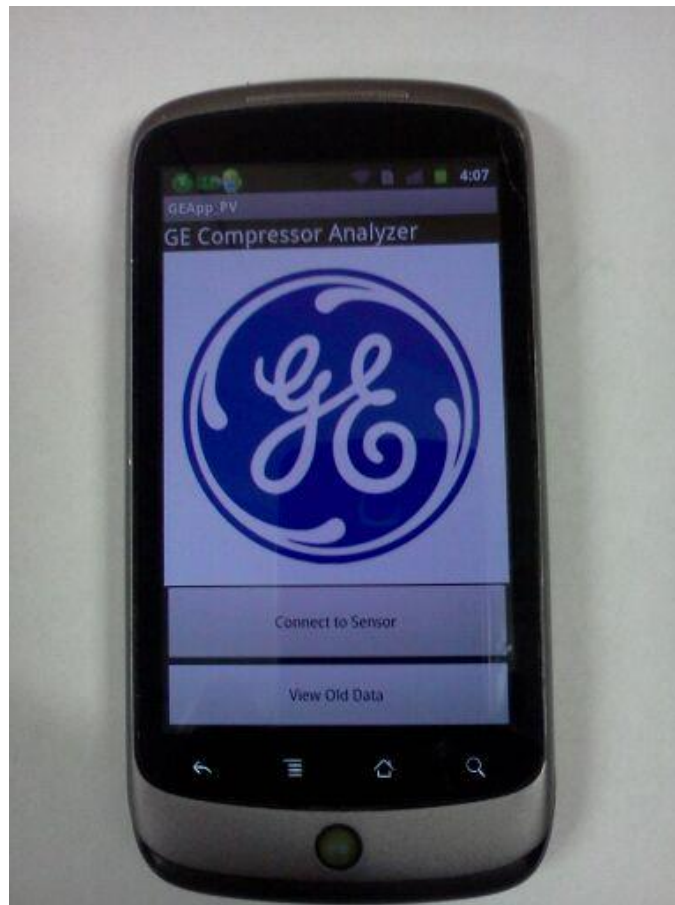# Mobile Application for Compressor Performance

INSTALLATION & OPERATING INSTRUCTIONS

GE OIL & GAS
HIGH SPEED
RECIPROCATING COMPRESSORS

Mobile Application for Compressor Performance

INSTALLATION & OPERATING INSTRUCTIONS

Table of Contents

Section A: General Information

General Scope

GE Oil & Gas High Speed Reciprocating Gas Compressors designs, manufacturers and supplies to customers and qualified packagers high quality compressors. In order to maintain superior compressor performance, a preliminary diagnostic system is used on the inlet and outlet pipes to obtain flow data which can be securely accessed in a mobile application for Android phones. The mobile application can be downloaded to any compatible Android phone and live and old flow data can be viewed on a P-V diagram.

Assembled View of Diagnostic System
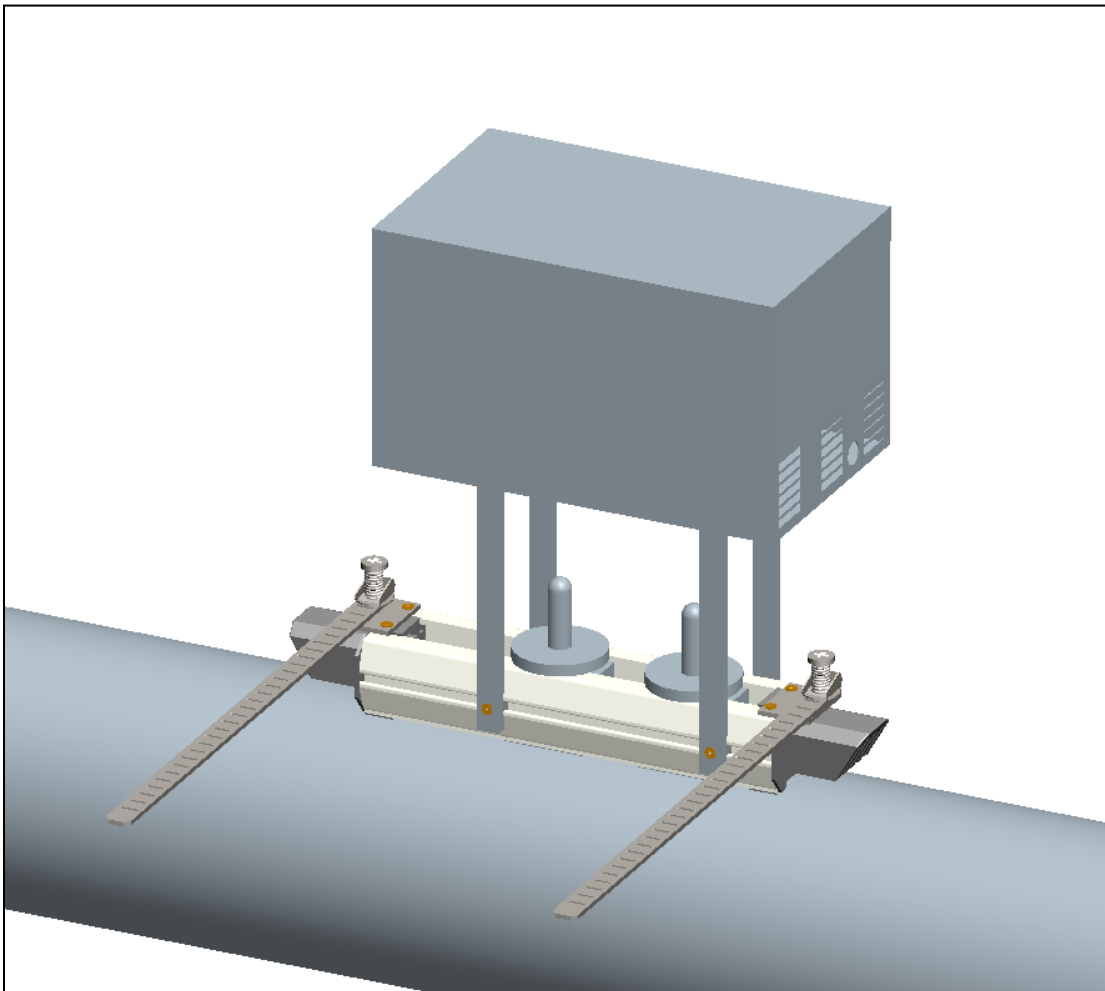
Exploded View of Diagnostic System

Figure 1: Insert of Exploded View

Saddle

Lock nut

Element holdder

BNC connector

Cursor

Mounting dimension (L)

Scale

Frame

Functional Diagram

```
┌─────────────────────────┐
│   System Powered Up,     │
│      Transducers         │
│    Mounted, Phone        │
│      Connected           │
│       Wirelessly         │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      User Inputs         │
│    Parameters to         │
│        Phone             │
└─────────────────────────┘
```
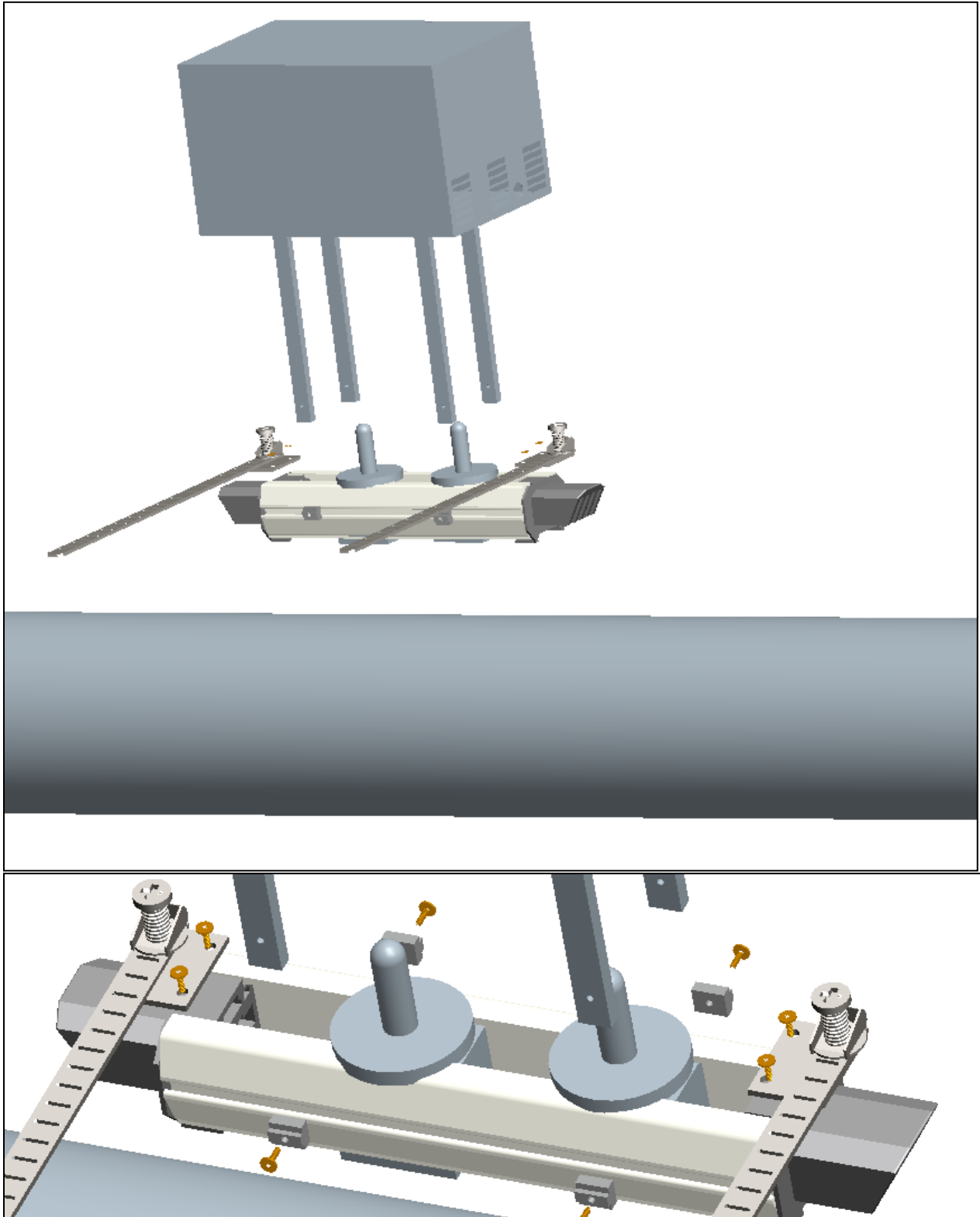
```
┌──────────────┐      ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│    Data      │ ───▶ │ Transit Time │ ───▶ │   Transit    │ ───▶ │    Phone     │
│ Acquisition  │      │ Differences  │      │ Times Sent   │      │  Converts    │
│  Unit Sends  │      │  Calculated  │      │  to Phone    │      │Transit Times │
│     and      │      │              │      │              │      │  to Velocity │
│   Receives   │      │              │      │              │      │              │
│   Signals    │      │              │      │              │      │              │
└──────────────┘      └──────────────┘      └──────────────┘      └──────────────┘
```

```
┌─────────────────┐
│  Phone Graphs   │
│ to P-V Diagram  │
│  and Displays   │
└─────────────────┘
```
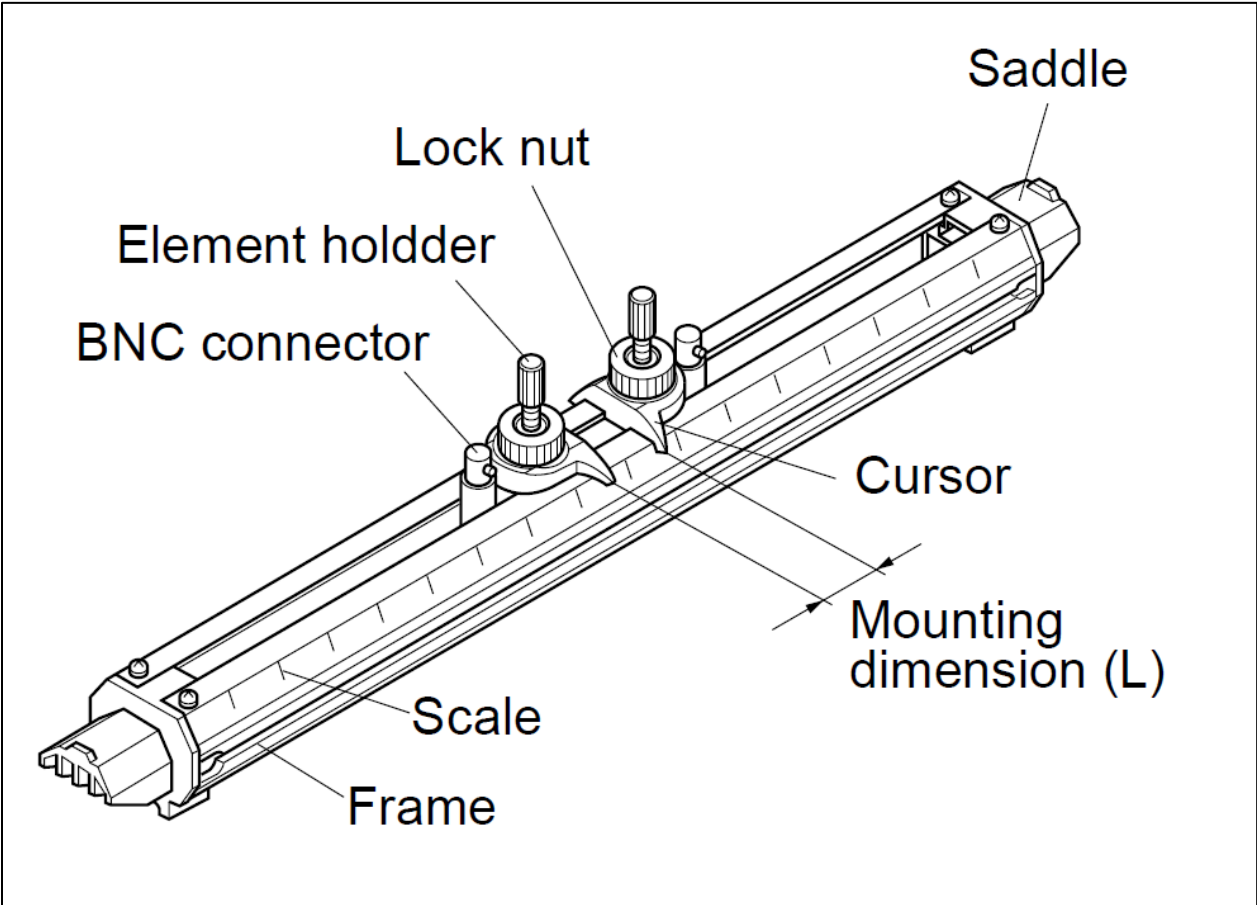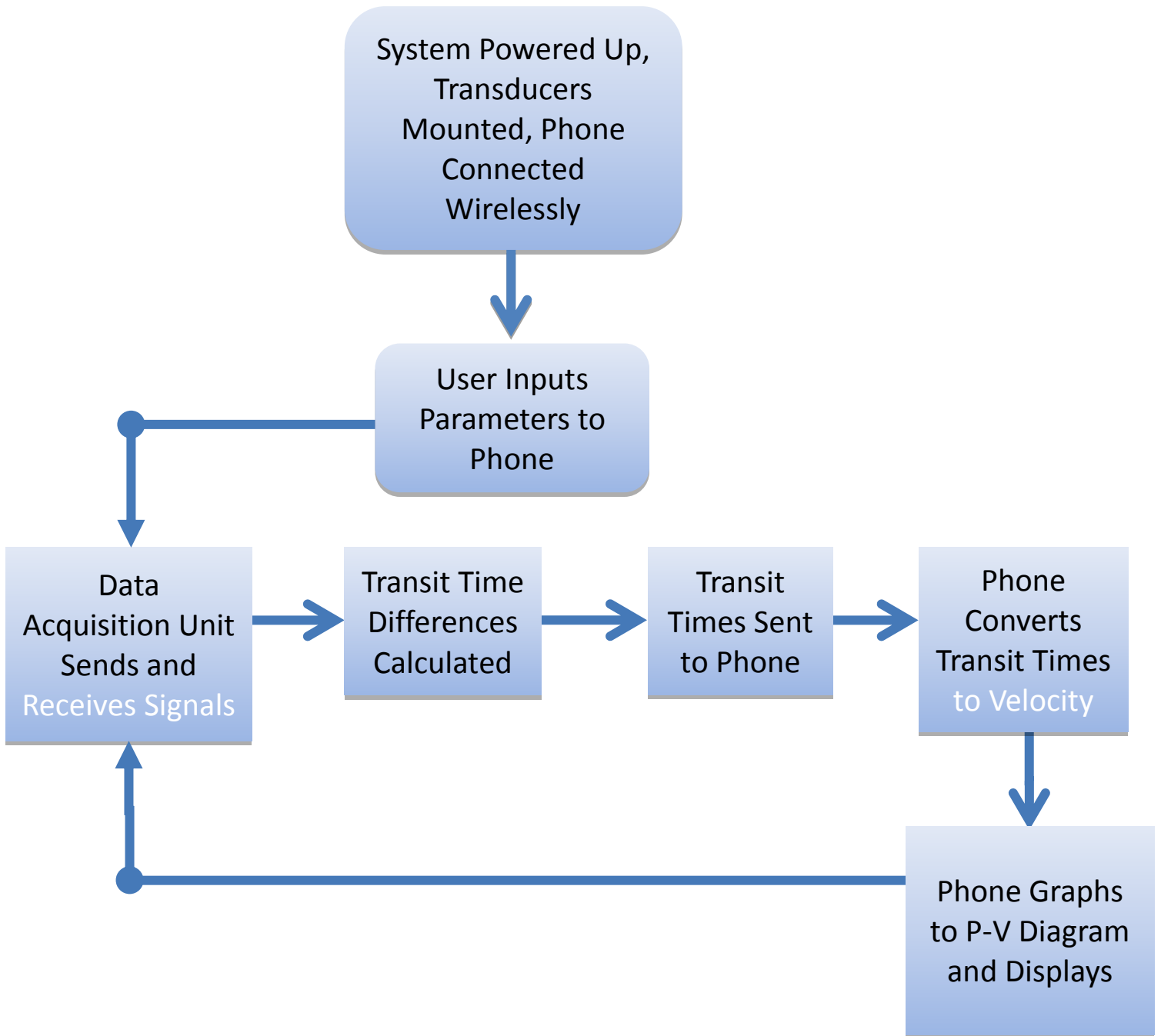
Warranty

Warranty is contingent on the following:

1. An authorized representative of GE Oil & Gas – High Speed Reciprocating Gas Compressors or the authorized packager is present at the initial start-up.

2. All components received proper installations and lubrication as stated in this manual.

3. Starting and operating the diagnostic system is within design limits stated in this manual.

4. Proper documentation from an authorized representative of GE Oil & Gas – High Speed Reciprocating Gas Compressors showing factory defect of system component(s) and return of one copy of purchase receipt.

Section B: Installation

The following section details the installation instruction for the diagnostic system and should be followed in chronological order.

T-Nuts Placements in Frame

1. Unscrew the top two UNC 6-32 screws (with the washers) on the frame from the saddle and place them cautiously to the side.

2. Unscrew the two UNC 6-32 screws in both of the frames and detach the saddle from the frame. (Note: There is one screw in each frame, two in total.)

3. Depicted in figure 2 is one of the t-nuts that are to be placed in the frame.

4. Place two t-nuts in the middle slot with the top of the "T" shape, which would be the horizontal top line of a "T" on the bottom surface of the track.
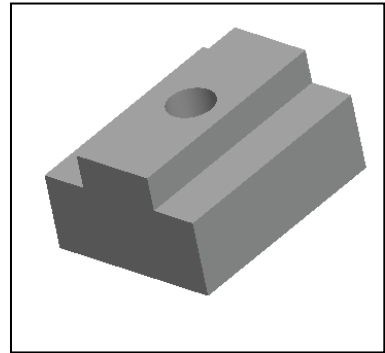

Figure 2: T-Nut

5. Replace all screws in the frame and saddle and the result should be like what you had in before doing step 1, with two t-nuts in each frame's slot.

6. Once those four steps are completed, the result should look like figure 3. The t-nut should not be able to fit but one way in the slot and they should be able to slide up and down the track freely. If this not the case, the t-nut is not installed correctly.

Figure 3: T-nuts in Frame

Assembling the Mounting System

Installing Clamp Attachment

1. Unscrew the top two UNC 6-32 screws (with the washers) on the right frame from the saddle and place them cautiously to the side.

2. Locate the right clamp attachment, which is the one that if placed on a table, the quick release clamp would be on the top surface and the steel plate would be underneath it.

3. Place the bottom of the right clamp attachment on top of the right side of the frame, with the two holes for the screws align with the holes for the screws on the frame.

4. Screw the top two UNC 6-32 screws (with the washers) though the steel plate into the treads in the holes in the frame.

5. Repeat steps 1-4, with the left side and left clamp attachment. Figure 4 one shows the end result. If the assembly does not look like figure 4, it is not correct and disassembly and reassembly thinking about figure 4.

Figure 4: Mounting System Complete

Selection of mounting location

For accurate measurements, choose a portion of the pipe that is straight and at least 10 diameters long on the upstream side and that is at least 5 diameters long on the downstream side. Also make sure there are no factors to disturb the flow (such as pumps and valves) with 30 diameters on the upstream side.

Measuring detectors location on frame

1. Unlock the lock nut and slide the sensor so that they are about a diameter length apart.

2. Tighten the lock nut and place the flow meter to the side.

Attaching the Housing Unit to the frame

1. Use a handle screwdriver to install the 5V DC fan using four UNC 6-32 screws on left side of housing unit.

2. Place the Single Board Personal Computer (SBPC) with Wifi adapter on the bottom level of the housing unit.

3. Connect the power source to the SBPC through the hole on the right side of the housing unit.

4. Place the completed circuit on the bread boards on the ledge in the housing unit.

5. Connect the wires in the top of the housing unit for the BNC cables into the bread board.

6. Using a handle screwdriver and four UNC 2-56 screws, connect the top to the housing unit. Carefully place the housing unit to the side.

7. Connect the BNC cables to the both the detectors.

8. Place the housing unit on top the frame, with the frame in between the housing legs.

9. Line up the holes of the housing unit with the threads in the t-nut by sliding the t-nuts on the track and moving the housing.

10. Using 4 UNC 6-32 screws connect the legs of the housing unit with the t-nuts, by screwing the screws through the hole in the housing legs into t-nut.

11. Connect the other ends of the BNC cables to the top of the housing unit.

Installing Assembled System on Pipe

Lubrication of Detectors

1. Apply a small quantity of silicone grease to the transmitting surface of the sensor and spread the compound over the entire area, as seen in figure 5.

2. Keep the sensor retracted by turning the element holder counterclockwise.

3. After cleaning the surface of the pipe, the sensor should be mounted following the instruction in the next sect, "Mounting the Assembled System to the Pipe".
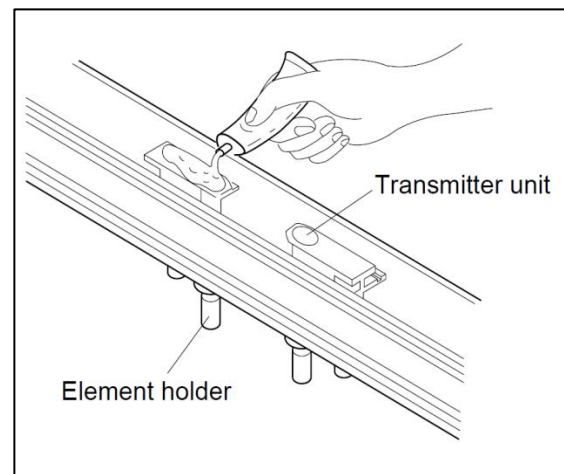

Figure 5: Applying Silicone Gel

Mounting of Assembled System to Pipe

1. Hold the lubricated sensor with your left hand, with the straps facing away from your body.

2. Place the sensor in the desired location.

3. Pull one of straps of the quick release clamp around the pipe and bring the strap through the worm gear part of the clamp.

4. With your thumb, lock the clamp by pressing the screw in place.

5. Tighten that clamp, by using a handle screw driver.

6. Repeat steps 2 – 5, for the other clamp.

7. Installation of the system is now complete.

Section C: Operation

If the housing unit is not already attached to the frame and assembled please go back to the Section B: Installation before continuing.

Set up Sensors:

1. Plug data acquisition unit into wall.

2. Wait at least one minute for the unit to boot up.

3. Once booted up, you will be able to connect to it on your phone. It should be labeled "GECompressor" with the password: *abcdefg*

Phone Application

Once the application is installed in the device, search for it in the applications menu and click on the icon to run.

Connecting to Sensors and graphing incoming data:

1. From the main screen there is the option to "Connect to Sensors" and View Old Data". Click on "Connect to Sensors".

2. Now the input screen should be displayed. Type in a meaningful name and location for the compressor. *Note: these will be used to find the data later in the "View Old Data" section of the application.*

3. Input the parameters: temperature at suction, temperature at discharge, static pressure at suction and length from the static pressure gauge to the suction valve in the units indicated on the screen. *Note: numeric values must be typed into this section, any other values with create an error.*

4. For the nominal pipe size and type of fluid click on the bar to view the drop down list of choices. Click on the selection to close the list and have the selection on top. If nothing is chosen for these sections the first item on the list will be chosen by default.

5. When finished inputting all values click on the save button to continue.

6. On the graphing screen the graph will be displayed plotting live. Under the graph the current values of flow rate at the suction and discharge are displayed in CFM as well as

MMscfd. To disconnect from sensors and return to the main screen press the back button on the device.

Viewing Old Data:

1. From the main screen click the "View Old Data" button.
2. A list of compressors is shown with their corresponding locations.
3. Click on the desired compressor to view options.
4. Click on edit to change any of the inputs made when first creating the corresponding file. *See steps 2-5 of the Connecting to Sensors section for steps on how to input parameters. Clicking save on step 5 will return you to the list.*
5. Click on delete to delete the selected compressor file. *Caution the item CANNOT be recovered if erased.*
6. Click on graph to view the graphing screen with the selected data. The graph will appear to be plotting live, however, when the graph stops it means it has run out of data points to graph. Press the back button on the device to return to the list.
7. Click cancel to exit options.
8. Press back button on the device to return to main screen.

Troubleshooting:

1. When clicking save button on the input screen, if system crashes something other than a number was typed into the one of the parameter fields.
2. When going to the graphing screen if nothing is displayed or updated check to see that you are connected to the sensors Wi-Fi access point via the Wi-Fi setting on the device. View step three of the Setting up Sensors section for details.
3. When collecting data if system crashes, check to see that the device has enough free memory to be storing more information. If not consider erasing old data via the delete option (view step 5 in Viewing Old Data section) or clearing all data from the application via the manage applications menu on the device.

Section D: Safety Information

Care should generally be taken when working in an area with a running High Speed Reciprocating Compressor. Proper Personal Protective Equipment (PPE) should be used as necessary, dictated by the working environment. For example, if the compressor is located in a hard-hat area, proper head protection shall be worn. OSHA regulations also state that if noise levels reach above 120dB, which may often be the case with this equipment, the operator is required to wear ear protection.

The majority of the electronics are enclosed in a protective casing, but it is imperative that they do not come into contact with water. There is a risk of electrocution in this case, and with the high voltage that the power supply outputs, electrocution can result in serious injury or death.

Section E: Appendices

Contact Information

GE Oil & Gas

4424 West Sam Houston Parkway North

Suite 100

Houston, TX 77041

P.O. Box 2291

Houston, Texas 77252-2291

Tel +1 713 683 2400

Fax +1 713 683 2421

References

Portable Type Ultrasonic Flowmeter. Feb. 2001. Instruction Manual. Japan.