1) **Phoenix UAS mRID Operating Manual**
2) **Disclaimer:**
   a) Operator responsibilities:
      i) <u>Airspace</u>: It is the UAS operator to ensure they are following all applicable law and regulations at the intended flying site. The use of a broadcast module will not make you legal to fly anywhere or in any airspace.
      ii) <u>Wiring</u>: It is the operator to ensure that the wiring is correct and no more than 5vdc is applied to the module.
      iii) <u>GPS data over MSP</u>: It is the UAS operator to verify that data sent to their FC from the mRID over MSP is accurate and the FC is setup correctly. <u>It is prudent to full test OSD elements and automated flight functions prior to depending on them in the field.</u>
      iv) <u>Function</u>: It is the UAS operators' responsibility to ensure their RID unit is properly functioning and transmitting. Use of mRID GPSL (GPS Lock) indication in conjunction with a mobile app will give conformation of proper unit operation.
      v) <u>MSP GPS Data</u>: to use GPS data over MSP update to BF 4.5 RC2 or latter and update the mRID firmware to the newest version.
   b) Unit limitations:
      i) Power:
         (1) 3.3vdc – 5vdc DC only
         (2) via USB 5v
         (3) Current Draw < 160mA
         (4) The mRID will passthrough i^{2}C data from an equipped GPS to the FC if the SLC and SDA wires are connected.
      ii) Transmits RID messages only on BT 4 & 5
      iii) **Requires the use of an external M10 GPS**
      iv) MSP GPS data to FC is currently available in BetaFlight 4.5 RC2 and will work with the mRID after FW is updated to version 1.0.1
         (1) There is a math error in BF 4.4.3, and 4.5 RC1 that prevents proper operation of GPS rescue when using MSP GPS DATA.
         (2) The newest mRID firmware and installer can be found on our support page: https://www.phoenixuas.us/support
         (3) **Verify proper operation of GPS enabled functions prior to relying on them to save your aircraft.**
      v) MSP GPS data to FC is currently available for iNav.
         (1) **Verify proper operation of GPS enabled functions prior to relying on them to save your aircraft.**
      vi) Compatibility with Ardupilot and KISS is in development.
3) **Included in packaging:**
   a) Phoenix mRID (x1)
   b) SH1.0 6P connectors (x4)
   c) SH1.0 cable pre-terminated (x12)
4) **Functional description:**
   a) The Pheonix mRID is designed to meet the FAA requirements for a Remote Identification Broadcast Module. It is **NOT** designed to meet requirements of standard remote identification. The module is wired to a M10 GPS and receives power from the UAS's flight controller (FC), a 1s battery, or via the micro-USB port.
      i) LEDs:
         (1) Power (blue),
         (2) GPS lock (green),
         (3) MSP heartbeat (green/flashing),
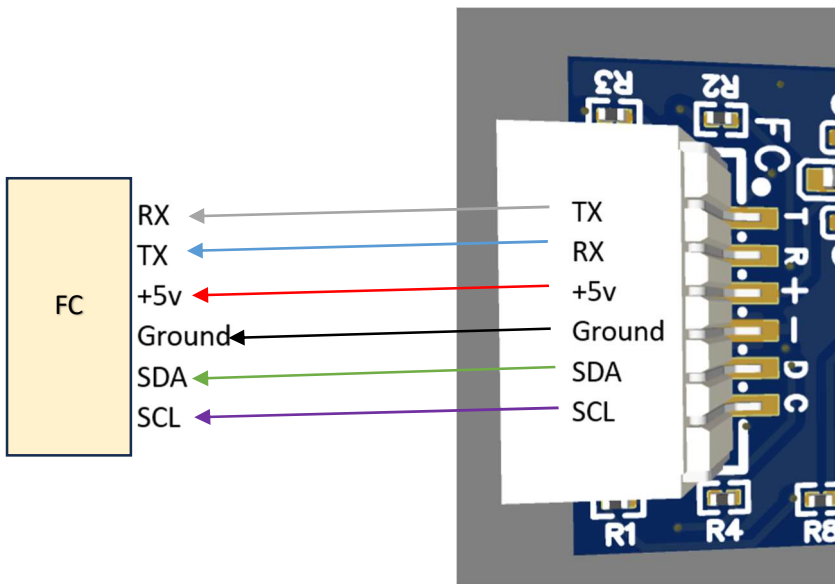   (4) System fault (red).
5) **Wiring:**
   a) NOTE: if your GPS is not equipped with a magnetometer/compass the SCL and SDA cables are not required.
   b) GPS to mRID:
      i) From mRID "GPS" plug to GPS:
         (1) SCL   →   SCL
         (2) SDA   →   SDA
         (3) Ground   →   Ground
         (4) +5v   →   +5v
         (5) RX   →   TX
         (6) TX   →   RX
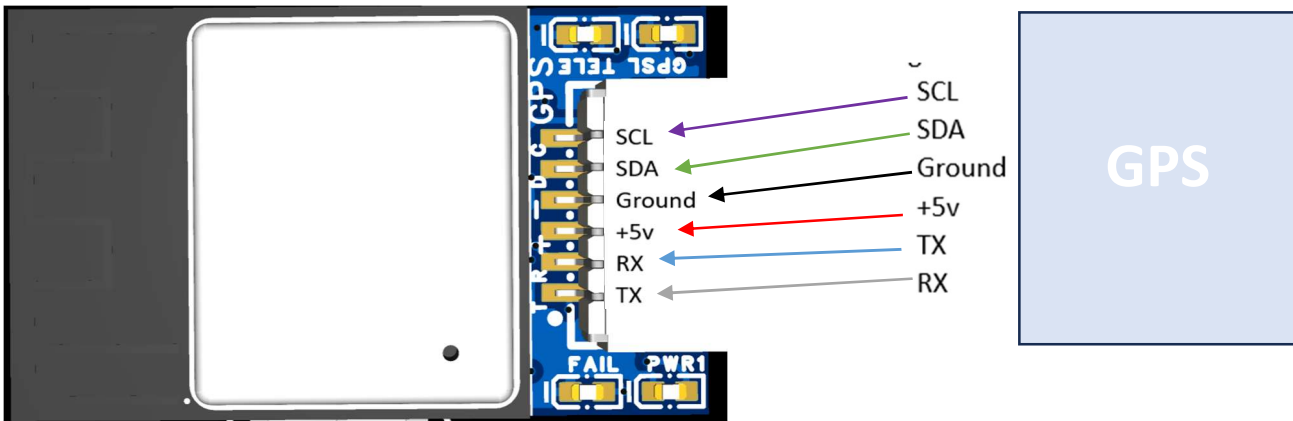
c) From FC to mRID GPS "FC" plug
   (1) RX   →   TX
   (2) TX   →   RX
   (3) +5v   →   +5v
   (4) Ground   →   Ground
   (5) SDA   →   SDA
   (6) SCL   →   SCL

6) **Quick start guide:**
   a) Wire mRID as described in section 5.
   b) Power the mRID, verify the Blue "PWR1" LED is lit.
   c) When the GPS indicates it has a GPS lock (see user's GPS documentation), the mRID Green "GPSL" LED will light up and stay solid, and the Green "TELE" led will blink to indicate MSP data TX heartbeat.
   d) If the Red "FAIL" LED is illuminated, or the "GPSL" LED fails to illuminate see troubleshooting guide in section 12.
   e) Verify mRID is transmitting by checking with one of the available RID apps.

7) **GPS & mRID mounting recommendations:**
   a) The mRID has been tested with most of the M10 GPS units on the market.
   b) Place the GPS on the top of the aircraft with the antenna facing the sky.
   c) Verify the GPS is as far away from other electrical interference as possible.
   d) Mount the mRID on the aircraft where the PCB antenna will not be obstructed.

8) **Installation and Operations**
   a) Power Requirements:
      (1) 3.3vdc – 5vdc DC only through the "FC" plug.
      (2) via USB 5v

b) Installation options:
    i) FC power
    ii) Flight battery power
    iii) External power
        (1) USB
        (2) Non-flight battery 1S MAX or run off 5vdc regulator.

c) **BetaFlight GPS MSP Passthrough:**
    i) Wire mRID and m10 GPS module as shown in section 5.
    ii) Update BetaFlight to the most recent built (BF 4.5 RC2 fixed MSP GPS rescue behavior)
    iii) Under the ports tab enable MSP the UART that your mRID is connected to and set the BAUD rate to **57600**, and SAVE.

    iv) Under the Configuration tab select GPS for navigation and telemetry and MSP as the Protocol and SAVE.
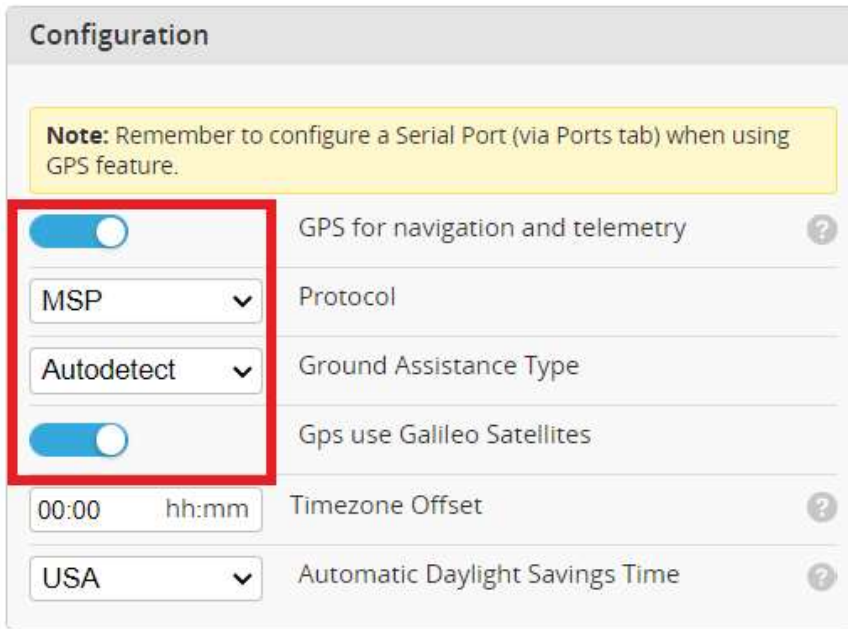

    v) <u>**Verify proper operation of GPS enabled functions prior to relying on them to save your aircraft.**</u>

d) **iNav GPS MSP Passthrough:**
    i) Wire mRID and m10 GPS module as shown in section 5.
    ii) Under the ports tab enable MSP the UART that your mRID is connected to and set the BAUD rate to **57600**, and SAVE.

iii) Under the Configuration tab select GPS for navigation and telemetry and MSP as the Protocol and SAVE.

iv) **Verify proper operation of GPS enabled functions prior to relying on them to save your aircraft.**

9) **Preflight Warmup:**
   a) To reduce time to get a GPS lock on the mRID & GPS "warmed up" by powering the GPS through the mRID USB Port or with an external 1s battery. **NOTE: if the FC plug is wired to the FC the USB will power the FC through the 5v regulator. It is recommended to unplug the mRID FC plug prior to powering the unit from the USB on the mRID.**
   b) Pre-flight GPS warmup:
      i) Verify the mRID and GPS wired per section 5.
      ii) Power the mRID and GPS
      iii) When GPSL LED is solid verify proper operation with one of the available RID sensing apps.
      iv) Remove power from the unit

10) **Firmware updates:**
    a) Firmware and update link can be found on the support page: https://www.phoenixuas.us/support
    b) Download the most recent firmware and save to your computer in a convenient place.
    c) Open the firmware flashing tool and connect the mRID to the computer via USB.
    d) Load firmware by clicking on the "choose file" and selecting the downloaded firmware.
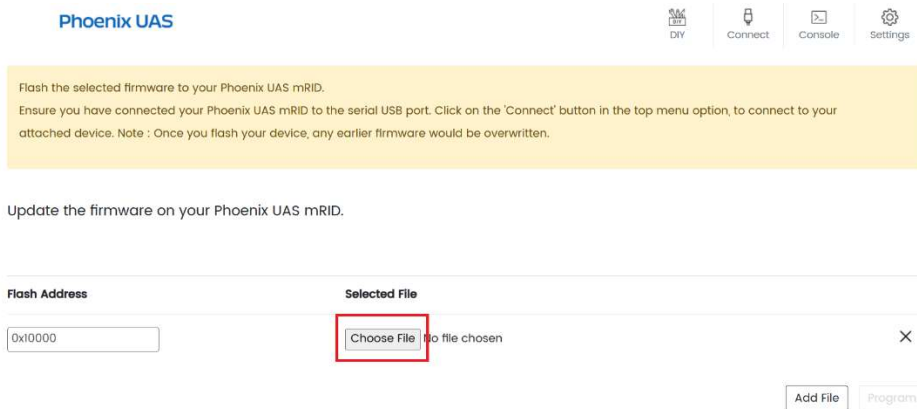
e) In the firmware flashing tool, select "Cconnect" and select the COM port your mRID is connected to.
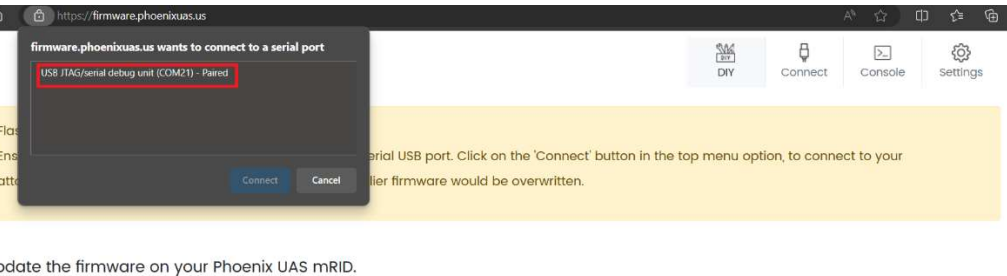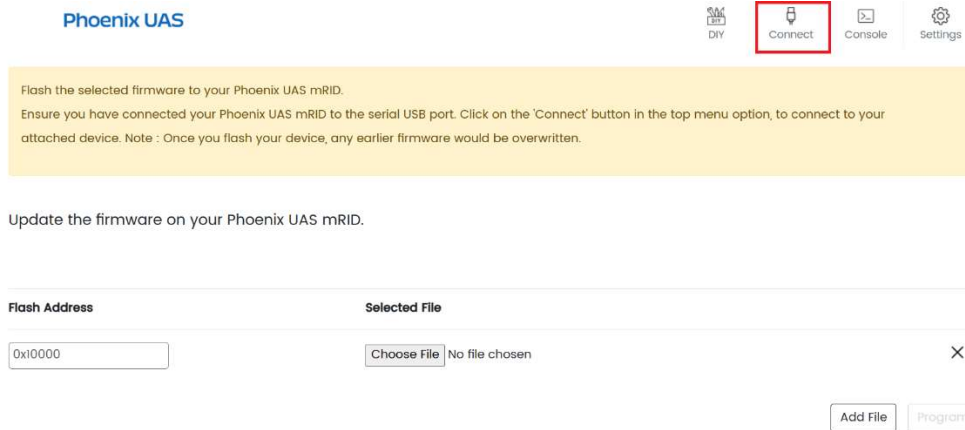
f) Click Program. When programming is complete the dialog box will display "leaving". After this message click "Disconnect" and disconnect the mRID from the USB.


```
Wrote 1037536 bytes (568137 compressed) at 0x10000 in 7.699 seconds.
Leaving...
```

11) Troubleshooting:

Problem Description	Possible Cause	Corrective Action
Blue PWR LED not Lit	Unit is miss wired	-Remove power -Verify wiring -If FC is powered by USB for testing/setup the 5v regulator may require the flight battery to be plugged in.
	Battery power below 3.3v	-Replace or charge battery
	Flight Controller 5v not available	-Verify 5v reg is functioning -Verify if 5v regulator is controlled by FC that it is set up to be on. -If FC is powered by USB for testing/setup the 5v regulator

		may require the flight battery to be plugged in.
	Inadequate power available from Flight controller 5v regulator	-Ensure FC 5v regulator has sufficient overhead for the additional current draw of the mRID (<160mA)
GPS has no power indication	Unit is miss wired	-Remove power -Verify wiring -Replace GPS
Fail LED Lit	Unit is miss wired	-Remove power -Verify wiring
	GPS Unit failure	-Replace GPS
	mRID fault	-Cycle power to the mRID -Reload Firmware -Replace mRID
	GPS is not an M10 GPS	-Replace GPS
	Wiring failure	-replace affected wiring
GPS indicates lock but mRID GPSL LED is not Lit	Matek GPS units (and possably some others) did not sync to original Firmware	Update Firmware IAW section 10 of this manual
	Failure of GPS to sync with mRID during GPS Cold start	-Cycle power to mRID
	GPS and mRID minimum satellite lock for fix mismatch.	-Wait for additional satellites to lock with the GPS -Cycle power to the mRID