Service Instructions
DT5009E Rev. 0
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Biffi Electronic Portable Unit

Pneumatic Line Break Setting and Test Device

BIFFI

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Section 1: Introduction

Electronic portable unit with digital pressure gauge instrument for “line break” device setting and test.

On gas lines, it is necessary to set up some safety devices that automatically close the valves in case of line breaking, to prevent gas leaks that could cause damages to person, to things and economic damages too.

The Biffi “LINE BREAK” device controls the automatic valve closing operation in case of gas line break, by using only the pneumatic connection to the GAS LINE and without the need of an external energy source.

For the setting and the operation test of the device, when it is assembled on the GAS LINE, a portable control unit has to be used, which allows to gauge the pressures into the GAS LINE (or into the tank which simulates, for the tests, the GAS LINE) and into the REFERENCE TANK, the difference between the two a.m. pressures and which includes also the devices proper to cause the required pressure drop rates.

The BIFFI “LEBPTU 03” electronic portable unit has been designed to perform all the “LINE BREAK” device setting and test operations with high accuracy and reliability. This unit is handy and not heavy then truly portable.

Moreover, the unit is not too breakable: for its use, it is necessary to handle with care as for whatever electronic instrument.

Section 2: Description of Unit

The unit operating diagram is shown by the Figures 1 and 2, where the unit is drawn connected to the actuator control panel complete with “LINE BREAK” device.

The unit is essentially constituted by:

- digital readout DR
- two pressure transducer PTR1 and PTR2
- manifold M complete with stop valves SV1 and SV2 and with exhaust flow regulator EFR
- three flexible pipes FP with adapter fittings
- case suitable to contain all the above-mentioned components

2.1 Connection of the Unit

To perform the setting and the operation test of “LINE BREAK” device, the unit has to be connected as shown in Figure 2.

- The cable TCR1 of pressure transducer PTR1 has to be connected to the port “1” of digital readout DR.
- The pressure transducer PTR1 has to be screwed into the threaded hole P2 of manifold M, which is connected to the flexible pipe FP2.
- The cable TCR2 of pressure transducer PTR2 has to be connected to the port “2” of digital readout DR.
- The pressure transducer PTR2 has to be screwed into the threaded hole P1 of manifold M, which is connected to the flexible pipe FP1.
- The threaded fitting of flexible pipe FP1 has to be screwed into the threaded hole of CVOB valve body, corresponding to “REFERENCE TANK”, after having unscrewed the plug.
- The threaded fitting of flexible pipe FP2 has to be screwed into the threaded hole of CVOB valve body, corresponding to “GAS LINE”, after having unscrewed the plug.
- The flexible pipe FP3 threaded fittings have to be screwed one into the threaded hole of SV2 stop valve, the other into the threaded hole of LT tank (not supplied by Biffi) for GAS LINE simulation. This connection can be omitted if only the diaphragm valve setting has to be checked.

Section 3: Procedures for Unit Use

NOTICE

Before carrying out any setting and operation test of “LINE BREAK” device, proceed as follows (see Figure 1):

a. If the valve closing operation, caused by the “LINE BREAK” device during its setting and operation tests, has to be prevented. In order to not interrupt the GAS LINE normal operation, the valve 632 E has to be turned to “CLOSED” position.

b. The stop valve 601 need to be closed in order to stop the connection between the “LINE BREAK” device and the GAS LINE and open the drain plugs of REFERENCE TANK 31 and of gas filter/condensate separator 608, to completely exhaust the pressure from the “LINE BREAK” device.

c. Close the drain plugs when the pressure has been completely exhausted from “LINE BREAK” device.

3.1 Check the Setting of Diaphragm Valve

The check of “LINE BREAK” device setting and good operation is the recommended routine test to be performed on the field as it is simple but allows to show if there are components malfunctions and can be performed without interrupting the GAS LINE operation as it is possible to prevent the valve closing operation.

- Remove the plugs from the threaded holes of valve CVOB body lower side.
- Remove the residual pieces of PTFE tape from the threaded holes: do not remove by blowing with gas or compressed air so to avoid that the PTFE tape pieces going into the check valve orifice and clog it.
- Open the stop valve SV1 and check. that the exhaust flow regulator EFR is not fully closed.
- Check that the stop valve SV2 is closed.

To perform this, checking the tank LT for GAS LINE simulation is not required.

- Screw the threaded fitting of flexible pipe FP1 into the threaded hole of CVOB valve body, corresponding to “REFERENCE TANK”, as shown by the plate.
- Screw the threaded fitting of flexible pipe FP2 into the threaded hole of CVOB valve body, corresponding to “GAS LINE”, as shown by the plate.
- Connect the cable TCR1 of pressure transducer PTR1 to the Port 1 of digital readout DR.
- Connect the cable TCR2 of pressure transducer PTR2 to the Port 2 of digital readout DR.
- Switch on the digital readout by depressing the “ON/OFF” key. After a few seconds, the display shows the actual values of pressure inside the GAS LINE on Channel 1 and the pressure inside the REFERENCE TANK on Channel 2.

At this stage of test procedure, the pressure transducers PTR 1 and PTR2 are gauging the atmospheric pressure and both indicated values are 0.

By depressing and holding the key “DISP-LINE”, the instrument shows the list of LINE DISPLAY with line 2 highlighted. Depress then the OK key and, by the ▲▼ arrow keys, select “IN1-IN2” function. Depress then the OK key to confirm and the STOP ESC key to return to pressure reading display.

The value of the difference between the pressure into the GAS LINE (Channel 1) and the pressure into the REFERENCE TANK (Channel 2) is indicated on the display and “IN1-2” appears in place of Channel number 2.

NOTICE

At this phase, do not perform the zero setting of the difference between the two gauged pressures.

- Close the exhaust flow regulator EFR.
- Close the stop valve SV1.

The P2 (GAS LINE) pressure value is indicated on the display at Channel 1 line.

Start to pressurize the “LINE BREAK” device components by the gas of pipeline by slowly opening the stop valve (601 - Figure 1) and check the P2 pressure value indicated on the display.

To check the differential pressure set value of diaphragm valve, the gas pressure value, inside the “LINE BREAK” device, can be selected freely into the device working range, but a value included into the range from 10 to 30 bar is advisable.

When the pressure reaches the selected value, close the stop valve (601 - Figure 1).

Wait till the pressure is equalized into all the device components: the values of the pressures P1 and P2, indicated on the display, must be equal and fixed.

Perform the zero setting of the pressures difference indicated on the display by proceeding as follows:

- Hold the key “ZERO-IN1=IN2” depressed up to get a message on the display asking to confirm the measure alignment;
- Depress the key “OK” to confirm it; The differential value shown in line with “IN1-2” is now 0;
- Actuate the needle valve NV (625-B - Figure 1) to the closed position (shown by “OFF” on the plate) to close the connection between the two chambers of diaphragm valve: “-” (GAS LINE) side and “+” (REFERENCE TANK) side.
- By reading continuously in the display, the value of the pressure difference. Slowly open the stop valve SV1 and open a little the exhaust flow regulator EFR.

To detect the operation of diaphragm valve (645 - Figure 1), check the pressure gauge (632-D - Figure 1). When the pressure difference exceeds the valve set value, the pneumatic signal coming from diaphragm valve outlet port is gauged by the pressure gauge (632 - Figure 1).

Notice the differential pressure value indicated on the digital readout display when the diaphragm valve (645 - Figure 1) is operated and check that it is equal to the set value shown by the setting ring nut edge with reference to the plate.

The differential pressure value is indicated as a negative value, this is due to instrument internal configuration which detracts the REFERENCE TANK pressure (higher) from GAS LINE pressure (lower); disregard the sign.

If the difference between the differential pressure values, the one indicated on the display and the diaphragm valve setting, exceeds the tolerance value (0.1 bar), the maintenance of diaphragm valve must be performed to clean its components and to substitute the damaged components, if any.

During the check of diaphragm valve differential pressure set value, it is also necessary to verify if the diaphragm valve is actuated and the valve (681 - Figure 1) which prevents the opening operation is actuated too.

During the check of the device good operation, as the device components are pressurized, it is necessary also to verify that there are not gas leakage in the pneumatic connections and through the components seals.

When the test procedures have been completed, the drain valves of REFERENCE TANK and of filter/condensate separator must be opened to exhaust the gas pressure from the “LINE BREAK” device components.

- Remove the flexible pipes FP fittings from the threaded holes of valve CVOB body.
- Screw the plugs into the threaded holes of valve CVOB body, after having rolled up some PTFE tape on plugs threads.
- Check that the drain plugs of REFERENCE TANK and of gas filter/condensate separator 608 are closed, that the stop valve NV (625B - Figure 1) is open; then open the stop valve (601 - Figure 1) to restore the connection to GAS LINE.

3.2 Check the “LINE BREAK” Device Functionality

This test procedure is not a routine test to be performed on the field for “LINE BREAK” devices. This procedure is recommended as a special test, as it is more complex than the one described in Section 3.1 and it is not strictly required to check the functionality of “LINE BREAK” device.

- Remove the plugs from the threaded holes of CVOB body lower side.
- Remove the residual pieces of PTFE tape from the threaded holes: do not remove by blowing with gas or compressed air so to avoid that the PTFE pieces going into the check valve orifice and clog it.
- Open the stop valve SV1 and check that the exhaust flow regulator EFR is not fully closed.
- Open the stop valve SV2. Screw the threaded fittings of flexible pipe FP3 into the threaded hole of stop valve SV2 at one side and into the threaded hole of tank for GAS LINE simulation LT at the other side.
- Screw the threaded fitting of flexible pipe FP1 into the threaded hole of CVOB valve body, corresponding to “REFERENCE TANK”, as shown by the plate.
- Screw the threaded fitting of flexible pipe FP2 into the threaded hole of CVOB valve body, corresponding to “GAS LINE”, as shown by the plate.
- Connect the cable TCR1 of pressure transducer PTR1 to the Port 1 of digital readout DR.
- Connect the cable TCR2 of pressure transducer PTR2 to the Port 2 of digital readout DR.
- Switch on the digital readout by depressing the “ON/OFF” key. After a few seconds, the display shows the actual values of pressure inside the GAS LINE on Channel 1 and the pressure inside the REFERENCE TANK on Channel 2.

By depressing and holding the key “DISP-LINE”, the instrument shows the list of LINE DISPLAY with line 2 highlighted. Depress then the OK key and, by the ▲▼ arrow keys, select “IN1-IN2” function. Depress then the OK key to confirm and the STOP ESC key to return to pressure reading display.

The value of the difference between the pressure into the GAS LINE (Channel 1) and the pressure into the REFERENCE TANK (Channel 2) is indicated on the display and “IN1-2” appears in place of Channel number 2.

At this stage of test procedure, the pressure transducers PTR 1 and PTR2 are gauging the atmospheric pressure and both indicated values are 0.

NOTICE

At this phase, do not perform the zero setting of the difference between the two gauged pressures.

- Close the stop valve SV1.

The P2 (GAS LINE) pressure value is indicated on the display at Channel 1 line.

Start to pressurize the “LINE BREAK” device components by the gas of pipeline by slowly opening the stop valve (601 - Figure 1) and check the P2 pressure value indicated on the display.

When the pressure reaches the selected value, close the stop valve (601 - Figure 1).

Wait till the pressure is equalized into all the device components: the values of the pressures P1 and P2, indicated on the display, must be equal and fixed.

Perform the zero setting of the pressures difference indicated on the display by proceeding as follows:

- Hold the key “ZERO-IN1=IN2” depressed up to get a message on the display asking to confirm the measure alignment;
- Depress the key “OK” to confirm it;
- The differential value shown in line with “IN1-2” is now 0;
- Adjust the exhaust flow regulator EFR so to achieve the required pressure drop rate.

Arrange the stopwatch to measure the times.

- Open quickly the stop valve SV1 and at the same time start the stopwatch.
- Check that after the fixed time for the calculation of pressure drop rate average value, the pressure value into the tank for GAS LINE simulation is the required one.
- Let the pressure drop continue till the “LINE BREAK” device is actuated. To detect the operation of device and then of its diaphragm valve (645 - Figure 1), check if the pressure gauge (632-D - Figure 1) gauges a pressure value equal to P2; in the same time the valve (681 - Figure 1), which prevents the opening operation has to be actuated.
- Notice the time value required to get the device operation.

During the pressure drop, the display indicates the GAS LINE pressure on Channel 1 and the differential pressure in line with “IN1-2” on Channel 2.

The differential pressure value is indicated as a negative value, this is due to instrument internal configuration which detracts the REFERENCE TANK pressure (higher) from GAS LINE pressure (lower); disregard the sign.

If during the test, the pressure drop rate is noticeably different from the required value, close the stop valve SV1, open slowly the stop valve (601 - Figure 1), and fill again with gas the device components up to reach the required pressure value.

Adjust the exhaust flow regulator EFR on the base of the previous test so to achieve the required pressure drop rate. Open the stop valve SV1 to start the pressure drop again.

During the test of device operation, as the device components are pressurized, check also that there is no gas leakage in the pneumatic connections and through the component’s seals.

When the test procedures have been completed, the drain valves of REFERENCE TANK and of filter/condensate separator must be opened to exhaust the gas pressure from the “LINE BREAK” device components.

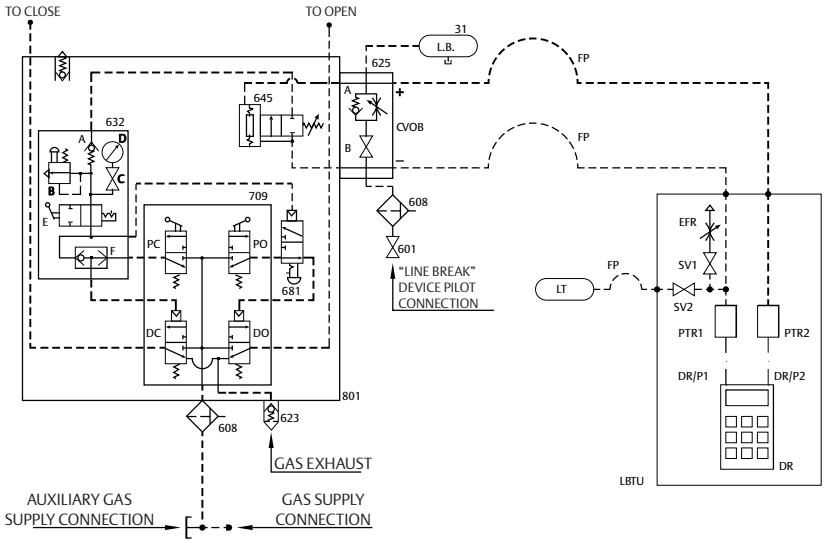
- Remove the flexible pipes FP fittings from the threaded holes of valve CVOB body.
- Screw the plugs into the threaded holes of valve CVOB body, after having rolled up some PTFE tape on plugs threads.
- Check that the drain plugs of REFERENCE TANK and of gas filter/condensate separator 608 are closed, that the stop valve NV (625B - Figure 1) is open, then open the stop valve (601 - Figure 1) to restore the connection to GAS LINE.

3.3 Data Recording and Editing

The digital pressure gauge instrument is able to record the read pressure values (see instrument Instruction Manual for detailed instructions).

By proper connection cable and dedicated software (supplied by Biffi on request), the recording can be downloaded to a PC and edited to get charts showing the behaviour of differential pressure as a function of pressure drop rate.

Figure 1 "LINE BREAK" device test unit and control



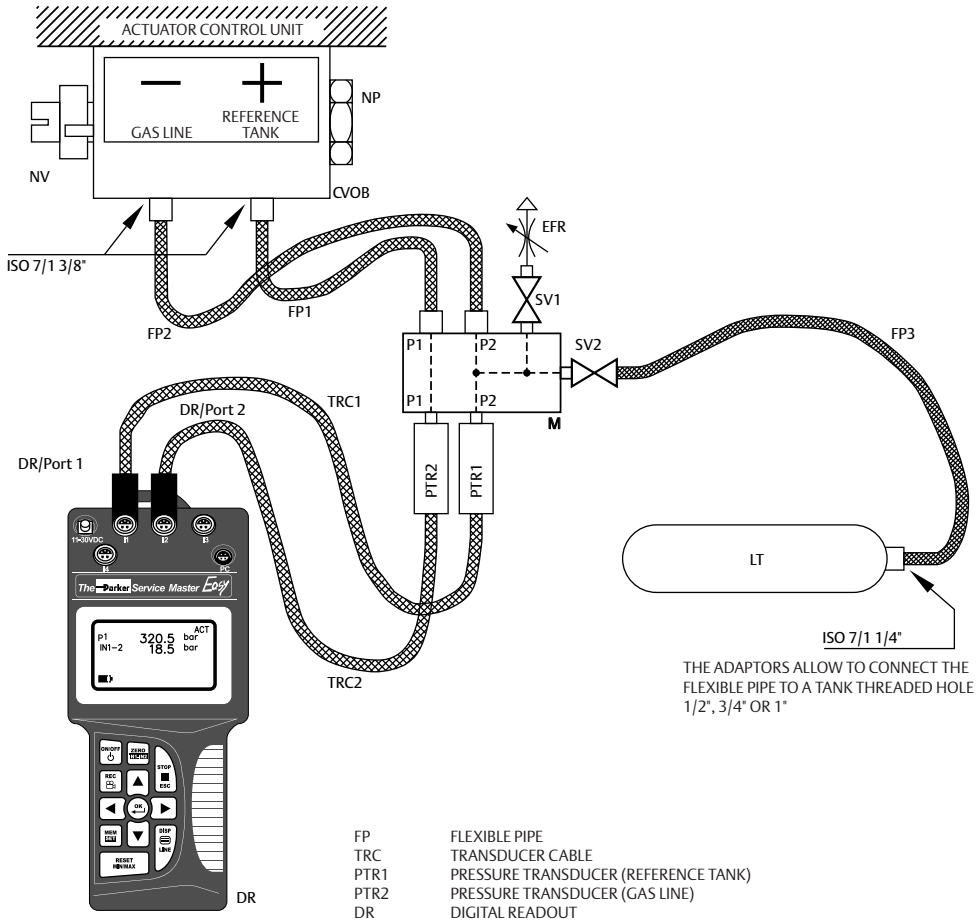
31	REFERENCE TANK FOR LINE BREAK DEVICE
601	STOP VALVE
608	GAS FILTER/CONDENSATE SEPARATOR
623	DUST EXCLUDER WITH CHECK VALVE
CVOB - 625	CHECK VALVE WITH ORIFICE FOR LINE BREAK DEVICE
	A - CHECK VALVE WITH ORIFICE
632	B - STOP VALVE
	SHUTTLE VALVE DEVICE
	A - CHECK VALVE
	B - LOW PRESSURE VENT VALVE
	C - STOP VALVEFOR PRESSURE GAUGE
	D - PRESSURE GAUGE
	E - 2/2 HAND OPERATED VALVE
	F - HIGHER PRESSURE SHUTTLE VALVE
645	2/2 N.C. DIAPHRAGM PILOT VALVE (ADJUSTABLE)
681	3/2 N.O. PNEUMATIC PILOT/HAND RETURN VALVE
709	DOUBLE 3/2 N.C. PNEUM. PILOT AND HAND OPERATED/SPRING VALVE
	PC - 3/2 N.C. HAND OPER./SPRING PILOT VALVE (TO CLOSE)
	PO - 3/2 N.C. HAND OPER./SPRING PILOT VALVE (TO OPEN)
	DC - 3/2 N.C. PNEUM. PILOT/SPRING RET. VALVE (TO CLOSE)
	DO - 3/2 N.C. PNEUM. PILOT/SPRING RET. VALVE (TO OPEN)
801	CONTROL VALVES ENCLOSURE WITH VENT VALVE
DR	DIGITAL READOUT
EFR	EXHAUST FLOW REGULATOR
FP	FLEXIBLE PIPE
LBTU	"LINE BREAK" DEVICE TEST UNIT
LT	TANK
DR/P1	PORT "1"
DR/P2	PORT "2"
PTR1	PRESSURE TRANSDUCER (REFERENCE TANK)
PTR2	PRESSURE TRANSDUCER (GAS LINE)
SV1	STOP VALVE
SV2	STOP VALVE

PNEUMATIC CONNECTION

ELECTRIC CONNECTION

Rev. 1	Date 03/10/06	By VR	Approved GUD	Description MOVED LT CONNECTION
	Path	"LINE BREAK" DEVICE TEST UNIT and CONTROL UNIT – OPERATING DIAGRAM –	Drawing Number FIGURE 1	
	BIFFI		File LB_FIG_1_608_PARKER	Date 11/08/05
			By VR	Approved GUD

Figure 2 "LINE BREAK" device test unit



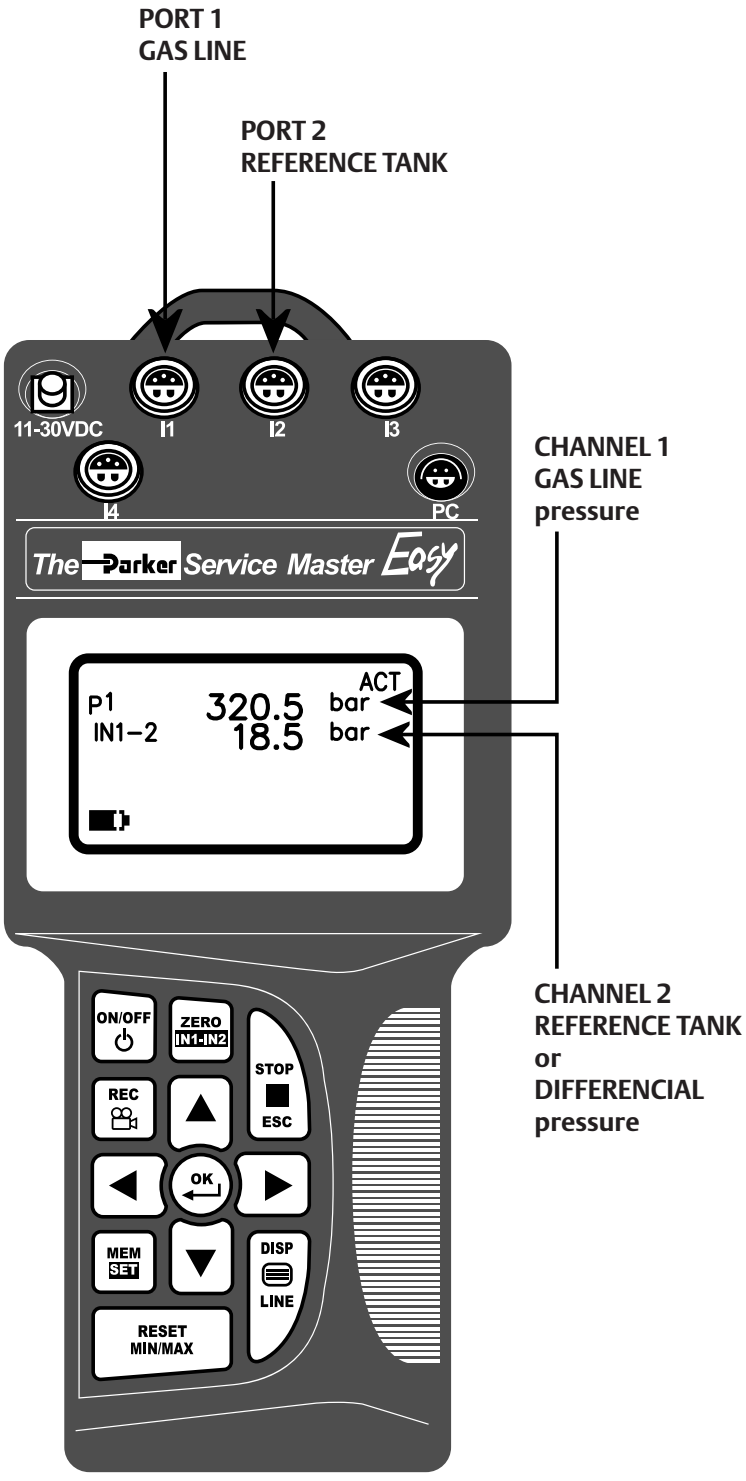
FP	FLEXIBLE PIPE
TRC	TRANSDUCER CABLE
PTR1	PRESSURE TRANSDUCER (REFERENCE TANK)
PTR2	PRESSURE TRANSDUCER (GAS LINE)
DR	DIGITAL READOUT
M	MANIFOLD
DR/P1	PORT "1"
DR/P2	PORT "2"
EFR	EXHAUST FLOW REGULATOR
SV1	STOP VALVE
SV2	STOP VALVE
LT	TANK FOR GASOLINE SIMULATION (NOT SUPPLIED BY BIFFI)
NP	NOZZLE PLUG
NV	NEEDLE VALVE
CVOB	BODY OF CHECK VALVE WITH ORIFICE

PNEUMATIC CONNECTION

Rev.	Date	By	Approved	Description

AutoCad 10.0	Path	"LINE BREAK" DEVICE TEST UNIT – ASSEMBLY DIAGRAM –	Drawing Number FIGURE 2
	BIFFI		File LB_FIG_2_PARKER / Date 08/04/10
			By / Approved

Figure 3 Digital Readout



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