1) Initial Setup

   a) *Supplies Required*

      i) *7.6 cm (3 inch) stainless steel braided hose for natural gas transport*

      ii) *Tube burner*

      iii) *115 VAC electrical power – single extension cord*

      iv) *FireTOSS connectivity – single ethernet cable*

      v) *FireTOSS client computer with LabView installed*

   b) *Plumbing and Electrical / Data Connections*

      i) *Connect stainless steel braided hose from gas main to burner*

      ii) *Perform a leak check on all connections*

      iii) *Connect burner to power outlet using extension cord. Confirm green power LED activated on left of burner electrical box.*

      iv) *Connect burner electrical box to FireTOSS port using ethernet cable*

2) Start-Up and Pre-Test

   a) *Check calibration status of NI FieldPoint modules inside tube burner electrical box and at mezzanine gas train*

   b) *Position burner where needed*

   c) *Launch LabVIEW tube burner control program on FireTOSS computer. Confirm communication between LabVIEW and FieldPoint modules*

   d) *Verify functionality of pilot spark igniter PRIOR to turning natural gas ON*

      i) *If spark igniters do not function, check Fireye module in the burner electrical box. If the "Fire" LED is illuminated, press the RESET button on the module.*

      ii) *After verifying functionality, turn spark igniter OFF.*

e) *Turn natural gas ON*

    i) *In mezzanine, turn gas ball valve to ON position*

    ii) *Turn control switch on gas train electrical box to LABVIEW position*

    iii) *Pull out emergency shutoff "mushroom" button located on wall of burn room*

f) *Check pressures to verify adequate gas supply*

g) *Ignite pilot gas bank*

    i) *Open ball valve on gas main*

    ii) *Immediately after gas main has been opened, trigger "Switch 0" on LabVIEW control screen to activate spark igniter.*
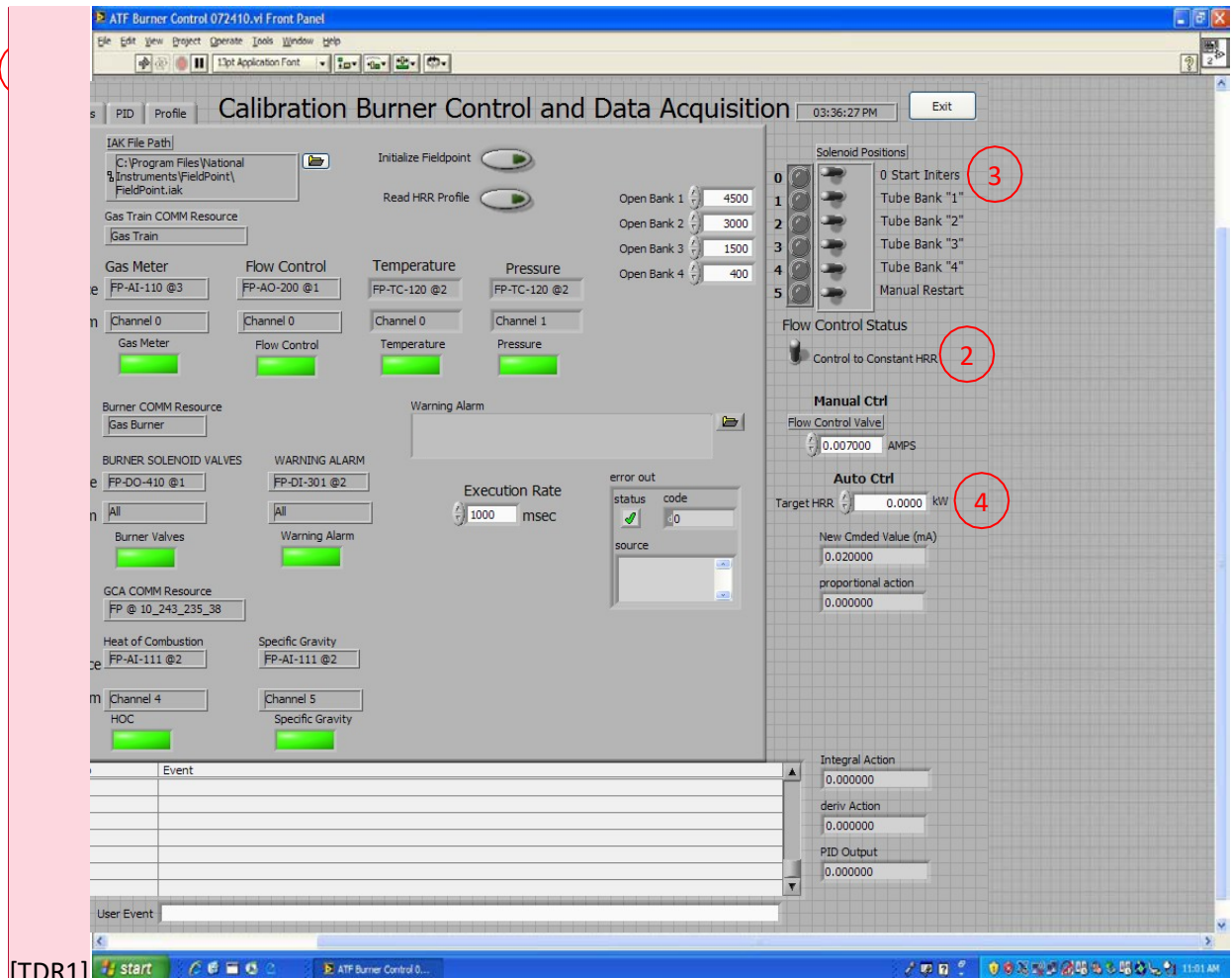
3) Experiment Procedure

a) *During Test*

    i) *Monitor pressure in flow meter to ensure adequate supply of natural gas*

    ii) *Monitor burner heat release rate to verify desired flow*

b) *Burner Control Through LabVIEW*

    i) *Select "ATF Burner Control 072410.vi" from desktop*

    ii) *The following screen should initialize:*

[TDR1]

NOTE: Red numbers are for reference only and do not appear on the actual burner control screen

iii) To start test, click on the arrow button located at reference number 1

iv) Verify "Flow Control Status" switch located at reference number 2 is set to "Control to Constant HRR"

v) To trigger spark igniters, toggle switch zero located at reference number 3

vi) Once pilot tubes are ignited, the burner HRR can be controlled using the "Auto Ctrl" field located at reference number 4.

  (1) To change burner HRR, type desired HRR value (in kW) into the field and press "Enter" key. The HRR will not change until "Enter" key is pressed (even if there is a new value in the field)

  (2) There is no need to manually toggle the remainder of the tube bank toggles located at reference number 3. The "Auto Ctrl" field values will toggle the tube banks automatically as long as the "Flow Control Status" toggle is set to "Control to Constant HRR"

  (3) NOTE: When first using the main banks of the tube burner there cab be a delay to achieve desired HRR due to gas transport times. Please take note of when desired HRR is achieved.

vii) Clicking on the "Ops" tab located below the test Start/Stop buttons at reference number 1 will show the data being transmitted by the tube burner FieldPoint units. This includes desired and actual HRR, and gas train flowrate, pressure and temperature.

4) Shut-Down and Post-Test

  a) To end test, set "Auto Ctrl" field to 0.0000 kW and press "Enter" key. Then press the stop sign button at reference number 1.

  b) Turn OFF natural gas.

    i) Turn wall main ball valve to OFF position

    ii) Allow gas in stainless steel line to burn off through pilot bank

    iii) Push in emergency shutoff "mushroom" button located on wall of burn room

    iv) In mezzanine, turn gas ball valve to OFF position and turn control switch to OFF position

  c) Disconnect power and Ethernet cords if no other tests are being performed

5) Maintenance

   a) *Periodically check for leaks at connections*

   b) *Make sure that spark igniters stay clean*

6) Calibration - All instrumentation associated with the tube burner shall be calibrated according to FRL specifications. These instruments include:

   a) *NI FieldPoint modules – annual calibration*

   b) *Pressure transducer in rotary flow meter – annual calibration*