STEREO IMPACT

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag, 6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : SWEA/STE-D	**SubAssembly :**
Component/Part Number:	**Serial Number:** FM2
Originator: David Curtis	**Organization:** U.C. Berkeley
Phone : 510-642-5998	**Email :** dwc@ssl.berkeley.edu

Failure Occurred During (Check one √)

v Functional test | Qualification test | S/C Integration | Launch operations

Environment when failure occurred:

Ambient | Vibration | Shock | Acoustic
Thermal | v Vacuum | Thermal-Vacuum | EMI/EMC

Problem Description

During SWEA/STE-D FM2 Calibrations Anode 11 (counting from zero) started counting well above the expected counts (it had been functioning properly). Counts from the test pulser are now always above normal, while counts from the MCP are sometimes high and sometimes zero. When no stimulus is applied, there are no counts. This channel had been working correctly previously.

Shortly before Anode 11 started mis-behaving there was an incident with the instrument MCP high voltage. While ramping up the MCP voltage the housekeeping reported the MCP high voltage pegged at the top of range, which is higher than the supply can generate. In response the supply was shut down. Later the supply came up normally and the preamp seemed to work fine for a while, then failed. The anomalous HV reading could well be a telemetry hiccup and the timing a coincidence. Note that the preamps are well protected against high voltage discharge.

Analyses Performed to Determine Cause

The unit was disassembled and it the pedestal electronics was tested by itself, which worked fine. SWEA was then re-attached to the pedestal via an extender and the signal from Anode 11 was monitored, which showed excessive counts coming at up to ~1MHz; it looked like some kind of ringing or feedback. SWEA was disassembled and the electronics boards were inspected (HV, preamp, and HV coupling boards), including the parts, wires, traces, and connectors. Nothing was found. The parts on the HV coupling board in the Anode 11 signal chain were tested with an ohm-meter, and found to be OK. The input impedance of the Anode 11 preamp looked OK (diodes to ground). The preamp board was tested by itself, and Anode 11 did not respond correctly to test pulser input (no counts). The preamp board power consumption was also anomalously high.

See below for more.

Corrective Action/ Resolution

v Rework | Repair | Use As Is | Scrap

Anode 11 preamp (U12 on the preamp board) and decoupling capacitor (C12 on the HV Coupling board) were replaced with fresh parts from CESR stock (same lot). The parts were sent to GSFC for failure analysis.

Date Action Taken:_____ **Retest Results**:_____

Corrective Action Required/Performed on other Units Serial Number(s): _____

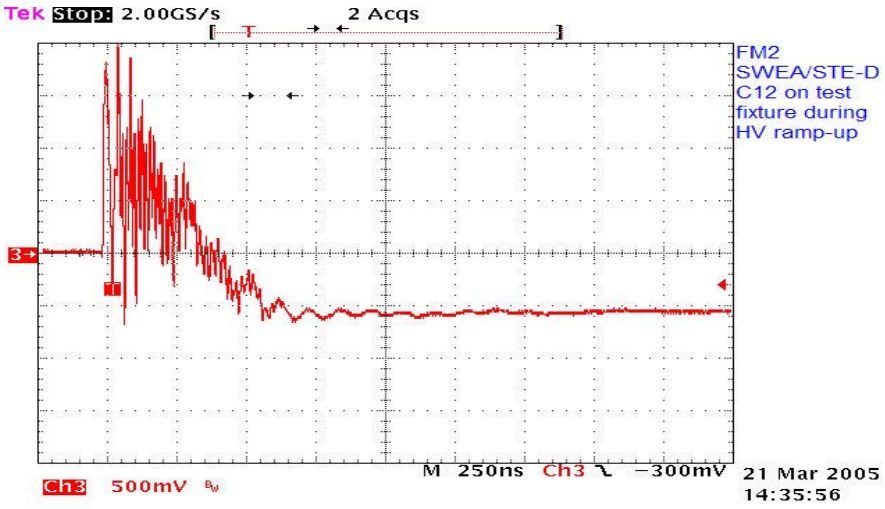
Closure Approvals

Subsystem Lead: _____ Date:_____
IMPACT Project Manager: _____ Date _____
IMPACT QA: _____ Date:_____
NASA IMPACT Instrument Manager: _____ Date:_____

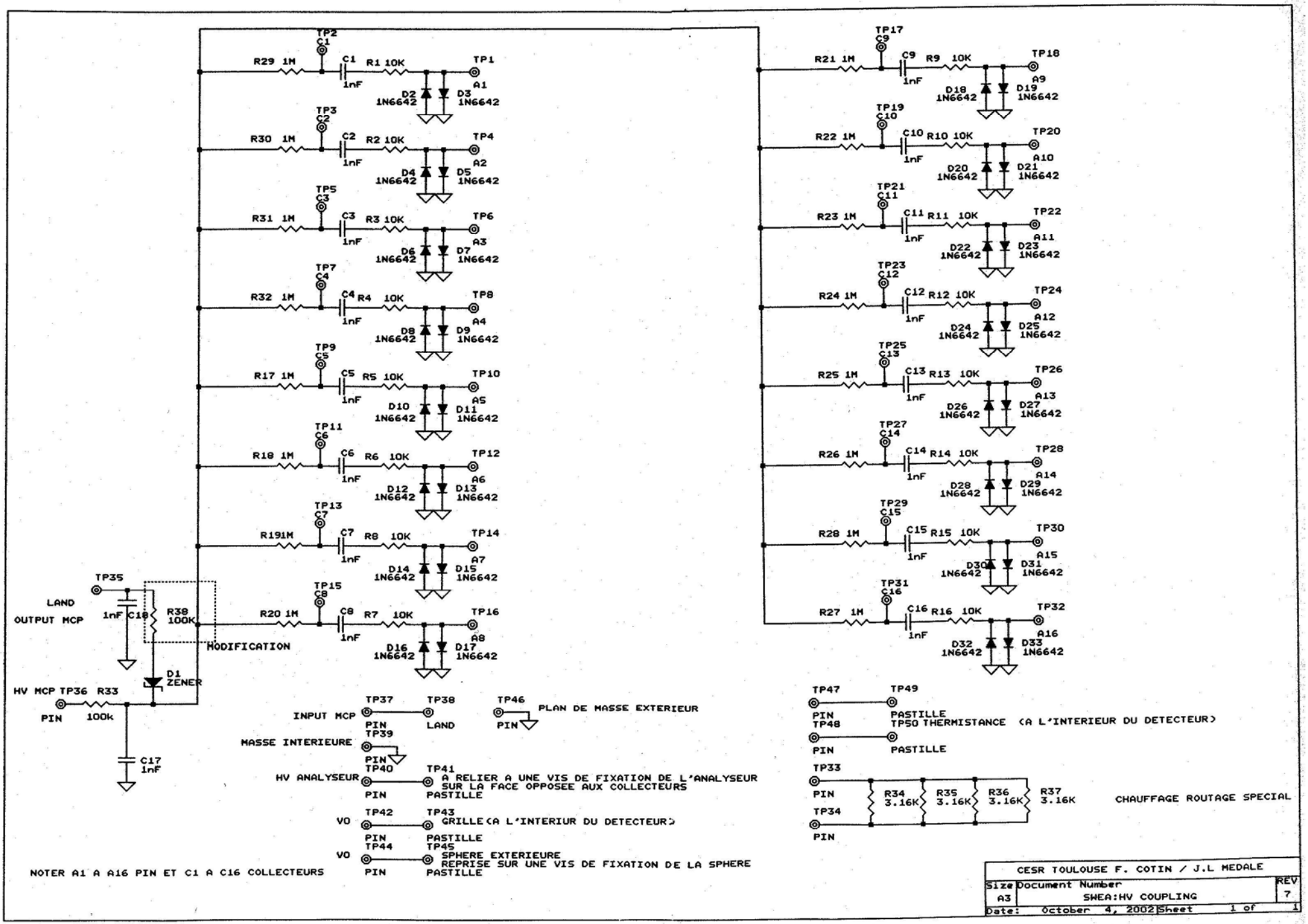
Analysis, continued

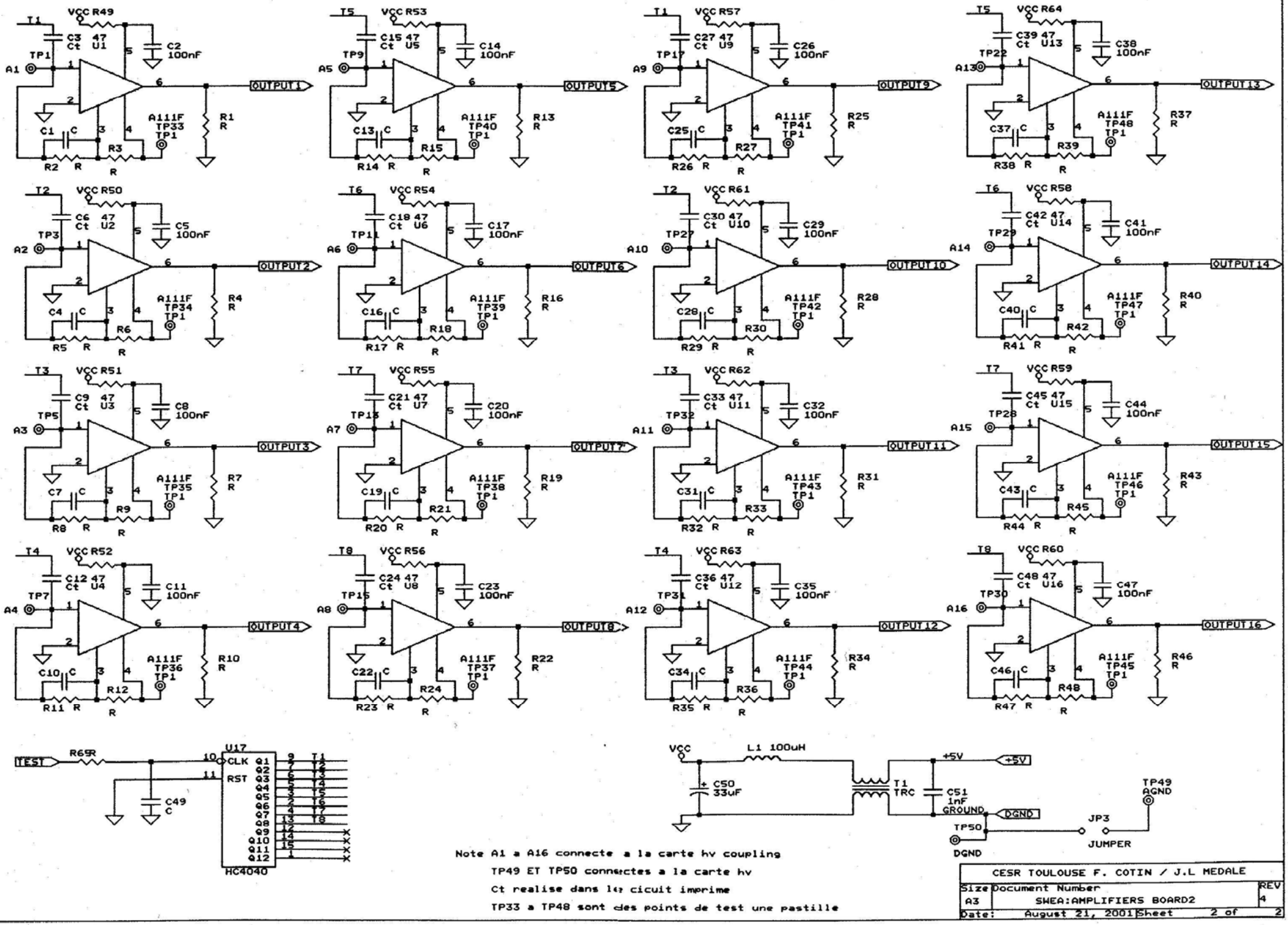
Anode 11 preamp (U12 on the preamp board) was replaced with a fresh part from CESR stock (same lot). The parts was sent to GSFC for failure analysis. The FM2 SWEA was re-assembled and returned to test. It worked fine on the bench (but MCP High Voltage cannot be applied except in vacuum), and was returned to the calibration chamber. When the MCP high voltage was again ramped up (in vacuum) the Anode 11 preamp again failed (no counts from either the test pulser or the MCP).

The unit was again disassembled and diagnosed. U12 was again found to be failed. The rest of the parts in the signal chain for all amplifiers were measured and found to be nominal. The decoupling capacitor for channel 11 (C12 – see schematic below) was removed from the decoupling board and tested under bias. It was found that the part exhibited fast transients, particularly while the bias voltage is being ramped up. Tranients exceeded 2 volts in spite of protection diodes in the test circuit similar to those in the instrument, indicating the transient is faster than the diode can react. This could be the cause for the U12 failures.



C12 and U12 were replaced with spares from CESR flight stock.


TP2 C1 R29 1M C1 1nF R1 10K TP1 A1 D2 1N6642 D3 1N6642
TP3 C2 R30 1M C2 1nF R2 10K TP4 A2 D4 1N6642 D5 1N6642
TP5 C3 R31 1M C3 1nF R3 10K TP6 A3 D6 1N6642 D7 1N6642
TP7 C4 R32 1M C4 1nF R4 10K TP8 A4 D8 1N6642 D9 1N6642
TP9 C5 R17 1M C5 1nF R5 10K TP10 A5 D10 1N6642 D11 1N6642
TP11 C6 R18 1M C6 1nF R6 10K TP12 A6 D12 1N6642 D13 1N6642
TP13 C7 R191M C7 1nF R8 10K TP14 A7 D14 1N6642 D15 1N6642
TP15 C8 R20 1M C8 1nF R7 10K TP16 A8 D16 1N6642 D17 1N6642
TP17 C9 R21 1M C9 1nF R9 10K TP18 A9 D18 1N6642 D19 1N6642
TP19 C10 R22 1M C10 1nF R10 10K TP20 A10 D20 1N6642 D21 1N6642
TP21 C11 R23 1M C11 1nF R11 10K TP22 A11 D22 1N6642 D23 1N6642
TP23 C12 R24 1M C12 1nF R12 10K TP24 A12 D24 1N6642 D25 1N6642
TP25 C13 R25 1M C13 1nF R13 10K TP26 A13 D26 1N6642 D27 1N6642
TP27 C14 R26 1M C14 1nF R14 10K TP28 A14 D28 1N6642 D29 1N6642
TP29 C15 R28 1M C15 1nF R15 10K TP30 A15 D30 1N6642 D31 1N6642
TP31 C16 R27 1M C16 1nF R16 10K TP32 A16 D32 1N6642 D33 1N6642
TP35
LAND
OUTPUT MCP
1nF C18
R38 100K
MODIFICATION
D1 ZENER
HV MCP TP36 R33
PIN 100k
C17 1nF
TP37 TP38
INPUT MCP
PIN LAND
TP46
PIN
PLAN DE MASSE EXTERIEUR
MASSE INTERIEURE
TP39
PIN
TP40 TP41
HV ANALYSEUR
A RELIER A UNE VIS DE FIXATION DE L'ANALYSEUR
SUR LA FACE OPPOSEE AUX COLLECTEURS
PIN PASTILLE
TP42 TP43
VO
GRILLE (A L'INTERIUR DU DETECTEUR)
PIN PASTILLE
TP44 TP45
VO
SPHERE EXTERIEURE
REPRISE SUR UNE VIS DE FIXATION DE LA SPHERE
PIN PASTILLE
NOTER A1 A A16 PIN ET C1 A C16 COLLECTEURS
TP47 TP49
PIN PASTILLE
TP48 TP50 THERMISTANCE (A L'INTERIEUR DU DETECTEUR)
PIN PASTILLE
TP33
PIN
R34 3.16K
R35 3.16K
R36 3.16K
R37 3.16K
TP34
PIN
CHAUFFAGE ROUTAGE SPECIAL
CESR TOULOUSE F. COTIN / J.L MEDALE
Size A3
Document Number
SWEA:HV COUPLING
REV 7
Date: October 4, 2002 Sheet 1 of 1


I1
VCC R49
C3 47 Ct U1
C2 100nF
TP1
A1
OUTPUT1
C1 C
R3
A111F TP33 TP1
R1 R
R2 R
R
I5
VCC R53
C15 47 Ct U5
C14 100nF
TP9
A5
OUTPUT5
C13 C
R15
A111F TP40 TP1
R13 R
R14 R
R
I1
VCC R57
C27 47 Ct U9
C26 100nF
TP17
A9
OUTPUT9
C25 C
R27
A111F TP41 TP1
R25 R
R26 R
R
I5
VCC R64
C39 47 Ct U13
C38 100nF
TP22
A13
OUTPUT13
C37 C
R39
A111F TP48 TP1
R37 R
R38 R
R
I2
VCC R50
C6 47 Ct U2
C5 100nF
TP3
A2
OUTPUT2
C4 C
R6
A111F TP34 TP1
R4 R
R5 R
R
I6
VCC R54
C18 47 Ct U6
C17 100nF
TP11
A6
OUTPUT6
C16 C
R18
A111F TP39 TP1
R16 R
R17 R
R
I2
VCC R61
C30 47 Ct U10
C29 100nF
TP27
A10
OUTPUT10
C28 C
R30
A111F TP42 TP1
R28 R
R29 R
R
I6
VCC R58
C42 47 Ct U14
C41 100nF
TP29
A14
OUTPUT14
C40 C
R42
A111F TP47 TP1
R40 R
R41 R
R
I3
VCC R51
C9 47 Ct U3
C8 100nF
TP5
A3
OUTPUT3
C7 C
R9
A111F TP35 TP1
R7 R
R8 R
R
I7
VCC R55
C21 47 Ct U7
C20 100nF
TP13
A7
OUTPUT7
C19 C
R21
A111F TP38 TP1
R19 R
R20 R
R
I3
VCC R62
C33 47 Ct U11
C32 100nF
TP32
A11
OUTPUT11
C31 C
R33
A111F TP43 TP1
R31 R
R32 R
R
I7
VCC R59
C45 47 Ct U15
C44 100nF
TP28
A15
OUTPUT15
C43 C
R45
A111F TP46 TP1
R43 R
R44 R
R
I4
VCC R52
C12 47 Ct U4
C11 100nF
TP7
A4
OUTPUT4
C10 C
R12
A111F TP36 TP1
R10 R
R11 R
R
I8
VCC R56
C24 47 Ct U8
C23 100nF
TP15
A8
OUTPUT8
C22 C
R24
A111F TP37 TP1
R22 R
R23 R
R
I4
VCC R63
C36 47 Ct U12
C35 100nF
TP31
A12
OUTPUT12
C34 C
R36
A111F TP44 TP1
R34 R
R35 R
R
I8
VCC R60
C48 47 Ct U16
C47 100nF
TP30
A16
OUTPUT16
C46 C
R48
A111F TP45 TP1
R46 R
R47 R
R
TEST
R69R
C49 C
U17
CLK
RST
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
T1
T2
T3
T4
T5
T6
T7
T8
HC4040
VCC
L1 100uH
+ C50 33uF
T1 TRC
C51 1nF
+5V
+5V
GROUND
DGND
TP50
DGND
JP3
JUMPER
TP49
AGND
Note A1 a A16 connecte a la carte hv coupling
TP49 ET TP50 connectes a la carte hv
Ct realise dans le circuit imprime
TP33 a TP48 sont des points de test une pastille
CESR TOULOUSE F. COTIN / J.L MEDALE
Size A3
Document Number
SWEA:AMPLIFIERS BOARD2
REV 4
Date: August 21, 2001
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