Author	Checked	Approved
Date	Date	Date

MicroLab MK8 Service Manual

085-46 Issue. 1.0 July 2006

Micro Medical

Contents

MicroLab - System Overview

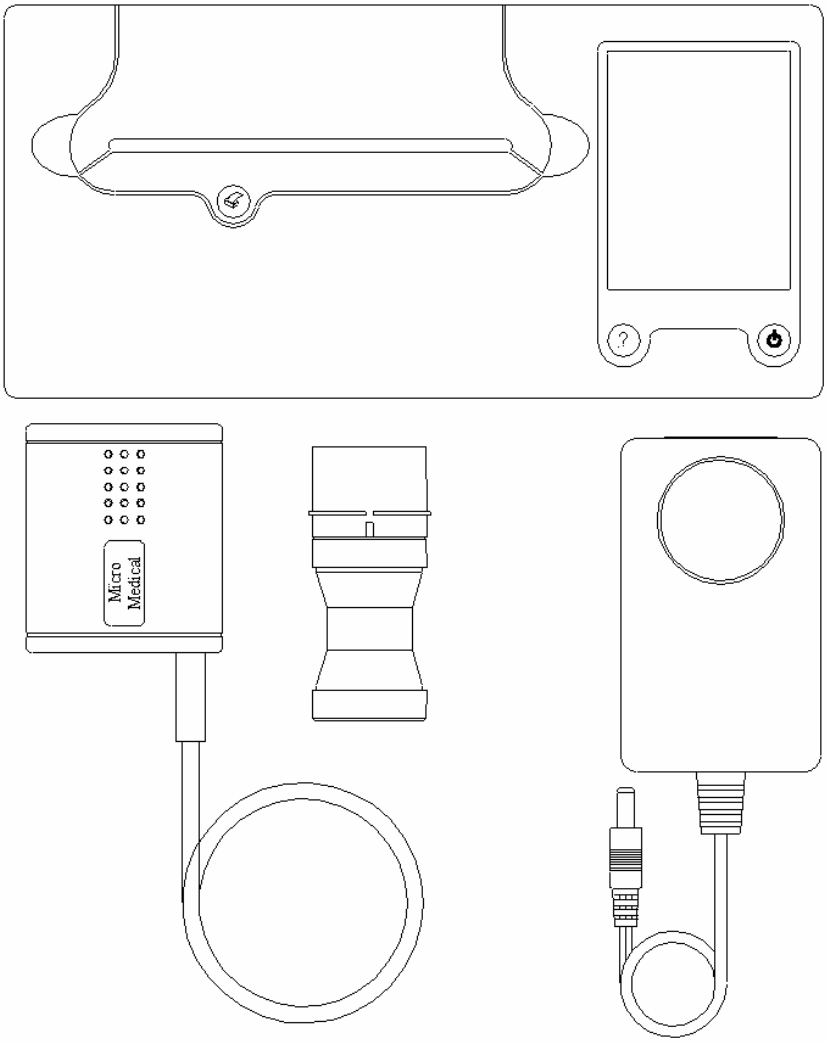
MicroLab MK8 System

The Micro Medical MicroLab is a data recording spirometer consisting of a microcomputer unit incorporating a high resolution colour touch screen, Internal printer, USB and RS232 interfaces, mouse and transducer ports and all associated circuitry.

Supplied with the microcomputer is a Bi-directional transducer, disposable mouthpieces, mains adapter, nose clip and USB printer cable.

The MicroLab is powered by internal Nickel Metal Hydride cells or by the mains adapter supplied.

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.

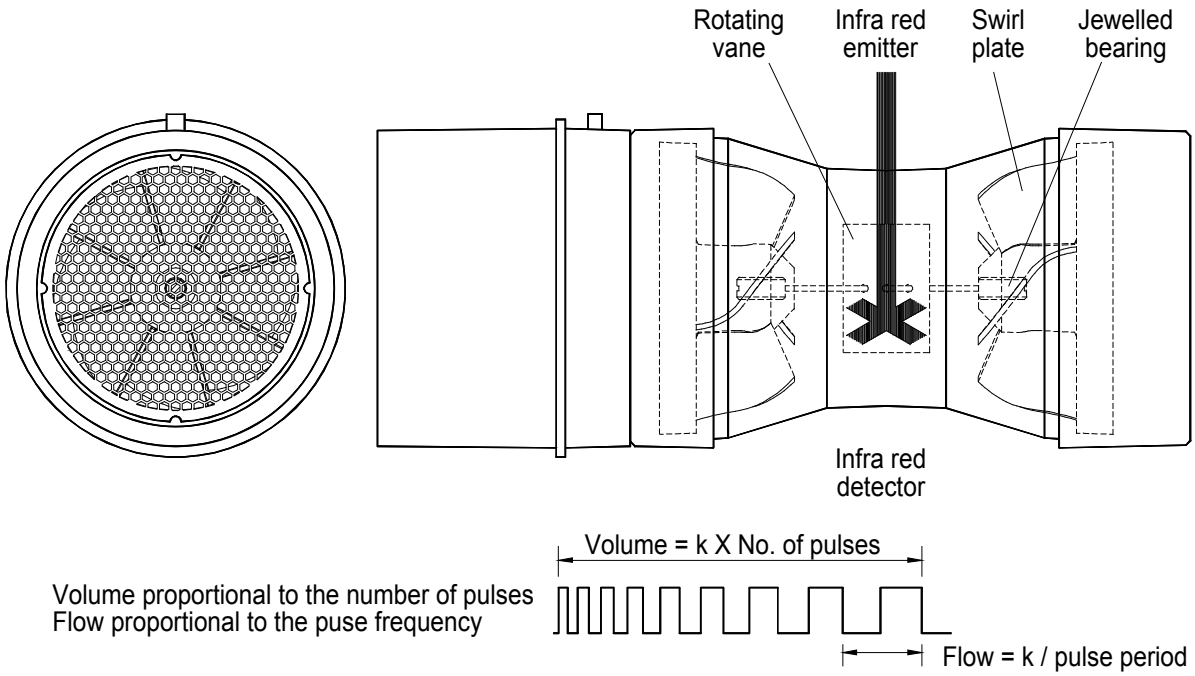


Bidirectional Transducer

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



MicroLab Mk8 Repair

Disassembling the MicroLab Mk8 for Repairs

1. Disconnect the mains power supply
2. Open the printer cover and remove the paper roll from the unit.

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

3. Place the MicroLab Mk8 face down on a soft surface to remove the six screws in the lower moulding. Put the screws to one side.
4. Turn the unit face up before easing the upper and lower mouldings apart. Remove the paper cover and side panels
5. Taking all precautions against static damage, lift the MicroLab PCB, battery and printer assembly out of the bottom moulding and place on an antistatic work surface.
6. Reconnect the power supply to the MicroLab Mk8 charging socket
7. The MicroLab is now ready for fault finding.

Reassembling the MicroLab after repairs

1. Disconnect all mains power supplies.
2. Place the MicroLab PCB (and printer/battery if connected) into the MicroLab bottom moulding.
3. Insert the Left hand side panel into the bottom moulding.
4. Insert the Right hand side panel into the bottom moulding and onto the ML8 PCB connectors by lifting the right hand edge of the PCB slightly
5. Ensuring that the keys do not fall out, position the top moulding over the bottom moulding and ensure that they both mate correctly.
6. Lift the rear of the top moulding to insert the paper cover hinge pins.
7. clip the paper cover shut

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

8. Place the MicroLab Mk8 face down on a soft surface and replace the six screws in the lower moulding.
9. The MicroLab Mk8 is now ready for operation.

Circuit Descriptions

Microcomputer Unit

Overview (085-01) and Micro controller (085-02).

The drawing 085-01 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).

U2 is a reset controller, which holds the reset line low on power up.

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.

U3 is a multiplexer used to direct the communications to the correct channel on UART1. The directions are printer, MM Sensor 1, and MM Sensor 2.

Power Supply (085-03)

The power to the system is either supplied by the 8.4V NiMH battery or from an external 12V DC regulated power supply. If the external supply is connected, then TR6 & TR12 are switched off and the battery is not used. R8 ensures that the battery is trickle charged at all times.

U40 is the charging circuit for the NiMH battery. The typical charge charge current is about 500mA, which equates to about 375mA out of the 12V supply.

Charging is disabled when the unit turns on with TR23.

U4 is a step-down switching regulator used to create the 3.3 and 1.8 volt rails.

U6 is a step-down switching regulator used to create the 5V rail.

U43 is a 1Hz oscillator used to blink the LED when the battery is charging. If the battery is fully charged CHARGE- is high, and the LED is on – assuming the mains is plugged in.

U33 is the power on circuit. If the unit is off and the on/off button is pushed, the unit should turn on. The microcontroller can turn off the unit using MC_OFF+. Holding the on/off button down for 10 secs can also turn the unit off if necessary.

U5 is used to hold the unit off if the supply voltage is too low (approximately 5.5V).

R24 and R25 divide the unregulated battery voltage, which is applied to a spare A/D channel in the touch screen driver. The uC continuously examines the reading and gives a battery low or battery dead warning message.

Inductors L1 and L2 are placed for EMC filtering and D14 protects the unit from reverse polarity power supply

Microlab8 Sensor Interface (085-04)

2 Sensor ports are available for the unit to plug their transducers into (eg. Turbine, SPO2).

U30 is used to translate the levels from 3.3 to 5V.

U34, and U35, are used to buffer the receive line to the level translator. This was found to be necessary for the SPO2.

TR17 is used to switch the power on for MM Sensor 1.
TR19 is used to switch the power on for MM Sensor 2.

Keypad, EEPROM, MOUSE, RTC, RS232 (085-05)

Three buttons are available on the unit.

KEY0 is the ON/OFF button.
KEY1 is the HELP button
KEY3 is the PAPER_FEED button
U8 is used to generate an interrupt to the microcontroller if either the on/off or help button is pushed.

The mouse is controlled by 2 data lines. 4 lines come from the microcontroller to interface with these 2 lines. U22, U31 are inverting buffers. TR7 and TR8 are used to drive the data lines low.

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.

The uC communicates with the PC an RS232 serial interface at 115,200 Kbits per sec baud rate, with 8 bits data, 1 stop bit and no parity. U9 converts the RS232 signal to a logic signal of 3.3V. The uC uses channel 0 of it's inbuilt serial controller for RS232 communication.

Printer Driver (085-06)

The printer driver circuit is controlled by a Hitachi H8/3687 microprocessor. It includes the head driver, the motor driver, and the paper detection. The microprocessor has a built in Flash, which needs to be programmed by the main microcontroller, in order for the printer driver to operate correctly.

U12 is used to drive the correct signals to rotate the motor.
U13 is used to translate the communication levels from 3.3 to 5V.
TR1 is to turn off the 5V supply to the printer, when not required.
U7 is a linear regulator for the 7V printer head voltage.
J7 is the connector for the head
J14 is the connector for paper detection
J6 is used for debugging the printer, and should never even be populated in production.
J12 is the connector for the motor.

Display Driver (085-07)

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).

U28, and U29 are used to invert 2 lines from the processor.
U14 is the touch screen controller.
U16 controls a constant current through the LED backlight of the display.
U15 can adjust the current to which U16 has to control.
U17 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 (085-08)

The sound driver includes a low-pass filter, a digital potentiometer, and an amplifier. The low-pass filter (R100, and C110) turn the PWM digital signal from the microcontroller into an analog voltage. The digital potentiometer (U18) is used to adjust the volume, and the amplifier (U19) is used to drive the 16ohm speaker with the final signal.

USB Driver (085-09)

The cypress SL811HST (U20) 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 (085-10)

U23 is a 32Mbyte FLASH 28F256P30 used to store all program code, and the files/filing system.

U24 is a 2Mbyte SRAM CY62167DV30 used to store all volatile memory, such as video memory, and program memory.

MicroLab Mk8 Parts List

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
Revision No. 1.2		Page: 1 OF 7
Designation	Part No. (F=Farnell)	Description.
MIM-085-17 PCB ASSEMBLY		
U1	INC-LH79520	Sharp ARM7 Microcontroller, LQFP176 package
U2	INC-LM809M3-3.08 NOPB	National Semiconductor Reset Circuit, SOT-23 package
U3	INC-MM74HC4052M	Dual 4-ch analog mlplex, SO-16 package, Farnell 3548892
U4	INC-MAX1775EEE+	Maxim dual-output step-down converter, QSOP16 package
U5	INC-MAX6457UKD3B+T	Maxim undervoltage sensing circuit, SOT23-5 package
U6	INC-MAX1626ESA+	Maxim step-down DC-DC converter, SO-8 package
U8	INC-BU4S11	Rohm individual CMOS NAND gate, SOT23-5 package
U9	INC-MAX3221CAE+	Maxim RS232 transceiver, SSOP16 package
U10	INC-DS1629S+	Maxim digital temp and RTC, SO-8 package, Farnell 3330023
U11	INC-HD64F3687FP	Hitachi microcontroller, FP64E package
U12	INC-L6219DS	Allegro Surface mount PWM Motor driver, SOP24 package
U13	INC-MAX3378EEUD+	Maxim level translator, TSSOP14 package
U14	INC-ADS7846E	Texas Instruments Touch screen controller TSSOP16 package
U15	INC-MAX5465EXT+	Maxim digital Potentiometer, SC70 package
U16	INC-LT3465ES6#TRPBF	Linear Technology White LED Driver, SOT-23 package
U17	INC-LT1615ES5#TRPBF	Linear Technology DC/DC convertor, SOT23-5 package
U18	INC-MAX5465EXT+	Maxim digital potentiometer, SC70 package
U19	INC-LM4864MM	Audio Power Amplifier, MMSOP package
U20	INC-SL811HST-AXC	Cypress USB controller TQFP48 package
U21	INC-BU4S01	Rohm individual CMOS NOR gate, SOT23-5 package
U22	INC-BU4S584	Rohm individual CMOS Schmitt invertor, SOT23-5 package
U23	INC-JS28F256P30B85	Intel NOR Flash, TSOP56_14X20 package
U24	INC-CY62167DV30LL-70ZXI	Cypress 256Mbit SRAM, TSOP48_12X20 package
U25	INC-24LC256I/SN	Microchip 256K EEPROM, SO-8 package
U26	INC-MAX4544EUT+T	Maxim SPDT analogue switch, SOT23-6 package
U27	INC-MAX4544EUT+T	Maxim SPDT analogue switch, SOT23-6 package
U28	INC-BU4S584	Rohm individual CMOS Schmitt invertor, SOT23-5 package
U29	INC-BU4S584	Rohm individual CMOS Schmitt invertor, SOT23-5 package
U30	INC-MAX3378EEUD+	Maxim level translator, TSSOP14 package
U31	INC-BU4S584	Rohm individual CMOS Schmitt invertor, SOT23-5 package
U33	INC-4093	CMOS Quad NAND Schmitt input gate, SO-14 package
U34	INC-BU4S81	Rohm individual CMOS AND gate, SOT23-5 package
U35	INC-BU4S81	Rohm individual CMOS AND gate, SOT23-5 package
U40	INC-LTC4010CFE#TRPBF	Linear Technology Battery Charging Circuit, TSSOP16 package
U42	INC-LT1084CT#TRPBF	Linear Technology Voltage Regulator
U42 PAD	PAD-OE02910	CPC Sellotape permanent, double-sided, self adhesive pad 12x25x1.5mm
U43	INC-LM555CM	National Semiconductor 555 Timer IC, SO-8
TR1	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR2	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR3	TRA-FDN361AN	Fairchild Semiconducter N-channel Mosfet, size SOT-23
TR4	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR5	TRA-DTC114EK	High speed switching NPN transistor, size SOT23

TR6	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR7	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR8	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR9	TRA-FMMT491A	Zetex NPN transistor, size SOT-23
TR10	TRA-DTA114EK	High speed switching PNP transistor, size SOT23
TR11	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR12	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR13	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR14	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR15	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR16	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR17	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR18	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR19	TRA-DTC114EK	High speed switching NPN transistor, size SOT23
TR20	TRA-FMMT491A	Zetex NPN transistor, size SOT-23
TR21	TRA-FDN360P	Fairchild Semiconductor P-channel Mosfet, size SOT-23
TR22	TRA-FDN361AN	Fairchild Semiconducter N-channel Mosfet, size SOT-23
R1	RES-5.6K0603	5.6K Surface mount resistor 0.063 watt 1% size 0603
R2	RES-75R0603	75R Surface mount resistor 0.063 watt 1% size 0603
R3	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
Revision No. 1.2		Page: 2 OF 7
Designation	Part No. (F=Farnell)	Description.
R4	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R5	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R6	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R7	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R8	RES-1K0805	1K Surface mount resistor 0.125 watt 1% size 0805
R9	RES-1M0603	1M Surface mount resistor 0.063 watt 1% size 0603
R10	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R11	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R12	RES-100R0603	100R Surface mount resistor 0.063 watt 1% size 0603
R13	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R14	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603
R15	RES-1M0603	1M Surface mount resistor 0.063 watt 1% size 0603
R16	RES-432K0603	432K Surface mount resistor 0.063 watt 1% size 0603
R17	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R18	RES-36K0603	36K Surface mount resistor 0.063 watt 1% size 0603
R19	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603
R20	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603
R21	RES-27K0603	27K Surface mount resistor 0.063 watt 1% size 0603
R22	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R23	RES-0.047R0805	0.047R Surface mount resistor 0.25 watt 1% size 0805
R24	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R25	RES-47K0603	47K Surface mount resistor 0.063 watt 1% size 0603
R26	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R27	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R28	RES-1K0603	1K Surface mount resistor 0.063 watt 1% size 0603
R29	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R30	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603

R31	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R32	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R33	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R34	RES-100R0603	100R Surface mount resistor 0.063 watt 1% size 0603
R35	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R36	RES-10M0805	10M Surface mount resistor 0.125 watt 1% size 0805
R37	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R38	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R39	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R40	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R41	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R42	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R43	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R44	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R45	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R46	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R47	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R48	RES-1R0603	1R Surface mount resistor 0.063 watt 1% size 0603
R49	RES-1K0603	1K Surface mount resistor 0.063 watt 1% size 0603
R50	RES-1R0603	1R Surface mount resistor 0.063 watt 1% size 0603
R51	RES-1K0603	1K Surface mount resistor 0.063 watt 1% size 0603
R52	RES-33K0603	33K Surface mount resistor 0.063 watt 1% size 0603
R53	RES-33K0603	33K Surface mount resistor 0.063 watt 1% size 0603
R54	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R55	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R56	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R57	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R58	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R59	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R60	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603
R61	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603
R62	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
Revision No. 1.2		Page: 3 OF 7
Designation	Part No. (F=Farnell)	Description.
R63	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R64	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R65	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R66	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R67	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R68	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R69	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R70	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R72	RES-8.2R0805	8.2R Surface mount resistor 0.125 watt 1% size 0805
R73	RES-91K0603	91K Surface mount resistor 0.063 watt 1% size 0603
R74	RES-15K0603	15K Surface mount resistor 0.063 watt 1% size 0603
R75	RES-51K0603	51K Surface mount resistor 0.063 watt 1% size 0603
R76	RES-1K0603	1K Surface mount resistor 0.063 watt 1% size 0603
R77	RES-47K0603	47K Surface mount resistor 0.063 watt 1% size 0603
R78	RES-7.5K0603	7.5K Surface mount resistor 0.063 watt 1% size 0603
R79	RES-5.6K0603	5.6K Surface mount resistor 0.063 watt 1% size 0603
R80	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603

R81	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R82	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R83	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R84	RES-1M0603	1M Surface mount resistor 0.063 watt 1% size 0603
R85	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R86	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R87	RES-1.5K0603	1.5K Surface mount resistor 0.063 watt 1% size 0603
R88	RES-33R0603	33R Surface mount resistor 0.063 watt 1% size 0603
R89	RES-33R0603	33R Surface mount resistor 0.063 watt 1% size 0603
R90	RES-15K0603	15K Surface mount resistor 0.063 watt 1% size 0603
R91	RES-15K0603	15K Surface mount resistor 0.063 watt 1% size 0603
R92	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R93	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R94	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R95	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R96	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R97	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R98	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R99	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R100	RES-3.3K0603	3.3K Surface mount resistor 0.063 watt 1% size 0603
R101	RES-1M0603	1M Surface mount resistor 0.063 watt 1% size 0603
R102	RES-18K0805	18K Surface mount resistor 0.125 watt 1% size 0805
R103	RES-100K0805	100K Surface mount resistor 0.125 watt 1% size 0805
R104	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R105	RES-0.22R0805	0.22R Surface mount resistor 0.25 watt 1% size 0805
R106	RES-604K0603	604K Surface mount resistor 0.063 watt 1% size 0603
R107	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R108	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R109	RES-121R0603	121R Surface mount resistor 0.063 watt 1% size 0603
R110	RES-560R0805	560R Surface mount resistor 0.125 watt 1% size 0805
R111	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R112	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R113	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R114	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R116	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R117	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R119	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R120	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R121	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R122	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R123	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R124	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R125	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R126	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R127	RES-22K0603	22K Surface mount resistor 0.063 watt 1% size 0603

R128	RES-68K0603	68K Surface mount resistor 0.063 watt 1% size 0603
R129	RES-33K0603	33K Surface mount resistor 0.063 watt 1% size 0603

R130	RES-330R0805	330R Surface mount resistor 0.063 watt 1% size 0805
R131	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R132	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R133	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R134	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R135	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R136	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R137	RES-0.1R0805	0.1R Surface mount resistor 0.25 watt 1% size 0805
R138	RES-33K0603	33K Surface mount resistor 0.063 watt 1% size 0603
R139	RES-10K0603	10K Surface mount resistor 0.063 watt 1% size 0603
R140	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R141	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R142	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R143	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
R145	RES-100K0603	100K Surface mount resistor 0.063 watt 1% size 0603
C1	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C2	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C3	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C4	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C5	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C6	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C7	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C8	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C9	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C10	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C11	CAP-10PF0603	10pF ceramic capacitor size 0603
C12	CAP-10PF0603	10pF ceramic capacitor size 0603
C13	don't populate	
C14	don't populate	
C15	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C16	CAP-10UF1206	10uF 10V ceramic capacitor size 1206
C17	CAP-10UF1206	10uF 10V ceramic capacitor size 1206
C18	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C19	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C20	CAP-10NF0603	10nF ceramic capacitor size 0603
C21	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C22	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C23	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C24	CAP-0.22UF0805	0.22uF 25V ceramic capacitor size 0805
C25	CAP-2.2UF0805	2.2uF 25V ceramic capacitor size 0805
C26	CAP-0.1UF0805	0.1uF 25V ceramic capacitor size 0805
C27	CAP-0.47UF0805	0.47uF 25V ceramic capacitor size 0805
C28	CAP-2.2UF0805	2.2uF 25V ceramic capacitor size 0805
C29	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C30	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C31	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C32	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C33	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C34	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C35	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C36	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C37	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C38	CAP-TAJD107K016R	AVX 100uF/16v Surface mount Tantalum. Farnell 197-348
C39	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603

C40	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C41	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C43	CAP-TAJD107K016R	AVX 100uF/16v Surface mount Tantalum. Farnell 197-348
C44	CAP-820PF0603	820pF ceramic capacitor size 0603

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
Revision No. 1.2		Page: 5 OF 7
Designation	Part No. (F=Farnell)	Description.
C45	CAP-820PF0603	820pF ceramic capacitor size 0603
C46	CAP-820PF0603	820pF ceramic capacitor size 0603
C47	CAP-820PF0603	820pF ceramic capacitor size 0603
C48	CAP-10NF0603	10nF ceramic capacitor size 0603
C49	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C50	CAP-33PF0603	33pF ceramic capacitor size 0603
C51	CAP-33PF0603	33pF ceramic capacitor size 0603
C52	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C53	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C54	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C55	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C56	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C57	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C58	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C59	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C60	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C61	CAP-10NF0603	10nF ceramic capacitor size 0603
C62	CAP-10NF0603	10nF ceramic capacitor size 0603
C63	CAP-10NF0603	10nF ceramic capacitor size 0603
C64	CAP-10NF0603	10nF ceramic capacitor size 0603
C66	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C67	CAP-2.2UF0805	2.2uF 25V ceramic capacitor size 0805
C68	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C69	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C70	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C71	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C72	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C73	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C74	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C75	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C76	CAP-2.2UF0805	2.2uF 25V ceramic capacitor size 0805
C77	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C78	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C79	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C80	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C81	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C83	CAP-22PF0603	22pF ceramic capacitor size 0603
C84	CAP-22PF0603	22pF ceramic capacitor size 0603
C85	CAP-0.1UF0805	0.1uF 25V ceramic capacitor size 0805
C86	CAP-2.2UF0805	2.2uF 25V ceramic capacitor size 0805
C87	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C88	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C89	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C90	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C91	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603

C92	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C93	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C94	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C95	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C96	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C97	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C98	CAP-0.1UF0805	0.1uF 25V ceramic capacitor size 0805
C99	CAP-EEVFK1C470UR	Panasonic 47uF electrolytic UWX5 package. Farnell 383-5856
C100	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C101	CAP-TAJD107K016R	AVX 100uF/16v Surface mount Tantalum. Farnell 197-348
C102	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C103	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C104	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C105	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C106	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C107	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
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Designation	Part No. (F=Farnell)	Description.
C108	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C109	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C110	CAP-10NF0603	10nF ceramic capacitor size 0603
C111	CAP-1UF0805	1uF 25V ceramic capacitor size 0805
C113	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C114	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C115	CAP-TPSC336K16R0300	AVX 33uF/16v surface mount Tantalum. Farnell 301-8544
C117	CAP-10UF1206	10uF 10V ceramic capacitor size 1206
C118	CAP-1UF0603	1uF 25V ceramic capacitor size 0805
C120	CAP-10NF0603	10nF ceramic capacitor size 0603
C121	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C122	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
C123	CAP-0.1UF0805	0.1uF 25V ceramic capacitor size 0805
C130	CAP-0.1UF0603	0.1uF 25V ceramic capacitor size 0603
D1	DIO-BAT54C	General purpose Dual Schottky diode, Common Cathode
D2	DIO-BAT54C	General purpose Dual Schottky diode, Common Cathode
D3	DIO-ZHCS1000	Zetex Schottky diode, SOT-23 package
D4	DIO-ZHCS1000	Zetex Schottky diode, SOT-23 package
D5	LED-L-934ND	Kingbright 3mm orange LED. Farnell 329-9478
D6	DIO-ZHCS1000	Zetex Schottky diode, SOT-23 package
D7	DIO-BAT54S	General purpose Dual Schottky diode in Series
D8	DIO-BAT54S	General purpose Dual Schottky diode in Series
D9	DIO-BAS21	General purpose diode
D10	DIO-BAS21	General purpose diode
D11	DIO-ZHCS1000	Zetex Schottky diode, SOT-23 package
D13	DIO-ZHCS1000	Zetex Schottky diode, SOT-23 package
D14	DIO-SMAJ12A	General Semiconductor TVS 12V protection diode, DO214 package
D15	DIO-BAS21	General purpose diode
D16	DIO-BAS21	General purpose diode
D17	DIO-BAS21	General purpose diode
L1	IND-NLC565050T-3R9K-PF	TDK 3.9uH inductor
L2	IND-NLC565050T-3R9K-PF	TDK 3.9uH inductor

L3	IND-B82462-G4103-M	Epcos 10uH Power Inductor, Farnell 7430027
L4	IND-LQH32CN100K33L	muRate 10uH inductor, 1210 package, Farnell 9522204
L5	IND-B82462-G4223-M	Epcos 22uH Power Inductor, Farnell 7430043
L6	IND-LQH32MN220J23L	muRate 22uH inductor, 1210 package, Farnell 9522069
L7	IND-LQH32CN100K33L	muRate 10uH inductor, 1210 package, Farnell 9522204
L8	IND-BLM41PG750SN1B	muRata inductor, 1806 package.
L9	IND-DO3340P-103ML	Coilcraft 10uH inductor
X1	XTL-14.745HC49/4H	14.745 MHz crystal, HC49/4H package
X2	XTL-32.768WATCH	Seiko C-001R 32.768 KHz crystal, WATCH package. Farnell 571672
X3	XTL-14.745HC49/4H	14.745 MHz crystal, HC49/4H package
X4	XTL-CS1012.000MABJTR	Citizen 12MHz surface mount crystal. Digi-Key 300-8089-1-ND
F1	FUS-MINISMD050-2	Tyco 0.5A surface mount Polyswitch. RS 136-864
F2	FUS-MF-SM150-2	Bourns Surface Mount 3 Amp Resettable Fuse
BAT1	SKT-B2B-PH-K-S	JST 2 way PCB socket
BAT2	BAT-CR2430PCB	Varta 260mA-hr PCB mounted coin cell battery. Farnell 425345
J1	CON-M20-9980706	Harwin 7x2-way 2.54mm pitch Header
J2	CON-CN06486	CPC DC Power Socket
J3	CON-MQ172X-4PA(55)	Hirose 4-way connector
J4	CON-MQ172X-4PA(55)	Hirose 4-way connector
J5	CON-MJ2135	3.5mm 4-pole Jack Socket (Farnell 5096297)
J6	Not Used	Printer Debug Port
J7	CON-FH12-22S-1SV(55)	Hirose 22way connector
J8	CON-FH12-50S-0.5SV(55)	Hirose 50way connector
J9	SPK-KDM-40016	Roxborough speaker
J10	CON-56579-0588	Molex USB Mini AB connector
J12	CON-52852-0470	Molex 4-way 1mm pitch FFC connector
J13	CON-RP34L5R-3PD(71)	Hirose 3-way connector
J14	CON-52852-0470	Molex 4-way 1mm pitch FFC connector
JP1	CON-M20-9990206	Harwin 2-way 2.54mm pitch Header (Farnell 511705)

Parts List For: MicroLab MK8

Drawing No.	085-00	Date 12/12/05
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Designation	Part No. (F=Farnell)	Description.
KEY0	SWT-TSS644R	Knitter-switch switch
KEY1	SWT-TSS644R	Knitter-switch switch
KEY3	SWT-TSS644R	Knitterswitch switch
VR1	POT-3150W203P	Tyco Electronics 20K surface mount pot. Farnell 4631869
	HEAT6900	Aavid Thermalloy heatsink TO220 type PF433 for U42.
	TX09D70Vm1CAA	Hitachi 1/4 VGA colour TFT display
	MIM-085-27	MicroLab - display holder
	MIM-085-11	PCB issue 1.0

MIM-039-18 TURBINE ASSEMBLY

	MIM-031-17	2 off moulded turbine inner swirl plate
	MIM-031-18	2 off moulded turbine outer swirl plate
	MIM-039-12	Transducer Body - Reduced Cone Diameter
	MIM-039-02	Mouthpiece holder
	MIM-039-14	Jewelled fixed bearing M3 thread
	MIM-039-16	Jewelled sprung bearing M3 thread
	MIM-039-17	27mm offset vane assembly

	MIM-039-15	27mm Pivot
	MIM-039-08	Flow deflector plate (039-08 iss 1.3)

BI-DIRECTIONAL TURBINE HOUSING MIM-101-00

CASE COMPONENTS

	MIM-085-18	MicroLab - top moulding
	MIM-085-19	MicroLab - bottom moulding
	MIM-085-20	MicroLab - paper cover
	MIM-085-21	MicroLab - display bezel
	MIM-085-22	MicroLab - right hand panel
	MIM-085-23	MicroLab - left hand panel
	MIM-085-24	2 off MicroLab - front feet
	MIM-085-25	2 off MicroLab - rear feet
	MIM-085-26	MicroLab - hinged foot
	MIM-085-28	MicroLab - paper feed key
	MIM-085-29	MicroLab - on/off key
	MIM-085-30	MicroLab - help key
	MIM-085-16	Serial Number label
	MIM-085-15	8.4 Volt 1.1A-hr NiMH battery pack
	MEC-Porti-M400	Woosim thermal printer mechanism
	SCW-W/3.0/8/PRST30/ZC1D	6 off TR fastenings, polymate 30 panhead screw, posidrive, 3x8mm zinc & clear finish
Alt. Part	SCW-202101412KB30086	6 off Harrison Silverdale, polypast 30 screw, panhead, posidrive 3x8mm zinc & clear finish

MIM-085-35 MOUSE ASSEMBLY

	SWT-13083	Mini optical USB/PS2 mouse available from PWM
	PLG-509-6212	Farnell 4 pole 3.5mm jack plug

SUNDRY ITEMS

	PSU-MW128RA1200F02	Ault universal 15 volt mains adapter supplied by Craftec
		USB lead
		Three pole mains cable for destination country

Technical Support

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Contact Micro Medical Ltd for the local agent in your region or country for local service:

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 MicroLab.
-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 MicroLab.
-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

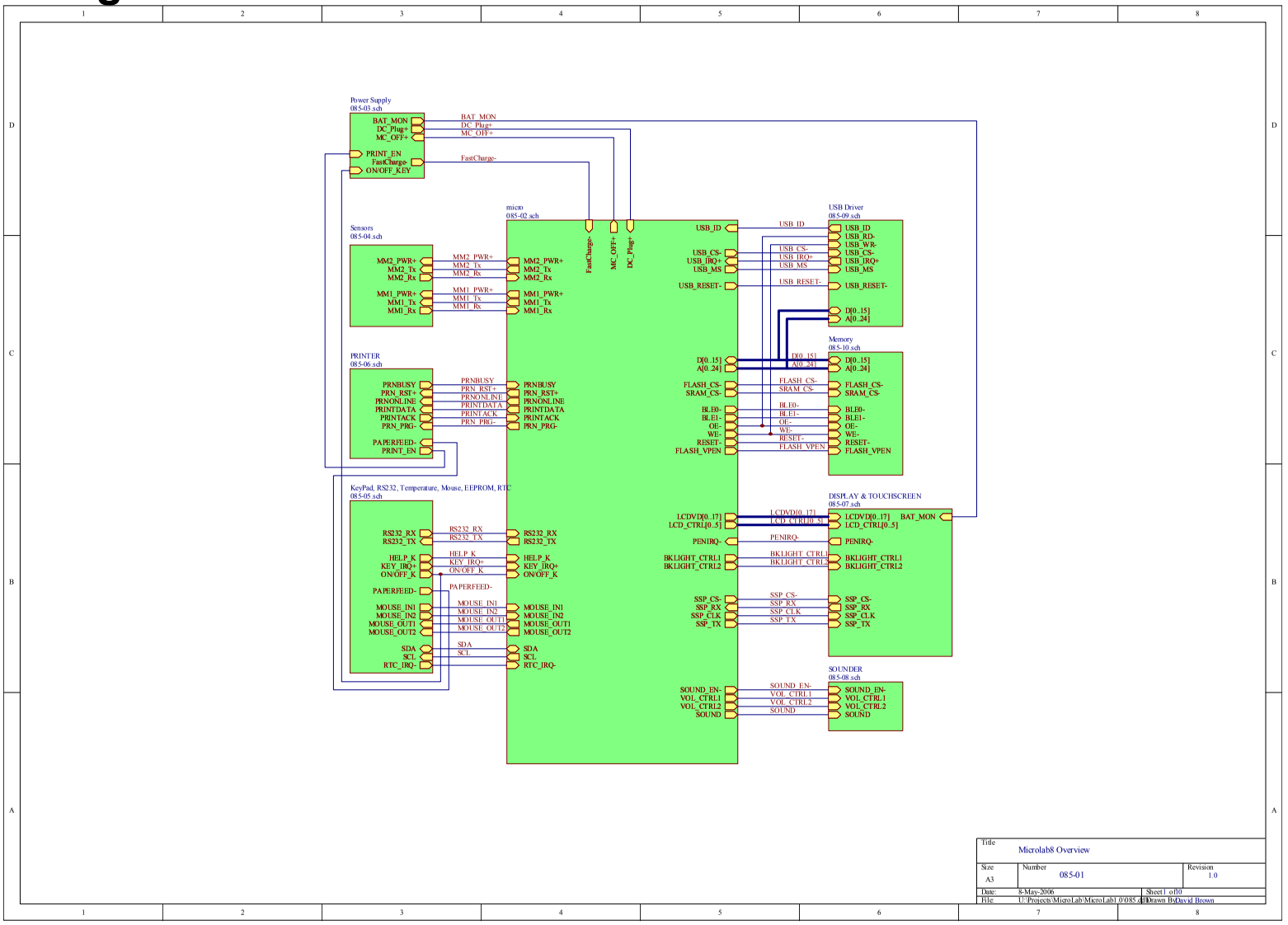
Spirometry

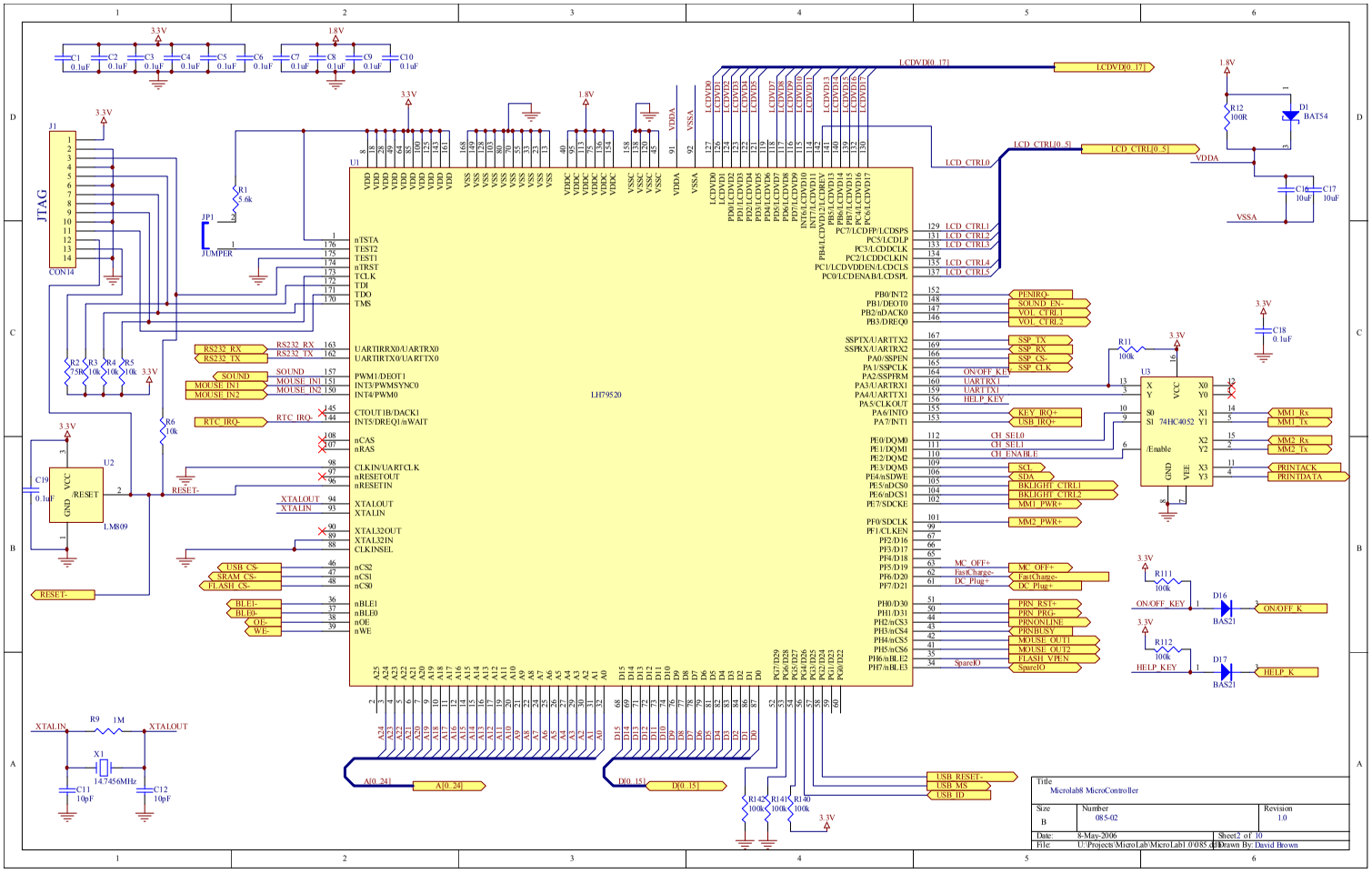
Measurements, (Forced)	VC, FEV.75, FEV1, FEV3, FEV6, FVC, PEF, FEV.75/VC, FEV.75/FVC, FEV1/VC, FEV1/FVC (FER), FEV3/VC, FEV3/FVC, FEV.75/FEV6, FEV1/FEV6, FEF25 (MEF75), FEF50 (MEF50), FEF75 (MEF25), FEF25-75 (MMEF), FEF50/VC, FEF50/FVC, MMEF/FVC (FEF25-75/FVC), FIV1, FIVC, PIF, FIV1/FIVC (FIR), FIF25 (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 Medical (External Printers)	For the latest listing of compatible Hewlett Packard printers visit Micro Website at www.micromedical.co.uk
Printer Output (internal Printer)	13mm/s (avg)
Power Supply	Input: 100-240V AC 50-60Hz Output: 12V 2.5A
Battery Pack	Rechargeable NiMH 8.4V 1Ah
Dimensions	25.5cm x 12cm x 3.5cm Transducer 50 x 60 x 90mm
Weight	Excluding any transducers : 630g
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	RS232 serial and USB 1.1

Circuit Diagrams

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JTAG
CON14
LM809
74HC4052
LCDVD[0..17]
LCD_CTRL[0..5]
A[0..24]
D[0..15]
Title
Microlab8 MicroController
Size
B
Number
085-02
Revision
1.0
Date:
8-May-2006
Sheet2 of 10
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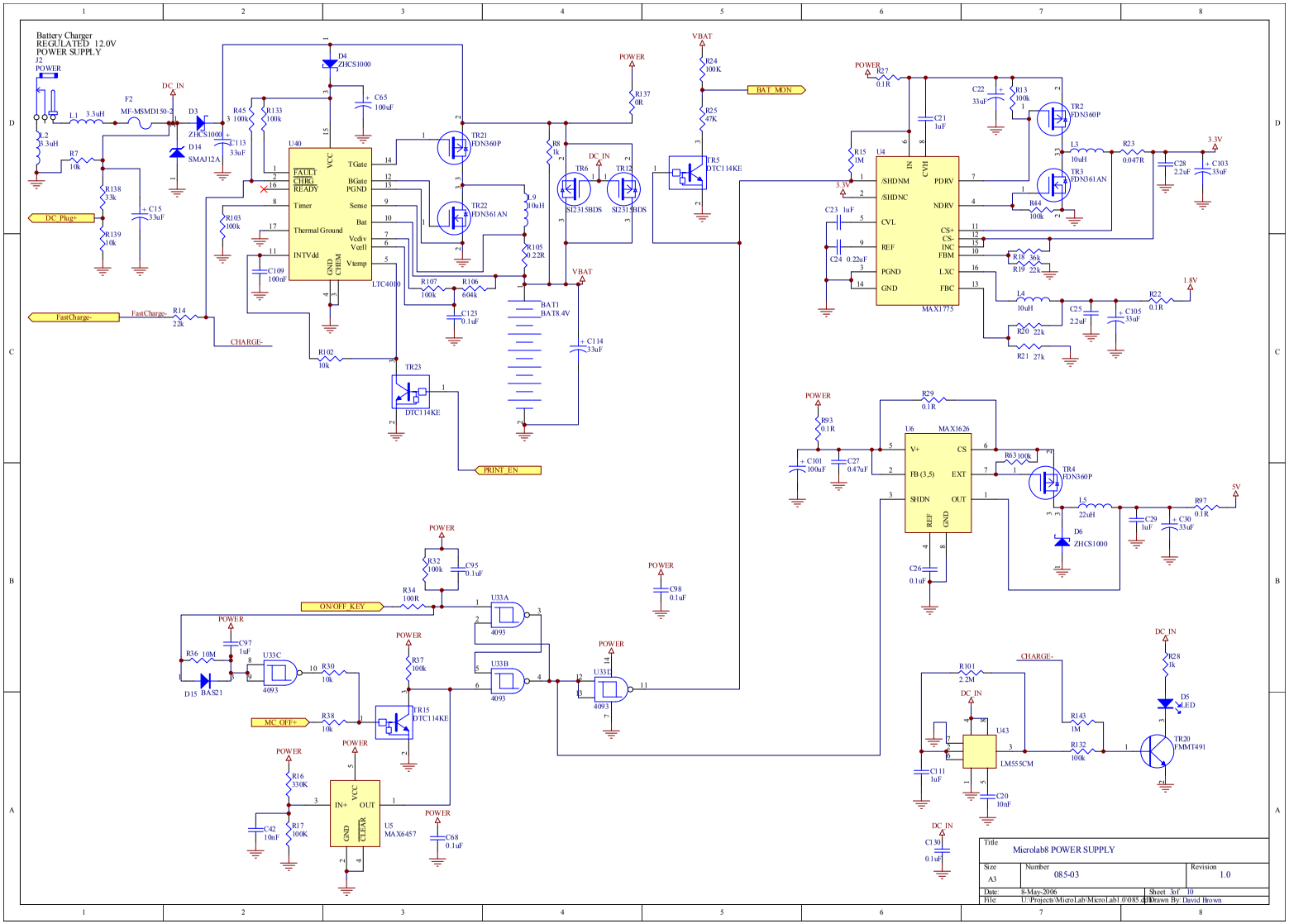
Drawn By:
David Brown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REGULATED 12.0V
POWER SUPPLY
Microlab8 POWER SUPPLY
Size A3
Number 085-03
Revision 1.0
Date: 8-May-2006
Sheet 3of 10
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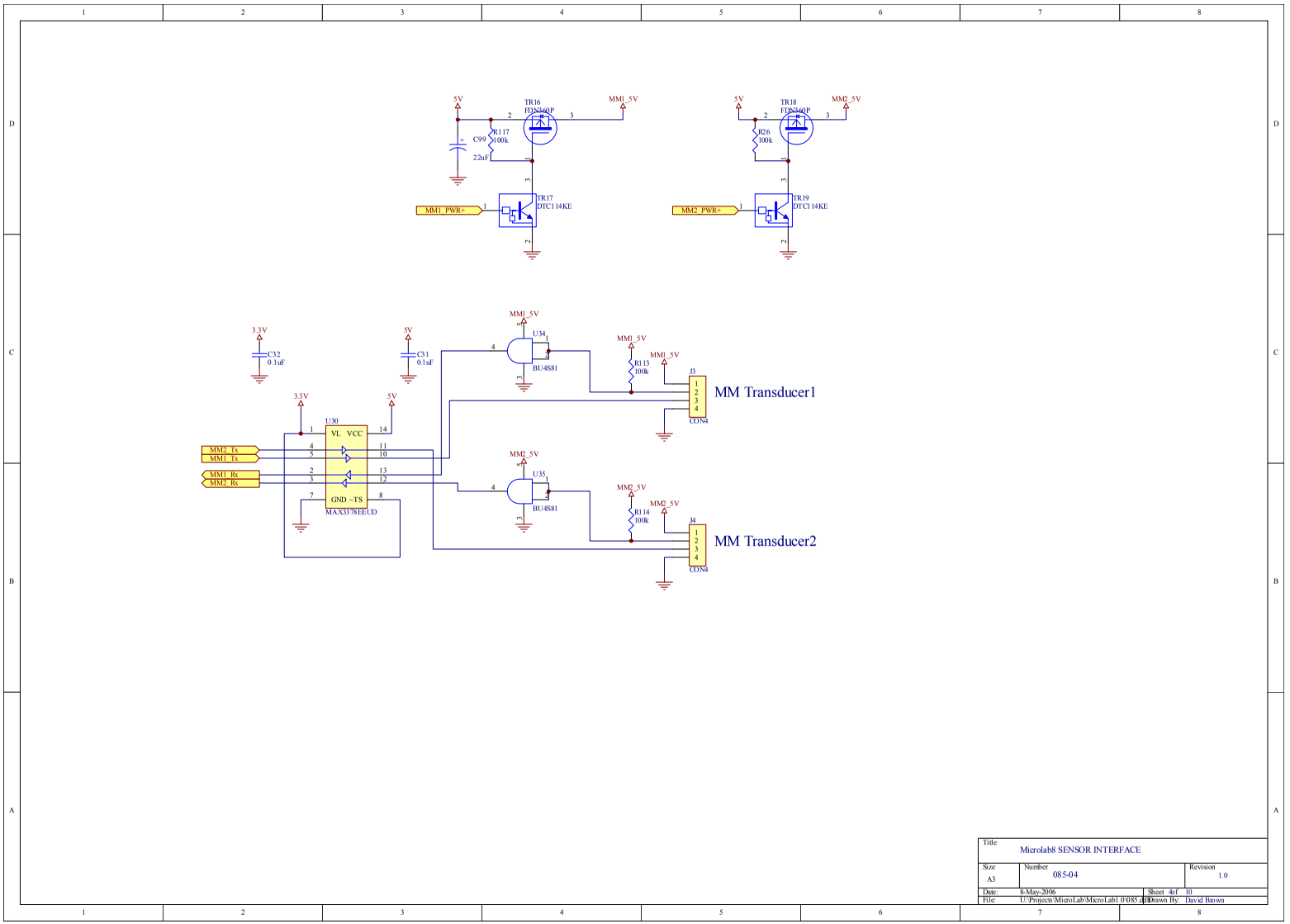
Drawn By: David Brown


5V
TR16
FDN340P
MM1_5V
R117
100k
C99
22uF
TR17
DTC114KE
MM1_PWR+
5V
TR18
FDN340P
MM2_5V
R26
100k
TR19
DTC114KE
MM2_PWR+
3.3V
C32
0.1uF
5V
C31
0.1uF
U30
VL
VCC
GND
TS
MAX3378EEUD
MM2_Tx
MM1_Tx
MM1_Rx
MM2_Rx
U34
BU4S81
U35
BU4S81
R113
100k
R114
100k
J3
J4
CON4
MM Transducer1
MM Transducer2
Title
Microlab8 SENSOR INTERFACE
Size
A3
Number
085-04
Revision
1.0
Date:
8-May-2006
Sheet 4of 10
File:
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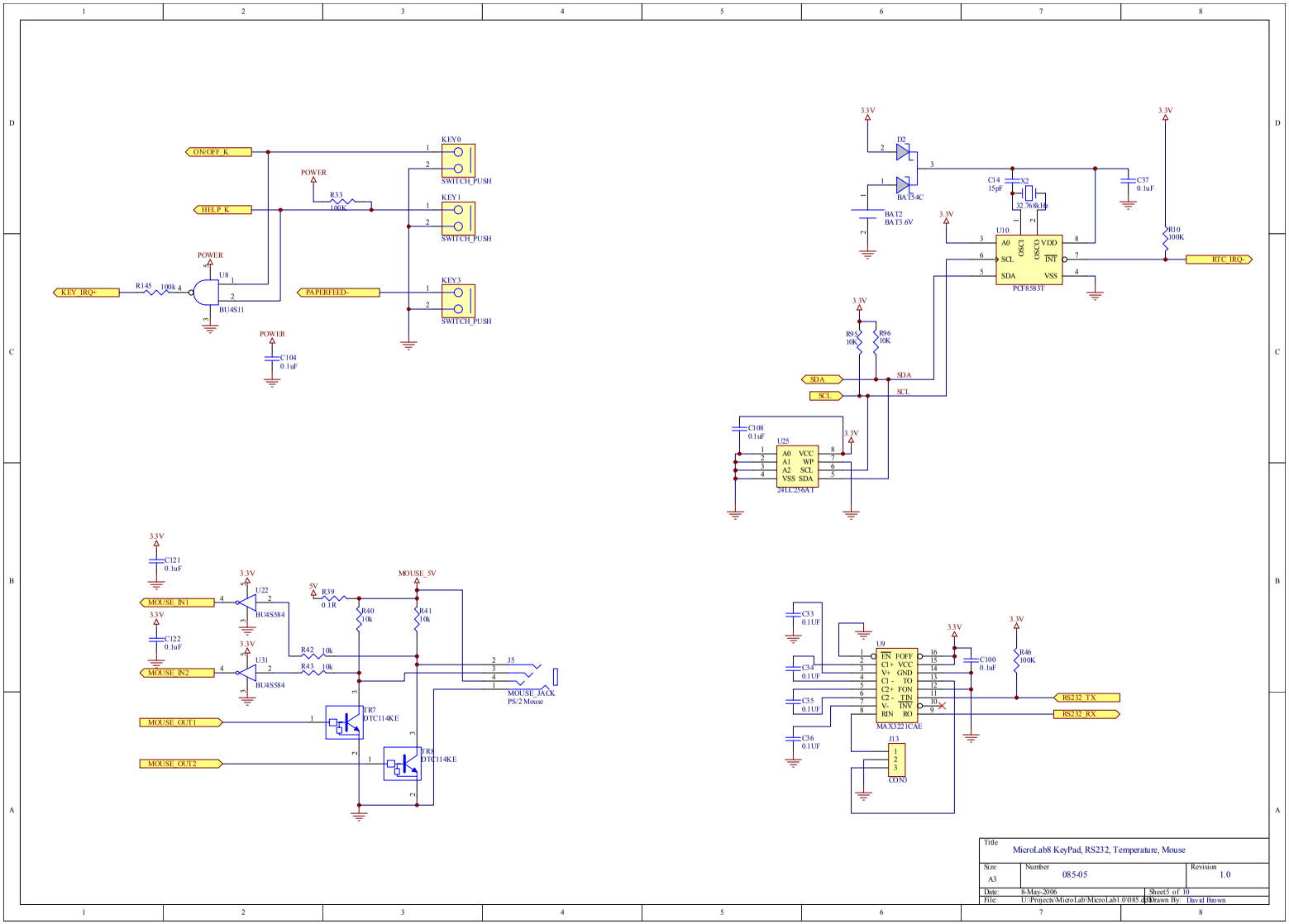
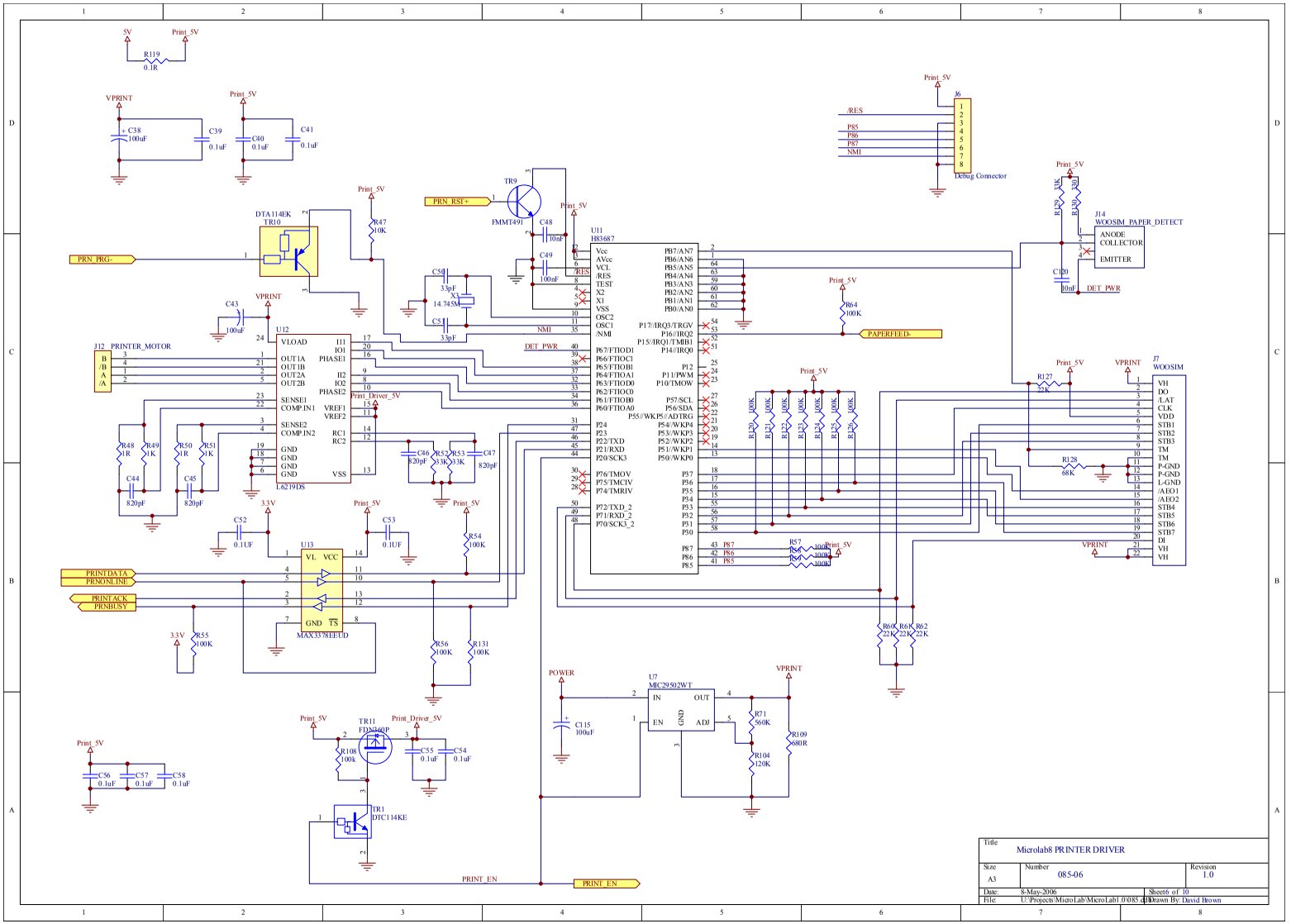
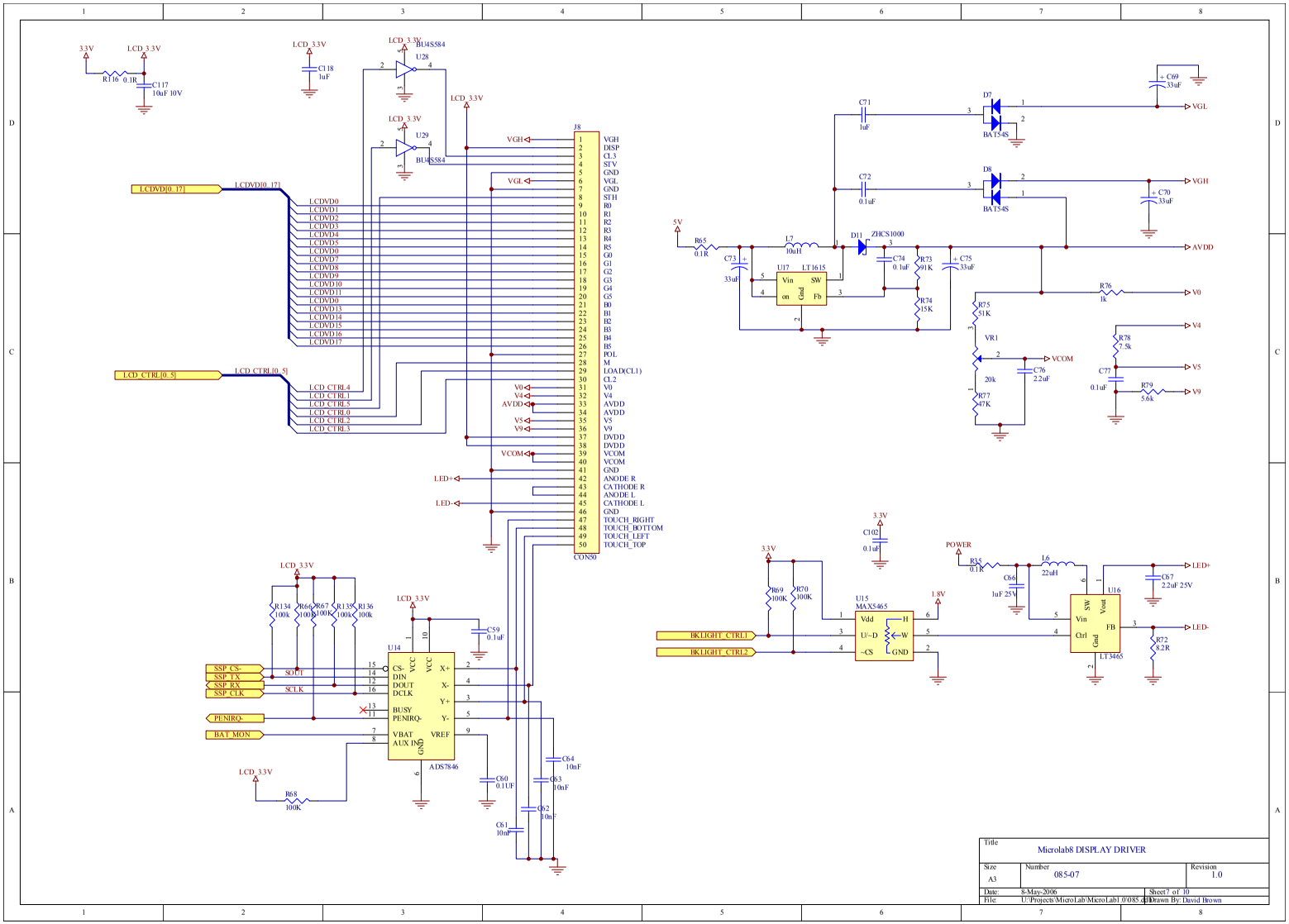
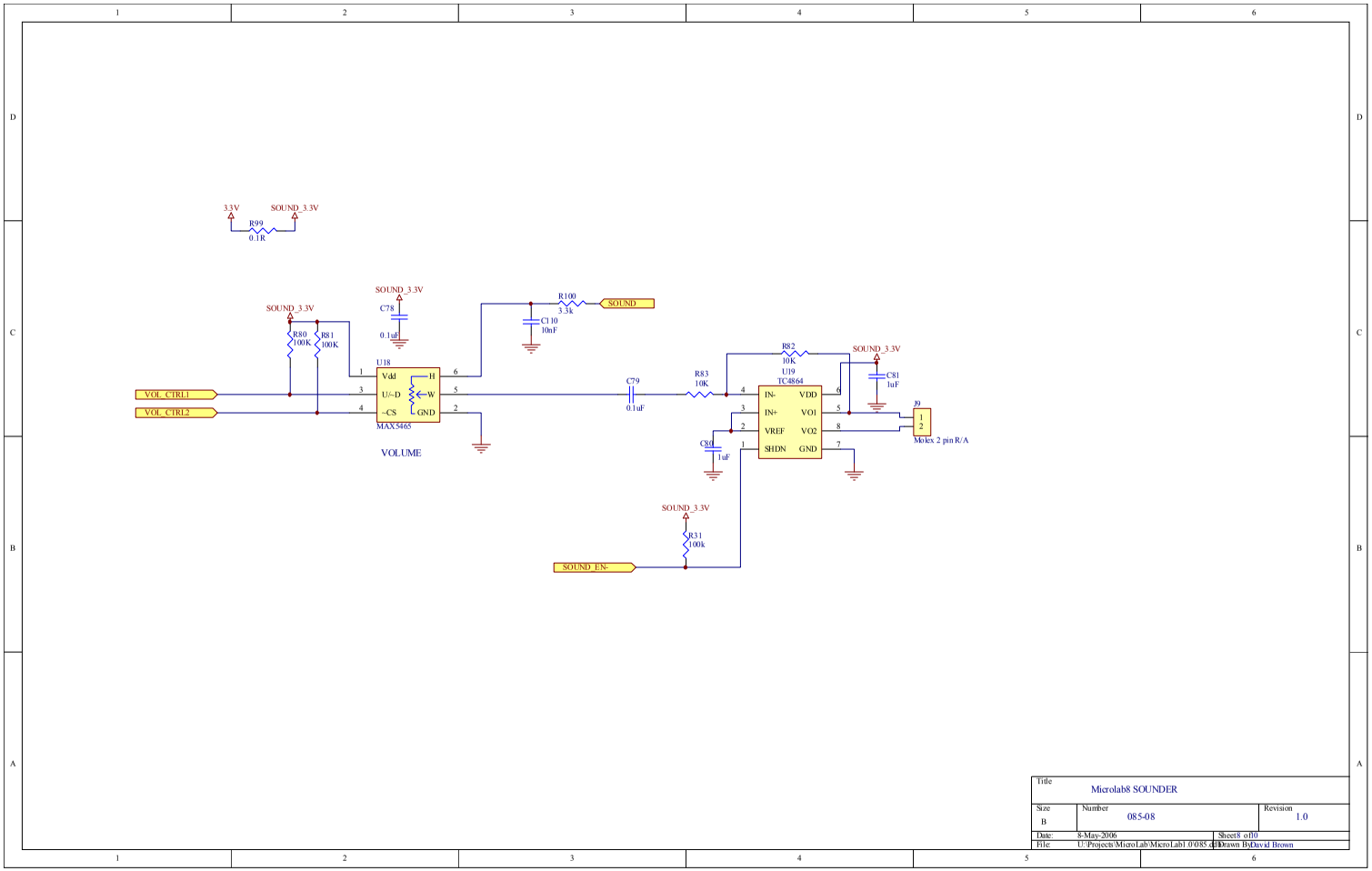
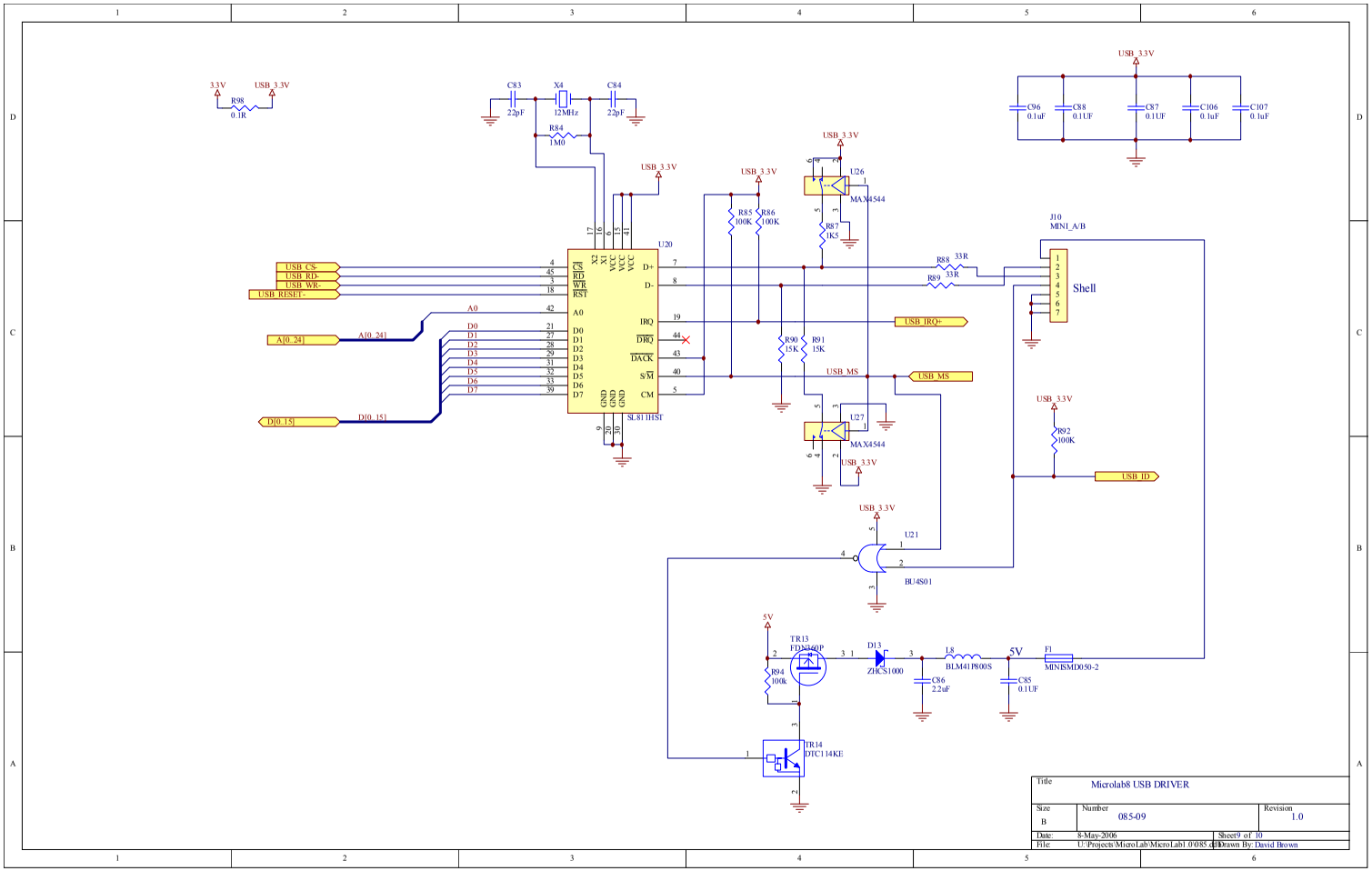
Drawn By:
David Brown

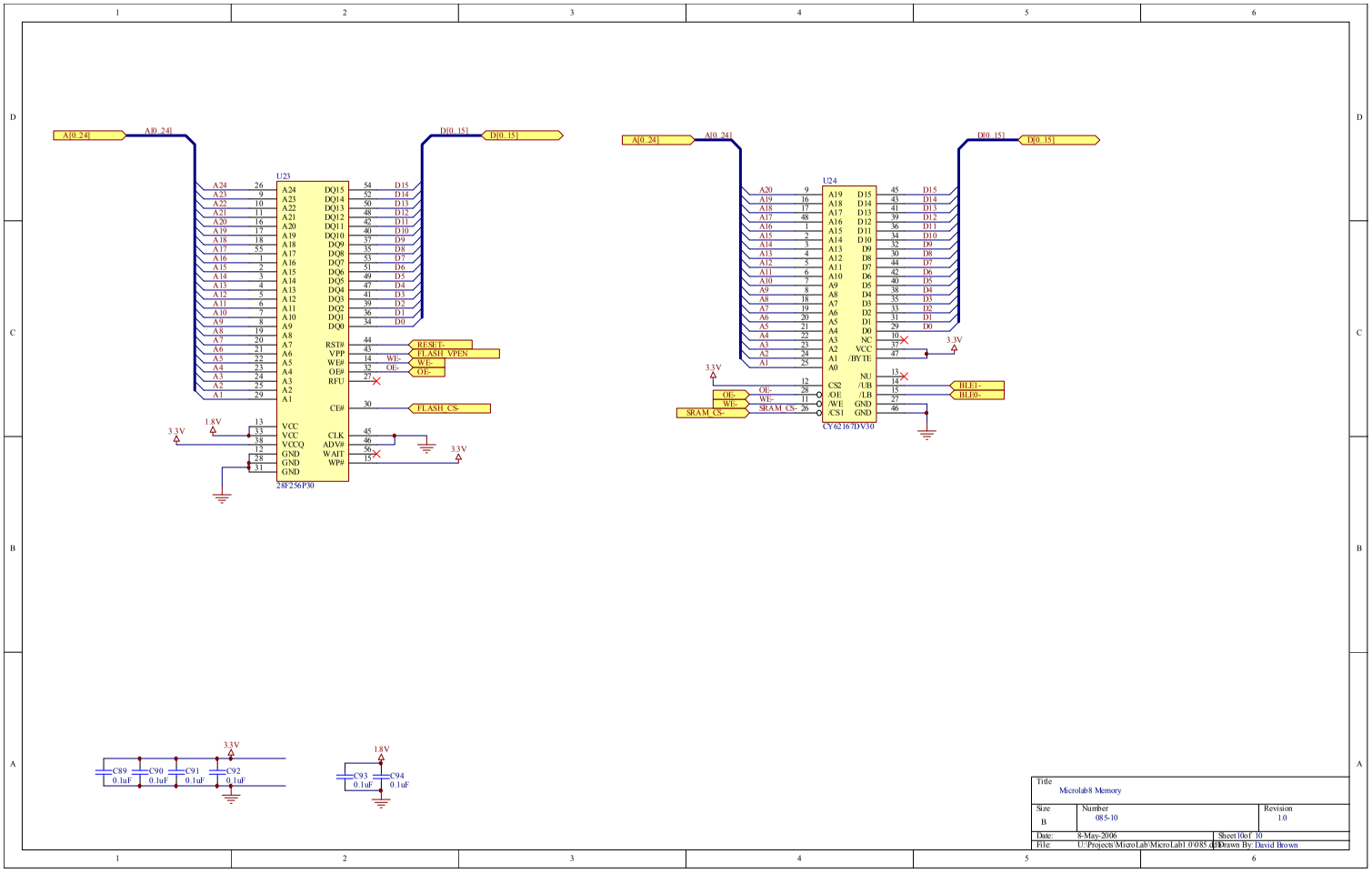

ON/OFF_K
HELP_K
KEY_IRQ+
PAPERFEED-
R145 100k
R33 100K
U8
BU4S11
KEY0
KEY1
KEY3
SWITCH_PUSH
POWER
C104 0.1uF
3.3V
D2
BAT54C
BAT2
BAT3.6V
C14 15pF
X2
32.768KHz
C37 0.1uF
U10
PCF8583T
R10 100K
RTC_IRQ-
R95 10K
R96 10K
SDA
SCL
C108 0.1uF
U25
24LC256AT
C121 0.1uF
C122 0.1uF
MOUSE_IN1
MOUSE_IN2
U22
U31
BU4S584
R39 0.1R
R40 10k
R41 10k
R42 10k
R43 10k
MOUSE_5V
5V
J5
MOUSE_JACK
PS/2 Mouse
MOUSE_OUT1
MOUSE_OUT2
TR7
TR8
DTC114KE
C33 0.1UF
C34 0.1UF
C35 0.1UF
C36 0.1UF
U9
MAX3221CAE
C100 0.1uF
R46 100K
RS232_TX
RS232_RX
J13
CON3
Title
MicroLab8 KeyPad, RS232, Temperature, Mouse
Size
A3
Number
085-05
Revision
1.0
Date:
8-May-2006
Sheet5 of 10
File:
U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By:
David Brown


Microlab8 PRINTER DRIVER
Size A3
Number 085-06
Revision 1.0
Date: 8-May-2006
Sheet6 of 10
File: U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By: David Brown
Debug Connector
WOOSIM_PAPER_DETECT
WOOSIM
PRINTER_MOTOR
L6219DS
MAX3378EEUD
MIC29502WT
FMMT491
DTA114EK
DTC114KE
FDN360P
PRN_RST+
PRN_PRG-
PAPERFEED-
PRINTDATA
PRNONLINE
PRINTACK
PRNBUSY
PRINT_EN
DET_PWR
Print_5V
Print_Driver_5V
VPRINT
3.3V
POWER


Microlab8 DISPLAY DRIVER
Size A3
Number 085-07
Revision 1.0
Date: 8-May-2006
Sheet 7 of 10
File: U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By: David Brown
J8
CON50
U14
ADS7846
U15
MAX5465
U16
LT3465
U17
LT1615
U28
U29
BU4S584
D7
D8
BAT54S
D11
ZHCS1000
VR1
20k
LCDVD[0..17]
LCD_CTRL[0..5]
SSP_CS-
SSP_TX
SSP_RX
SSP_CLK
SDOUT
SCLK
PENIRQ-
BAT_MON
BKLIGHT_CTRL1
BKLIGHT_CTRL2
POWER
3.3V
5V
LCD_3.3V
1.8V
VGH
VGL
AVDD
VCOM
V0
V4
V5
V9
LED+
LED-


3.3V
SOUND_3.3V
R99
0.1R
SOUND_3.3V
C78
0.1uF
R100
3.3k
SOUND
C110
10nF
SOUND_3.3V
R80
100K
R81
100K
U18
Vdd
U/~D
~CS
H
W
GND
MAX5465
VOLUME
VOL_CTRL1
VOL_CTRL2
C79
0.1uF
R83
10K
R82
10K
SOUND_3.3V
C81
1uF
U19
TC4864
IN-
IN+
VREF
SHDN
VDD
VO1
VO2
GND
J9
Molex 2 pin R/A
C80
1uF
SOUND_3.3V
R31
100k
SOUND_EN-
Title
Microlab8 SOUNDER
Size
B
Number
085-08
Revision
1.0
Date:
8-May-2006
Sheet8 of10
File:
U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By:
David Brown


3.3V
USB_3.3V
R98
0.1R
C83
22pF
X4
12MHz
C84
22pF
R84
1M0
C96
0.1uF
C88
0.1UF
C87
0.1UF
C106
0.1uF
C107
0.1uF
U20
SL811HST
USB_CS-
USB_RD-
USB_WR-
USB_RESET-
A[0..24]
D[0..15]
U26
MAX4544
R85
100K
R86
100K
R87
1K5
R88
33R
R89
33R
J10
MINI_A/B
Shell
USB_IRQ+
R90
15K
R91
15K
USB_MS
U27
MAX4544
R92
100K
USB_ID
U21
BU4S01
TR13
FDN340P
D13
ZHCS1000
L8
BLM41P800S
5V
F1
MINISMD050-2
C86
2.2uF
C85
0.1UF
R94
100k
TR14
DTC114KE
Title
Microlab8 USB DRIVER
Size
B
Number
085-09
Revision
1.0
Date:
8-May-2006
Sheet9 of 10
File:
U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By:
David Brown


A[0..24]
A[0..24]
D[0..15]
D[0..15]
U23
28F256P30
RESET-
FLASH_VPEN
WE-
OE-
FLASH_CS-
3.3V
1.8V
U24
CY62167DV30
SRAM_CS-
OE-
WE-
BLE1-
BLE0-
C89 0.1uF
C90 0.1uF
C91 0.1uF
C92 0.1uF
C93 0.1uF
C94 0.1uF
Title
Microlab8 Memory
Size
B
Number
085-10
Revision
1.0
Date:
8-May-2006
Sheet 10 of 10
File:
U:\Projects\MicroLab\MicroLab1.0\085.ddb
Drawn By:
David Brown