

RG NDT INTERNATIONAL INC

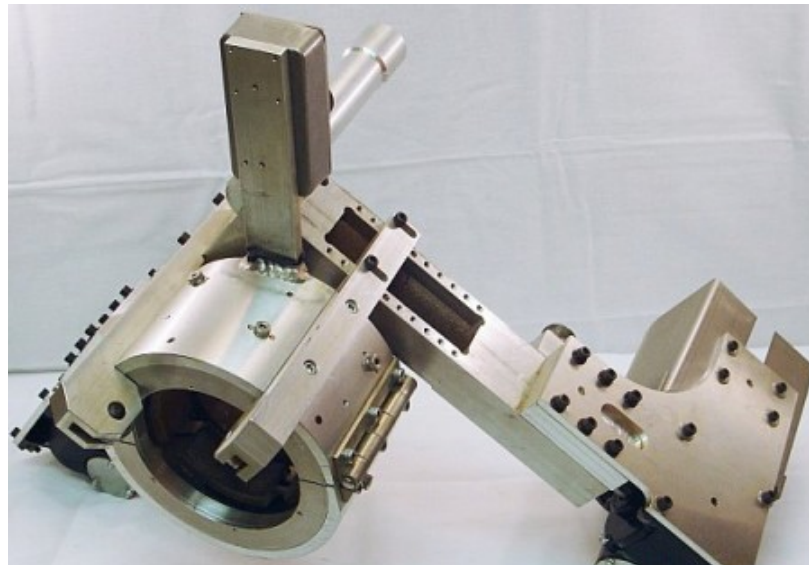
Drill Pipe and Tubing Inspection System

Computerized Drill Pipe Manual

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ELECTRONIC DRILL PIPE DESK



MOTORIZED BUGGY DRIVE HEAD

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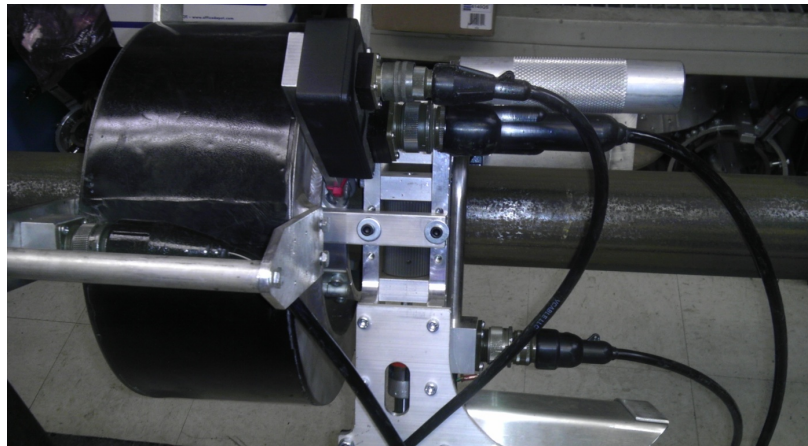
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GENERAL OVERVIEW

The drill pipe and tubing inspection system consists of an electronic desk connected to a motorized head through four (4) seventy (70) foot cables. The molded ended cables allow electrical power to be supplied to the head and the detected signals to return to the electronic desk for analysis. The inspection system was designed to inspect drill pipe and used tubing.

The electronic desk houses: two (2) embedded computers, flaw signal amplifiers and peak detectors, interface cards for magnetic wall loss, electronic power supply, magnetizing power supply, buggy drive power supply, and a four (4) channel thermal recorder. Desk-mounted switches and controls give the operator full control over magnetizing current, buggy travel (speed and direction) and thermal recording speed. The operator can also choose to enable or disable individual channels. Light emitting diodes (LEDs) and audible alarms denote when a signal exceeds predetermined conditions. The sensitivity of all information channels are digitally controlled through the respective touch screens.

The desk has two unique features: a **CONSTANT-CURRENT MAGNETIZING SUPPLY** and a **REGENERATING POWER SUPPLY**. These features allow the user to control the movement of the scanner while producing little or no electronic signal indications. The **CONSTANT-CURRENT MAGNETIZING SUPPLY** supplies the magnetizing coil with a specific amount of current which is displayed on a digital meter. The **REGENERATING POWER SUPPLY** allows the operator to control the movement of the buggy while producing little to no interfering electronic signal indications. The system contains **MAGNETIC FLAW DETECTION** and **MAGNETIC WALL LOSS**.



MAGNETIC FLAW DETECTION

Eight shoes, each with an individual small coil, scan the outside circumference of the pipe to detect flux leakage caused by flaws. The information is directly sent to the electronic desk, where the detected signals are amplified, digitized and processed via an OP7200 single-board computer. The computer sets the gain (sensitivity) of each channel and the level at which a signal will cause a visual and an audible alarm. In order to simplify the display on the chart recorder, the largest indication from the ODD channels is extracted and displayed on one channel (output number 3), and the largest indication from the EVEN channels is extracted and displayed on one channel (output number 4). These results can be displayed on a laptop computer.



MAGNETIC WALL LOSS

The wall monitoring head employs an encircling array of Hall Effect transducers that monitor the pipe traveling through the unit. These non-contact transducers detect metal loss and material grade changes. Changes in metal thickness and grade are detected and processed via a second OP7200 single-board computer. The computer will allow for the setting of two (2) digital wall thicknesses for each channel. The computer also provides two (2) outputs. The first output continuously indicates the minimum wall thickness (trace Number 1) and the second output, during normal operation, indicates the wall reduction by causing a pulse with relative amplitude that is directly related to the wall loss detected. A switch and a potentiometer are used to show short durations of wall loss that are often associated with tubing on the second output trace.

NOTE: Grade and metal hardness variations that occur in Drill Pipe and Tubing may cause magnetic indications similar to wall loss indications.



SET UP

Make sure the POWER switch is in the OFF position.

1. Connect the power cable to a 110VAC (50-60 Hz) source, (A digital meter indicates the potential of the power source).
2. 110 VAC gauge should show voltage to be around 105-125V.
Do not turn on unit if it is out of range.
If input AC voltage is within range, turn on the unit.
3. Verify that the pipe size specific transducer array is connected, (for example, 4" diameter pipe requires 4" transducer head).
4. Before turning the desk ON, securely connect both ends of the four (4) cables from the desk to the inspection head. (FLAW SIGNAL, WALL SIGNAL, BUGGY DRIVE, and MAG COIL).
5. Make sure that the direction of the MAG coil is chosen so that an increase in MAGNETIC CURRENT causes a decrease in wall indications.
6. Select the current level for magnetizing the pipe with a switch and a potentiometer marked MAG. (A digital meter will indicate this level)
7. Select the inspection speed of the traveling head with a switch and a potentiometer marked BUGGY.

NOTE: Set the MAG current to at least 0.8 amp for every 0.100" of wall thickness. A MAG current of 1.0 amp for every 0.100" is recommended. (At least a MAG current of 1.6 amps for a wall of 0.200", at least a MAG current of 2.4 amps for wall of 0.300", etc.)

The MAG supply MUST be turned on AFTER the electronic desk is turned on. The supply MUST be turn OFF before the electronic desk is turned off.



THE FLAW DETECTION AND PROCESSING SYSTEM

- Each of the eight (8) flaw channels has an independent enable/disable switch. A channel is enabled when the switch is in the up position and disabled when the switch is in the down position.
- In the VIEW mode select each of the eight (8) channels and set its sensitivity via an on-screen 'Button.' (Enter a sensitivity level from 1% to 100%)
- In the VIEW mode set the ALARM level that, once exceeded by a flaw signal, will alert the operator by turning on respective LED and, if the ALARM switch is ON and the RUN/VIEW switch is in the INSPECT position, will also sound an audible alarm.
- The LED is timed to indicate for two (2) seconds for every occurrence. (If selected, the audible alarm will also activate for two (2) seconds during each occurrence)
- Using a reference standard, each of the inspection channel's sensitivity is set to generate a predetermined height indication.
- The electronic sensitivity of all eight channels can be set at once using the SET ALL button and by entering the sensitivity level from 1% to 100%.
- Such setting will not compensate for anticipated differences between transducers.

Once CALIBRATION is achieved, switch from VIEW mode to the INSPECT mode to improve inspection at faster speeds.

A REJECT button allows removal of small signals. Make sure that the desired signals are at least twice the size of the rejected noise.



THE WALL LOSS DETECTION AND PROCESSING SYSTEM

- The NOMINAL wall thickness should be entered with pressing the NOMINAL button and entering the nominal pipe wall thickness.
- An ALARM level is selected automatically to 80% once a NOMINAL is entered, but can be chosen by entering the digital wall thickness that, when encountered, triggers the ALARM.
- The system features a “BIAS” potentiometer that allows the adjustment needed to bring various different thicknesses to the operating range of the computer.
- Changes in wall thickness can be monitored as vertical line on a display in the VIEW mode.
- Switches are provided to enable/disable individual channels. A channel is enabled when the switch is in the up position and disabled when the switch is in the down position.
- The VIEW mode enables the user to set, with a number, each quadrant of wall loss detection.
- During times when the wall thickness is below the set level, the ALARM will be indicated by a LED. An audible ALARM will sound if the ALARM switch is ON and the VIEW/INSPECT switch is in the INSPECT position.

Set the cursor (<) to Cal ALL with the center up/down arrows and, after pressing the larger diamond button, enter the NOMINAL PIPE WALL.

This type of calibration is somewhat limited because it is considered a ‘one-point’ calibration.’

Once calibration is achieved, switch from VIEW mode to the INSPECT mode to improve inspection at faster speeds.



HOW TO CALIBRATE FOR WALL LOSS:

- 1) Check wall thickness on pipe at both the nominal and reduction areas. Check wall thickness by hand with UT meter/gauge. Take measurements at all four quadrants in each area. Take all four measurements from the nominal area and divide them by 4, this will be your nominal number. Repeat with reduction measurements.
- 2) Line up buggy on first hole. Insure that the first shoe covers the first hole.
- 3) Turn on MAG.
- 4) Set MAG current to be set at 0.80 AMPs per 0.1 inch body wall thickness.
Ex: 4 ½" pipe with nominal of 0.350 inches the MAG current should be at least 2.8 AMPs.
- 5) Set buggy speed then lock.
- 6) Set nominal measurement on wall computer. Scroll by hard keys and insert measurement by touch screen. Hit RET.
- 7) Set Wall sensitivity via left knob (BIAS) to about half scale.
- 8) Set wall alarm.
Ex: 10%, 15%, etc. Computer will default to 20% automatically.
- 9) Set 'WALL CAL ALL' by pressing down arrow key, enter category by pressing center diamond.
- 10) Set 'HI CAL ALL' by entering measurement via touch screen. Hit RET.
- 11) Move buggy to center of wall reduction.
- 12) Set 'LOW CAL ALL' measurement via touch screen. Hit RET.
- 13) Switch from View to Inspect.



CALIBRATION

This unit allows for a TWO point calibration for WALL LOSS

(Using Nominal {1} and a reduced wall section {2} a TWO point calibration is obtained).

1. Ultrasonically test at several points around the circumference at a NOMINAL point and at a second WALL reduction point location.
2. Set unit in VIEW MODE and set the desired current as suggested above.
3. Place pipe of about nominal wall thickness and grade within the system's array.
4. Set the BIAS potentiometer to indicate the actual wall thickness on at least one quadrant. (Lock the dial of the potentiometer)
5. Move cursor up (or down) in each quadrant

Make sure buggy head is placed away from the ends of the pipe!

6. Press 'Cal Hi' of that quadrant and enter the wall thickness read with the Ultrasonic gauge, repeat for all four (4) quadrants.
7. If the information has been entered correctly, all (4) wall readings will read the correct decimal readings.
8. Bring the buggy head to the reduced wall area. (if present)
9. Press 'Cal Lo' of that quadrant and enter the wall thickness read with the Ultrasonic gauge, repeat for all four (4) quadrants.

When the unit is connected to a laptop computer via a USB port, the display and pipe numbering can be seen. The laptop can be used to store inspection files, browse and recall inspection files.

A Macro keyboard is recommended to ease the inspection operation, making the thermal recorder only a secondary storage medium.



Any change in MAGNETIC CURRENT or BIAS will result in the need for RECALIBRATION!

When the MAG current is increased, the wall readings should decrease!

If the wall readings increase when the magnetic current is increased, turn off magnetic supply and reverse the magnetic current direction by switching the rotating coil. The two leads from supply to the coil can be also reversed to achieve the correct magnetizing direction! Turn on magnetic supply and verify that the wall readings are decrease with an increase in magnetic current.

Example:

Without current in the MAG coil, the respective channel readings are 0.500, 0.510, 0.523, and 0.500.
With current in the MAG coil, the respective channel readings are 0.350, 0.355, 0.357, and 0.350.

EXPECTED VALUES

The following table shows an example of the expected outputs:

Minimum Wall Output	Condition
0V	Wall Thicker 10% or more
1V	NOMINAL
2V	NOMINAL - 10%
3V	NOMINAL - 20%
4V	NOMINAL - 30%
5V	NOMINAL - 40%
6V	NOMINAL - 50%
Etc.	

Pulsed Wall Output	Condition
0V	Nominal - 12.5% to Nominal
1.5V	Nominal - 15%
2V	Nominal - 20%
3V	Nominal - 30%
4V	Nominal - 40%
5V	Nominal - 50%
Etc.	

Short Duration Wall Output (Tubing)	Condition
0V	Wall Thicker 10% or more
1V	Nominal - 10%
2V	Nominal - 20%
3V	Nominal - 30%
4V	Nominal - 40%
5V	Nominal - 50%
Etc.	

The Drill Pipe and Tubing Inspection System indicates the Minimum Thickness (Maximum wall loss) and the pulsed wall loss (or short wall loss). These analog outputs are scaled to produce 1 volt per 10% wall loss. The baseline starts at 1 volt when the Wall thickness is equal to NOMINAL. This allows a 10% increase in wall thickness to be seen as 0 volts. The output is accurate to within 0.1 volts, in most cases.

TRANSVERSE FLAW CALIBRATION

(USING A TRANSVERSE PIPE STANDARD)

1. Select the buggy drive with the correct size head.
2. Line up the #1 flaw shoe to the first hole in the pipe (at approximately 3 o'clock). The holes are made in a clockwise format when looking down the pipe.
3. Set the alarm level.
4. Turn off all shoe switches except the #1 shoe.
5. Run buggy over the first hole until the signal on the chart is 10 mils (approx 2nd large division). This is done by pressing the center arrows until the cursor, '<', is at channel 1.
6. Press CAL button and raise or lower the gain until desired indication height is obtained.
7. Set all flaw shoes the same way: by turning the next flaw switch ON as a flaw shoe is calibrated.
8. All flaws should be calibrated to the same height on the chart when completed.
9. If you need to remove low level noise (or false indications) on the pipe, you can select a REJECT if necessary.

Too high of a level in REJECT can cancel out some of the needed indications.

(2013 models of the have a set limit where the REJECT can't be set past 2.0)

- NOTE: All touch screen computers have +/- contrast to make the screen darker or lighter.



RG NDT INT, Inc. warrants that the **Drill Pipe and Tubing System** will be free from defects in material and workmanship and that it will perform in accordance with this written document for a period of **SIX (6) MONTHS** from the date of purchase.

The warranty for the inspection heads, transducers and cables is limited to **NINETY (90) DAYS** from the date of purchase.

RG NDT INT., Inc. will repair or replace, at its sole option, any equipment that is found to be defective provided that the customer returns the defective instrument or system to RG NDT INT., Inc. with transportation prepaid. This warranty is **void** if the defect(s), based on the sole judgment of RG NDT INT., Inc., is a result of misapplication, accident, abuse, negligence, **tampering** or modification of the product by persons not authorized by RG NDT INT., Inc.

Within the SIX MONTH warranty period RG NDT INT., Inc. will repair returned equipment that was damaged accidentally or by misapplication, at cost plus 40%.

Equipment damaged due to **abuse, tampering, or modification to the electronics will not** be repaired and will be shipped back to customer.

In no event will **RG NDT INT, Inc.** be liable for any indirect, incidental or consequential damage or loss of revenue arising from the use or failure of this product. Purchaser agrees to indemnify, hold harmless and defend, including but not limited to attorney's fees, court costs, and travel costs, **RG NDT INT, Inc.** from any claims or lawsuits that arise from the use of this product.

RG NDT INT, Inc. reserves the right to make any changes in design or construction without incurring any obligation to retrofit units previously delivered.

This Equipment is NOT certified to be used in hazardous areas.

Computer programs are the sole property of RG NDT INT, Inc., Houston, Texas 77013.

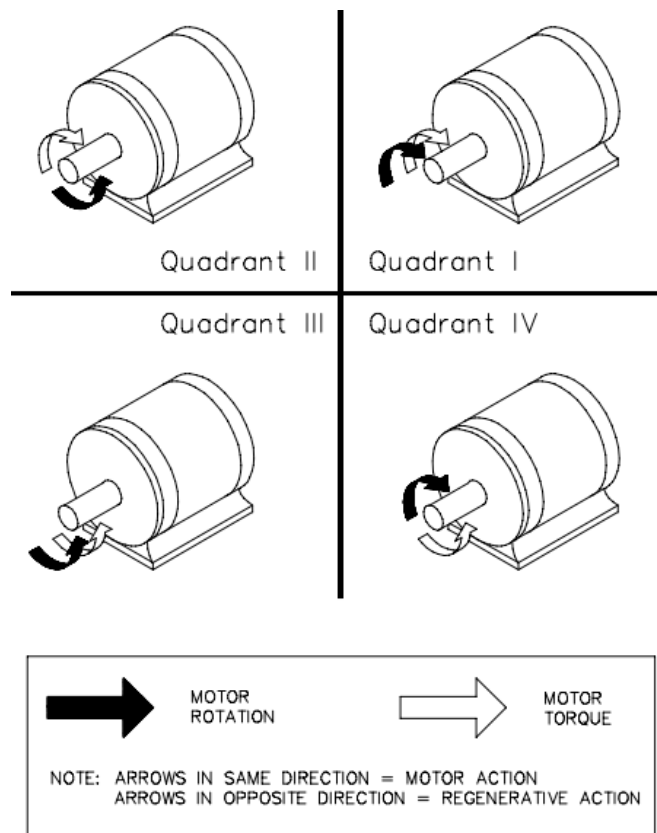
Any changes, modifications or abuse voids all warranty.

REGENERATIVE DRIVES

Most non-regenerative, variable speed, DC drives control current flow to a motor in one direction. The direction of current flow is the same direction as the motor rotation. Non-regenerative drives operate in Quadrant 1, and also in Quadrant 3 if the drive is reversible (see picture). Motors must stop before reversing direction. Unless dynamic braking is used, non-regenerative drives cannot oppose an overhauling load, and cannot decelerate a load faster than coasting to a lower speed.

Regenerative drives operate in two additional quadrants: Quadrant 2 and Quadrant 4. In these quadrants, motor torque is in the opposite direction of motor rotation.

This allows regenerative drives to reverse a motor without contactors or switches, to control an overhauling load, and to decelerate a load faster than it would take to coast to a lower speed.



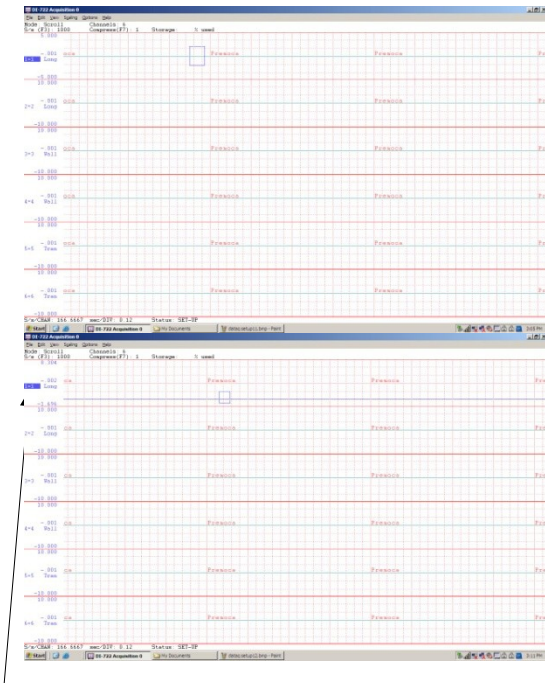
DATAQ SOFTWARE

This is the basic screen of your dataq application. Your screen may have multiple tracers but this will cover the basic usage.

Set-up means the program isn't recording and the screen is able to be manipulated



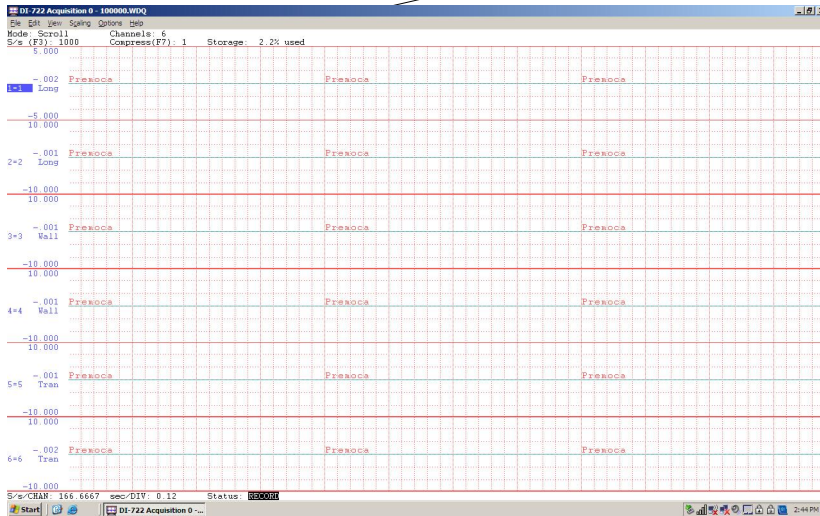
At this screen you can change the positioning of the tracers by making a box around the tracer and moving it up or down.



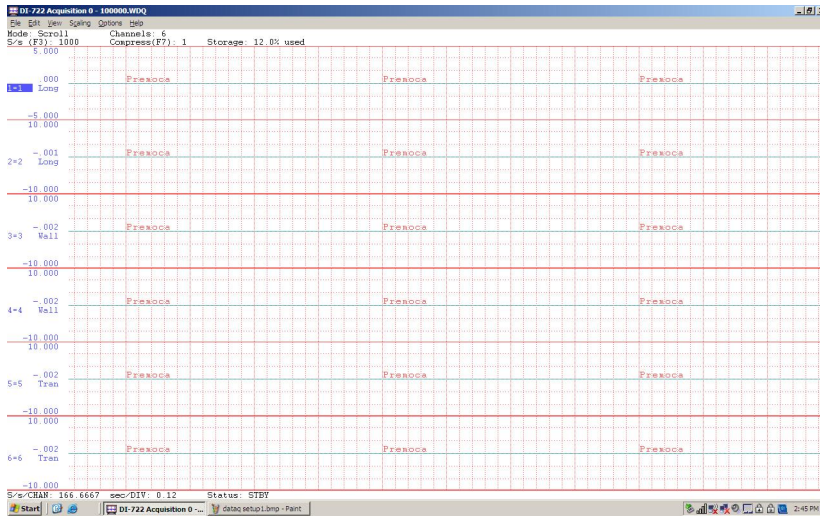
The channel you intend to manipulate must be highlighted by clicking on the channel.

In addition to this you can also increase or decrease the tracer strength by clicking on the channel and pressing up and down on your keyboard.

This shows how much of that individual file has been filled.



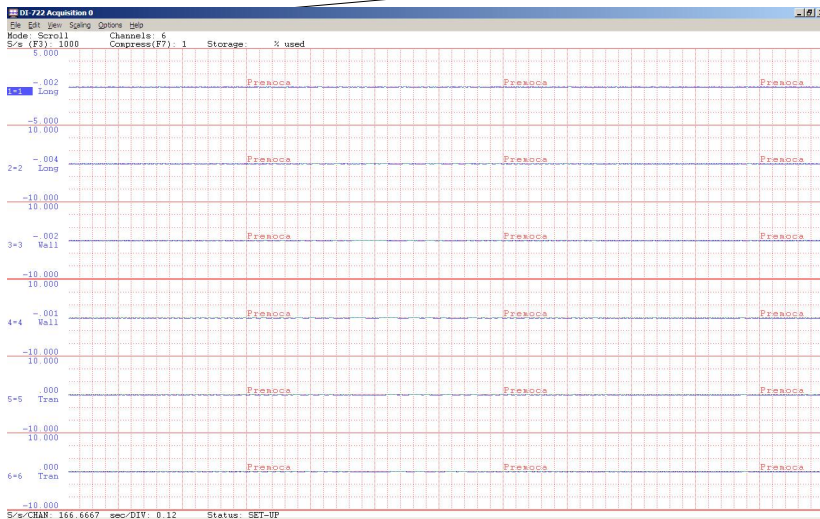
Recording means that the program is recording and is taking all the information on the screen into the file. You get this by hitting F4 or going up to file and clicking on record.



STBY is standby and the program is still in recording mode but is not actively recording the tracers on the screen

You can increase the chart speed on screen and adjust the tracer intensity on screen.

The chart speed can be increased by changing the values of **S/s** here by pressing F3.

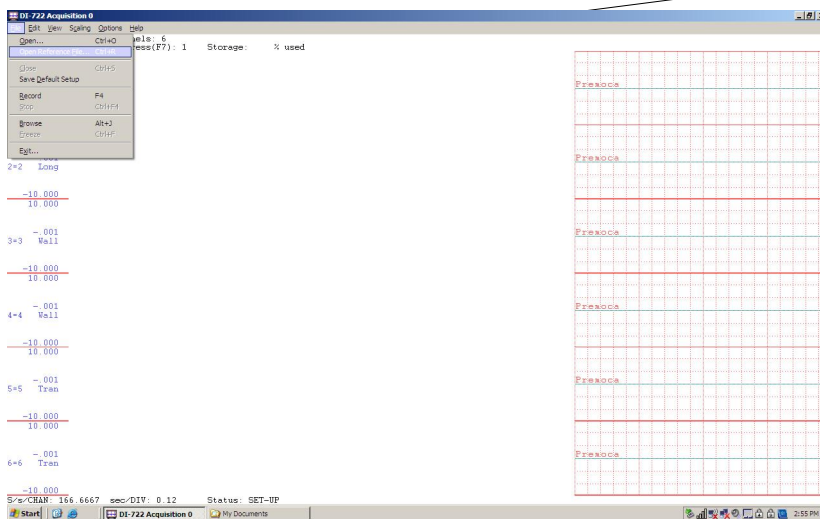


You can change the tracer intensity by changing the values in Compress by pressing F7.

Note that when you change either ‘Compress’ or ‘S/s’ the entire screen will change in velocity. The trick is finding a happy medium between speed and a strong indication.

If you ever change the screen in a manner where you cannot undo what you’ve done, you can always exit out of the program and re-enter and the program and it will go back to the original setup.

To save the setup once you’re comfortable with the way it works, you **MUST** click on **Save Default Setup**



CHERRY KEYBOARD

This is the **(STT) Start Job** button- it starts a new file (such as pipe100000).



Once the directory file name series is set, the **(Ctrl) Control** button finishes the setup.

This is the **(FRE) Freeze** button- it will take the program into standby and allow the information on the open file to be able to be reviewed.



This is the **(STP) Stop** button - it ends the file so that you can move on to another file/joint.

This is the **(NXT) Next Job** button, when you have set up a correct file name it will open to the next successive file. For example, the filename will change from pipe100000 to pipe1000001.

