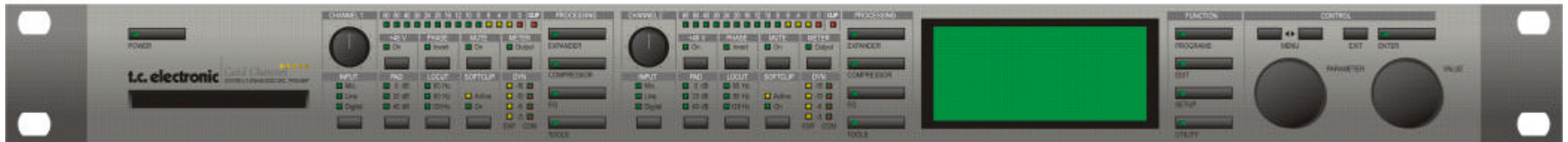


# GOLD CHANNEL

## Service Manual



**t.c. electronic**

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1st Edition, Gold Channel service manual

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# Introduction

The purpose of this manual is to support skilled technicians in repairing the Gold Channel.

The manual begins with a Quick Trouble Shooting table. Here, hints, advices and possible problems are described.

If the problem is more serious, the next step is to use the Built-in Test Program. With this program the problem can often be narrowed down to a specific section, channel or even component.

The next section consist of disassembly and exchange procedures. Please be aware of warranty rights before disassembling. Refer to the warranty card.

The Block diagram gives a quick overview of the signal flow.

Circuit description is a brief description of the circuits on the different boards.

LED error codes and Jumper settings are described on page 13.

Software Changes describes the changes from older software versions to newer versions.

Appendix contains Schematics, Part lists, PCB Layouts and service notes.

The schematics start with a main sheet, where sub sheets are shown as blocks. Even sub sheets might have sub sheets. In the schematics some connections have label names to help the reader. If a label name is framed, it means that it is "connected" to another sheet. Label names followed by the symbol "\*" mean that the signal is active low, i.e. RESET\*: the reset function takes place when the signal is low.

Part lists contain a column called TCcode/ Item no. Use this code/no. when ordering spare parts. If the field is empty; it means the component cannot be ordered separately.

The coordinates in the column Pos. refer to the PCB layout page. The column named Page refers to page no. in the schematics. In column comments a short explanation of the function is stated. For some components, alternative types are mentioned.

Some PCB layouts are made as gatefolds (fold-out page).

Finally appendix contains a list for mechanical parts.

This service manual does not contain schematics for the power supply module, because any attempt to repair the power supply module must be completed with some safety tests such as high voltage and EMC tests. Hence, it is strongly recommended that the entire power supply module is replaced in case of malfunction.



## Quick Trouble Shooting

Use this table to solve problems or find out what to do next. (check also the section; Software Changes, on page 14)

Symptom	Comments / Action:
Noise when using Mic. in	Update or replace the Mic amp board (P12905-x).
No output when using Mic. in	Please refer to service note no. 720 10 06 04 and 720 10 06 05 and 720 10 06 06 in appendix
Analog in/out fails	Update or replace the Mic amp board (P12905-x). Please refer to service note no. 720 10 06 04 and 720 10 06 05 and 720 10 06 06 in appendix  Try with other cables or read section "Built-in Test program". Note: When analog in/out is connected to unbalanced equipment, XLR pin 3 must be connected to pin 1.  Note: If IC35 or IC36 or IC41 is defective, they should be replaced with type MC33079 Note: In the Built-in test program it says "Meter must show -12dB.." However, if the meter only shows -16dB, it is also OK.
Cannot turn power off with power switch at front	The switch must be pressed for at least 1 second to turn off power. The delay provide unintended power off during recording.
Blank display. Cannot run application software.	Enter the SOFTWARE BOOT menu, by keeping ENTER button pressed at power on. Dial option to INFO, press ENTER to check the application software. If corrupted; load the application software again. Or try to run the self test prom, see section "Built-in Test program".
Lines or spots in display Backlight is blinking	Make sure no external equipment is influencing the display, i.e. magnetic fields, hot fields. If the picture is still distorted, replace the display. If the backlight is bad or blinking; check the soldering on the display itself, especially the two connections going to the upper part of the display.
Message: "User Preset Error, Cleared All Presets"	Appears normally at first power on after RESET. All Presets are set to factory default!
Bad LED's, keys or Parameter/Value wheel.	See section "Built-in Test program".
Digital or Midi in/out fails	Try with other cables or read section "Built-in Test program". Digitech pedals are incompatible.
External Control In fails	Try with other cables or read section "Built-in Test program".

Check also the section; Software Changes, on page 14

## Software Boot Menu

To access the Software Boot Menu; press the ENTER button while powering on.

Option	Description
Load PCMCIA	Load Application or Boot software directly from PCMCIA card.
Load Link	Not implemented. Load from PCMCIA card instead.
Save Link	Not implemented.
Reset	Master Reset. Run this command and all global and preset settings are reset!!!
Info	Display the Device type, the Serial no. and software version
Start	Start the loaded software

## Built-in Test Program

The Gold Channel has a Built-in Test Program. To run the program; Press the PROGRAM button while powering on. Select RUN TEST PROGRAM and press ENTER. Follow the instructions on the display. To leave the Built-in Test Program; turn off the power.

### Gold Channel Built-in-Test Program v3.09 has following tests:

TEST	Function / Comments
Keys	Tests the keys at the front panel one by one. If a key hasn't been pushed a warning message will appear when leaving the test
IN knobs	Tests the function of the Input potentiometers
PARAM+VALUE	Tests the steps of the encoders. Each step is counted at the display, if not; check soldering at the encoder of the front connector.
LED's	Tests the LED's at the front panel one by one. If no light; check soldering at the LED and at the flat cables between the front boards.
Display	Tests all dots in the display. If any missing; replace the display. If the backlight is bad or blinking; check the soldering on the display itself, especially the two connections going to the upper of the display.
Analog I/O	A sine wave is generated on both analog outputs. When connected to one of the analog inputs the display reads OK if the level is correct. In this way a problem might be narrowed down to a specific input or output. The levels can be checked at 60dB, 40dB, 20dB and 0dB PAD. Note: On the display it says "Meter must show -12dB.." However, if the meter only shows -16dB, it is also OK. Note: In case of defective IC35, IC36, IC41 they should be replaced with type MC33079
Digital I/O	A digital signal is generated on the digital output. When connected to the digital input the display reads OK if the level is correct.
Midi I/O	A midi signal is generated on output. When connected to the input the display reads OK if the signal is correct. The midi signal from input is sent on to MIDI THRU. If not OK; try with another midi cable or check soldering and components in the midi circuit.
Pedal socket	Tests the status on the EXTERNAL CONTROL IN. When no jack plug is inserted the result must read "Not OK". If a jack plug is inserted and the tip of the plug is connected to ground, the result must read OK.
PCMCIA	Tests whether programming, reading or deleting are OK. NOTE: All data on PCMCIA card will be destroyed.
Battery	Tests the DC voltage at the Back up battery. If low; check battery voltage with a multimeter and check also the standby current by measuring the voltage across R27; max. 20mV (numerical value). If the voltage is higher; replace IC4. When replacing battery, please refer to section "exchange of battery"
System.	Tests the MPU, DSP, DARC, SOUND RAM to some extent.

# Disassembly Procedure for Main Board

1. **Turn Off Power and Disconnect Power Cord.**
2. Loosen 5 screws, see fig. 1, and remove the top cover.
3. Disconnect front connector, J1, see fig. 2.
4. Remove screws at MT7, MT8, MT2 on the main board, see fig. 2.
5. Remove 9 screws at the XLR connectors on the back panel, see fig. 3.
6. Remove the screw at the SPDIF in/out connector, see fig. 3.
7. Remove the screws at the ADAT in/out connector, see fig. 3.
8. Remove the jack nut at the EXT. IN connector, see fig. 3.
7. Push the main board into the front profile a little to free the connectors from the back panel, then lift out the board.
9. Desolder the wires from power supply - see fig. 7.

Fig. 1: Screws at top lid

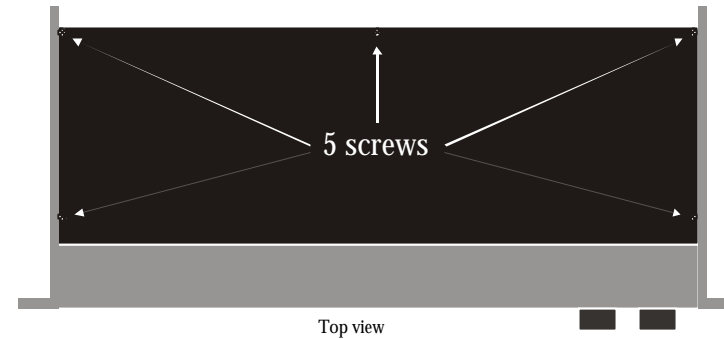


Fig. 2: Screws and front connector at main board

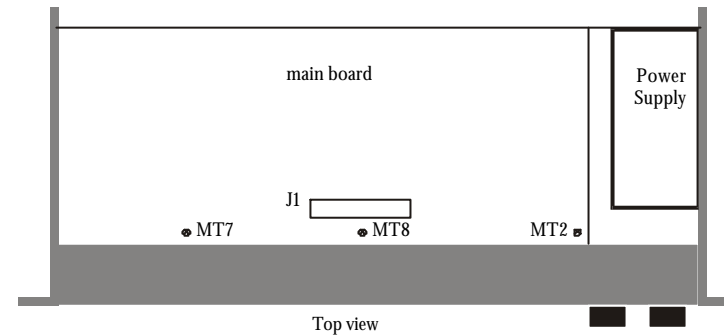
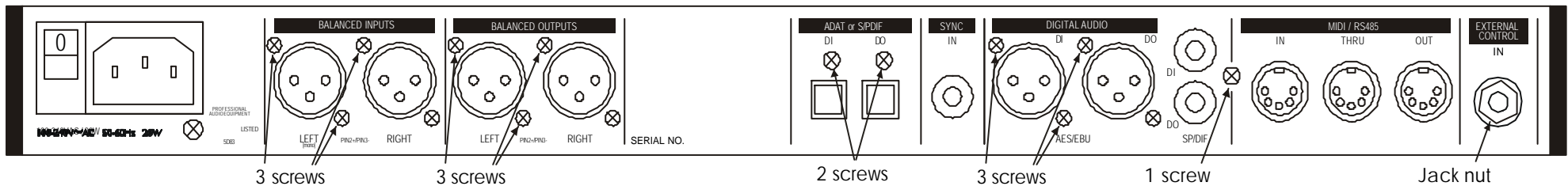


Fig. 3: Screws at back panel.





## Disassembly Procedure for Front Section

1. **Turn Off Power and Disconnect Power Cord.**
2. Loosen 5 screws, see fig. 1, and remove the top cover.
3. Disconnect front connector J1, see fig. 2.
4. Remove side panels by unscrewing 4 screws at each side, see fig. 4.
9. Use the ribbon cable to lift up the front board assembly a little and then slide it out gently at the end with PARAMETER and VALUE encoders. The shafts of the encoders can just pass the profile in this way.

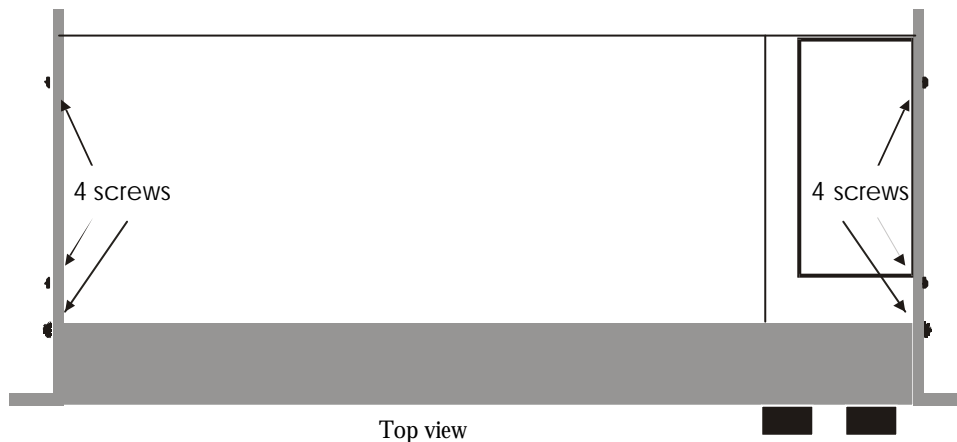


Fig. 4: Screws at side panels.

5. Remove the front section.
6. Pull off the PARAMETER and VALUE knobs by hand.
7. Place the front profile horizontally with the buttons facing down. Place the profile on some stand-off to avoid any pressure on the push buttons.
8. At the end with the VALUE knob, pull out the two white PCB guides. Opening up the profile a little will lighten the pressure at the PCB guides, see fig. 5.

Note: All push buttons are loose in the profile after removing the guides.

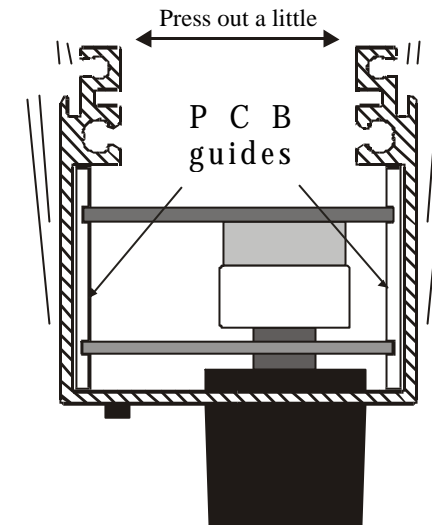


Fig. 5: Front profile shown from the VALUE knob end.

## Exchange of Power Supply Module

1. **Turn Off Power and Disconnect Power Cord.**
2. Loosen 5 screws, see fig. 1, and remove the top cover.
3. Disconnect the front connector J1, see fig. 2.
4. Loosen the front section by removing two small screws at each side panel, see fig. 6.

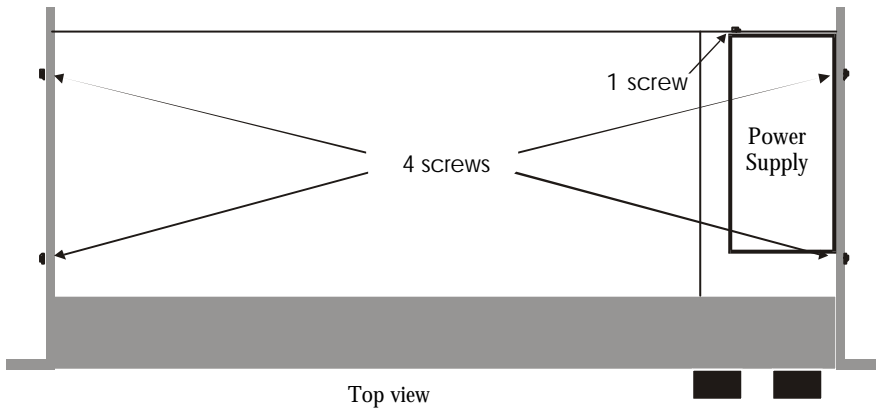


Fig. 6: Screws at side panels.

5. Press out the side panels a little and gently push out the front section.
6. At the main board, desolder all power supply wires.
7. Dismount the power supply by removing the screw, just below the mains plug at the back panel, see fig. 6.
8. Mount the new power supply with the screw at the back panel.

8. Solder the power wires into the main board - see fig 7.  
Make sure the wire ends don't short circuit to the bottom panel!

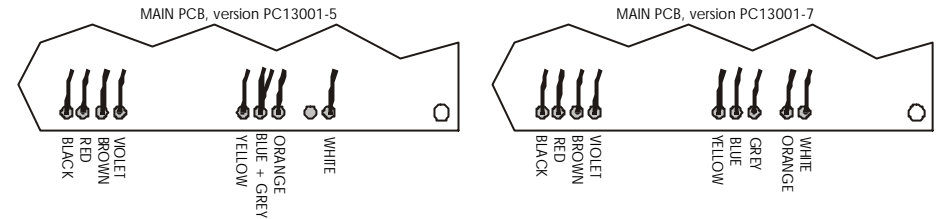


Fig. 7: Placement of power wires

10. Remount the front section with two screws in each side panel.  
Make sure the edge of the bottom panel is pressed into the front profile.
11. Connect the front connector J1.
12. Mount the top lid with five screws.
13. Connect power cord and turn on power.

If the unit has a malfunction; turn off power and check the following:

- Is the front connector mounted correctly?
- Are the power supply wires correctly placed?
- Do the wire ends short circuit to the bottom panel?

## Exchange of Battery

**CAUTION:**

DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER. DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURERS INSTRUCTIONS.

**VARNING:**

Felaktigt batteribyte kan medföra fara för explosion. Använd därför endast samma typ eller likvärdig typ enligt apparattillverkarens rekommendation.

Kassera förbrukade batterier enligt tillverkarens anvisning

**ADVARSEL:**

Lithiumbatteri. Eksplosionsfare ved fejlagtig håndtering. Må kun udskiftes med batteri af samme fabrikat og type.

Lever det brugte batteri tilbage til leverandøren.

Recommended battery type: CR2032-FT-4-2.

TC stock no. (TCcode) for battery: 342 0000 11

## Exchange procedure

1. **Turn Off Power and Disconnect Power Cord.**
2. Loosen 5 screws, see fig. 1, and remove the top cover.
3. Desolder the old battery by warming up each terminal one by one. Avoid any short circuit of the terminals. Be careful not to damage the wiring on the board.
4. Insert new battery and solder the terminals one by one. Avoid any short circuit of the terminals.
5. The voltage measured directly across the terminals of the new battery should be higher than 3.0VDC.
6. Do not discard the old battery. Hand it over to a recycling company or your dealer.

# Block Diagram

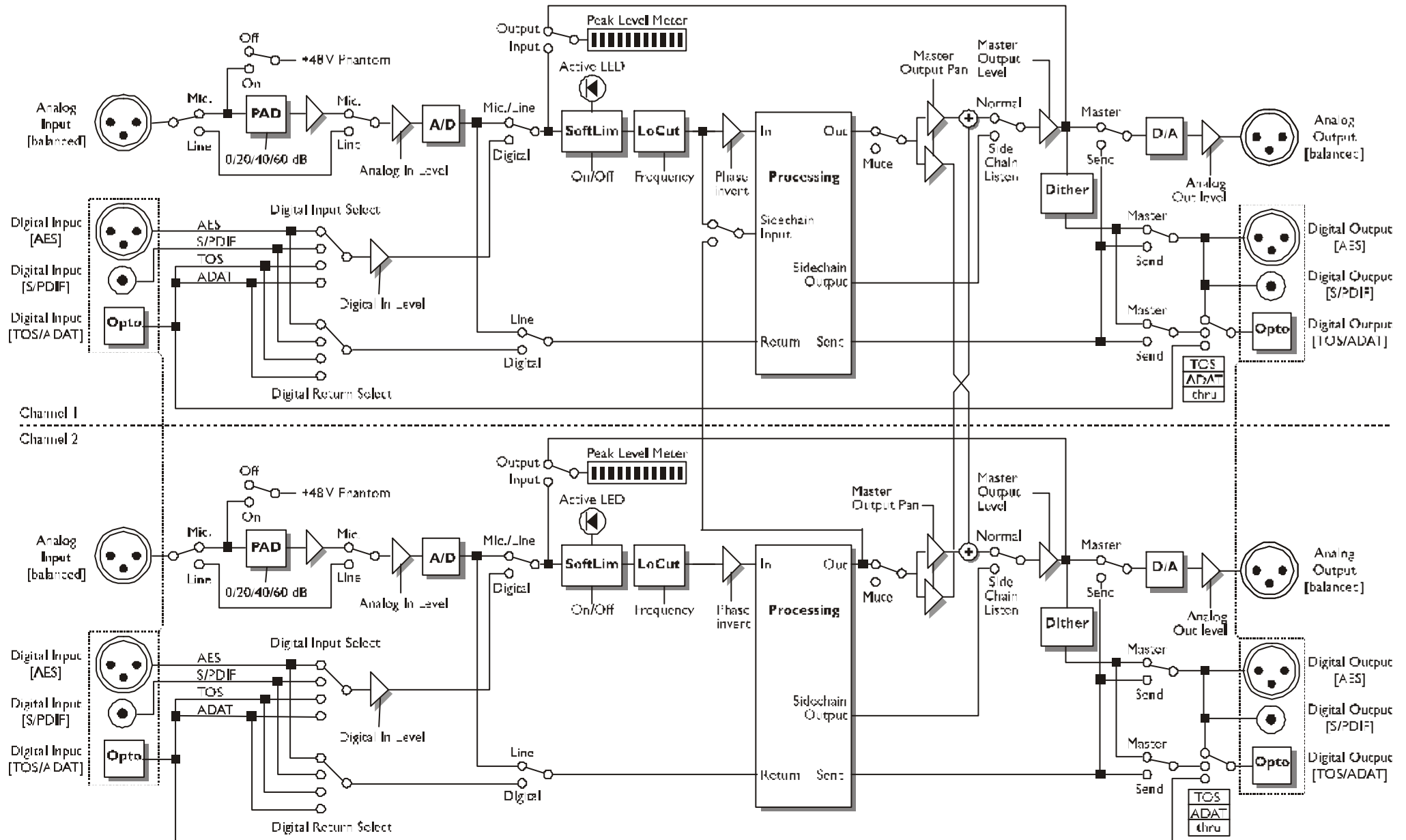


Fig. 8: Block diagram for the signal flow in the Gold Channel.

## Circuit Description

The Gold Channel consist of a front, a digital, an analog and a power supply section. Here is a brief description of the sections:

**Front section** consist of three boards and a display, all placed in the front profile. The big board has two matrix circuits; one for LED's and one for keys. The two encoders are scanned by IC20 and the two pots are connected directly to the MPU on the main board. The EEPROM contains the serial no.

The small boards are for LED's and key switches.

**Digital section** is placed mainly in the middle and in the left side of the main board.

This section contains the Reset, MPU, SRAM, DSP, DARC, Sound RAM, FLASH, Interfaces and PLL circuit.

Reset controls the MPU and the DA.

The Software for MPU is loaded into the FLASH. The MPU controls DSP, SRAM, Jaida, Front, MIDI, External Control In and analog gain settings.

The major task for the DSP is to "calculate" sound. It also generates the 80MHz clock for the DARC chip.

The DARC chip controls the sound data to/from; DSP, Sound RAM, digital in/outputs, Word clock Input and AD/DA converters.

Interface for MIDI and External Control In consist almost of discrete components.

The interface for the front has an integrator, which converts a 3.3kHz square wave to a negative DC voltage for the display contrast. By changing the duty cycle of the square wave the DC voltage and thereby contrast will also change. An attenuator allows the MPU to measure the contrast voltage.

The PLL circuit (placed on a separate board) makes a very stable frequency at 256 x sample rate, this frequency is divided down to 64 x sample rate and to 1 x sample rate by the DARC. The PLL has its own power regulation.

**Analog section** is placed mainly on the right side of the main board.

The analog input is balanced, thus pin 3 should be connected to pin 1 when used with unbalanced equipment.

Input levels are controlled by digital potentiometers. These potentiometers are located in a single chip, which controls both the two analog input levels and the two analog output levels.

The A/D converter is a 24bit converter . The A/D and D/A converters have also a separate power regulation.

The D/A converter is also 24bit. A DC voltage is applied to the left & right signal output at the converter.

After the D/A comes a 2nd order filter, then the output level and then a 1st order filter.

An electronic balanced circuit perform the output stage. Again XLR pin 3 should be connected to pin 1 when used with unbalanced equipment.

The Mic. amp is placed on a separate board. This board comes in two versions; P12905-3 and P12905-5. If the board version is P12905-3, make sure it is updated according to the service notes in appendix.

**Power supply section** consist of a separate Power Supply Module and some regulation circuits on the main board.

One regulation circuit has an electronic switch for the +/-15V. The electronic switch for the +5V is mounted inside the Power Supply Module. The switches are controlled by the Stand By circuit. The Stand By circuit is supplied from a separate power wire from the Power Supply Module.

Phantom power is fed to the Mic. amp board. Here it can be switched on or off.

This service manual does not contain schematics for the Power Supply Module, because any attempt to repair the module must be completed with some safety tests such as high voltage and EMC test. Hence it is strongly recommended that the entire Power Supply Module is replaced in case of malfunction.

**Note:** The Power Supply module for the Gold Channel is unique due to the phantom power.

## LED Error Codes

LD1	LD2	LD3	Code explanation	Comment
off	off	off	Normal	
on	on	on	Checksum error in boot software	Reload boot software

LD4 has two functions: 1: Show power on. 2: Define clean power for IC33 pin16.

## Jumper settings

### Main board version PC13001-5 and PC13001-7:

JTAG is unused. JP3, JP4, JP5 & JP6 controls boot mode:

Boot from Flash  
(normal mode)



Boot from PCMCIA  
(for service only)



Booting from PCMCIA requires a PCMCIA card loaded with special boot software.

Contact TC Electronic for further information.

## Software Changes

### Software changes from 1.05 to 1.07:

1. In mode "1->2 pre" the ch2 CLIP LED doesn't follow ch1's CLIP LED. Corrected.
2. Can't read preset cards from 1.02 and before. Corrected.
3. "Number of presets to be copied" shows erroneous number (when cardbank number + number to be copied is over cardbanksizesize). Corrected.
4. V.1.03 and after can't receive bulk dump of pre 1.03 userbank. Corrected.
5. MIDI bulkdump speed reduction. Corrected.
6. Changing input selection to DIGI shouldn't change from SYNC. Corrected.
7. Sync, Dither, & Opt. Status should not be recalled in total recall. Corrected.
8. Midi Controller map for Gold Channel is implemented:  
cc10 Input Channel 1 Mute , 0..63 Unmute, 64..127 Mute  
cc11 Input Channel 2 Mute , 0..63 Unmute, 64..127 Mute  
cc12 Input Channel 1 OutLevel, 0..127 Maps to -31dB to +6dB  
cc13 Input Channel 2 OutLevel, 0..127 Maps to -31dB to +6dB  
  
Above controllers are receive only, they are not send to MIDI out on the Gold Channel.

### Software changes from 1.04 to 1.05:

1. Setup Win, Input Ch.2: ADAT channel shown when routing ch.1 to 2 fixed
2. Reset Menu and User Info layout brush-up.
3. Copy bank to/from card: Offset of 100 - fixed

### Software changes from 1.03 to 1.04:

1. POST Insert: Can't enter insert-edit-window - fixed
2. EditPage: Unlinking with Enter sets channel 2 effect on. If it's done with the value dial the effect returns to the state it had before it was linked - fixed
3. Number of presets to be copied can become negative if no card is inserted - fixed

### Software changes from 1.02 to 1.03:

1. Different minor adjustments and bug -fixing in the user-interface displays.
2. Four double cursor-positions in the Routing display (@ two channel/normal sample rate mode) has been added, to enable inserting two blocks at a time. This is done to make it possible to quickly set up a stereo routing.
3. Softlim on/off parameter in Advanced EQ is renamed to Softclip on/off.
4. Key sequence: Analog gain change -> Menu left -> Exit, results in blank screen. Fixed
5. Initial display contrast is not the same as present setting. Fixed
6. After total recall the parameter "Proc. Delay" defaults to 1.1ms not the actual setting. Fixed
7. At the Signal page it is now possible to change the Status Bit output between AES/EBU and S/PDIF. Place cursor at the output block, use Value wheel to change. When AES/EBU is above S/PDIF in the output list, the Gold Channel output professional status bits, and when S/PDIF is on top of AES/EBU consumer status bits are output.
8. Clicking when bypassing the EQ and Dynamic EQ has been fixed.
9. Clicking when adjusting the EQ has been fixed.
10. Clicking at PAD changes has been fixed.
11. Software boot info screen now includes software version.
12. At MIDI dumps some displays wasn't updated properly. Fixed



# Technical Specifications

## ANALOG LINE INPUT

Connectors:	XLR balanced (pin 2 hot)
Impedance (Balanced):	6.8 kOhm
Max. Input Level (Balanced):	22 dBu
Sensitivity, @ 12 dB headroom (Balanced):	-10 dBu to 10 dBu
Dynamic Range (Unweighted):	> 103 dB
THD+N:	< -90 dB (0.003 %) @ 1 kHz, -3 dBFS
Frequency Response:	20 Hz to 20 kHz, +/-0.3 dB
Crosstalk	
(Line to Mic Pad 0), worstcase:	< -65 dB, 20 Hz to 20 kHz
(Line to Line or Mic. Pad 20/40/60), worstcase:	< -85 dB, 20 Hz to 20 kHz
Common Mode Rejection, RS = 40 Ohm:	> 60 dB @ 50/60 Hz & > 70 dB @ 1 kHz
A to D Conversion:	24 bit (1 bit, 128 times oversampling)
A to D Delay:	0.8 ms @ 48 kHz

## ANALOG MIC INPUT

Connectors:	XLR balanced (pin 2 hot)
Impedance (Balanced):	6.8 kOhm
Phantom supply:	48V +/-10%, pin 2 & 3 through 6.81 kOhm
Max. Input Level (Balanced), Pad 0/20/40/60:	0: -40 dBu, 20: -18 dBu, 40: 2 dBu, 60: 22 dBu
Sensitivity @ 12 dB headroom (Balanced):	0: -82 dBu to -52 dBu, 20: -52 dBu to -30 dBu, 40: -30 dBu to -10 dBu, 60: -10 dBu to 10 dBu
Dynamic Range, RS = 200 Ohm (Unweighted):	0: > 56 dB, 20: > 88 dB, 40: >98 dB, 60: > 100 dB
Noise Figure, Pad 0, RS = 200 Ohm:	< 1.8 dB
THD+N:	0: < -80 dB, 20/40/60: < -92 dB, -3 dBFS
Frequency Response:	0: 20 Hz to 20 kHz, +/-0.9 dB, 20/40/60: 20 Hz to 20 kHz, +/-0.3 dB

## Crosstalk

(Mic., all Pad to Mic., Pad 0), worstcase:	< -66 dB, 20 Hz to 20 kHz
(Mic., all Pad to Mic., Pad 20/40/60), worstcase:	< -82 dB, 20 Hz to 20 kHz

Common Mode Rejection, RS = 200 Ohm:	> 60 dB @ 50/60 Hz & > 70 dB @ 1 kHz
A to D Conversion:	24 bit (1 bit, 128 times oversampling)
A to D Delay:	0.8 ms @ 48 kHz

## ANALOG OUTPUT

Connectors:	XLR balanced (pin 2 hot)
Impedance:	40 Ohm (Active transformer)
Max. Output Level:	22 dBu (Balanced)
Full Scale Output Range:	-10 dBu to 22 dBu
Dynamic Range, 20 Hz to 20 kHz:	> 100 dB (Unweighted) @ Output Level > 6 dBu
THD+N, 20 Hz to 20 kHz:	-86 dB (0.005%) @ 1 kHz, -6 dBFS

Frequency Response:	12 Hz to 20 kHz, +/-0.6 dB
Crosstalk:	< -80 dB, 10 Hz to 20 kHz, typ. < -100 dB @ 1 kHz
D to A Conversion:	24 bit (1 bit, 128 times oversampling)
D to A Delay:	0.57 ms @ 48 kHz

## DIGITAL INPUT AND OUTPUT

Connectors:	XLR (AES/EBU), RCA Phono (S/PDIF), Optical (Tos-link, ADAT)
Formats:	AES/EBU (24 bit), S/PDIF (20 bit), EIAJ CP-340, IEC 958, EIAJ Optical (Tos-link), ADAT Lite pipe
Output Dither:	HPF TPDF dither 8-24 bit
Word Clock Input:	RCA Phono, 75 Ohm, 0.6 to 10 Vpp, 30 – 50 kHz
Sample Rates:	44.1 kHz, 48 kHz
Processing Delay:	0.2 ms @ 48 kHz
Frequency Response DIO:	20 Hz to 23.9 kHz +/-0.01/-0.1 dB @ 48 kHz

## PCMCIA INTERFACE

Connector:	PC Card, 68 pin type I cards
Standards:	PCMCIA 2.0, JEIDA 4.0
Card Format:	Supports up to 2 MB SRAM

## CONTROL INTERFACE

MIDI:	In/Out/Thru: 5 Pin DIN
GPI, Pedal, Fader:	1/4" phone jack

## GENERAL

EMC Complies with:	EN 55103-1 and EN 55103-2 FCC part 15, Class B CISPR 22, Class B
Safety Certified to:	IEC 65, EN 60065, UL 1419 and CSA E65
Operating Temperature:	32° F to 122° F (0° C to 50° C)
Storage Temperature:	-22° F to 167° F (-30° C to 70° C)
Humidity:	Max. 90 % non-condensing
Finish:	Anodized aluminum front, Plated and painted steel chassis
LCD:	56 x 128 dot graphic LCD-display
Dimensions:	19" x 1.75" x 8.2" (483 x 44 x 208 mm)
Weight:	5.5 lbs. (2.5 kg)
Mains Voltage:	100 to 240 VAC, 50 to 60 Hz (auto-select)
Power Consumption:	< 20 W

Backup Battery Life: > 10 years  
Warranty Parts and Labor: 1 year

Note: Due to continuous development and standardization all specifications are subject to change without notice

## Appendix list: Service notes, Schematics, Part lists, PCB Lay-out

The list below show the contents and the order of appendix.

Service note no. 720 1006 04	1 page
Service note no. 720 1006 05	2 pages
Service note no. 720 1006 06	1 page
Schematic for Main board ver. PC13001-7	14 pages
Part list for Main board ver. PC13001-7	14 pages
PCB lay-out for Main board ver. PC13001-7	2 pages
Schematic for Main board ver. PC13001-5	14 pages
Part list for Main board ver. PC13001-5	15 pages
PCB lay-out for Main board ver. PC13001-5	2 pages
Schematic for Front boards ver. PC12506-2	5 pages
Part list for Front boards ver. PC12506-2	5 pages
PCB lay-out for Front boards ver. PC12506-2	1 page
Schematic for Mic Amp board ver. PC12905-5	3 pages
Part list for Mic. Amp board ver. PC12905-5	5 pages
PCB lay-out for Mic. Amp board ver. PC12905-5	1 page
Schematic for Mic Amp board ver. PC12905-3	3 pages
Part list for Mic. Amp board ver. PC12905-3	4 pages
PCB lay-out for Mic. Amp board ver. PC12905-3	1 page
Schematic for PLL board ver. PC12903-3	3 pages
Part list for PLL board ver. PC12903-3	2 pages
PCB lay-out for PLL board ver. PC12903-3	1 page

Part list for mechanical parts in Gold Channel	2 pages
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