

EchoStar / RCA
Satellite Receiver Schematics
31 / Oct / '03
Ver 5.1

Drawn by: MDevries

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Hi guys:

While these schematics are not perfect, they are quite compressive. They are the result of many nights work. Hopefully you find them useful and will support me in the drawing of more.

If you find any errors, and like any work in progress, I'm sure there are some, you can private message (PM) me at <http://fd-discussions.com/vbulletin/index.php>

Drawing up schematics of something as complicated as this, is not something you want to do with a working unit as you typically have to rip them apart, which unless you're very lucky, destroys them. Fortunately I had a dead 2700 I purchased on Ebay for \$5.00. I would like to post more schematics and am looking for the following units (CHEAP/DEAD):

- Echostar 5100/5800: (would trade a much larger Hard Drive for a dead but complete unit),
- Echostar UHF receiver module from either a 6000 or 47/4900
- Echostar 47/4900,
- Any newer StarChoice unit.
- Any dead Echostar remote, LNB or switch

One of the reasons I drew up these schematics was that I had noticed my 2700's PCB was laid out for several unpopulated components. I then developed the theory that the 27/3700 and the 4700 used the SAME PCB. I.e that the only difference between these models was in how the PCB was populated. I still hold this belief, unfortunately I now realize that such an upgrade is virtually impossible. The problem is the 4700 uses a custom IC, or ASIC, for the AC3 Dolby, the optical output, the IR Blaster and the UHF remote. To make things worse the 4700 also uses an obsolete IC for the system clock. As neither of these ICs are commercially available the upgrade can only be done by using a dead 4700 as a donor. :(

One important note: I've drawn up these schematics in the hope that they will be useful in the servicing of these receivers, and so that those of use who's hobby is electronics can add features such as extra video and audio outputs. These schematics are NOT intended to aid in the hacking of satellite TV.

One last thing, I don't have a oscilloscope, so I've not drawn the powersupply waveforms. If someone with a scope would be so kind as to draw up these waveforms and email them to me, I'll include them in the next release.

EchoStar 2/3/4700:

A bit of warning. It appears that there are several PCB versions of the 27/37/4700. As such there may be slight variations between things such as component labels. Also the LNB Tuner and AC3 sections were drawn up without the aid of data sheets and as such I've have no means to cross check these pages, so please be very careful when using these two pages.

EchoStar 3100 / DP301

There are at least two completely different flavors of the 3100/DP301. The one with a SC2000 processor (made by LSI), is called the model 3100 in Canada, but in the USA it's called the DP301.010. The other 3100/DP301, with a ST15518 processor by STMicroelectronics, is not avaiable in Canada and is called the DP301.013 in the USA. Please note that each of these may come in slightly different versions, so don't assume the schenitics match the unit you are working.

The 3100/DP301.010 is a work in progress. I have rough drafts of the audio, video and modem sections, which I'll work on and post as I have time. On the other hand the DP301.013 is complete.

EchoStar 6000

This model uses a multi layer PCB which makes tracing runs very difficult. As a result it's possible that the drawing may a couple of errors or even more likely may be missing a couple of traces.

RCA DRD 420:

I emailed early beta copies of these schematics to a few friends on the net and within a couple hours two emailed me back with other schematics for this unit. While parts of these schematics are similar, other parts are quite different. This leads me to believe that there is at least two and maybe more versions of this model. So don't assume your 420 will match my schematics.

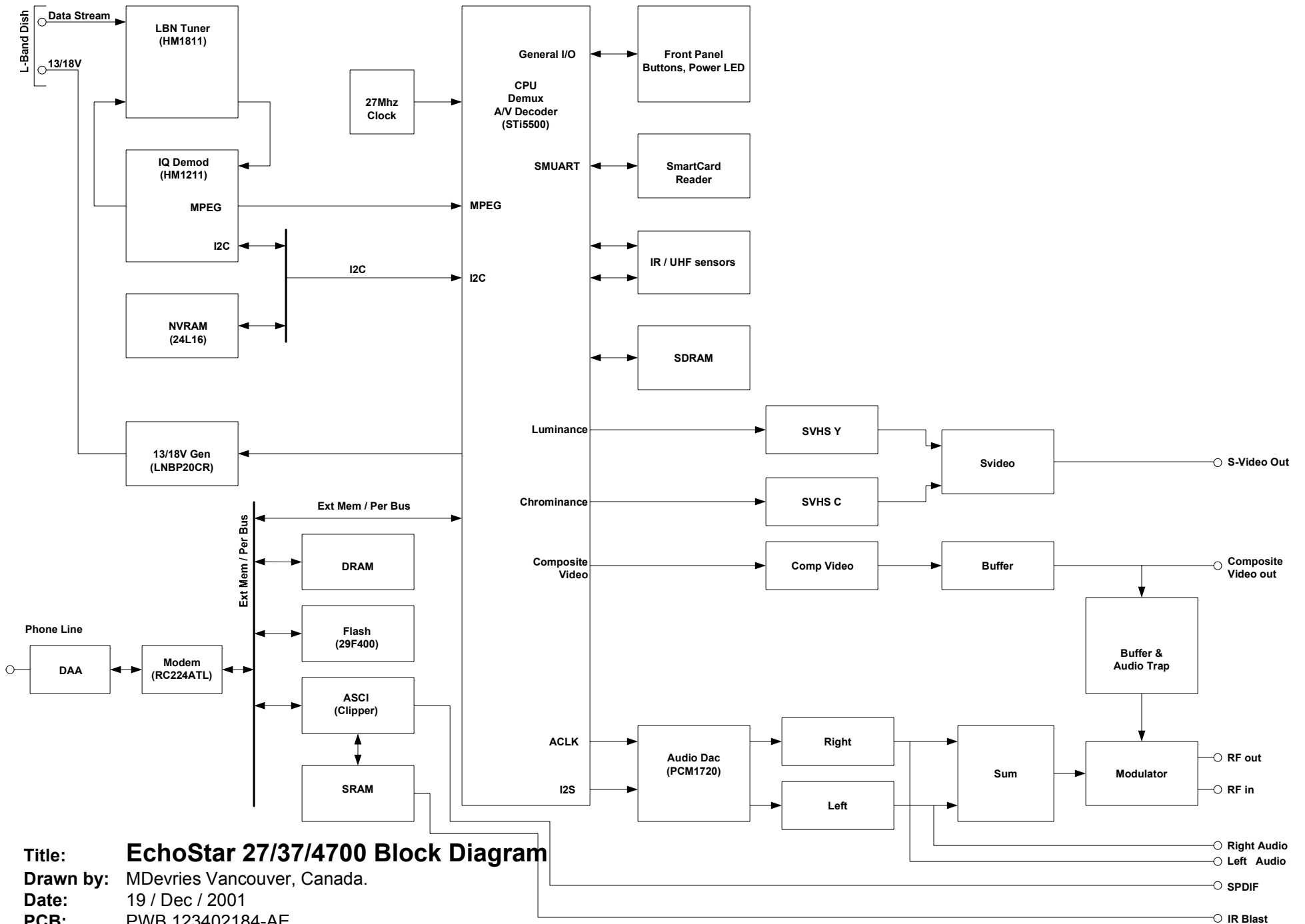
I'm also unable to e-mail or post copies of these other schematics as they were given to me in confidence and under the condition that I not spread them around.

On the PCB I used, only through hole components and ICs are labeled. This, in my opinion, is a very poor PCB design practice as it makes service very difficult, anyway this is why a lot of components on my drawings don't have labels.

Another problem with my schematics for this model is I'm unable to draw up schematics of either the LNB tuner or the modulator, due to the lack to datasheets for the the ICs used in these sections.

Cheers

Al Morrison



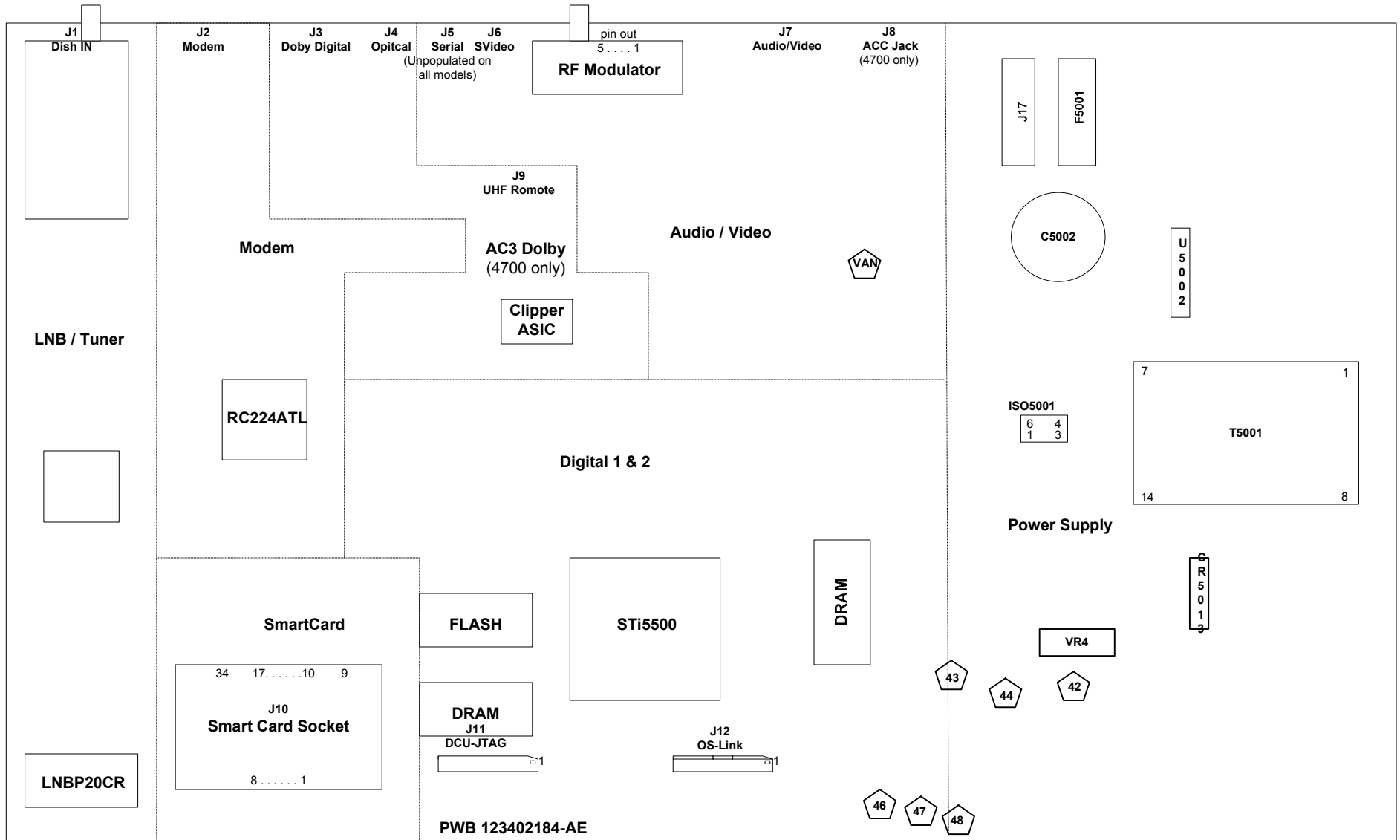
Title: EchoStar 27/37/4700 Block Diagram

Drawn by: MDevries Vancouver, Canada.

Date: 19 / Dec / 2001

PCB: PWB 123402184-AE

Comment: While this block diagram is for the 27/37/4700, it is general enough to fit most EchoStar receivers of a similar generation.



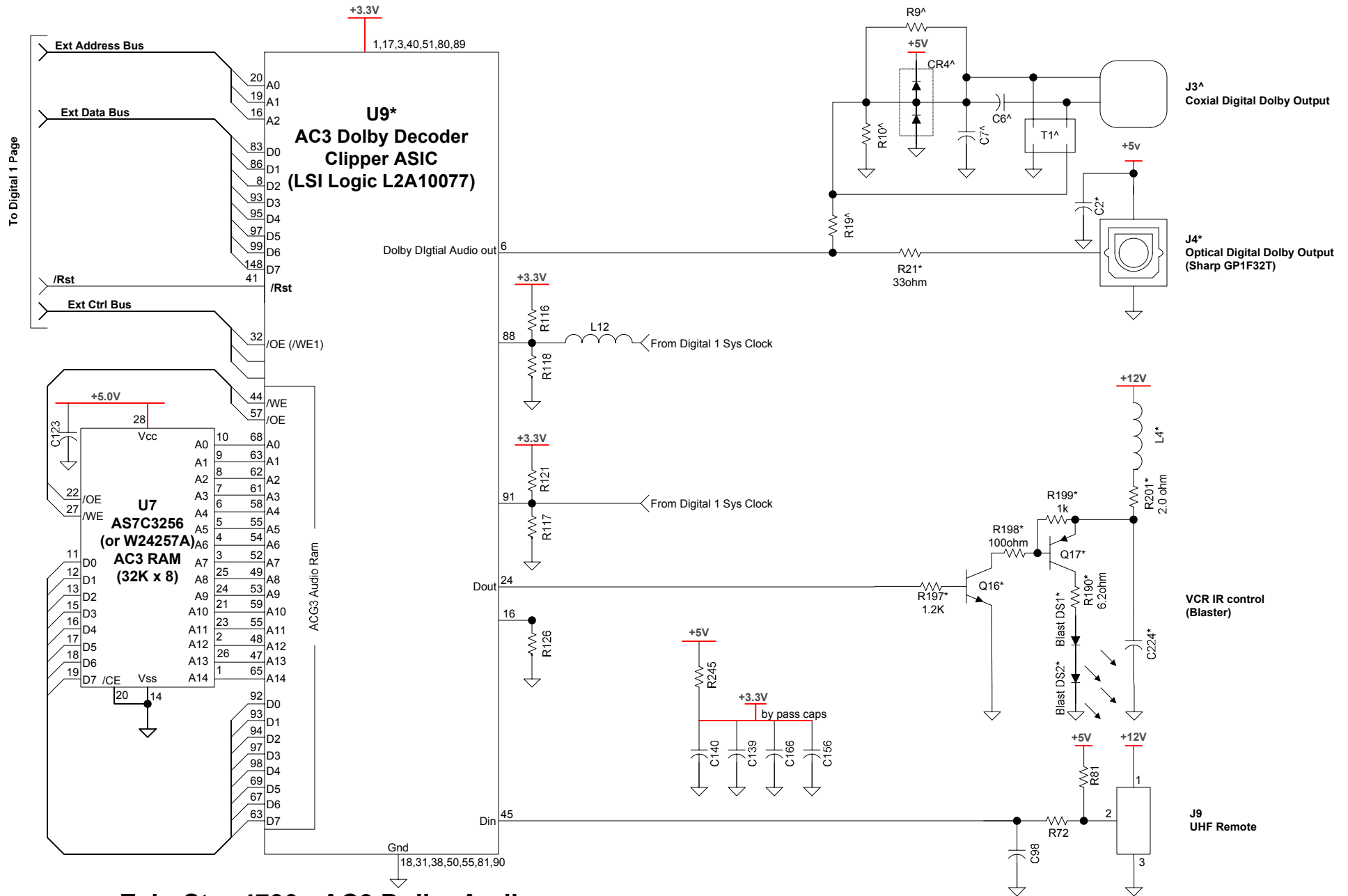
Title: EchoStar 27/37/4700 rev C Parts Layout

Drawn by: MDevries, Canada.

Date: 1 / Dec / 2001

PCB: PWB 123402184-AE

Comment: Parts layout of the EchoStar satellite receiver models 2700/3700/4700 used by Bell Express UV in Canada and by DishNet in the USA.



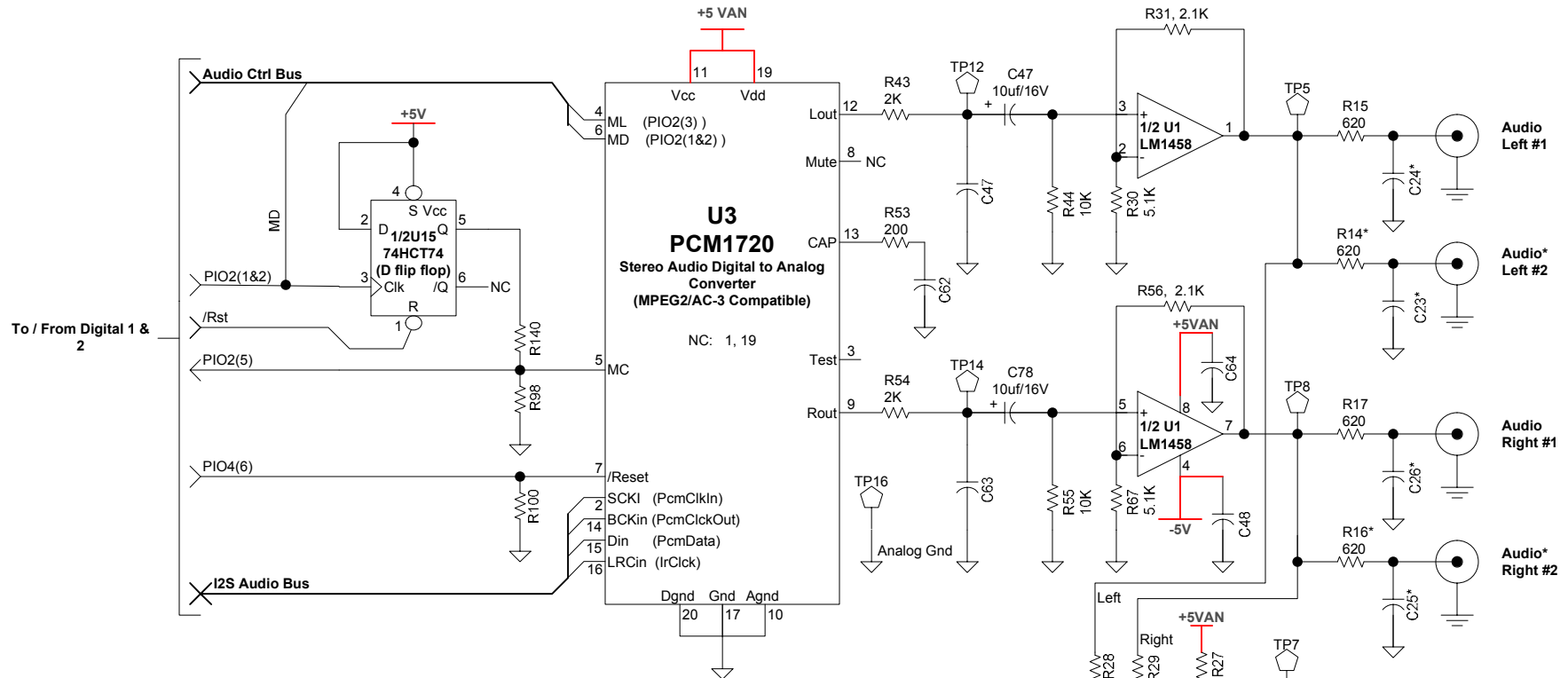
Title: EchoStar 4700 - AC3 Dolby Audio

Drawn by: MDevries, Canada.

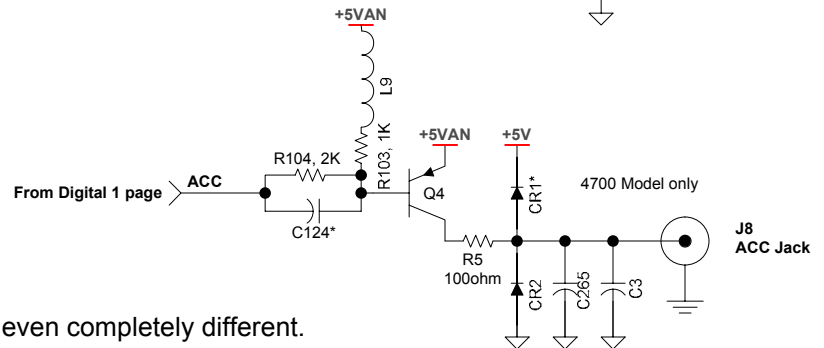
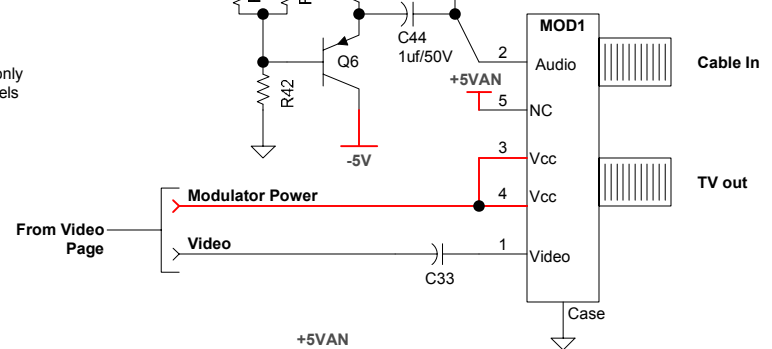
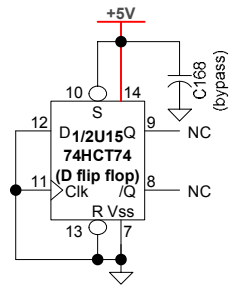
Date: 10 / Feb / 2002

PCB: PWB 123402223-AE

Comment: Note this schematic was draw based on the missing parts in a 2700 and is NOT complete and also MAY not be correct.



*PCB is laid out for component but is populated on the 4700 model only
 ^PCB is layout for component but is not populated in any of the models



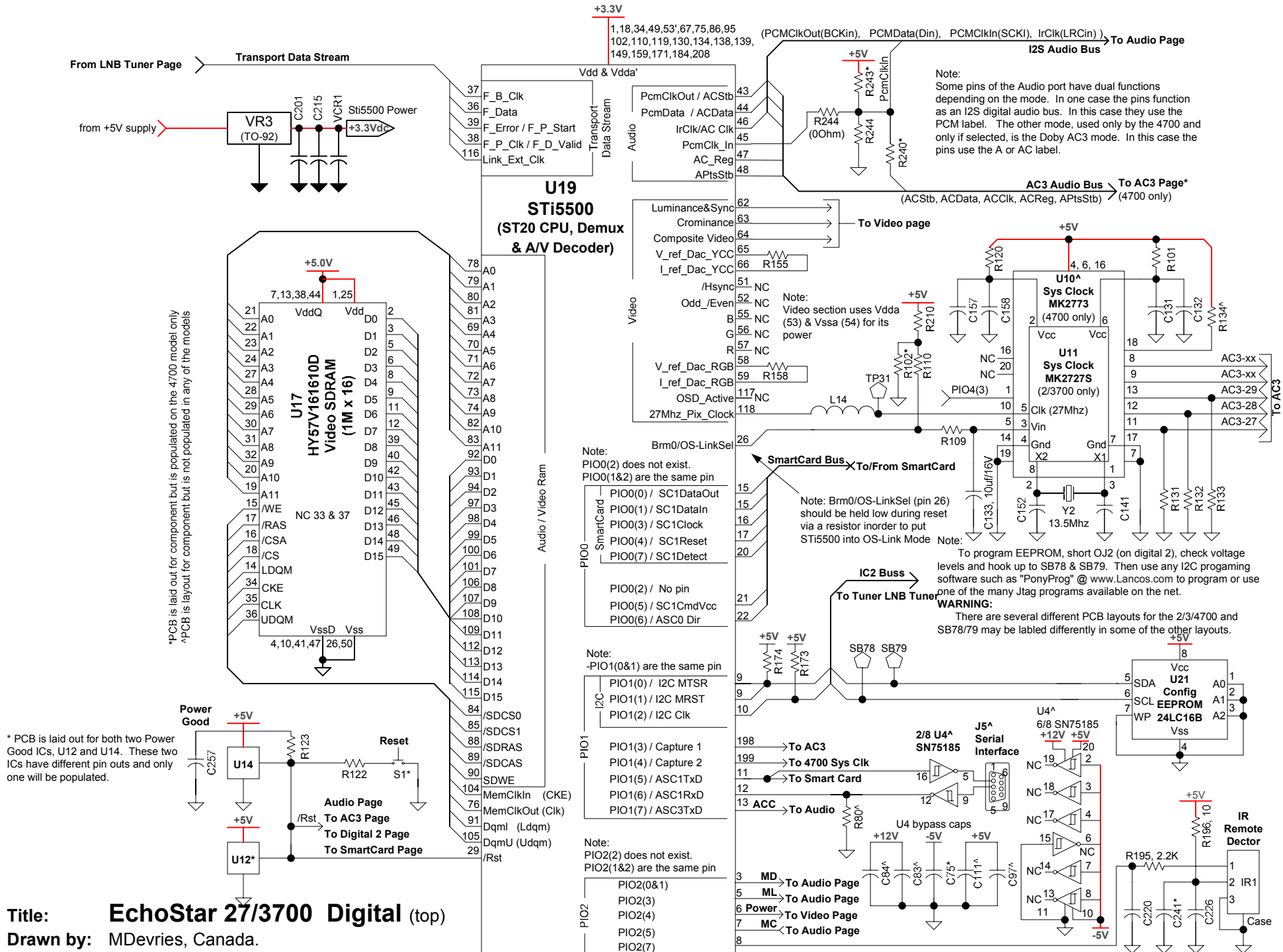
Title: EchoStar 27/3700 Audio

Drawn by: MDevries, Canada.

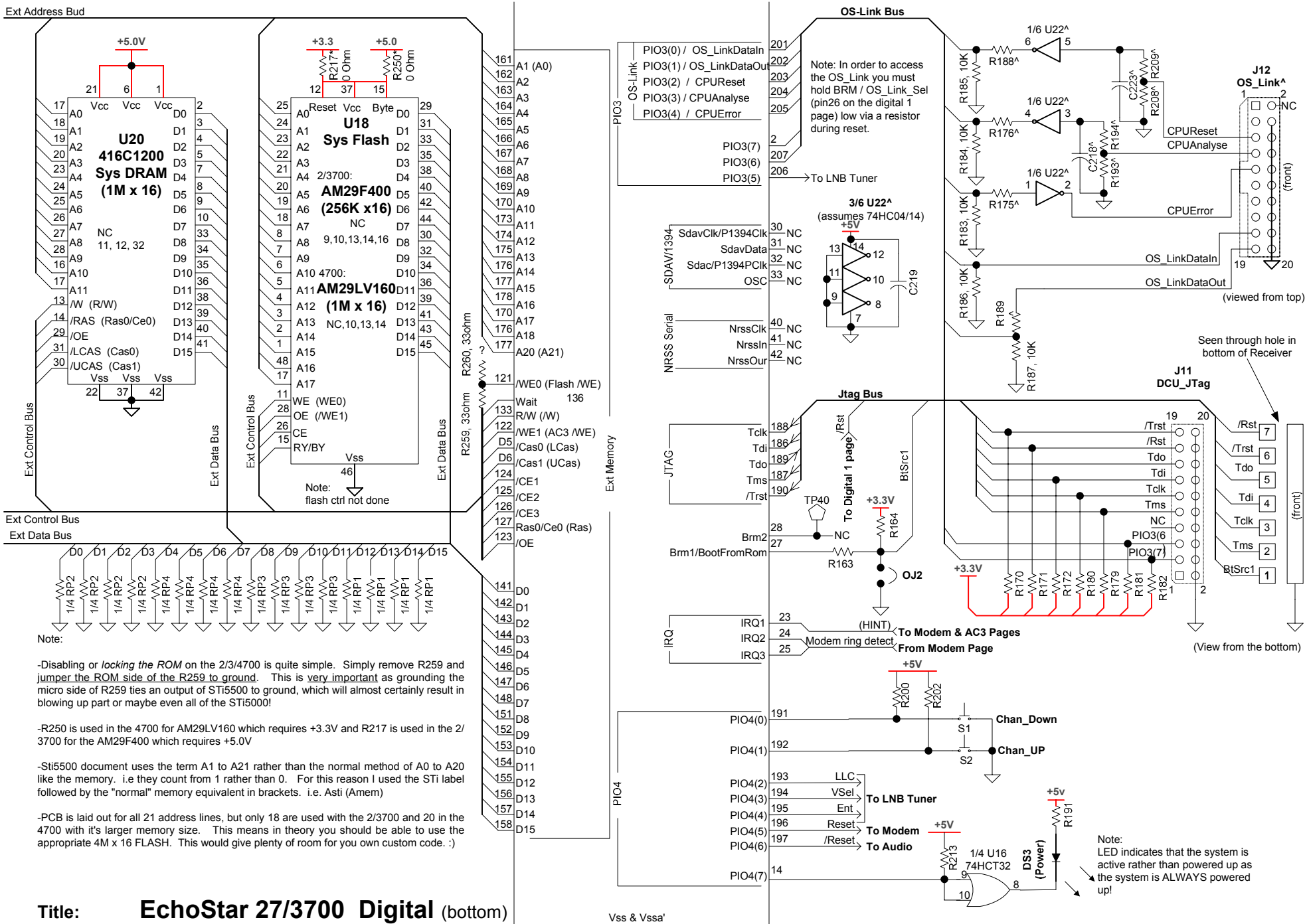
Date: 19 / Dec / 2001

PCB: PWB 123402184-AE

Warning: Other PCB versions MAY have difference component labels, or maybe even completely different.



Title: **EchoStar 27/3700 Digital (top)**
 Drawn by: MDevries, Canada.



Note:

-Disabling or *locking the ROM* on the 2/3/4700 is quite simple. Simply remove R259 and jumper the ROM side of the R259 to ground. This is very important as grounding the micro side of R259 ties an output of STi5500 to ground, which will almost certainly result in blowing up part or maybe even all of the STi5000!

-R250 is used in the 4700 for AM29LV160 which requires +3.3V and R217 is used in the 2/3700 for the AM29F400 which requires +5.0V

-Sti5500 document uses the term A1 to A21 rather than the normal method of A0 to A20 like the memory. i.e they count from 1 rather than 0. For this reason I used the STi label followed by the "normal" memory equivalent in brackets. i.e. Asti (Amem)

-PCB is laid out for all 21 address lines, but only 18 are used with the 2/3700 and 20 in the 4700 with it's larger memory size. This means in theory you should be able to use the appropriate 4M x 16 FLASH. This would give plenty of room for you own custom code. :)

Title: EchoStar 27/3700 Digital (bottom)

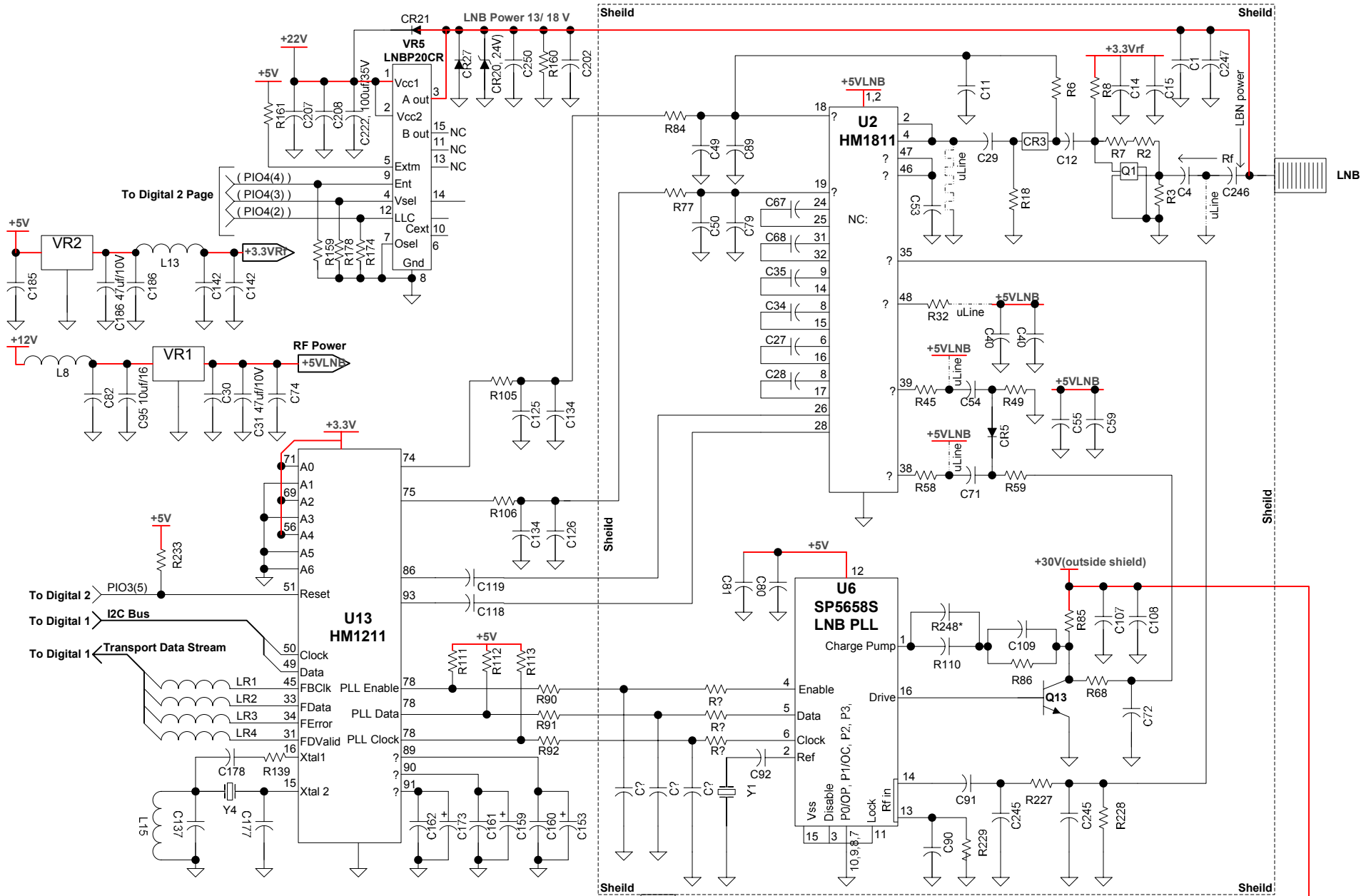
Drawn by: MDevries, Canada.

Date: 28 / Jan / 2002

PCB: PWB 123402184-AE

4,19,35,50,54,61',68,77,87,
96,103,111,120,131,135,140,
150,160,172,185,200

*PCB is laid out for component but is populated on the 4700 model only
*PCB is layout for component but is not populated in any of the models



Title: EchoStar 27/37/4700 LNB tuner

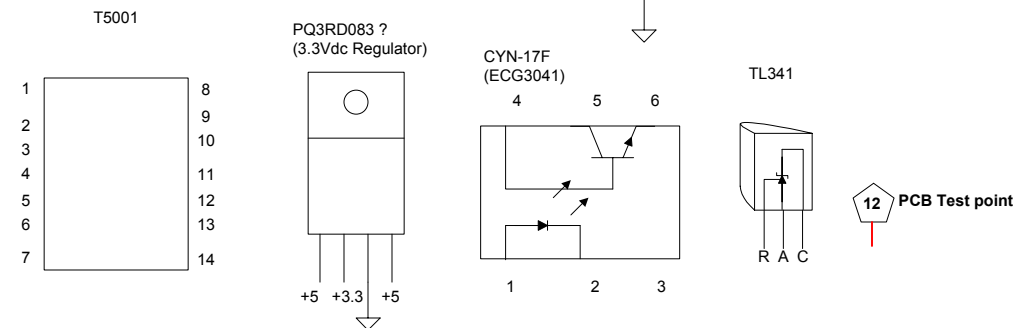
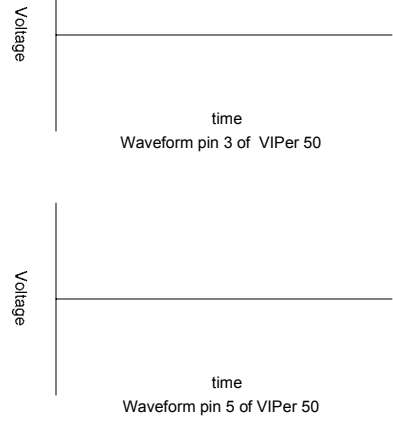
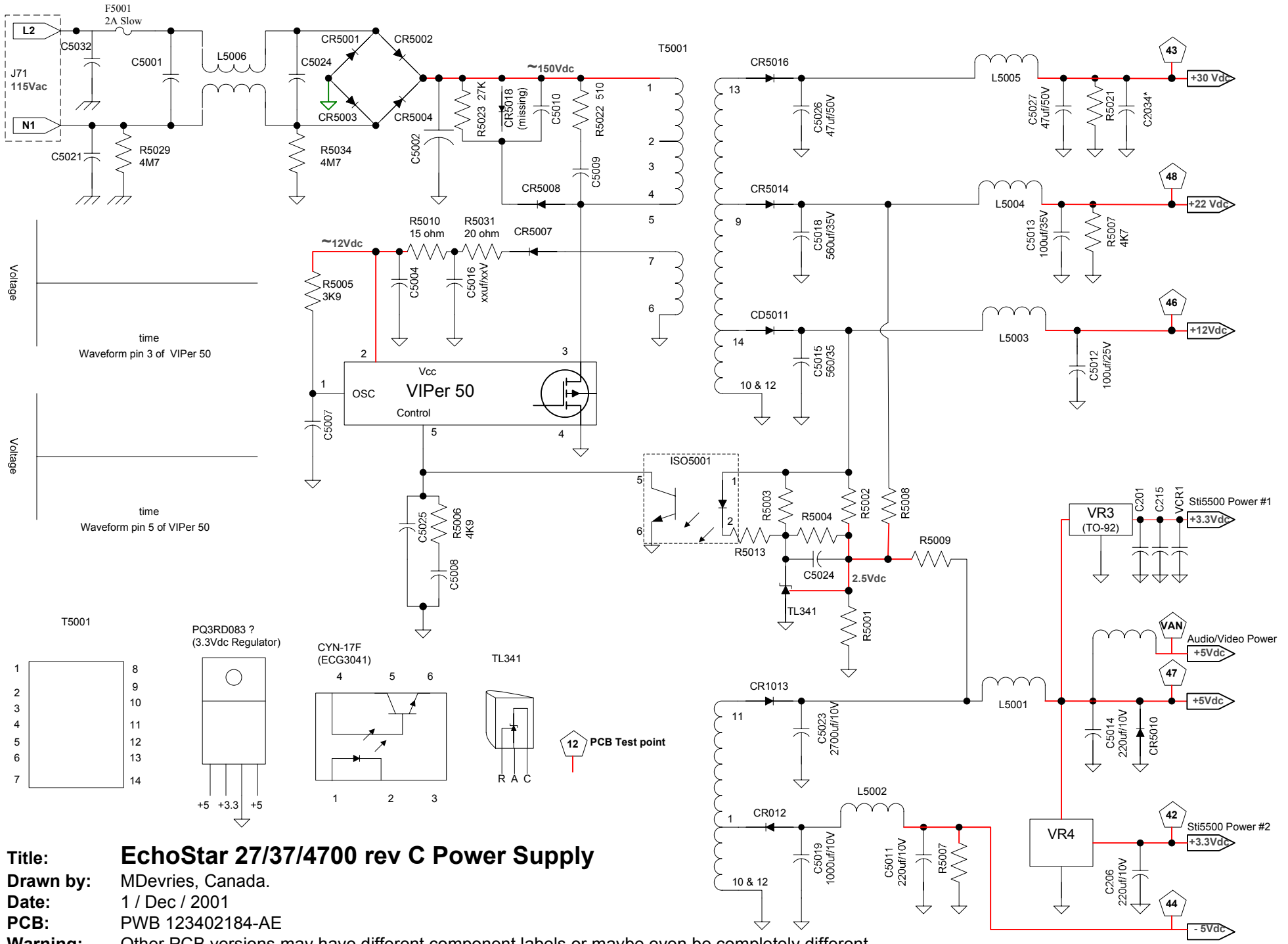
Drawn by: MDevries, Canada.

Date: 22 / Feb / 2002

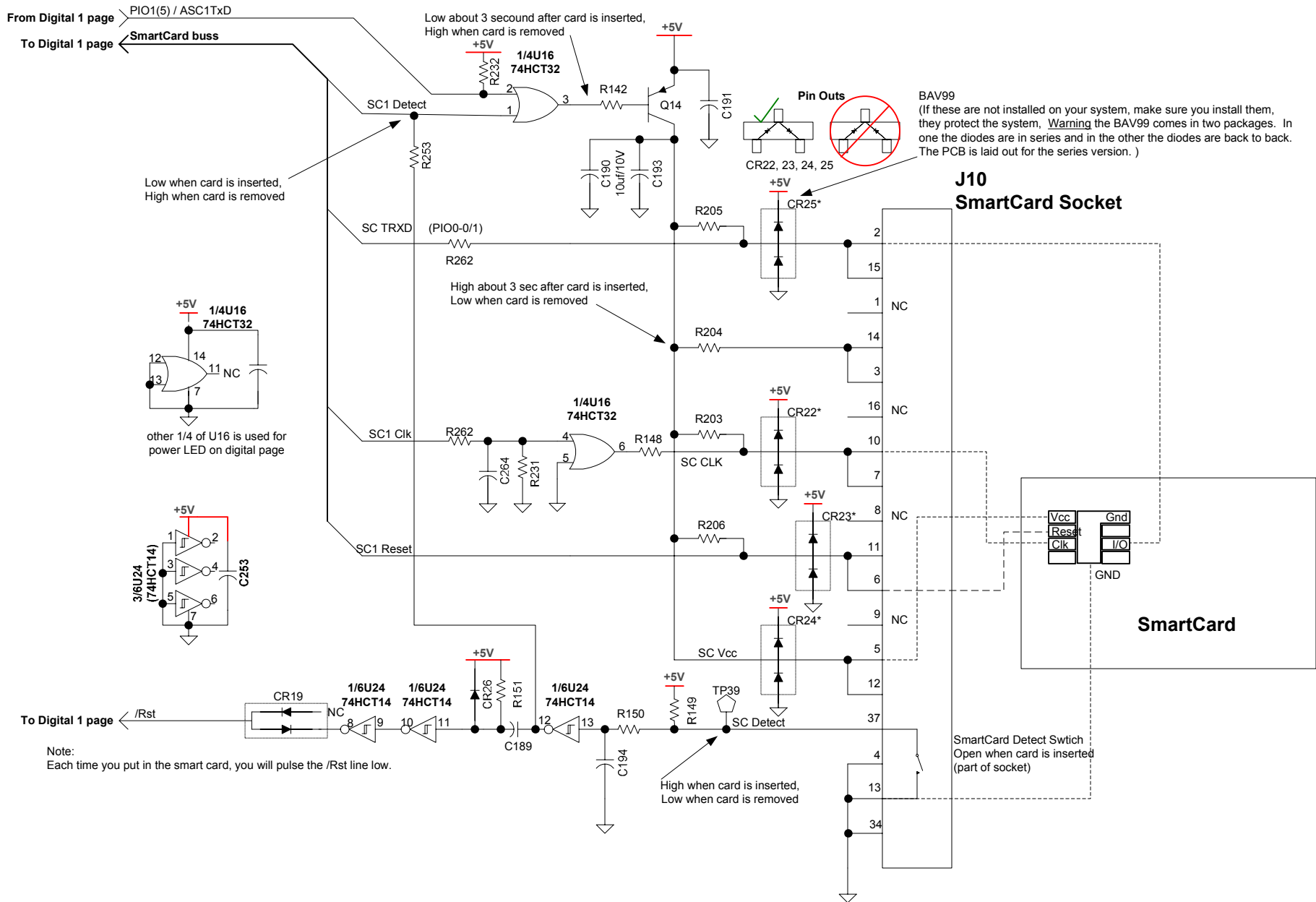
PCB: PWB 123402184-AE

Comment: Drawn with out the aid of datat sheets so I had no way to cross check, as a result don't assume anything on this page is correct.





Title: EchoStar 27/37/4700 rev C Power Supply
Drawn by: MDevries, Canada.
Date: 1 / Dec / 2001
PCB: PWB 123402184-AE
Warning: Other PCB versions may have different component labels or maybe even be completely different.



Title: EchoStar 27/37/4700 SmartCard Reader

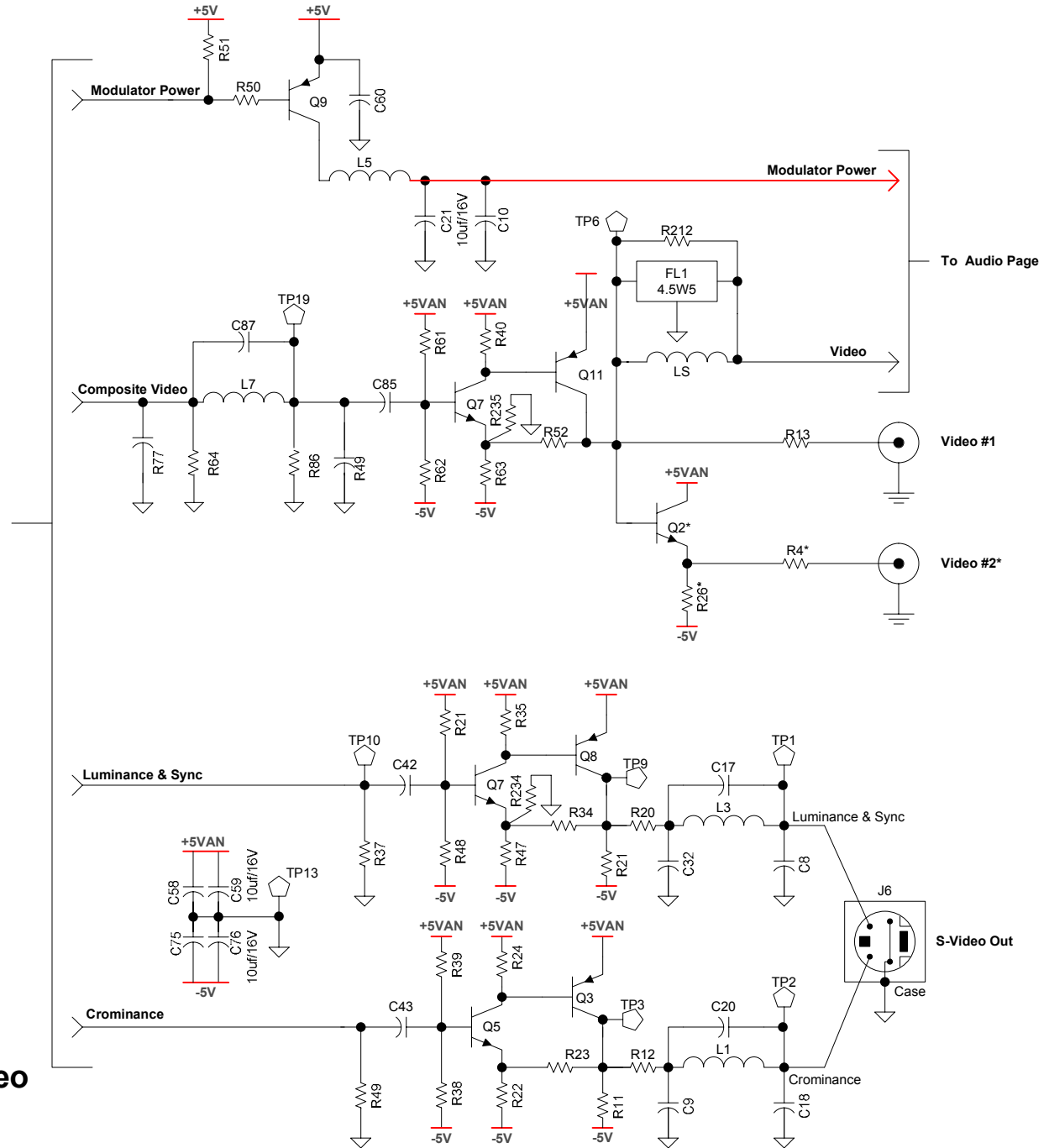
Drawn by: MDevries, Canada.

Date: 20 / Jan / 2002

PCB: PWB 123402184-AE

Warning: Other PCB versions may have different component labels or maybe even be completely different.

To Digital 1 Page



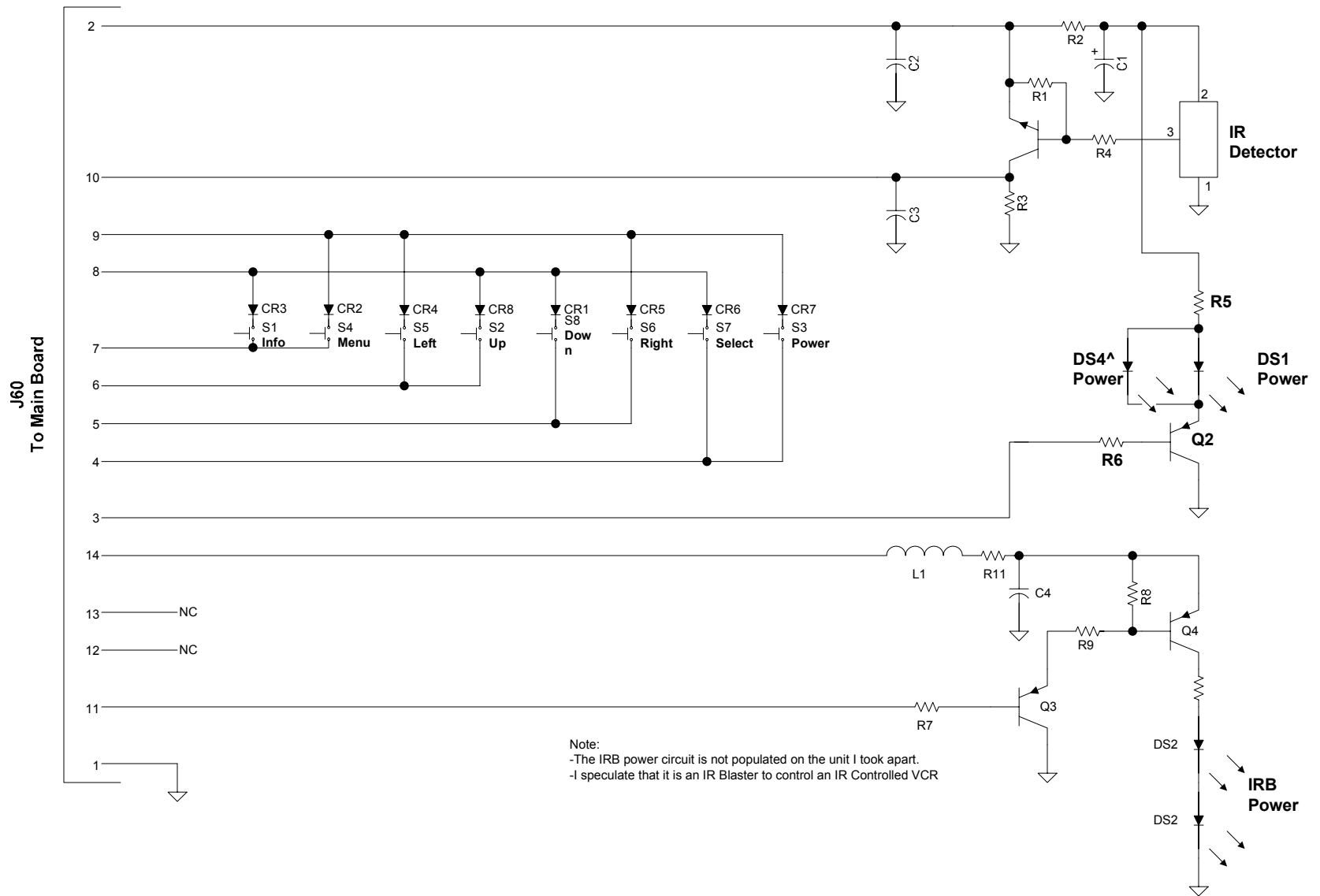
Title: EchoStar 27/3700 Video

Drawn by: MDevries, Canada.

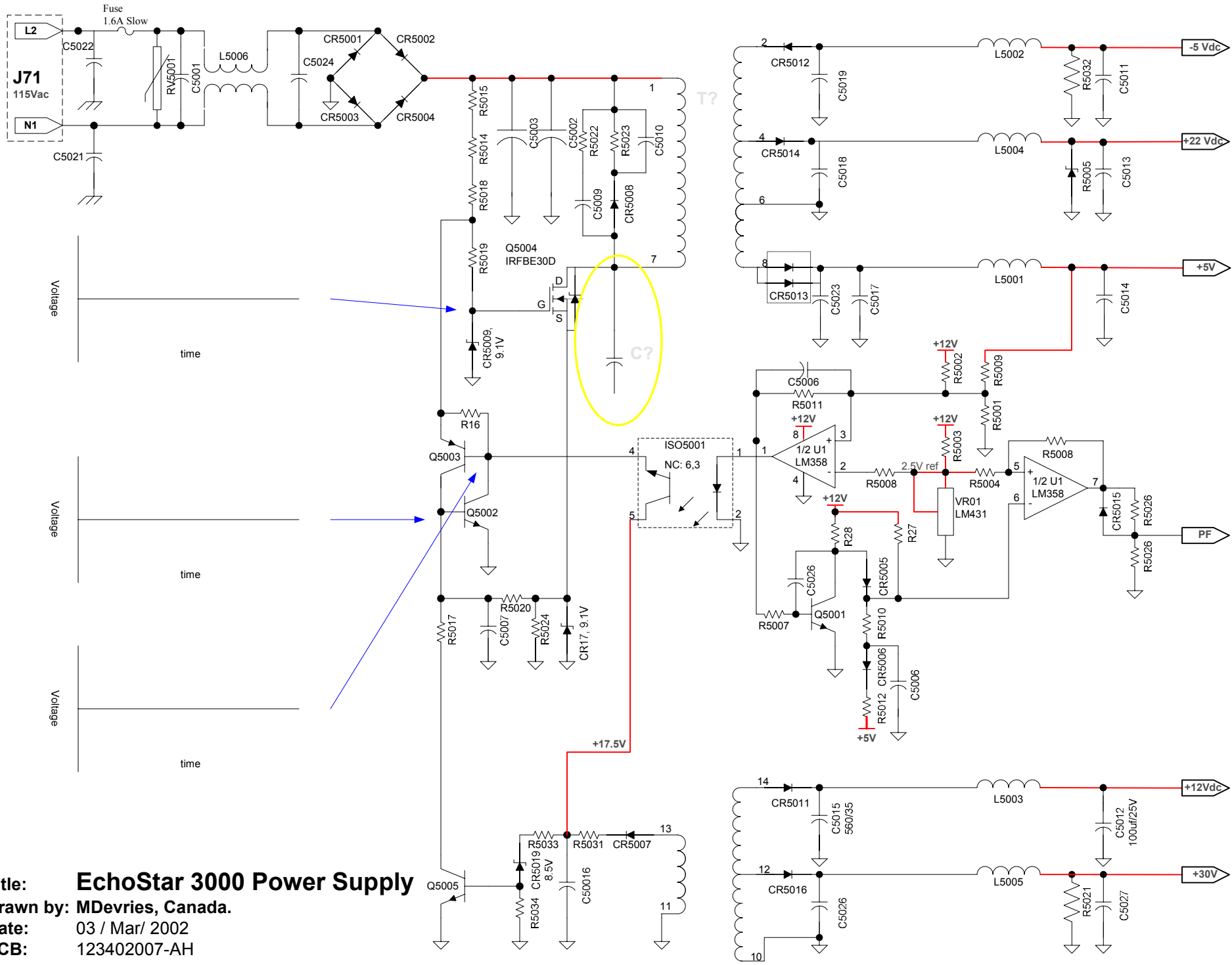
Date: 19 / Dec / 2001

PCB: PWB 123402184-AE

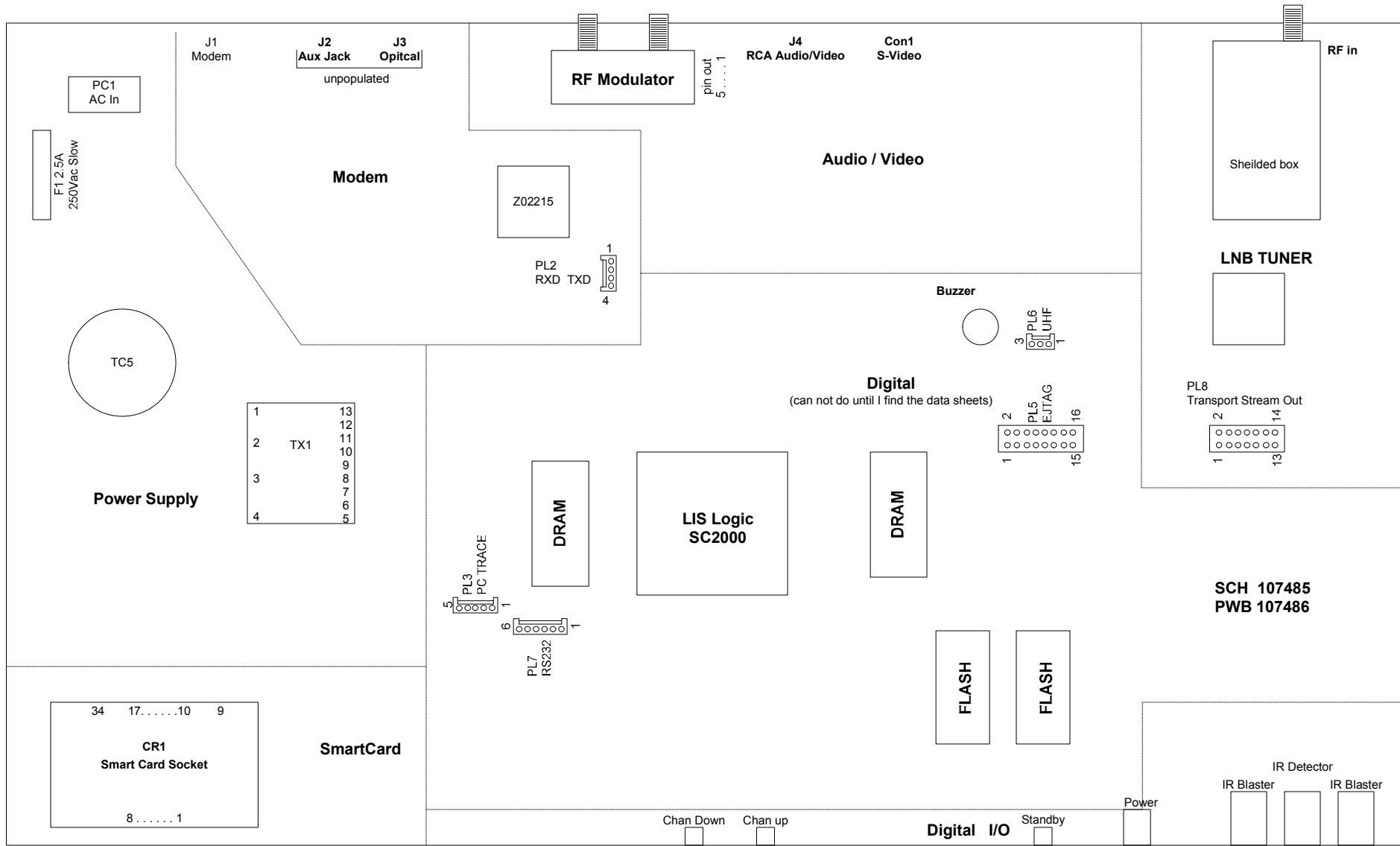
Warning: Other PCB versions MAY have difference component labels, or maybe even completely different.



Title: EchoStar 3000 Front Panel PCB
Drawn by: MDevries, Canada.
Date: 25 / Feb / 2002
PCB: PWB 123402097-AA



Title: EchoStar 3000 Power Supply
Drawn by: MDevries, Canada.
Date: 03 / Mar/ 2002
PCB: 123402007-AH



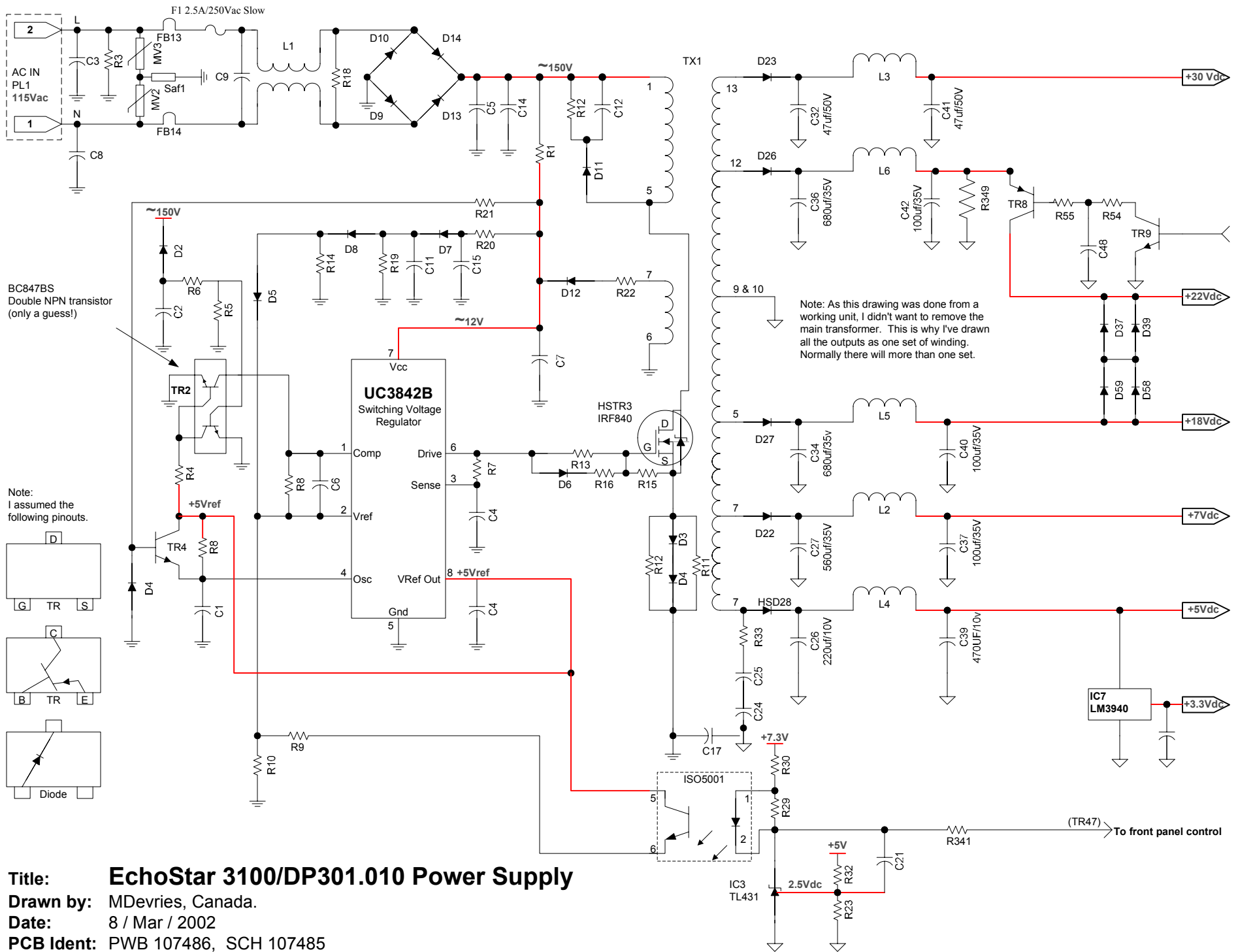
Title: EchoStar 3100 / DP301.010 Parts Layout

Drawn by: MDevries, Canada.

Date: 5 / Mar / 2002

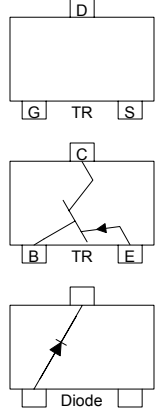
PCB Ident: PWB 107486, SCH 107485

Comment: This is the parts layout of the EchoStar satellite receiver, model 3100 used by Bell Express UV in Canada and model DP301 used by DishNet in the USA.



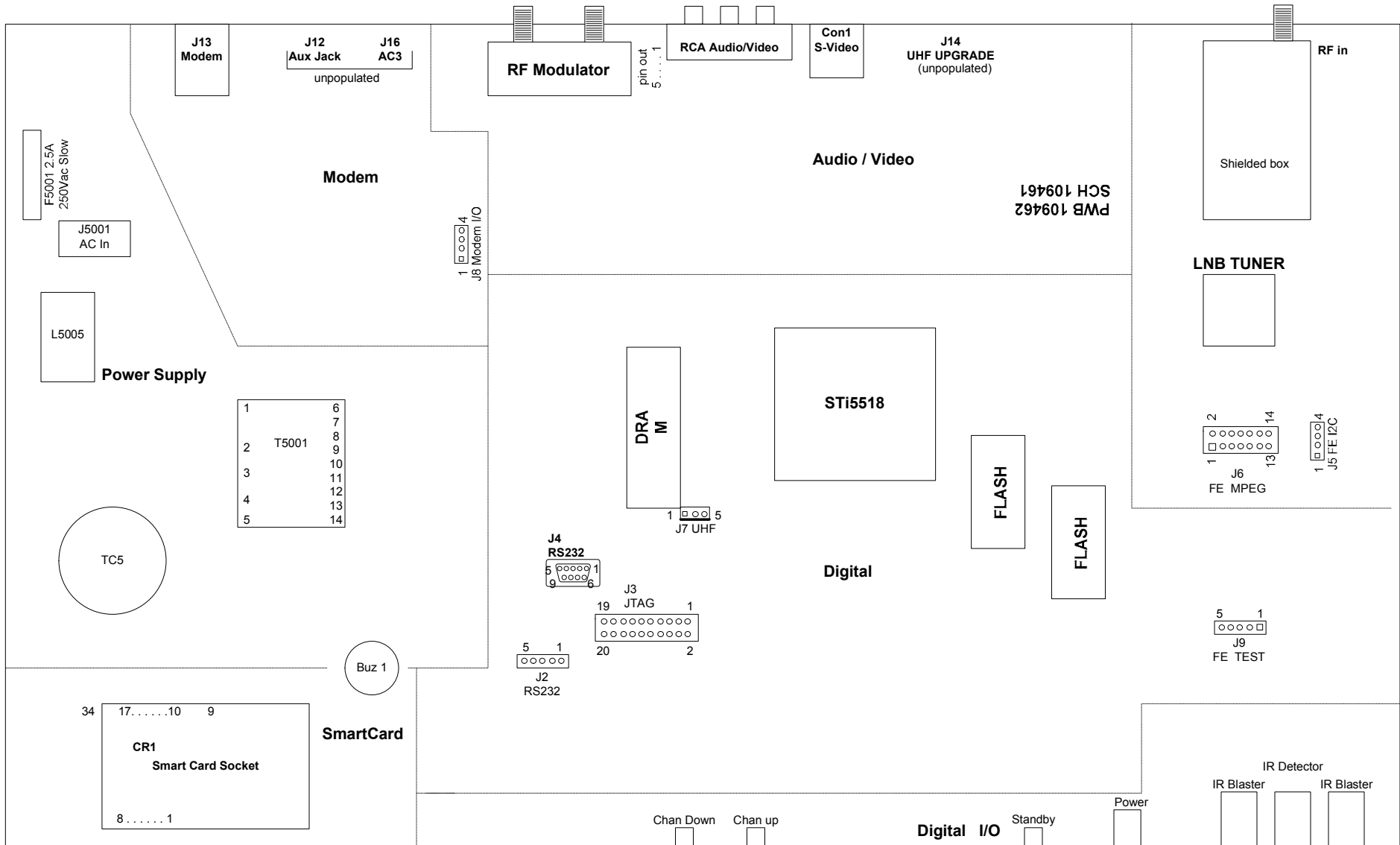
BC847BS
Double NPN transistor
(only a guess!)

Note:
I assumed the
following pinouts.



Title: EchoStar 3100/DP301.010 Power Supply
Drawn by: MDevries, Canada.
Date: 8 / Mar / 2002
PCB Ident: PWB 107486, SCH 107485

3100/DP301.010 (STi) block Diagram - Being worked on- Comming soon



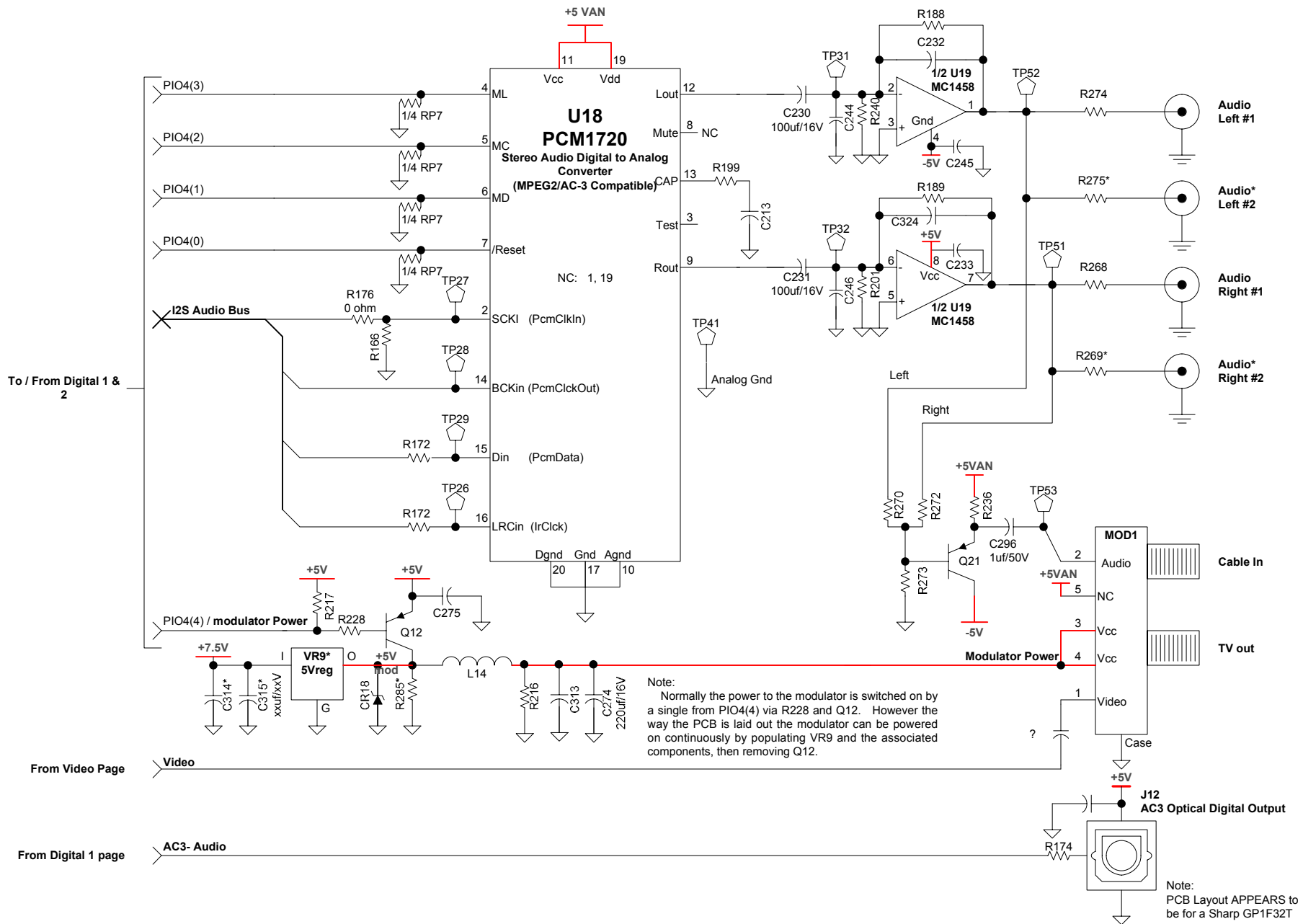
Title: EchoStar / DP301.013 Parts Layout

Drawn by: MDevries, Canada.

Date: 1 / Jul / 2003

PCB Ident: PWB 109461 / SCH 109462

Comment: This is the parts layout of the EchoStar satellite receiver, model 3100 used by Bell Express UV in Canada and model DP301 used by DishNet in the USA.

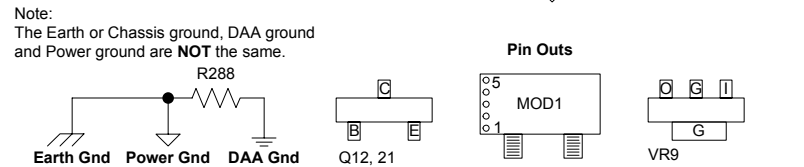


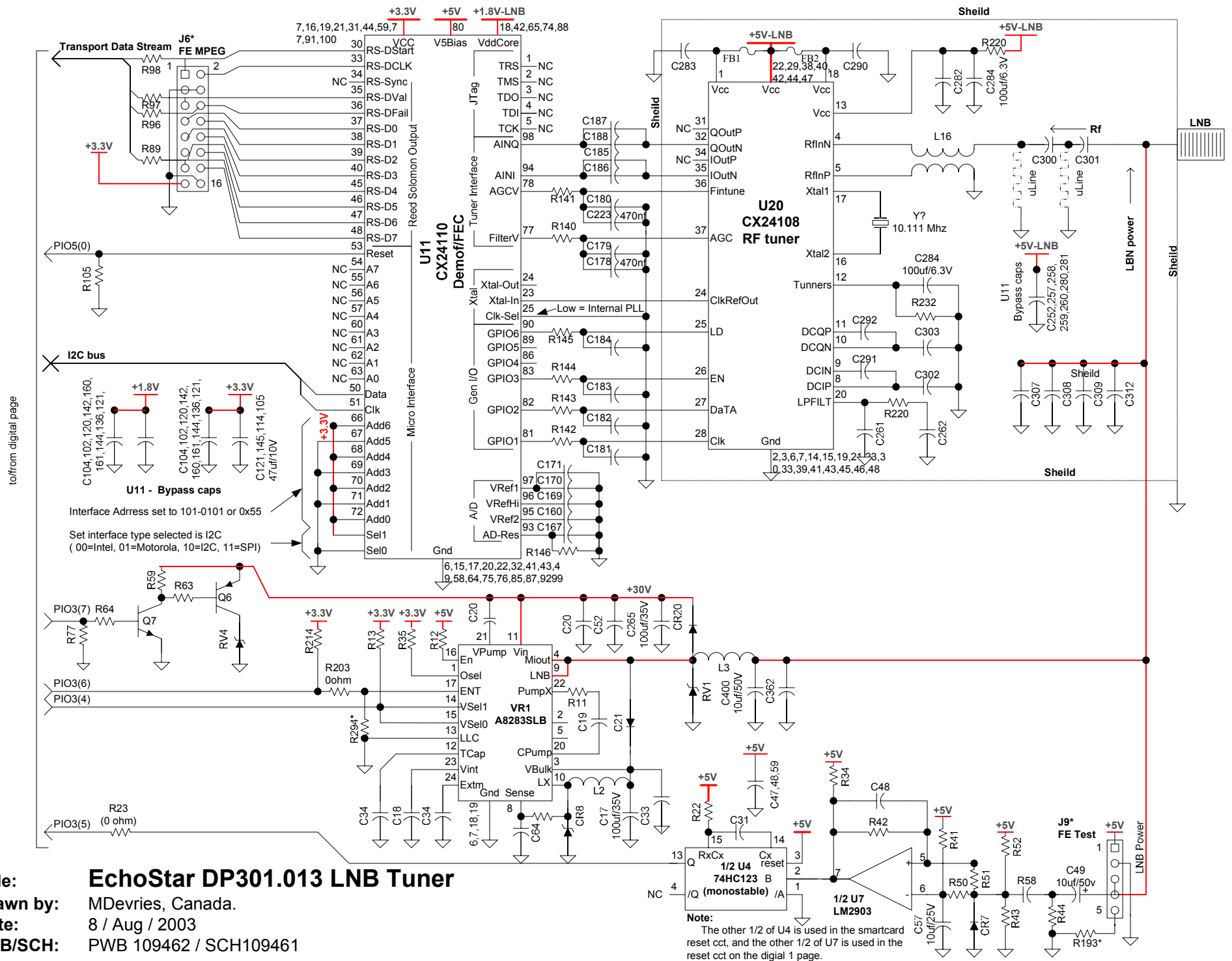
Title: EchoStar 3100 / DP301.013 Audio

Drawn by: MDevries, Canada.

Date: 12 / Jul / 2003

PCB/SCH: PCB:109462 / SCH:109461



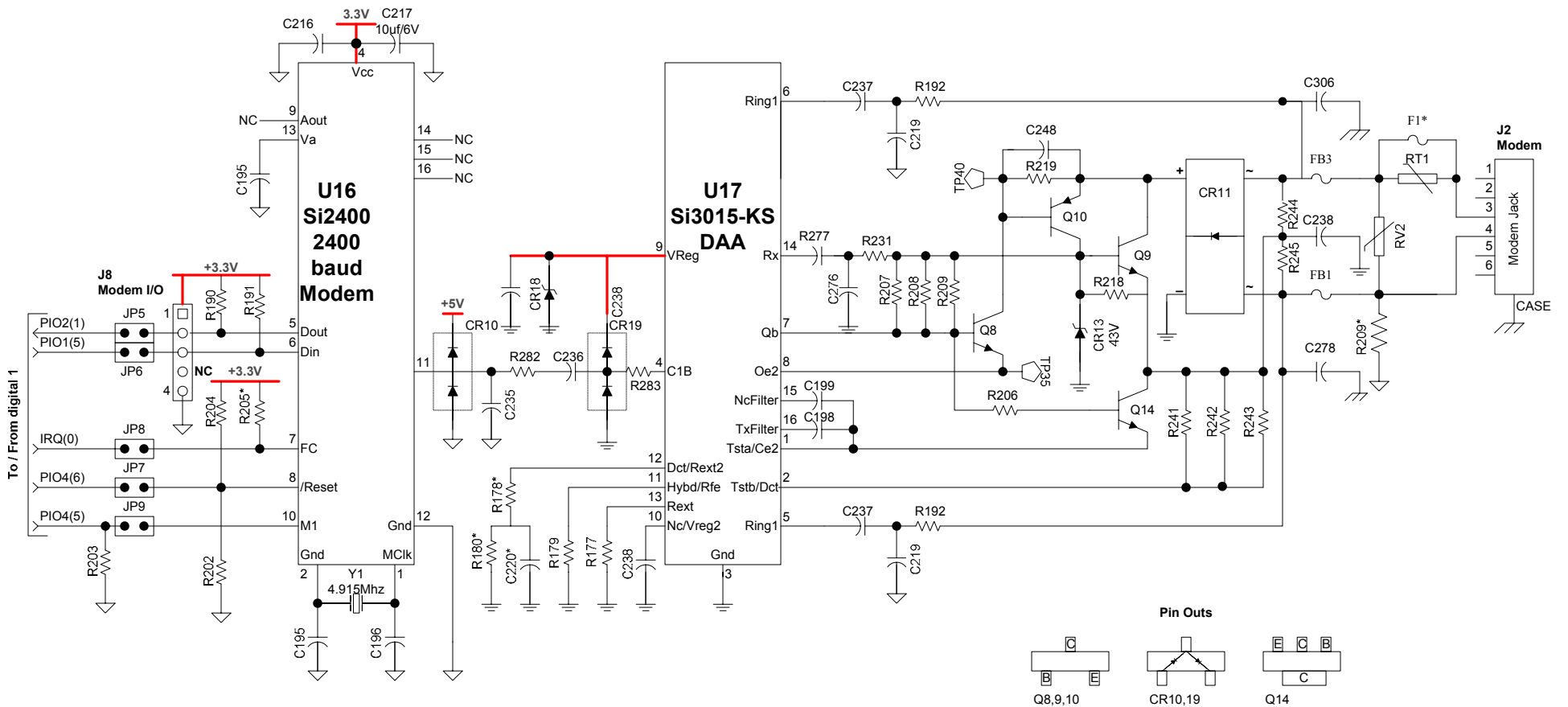


Title: EchoStar DP301.013 LNB Tuner

Drawn by: MDevries, Canada.

Date: 8 / Aug / 2003

PCB/SCH: PWB 109462 / SCH109461



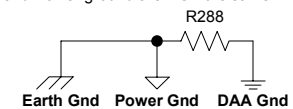
Title: **EchoStar DP301.013 Modem**

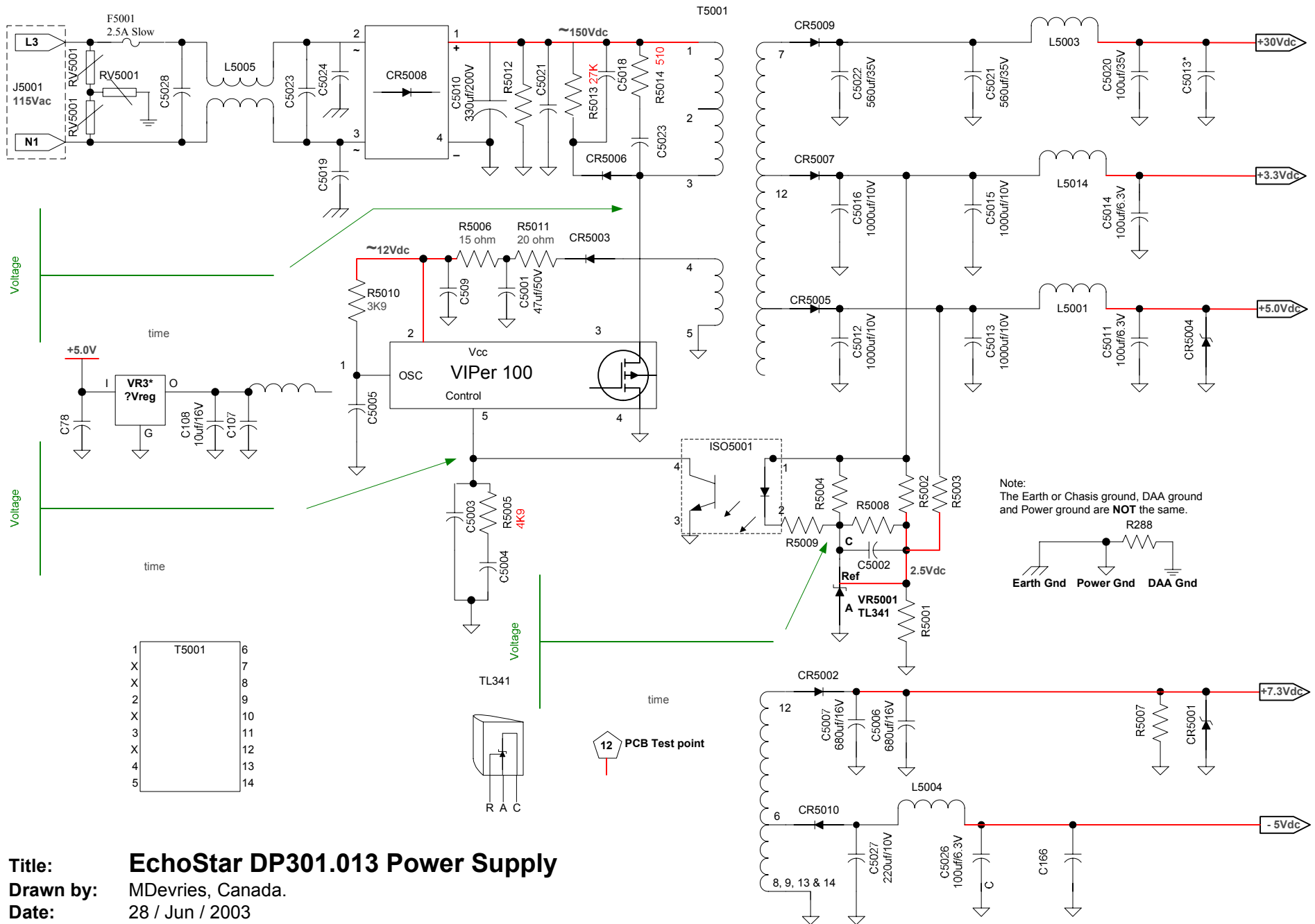
Drawn by: MDevries, Canada.

Date: 8/ Jul / 2003

PCB/SCH: PCB:109462 / SCH:109461

Note:
The Earth or Chasis ground, DAA ground
and Power ground are **NOT** the same.





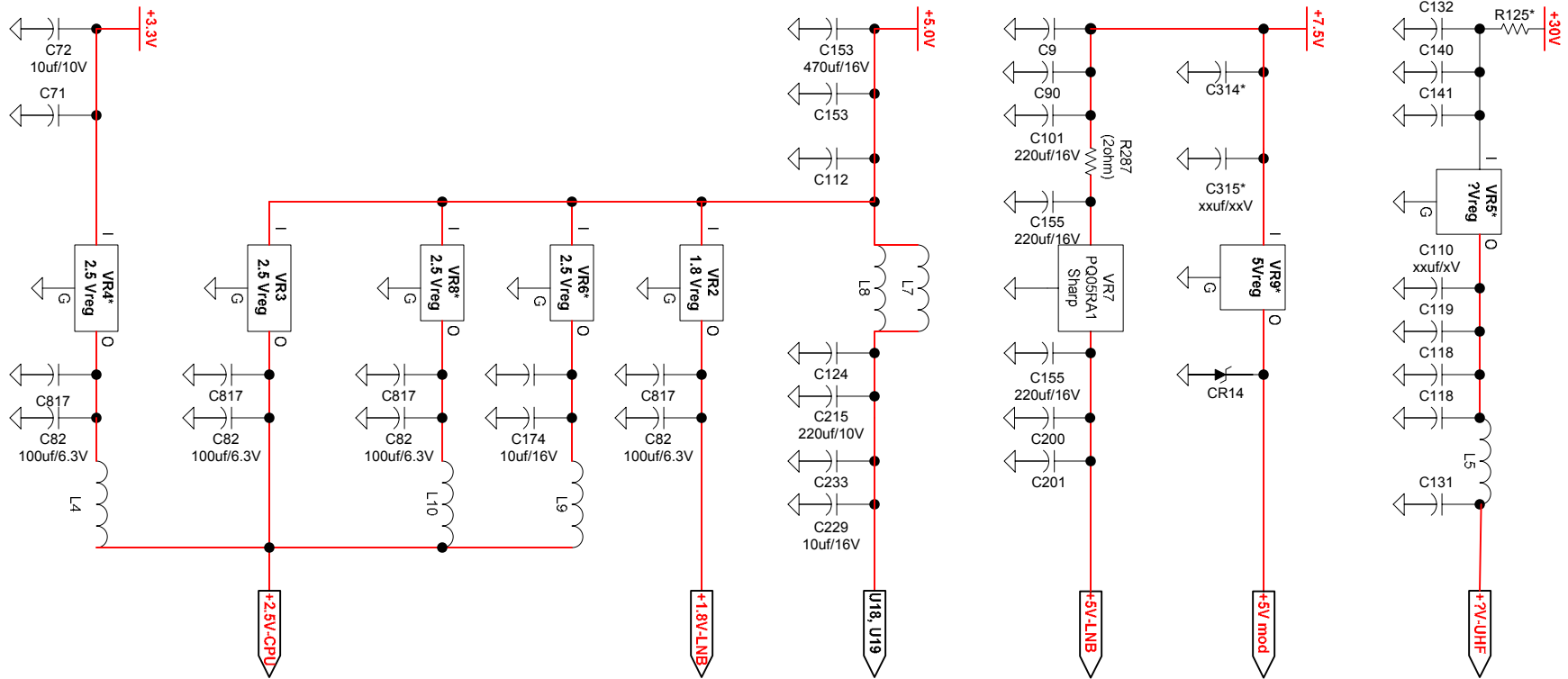
Title: EchoStar DP301.013 Power Supply

Drawn by: MDevries, Canada.

Date: 28 / Jun / 2003

PCB/SCH: PWB 109462 / SCH109461

Warning: Other PCB versions may have different component labels or maybe even be completely different.

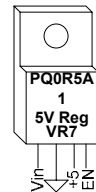
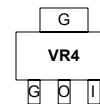
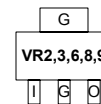
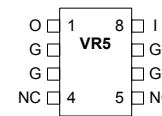


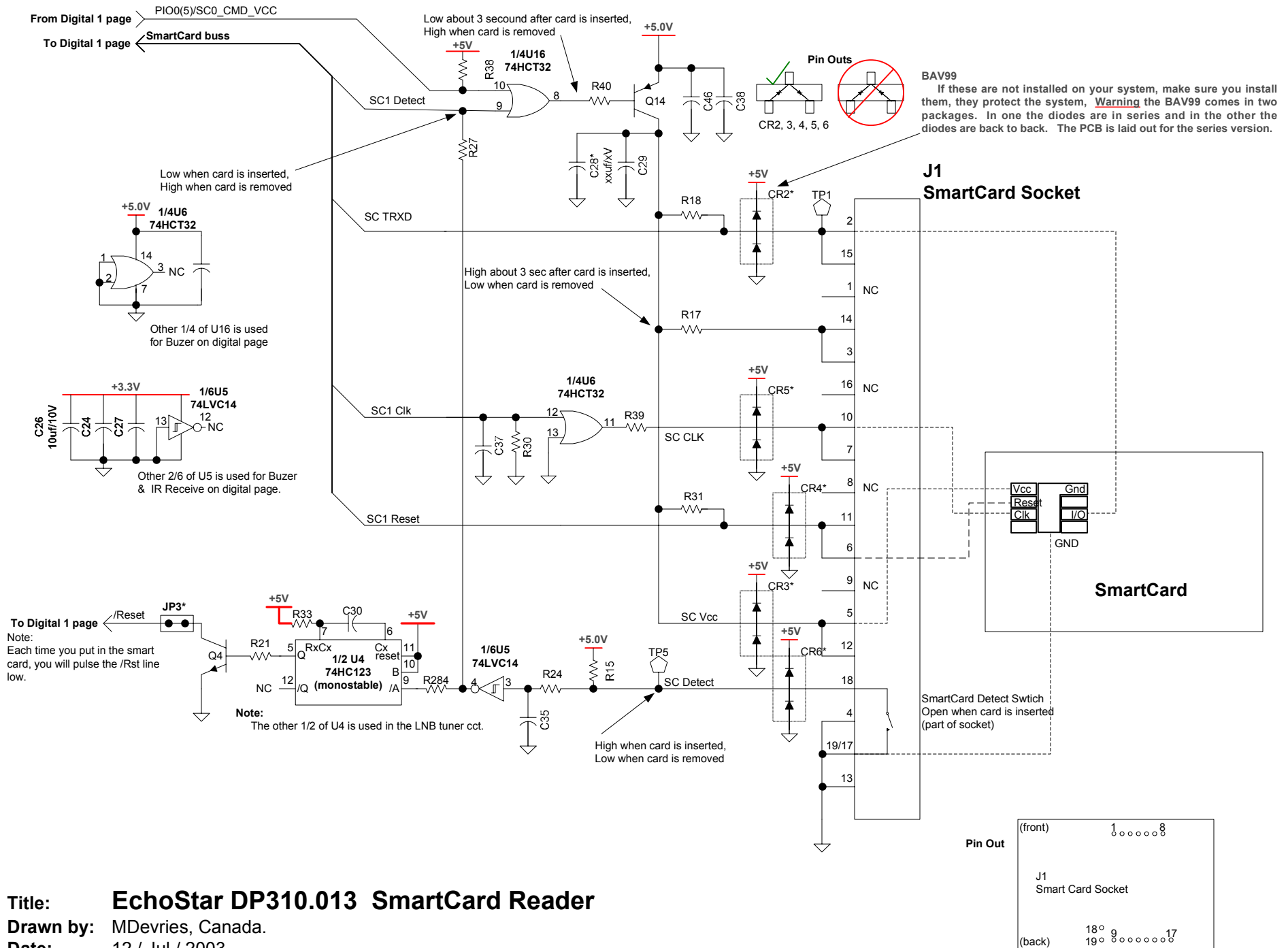
Title: EchoStar DP310.013 Power Distribution

Drawn by: MDevries, Canada.

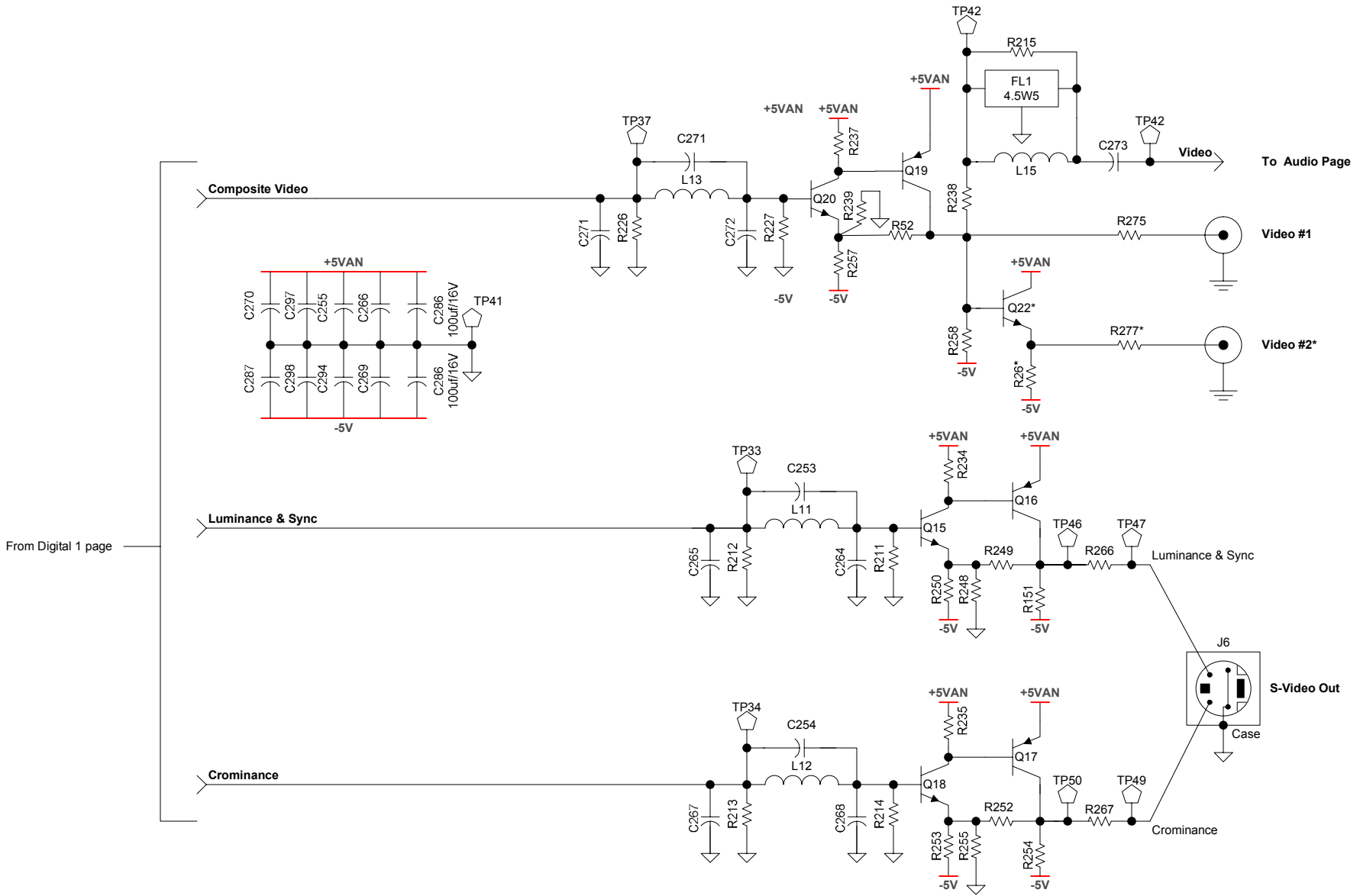
Date: 16 / Nov / 2003

PCB/SCH: 109462 / 109461

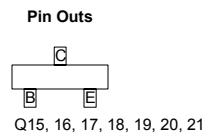




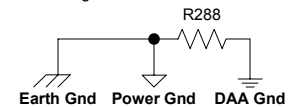
Title: EchoStar DP310.013 SmartCard Reader
Drawn by: MDevries, Canada.
Date: 12 / Jul / 2003
PCB/SCH: 109462 / 109461

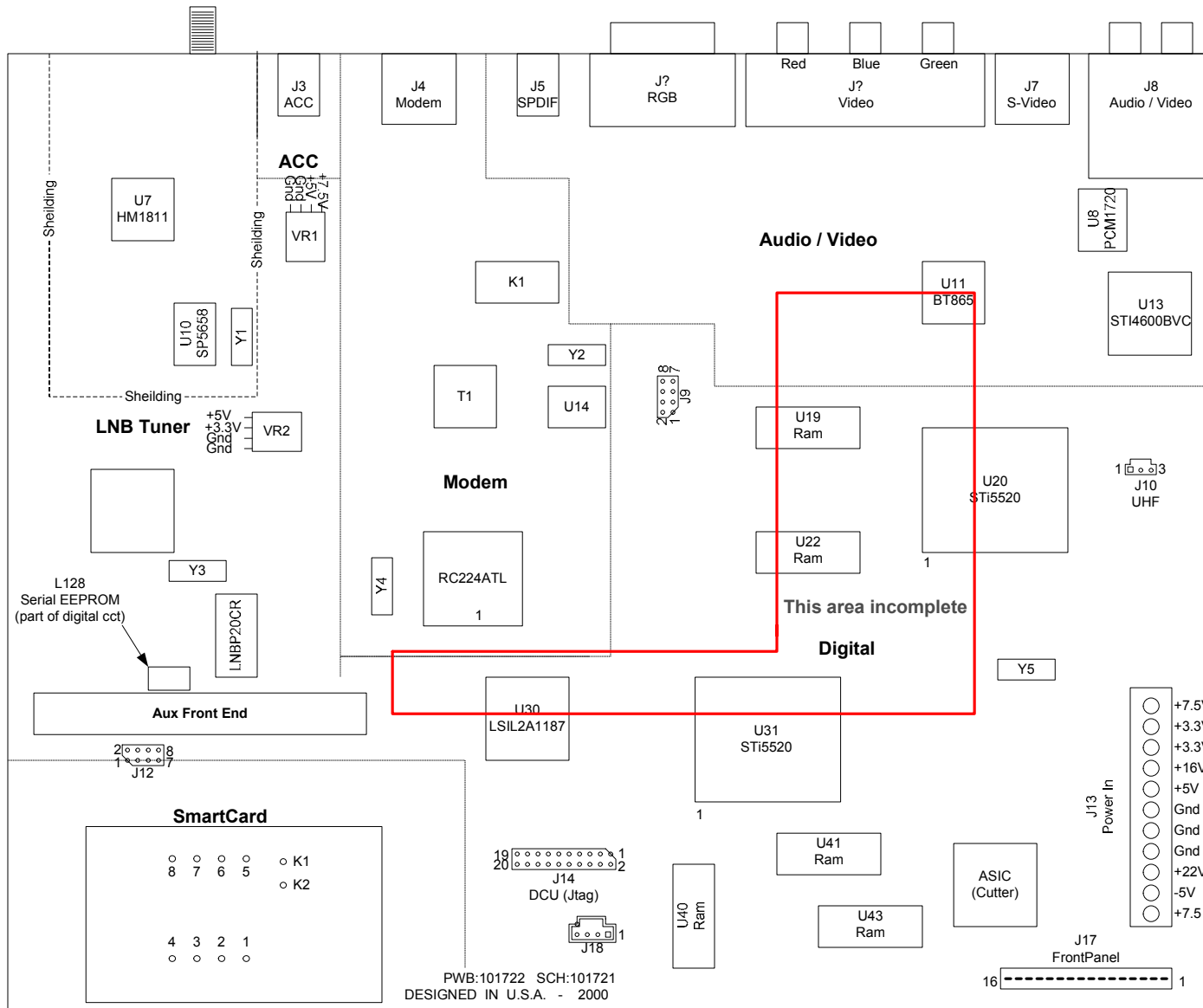


Title: EchoStar DP301.013 Video
Drawn by: MDevries, Canada.
Date: 10 / Jul / 2003
PCB/SCH: PCB:109462 / SCH:109461



Note:
 The Earth or Chasis ground, DAA ground
 and Power ground are **NOT** the same.





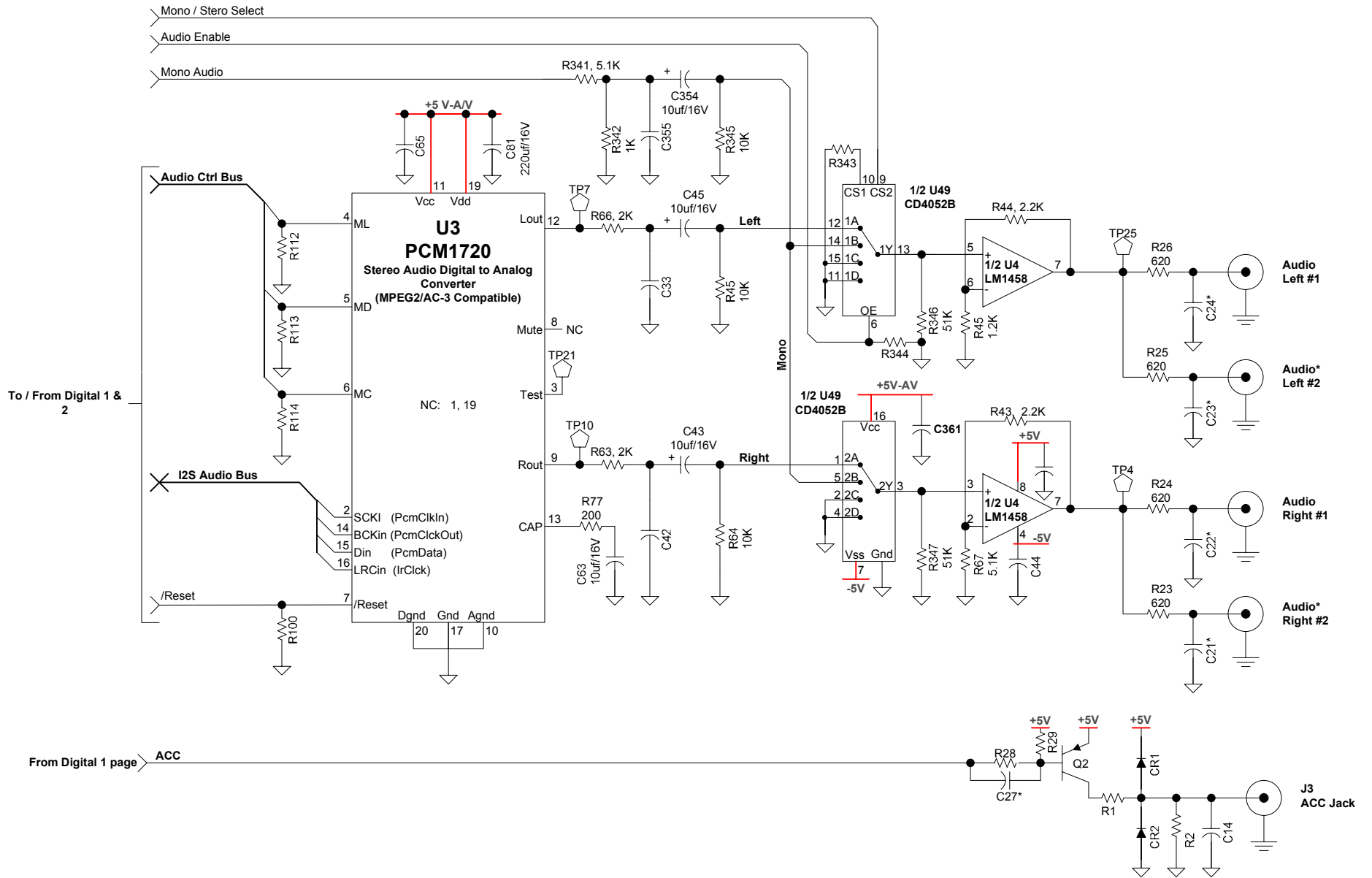
Title: EchoStar 6000 Parts Layout

Drawn by: MDevries, Canada.

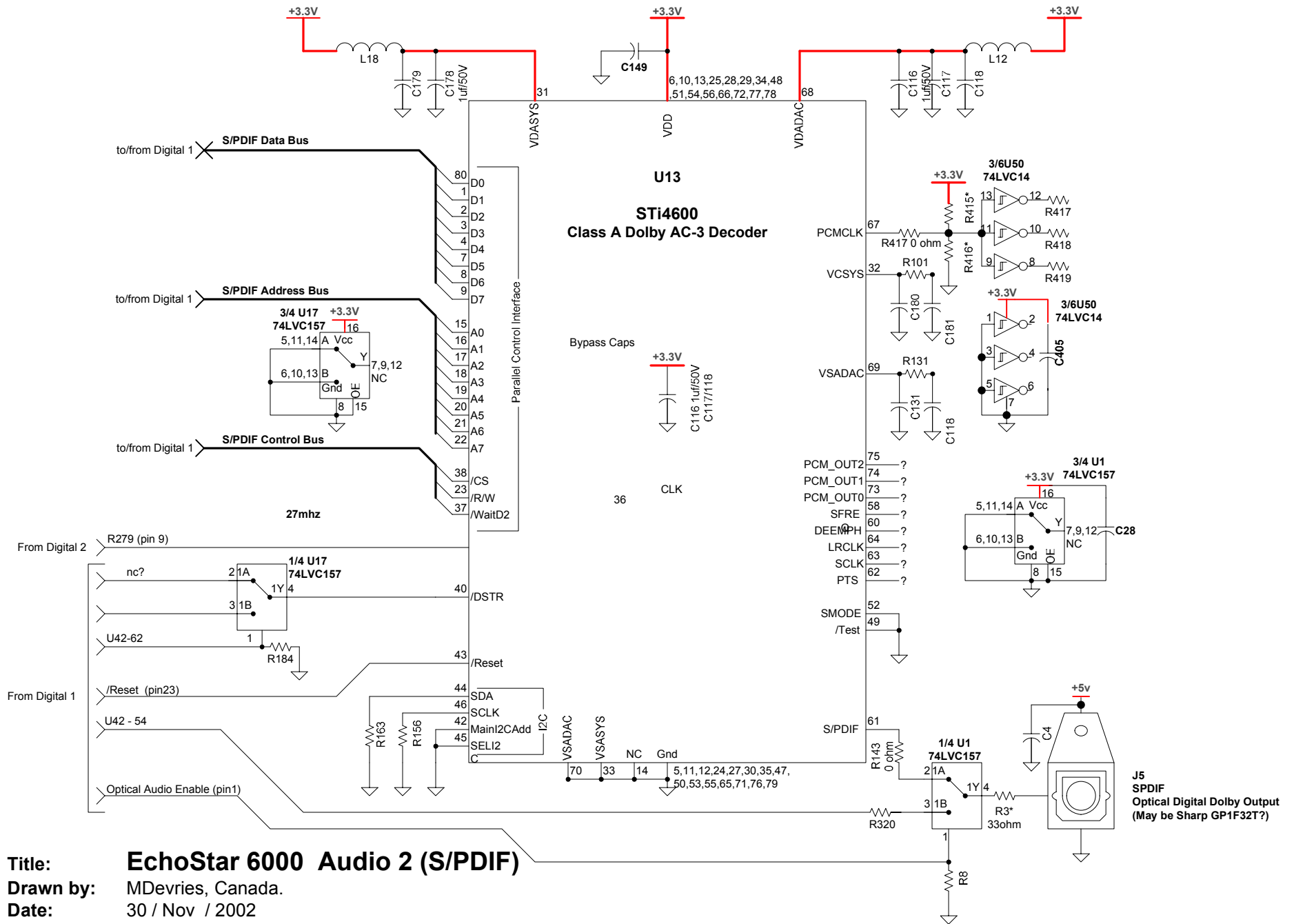
Date: 1 / Aug / '02

PCB: 101722

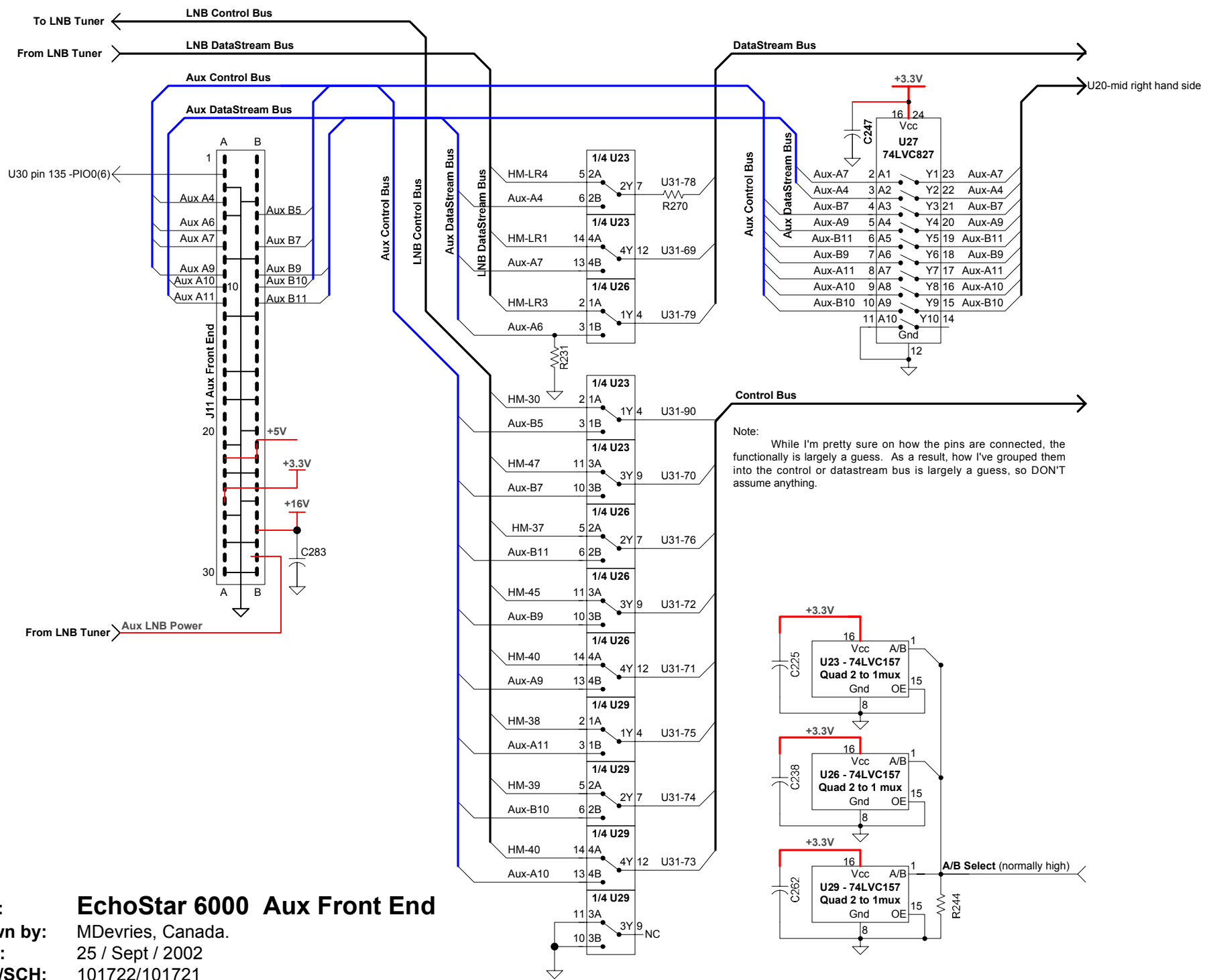
SCH: 101721



Title: EchoStar 6000 Audio 1 (Stereo)
Drawn by: MDevries, Canada.
Date: 05 / Oct / 2002
PCB/SCH: 101722/101721

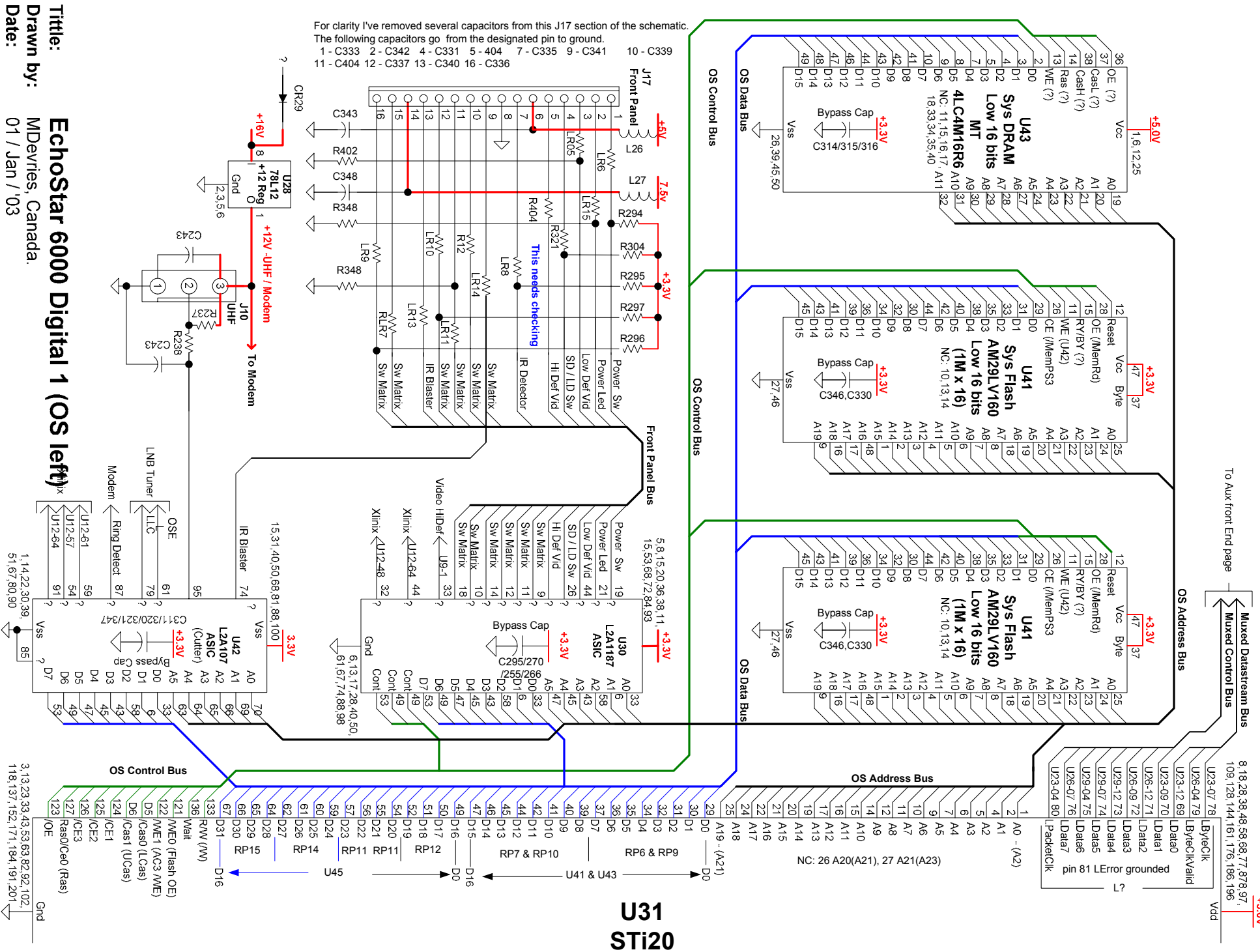


Title: EchoStar 6000 Audio 2 (S/PDIF)
Drawn by: MDevries, Canada.
Date: 30 / Nov / 2002
PCB: 101722
SCH: 101721



Title: EchoStar 6000 Aux Front End
Drawn by: MDevries, Canada.
Date: 25 / Sept / 2002
PCB/SCH: 101722/101721

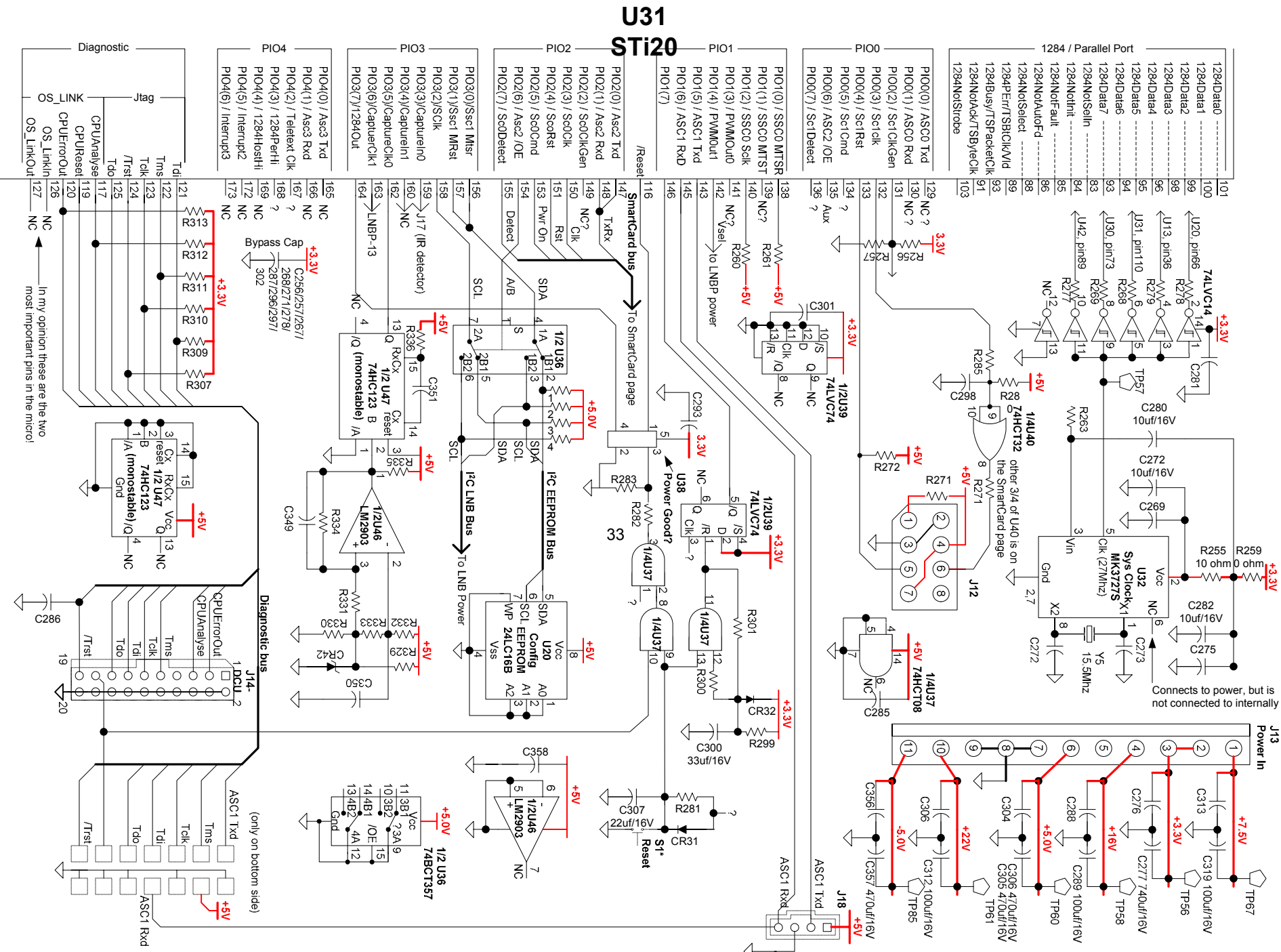
Title: EchoStar 6000 Digital 1 (OS left)
Drawn by: MDevries, Canada.
Date: 01 / Jan / '03

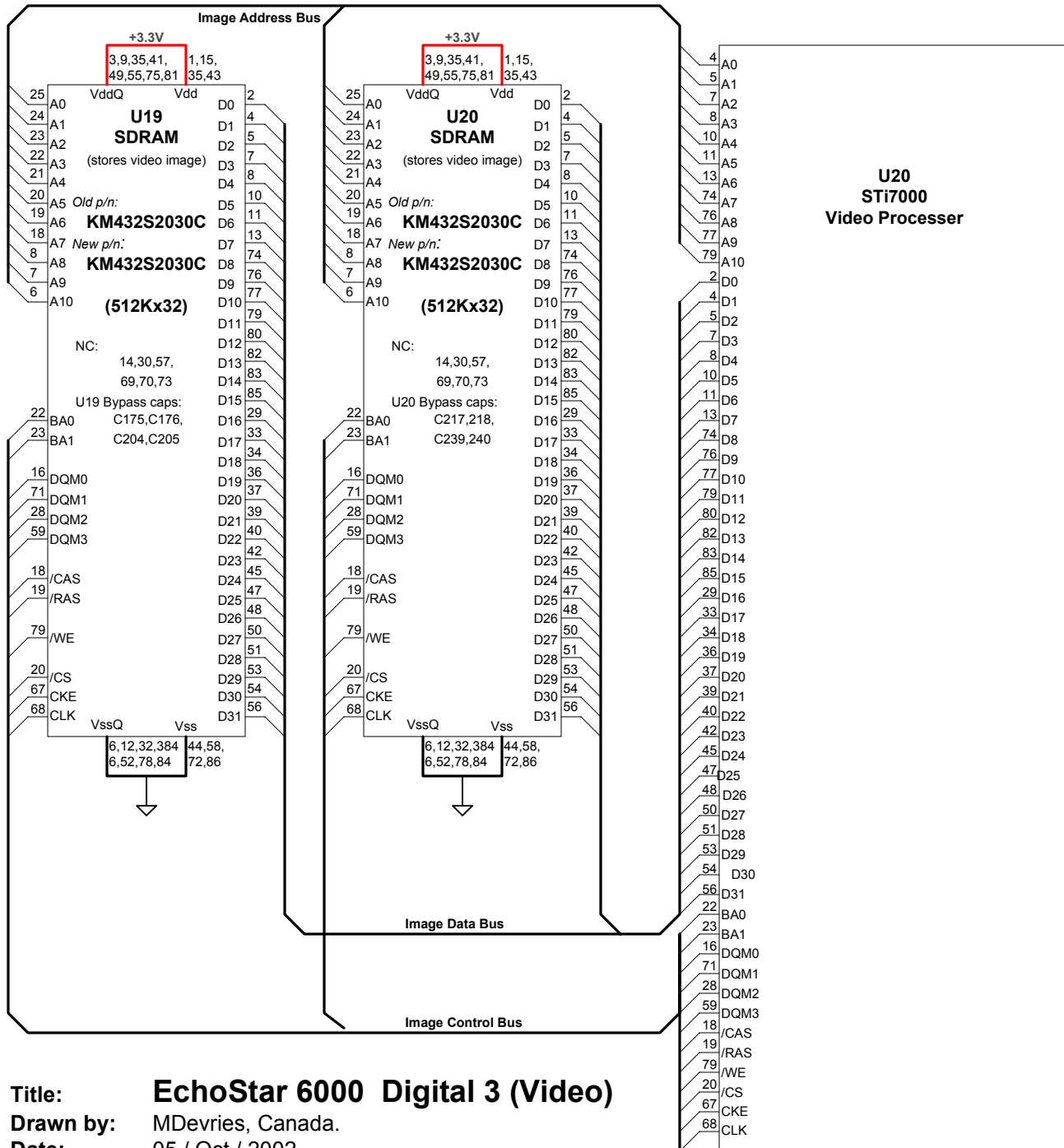


For clarity I've removed several capacitors from this J17 section of the schematic. The following capacitors go from the designated pin to ground.
 1 - C333 2 - C342 4 - C331 5 - 404 7 - C335 9 - C341 10 - C339
 11 - C404 12 - C337 13 - C340 16 - C336

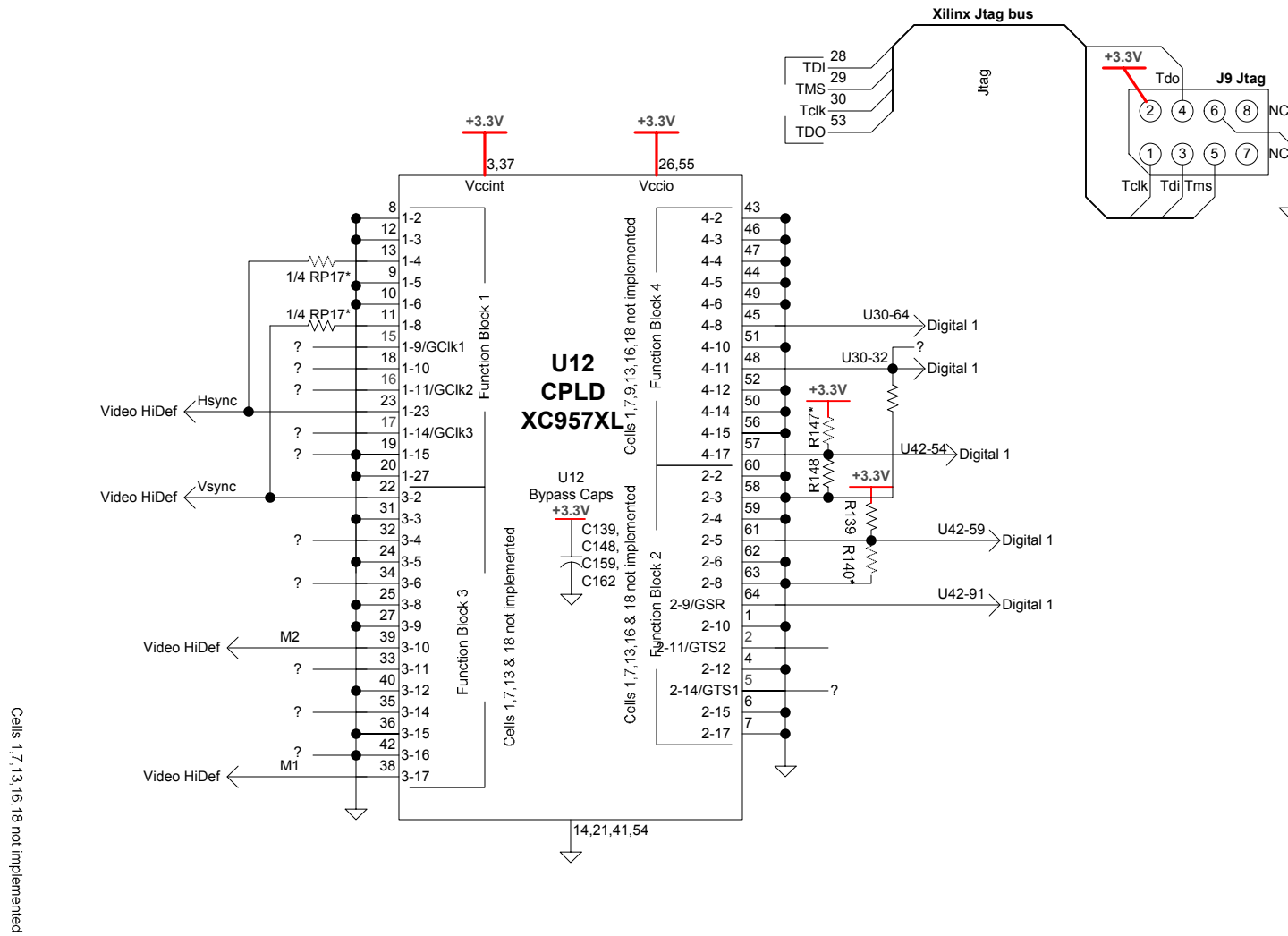
OS Control Bus
 3 13 23 33 43 53 63 82 92 102
 118 137 152 171 184 191 201

U31 STi20

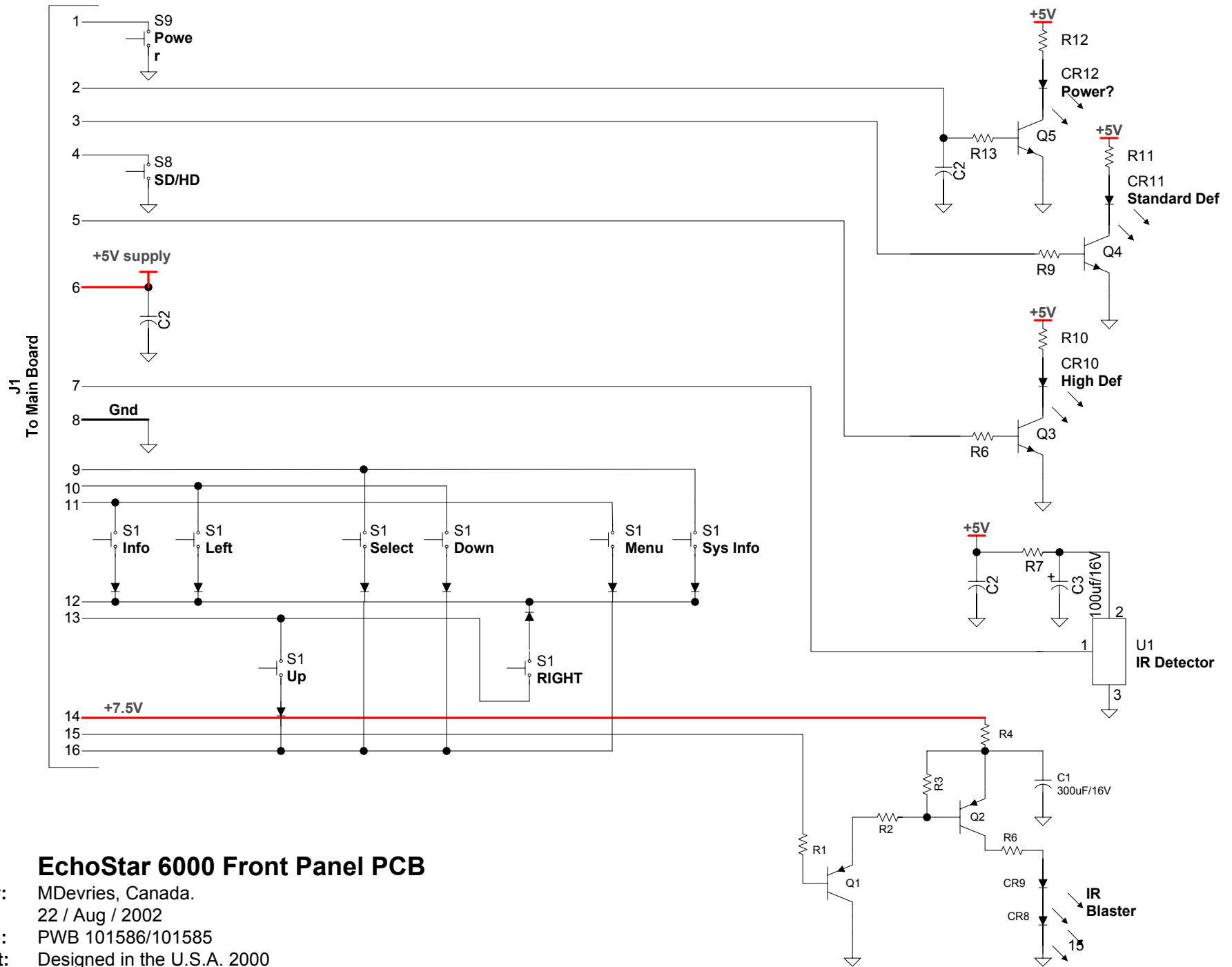




Title: EchoStar 6000 Digital 3 (Video)
Drawn by: MDevries, Canada.
Date: 05 / Oct / 2002
PCB/SCH: 101722/101721



Title: **EchoStar 6000 Digital 4** (Xilinx)
 Drawn by: MDevries, Canada.
 Date: 25 / Feb / 2003
 PCB/SCH: 101722/101721



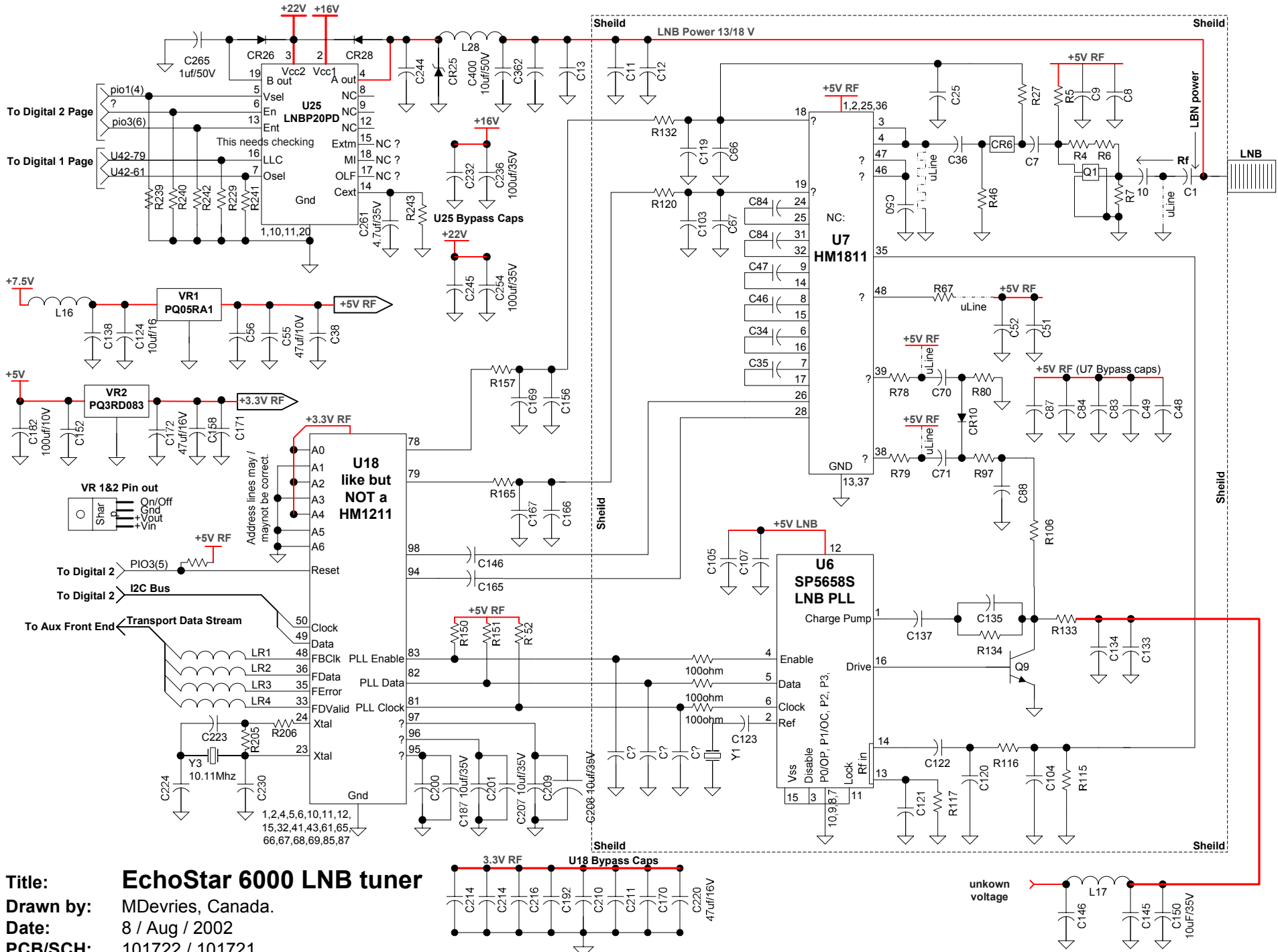
Title: EchoStar 6000 Front Panel PCB

Drawn by: MDevries, Canada.

Date: 22 / Aug / 2002

PCB/SCH: PWB 101586/101585

Comment: Designed in the U.S.A. 2000



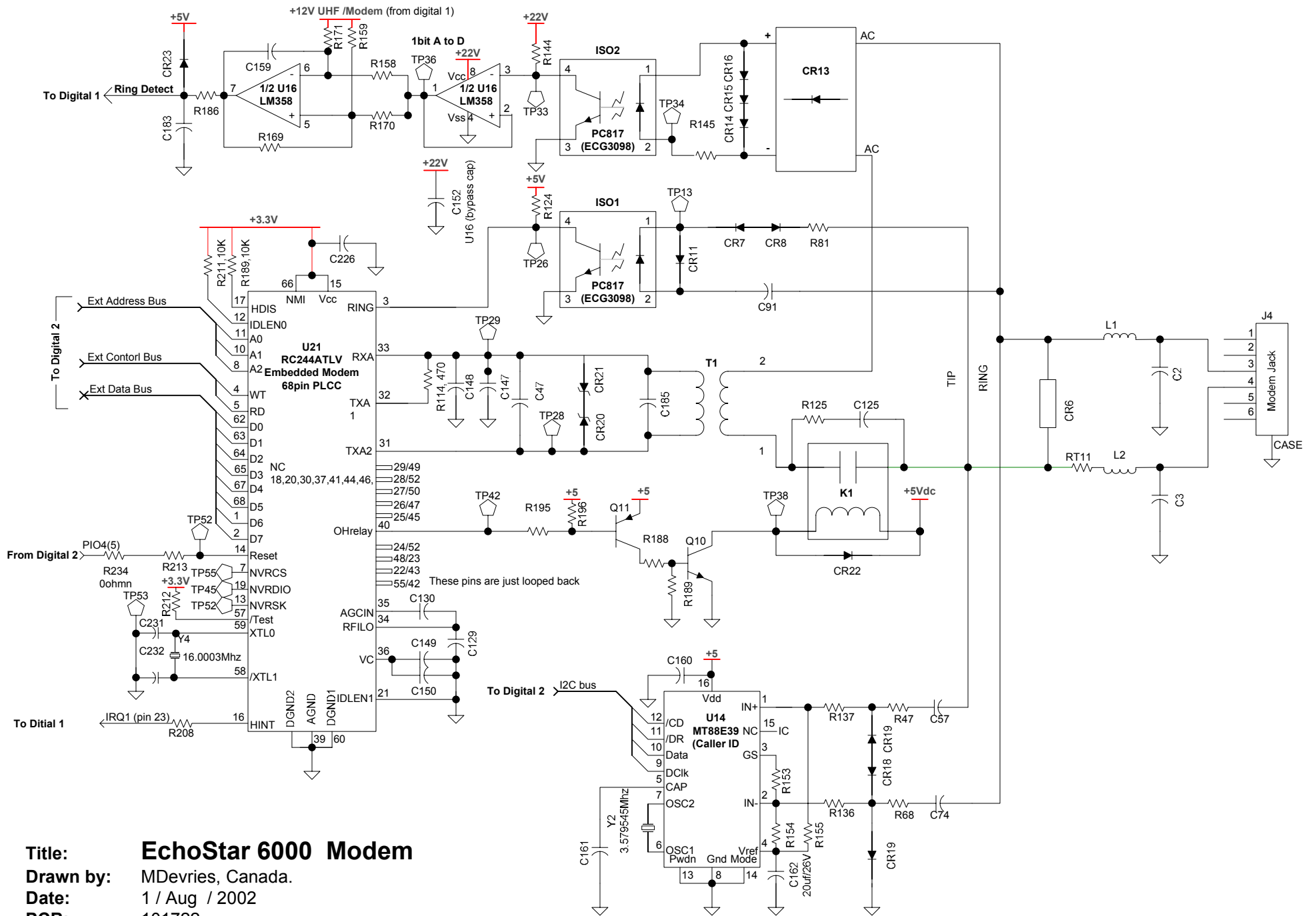
Title: EchoStar 6000 LNB tuner

Drawn by: MDevries, Canada.

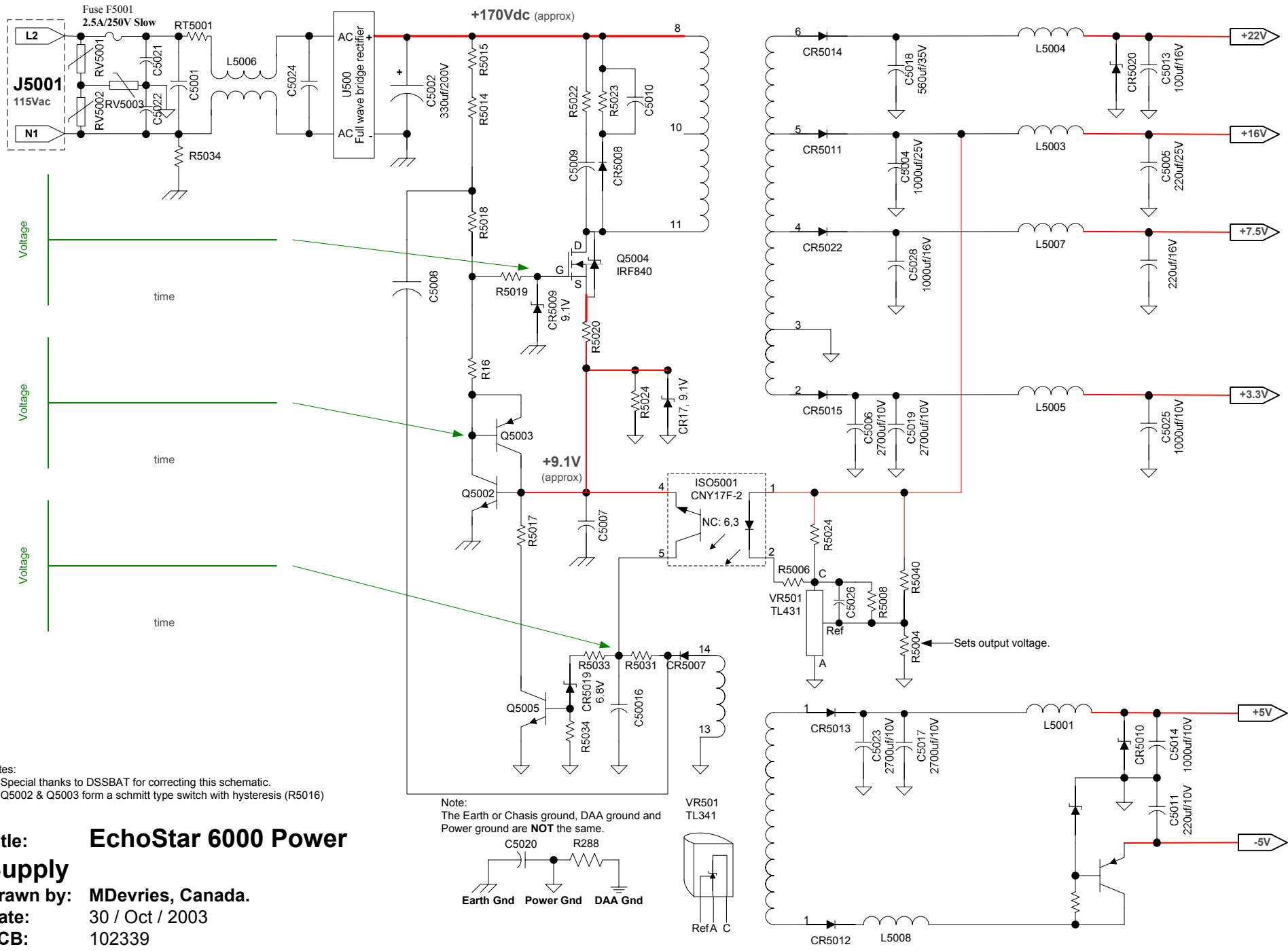
Date: 8 / Aug / 2002

PCB/SCH: 101722 / 101721

Comments: Drawn without datasheets so drawing has not been crosschecked and **WILL** have errors.

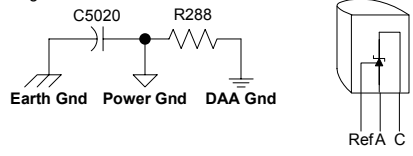


Title: EchoStar 6000 Modem
Drawn by: MDevries, Canada.
Date: 1 / Aug / 2002
PCB: 101722
SCH: 101721



Notes:
 - Special thanks to DSSBAT for correcting this schematic.
 - Q5002 & Q5003 form a schmitt type switch with hysteresis (R5016)

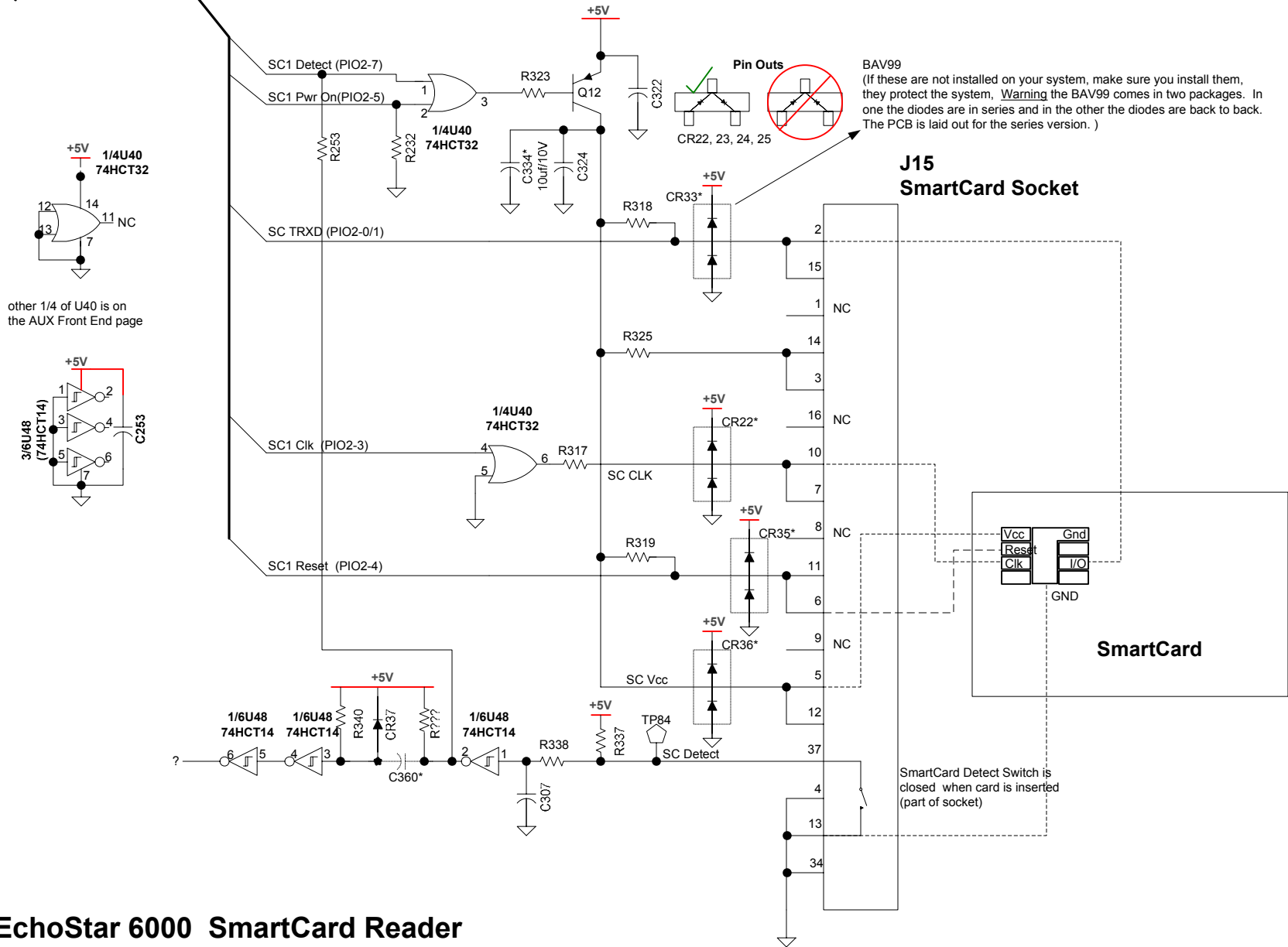
Note:
 The Earth or Chassis ground, DAA ground and Power ground are **NOT** the same.



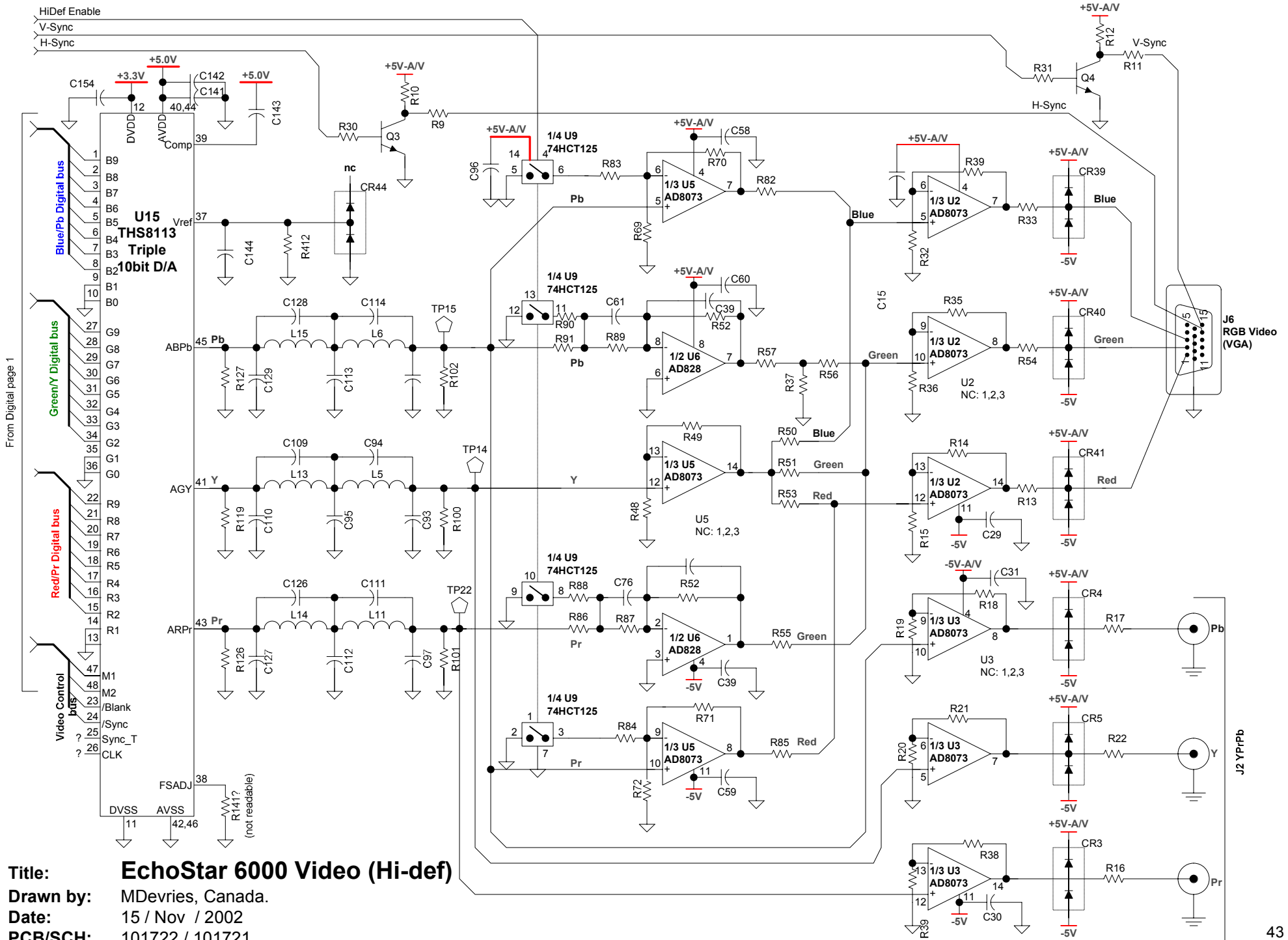
Title: EchoStar 6000 Power Supply
Drawn by: MDevries, Canada.
Date: 30 / Oct / 2003
PCB: 102339
SCH: 102338

To / From
Digital 1 page

SmartCard buss



Title: EchoStar 6000 SmartCard Reader
Drawn by: MDevries, Canada.
Date: 05 / Sept / 2002
PCB/SCH: 101722/101721

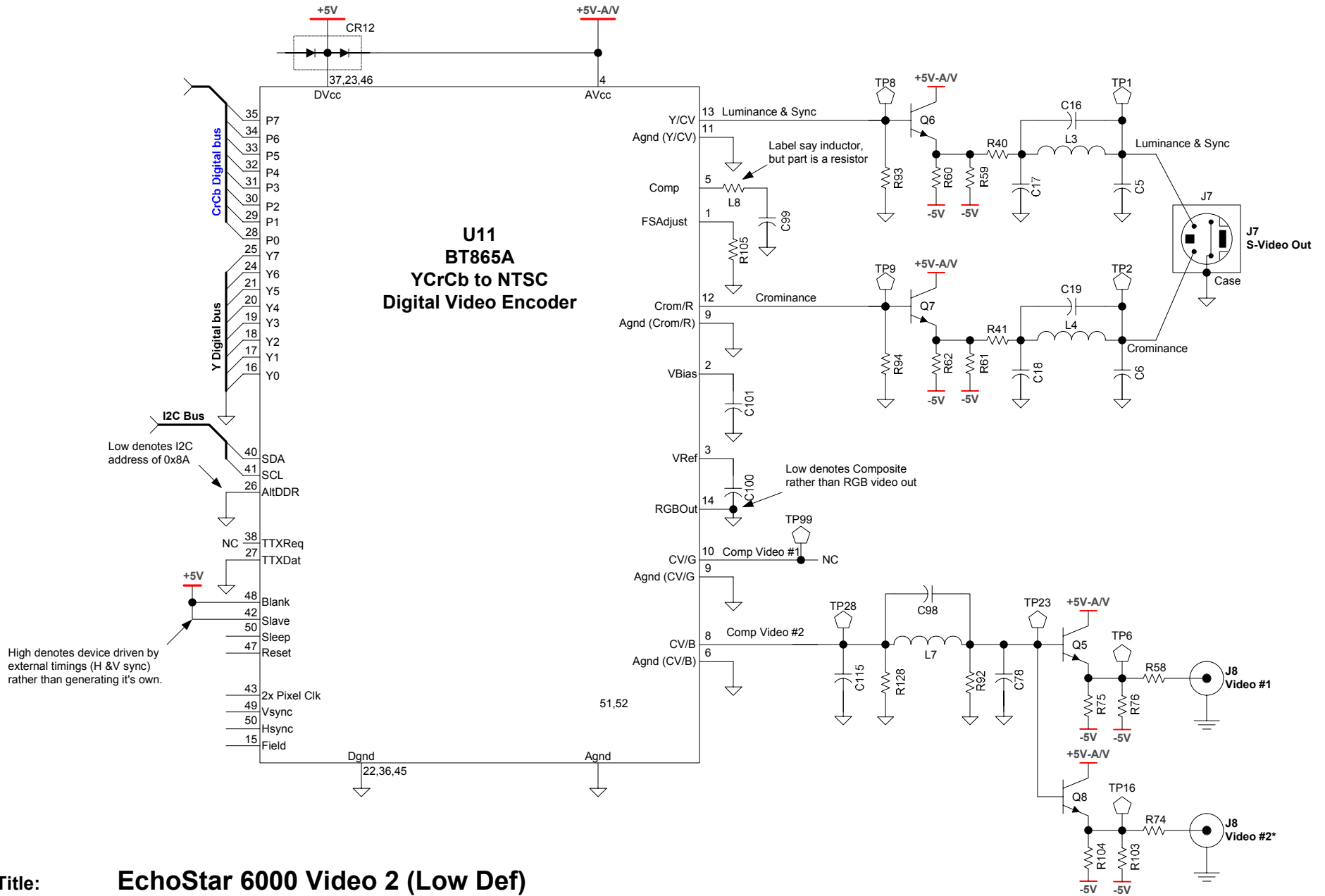


Title: **EchoStar 6000 Video (Hi-def)**

Drawn by: MDevries, Canada.

Date: 15 / Nov / 2002

PCB/SCH: 101722 / 101721

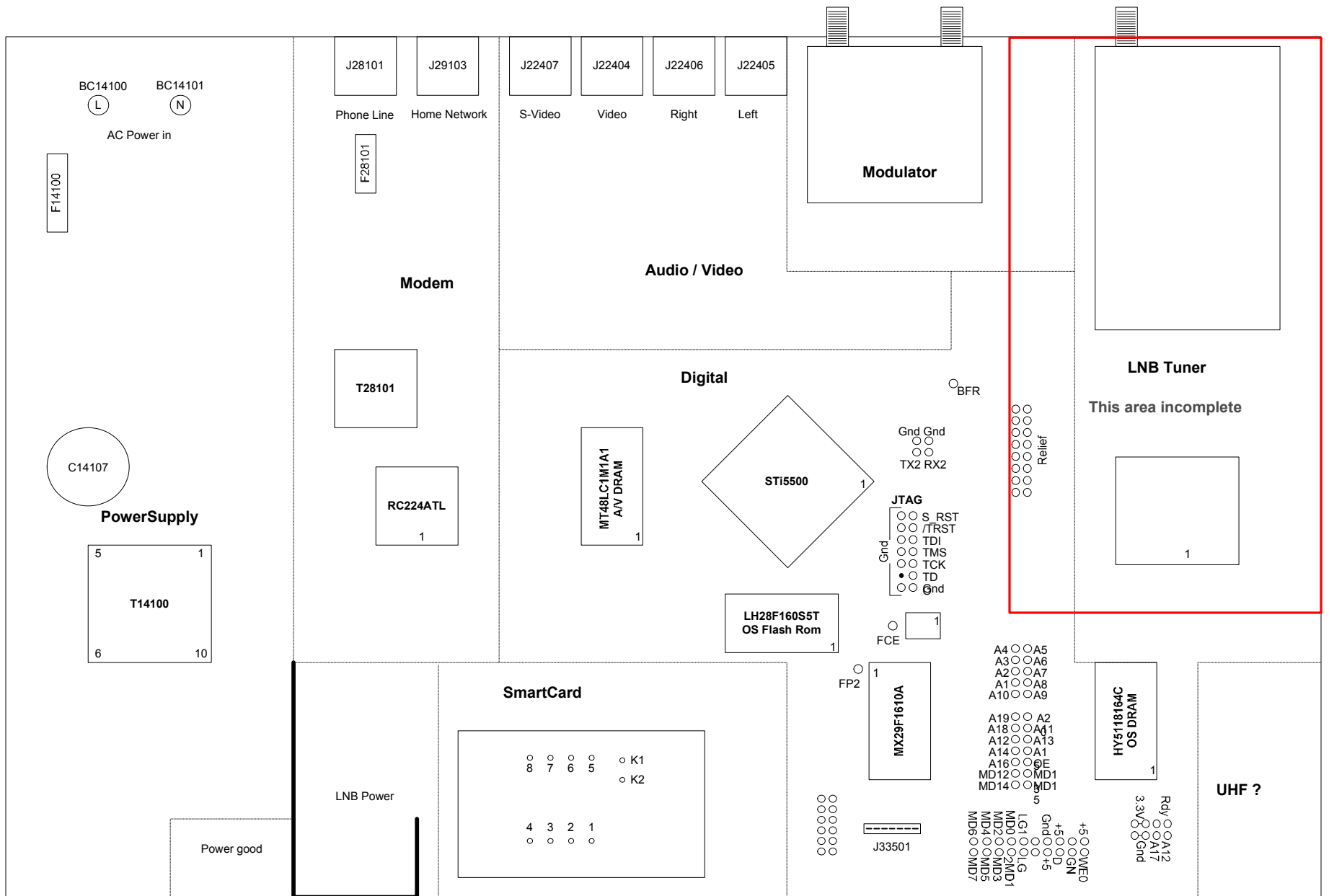


Title: EchoStar 6000 Video 2 (Low Def)

Drawn by: MDevries, Canada.

Date: 16 / Nov / 2002

PCB/SCH: 101722 / 101721



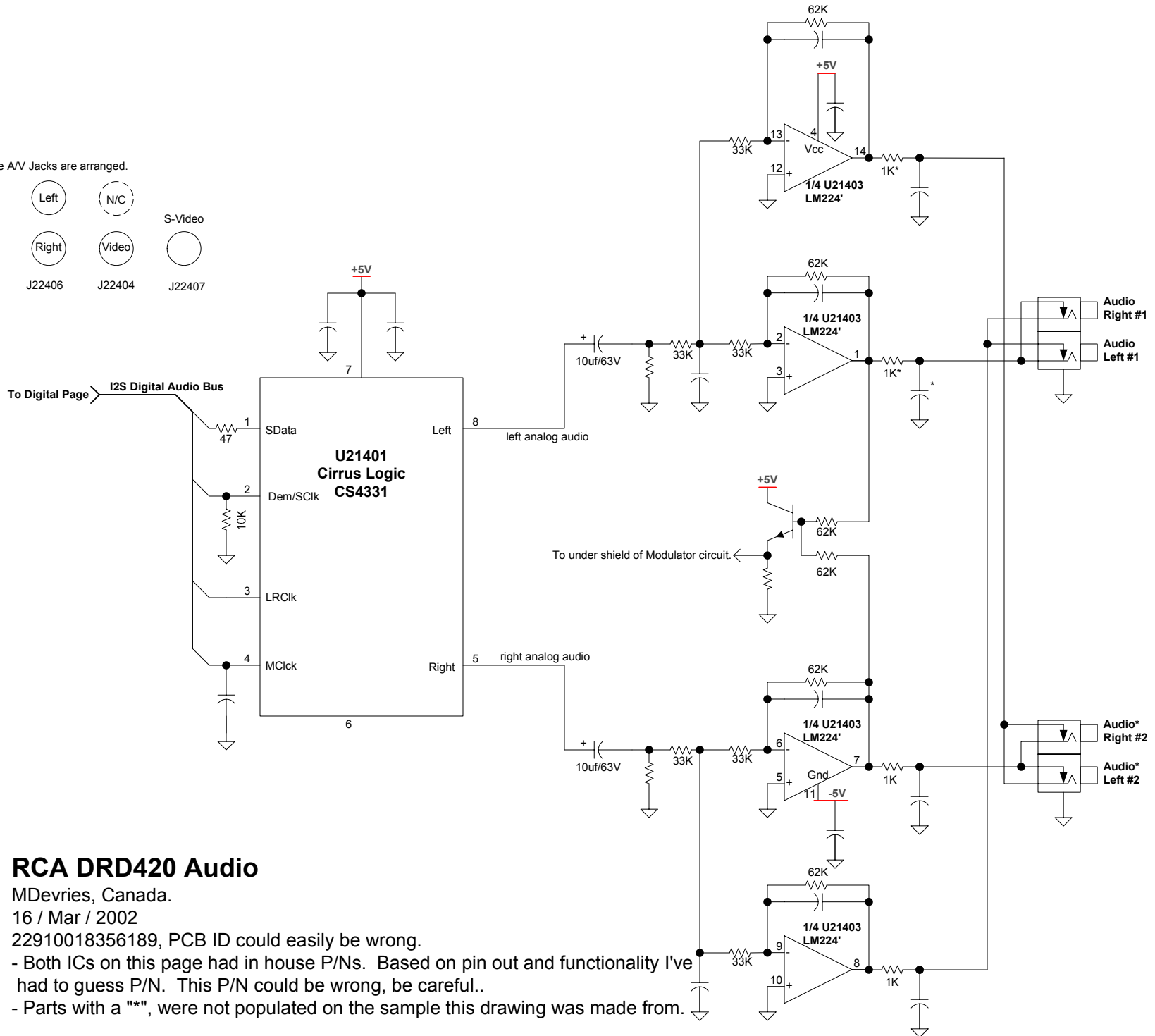
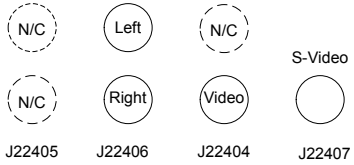
Title: RCA DRD420 Parts Layout

Drawn by: MDevries, Canada.

Date: 10 / Mar / 2002

PCB Ident: 22910018356189 (this could be wrong)

How I'm told the AV Jacks are arranged.



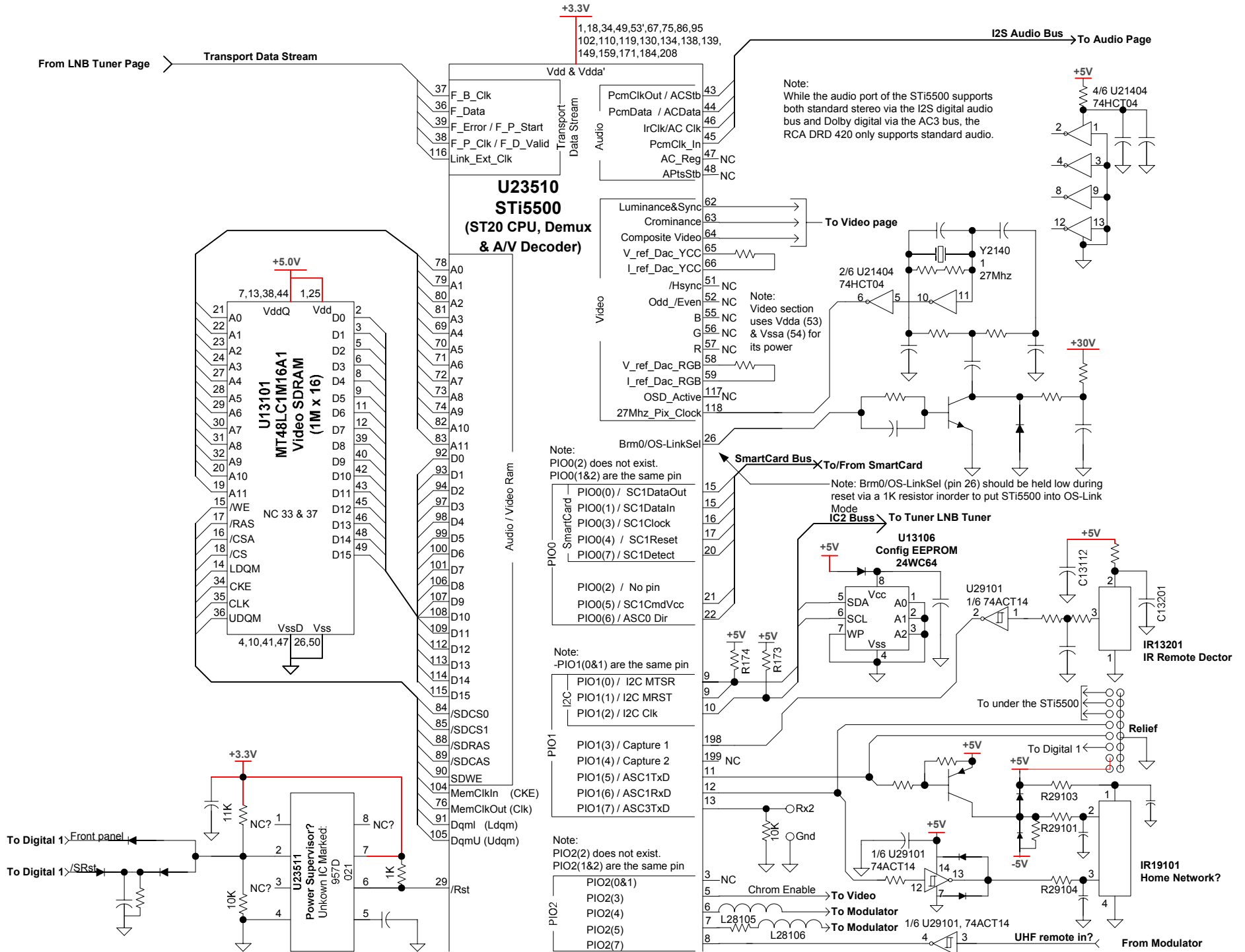
Title: RCA DRD420 Audio

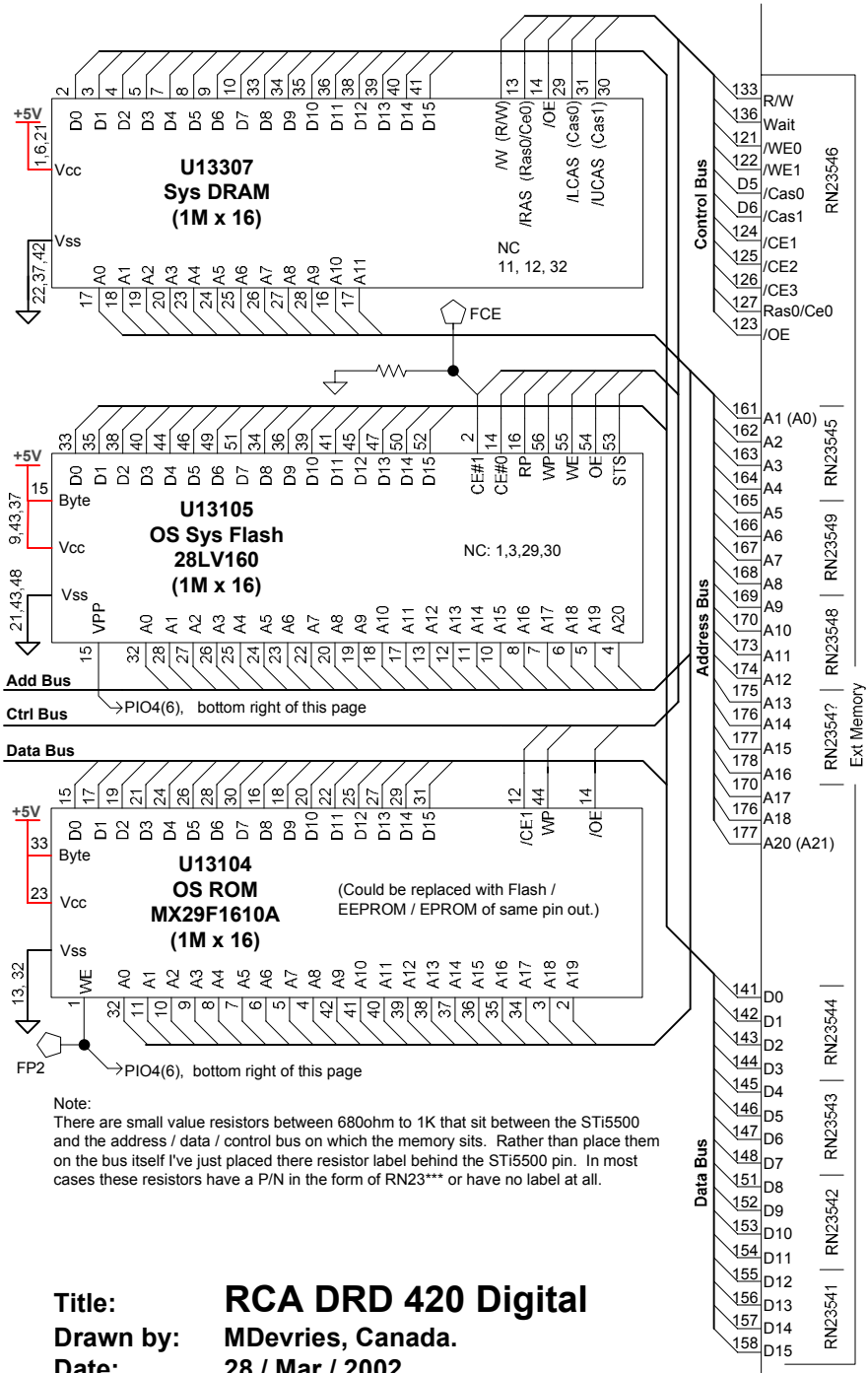
Drawn by: MDevries, Canada.

Date: 16 / Mar / 2002

PCB ID: 22910018356189, PCB ID could easily be wrong.

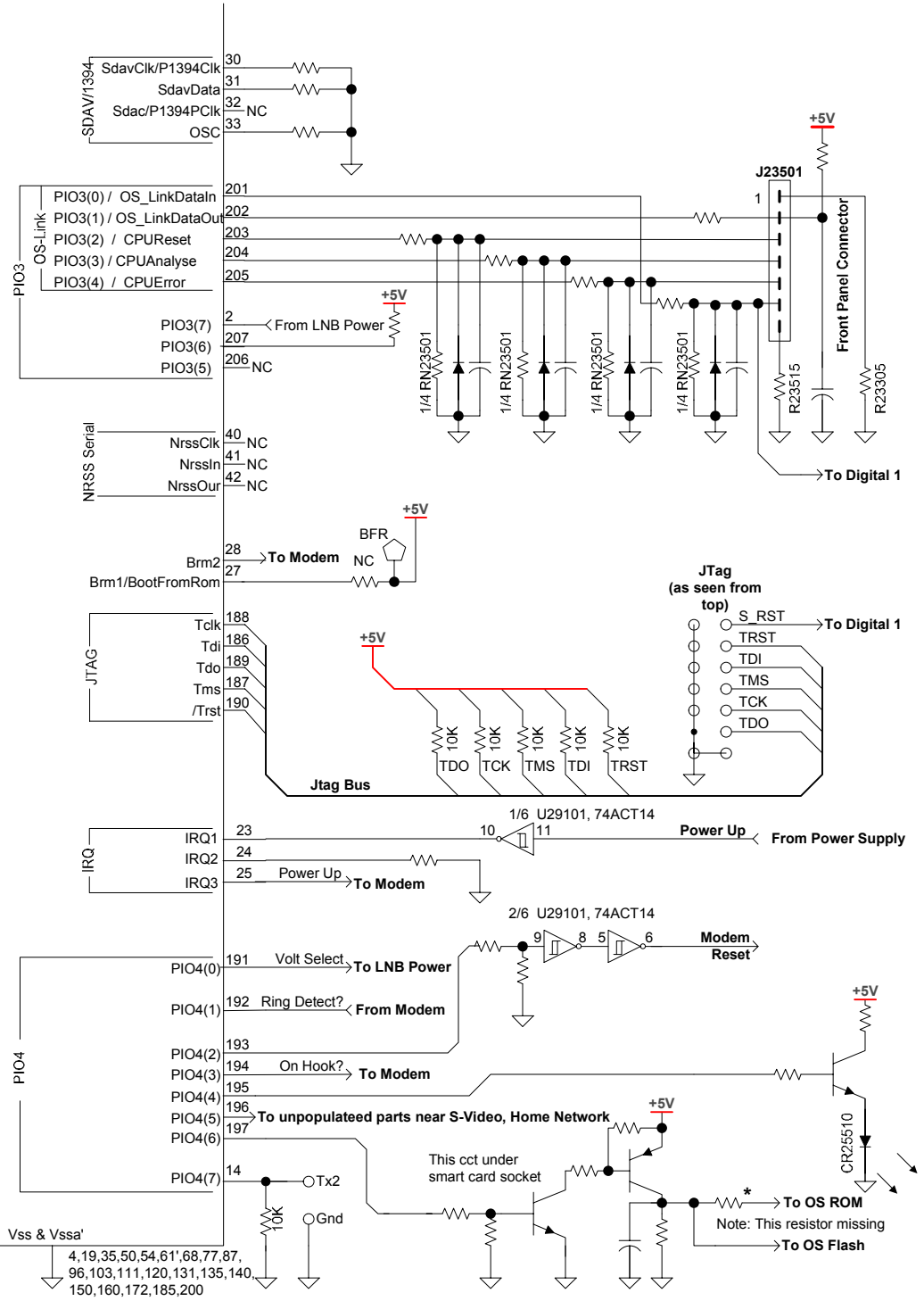
Comment: - Both ICs on this page had in house P/Ns. Based on pin out and functionality I've had to guess P/N. This P/N could be wrong, be careful..
 - Parts with a "*", were not populated on the sample this drawing was made from.

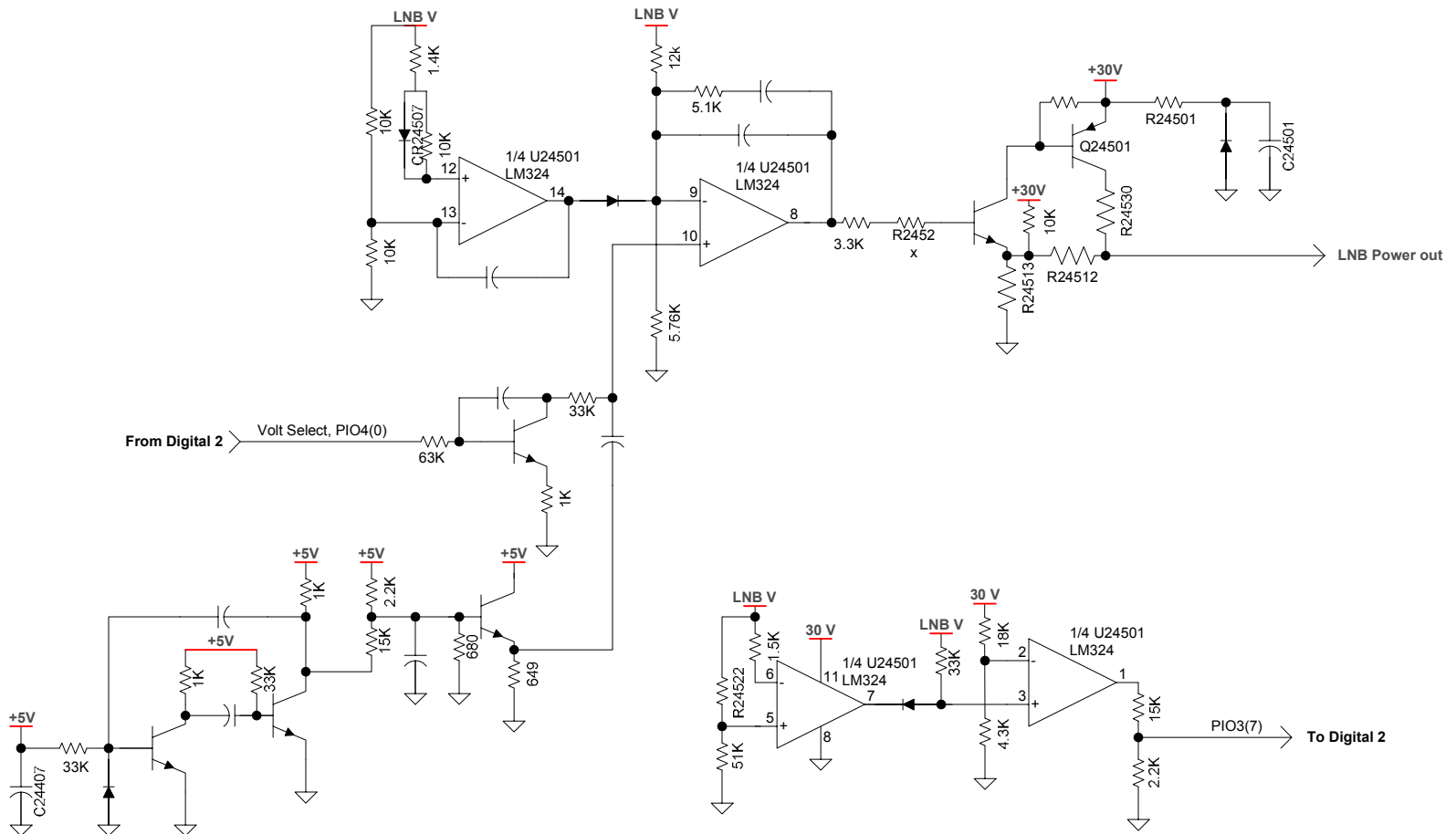




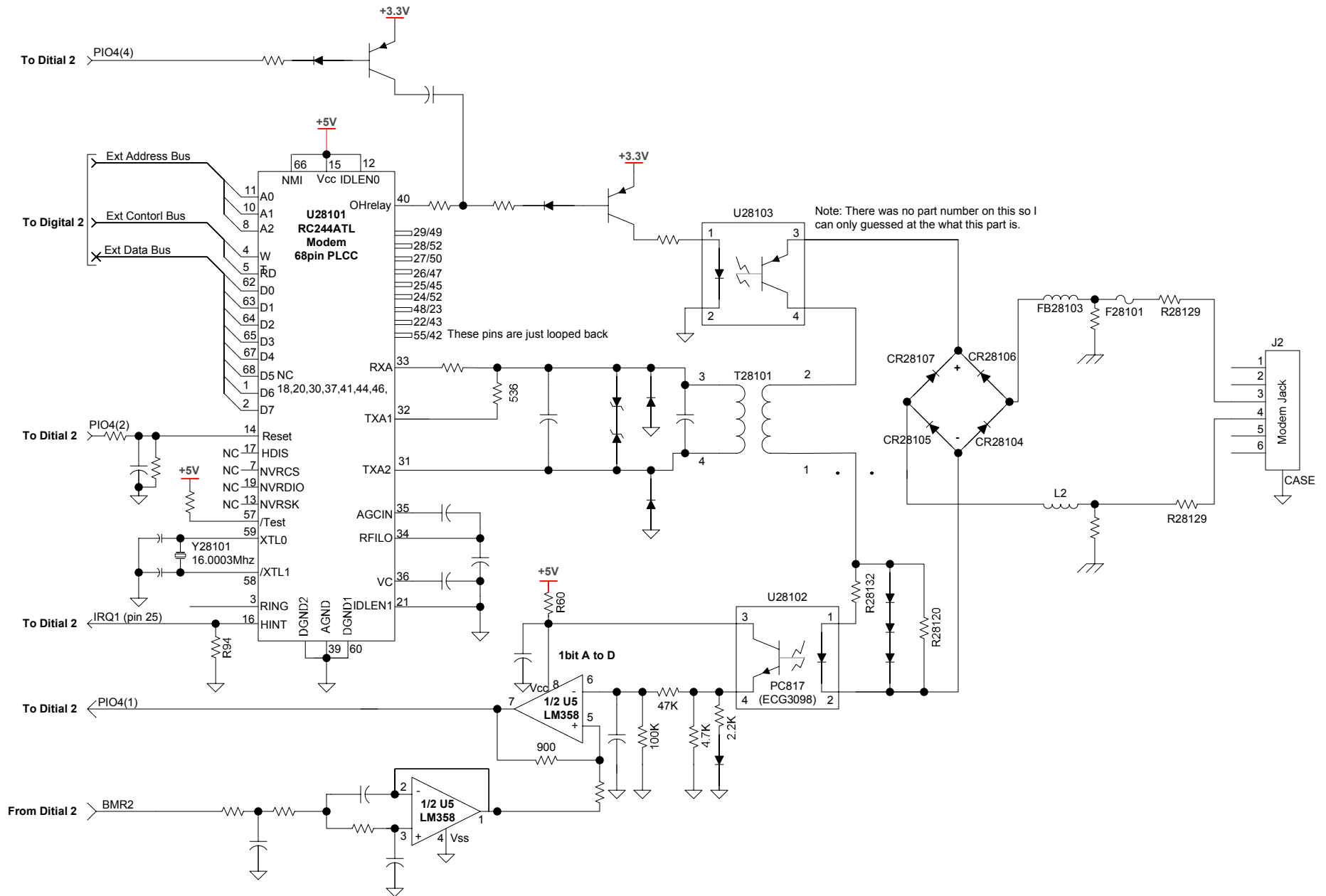
Note:
 There are small value resistors between 680ohm to 1K that sit between the STi5500 and the address / data / control bus on which the memory sits. Rather than place them on the bus itself I've just placed there resistor label behind the STi5500 pin. In most cases these resistors have a P/N in the form of RN23*** or have no label at all.

Title: RCA DRD 420 Digital
Drawn by: MDevries, Canada.
Date: 28 / Mar / 2002
PCB ID: 22910018356189, (PCB ID could easily be wrong)

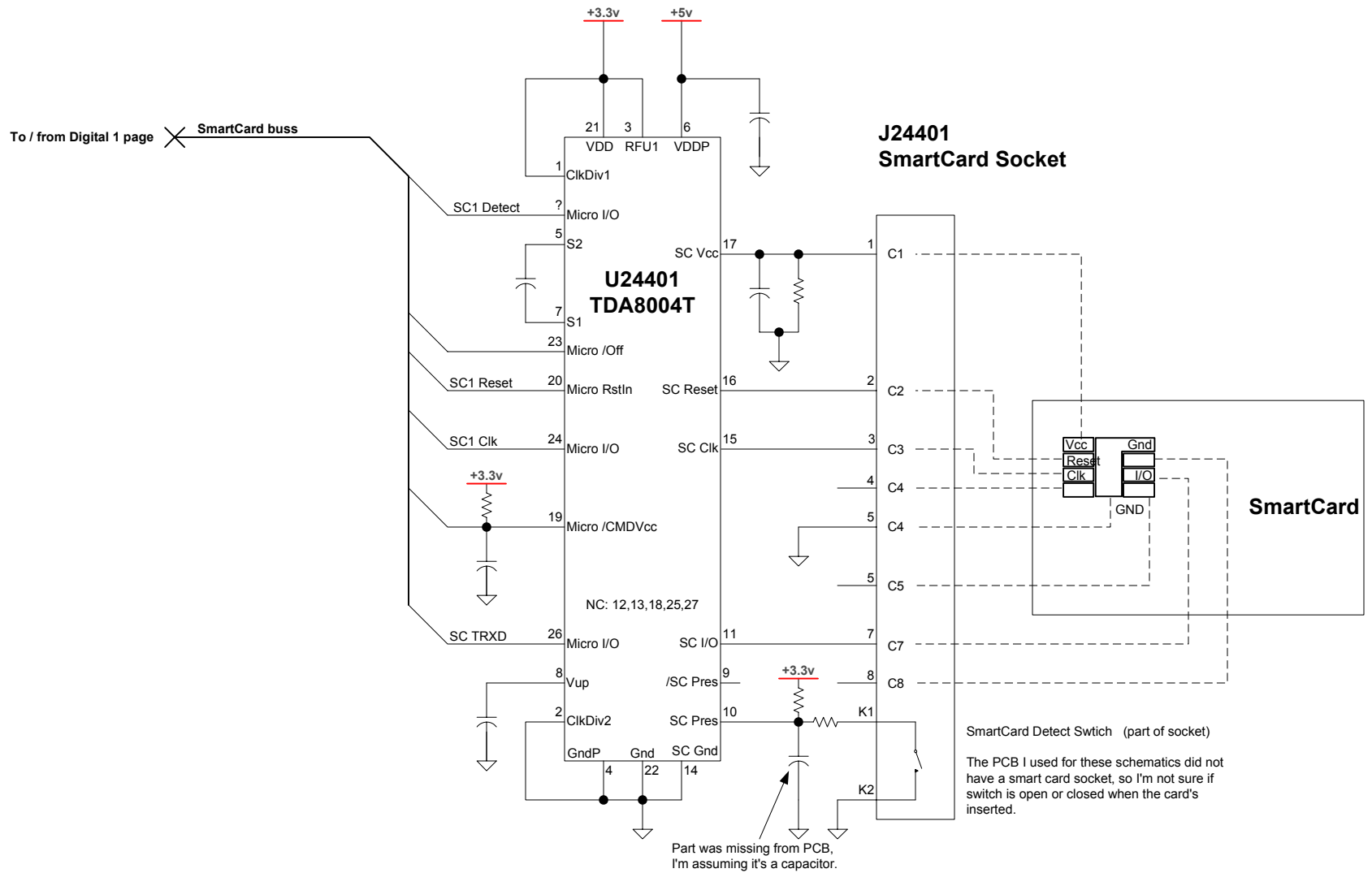




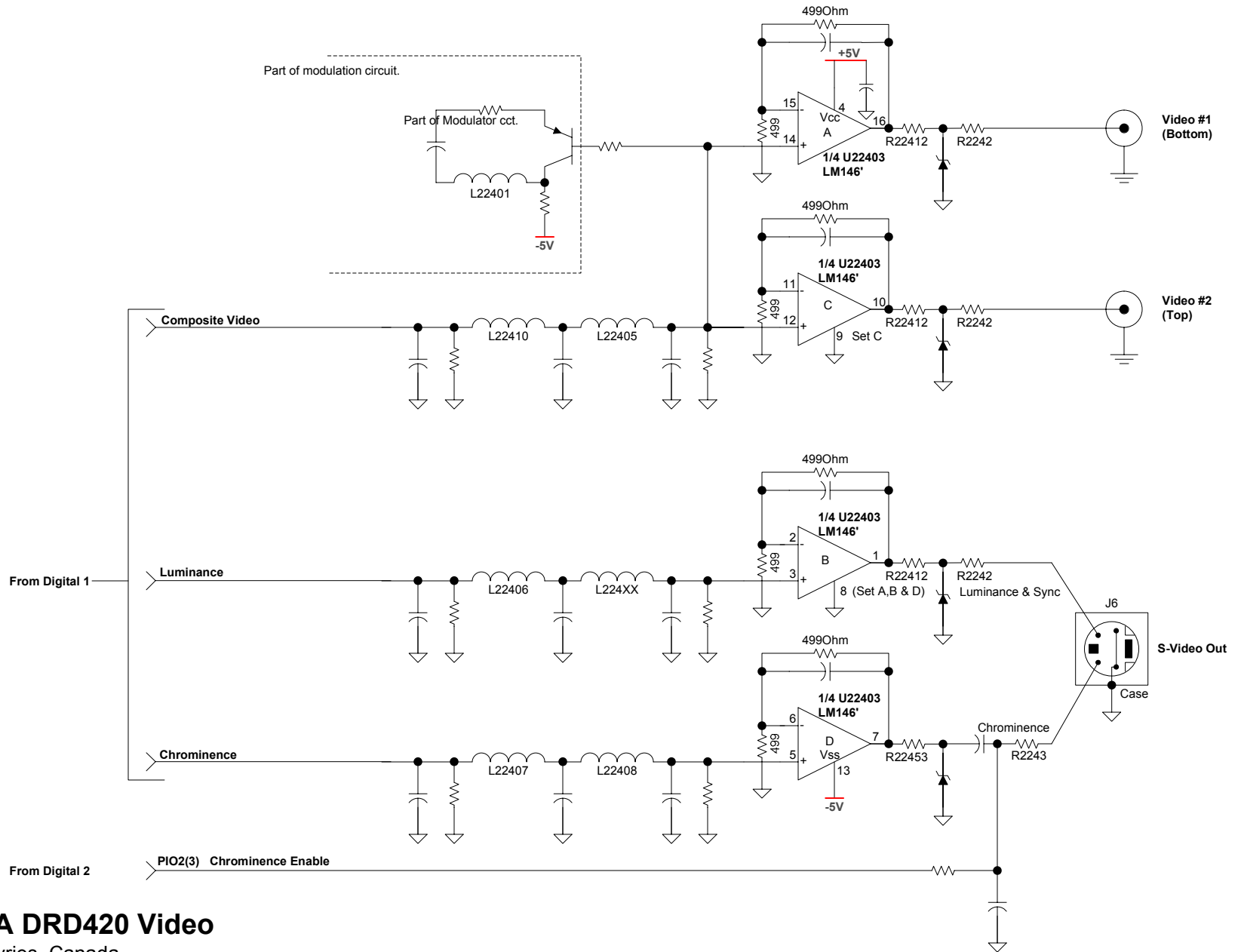
Title: RCA DRD420 LNB Power
Drawn by: MDevries, Canada.
Date: 28 / Mar / 2002
PCB ID: 22910018356189?, PCB ID could easily be WRONG



Title: RCA DRD420 Modem
Drawn by: MDevries, Canada.
Date: 25 / Mar / 2002
PCB ID: 22910018356189?, PCB ID could easily be wrong



Title: RCA DRD420 SmartCard
Drawn by: MDevries, Canada.
Date: 18 / Mar/ 2002
PCB ID: 22910018356189 (this could be wrong)



Title: RCA DRD420 Video

Drawn by: MDevries, Canada.

Date: 18 / Mar / 2002

PCB ID: 22910018356189, PCB ID could easily be wrong

Comment: With only in house marking on the Video Op Amp I can only guess at the p/n. Therefore while the LM146 fits both pin out and functionality, I cannot promise that this the correct p/n, there are other 16 pin quad op amps that might be better suited.