Ultrasound Technologies Ltd

fetatrack® 310

fetal monitoring system

Service Manual
Issue 2

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About This Manual

This booklet explains the operation and service of the *FETATRACK 310s2 Fetal Monitoring System*. Care has been taken during the design and manufacture of this product so that it satisfies all of the current safety standards set down by BS EN60601-1-2006.

To achieve the best from this product read the following sections several times and if you have any problems in the operation of a particular part of the product then contact your dealer immediately or contact :

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This service manual contains circuit descriptions, diagrams, parts and spares lists for the *FETATRACK 310s2*

To maintain the *FETATRACK 310s2*'s performance it is recommended that it be included in a periodic maintenance program. The user preventative maintenance program is covered in this manual. Maintenance outside the scope of the user should be undertaken on an annual basis by trained service personnel; full details are available from your supplier, service centre or from Ultrasound Technologies Ltd.

The FETATRACK 310s2 is supplied complete with the following: -

	310s2 basic	310s2 elite
Wide Angle Ultrasound Transducer US1	1	1
Wide Angle Ultrasound Transducer US2	Optional	Optional
Wide Angle Ultrasound Transducer US3	No	Optional
External Uterine Pressure Transducer	1	1
Event Marker	1	1
Input sockets	3	6
Elastic Belt	2	2 / 3 / 4
Chart Paper	1	1
Ultrasound Coupling Gel 0.25ltr	1	1
AC line cord	1	1
User Instructions	1	1

Special Precautions

Your *FETATRACK 310s2* has been designed for electrical safety. All the safety and operating instructions should be read before operating the *FETATRACK 310s2*. Failure to do so could result in injury to the user, patient, or damage to the system and accessories.

Electrical Shock Hazard

Do not defeat the grounding integrity of this system. Protection against electrical shock, in the event of failure of basic insulation, is provided by the connection of the chassis to the safety ground. Safety grounding occurs only when the 3-wire cable and plug provided with the system are connected to a properly grounded receptacle.

Do not remove the system cover. The system should be serviced by trained and qualified personnel only. Contacting the hazardous voltages within the system could cause serious injury.

Do not use the system if the power cord has any cuts or openings.

Do not use the transducer if the cable has any cuts or openings.

Do not use the transducer if the transducer face is cracked or chipped.

Do not immerse the transducer cable connectors in any liquids.

Should the electrical safety fuses have to be replaced, use only fuses of the same type and rating.

Explosion Hazard

Do not operate or use this system in the presence of flammable anesthetics, gases or oxygen rich environments as it could lead to explosion.

Handling the Delicate Transducers

The transducers are delicate parts of the ultrasound system and should be treated with care. The delicate crystals in the transducer may crack and render the transducer unusable if the transducer is subject to shock. Room temperature liquids should be used for cleaning.

NEVER use alcohol or mineral oil as an acoustic coupling agent as transducer face and cable damage will occur.

ONLY use approved ultrasound coupling gels.

Symbols Used

The following symbols are used on the *FETATRACK 310s2* and are in accordance with BS EN60601-1-2006.
Where they are associated with the connection of external equipment, that equipment **must meet** the relevant safety standards in all cases.

Alternating current
Associated with power on indicator

Type B Equipment
Unit classification

Off (power: disconnection from the mains)

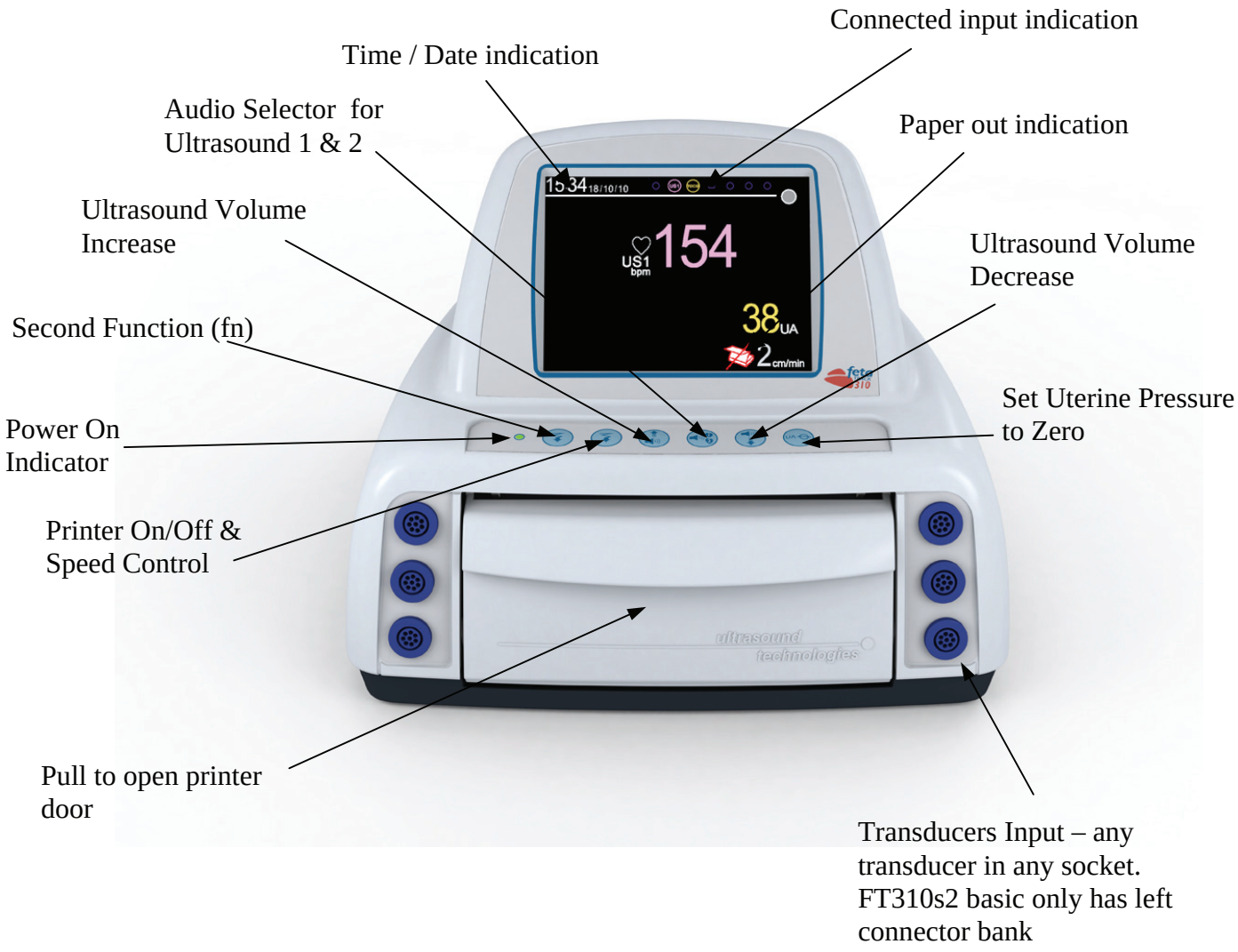
On (power: connection to the mains)

Attention, consult accompanying documents.
Associated with auxiliary connections see operating instructions.

This symbol on the product or on its packaging indicates that this product must not be disposed of with your normal waste.

FETATRACK 310s2 Front Panel Controls

The front panel control area contains 6 buttons used to control the operation of the unit, they are all indicated by icons to aid language variations.



Fn

Allows access to secont function keys
.

Recorder On/Off and Speed Change

This button is used to control the operation of the recorder. Press once and the chart recorder will start, each consecutive short press will change the speed . Pressing and holding the button down will stop the recording.

Volume Up

This button is used to increase the audio volume level, or in configuration mode to change user options.

Volume Down

This button is used to decrease the audio volume level, or in configuration mode to change user operations.

US1 / US1 Transducer Select in Twins / Triplets mode

Pressing this button changes the selected probe from US1 to US2 to US3 for volume output. This is used when the unit is in twins or triplets mode with two or three US channels for listening to either of the fetuses.

Toco Zero

This button zeros the Toco trace to the selected baseline.

Second Function Keys (fn)

FT310 basic

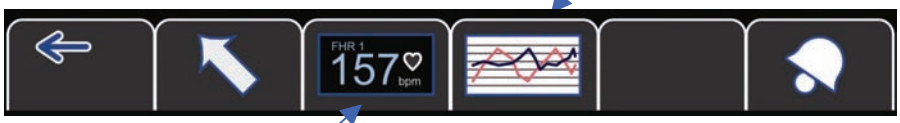
Return from function

Operator event indication, prints mark on paper.

Alarm Status

FT310 elite

Normal trace mode (plain paper mode only)



Change to numeric mode

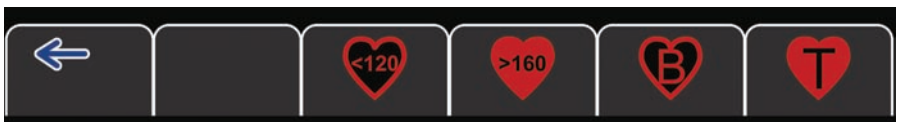
Split trace mode (plain paper mode only)

Change to trace mode display (2 HR channels only)

Alarm options

Select Alarm Modes

Low High Bradycardia Tachycardia



Inputs / Outputs and Displays

'Power On' Indication

The green LED associated with the above symbol indicates that power is connected to the apparatus when illuminated.

RS232 Output

This output is for the connection of an external computer for data transfer. The maximum voltage that can be applied to this output is 15VDC.

WARNING: Any external equipment connected to this output must meet the equivalent **MEDICAL** safety standard to this product.
Connection must only be made by a qualified technician.
An isolation connection may be necessary when connection is to be made to a personal computer.

Transducer Inputs

This is for the connection of Fetatrack 310s2 transducers ONLY, all transducers (and the event marker) can be connected to ANY socket and the unit will automatically identify the transducer used.. The maximum voltage that can be applied to this output is 15VDC.

Operating the *FETATRACK 310s2*

In this section, information is supplied which will help you use the *FETATRACK 310s2* for the fist time.

User Configuration

Firstly connect the *AC supply cord.*

It is necessary to set the operation of the *FETATRACK 310s2* to meet your requirements.

Before turning the *FETATRACK 310s2* on, press and hold down the *Fn* button. Then, whilst keeping the *Fn* button pressed down, turn the *FETATRACK 310s2* on by flicking the *AC input on/off* switch which is located on the rear of the unit as part of the *AC line input socket*. When the unit is on the front panel LED ∿ will be illuminated.

The *FETATRACK 310s2* starts and then enters its *User Configuration* Mode, release the Fn button as soon as '*Calibrate System'* screen is displayed .

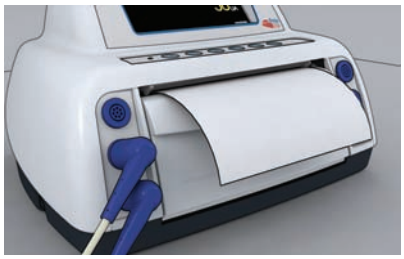
A red underline indicates the entry you can change by pressing the *Volume Up or Volume Down* button. One press changes the entry by one, pressing the button for longer changes the entry by 10.

When the correct date is displayed press the *Toco Zero* button once to advance to the next entry or the Fn key to move back a previous entry.

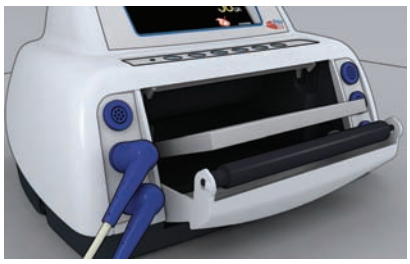
Ptrssing the *Toco Zero* button while over the EXIT enty on the screen saves the changes and returns to the normal operating system.

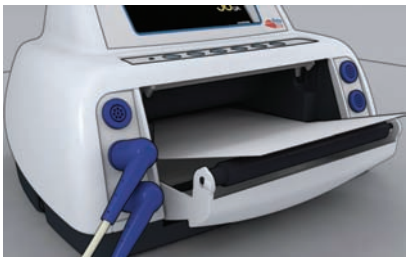
The Printer

The FETATRACK 310 prints on thermo-sensitive z-fold paper using a high resolution thermal matrix printer. The data is presented to the thermal printer digitally and therefore no calibration is necessary. Heart rate, uterine activity and fetal movement are recorded together with event marks, alarm indication, date, time, recorder speed, operating mode and alarm status.



To load the paper pack in the printer, open the printer door by pulling the door open, giving easy access for paper loading. Open two pages of paper from the beginning of the paper pack and with the thermal sensitive side uppermost and then place the pack in the bottom of the printer tray. Make sure that the paper is properly positioned; pull the free end of the pack over the roller and close the door with the paper coming out over the top edge of the printer door. The chart pack will self align once the recorder is running.





To operate the printer press the Printer On/Off switch on the front panel. The printer will start to run and the chart speed will be shown in the display. To turn the printer off press and hold the printer on/off switch until the printer stops. A few centimeters of paper will be fed out at high speed.

The FETATRACK 310 printer will record at 1, 2 or 3 cm/min. To change the speed during recording simply press the printer on/off switch momentarily. The FETATRACK 310 is set to run at the speed of your choice and will always start at this speed every time the printer is turned on. For details of how to change the default speed see the section entitled "SETTING UP THE FETATRACK 310".

A data block can be printed on the paper at the start of recording, this contains Patient Name, Gestational Age, Patient Number, Hospital / Doctor and Bed Number. The printed language and data entry can be changed in the "SETTING UP THE FETATRACK 310".

In the event that the paper pack is exhausted during recording the printer will automatically turn off. The display will indicate "Paper Out" and the unit will emit an audible bleep. Load a new paper pack as described above and close the recorder door.

To recommence recording press the printer on/off switch momentarily. The printer will print at high speed from its internal memory, the data gathered during the time taken to change the pack. In this way a complete recording may be obtained without any loss of information whilst the printer is reloaded. Once the memory printout is complete the printer will continue to record at the selected speed.

The printer may be turned off while the paper pack is changed if the printer on/off button is pressed and held before opening the printer door. In this case there is no automatic printout of data at the recommencement of recording.

Ultrasound Fetal Monitoring

The FETATRACK 310 ultrasound transducers are used to detect the fetal heart beat. The transducers are colour coded for ease of identification.

To monitor the first heart rate push the (pink) transducer plug firmly into the front panel socket of your choice and turn the FETATRACK 310 on. The second heart rate channel may be used simultaneously to monitor twins externally by connecting the second (blue) ultrasound transducer to any other socket.

Locate a clear fetal heart sound using a Doppler Fetal Heart Detector (FETATRACK 120 or similar). Secure the stretch belt in position, so that it passes over the transducer site and clamp in place. Apply a liberal amount of coupling gel to the transducer face and place the transducer, locating it approximately in the position determined by the Doppler detector. Ensure that the belt tension is sufficient to hold the transducer in good contact with the abdomen.

The heart rate processor will start to calculate heart rate within a few seconds and the heart rate can be observed on the digital display. Correct operation can be verified by observing that the heart shaped fetal pulse lamp is flashing at the heart rate.

The fetal pulse lamp is also used as a signal quality indicator. When positioning the transducer observe the shape, which should be solid under best signal conditions. If heart is hollow, this is an indication that the signal quality is not at its optimum. Improved recordings can be obtained by repositioning the transducer so that the heart flashes solid.

When the fetal pulse heart changes to hollow a black dot or line is marked on the recording for the time that signal quality remains low. No mark is made in the absence of signal, or when signal quality is adequate for correct positioning. Low signal quality is marked on the lower edge of the fetal heart rate scale for US1 and at the top edge of the scale for US2.

The audio volume can be increased or decreased by pressing the appropriate volume control button once a clear fetal heart signal has been located.

When monitoring twins it is possible to listen to either the US1 or US2 signal by pressing the Audio Selector Switch. The display will indicate the selected channel. Turn the printer on and observe that the digital display of fetal heart rate (FHR) and chart record are in agreement, taking into account that the recording is a few seconds behind the display.

Transducer position should be checked at least half-hourly during labour monitoring or prolonged NST. When repositioning the transducer, further coupling gel may be required. Since the transducer is free to slide on the belt, repositioning is easily achieved. When repositioning the transducers always ensure that the fetal pulse icon flashes solid to ensure good quality recordings and heart rate tracking.

Results will vary from one patient to another, but in all cases good transducer positioning is essential, and this may be aided by the use of a liberal amount of coupling gel. It is also important that the belts are correctly tensioned to maintain good contact with the abdomen.

With the fetus in the vertex presentation and the mother sitting or supine the clearest sound will normally be found on the midline below the umbilicus. In the lateral position clearer sounds may be found with the transducer displaced from the center line to the upper surface of the abdomen. The clearest signals in breach presentation may be located higher and to one side.

Transducer position which results in sounds with a strong placental or cord signal should be avoided, as these frequently render traces with artifacts.

It is important that a distinct fetal heart sound is present during monitoring for correct function of the FETATRACK 310. Any doubt about fetal viability should be checked by listening to the audible signal, or by an alternative diagnostic technique.

A simple check of the ultrasonic system can be made by holding the transducer against the palm of the hand and stroking the back of the hand at a fixed rate, say twice per second. A clear audible signal should be heard and the digital display should show a rate after approximately five seconds. With the printer running this rate will be recorded on the chart.

Uterine Activity Monitoring

The FETATRACK 310 External Uterine Pressure (tocodynamometer) transducer is used to monitor external uterine activity. The transducer is colour coded yellow for ease of identification. To monitor uterine activity plug the transducer into the input socket of your choice.

The FETATRACK 310 EUP transducer is sealed to prevent the ingress of fluids, nevertheless no coupling gel or other fluid should come into contact with the transducer face.

Place the transducer on the center line over the fundus in a position where the uterus is firm and secure in place with stretch belting. As with the ultrasound transducer the belt should first be secured in position and then the transducer slid onto it.

Once the transducer is in position, push the UA0 button on the front panel to zero the recording. The position of the zero baseline can be set to suit individual preference, see the section "SETTING UP THE FETATRACK 310".

Fetal Activity

Fetal activity may be recorded with the assistance of the patient. A hand-held Event Marker switch is provided for this purpose and this is plugged into any socket on the front of the FETATRACK 310. If the patient feels fetal movement she may press the switch and this will mark the paper with an arrow at the bottom edge of the FHR scale. Alternatively this marker may be used by the midwife to indicate any changes made during the procedure, such as repositioning of the transducers or movement of the patient.

The FETATRACK 310 also has ultrasound detected automatic movement identification. When set to active the low frequency movements of the fetus are detected, a movement event is printed on the paper using an arrow at the bottom edge of the FHR scale and a letter A to indicate automatic detection.

Alarms:

Facilities are provided for both low (B) and high (T) rate alarm settings. A master OFF can be set for both during initial set-up of the FETATRACK 310. Either alarm can be set on or off independently in this way.

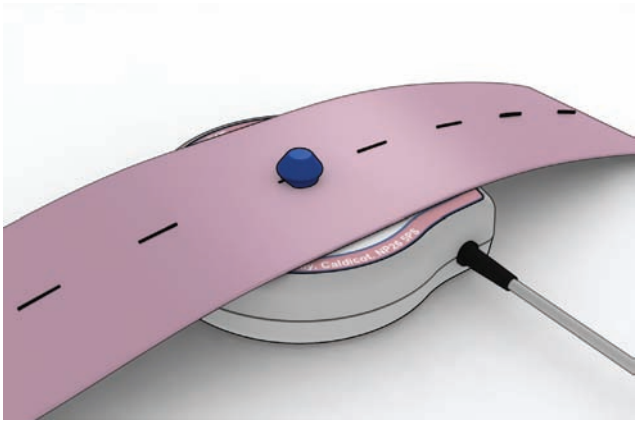
In normal operation if alarm levels have been set, then the alarm can be enabled or disabled by pressing the second function key followed by the key under the alarm icon on the screen. Alarm status is shown on the display for a few seconds. Alarm settings are printed between the chart scales on every page of the recording.

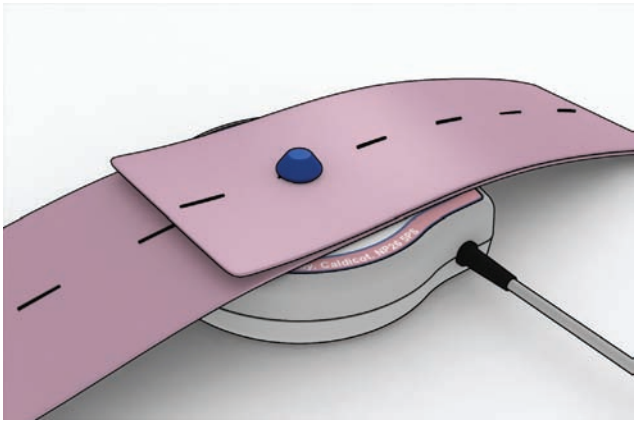
If an alarm condition arises the FETATRACK 310 emits an intermittent beep. The chart recording indicates an alarm state with a down arrow marked with an “A” on the top edge of the chart. Pressing either volume button resets the alarm.

A low heart rate alarm may be set between 90 and 120 BPM in steps of 5 BPM. A high heart rate alarm may be set between 160 and 190 BPM in steps of 5 BPM. For details of how to set the alarm levels, or to turn the alarms off, see the section "SETTING UP THE FETATRACK 310".

Transducer Belts

Both the ultrasound and contractions transducers are held in position with elastic belting which maintains the active elements in contact with the abdomen. The belts should first be placed around the patient and held in place at the correct tension with the plastic buttons on the rear of the transducers.





Interpretation

The following is intended only as a brief guide. For a fuller explanation of the interpretation of chart records, refer to suitable reference books.

During the antepartum period the Non Stress Test (NST) is an accurate means of predicting fetal well-being. The criteria proposed by Schifrin et al for the interpretation of the NST is summarised.

Reactive - accelerations of 15 BPM or more which last for 15 seconds or longer twice in any 10 minute period. These may be accompanied by fetal activity.

Non-reactive - evidence of fetal movement during a forty minute period, but without the reactivity indicated above.

Unsatisfactory - recording quality too poor to determine the above criteria. Stimulation of the fetus, or repositioning of the transducers may result in an improved recording.

Results from the NST may indicate the requirements to perform other diagnostic checks such as the Contractions Stress Test (CST).

The information in this section will help you to check and correct common operation and system problems. Refer to the troubleshooting hints which deal with your problem. Perform the suggested steps. If the problem is not solved, check once again to make sure that you have used all of the suggested steps to resolve the problem.

Electronic failures and service procedures are not included in this manual, as all servicing of the system must be performed by a qualified service technician. Valuable time however can be saved by documenting the problem .

In general, when you have a problem, check your control settings to be sure that they are in proper operating position. Consult the appropriate section in this manual for specific information on particular controls or operating modes.

WARNING:

Disconnect system from the power source before checking fuses and connections.

Check all connections and fuses. Replace fuses with same type and rating as indicated on the rear panel of the unit.

No display information on LCD

- Verify the system is on and that the fuses are intact.:

Keyboard does not respond

- Reset system by turning off then back on.
- Verify the system is on and that the fuses are intact.

No sound from loudspeaker.

- Verify the system is on and that the fuses are intact.
- Check volume control is set high.
- Check that the correct transducer has been selected.
- Check connection of the transducer.

No FHR information on display or FH trace printed on recorder.

- Check that the correct transducer has been selected and connected to the patient.
- Check connection of the transducer.
- Check for audio FH complex and reposition transducer until clearly heard.

No chart printed .

- Verify the system is on and that the fuses are intact.
- Check that the recorder is turned on.
- Check paper is inserted into the recorder correctly.
- Check recorder door is correctly closed
- Check that paper moves out of the recorder at the correct rate.

USER Tasks

The following are the user preventative maintenance tasks. It is recommended that these be performed on a regular basis at a frequency determined by the usage of the equipment, but not less than once every month.

WARNING:

Before undertaking any of these tasks disconnect the unit from the mains.

General

Check all cables, connectors and transducers for damage and repair or replace where necessary. The repair may involve your local service centre, supplier or Ultrasound Technologies Ltd. For advise on any damaged part contact them immediately.

Cleaning - Enclosure

Clean the exterior of the system with a soft dry cloth. In the event of stubborn spots, disconnect the system from the power source. Use a soft cloth that has been dampened - not soaked - in a mild detergent solution. Be sure to keep excess moisture from entering the cabinet via any openings that may be present.

Cleaning - Transducers

Use a cloth dampened in a mild detergent solution to clean the transducer and cable. Remove all traces of the detergent by wiping with a cloth dampened in clear water. Never soak the transducer cable or connector.

WARNING:

Transducers must never be exposed to gas or heat sterilization or be left immersed in any liquid for more that a few seconds.

Service Tasks

The following are the Service preventative maintenance tasks. It is recommended that these be performed on a regular basis at a frequency determined by the usage of the equipment, but not less than once every year.

Perform all tasks as described in the USER tasks as well as:-

Printing System

Clean the system printhead. Open the printer door and remove the chart paper pack. Using a cotton bud soaked in an alcohol based cleaning liguid (eg methalated sprits) wipe the underside of the printhead, over the entire length cobering the area from the front of the printhead to 5mm in from the pfront. This removes any build up of thermal ink that remains on the head after use and can cause printing issues.

Performance Checks.

Perform the checks detailed in the Performance checks section of this manual.

Size:	290 x 260 x 220 mm
Weight:	4 kg
Voltage:	100-130 VAC or 200-260 VAC 46/64 Hz
Power:	30VA
Safety:	Complies with EN60101-1 Class 1 Type B

ULTRASOUND

Type:	Continuous Doppler
Transducer:	Multi element wide angle
Operating Frequency	1.5MHz±2% or 1.6MHz±2% and 1.8MHz ±2%
Power Output	5 mW/sq cm max. SATA
Audio:	Response 300 to 1KHz at 8W
Signal Processing	Software AUTOCORRELATOR
Range:	30 to 250 bpm

ALARMS

Low Level:	90 - 120 BPM, Adjustable in steps of 5 BPM
Process:	Bradycardia algorithm or level sense
High Level:	160 - 190 BPM, Adjustable in steps of 5 BPM
Process:	Tachycardia algorithm or level sense
Paper Out:	Last paper sheet taken

EXTERNAL UTERINE ACTIVITY

Type:	Differential external pressure transducer
Response:	0 to 5Hz
Signal Range:	0 - 110 relative contractions strength

EVENT MARKER

Hand held:	User operated
Automatic:	Ultrasound Transducer detected

PRINTER

Type:	Thermal Array 8 dots/mm
Print Speed:	1,2 and 3 cm/min
Print Speed Accuracy	Better than 1%
Paper Size:	145 mm x 15 mtr
FHR Sensitivity:	20 or 30 BPM/cm
UA Sensitivity:	30/cm

DISPLAY/PRINTER RANGES

FHR Range:	30 - 240 BPM
FHR Accuracy:	+/- 1 BPM
UA Range:	0 - 110 units

DISPLAY

Display Type	Full Colour Graphic Back Lit LCD
Display Size	115 x 86 mm
Display Data Numeric	FHR, UA, Print Speed
Display Data graphical	FHR, UA

ENCLOSURE

Material	Plastic PCABS

ENVIRONMENTAL

Working temperature	+10°C to +40°C
Relative humidity	30% to 75%
Storage/Transport temperature	-10°C to +70°C

COMPUTER INTERFACE

Transfer	3 wire RS232
Data Rate	9600 baud
Data Standard	8 bits no parity 1 stop bit
Data Format	UltraTec Comms Standard

The following Consumables are available for use with the FETATRACK 310s2

Belt / Buckle set (10 belts / 2 Buckles per pack)
Chart pack (10 per pack))
Power Cord
Coupling gel (0.25ltr) (12 per box)

This Equipment complies with the essential requirements of the European Council Directive. 93/42/EEC

CE
0120

Guidelines for Identifying and resolving adverse EMC conditions

Emissions

Care has been taken through the design and manufacturing processes to minimise the EM emissions that may be produced by this equipment. However, in the unlikely event that the unit causes an EM disturbance to adjacent equipment, we suggest that the procedure is carried out 'out of range' of the affected equipment.

Immunity

If the user has any doubt regarding the unit's EM immunity during routine operation, we suggest that the source of EM disturbance is identified and its emissions reduced.

If the user has any doubt regarding the identification and resolution of adverse EM conditions, they may contact Ultrasound Technologies Ltd to seek advice

EMC Testing

During conformity testing the Fetatrack 310 was subjected to International Standard EMC tests. During the majority of these tests no non conformances were observed.

During EN60601-1-1:2001 testing the FetaTrack 310 was shown to be susceptible to the following tests.

Conductive disturbance induced by applied RF field	Test applied a 3Vrms RF magnetic field to transducer cables with a 2Hz modulation.	Effect was a displayed rate of 115 to 125 bpm at each harmonic and sub harmonic of the transducer frequency. No disturbance was detected at other frequencies	Applied test signal is very high for high sensitivity electronics and non applied transducers. With correctly applied transducers interference from in band RF signals is unlikely.
Radiated RF	Test applied: 3V/m 80Mz to 2.5GHz	Effect was a disturbance to the UA transducer causing a static UA reading of up to 9 units	Normal operation is unaffected and the static reading can be cancelled by pressing the toco zero button
Electrical fast transients and bursts	Test applied: +/-2KV AC power, +/-1KV Signal Cables	Effect was a FHR reading of 198 BPM .	Normal mains power is unlikely to cause such a transient / burst. Displayed rate is unlikely to occur when transducers are connected to a patient.
Electro Static Discharge	Test applied: +/-2KV, +/-4Kv, +/-8KV Air Discharge, +/-2KV, +/-4KV, +/-6KV Contact Discharge. Repetition Rate 1second	Effect was a FHR reading of 58 BPM .	Unit should be used in a low static environment. Displayed rate is unlikely to occur when transducers are connected to a patient.
Surge	Test applied: +/-0.5KV, +/-1KV, +/-2KV AC power line to ground, +/-0.5KV, +/-1KV, +/-6KV AC power line to line	Effect was a FHR reading of 58 BPM .	Normal mains power is unlikely to cause such a surge. Displayed rate is unlikely to occur when transducers are connected to a patient.

Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)

There is an increasing interest in the proper disposal of used electronic equipment. The European Union (EU) has developed the WEEE (Waste Electrical and Electronic Equipment) Directive to ensure that systems for collection, treatment and recycling of electronic waste will be in place throughout the European Union.

Ultrasound Technologies Position with regard to the WEEE Directive

Product recycling is nothing new and Ultrasound Technologies have implemented processes in each member state where the company has a presence. Ultrasound Technologies will comply with the provisions of the WEEE Directive and national implementing legislation.

Instructions for Disposal of Waste Equipment by Users in Private Households

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local waste disposal authority, your household waste disposal service or the supplier where you purchased the product.

As a producer of electronic devices, Ultrasound Technologies will provide for the financing of the treatment and recycling of waste returned through these designated collection points in accordance with local requirements.

Instructions for Disposal of Waste Equipment by Commercial Users

For users of Ultrasound Technologies equipment, other than private households, Ultrasound Technologies will provide free recycling of equivalent medical electronic equipment once a customer has returned the equipment to Ultrasound Technologies, with all transport and importation costs paid, and where a replacement product is being supplied by Ultrasound Technologies. Where a replacement product is not being supplied, recycling services may be provided on request at additional cost.

RoHS

The RoHS (Restriction of Hazardous Substances) directive (2002/95/EC), compliments the WEEE Directive by banning the presence of specific hazardous substances in the products at the point of manufacture.

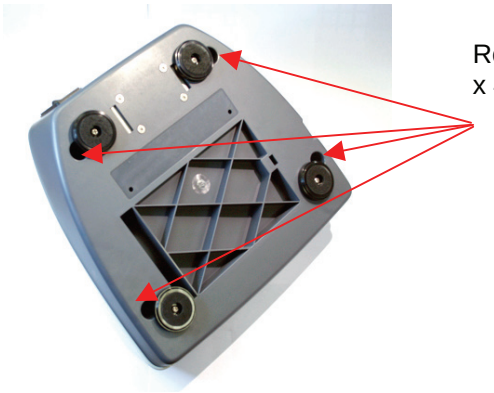
Ultrasound Technologies is a manufacturer of Medical Devices and is currently exempt from this directive.

However at Ultrasound Technologies we take our responsibilities to the environment very seriously and currently 100% of our entire manufacturing process and parts meet the RoHS directive and we are therefore fully compliant..

Dismantling Procedure

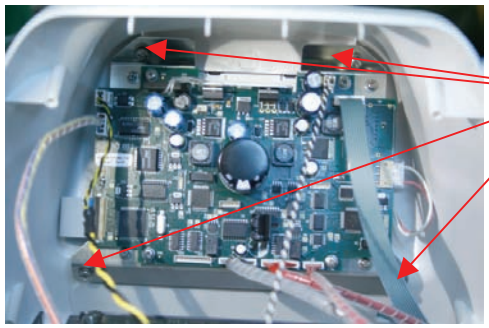
Note: Before disassembling the unit, unplug the transducers, accessories cable (if present), and the power cord from the instrument.

To remove the Top Cover, remove the four screws around the edge on the bottom of the unit and carefully lift the lid upwards. The Top Cover can now be removed taking care to disconnect the earth bonding cable connecting the lid to the base, and carefully disconnecting the front panel pcb interface cables.



Remove recessed screws x 4

The control PCB can be removed from the lid by careful removal of the 4 screws holding the parts in place.



Remove large screws x 4

Internal Layout

With the top cover removed and the front panel facing you, there is one large printed circuit board fixed to the back of the display of the monitor this contains all the power supply circuits, all the control circuits..

In addition, there is the serial interface and paper out detection board mounted in the base of the unit.

Technical Descriptions

The following sections provides a technical explanation of each of the sections within the Fetatrack 310s2 and its accompanying transducers.: -

(the following descriptions and circuit references refer to the FT310s2 "Recorder and Transducer interface circuits", "Display interface processor" and " power suppler and audio circuits" circuits)

Power Supply Circuit

The 240/110 VAC supply enters the Fetatrack 310s2 via an IEC double fused inlet / mains filter and switch and is fed to a torridal transformer. The input supply voltage is stepped down to a nominal 24 VAC and is then bridge rectified by D4, smoothed by C82.

Regulated Supplies

The voltage regulators (U25 and U26) are fed from D4 at a voltage of around 36VDC. These oscillate at approximately 120 KHz transferring pulses of current into L6 and L7 respectively. The output of inductor is fed back directly into U25 (26) which at pin 1 is reference comparator and alters the pulses transferred into the inductor to obtain a stable voltage output. The output of U25 is 5V DC and U26 is 12V DC. Pulses of current in to inductor L7 are also taken into a charge pump to provide a stable –12V DC after regulator transistor Q14. D19 also supplies current to the printhead and motor drive circuits via Q4 and U27 which provides a stable 24V DC.

Print-head and Motor Drive Supply

The printhead requires pulses of current equaling 10A but for a very small amount of time, therefore current is taken from the charge built up in C3 rather than expecting the power supply to supply the pulses. Q3 is connected as an ON/OFF switch to the printhead voltage circuits to act as protection. An explanation of its operation can be found in section PRINTER INTERFACE. When ON, current is fed to U27 connected as a variable voltage regulator with a range of +18 v to +24 v where VR2 adjusts this voltage.

Display module Microcontroller Circuit

The microcontroller circuit is arranged around a coldfire MCF5212 (U16) a fast RISC processing unit (CPU). When power is applied to the circuit a monitor circuit waits for the power rail to become stable and then 100 ms later takes the reset on the CPU high (logic 1) to 3.3 v. This starts the CPU working by reading the bytes at the very top of its memory map from the internal FLASH (ROM). This shows the CPU the start position in ROM from which to start executing. This sets up all the peripheral devices, which includes an interrupt timer, system clock and internal system watchdog. As all functions are time dependant nothing starts without this clock. The CPU now enables the display processor (U18) resets the colour LCD display and starts to display data. System presets are sent to the Display CPU (U16) by a interprocessor bus connecting to the Recorder CPU (U9).

After the CPU has loaded the variables it rums a system check for any internal problems if all is OK it enables the Print System interface that is controlled by the Recorder CPU (U9).

The display module controller also communicates, via RS485, to all the transducers on 2 serial bus interfaces via U19 and U20.

Power rails for the display module are produced by regulators U13 (1V2) and U15 (3V3) with the backlight current limited to 84mA via U14.

The power for the CPU is supplied by regulator U10 (3V3 shown as Vcc) which is shared between both CPU's.

Recorder Module Microcontroller Circuit

The microcontroller circuit is arranged around a coldfire MCF5212 (U9) and operates in an identical manner to U16.

U16 passes data from the serial probe interfaces to the Recorder microcontroller (U9) via the interprocessor serial bus. In return U9 returns keypress and event data, real time clock data and general status date over this bus to U16. The real time clock data is acquired by U9 via an SPI interface to a clock circuit U4 that is powered when the unit is off by B1 a Lithium Battery .

Printer Interface

A proportion of the micro-circuit is dedicated to printer interface and control, the primary interface circuit contains timers, serial drivers and peripheral drivers. The principal of operation of the print head and motor drive circuit is as follows:

Data is decoded by the software into bit positions within the allowable area of the print head. This data is then passed in serial form with a clock signal into the print head serial buffer. The data is latched by a pulse from the cpu via CMOS buffer, this gives added protection in the case of device failure. Data is then burnt onto the print head by strobes 1 to 4 from the cpu which last less than 1 mS .

Under normal conditions with the printer OFF, there is no supply connected to the print head or chart motor. Only when printing is requested does the cpu turn on the 24VDC supply.

The cpu also drives the chart recorder stepper motor via the high current micro-step interface.

Both the print motor and the printhead require 5V signals that are not available directly form the Microcontroller and there for an 8 bit parallel bus is formed via a level translation IC (U7), the 5V translated output is connected to the motor interface IC and to latches U5 and U6. Chip selection and serial data and clock fro the printhead is provided via U8.

The digital motor drive signals are decoded by U3 into 2 phase sinusoids and passed to the high current motor interface IC (U1) which controls the current into the motor to maintain a smooth movement.

Printhead latch and burn strobe data is latched into U5, as a precaution over processor failure the output of this latch is controlled by the display microcontroller.

Audio Interface

The printer microcontroller (U9) controls the audio channel selected from the probe inputs via U6. The display microcontroller supplies the display controller with active channel data and the user can then step though the device connected that supply audio to the monitor. Select lines from U6 connect to U21, U22 and U23 to route the differential audio signal from the probes to U24 a differential to signal ended audio converter. This signal is then filtered by U28 before passing to U29 and audio power amplifier and on towards the loudspeaker at J15.

(the following descriptions and circuit references refer to the FT310s2 " Integrated Ultrasound Transducer" circuits)

Integrated Ultrasound Circuit

The ultrasound circuit is built up of five discrete sections.

- Oscillator and Transmitter amplifier
- Receiver and Detector
- Audio amplifier
- Signal pre-processing.
- Microcontroller

These operate to produce a continuous wave of approximately 1.5MHz, which is passed to the transmitter crystal in the transducer. The signal is then reflected from moving interfaces within the body to the receiver crystal in the transducer, amplified and then detected so the audio Doppler shift of that moving interface can be heard audibly or passed via signal pre-processing to the A/D converter for rate calculation.

Oscillator and Transmitter output.

L4 forms an oscillator with Q5 and its associated capacitors producing a sine wave drive at the required frequency. This is fed via a high current output driver Q1 and tuned output transformer L1.

Receiver and Detector

The reflected Ultrasound signal is fed via a resonant transformer L2 to the gate of Q3, the drain of this FET connects to the source of Q2 to form a cascode amplifier. From the drain of Q2 and the tuned inductive circuit L2, C17 the amplitude complex of the received signal is detected by passing the signal through a synchronous detector Q4. The raw low frequency heart complex is then amplified and filtered by U1 where its associated components form a bandpass filter amplifier . This signal is passed to the audio section and the signal pre-processing.

Audio Amplification

The audio signal then passes to a high pass filter U3b and low pass U3a to remove signals that are out of the band of interest. U8 receives this signal and digitally controls the amplitude as a volume control before the signal is passed to a differential audio driver IC (U10) for transmission to the FT310s2 main unit via J4..

Signal Pre-processing

The detected audio complex is fed from U3b to U3c a bandpass amplifier where the filter characteristics are arranged to reject signals below 150Hz and above 1KHz, and the output is taken do a digital AGC U3d. AGC is controlled by the micro controller by altering the resistance of U4. The amplitude-controlled signal is then amplified by U5 and level shifted to 3.3V/2 before passing to the A/D converter stage of the CPU U6 Pin 25 for further digital signal processing.

DSP Microcontroller

The microcontroller circuit is arranged around a coldfire MCF5212 (U6) a fast RISC processing unit (CPU). When power is applied to the circuit a monitor circuit waits for the power rail to become stable and then 100 ms later takes the reset on the CPU high (logic 1) to 3.3 v. This starts the CPU working by reading the bytes at the very top of its memory map from the internal FLASH (ROM). This shows the CPU the start position in ROM from which to start executing. This sets up all the peripheral devices, which includes an interrupt timer, system clock and internal system watchdog. As all functions are time dependant nothing starts without this clock.

This processor gathers the data from the Fetal Heart Complex and performs an autocorrelation process on the data, the resultant data is the fetal heart rate (and period) of the signal. The processor monitors the received data and alters the gain of the agc to maximize the dynamic range of the signal.

Serial data is also received by the processor U6 through the RS485 interface U7. On connection to the FT310s2 it revives an enquiry, to which it replies with its ID. This is the setting obtained from the resistor combination of R41 to R48. The coding here determines the type of transducer connected and the setting of the FT310s2. If accepted the FT310s2 will then request data at regular intervals to which the active probe replies.

Data received from the FT310s2 also indicates the volume setting for the probe and U6 adjusts U8 accordingly.

(the following descriptions and circuit references refer to the FT310s2 " Integrated Toco Transducer" circuits)

Toco Circuit

The toco circuit is built up of three discrete sections.

- Cell Excitation
- Signal Acquisition
- Cell zero adjust
- Microcontroller

Cell Excitation

A stabilised 5V (U2) is fed to the toco transducer along with 0V which form the excitation of a Whetstone bridge in the transducer. The state of this voltage is controlled by the microcontroller (U4) and can be switching or stable dependent of program status. Pin 56 of U4 drives the gate of Q2, taking this point high turns Q2 on and pulling the gate of Q1 low allowing 12V to connect to U2.

Signal Acquisition

The Differential output of the Whetstone bridge is fed via a high gain differential amplifier U1 to a low pass filter (U3d and U3c) for signal smoothing into the A/D converter U4 pin 25 for further digital signal processing by U4.

Cell zero adjust

Toco Zero is automatically adjusted by D/A converter formed around U3b/U3a and controlled via U6 altering the resister ladder R19 to R26 and providing an offset voltage into the offset reference pin of U1. This voltage is set as part of the start up sequence and then left unaltered.

Toco DSP Microccontroller

The microcontroller operated identically to that of the Ultrasound transducer except instead of calculated rate it linearises the toco signal ad sends that result to the FT310s2 on request..

Introduction

The following sections details tests to ensure that the FETATRACK 310 is operating within specification. These tests may be performed in whole or part, however, if any repairs are carried out to the power supply circuits then it is recommended that the whole test/calibration procedure is undertaken.

The test procedures may be performed without removal of the circuit board from the unit.

Performance Checks

The following procedure is intended to provide a means of determining the functional status of the unit. It should be included as part of a preventive maintenance plan and should be performed on a regular basis.

1) Plug the monitor line cord into a grounded receptacle of suitable line voltage and frequency as indicated on the rear panel of the FETATRACK 310 .

2) Turn monitor on. The green front panel LED will illuminate.

3) The display will first show the system selftest followed by the software revision This indicates the instrument is switched on and awaiting inputs.

4) Load chart paper to recorder (for assistance see operating instructions) ensure paper is correctly aligned.

5) Depress printer on/off and recorder will run at either 1,2 or 3 cm/min dependent on the user preset value.

Ultrasound

6) Connect ultrasound transducer to one of the blue sockets on the front panel, check the system correctly identifies the transducer, and increase volume.

7) Place transducer in palm of hand (a small amount of ultrasound coupling gel may be required) and gently stroke the back of the hand at a constant rate of about 2 times a second.

8) Check audio volume is present, digital display will display the simulated rate (approx 120) and correspond with the data being printed on the chart paper. Rate calculations are crystal controlled and require no adjustment.

UA / Toco / Contractions

9) Connect the toco transducer to one of the blue sockets on the front panel, check the system correctly identifies the transducer, and press UA zero to set the baseline (baseline resets to value 1 -> 20 as selected in set up procedure).

10) Apply pressure onto the centre of transducer and check that the toco trace on chart recording increases to 100 + 10%. Remove load and trace will return to baseline.

Event Marker

11) Connect the hand held remote event marker to one of the blue sockets. Depress the button once and note that a half arrow is printed on the bottom of FHR recording.

Setting up the monitors

The mode of operation of the monitor is programmable through the front panel to give a certain amount of customisation. The programming mode is entered by pressing and holding the Fn key while turning the monitor ON, (Software Issue 1.01) or pressing when prompted (Software Issue 1.02 or greater).

Details of the user programmable options are at the beginning of this manual.

The following pages contain drawing data to assist in the service of the product.

Parts lists (Bills of material)

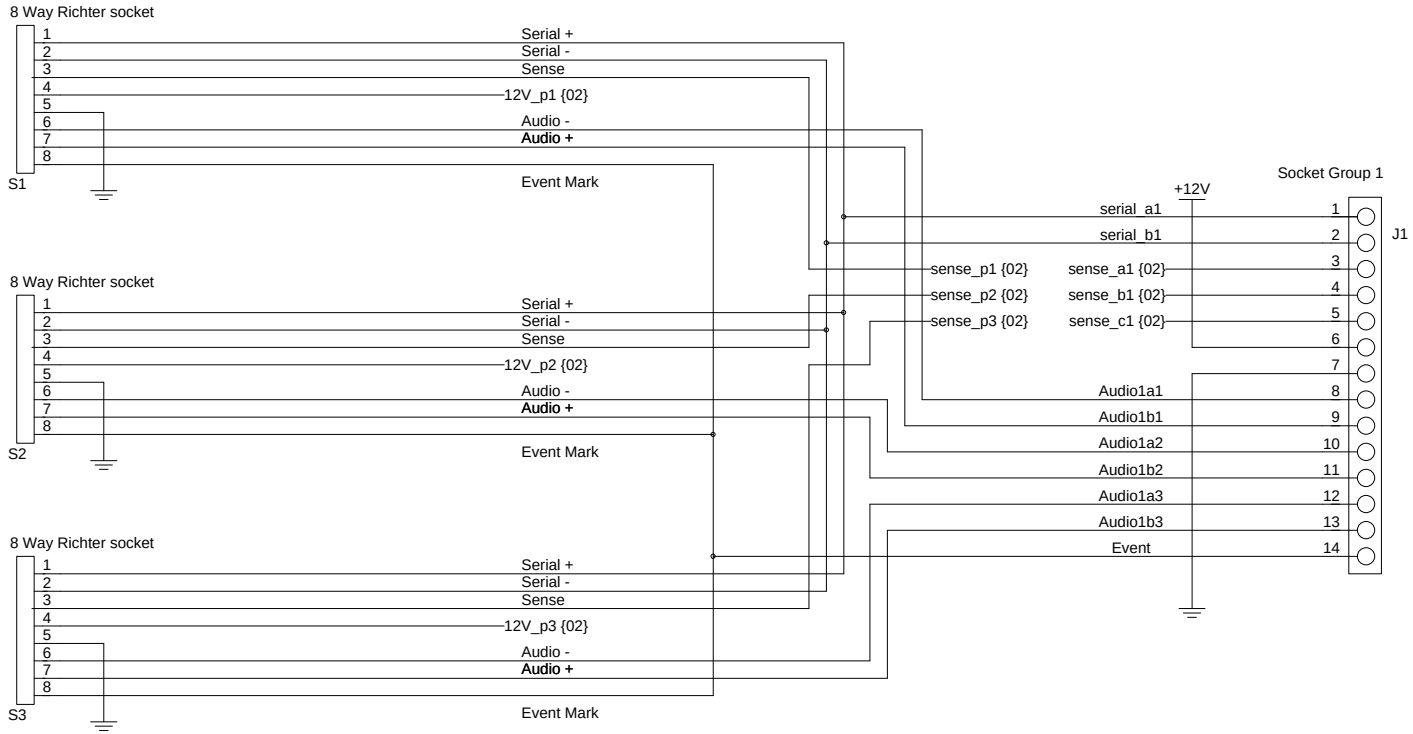
Fetatrack 310s2 Control PCB
Fetatrack 310s2 Input Connection PCB
Fetatrack 310s2 Paper Out and serial board
Fetatrack 310s2 Integrated US Transducer
Fetatrack 310s2 Integrated Toco Transducer

Circuit Data

Fetatrack 310s2 Recorder Interface Processor
Fetatrack 310s2 Display Interface Processor
Fetatrack 310s2 Power Supply and Audio
Fetatrack 310s2 Input Connection PCB
Fetatrack 310s2 Input connection probe power and sense
Fetatrack 310s2 Paper Out and serial board
Fetatrack 310s2 Integrated US RF & Signal Preprocessing
Fetatrack 310s2 Integrated US DSP & Comms
Fetatrack 310s2 Integrated Toco Transducer

Assembly Drawings

Fetatrack 310s2 Gearbox assembly
Fetatrack 310s2 Transformer Bracket Assembly
Fetatrack 310s2 Screen/PCB Bracket Assembly
Fetatrack 310s2 Enclosure Top Assembly
Fetatrack 310s2 Printer Sub-Assembly
Fetatrack 310s2 Printer Door Sub-Assembly
Fetatrack 310s2 Enclosure Bottom Assembly
Fetatrack 310s2 Final Assembly



Issue	ECN	Date
1		May 10

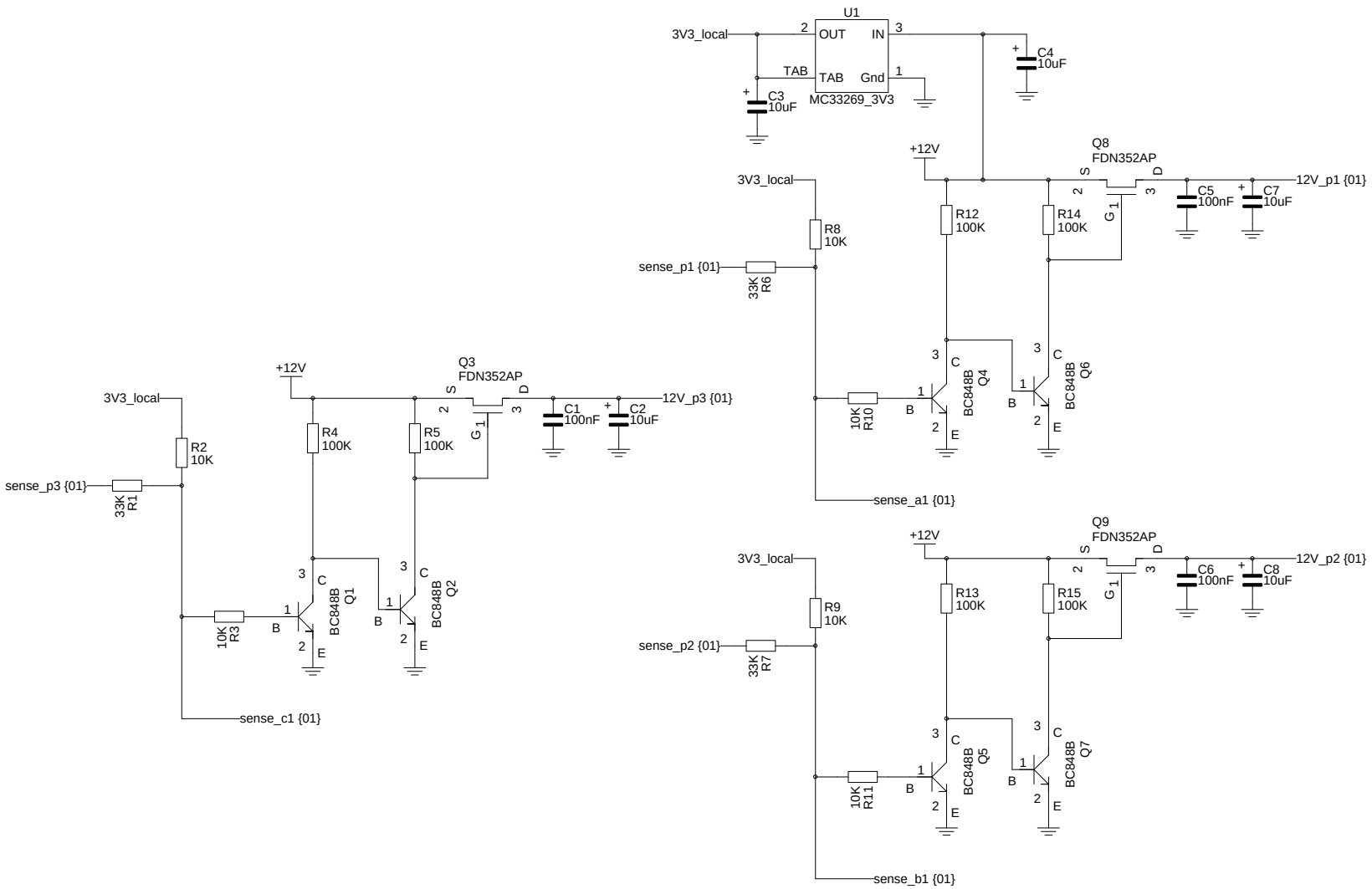
Ultrasound Technologies Ltd
Lodge Way
Portskewett, Caldicot
South Wales. NP26 5PS. UK

FT310s2 input connection PCB

Drawn: nas | Drg No:

Date:

Name: FT310S2_INPUT | Sheet 1 of 2



Issue	ECN	Date
1		May 10

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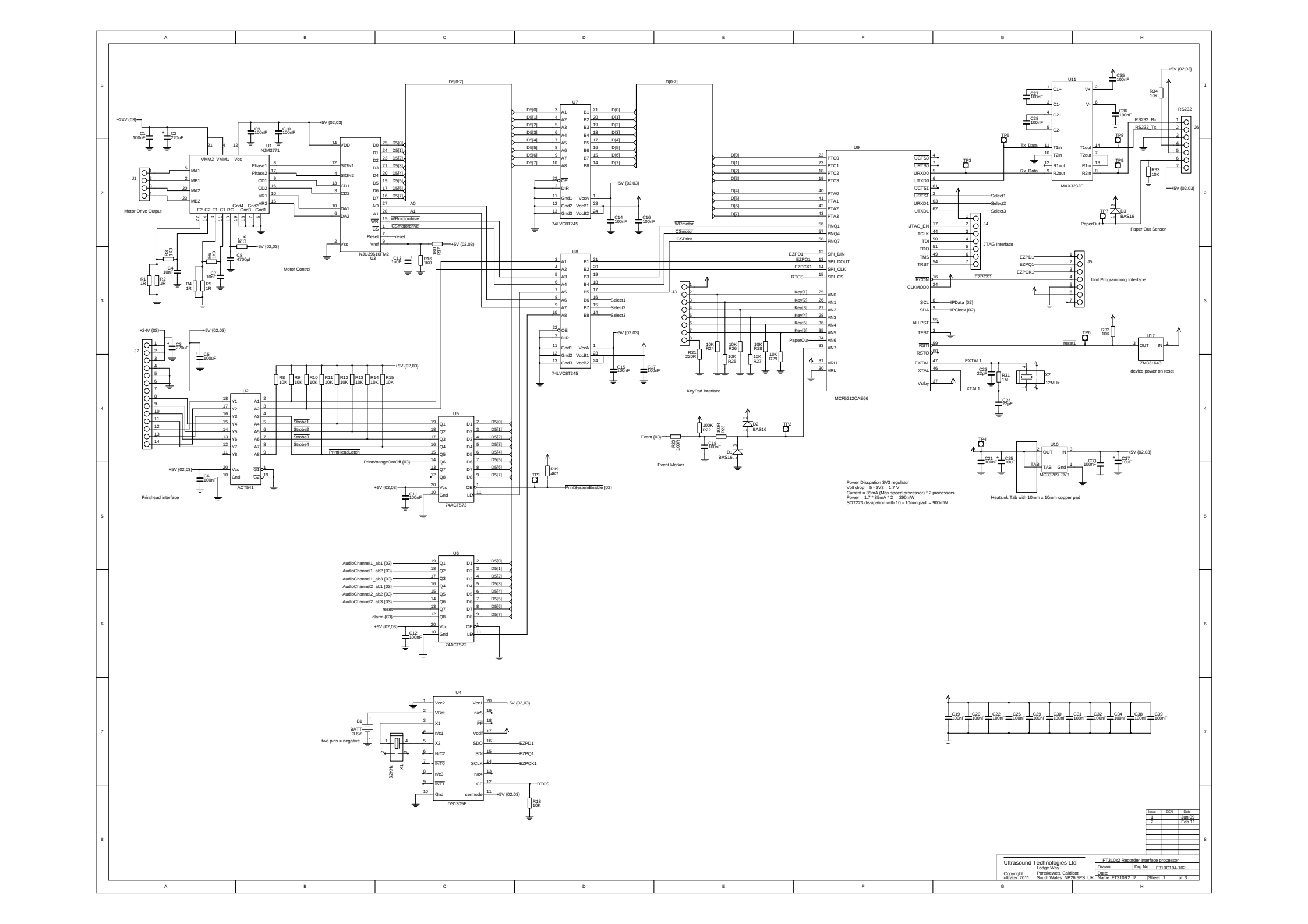
FT310s2 input connection probe power and sense

Drawn: nas | Drg No:

Date:

Name: FT310S2_INPUT | Sheet 2 of 2


Motor Drive Output
Motor Control
Printhead interface
Event Marker
KeyPad interface
Paper Out Sensor
JTAG Interface
Unit Programming Interface
device power on reset
Heatsink Tab with 10mm x 10mm copper pad
Power Disspation 3V3 regulator
Volt drop = 5 - 3V3 = 1.7 V
Current = 85mA (Max speed processor) * 2 processors
Power = 1.7 * 85mA * 2 = 290mW
SOT223 dissipation with 10 x 10mm pad = 900mW
two pins = negative
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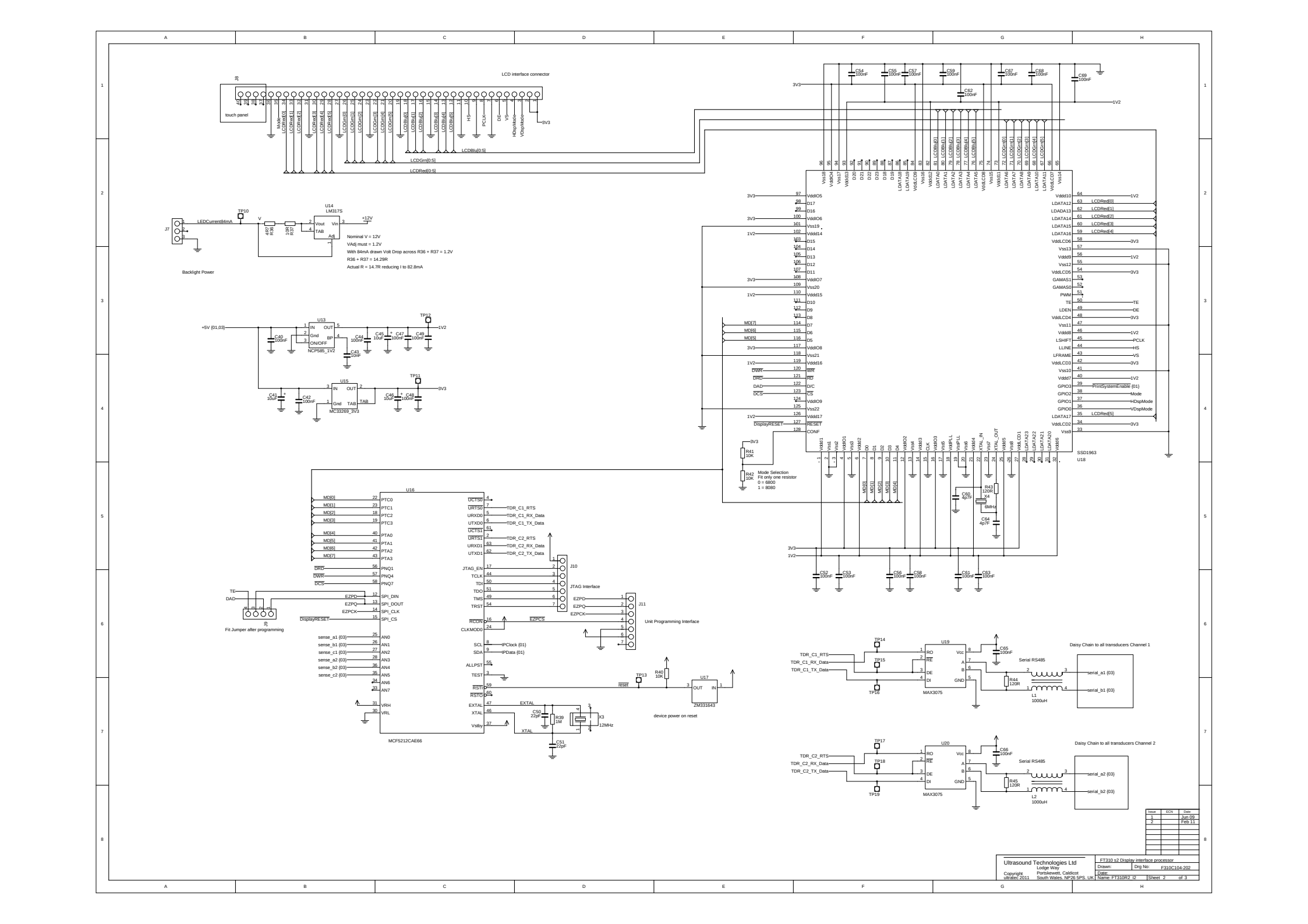
South Wales, NP26 5PS, UK
FT310s2 Recorder interface processor
Drawn:
Drg No: FS10C104-102
Date:
Name: FT310R2 i2
Sheet 1 of 3


LCD interface connector
touch panel
LCDBlu[0:5]
LCDGrn[0:5]
LCDRed[0:5]
Backlight Power
LEDCurrent84mA
U14 LM317S
Nominal V = 12V
VAdj must = 1.2V
With 84mA drawn Volt Drop across R36 + R37 = 1.2V
R36 + R37 = 14.29R
Actual R = 14.7R reducing I to 82.8mA
NCP585_1V2
MIC33269_3V3
SSD1963
U18
Mode Selection
Fit only one resistor
0 = 6800
1 = 8080
MCF5212CAE66
JTAG Interface
Unit Programming Interface
Fit Jumper after programming
device power on reset
ZM331643
MAX3075
Serial RS485
Daisy Chain to all transducers Channel 1
Daisy Chain to all transducers Channel 2
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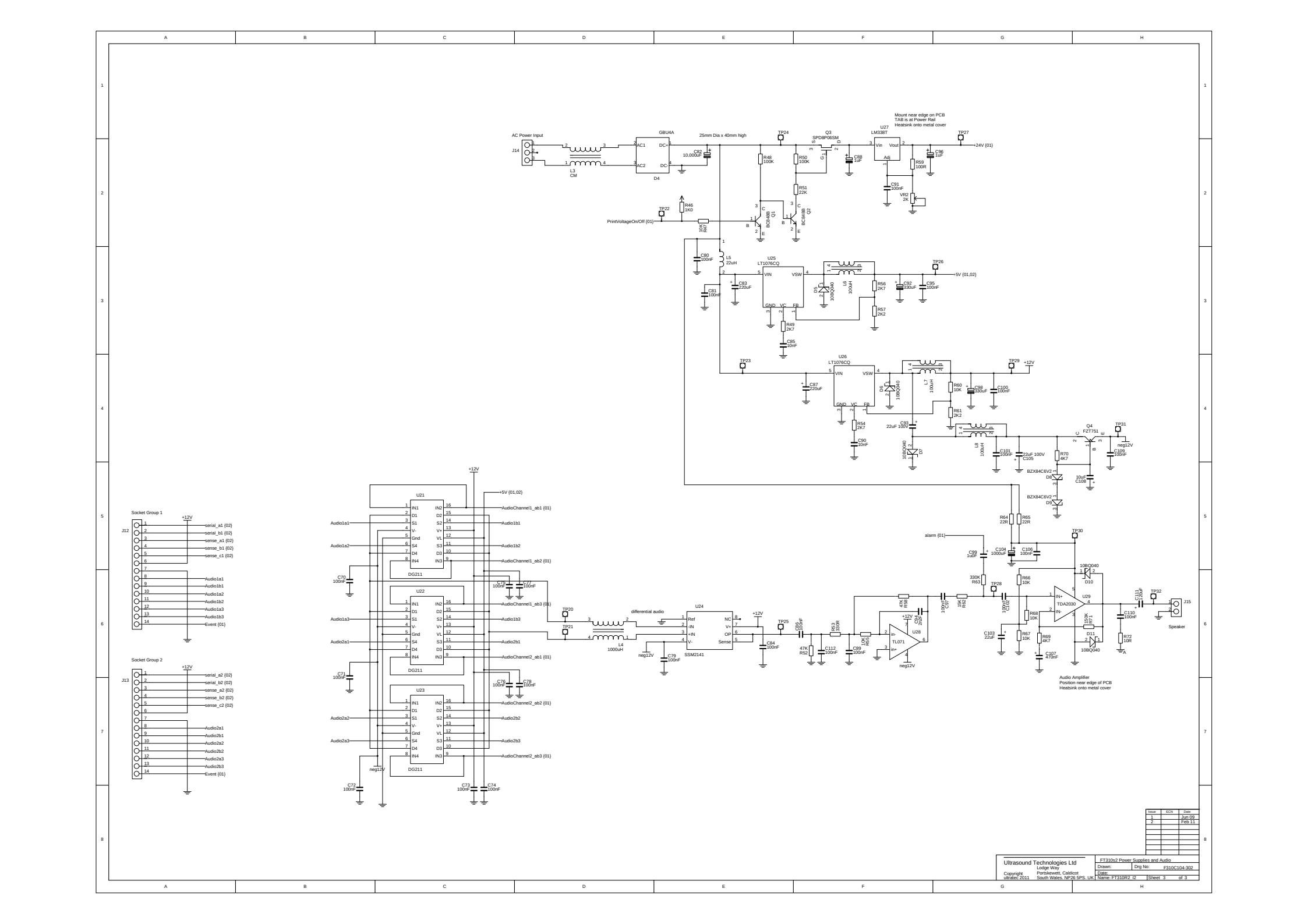
South Wales. NP26 5PS. UK.
FT310 s2 Display interface processor
Drg No: F310C104-202
Name: FT310R2 i2
Sheet 2 of 3



Issue	ECN	Date
1		Jun 09
2		Feb 11

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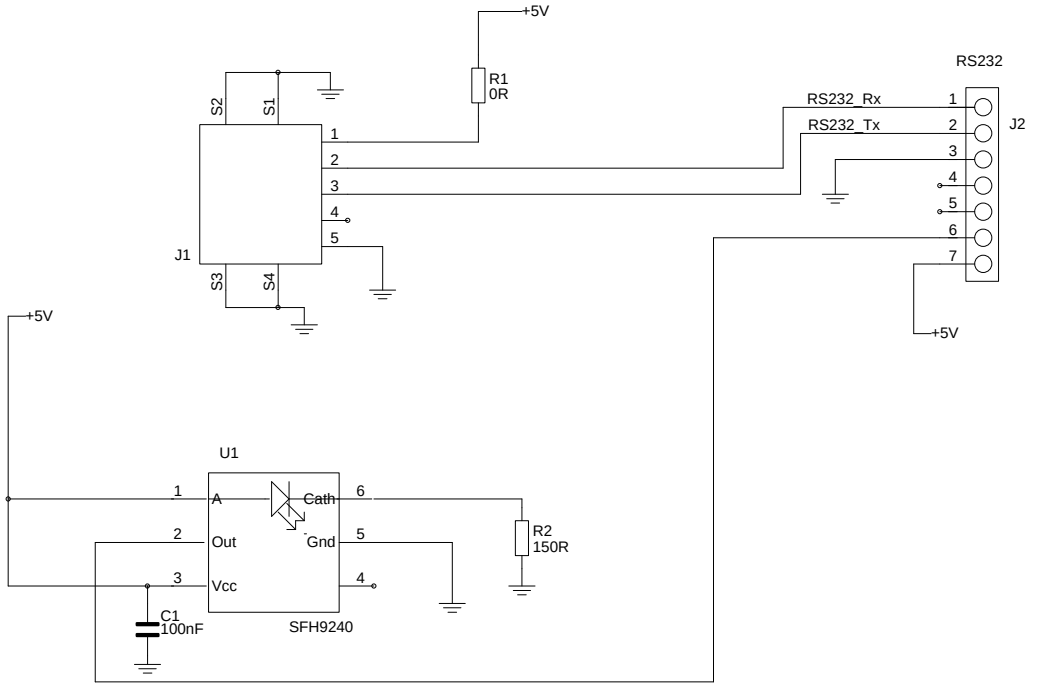
FT310s2 Power Supplies and Audio

Drawn:
Drg No: F310C104-302
Date:
Name: FT310R2 i2
Sheet 3 of 3



Issue	ECN	Date
1		June 10

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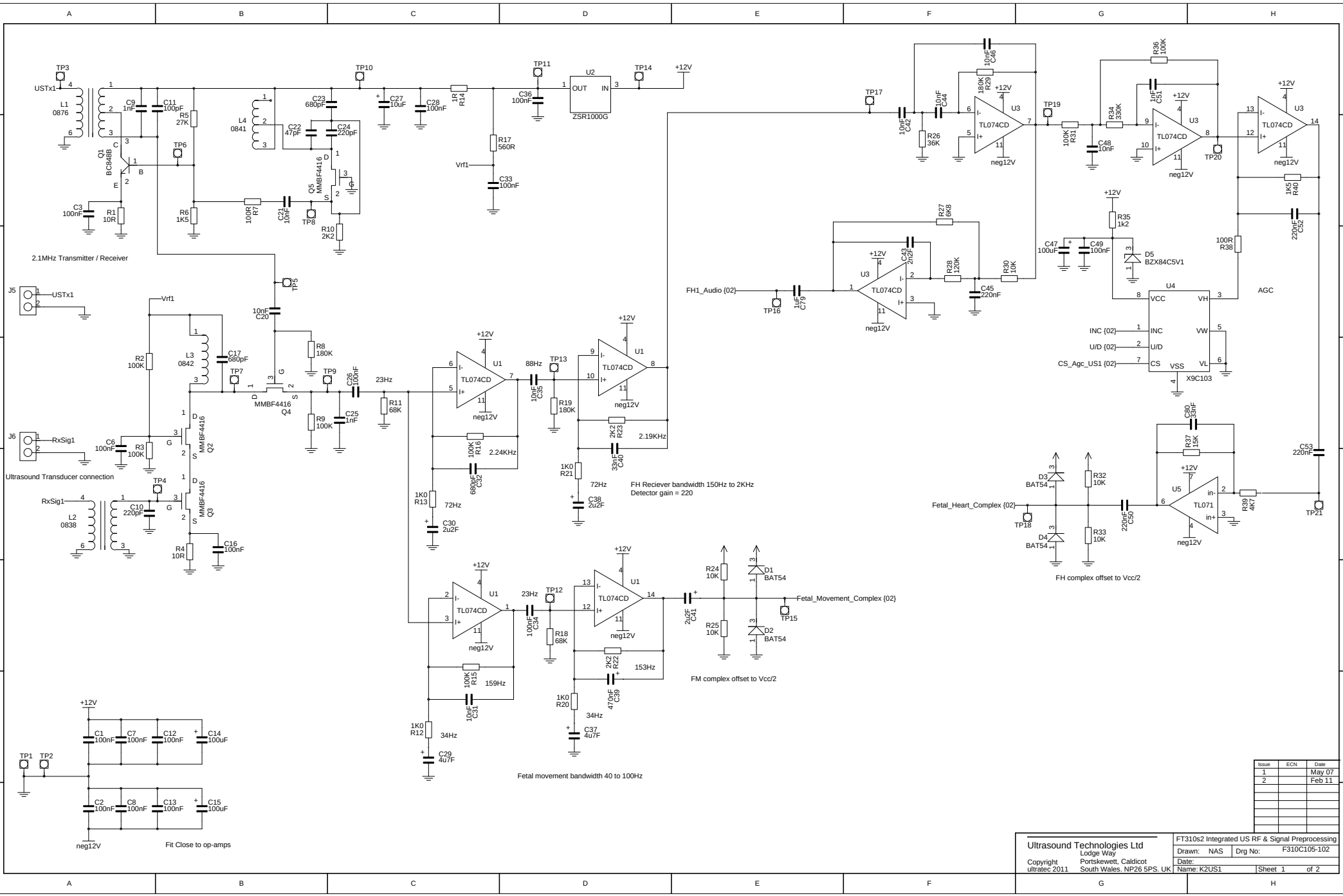
FT310s2 Paper out and serial board

Drawn: NAS | Drg No:

Date: 3/06/2010

Name: FT310S2PAPEROUT | Sheet 1 of 1


2.1MHz Transmitter / Receiver
Ultrasound Transducer connection
FH Reciever bandwidth 150Hz to 2KHz
Detector gain = 220
Fetal movement bandwidth 40 to 100Hz
FM complex offset to Vcc/2
FH complex offset to Vcc/2
AGC
Fit Close to op-amps
FH1_Audio {02}
Fetal_Movement_Complex {02}
Fetal_Heart_Complex {02}
INC {02}
U/D {02}
CS_Agc_US1 {02}
TL074CD
TL071
X9C103
ZSR1000G
BC848B
MMBF4416
BAT54
BZX84C5V1
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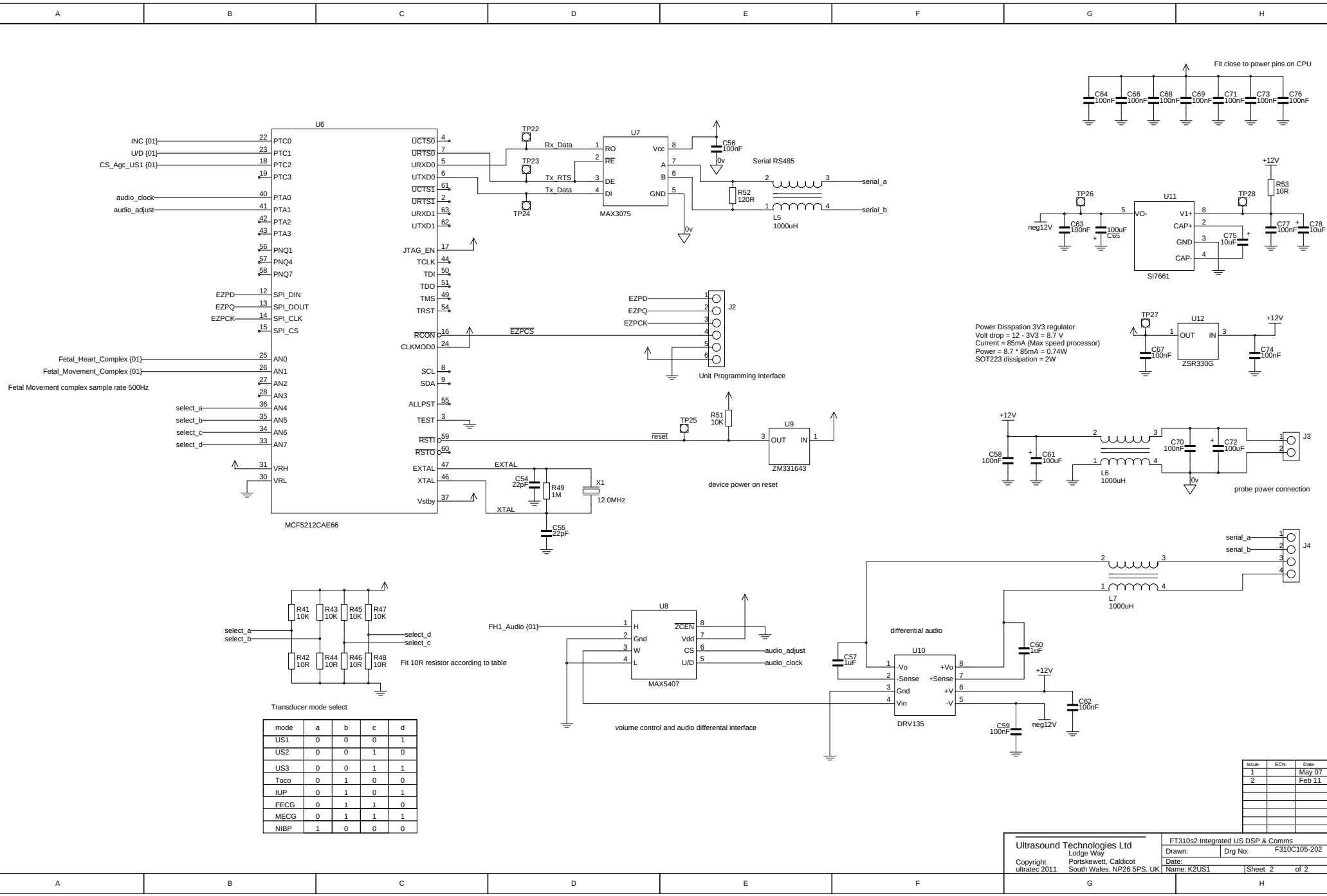
FT310s2 Integrated US RF & Signal Preprocessing
Drawn: NAS
Drg No: F310C105-102
Date:
Name: K2US1
Sheet 1 of 2
Issue 1 May 07
2 Feb 11



mode	a	b	c	d
US1	0	0	0	1
US2	0	0	1	0
US3	0	0	1	1
Toco	0	1	0	0
IUP	0	1	0	1
FECG	0	1	1	0
MECG	0	1	1	1
NIBP	1	0	0	0

Issue	ECN	Date
1		May 07
2		Feb 11

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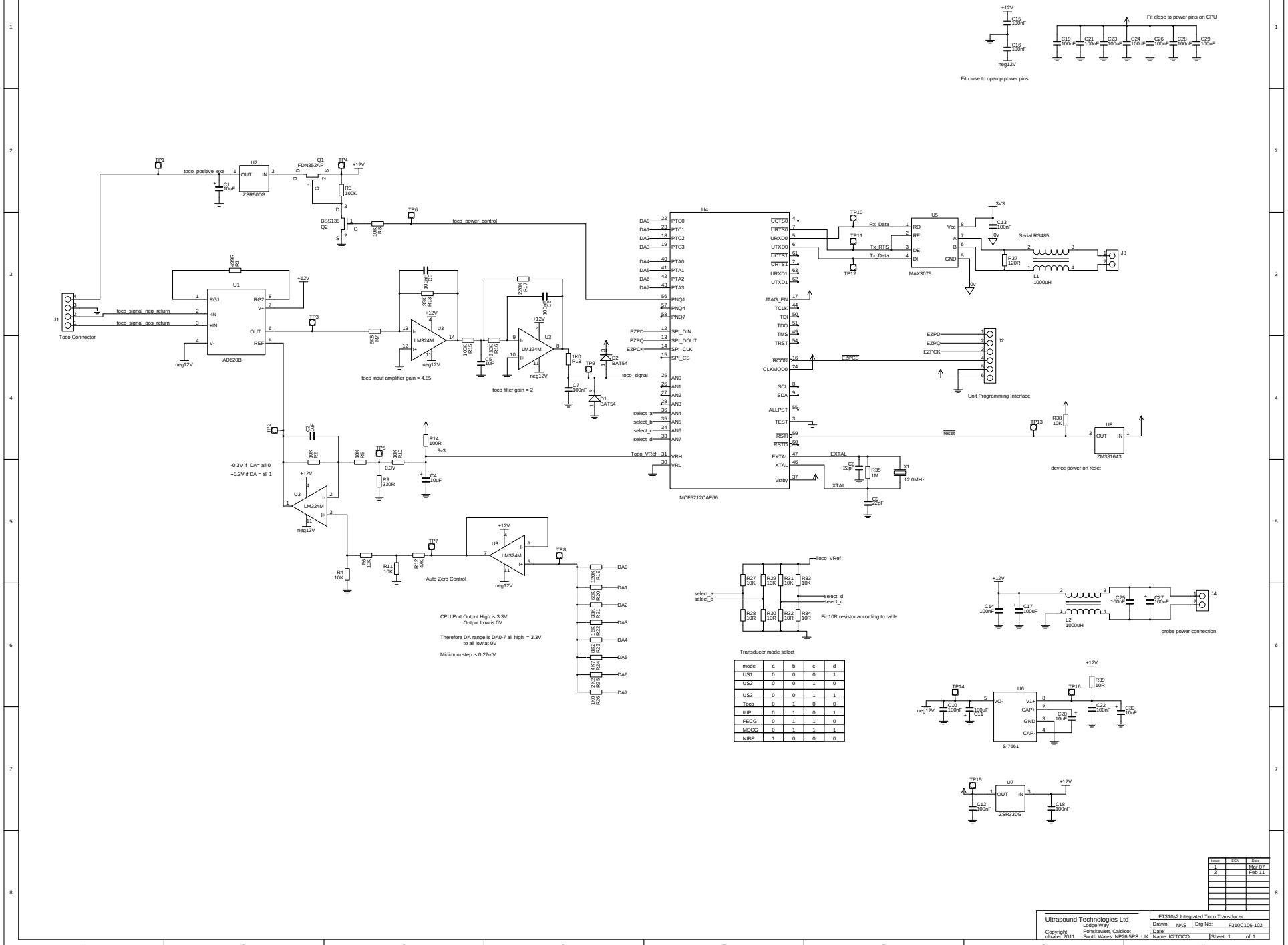
FT310s2 Integrated US DSP & Comms

Drawn:
Drg No: F310C105-202
Date:
Name: K2US1
Sheet 2 of 2



Issue	ECN	Date
1		Mar 07
2		Feb 11

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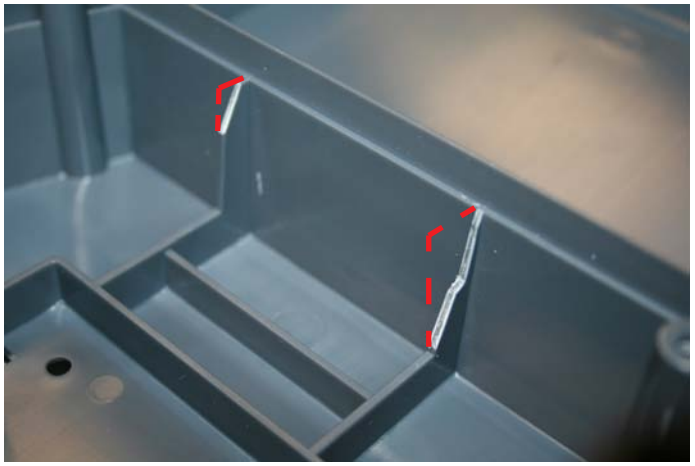
FT310s2 Integrated Toco Transducer

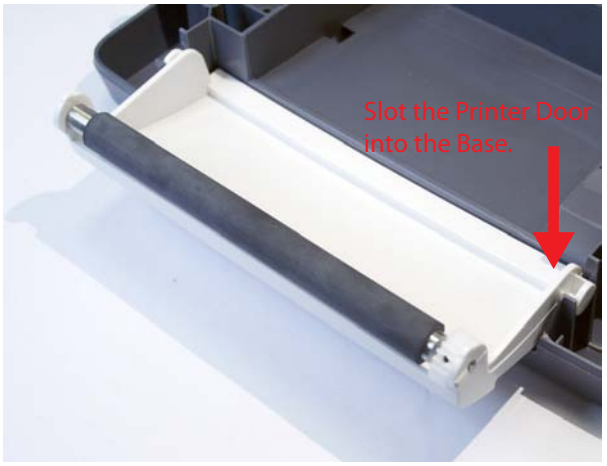
Drawn: NAS | Drg No: F310C106-102

Date:

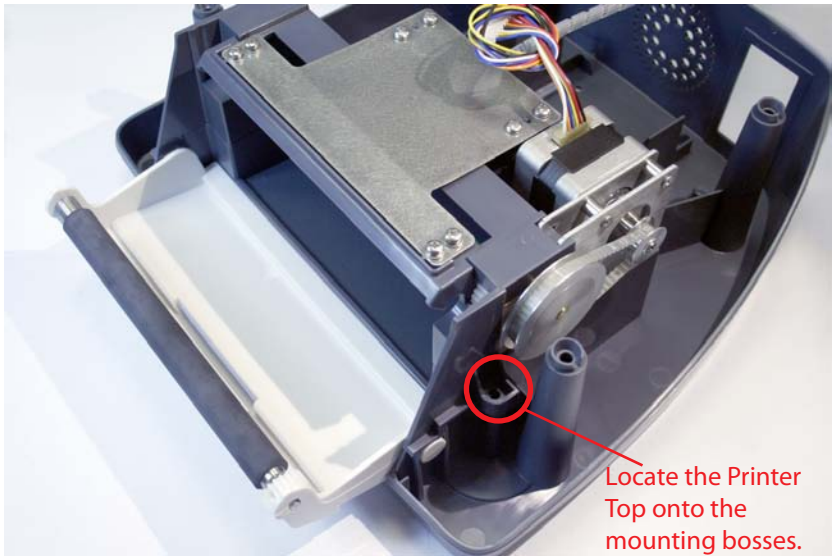
Name: K2TOCO | Sheet 1 of 1

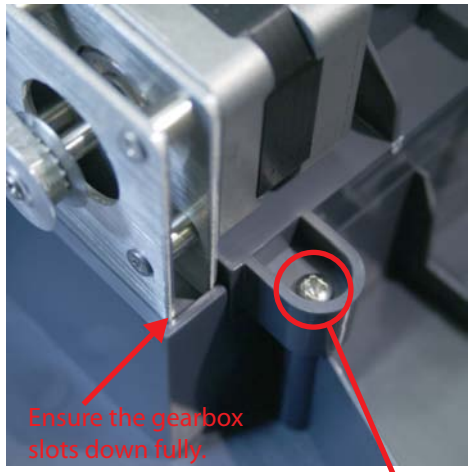


1. Trim the webs on the back of the printer



2. Attach Printer Door





3. Attach the Printer Top to the Base

Instructions:

1. Trim the Ribs on the Enclosure Base Part adjacent to the Transformer bracket as shown in the diagram.
2. Slot the Printer Door Sub-Assembly into the Enclosure Base part and rest the door in the open position.
3. Place the Printer Top Sub-Assembly onto the Enclosure Base. Ensure the Printer Top fits down fully over the mounting posts and that the gear box slots into the recess on the right hand side. Secure the Printer to using 4 M4x12 PT Screws.

Required Parts:

		Qua.	Part No:
1.	310S Monitor Base	1	100-1158-00
2.	310S Printer Sub-Assembly	1	F310AD104
3.	310S Printer Door Sub-Assembly	1	F310AD105
4.	310S Transformer Bracket Assembly	1	F310AD101
5.	Filter Mains Inlet (Traceable Product)	1	900-0026-00
6.	310S Paper Out Assembly PCB	1	100-0162-00
7.	USB Bracket (Separated From Printer Top)	1	100-1161-00
8.	Feet Heavy Duty ABS	4	900-0027-00
9.	Screw M4x10 CSK Hex Security	4	961-0085-00
10.	Screw M4x6 Taptite Pozi Pan	1	961-0089-00
11.	Screw M4x12 Pt Pozi Pan	8	961-0081-00
12.	Washer M4 Flat Nylon	1	961-0090-00
13.	Label USB (Part of Label Set)	1	100-1171-00

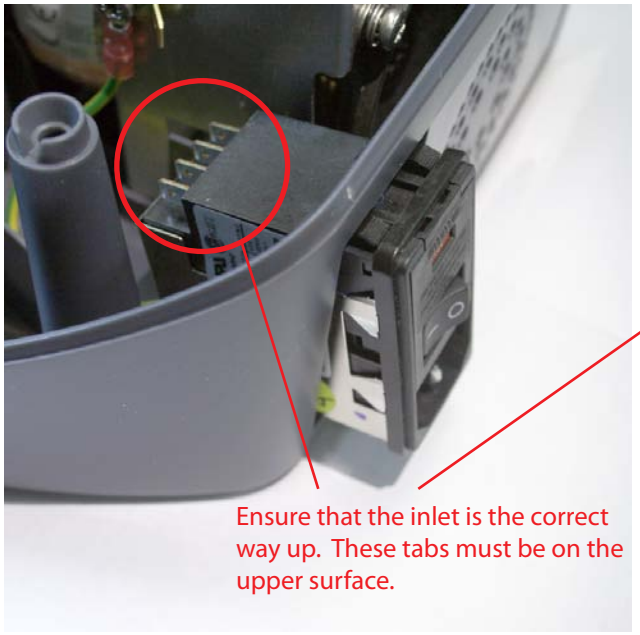
T +44 (0) 1291 425425 F: +44 (0) 1291 427093
E: ultratec@doppler.co.uk W: www.doppler.co.uk

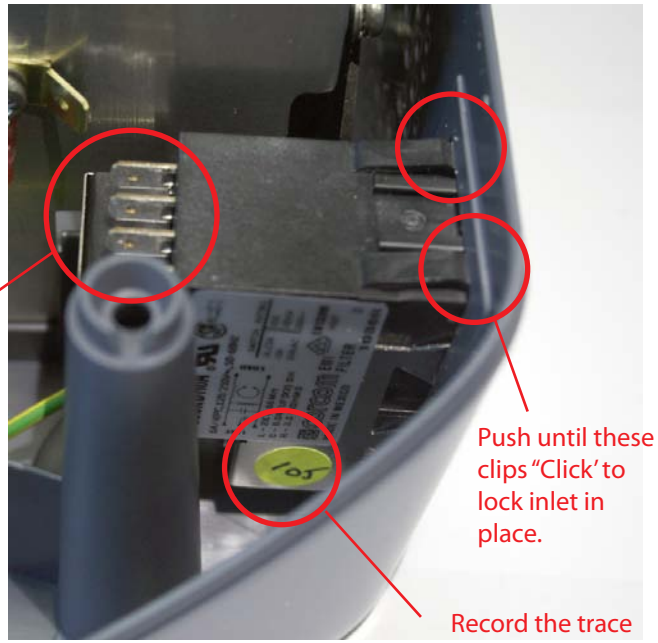
Product: Fetatrack 310S

Description: Enclosure Bottom assembly

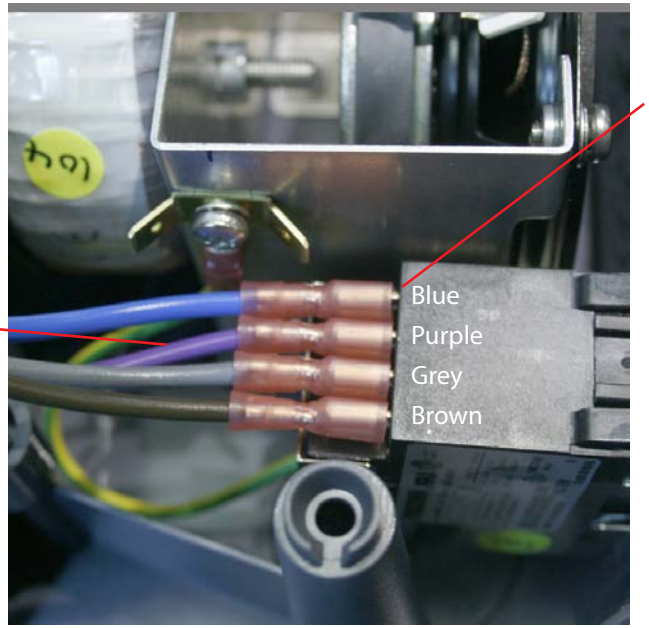
Drawing Number: F310D106-101

Revision: 1.0





6. Insert the Mains Inlet into the enclosure



Ensure the connectors are pushed fully over the terminals.

Orient all of the connectors the same way round to avoid deforming the terminals.

The Mains Inlet must be wired as shown.
Viewed from the back of the unit the wiring sequence is:

Blue (Nearest to transformer)
Purple
Grey
Brown

7. Connect the Mains Inlet to the Transformer

Instructions:

6. Insert the Filter Mains Inlet into the Enclosure throught the hole in the rear. Push it until it locks into place.

7. Connect the Mains Inlet to the Transformer according the diagram.

8. Drill the hole on the Paper out PCB to 4mm.

Required Parts:		Qua.	Part No:
1.	310S Monitor Base	1	100-1158-00
2.	310S Printer Sub-Assembly	1	F310AD104
3.	310S Printer Door Sub-Assembly	1	F310AD105
4.	310S Transformer Bracket Assembly	1	F310AD101
5.	Filter Mains Inlet (Traceable Product)	1	900-0026-00
6.	310S Paper Out Assembly PCB	1	100-0162-00
7.	USB Bracket (Separated From Printer Top)	1	100-1161-00
8.	Feet Heavy Duty ABS	4	900-0027-00
9.	Screw M4x10 CSK Hex Security	4	961-0085-00
10.	Screw M4x6 Taptite Pozi Pan	1	961-0089-00
11.	Screw M4x12 Pt Pozi Pan	8	961-0081-00
12.	Washer M4 Flat Nylon	1	961-0090-00
13.	Label USB (Part of Label Set)	1	100-1171-00

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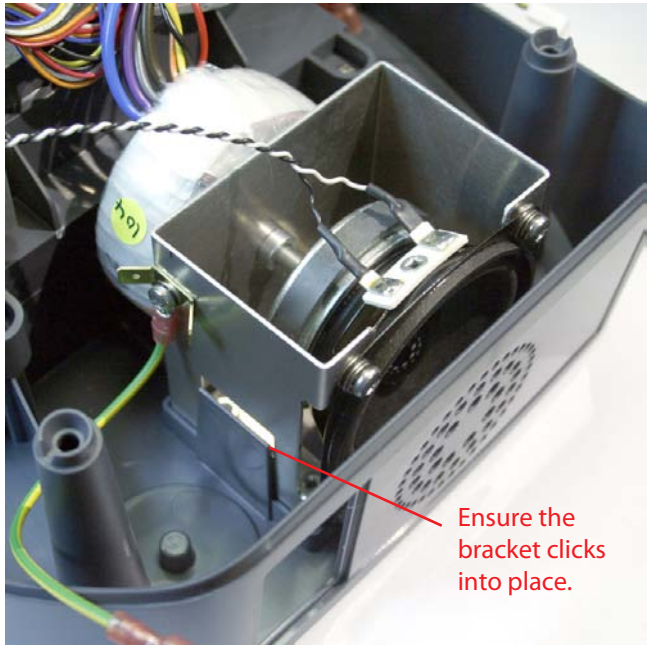
Product: Fetatrack 310S

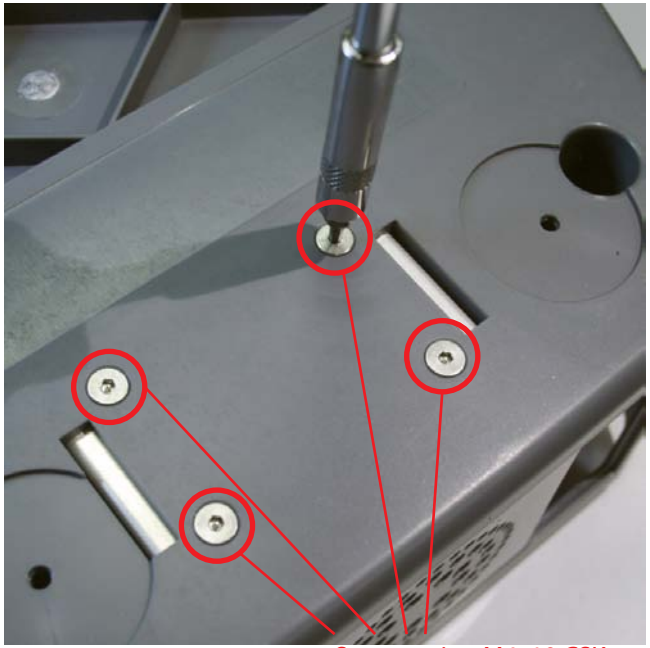
Description: Enclosure Bottom assembly

Drawing Number: F310D106-301

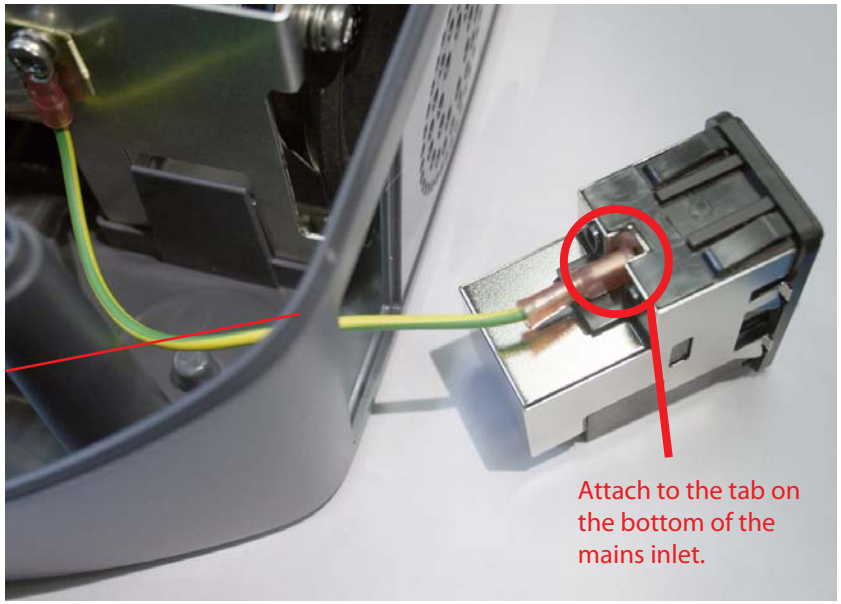
Revision: 1.0



4. Insert the Transformer bracket



Feed the Earth cable
through the hole in the
rear of the base.



5. Connect the Earth Bonding cable to Mains Inlet

Instructions:

4. Place the Transformer Brasket Assembly into the Enclosure Base. Press it down until the locking catches locate in the bracket. Secure the Bracket using 4 M4x10 CSK Hex Security screws inserted through the base of the Enclosure. A small bead of threadlock must be applied to each of these screws before inserting into the bracket.

5. Connect the Earth Bonding cable from the Transformer bracket to the Mains Inlet through the hole in the rear of the enclosure.

Required Parts:		Qua.	Part No:
1.	310S Monitor Base	1	100-1158-00
2.	310S Printer Sub-Assembly	1	F310AD104
3.	310S Printer Door Sub-Assembly	1	F310AD105
4.	310S Transformer Bracket Assembly	1	F310AD101
5.	Filter Mains Inlet (Traceable Product)	1	900-0026-00
6.	310S Paper Out Assembly PCB	1	100-0162-00
7.	USB Bracket (Separated From Printer Top)	1	100-1161-00
8.	Feet Heavy Duty ABS	4	900-0027-00
9.	Screw M4x10 CSK Hex Security	4	961-0085-00
10.	Screw M4x6 Taptite Pozi Pan	1	961-0089-00
11.	Screw M4x12 Pt Pozi Pan	8	961-0081-00
12.	Washer M4 Flat Nylon	1	961-0090-00
13.	Label USB (Part of Label Set)	1	100-1171-00

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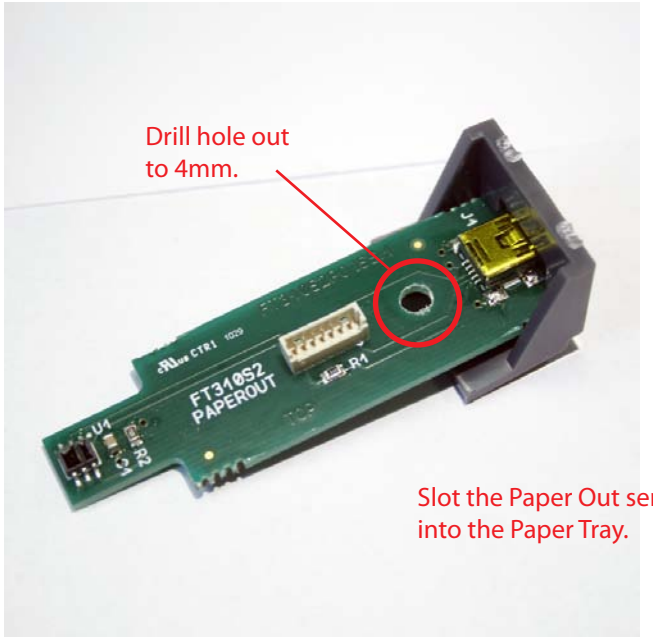
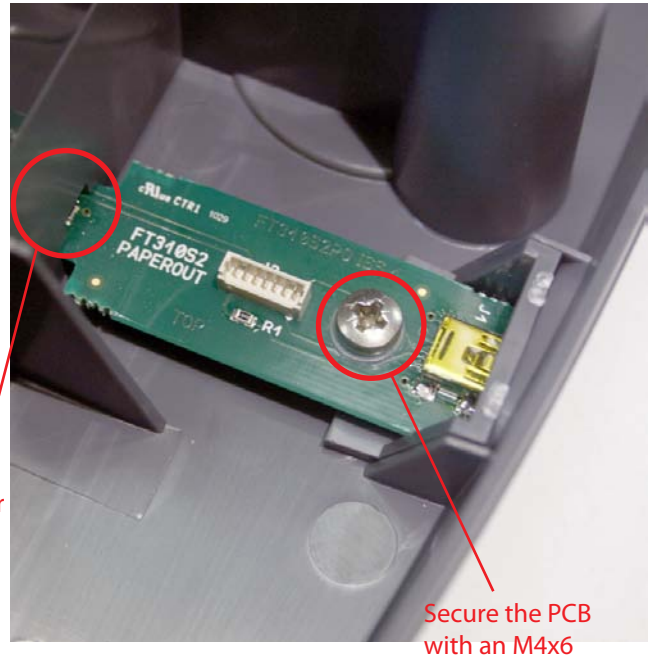
Product: Fetatrack 310S

Description: Enclosure Bottom assembly

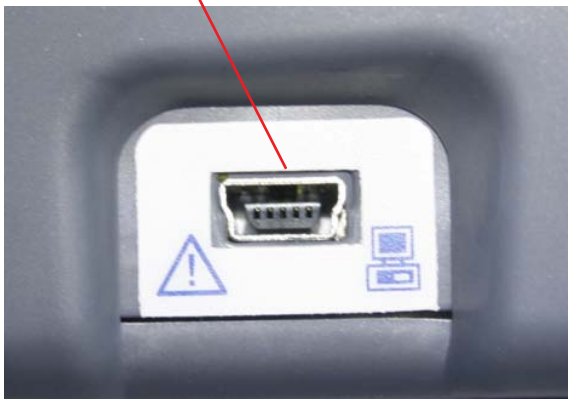
Drawing Number: F310D106-201

Revision: 1.0

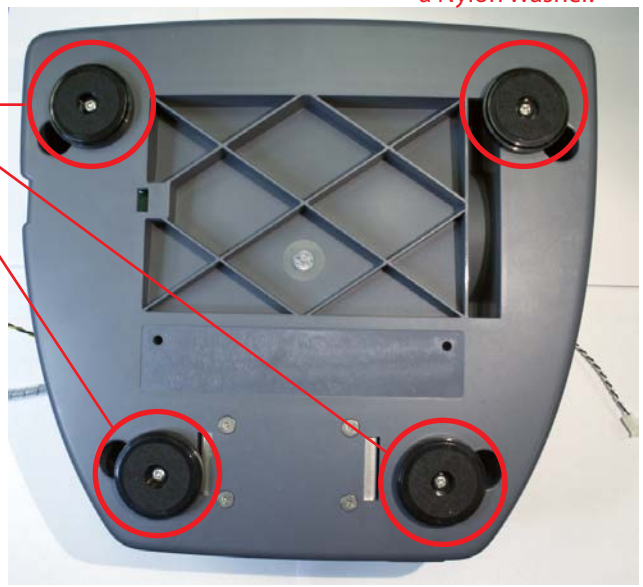




9. Insert the Paperout PCB into the Enclosure.



10. Attach the USB Label



11. Attach the Feet

Instructions:

9. Insert the Paper Out PCB into the USB Bracket and fit the assembly into the Enclosure base. Secure the PCB to the enclosure using an M4x6 Taptite Screw and an M4 Flat Nylon Washer.

10. Attach the USB Label to the USB Bracket. Ensure that it sits central around the USB socket and has an even gap around the label to the enclosure.

11. Attach the 4 Heavy Duty Feet to the bottom of the Enclosure Base and secure using 4 M4x12 PT Screws.

Required Parts:

		Qua.	Part No:
1.	310S Monitor Base	1	100-1158-00
2.	310S Printer Sub-Assembly	1	F310AD104
3.	310S Printer Door Sub-Assembly	1	F310AD105
4.	310S Transformer Bracket Assembly	1	F310AD101
5.	Filter Mains Inlet (Traceable Product)	1	900-0026-00
6.	310S Paper Out Assembly PCB	1	100-0162-00
7.	USB Bracket (Separated From Printer Top)	1	100-1161-00
8.	Feet Heavy Duty ABS	4	900-0027-00
9.	Screw M4x10 CSK Hex Security	4	961-0085-00
10.	Screw M4x6 Taptite Pozi Pan	1	961-0089-00
11.	Screw M4x12 Pt Pozi Pan	8	961-0081-00
12.	Washer M4 Flat Nylon	1	961-0090-00
13.	Label USB (Part of Label Set)	1	100-1171-00

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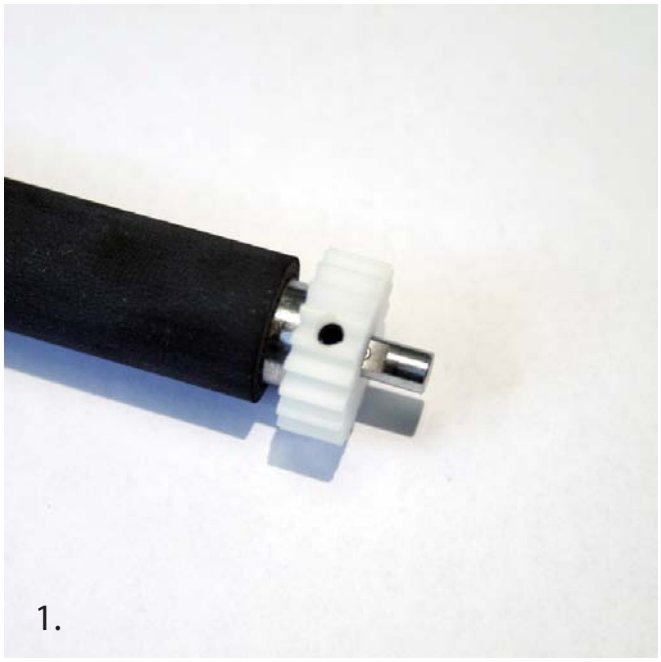
Product: Fetatrack 310S

Description: Enclosure Bottom assembly

Drawing Number: F310D106-401

Revision: 1.0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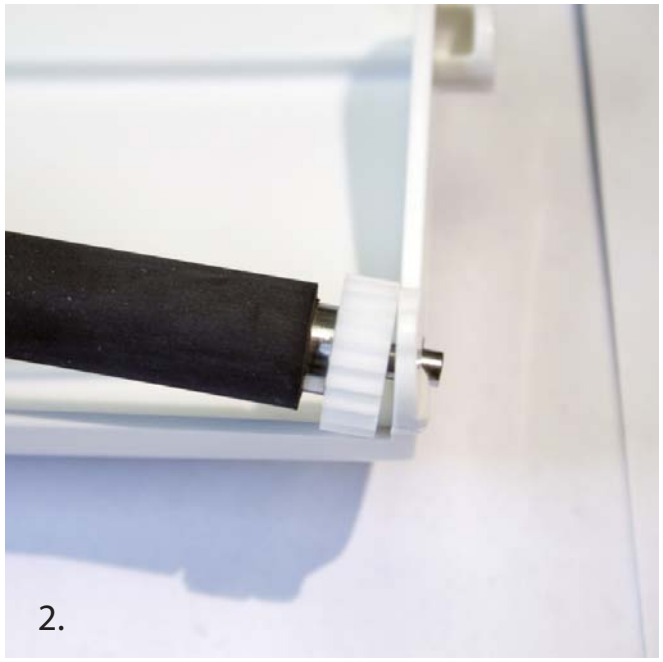
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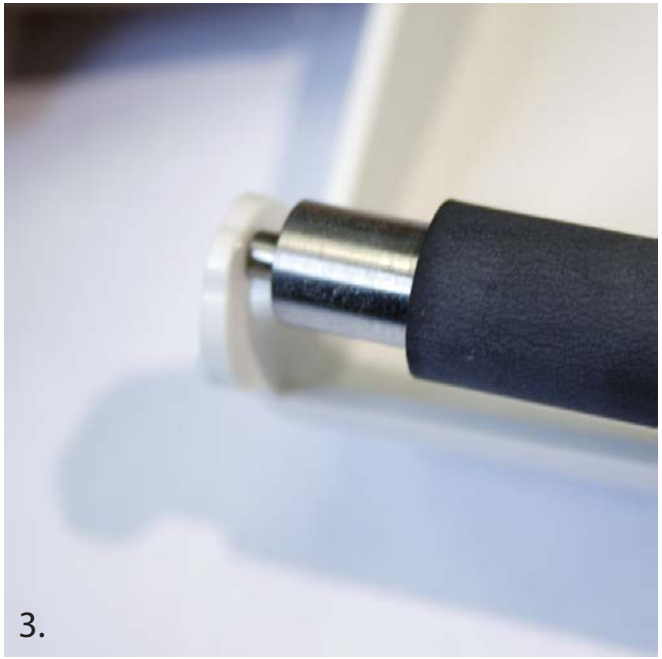
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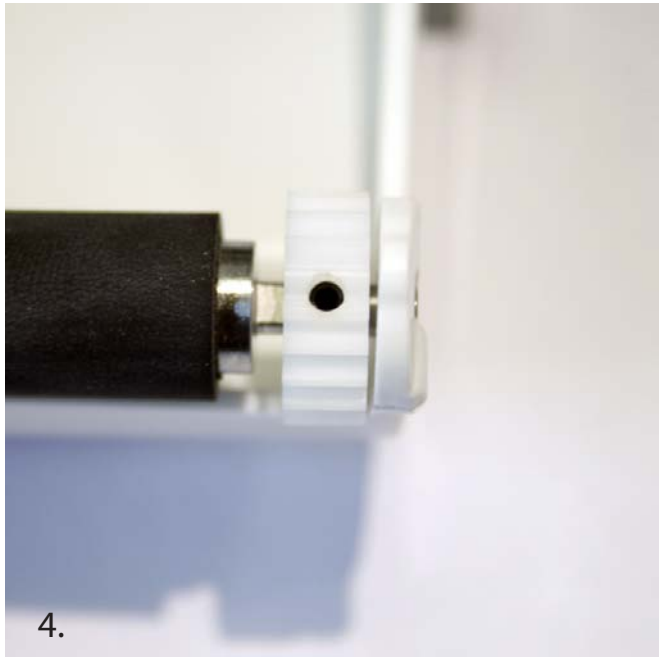
4.

Instructions:

1. Loosely place the Spur Gear over the Printer Roller (long side with flat) and push up to the shoulder.
2. Insert the Spur Gear side of the Roller into the right hand side hole of the Printer Door.
3. Push the free end of the Roller into the left hand hole of the Printer Door. Align the roller flush to the newly inserted side of the printer door.
4. Align the Spur gear on the Roller such that the Grub screw sits over the flat on the roller shaft and is approx. 0.5mm from the printer door edge.
5. Tighten the Grub srew using a 1.5mm Hex Driver onto the roller shaft. Take care not to overtighten as the Spur gear could deform or strip the thread in the hole.
6. The roller should now sipin freely in the printer door.

Required Parts:	Qua.	Part No:
1. 310S Printer Door	1	100-1160-00
2. 310S Printer Roller F310D137	1	100-1178-00
3. Spur Gear 22t M3 Tapped Hole	1	900-0143-00
4. Screw Grub M3x3	1	961-0086-00

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Product: Fetatrack 310S

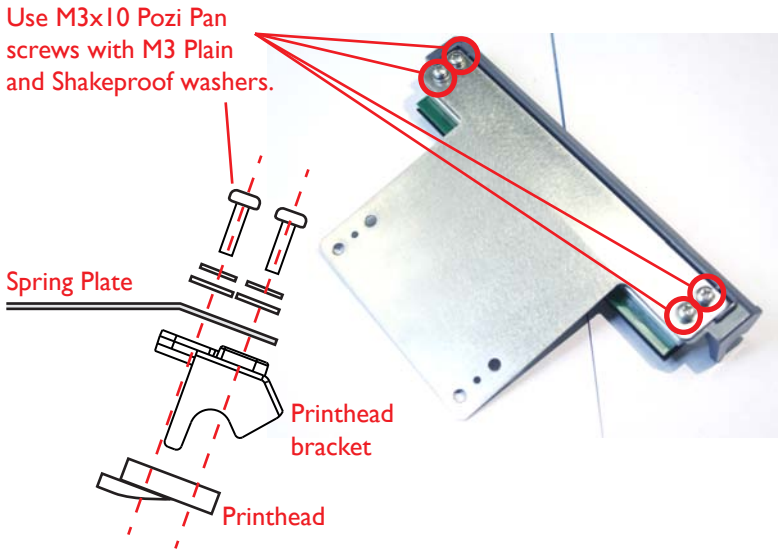
Description: Printer Door sub-assembly

Drawing Number: F310D105-101

Revision: 1.0

1. Cut away the Printhead bracket

2. Place the Printhead on the bracket



2. Screw the Spring Plate to the Printhead

WARNING: ESD Protection must be worn at all times during this assembly.

Instructions:

1. Separate the Printhead bracket and USB bracket from the printer top part using heavy duty flush cutters. Remove any excess plastic and sharp edges from all parts.

2. Fit the Thermal Printhead to the underside of the Printhead Bracket and fit the Spring Plate to the top of the Printhead bracket. Secure the three parts using 4 M3x10 screws with plain and shakeproof washers. Attach all screws loosely and align printhead centrally before tightening.

Required Parts:

		Qua.	Part No:
1.	310S Printer Top Cover	1	100-1161-00
2.	310S Print Spring Plate F310D139	1	100-1166-00
3.	Gearbox (Assembled)	1	F310AD100
4.	Printhead Thermal	1	900-0047-00
5.	310S Printer Cable Assembly	1	100-1187-00
7.	Screw M4x12 Pt Pozi Pan St/Steel	4	961-0081-00
8.	Screw M3x10 Pozi Pan St/Steel	4	961-0083-00
9.	Washer M3 Plain St/Steel	4	961-0018-00
10.	Washer M3 Shakproof St/Steel	4	961-0006-00

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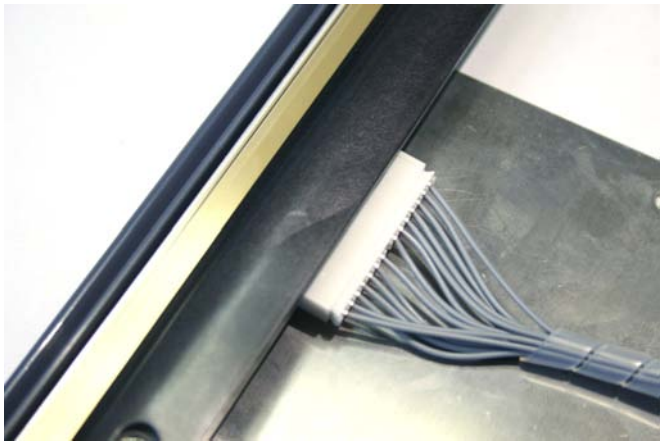
Product: Fetatrack 310S

Description: Printer Sub-assembly

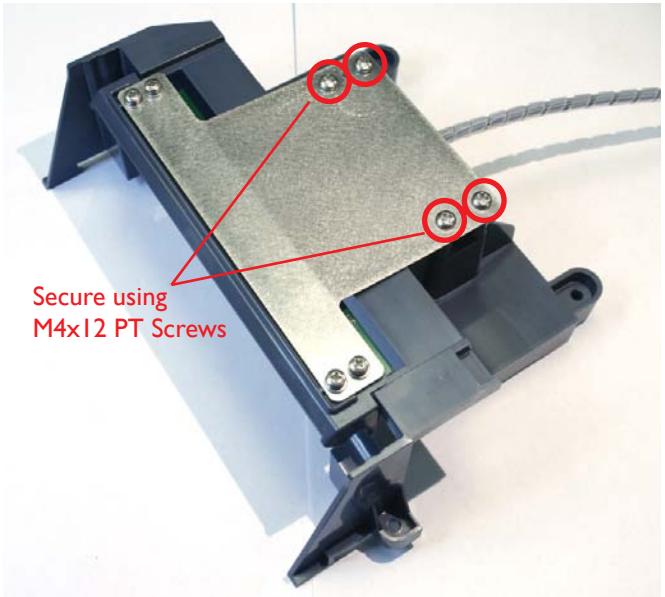
Drawing Number: F310D104-101

Revision: 1.0

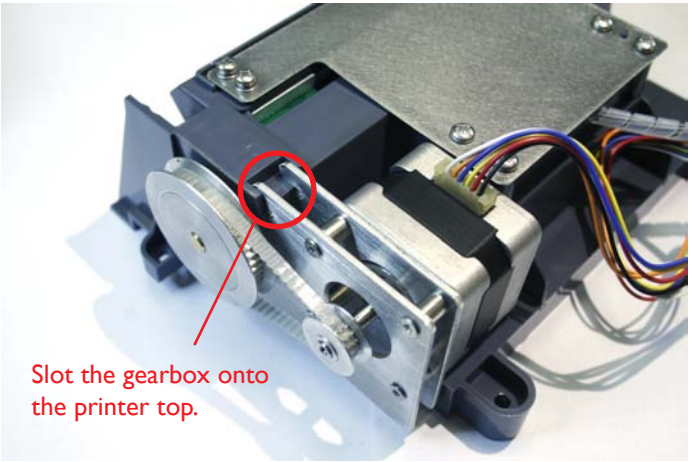


3. Attach the Printer Cable

4. Place the springplate over the mounting posts



4. Secure the printhead to the Printer Top



5. Fit the assembled gearbox.

WARNING: ESD Protection must be worn at all times during this assembly.

Instructions:

3. Connect the Printhead Cable Assembly to the Thermal Print head.
4. Place the Spring plate, complete with printhead assembly, over the two mounting posts on the Printer Top plastic and secure with 4 M4x12 PT Screws.
5. Fit the assembled Gearbox to the side of the Printer Assembly.

Required Parts:		Qua.	Part No:
1.	310S Printer Top Cover	1	100-1161-00
2.	310S Print Spring Plate F310D139	1	100-1166-00
3.	Gearbox (Assembled)	1	F310AD100
4.	Printhead Thermal	1	900-0047-00
5.	310S Printer Cable Assembly	1	100-1187-00
7.	Screw M4x12 Pt Pozi Pan St/Steel	4	961-0081-00
8.	Screw M3x10 Pozi Pan St/Steel	4	961-0083-00
9.	Washer M3 Plain St/Steel	4	961-0018-00
10.	Washer M3 Shakproof St/Steel	4	961-0006-00

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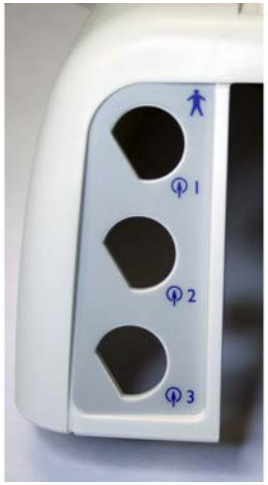
Product: Fetatrack 310S

Description: Printer Sub-assembly

Drawing Number: F310D104-201

Revision: 1.0

1.



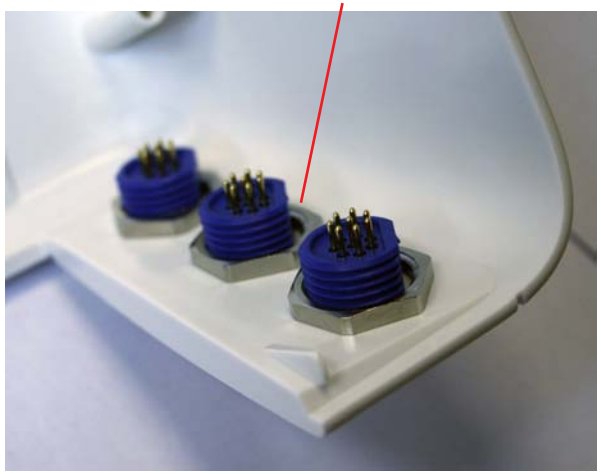
2.

3.

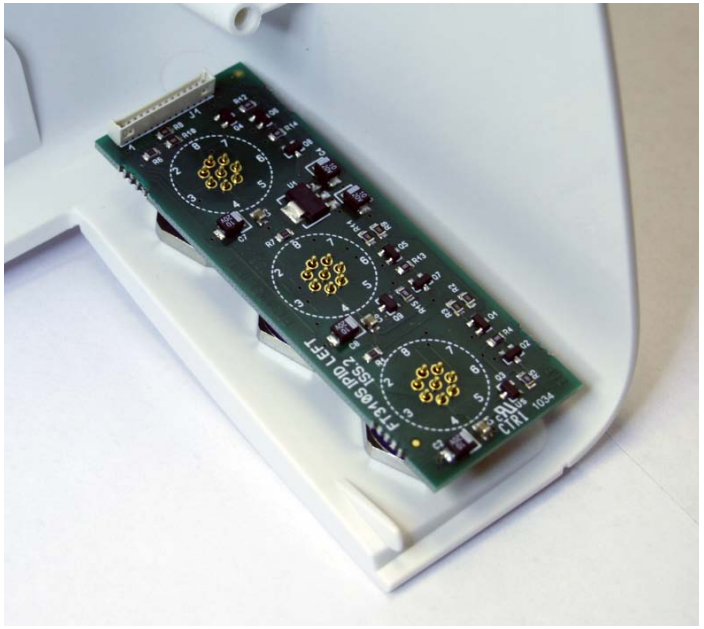
Attach the Connector Labels

4. Insert 3 Schurter Connectors.

Loosely attach the nuts to allow adjustment of the positions



4. Attach the nuts to the connectors.



5. Fit the Input ID PCB to the connectors.

Instructions:

1. Ensure that the connector label recesses on the enclosure top are clean and dry.
2. Attach the left hand connector label to the left side recess on the enclosure.
3. Apply the blanking label (standard) or the right hand connector label (elite) to the right side recess on the enclosure. Ensure that all connector holes sit with and even gap around the holes in the enclosure.
4. Insert 3 Schurter 8 pin sockets into the enclosure left side and loosely tighten the nuts on the inside of the case to secure the connectors.
5. Fit the left side Input Id PCB to the pins on the 3 Schurter sockets. Adjust the positions of the sockets to allow the pins to fit into the PCB easily.

Required Parts:		Qua.	Part No:
1.	310S Monitor Top	1	100-1159-00
2.	Screen/PCB Bracket Assembly	1	F310AD102
3.	310S Membrane & Label set	1	100-1171-00
4.	310S Input Id Assy Left Side PCB	1	100-0161-00
5.	310S Input Id Assy Right Side PCB (Elite only)	1	100-0163-00
6.	Schurter Socket 8 Pin Blue Plus Nut		500-0115-00
	Standard	3	
	Elite	6	
7.	Input Socket PCB Jumper Cables		F310D161
	Standard	1	
	Elite	2	
8.	Screw M4x12mm PT Pozi Pan	4	961-0081-00
9.	Washer M4 Plain St/Steel	4	961-0020-00
10.	Washer M4 Shakeproof St/Steel	4	961-0021-00

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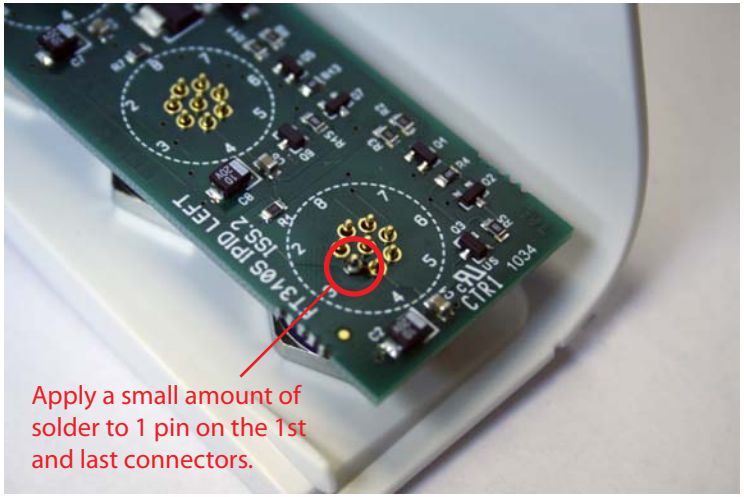
Product: Fetatrack 310S

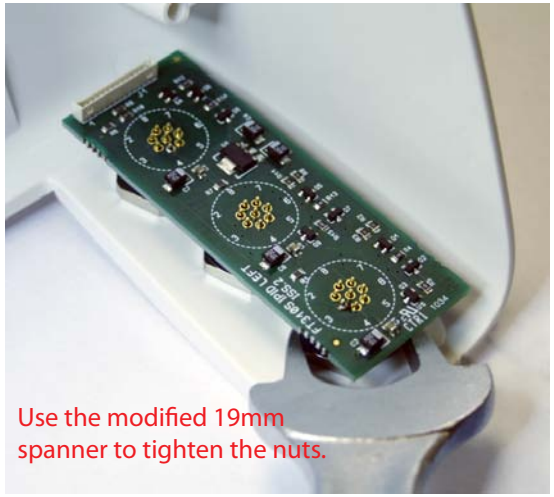
Description: Enclosure top assembly

Drawing Number: F310D103-101

Revision: 1.0



6. Fix the PCB to the sockets



7. Align the sockets and tighten nuts

10. Attach the Control Panel label

Instructions:

6. Fix the PCB to the input sockets by applying a small amount of solder ot 1 pin on the top and bottom sockets.

7. Position the socket/PCB assembly so that it sits neatly over the holes in the label on the front of the enclosure. Tighten the 3 nuts on the Schurter sockets.

8. Solder the remaining connections on the Input ID PCB sockets.

9. Elite Only - Repeat the process above (steps 4-8) to fit the right side Schurter sockets and Right Side Input Id PCB.

10. Ensure that the Control Panel Label recess is clean and dry then attach the Control Panel Label to the enclosure, feeding the tail through the hole in the recess. Take care to not trap, fold or otherwise damage the tail of the control panel label.

Required Parts:		Qua.	Part No:
1.	310S Monitor Top	1	100-1159-00
2.	Screen/PCB Bracket Assembly	1	F310AD102
3.	310S Membrane & Label set	1	100-1171-00
4.	310S Input Id Assy Left Side PCB	1	100-0161-00
5.	310S Input Id Assy Right Side PCB (Elite only)	1	100-0163-00
6.	Schurter Socket 8 Pin Blue Plus Nut		500-0115-00
	Standard	3	
	Elite	6	
7.	Input Socket PCB Jumper Cables		F310D161
	Standard	1	
	Elite	2	
8.	Screw M4x12mm PT Pozi Pan	4	961-0081-00
9.	Washer M4 Plain St/Steel	4	961-0020-00
10.	Washer M4 Shakeproof St/Steel	4	961-0021-00

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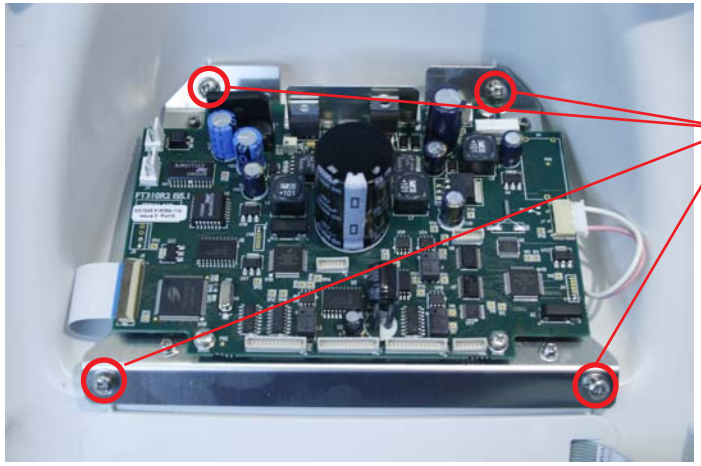
Product: Fetatrack 310S

Description: Enclosure top assembly

Drawing Number: F310D103-201

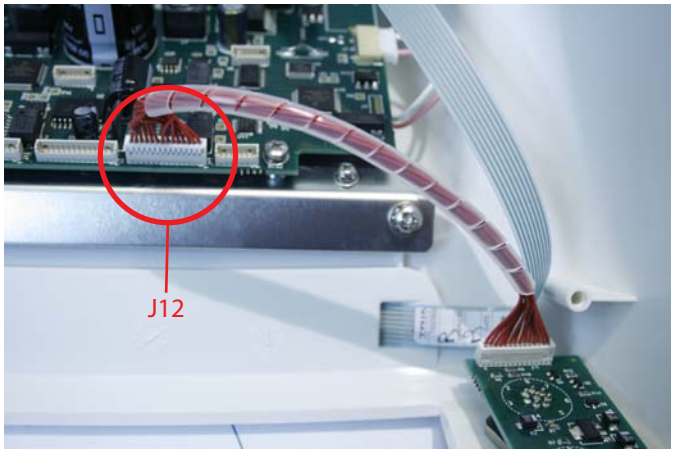
Revision: 1.0



11. Attach the Display Bracket to the enclosure

12. Attach the LCD label to the enclosure

13. Connect the Control Panel cable



14. Fit the Input socket PCB cable to J12

Instructions:

11. Remove the protective film from the front of the LCD screen and clean with a lint free cloth and anti-static cleaner. Insert the Screen/PCB bracket assembly into the enclosure top. Secure the PCB using M4x12 PT Pozi Pan screws with M4 plain and shakeproof washers.

12. Clean the screen of the LCD label using a lint free cloth and anti-static cleaning fluid, inside and outside.

13. Ensure the LCD label recess is clean and dry. Fit the LCD label to enclosure top, taking care to ensure there is an even gap all around the label.

14. Connect the Control Panel tail to the Ziff connector on the Main PCB as shown.

15. Connect the Input ID PCBs to the Main PCB using the Input Socket Jumper cables (14-way) as shown.

Required Parts:		Qua.	Part No:
1.	310S Monitor Top	1	100-1159-00
2.	Screen/PCB Bracket Assembly	1	F310AD102
3.	310S Membrane & Label set	1	100-1171-00
4.	310S Input Id Assy Left Side PCB	1	100-0161-00
5.	310S Input Id Assy Right Side PCB (Elite only)	1	100-0163-00
6.	Schurter Socket 8 Pin Blue Plus Nut		500-0115-00
	Standard	3	
	Elite	6	
7.	Input Socket PCB Jumper Cables		F310D161
	Standard	1	
	Elite	2	
8.	Screw M4x12mm PT Pozi Pan	4	961-0081-00
9.	Washer M4 Plain St/Steel	4	961-0020-00
10.	Washer M4 Shakeproof St/Steel	4	961-0021-00

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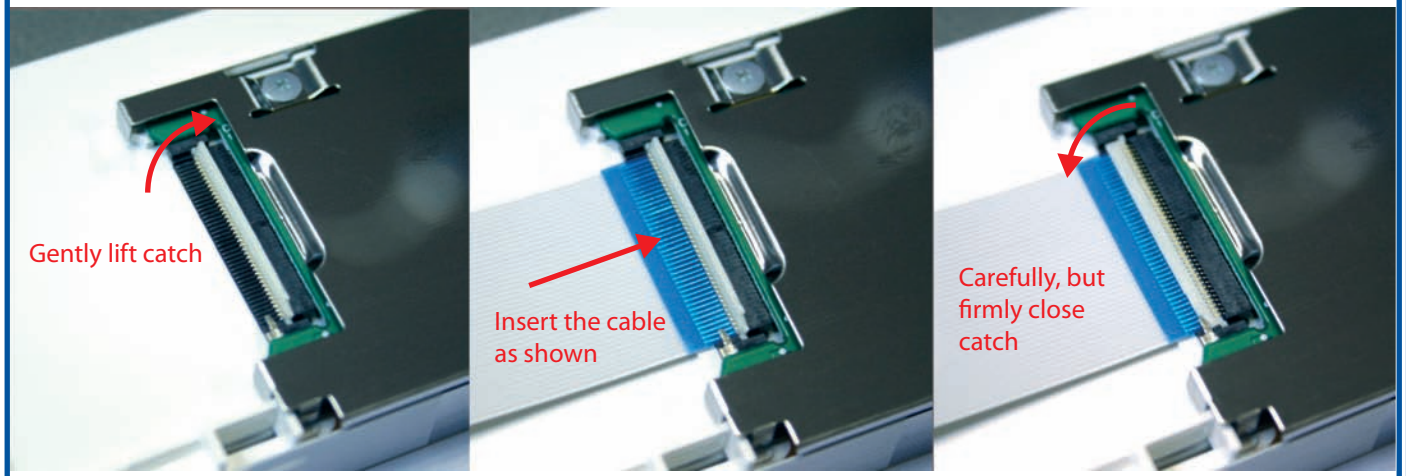
Product: Fetatrack 310S

Description: Enclosure top assembly

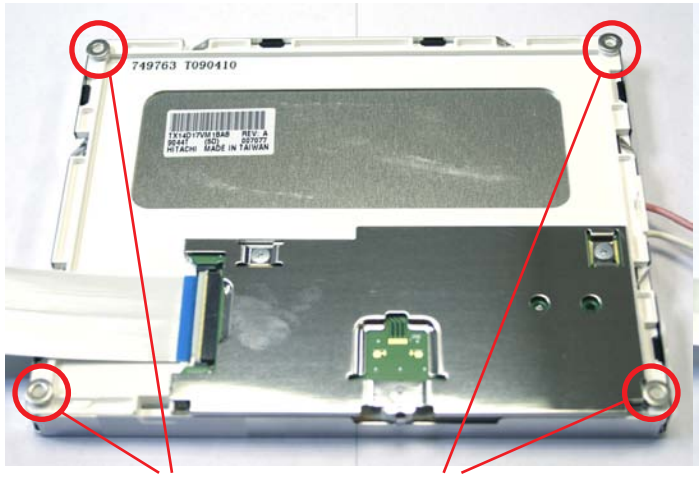
Drawing Number: F310D103-301

Revision: 1.0

2. Insert the 40 way cable

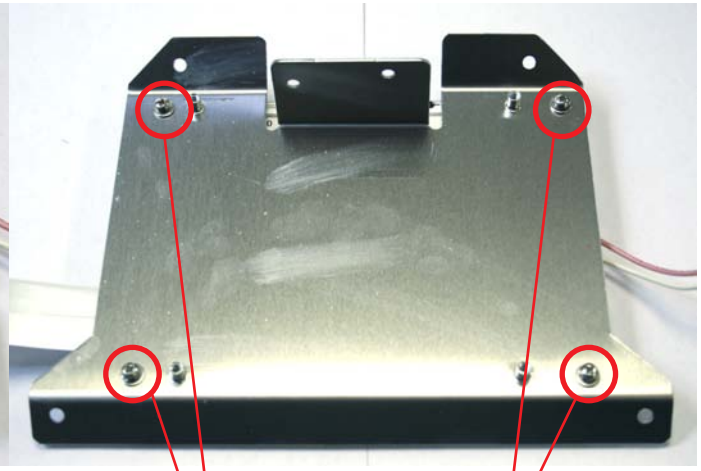


3. Position washers onto Display



Place 4 M2.5 Plain Washers over the bosses on the rear of the screen.

4. Attach Display to Bracket



Place the Screen Bracket over the screen and secure with 4 M3x6 PT Screws with plain and shakeproof washers.

WARNING: ESD Protection must be worn at all times during this assembly.

Instructions:

1. Remove the protective film from the display bracket.
2. Insert the 40 way Jumper Cable into the 5.7" Display and close the lock on the connector.
3. Place the Display face down and position an M2.5 plain washer over each of the bosses in the corners of the screen.
   Note: Ensure that the workspace is clear of screws and other objects which may scratch the screen before placing on the bench.
4. Place the Screen Bracket on top of the Display and secure with 4 M3x6 PT self tapping screws with M3 Plain and Shakeproof washers.

Required Parts:

		Qua.	Part No:
1.	PCB Assy 310S Main (Tested)	1	100-0153-00
2.	Display 310S Monitor 5.7"VGA LED	1	800-0033-00
3.	310S Display Bracket F310D141	1	100-1169-00
4.	Jumper Cable 102mm 0.5mm Pitch	1	600-0042-00
5.	Insulating Kit TO220 Silicone	2	961-0032-00
6.	Screw M3x6 PT Self Tapping Pozi Pan	4	961-0080-00
7.	Screw M3x8 Pozi Pan	6	961-0015-00
8.	Washer M3 Plain	10	961-0018-00
9.	Washer M3 Shakeproof	10	961-0006-00
10.	M3 Nut	2	961-0005-00
11.	Washer M2.5 Plain	4	961-0040-00

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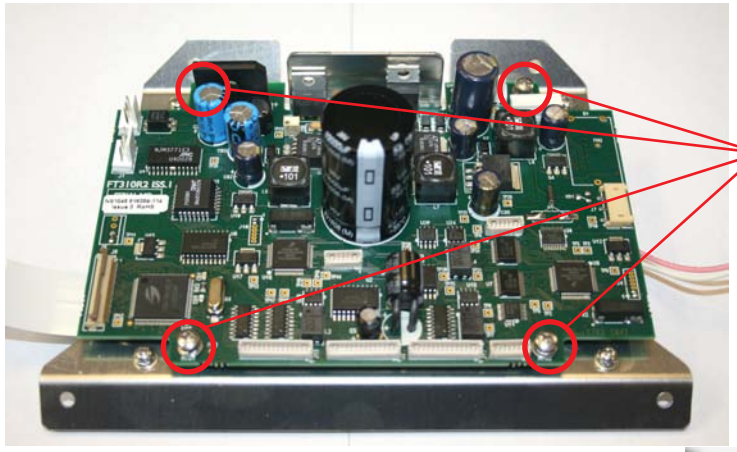
Product: Fetatrack 310S

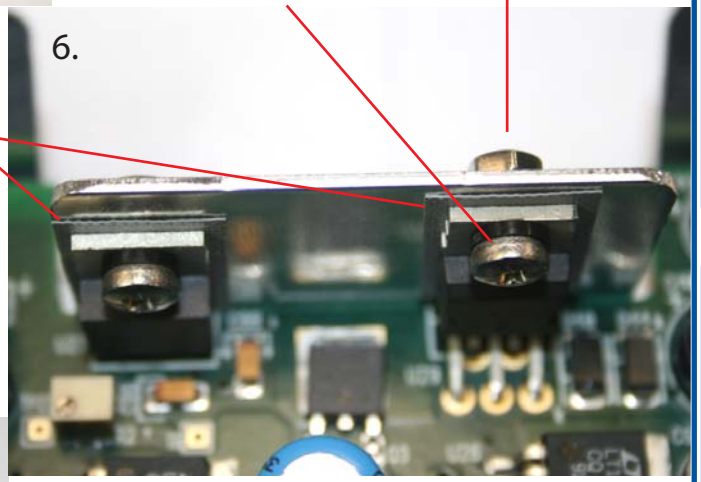
Description: Screen/PCB Bracket assembly

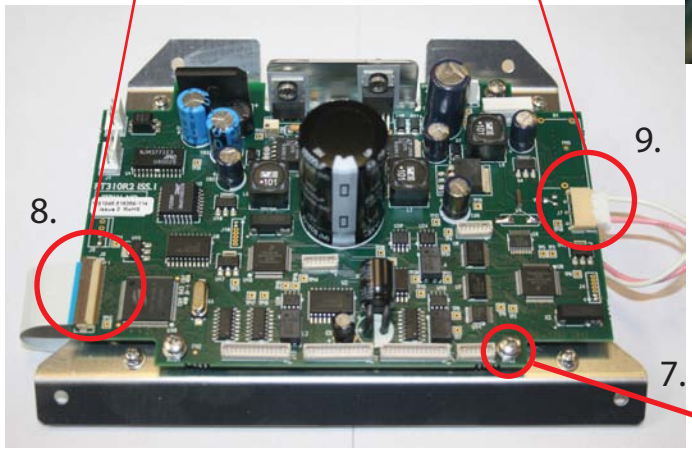
Drawing Number: F310D102-101

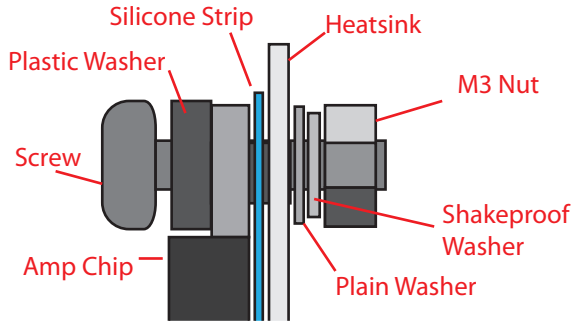
Revision: 1.0



5. Attach PCB to Bracket







Tighten the 4 PCB mounting screws.

WARNING: ESD Protection must be worn at all times during this assembly.

Instructions:

5. Place the PCB assembly onto the reverse of the display bracket- and fix to the bracket using 4 M3x8 Pozi Pan screws with M3 plain and shakeproof washers. Do not fully tighten at this stage.
6. Attach the two Power Amps to the Display Bracket Heatsink applying the Silicone Insulating Kit as shown. Secure using M3x8 Pozi Pan screws with plain and shakeproof washers onto an M3 Nut taking care to ensure that the Insulating SIlicone Sheet remains square with the Amp and entirely shields it from the heatsink.
7. Tighten the 4 PCB screws to secure the PCB.
8. Insert the 40 way Jumper Cable into the PCB connector and close the lock on the connector.
9. Connect the screen power cable to J7 on the PCB.

Required Parts:

		Qua.	Part No:
1.	PCB Assy 310S Main (Tested)	1	100-0153-00
2.	Display 310S Monitor 5.7"VGA LED	1	800-0033-00
3.	310S Display Bracket F310D141	1	100-1169-00
4.	Jumper Cable 102mm 0.5mm Pitch	1	600-0042-00
5.	Insulating Kit TO220 Silicone	2	961-0032-00
6.	Screw M3x6 PT Self Tapping Pozi Pan	4	961-0080-00
7.	Screw M3x8 Pozi Pan	6	961-0015-00
8.	Washer M3 Plain	10	961-0018-00
9.	Washer M3 Shakeproof	10	961-0006-00
10.	M3 Nut	2	961-0005-00
11.	Washer M2.5 Plain	4	961-0040-00

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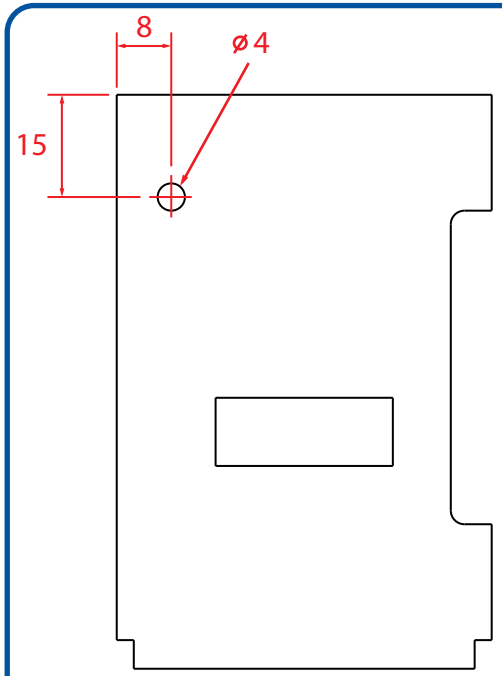
Product: Fetatrack 310S

Description: Screen/PCB Bracket assembly

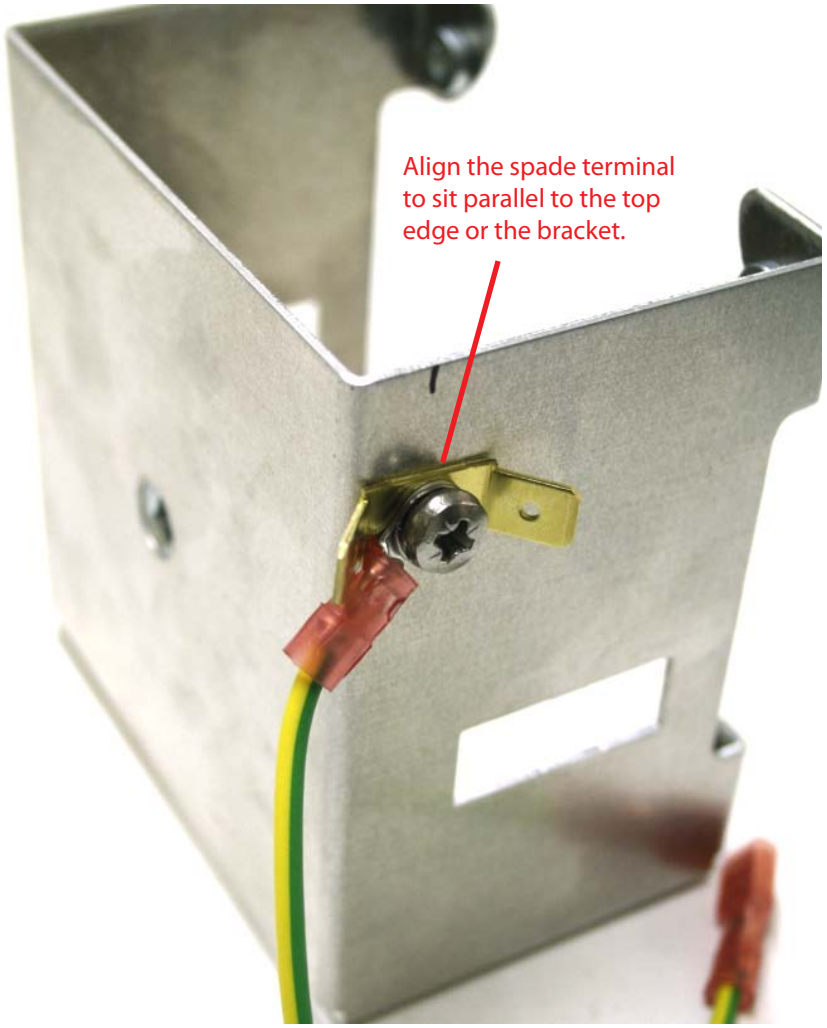
Drawing Number: F310D102-201

Revision: 1.0



2. Hole Position

3. Fit Earth Bonding Terminal



Instructions:

1. Remove the protective film from the Transformer bracket.
2. Drill a 4mm hole through the Transformer bracket according to the diagram. Remove any burrs from the hole.
3. Insert an M4x8 screw first through a shakeproof washer, then through the Mains Inlet Earth Lead ring terminal, followed by the Spade Terminal before pushing through the bracket. Secure the screw on the inside of the bracket with an M4 nut with a shakeproof washer.

Required Parts:		Qua.	Part No:
1.	Transformer Mains 30VA (Wired to drawing F310D163-101)	1	800-0055-00
2.	Loudspeaker 3" 10W (Wired to drawing F310D164-101)	1	800-0017-00
3.	310S Transformer Bracket F310D140	1	100-1170-00
4.	Spade terminal 0.25 RT Angle	1	961-0028-00
5.	Screw M4x8 Pan Hd Pozi St/Steel A2	5	961-0084-00
6.	Washer M4 Plain	5	961-0020-00
7.	Washer M4 Internal Shakeproof	5	961-0021-00
8.	Bolt M6x45 Hex Head	1	
9.	Mains Inlet Earth Lead	1	F310D166

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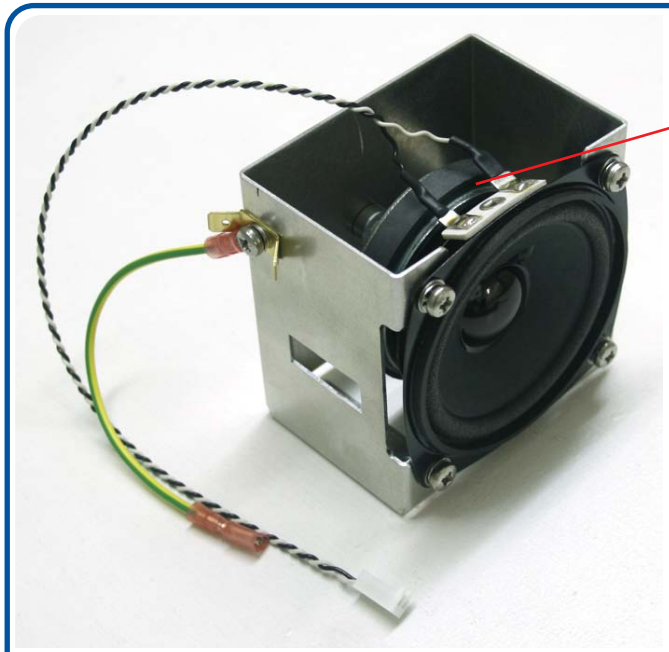
Product: Fetatrack 310S

Description: Transformer bracket assembly

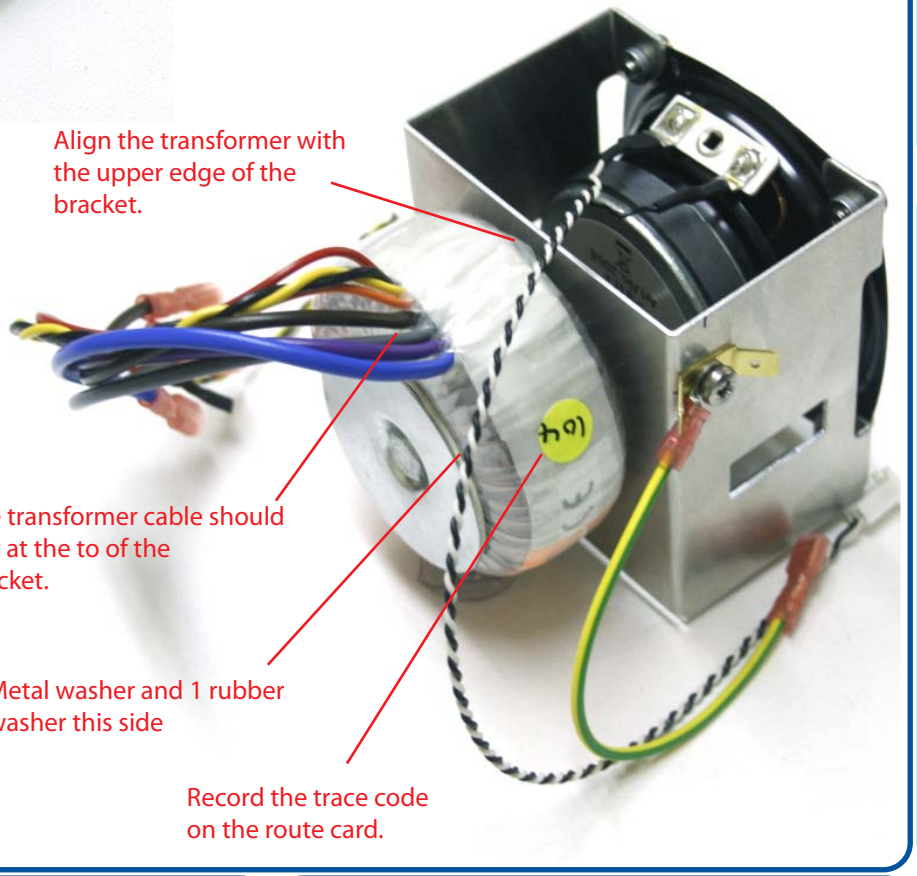
Drawing Number: F310D101-101

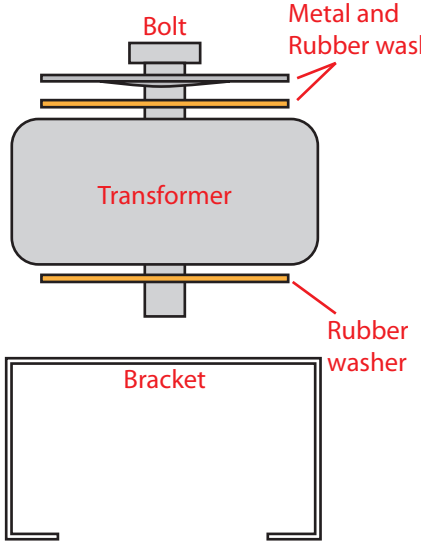
Revision: 1.0



4. Fit Speaker

4. Fit Transformer





Instructions:

4. Attach the speaker to the open side of the transformer bracket using 4 M4x8 Screws with plain and shakeproof washers. Align the speaker cable to the top side of the bracket.

5. Insert the M6x45 bolt through the transformer and its metal and rubber washers as shown in the diagram. Fit the transformer onto the bracket using the M6 bolt and tighten with the cables exiting at the top of the bracket.

NOTE:

Care should be taken during handling and storage of the bracket once the speaker has been attached. The speaker cone is delicate and should be protected from contact with other items.

Required Parts:

		Qua.	Part No:
1.	Transformer Mains 30VA (Wired to drawing F310D163-101)	1	800-0055-00
2.	Loudspeaker 3" 10W (Wired to drawing F310D164-101)	1	800-0017-00
3.	310S Transformer Bracket F310D140	1	100-1170-00
4.	Spade terminal 0.25 RT Angle	1	961-0028-00
5.	Screw M4x8 Pan Hd Pozi St/Steel A2	5	961-0084-00
6.	Washer M4 Plain	5	961-0020-00
7.	Washer M4 Internal Shakeproof	5	961-0021-00
8.	Bolt M6x45 Hex Head	1	
9.	Mains Inlet Earth Lead	1	F310D166

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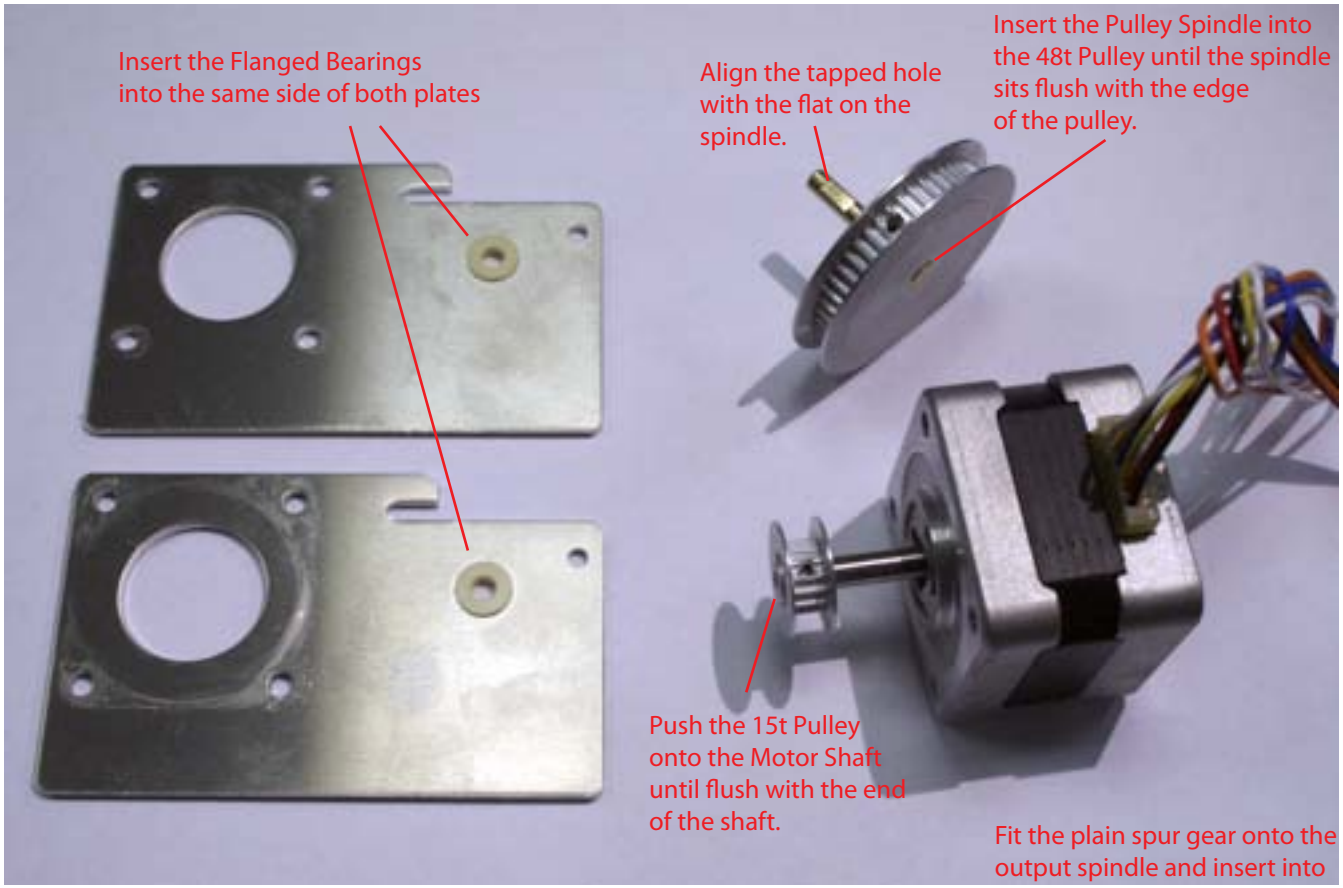
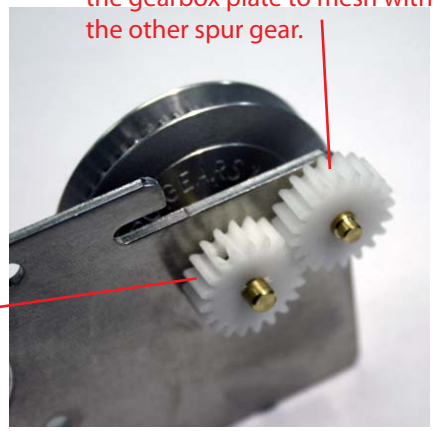
Product: Fetatrack 310S

Description: Transformer bracket assembly

Drawing Number: F310D101-201

Revision: 1.0





Instructions:

1. Remove the protective films from the 2 Gearbox plates.

2. Fit 1 flanged bearing into each gearbox plate. Both bearings should be inserted onto the same side of the plates.

3. Place the 15t timing pulley onto the shaft of the stepper motor. Align the edge of the pulley with the end of the motor shaft. Apply threadlock to the grub screw and tighten onto the shaft of the motor using a 1.5mm hex driver.

4. Insert the Pulley Spindle into the 48t Pulley until the endge of the pulley is flush with the edge of the chamfer on the spindle. Apply threadlock to the grub screw and tighten onto the flat of the spindle.

5. Slide 1 of the Gearbox Plates onto the Pulley Spindle through the Flanged Bearing.

6. Place the 22t Spur gear with tapped hole onto the Pulley spindle and tighten the grub screw onto the flat of the spindle.

Required Parts:		Qua.	Part No:
1.	310S Gearbox Plate F310D138	2	100-1165-00
2.	310S Output Gear Spindle F310D149	1	100-1167-00
3.	310S Pulley Spindle F310D150	1	100-1168-00
4.	Spur Gear Plain	1	900-0142-00
5.	Spur Gear M3 Tapped Hole	1	900-0143-00
6.	Timing Pulley 48t	1	900-0144-00
7.	Timing Pulley 15t	1	900-0145-00
8.	Bando Timing Belt 4mm	1	900-0146-00
9.	Flanged bearing ID 4.0mm OD 5.5mm	2	900-0147-00
10.	Stepper Motor	1	900-0021-00
11.	Spacer 6.35 x 8mm M4 Nickel	4	961-0082-00
12.	Screw M3x16 Csk St/steel A2	4	961-0004-00
13.	Screw M3x3 Grub St/Steel A2	3	961-0086-00

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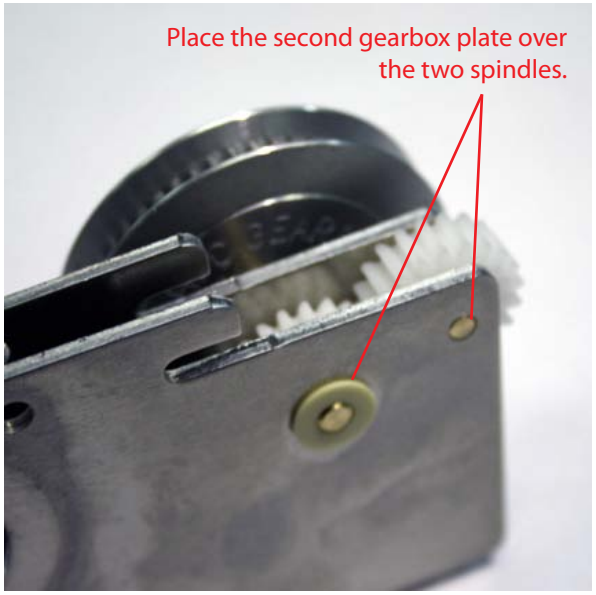
Product: Fetatrack 310S

Description: Gearbox assembly

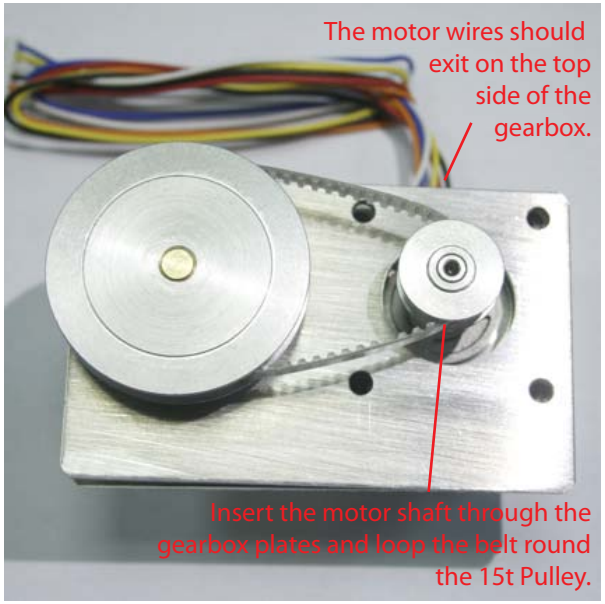
Drawing Number: F310AD100-101

Revision: 1.0



8.

9.



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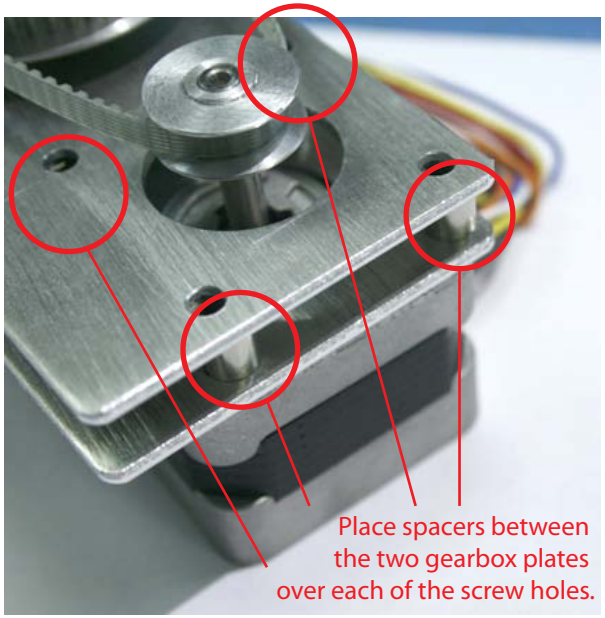

11.

Instructions:

7. Fit the 22t Plain spur gear onto the centre of the Output Gear Spindle and fit into the gearbox plate.

8. Place the second gearbox plate onto the spindles .

9. Loop the Bando Timing Belt around the 48t Pulley.

10. Feed the stepper motor shaft through the Gearbox plates and loop the Bando Timing Belt around the 15t Pulley.

11. Place the 4 Spacers between the two Gearbox Plates and align them with the motor mounting holes.

Required Parts:		Qua.	Part No:
1.	310S Gearbox Plate F310D138	2	100-1165-00
2.	310S Output Gear Spindle F310D149	1	100-1167-00
3.	310S Pulley Spindle F310D150	1	100-1168-00
4.	Spur Gear Plain	1	900-0142-00
5.	Spur Gear M3 Tapped Hole	1	900-0143-00
6.	Timing Pulley 48t	1	900-0144-00
7.	Timing Pulley 15t	1	900-0145-00
8.	Bando Timing Belt 4mm	1	900-0146-00
9.	Flanged bearing ID 4.0mm OD 5.5mm	2	900-0147-00
10.	Stepper Motor	1	900-0021-00
11.	Spacer 6.35 x 8mm M4 Nickel	4	961-0082-00
12.	Screw M3x16 Csk St/steel A2	4	961-0004-00
13.	Screw M3x3 Grub St/Steel A2	3	961-0086-00

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Product: Fetatrack 310S

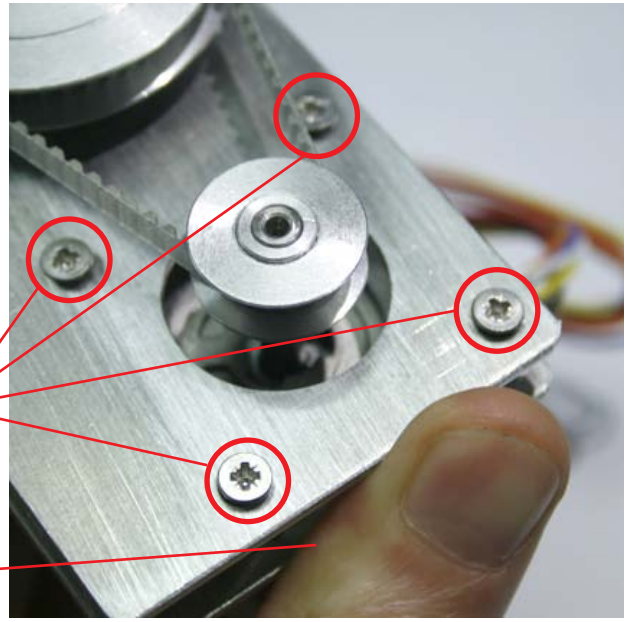
Description: Gearbox assembly

Drawing Number: F310AD100-201

Revision: 1.0

Apply a small drop of threadlock to the tip of the screw before inserting into the motor.

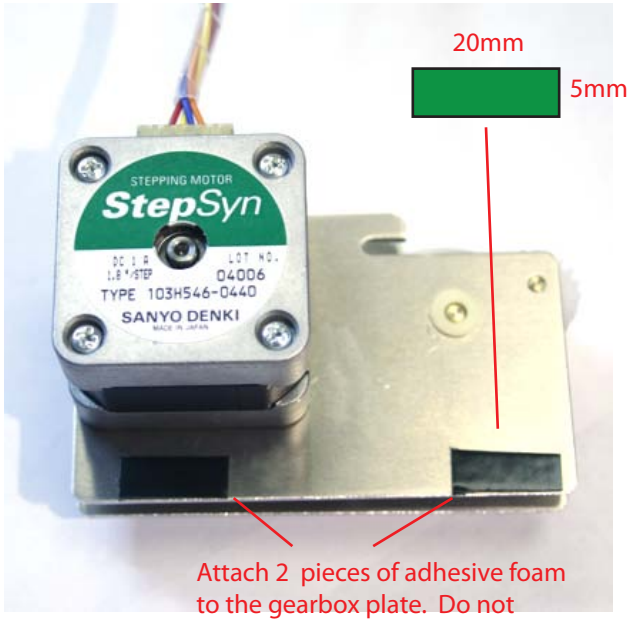
12.



Secure using M3x16 CSK screws.

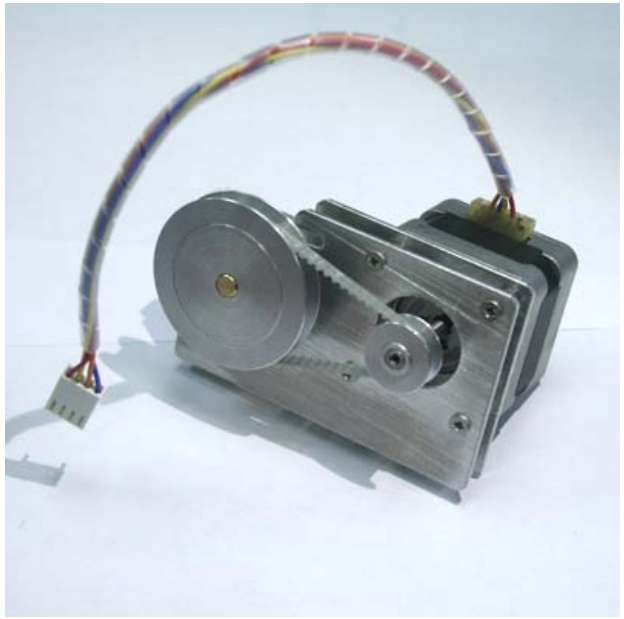
Apply pressure to the gearbox plates to tension the belt while tightening the screws.

13.



Attach 2 pieces of adhesive foam to the gearbox plate. Do not remove the backing on the exposed side.

14.



15.

Instructions:

12. Apply a drop of threadlock and insert M3x16 countersunk screws through each of the spacers and into the Stepper Motor - DO NOT tighten the screws.

13. Apply pressure to the motor and Gearbox Plates to tension the timing belt and tighten the screws in the Stepper Motor.

14. Cut 2 pieces of 2mm (green) adhesive foam to 20mm x 5mm and attach to the motor side gearbox plate at each end of the bottom edge (see diagram).

15. Trim and fit a 4 way molex crimp housing to the motor wires according to the drawing F310D165-101.

Required Parts:

		Qua.	Part No:
1.	310S Gearbox Plate F310D138	2	100-1165-00
2.	310S Output Gear Spindle F310D149	1	100-1167-00
3.	310S Pulley Spindle F310D150	1	100-1168-00
4.	Spur Gear Plain	1	900-0142-00
5.	Spur Gear M3 Tapped Hole	1	900-0143-00
6.	Timing Pulley 48t	1	900-0144-00
7.	Timing Pulley 15t	1	900-0145-00
8.	Bando Timing Belt 4mm	1	900-0146-00
9.	Flanged bearing ID 4.0mm OD 5.5mm	2	900-0147-00
10.	Stepper Motor	1	900-0021-00
11.	Spacer 6.35 x 8mm M4 Nickel	4	961-0082-00
12.	Screw M3x16 Csk St/steel A2	4	961-0004-00
13.	Screw M3x3 Grub St/Steel A2	3	961-0086-00

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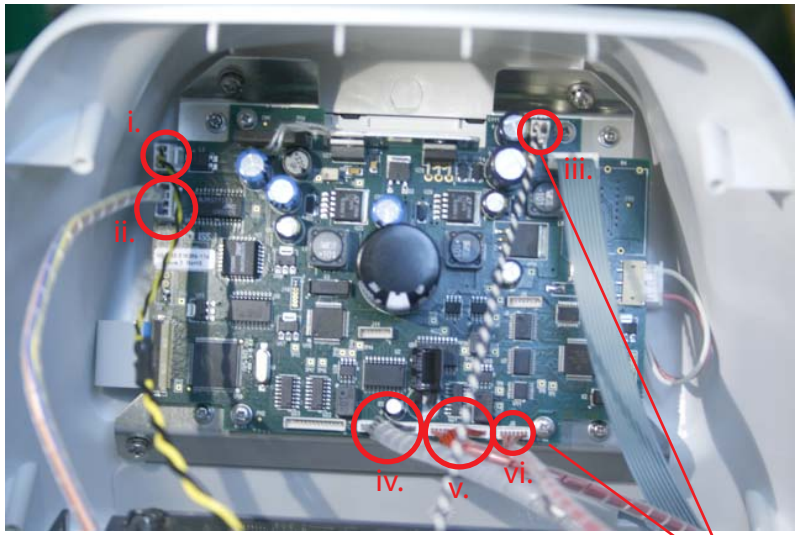
Product: Fetatrack 310S

Description: Gearbox assembly

Drawing Number: F310AD100-301

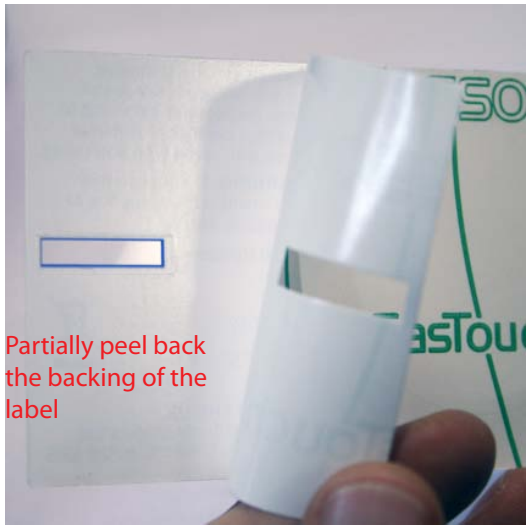
Revision: 1.0

1. Connect the Paper Out Cable



2. Connect Main PCB Cables

i. Power
ii. Motor
iii. Speaker
iv. Printhead
v. Input PCB
vi. Paper Out



5. Fit serial number onto label

Instructions:

1. Connect the Paper Out Cable to the Paper Out PCB.
2. Connect the Paper Out, Print Head, Stepper Motor, Speaker and Transformer Power cables to the Main PCB as shown.
3. Perform the Functional Test TP**
4. Issue the unit with the next available Serial Number, printing a Dymo Label with the serial number formatted to match the sample on the Serial Number Record Sheet.
5. Partially Peel Back the covering on the adhesive on the Rear Label to expose the serial number window. Fit the Serial Number Label to the rear of the window ensuring that it is central and level in the window.

Required Parts:

		Qua.	Part No:
1.	Enclosure Top Assembly	1	F310AD103
2.	Enclosure Bottom Assembly	1	F310AD106
3.	Paper Out Cable Assembly	1	F310D162
4.	Rear Label (Part of Label Set)	1	100-1171-00
5.	Screws M4x12 PT Pozi Pan	4	961-0081-00
6.	Serial Number Label (Dymo Print)	1	

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Product: Fetatrack 310S

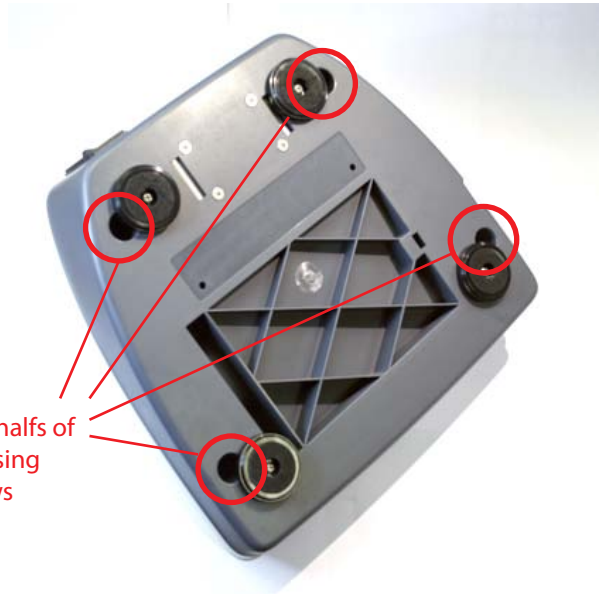
Description: Final assembly

Drawing Number: F310D107-101

Revision: 1.0

Align the Label so that it has an even gap all round in the recess.

6. Attach Rear Label



Secure the two halfs of the enclosure using M4x12 PT Screws

7. Secure the top of the enclosure to the base.

Instructions:

6. Ensure the Label recess on the rear of the Enclosure is clean and dry. Remove the adhesive coverings from the label and the serial number. Attach to the rear of the Enclosure.
7. Ensure that the Enclosure Top and Bottom are correctly seated together then secure using 4 M4x12 PT Pozi Pan Screws inserted from the base of the unit.
8. Safety Test the finished unit according to TP**.
9. Clean the exterior enclosure surfaces of the unit using Anti-Bacterial cleaner.
10. Clean the surface of the screen label using a clean lint free cloth and Anti-static cleaner.

Required Parts:		Qua.	Part No:
1.	Enclosure Top Assembly	1	F310AD103
2.	Enclosure Bottom Assembly	1	F310AD106
3.	Paper Out Cable Assembly	1	F310D162
4.	Rear Label (Part of Label Set)	1	100-1171-00
5.	Screws M4x12 PT Pozi Pan	4	961-0081-00
6.	Serial Number Label (Dymo Print)	1	

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Product: Fetatrack 310S

Description: Final assembly

Drawing Number: F310D107-201

Revision: 1.0