Actuation Test Equipment Company

Index Test Box Installation Manual

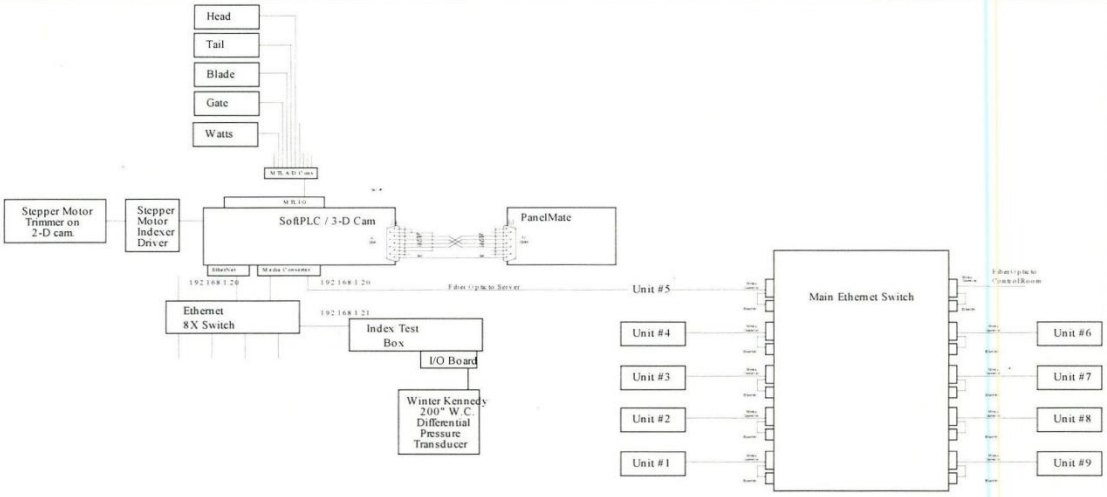

Figure 1 Block Diagram of ITB Installation

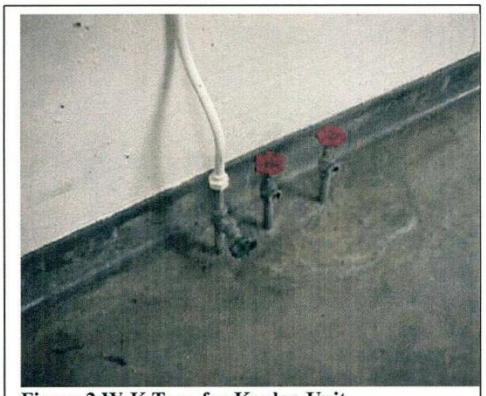

Figure 2 W-K Taps for Kaplan Unit

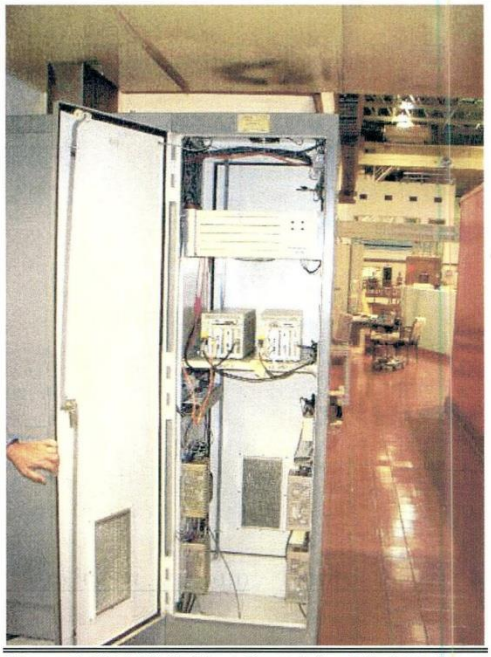

Figure 3 GDACS Cabinet Containing 2 SoftPLCs

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Introduction:

This document is the installation manual for the ITB. This first draft is for conceptual approval and installation of the ITB including Ethernet switch and Winter Kennedy Transducer. As each part of the plan is executed, detailed descriptions and exceptions to this manual will be added.

Please forward any suggestions or comments to Rod Wittinger HDC and/or Doug Albright at Actuation Test Equipment Company,
Email: DudleyDevices@Aol.com.

Updates will be made to this document as necessary.

This document details the installation procedure and techniques to install the Ethernet Switch, Index Test Box Pc computer and Winter Kennedy differential pressure transducer.

This document is pursuant to the "installation manual" requirement of paragraph 3.4.2.5 of contract W9127N-D-0009; "Submission of a prototype instruction manual, including installation, operation and maintenance instructions."

Best regards,

Doug Albright
Actuation Test Equipment Company

Safety concerns

Please observe all safety directives of the facility regarding housekeeping and placement of temporary test instruments. The tendency with temporary installations is to take shortcuts and make concessions to expediency that intersect the guidelines of safety.

Caution: Make sure to coordinate all GDACS system connections and disconnections with control room personnel.

This is a block diagram of the GDACS/SoftPLC to ITB connections showing how the ITB connects into the existing equipment.

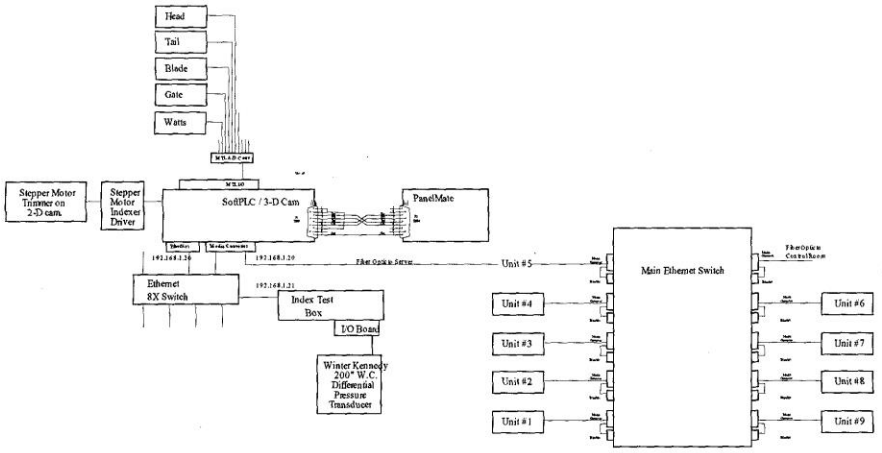


Figure 4 Block Diagram of Index Test Box Installation

The SoftPLC, PanelMate, MTL I/O & sensors for head, tail, gate & blade, the wattmeter, stepping motor and indexer driver are all preexisting equipment on the unit. The "Main Ethernet Switch" is the existing GDACS multiple switch setup.

This picture shows the layout of the ITB Computer, cabling and Winter Kennedy setup located on the other side of the Generator.

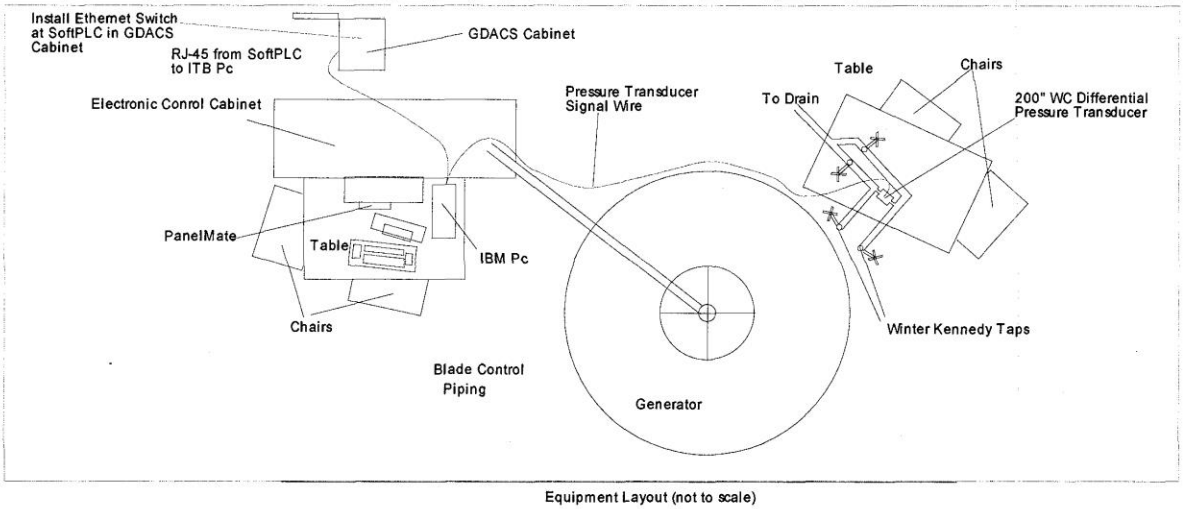


Figure 5 Floor Layout (Not to scale)
Floor layout of turbine/generator, governor and blade control cabinet, GDACS cabinet and placement of two tables and chairs for Index Test Box proof of concept demonstration.

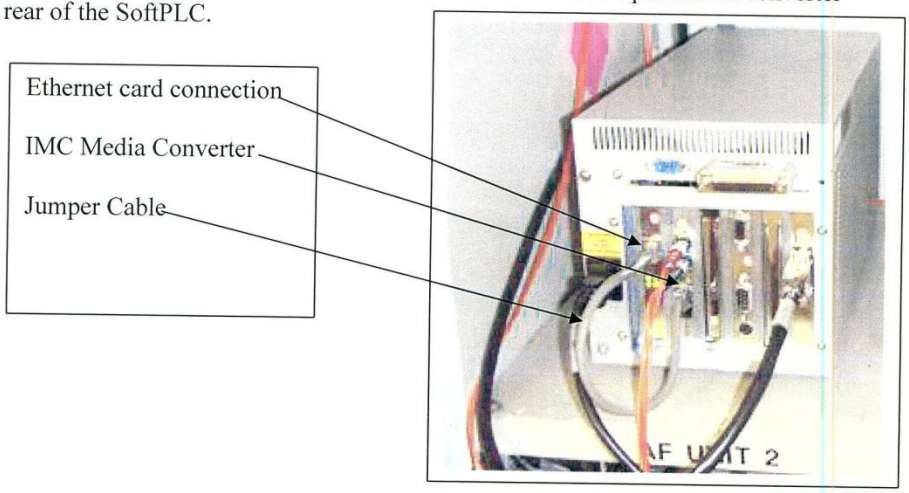
Installation Procedure

1.) The first part of ITB installation is to insert the 8X Ethernet Switch between the Unit to be tested and the rear of the Unit 5 SoftPLC in the GDACS network as shown.

Unpack LinkSys 8X Ethernet switch, power pack and Cat 5 cables.

Locate suitable spot to mount the Ethernet switch in the GDACS cabinet.

Unplug RJ-45 Ethernet cable between the Ethernet card and IMC Fiber Optic media converter board at the rear of the SoftPLC.



Plug the LinkSys power pack into a 110VAC power output, then plug the 12V output connector to the LinkSys Switch.

Plug the two 3' long RJ-45 cables supplied by ATECo into any two of the plugs in the LinkSys switch, and then plug the other ends into the Ethernet board and IMC fiber optic media converter board connectors on the rear of the SoftPLC.

Observe traffic indicator lights on the LinkSys switch to see that communication between the SoftPLC and GDACS network has been reestablished. Verify with Control Room.

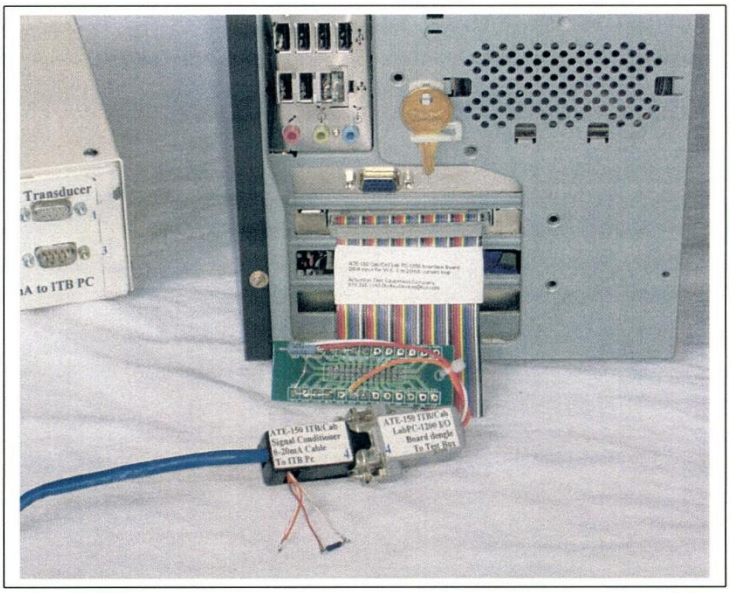
This concludes installation of Ethernet switch.

Setup of ITB Computer

2.) Get a small table and chair for the ITB Pc and place them convenient to the PanelMate display of the governor cabinet of Unit #5.

Setup the ITB Pc on the table and assemble with the keyboard, mouse and monitor as you would any other Pc.

Connect an Ethernet cable between the ITB Pc and the LinkSys Ethernet switch installed in the previous steps above.
Install the A/D I/O board Lab PC-1200 dongle as shown in this picture:



The 0to 20mA signal cable is a 100' long Cat-5 wire with 4 twisted Pairs100' long. DB-9 M & F connectors are installed on both ends of the cable to connect between ATE-150 Signal Conditioner and ITB Pc.

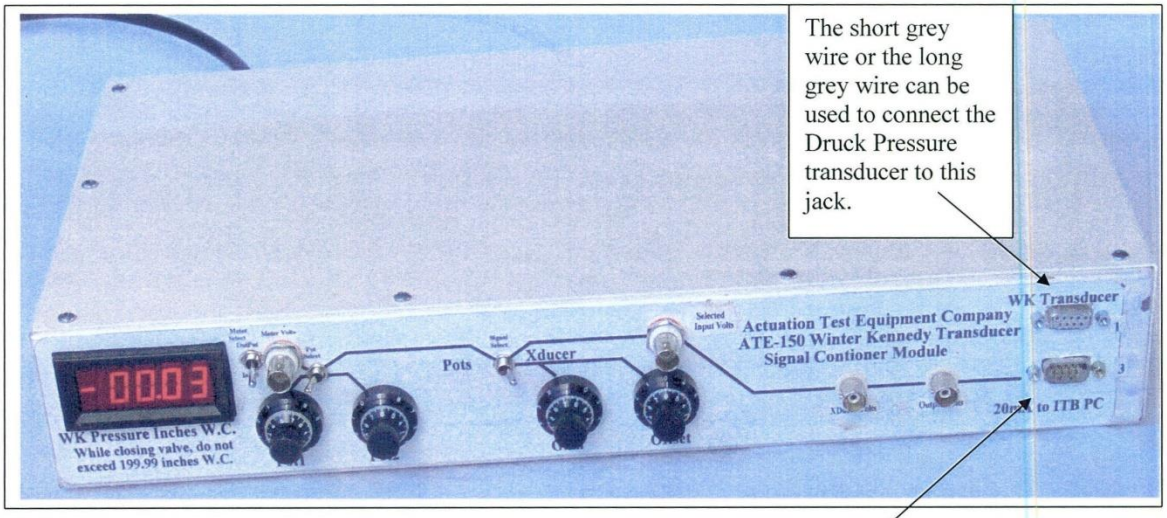
The two spare wire pairs in this cable will be used to carry switching signals for the automatic flushing system in a later revision of this system.

To facilitate a background noise measurement as part of the ITB setup procedure, the ends of these spare twisted pair wires in this wire have been exposed so measurements can be made of how much stray signal they pick up when the cable is in position.

The noise measurement uses a standard hand-held DMM on the AC-RMS voltage scale to see how much 60 Hz noise is picked up by the twisted pairs in the cable to measure the noise floor for his measurement.

If the original pre-installed wire from the Winter Kennedy taps to the Governor Cabinet is still there, then of course it would be best to use that, but if not, use this Blue wire to make this connection and check the background noise.

Plug the other end of the blue wire into the ATE-150 signal conditioner box as shown in this picture.



Plug in the 110VAC cable to the ATE-150 and observe the Meter lights up, indicating power has been applied. If the transducer is pressurized, and the Gain and Offset knobs are set to 1.74 and 0 respectively the Gain of the ATE-150 will be 1 with no Offset.

ATE-150 Setup

For the first field test, the ATE-150 Signal Conditioner box should be set for a Gain of 1 with no offset applied to the signal.

(Gain of 1 refers to the normalization schedule, where 0to 200" W.C. → 0 to 5V output of the transducer → 0 to 20mA output of the ATE-150 signal conditioner → 0 to10V input to the Lab PC 1200 I/O board. This represents full span of all elements in the string.)

The input 0 to 200" W.C. pressure gives a 0 to 5V output of the pressure transducer that can be verified by plugging a DMM with a BNC cable to the **Xducer Volts BNC** connector on the front. This jack is connected directly to the transducer output.

The output of the ATE-150 can be measured in the same direct way by connecting the DMM to the **Output Volts BNC** connector, which is connected directly to the ATE-150 output signal to the ITB Pc. This is a 0 to 20mA current loop for noise immunity. At 200" W.C. the voltage driving the current loop will be 10V at this test point.

The 110 inch Water Column maximum pressure anticipated at McNary will give a 2.75 Volt output of the transducer using only 55% (or 5.5V at the output of the ATE-150 Signal Conditioner) of the available A/D converter input range. This will result in reduced signal measurement resolution and accuracy, but should still give satisfactory results.

For more information on the transducer, cabling and ATE-150 Signal Conditioner, consult manual: **"p ATE-150 Winter Kennedy Signal Conditioner.doc."**

When all of the above connections are made, turn on the ITB Pc; observe the normal Windows XP boot sequence.

Start the ITB program from the desktop icon and observe the display.

Start the **TestUnitOPC** control form by clicking on the **TestUnit** tab on the main menu.The ITB will begin interrogating the SoftPLC and displaying the returned values on the Pc monitor.

Observe for data display on the monitor, and then verify head, tail, gate and blade values against the PanelMate display.

This concludes ITB Pc, transducer and signal conditioner installation.

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