STYSTEM CONTROLLER / COMMS - NOTES

MCP23017 Notes
==========
Note the Boron may be fully powered off
to save power for a week or more.
This is the reason that CTL_BAT1 etc.
are connected to the MCP23017 which
keeps these control lines biased while
using very little standby power.

The MCP23017 power is maintained
by the use of a backup batery.
This is essential to preserve output states
and so that its interrupt lines are powered
and can re-awaken the Boron when it
recieves the Alarm signal from the RTC.

MCP23017 should have interrupt Mirror bit
set to 1 so that INTA and INTB are logically OR'd.
For this reason only INTA need be
connected to the Boron.

SERIES RESISTORS:
These limit current in case of a fault which
could include a programming error during
testing.

The nominal 2k2 may need to be changed.
For example a low value may need to be fitted
if there is a weak pull-up at the device end.

IMPORTANT:
==========
Before powering off a sensor make sure the relevant
CS line is changed to highZ otherwise it could
be drawing high power through the input protection
diodes.

Before powering down the Boron make sure the
DEBUG_LED lines are changed to highZ so that
they are not drawing power from the MCP backup
battery. Same applies to other lines.

XC8107_SW Notes
==========
This power switch is connected by 100k Pull-up to
LiPo battery V+.

If it is pulled low it disables the 3V3 regulator
which supplies the Boron.

MCP_INTA should be to programmed go High
when the RTC_Alarm signal is active or the
user presses the external button. This is achieved
by programming the MCP23017 registers.

BOR_EN_OUT: When the Boron has a power on
reset it can be programmed to set this output High.
It then holds itself powered on regardless of the
MCP_INTA signal level.

BORON power off. The Boron sleep current in the
best case is ~ 1400 uA. This drains the battery over
the course of 1 year mostly in standby. It can set a
new Alarm for say 1 weeks time then prepare to power
off and set BOR_EN_OUT Low. In effect it shuts itself down
completely and will power back up when the alarm goes off
or if the user presses the external button.

For testing a jumper can be removed so that the Boron
stays powered up always. This will be useful during program
develoment to ensure a programming error does not cause
an unintended power off.

POWER_SW
==========
This is connected to SPDT rotary switch
on the enclosure. It is implemented as a
soft power switch.

The reason for the soft switch is that we want
the Boron to set the valves to a safe position,
complete ongoing transmits or writing
to the SD card etc. In summary a
controlled shutdown is prefereed.

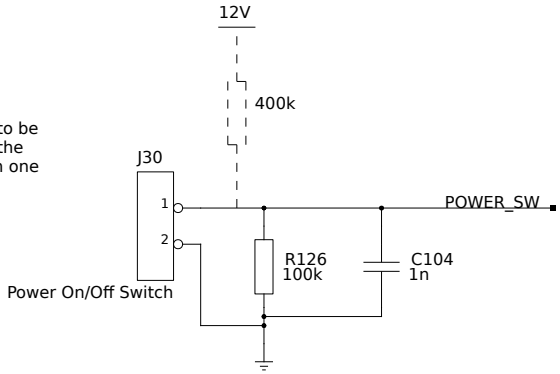
The pull-up for the power switch is
to VBAT (12V). This is because the pull-up needs to be
permenantly powered. Had it been connected to the
CR2477 3V it would deplete 25% of its capacity in one
year. This would be acceptable but it would be
preferred not to burden this backup battery.
The amount consumed from the 12V battery
is negligible compared to self-discharge.

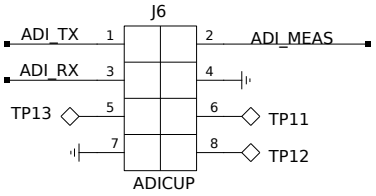
The POWER_SW level is under 3V3 at all
times based on the resistive divider.

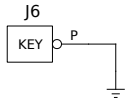
The MCP23017 pin will have an interrrupt
on change configured. This will activate
INTA which will enable power through
the XC8107 power switch to the Boron
if it is off. The Boron can read the MCP23017
port pins and figure out the interrupt source
and respond accordingly.

If the power switch is turned off the Boron
will recieve an interrupt through INTA. It can perform
a controlled shutdown before turning its own power
off.

The power switch will be have a wired 400k resistor
pull-up to the primary battery (12V).







ADICUP
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There are just a few signals connecting the
comms board to the ADICUP360 board.

Instead of stacking the comms board on
top of the current sense board it may be
preffered to place the comms board
further away.

The header J6 provides for
interconnection using an 8-way Micromatch
cable.

A few cable lines are uncommited
to facilitate future developments.

This board controls the following:

High Priority (Must Have)
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- Turning on/off the SMPS module and selecting between the two batteries.
  Managing energy consumption to provide for up to 12 month run-time.
- Logging data to SD card
- Showing system status on exterior LEDs after user presses external button
- Reading from Real Time Clock
- Reading RH/Temp/VOC from external GSFET module
- Sending data to the cloud over CAT-M1 (when signal strenght is adeqaute)

Medium Prioirity (Preferred though not critical)
==========
- Reading data from Electrochemical Sensor
- Turning off draining of batteries before they are fully depeleted e.g. 40% SOC

Low Priority (Nice to Have but not part of specification -
possibly include footprints for later stage intergation)
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- Optionally showing status on small OLED display (with user interaction buttons)
- Optionally sending data out to BLE serial terminal
- Optionally reading data from dry chamber BME680 (Temp/RH/VOC)

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