**Notes from reading pg 53 – 58 of handbook**

**Pre lab:**

Must decide on TCRT 5000 LED max current and current we will use

Must decide on the resistor value we will use to limit current

Must know the max current transistor photodiode can pass when at full light and the resistor that will convert current to voltage

Must know the max height the transistor will give the largest output

Creating a stripboard, pcb and breadboard schematic:

PCB includes the trct5000 sensors; the led and transistors and current limiting resistors

Stripboard diagram includes how the 8 way DIL connects to myDAQ

Breadboard shows how the mydaq will be used by the DIL

CANT WE DO THIS AFTER THE LAB?

Table for the TRCT5000:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SENSORS | Wavelength range/peak | Suggested current for LED | Response time at suggested current (us) | Beam half angle at half intensity |
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| --- | --- | --- | --- | --- | --- | --- |
| TRANSDUCERS | Wavelength range/peak | Suggested PSU current | Suggested PSU voltage | Expected output range | Response time (us) | Beam half angle at half intensity |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**The LAB:**

Things we don’t have for the lab:

Small pcb to convert sensors to 8 pin dil package

**Step 1: PCB to DIL**

The PCB is provided but the rest of the circuit has to be soldered on the stripboard

Using a small PCB that has a 8 DIL plug that will plug in a 8 way DIL socket on the strip board.

This TCRT5000 must connect to the right pins on the PCB and in turn the DIL socket

Repeat for the other sensors we are testing or not (up to decision of team)

**Step 2: stripboard to myDAQ**

Solder on wires to stripboard and connect them to the myDAQ breadboard

They have to be sturdy and long so to not pull off the board

**Step 3: conditioning signal for myDAQ to detect**

**myDAQ circuit current and voltage:**

power rail; for +-15 V, max current = 32mA, min voltage full load = 14V

for +5V, max current = 100mA, min voltage on full load =4V

Digital I/O; max current ouput = 4mA

Max current input = ?

Analogue I/O;

Analog input ............................................. ±10 V, ±2 V, DC-coupled

Analog output ........................................... ±10 V, ±2 V, DC-coupled

Maximum output current = 2mA

**myDAQ voltage and current measurement:**

DC Voltage ranges :. 200 mV, 2 V, 20 V, 60 V

AC voltage ranges: 200 mVrms, 2 Vrms, 20 Vrms

Current:

DC Current 20 mA, 200 mA, 1 A

AC current 20 mArms, 200 mArms, 1 Arms

TCRT5000 ratings of voltage and current:

**The LED current and voltage:**

Forward current Max= 60 mA

Reverse voltage = 5V

Forward voltage max = 1.5V

**Detector:**

Collector emitter voltage VCEO 70 V

Emitter collector voltage VECO 5 V

Collector current IC 100 mA

Power dissipation Tamb ≤ 55 °C PV 100 mW

**Sensor: basic current and voltage**

Expected current at collector = 1 mA and max 2.1mA

**Step 4: choosing resistors**

Tasks here:

* Choose a resistor that can drive the LED at less than 60 mA and still have a voltage of 5 – 1.25 V
* Choose a resistor that can that can convert the current to voltage (this voltage will be the voltage measured at output so should be less than what will be detected as digital 1)

This voltage should be at a maximum of 195.5V

* **Create a circuit the circuit to power the LED and detect voltage**

Step 5: checking the LED and transistor

LED:

Resistors should be less than 1k ohm

Positive power should be less than 100mW

Transistor:

Resistor should be at least 1 k ohm

Check response to height

Sensor characterization:

Step 6: Dark current measurement

Measure when off and detector in the dark

Step 7: Background Illumination

Measure detector output when led off and how it responds to bright light

Step 8: Variation with height

Will make 3 voltage – height graphs

Step 9: Line spread function

Measure change of sensitivity with 5 heights

Step 10: Effect of IR LED current