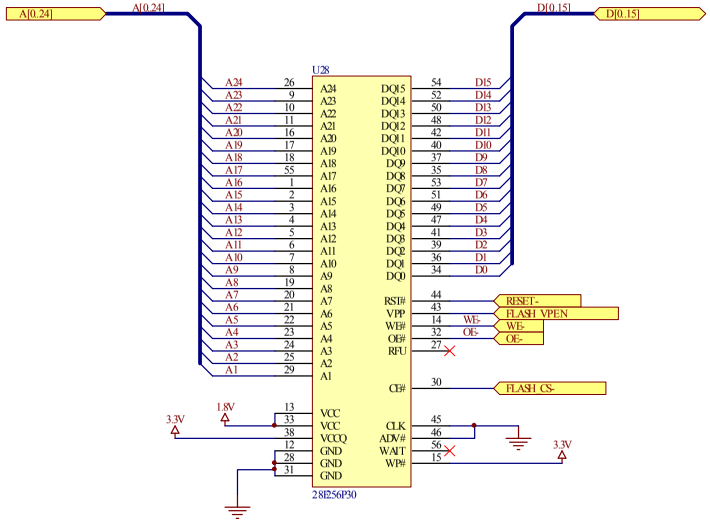
Title: Microlcop8 KeyPad, EEPROM, RTC			
Size: A3	Number: 105-05		Revision: 0.3
Date: 8-Aug-2007		Sheet 5of 10	
File: C:\Documents and Settings\robert.pentley\Desktop\Current Files\105-05\105-05.sch			

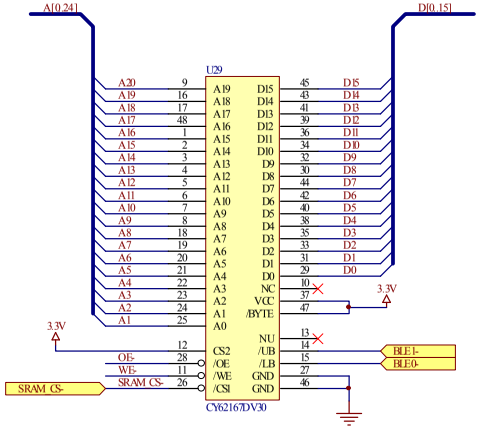

LCD_3.3V
CS4
0.1uF
U16
BU4S584
U17
BU4S584
J5
VCH
VCL
LCDVD[0..17]
LCD_CTRL[0..5]
LCD_CTRL4
LCD_CTRL1
LCD_CTRL5
LCD_CTRL0
LCD_CTRL2
LCD_CTRL3
LED+
LED-
VCOM
AVDD
V0
V4
V5
V9
TOUCH_RIGHT
TOUCH_BOTTOM
TOUCH_LEFT
TOUCH_TOP
CON50
C71
1uF25V
C72
0.1uF
D9
D10
BAT54S
C69
1uF25V
C70
1uF25V
LCD_POWER
R65
0.1R
L6
10uH
D11
ZHCS1000
C73
4.7uF/16V
U19
LT1615
C74
0.1uF
R73
91K
C75
4.7uF16V
R74
15K
R76
1k
R75
51K
VR1
20k
R77
47K
C76
2.2uF
R78
7.5k
C77
0.1uF
R79
5.6k
R55
0.1R
POWER
TR9
FDN360P
R56
100k
TR10
DTC114EK
LCD_ENABLE+
C65
0.1uF
R69
100K
R70
100K
U20
MAX5465
BKLIGHT_CTRL1
BKLIGHT_CTRL2
R39
39k
R35
0.1R
L7
2.2uH
C66
2.2uF
U21
LT3465
C67
2.2uF
R72
8.2R
R61
100k
R66
100K
R67
100K
R62
100k
R63
100k
U18
AD87846
SSP_CS-
SSP_TX
SSP_RX
SSP_CLK
SOUT
SCLK
PENIRQ-
C59
0.1uF
C64
10nF
C63
10nF
C62
10nF
C61
10nF
C60
0.1UF
R68
100K
Title
Microloop8 DISPLAY DRIVER
Size
A3
Number
105-07
Revision
0.3
Date:
8-Aug-2007
Sheet 7of 10
File:
C:\Documents and Setting\robert.pentley\Desktop\Panel Files\105-07.ddb

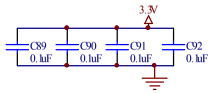


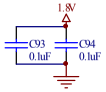
Title: Microloop8 SOUNDER		
Size: A3	Number: 105-08	Revision: 0.3
Date: 8-Aug-2007	Sheet 8of 10	
File: C:\Documents and Settings\robert.pentley\Desktop\Project Files\105-08 LOOP8.ddb		


3.3V
USB_3.3V
R98
0.1R
C83
22pF
X3
12MHz
C84
22pF
R84
1M0
C96
0.1uF
C88
0.1UF
C87
0.1UF
C95
0.1uF
C97
0.1uF
U24
SL811HST
USB_CS-
USB_RD-
USB_WR-
USB_RESET-
A[0.24]
D[0.15]
R85
100K
R86
100K
U25
MAX4544
R87
1K5
R88
33R
R89
33R
USB_IRQ+
USB_MS
USB_CM
R90
15k
R91
15k
R97
100k
U26
MAX4544
USB_5V
DC_IN_5V
J7
USB_D-
USB_D+
USB_ID
POWER
R99
10k
R95
100k
USB_IRQ2
TR15
FDN361AN
R96
100k
ST60-10P
Cradle Connector
USB_5V_IN
TR1
FDN360P
R93
100k
R92
10k
TR12
DTC114EK
5V
TR13
FDN360P
R94
100k
D12
ZHCS1000
L8
BLM41P800S
F1
MICROSMDC035F
C86
2.2uF
C85
0.1UF
U27
BU4S01
TR14
DTC114EK
Title
Microlcop8 USB DRIVER
Size
A3
Number
105-09
Revision
0.3
Date:
8-Aug-2007
Sheet 9of 10
File:
C:\Documents and Settings\robert.pantley\Desktop\Protel Files\105-09.ddb









Title: Microloop8 Memory		
Size: A3	Number: 105-10	Revision: 0.3
Date: 8-Aug-2007	Sheet 10f 10	
File: C:\Documents and Settings\robert pentley\Desktop\Protel files\105-01 DDB David Brown		