MEASUREMENT Technology NORTHWEST

WINCH MONITORING PROPOSAL

Equipment for Monitoring Tension, Speed and Payout in
Single or Multi-winch Systems

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Proposal Number: L959-11-10

Prepared for

Coast Guard – Polar Star, Healy & Polar Sea

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1.0 SCOPE OF WORK:

In response to the changes in UNOLS Rope and Cable Safe Working Load Standards, specifically Appendix A, Measurement Technology NW proposes to support US Coast Guard's fleet of research vessel ships with standardizing and upgrading the winch monitoring equipment to meet these specific safety standards.

RVSS Appendix A, 6.3 & 6.4 describe the winch and wire rope monitoring requirements when working to a safety factor of 2.5 to 1.5 as the following:

Tension Monitoring	Tension must be monitored at the winch operator's station with a display resolution of at least 10 Hz (every 100 mS). The system must also be capable of logging tension data at a minimum frequency of 20 Hz (every 50 mS). Tension must be continuously monitored using a "tension trending" graph at the winch operator's station. The tension measuring system must be calibrated at a minimum of every 6 months at load equal to the imposed load at a FS of 1.5. The tension measuring system must be maintained with an accuracy of 3% of the applied load.
Alarms	The handling system shall be fitted with both audible and visual tension alarms that sound and/or illuminate prior to reaching 60% (FS = 1.7) of a wire's Actual Breaking Load (ABL). Alarm conditions must automatically be included in the logged data.

(RVSS Appendix A, Sections 6.4)

The redesigned LCI-90i exceeds the requirements for displaying tension at 10Hz and exceeds the requirement of logging tension at 20Hz.

The LCI-90i has more than enough accuracy to meet the Appendix A standards but MTNW reserves the right to evaluate the existing sensors for their accuracy and repeatability.

As required, the new LCI-90i will show a trending graph at the winch operator's station and have the capability of issuing audible and visual alarms which will be customizable by the winch operator.

The LCI-90i can be installed in either a panel mount or gimbal bracket mount configuration. The standard stainless steel rear enclosure allows the operator to rotate the angle of view as the enclosure is fastened to the console with a gimbal bracket.

The LCI-90i can communicate to the shipboard computer system for data logging across a standard Ethernet connection. The following data transmission

annotation will be added to the data broadcast; rope ID and winch ID. This can be set by the winch operator.

Power for the LCI-90 is nominally 9-36VDC but an optional internal AC power supply is available with the stainless steel enclosure option.

On board critical data logging will be accomplished through a removable CF disk. Long term data logging should be designed though the Ethernet interface to the shipboard computer system.

Only local (master) displays will be quoted for these vessels so that remote stations will have the ability to accomplish a remote payout reset and contrast control through the front panel menu structure.

Note that the LCI-90i data protocol will be different than the existing LM-2000 units. Auxiliary devices interfacing to the existing protocol will be required to be adjusted.

MTNW recommends that all locals be included on an Ethernet LAN, including the PC station that is required to run the WinchDAC software. This would be a TCP connection. Remotes can be included on this network (UDP connection) but can function at the 20 Hz data rate specified by the existing RS-485 serial network.

1.1 Upgrade Display Ships & Locations

The Coast Guard has proposed the following ships and locations be upgraded to the new LCI-90i display.

SHIP: Polar Sea

1. OW1 FWD Sheave - Local
2. OW2 AFT Sheave - Local
3. Trawl – Local
4. Aft Control Station Display – Trawl Remote
5. Port Control Station – Oceanographic Remote

SHIP: Healy

1. Winch Room - TC #1 - Local
2. Winch Room - TC #2 - Local
3. Winch Room - OW #1 - Local
4. Winch Room - OW#2 - Local
5. Aft Com - Aft Controls - Remote
6. Aft Com - Starboard Controls - Remote
7. Winch Control Room - Lurker Panel Remote #1
8. Winch Control Room - Lurker Panel Remote #2

SHIP: Polar Star

Has not been audited by MTNW personnel.

2.0 INSTRUMENTATION SPECIFICATIONS

2.1 LCI-90i

- Fully sealed 316 stainless steel front panel.
- Fully sealed pushbuttons.
- Full menu programming utilization through front panel pushbuttons.
- Shatter resistant polycarbonate viewing window with anti-glare coating.
- Electroluminescent display.
- Minimum 160° viewing angle.
- Quarter VGA display, 320 x 240 pixel density.
- Luminance, typical 150 cd/m2.
- Standard voltage requirements: 9--36VDC, 0.75Amps @ 24VDC.
- Temperature rating: -40°C to 75°C.
- Dimensions, 7.60” x 5.70” x 4.0”.
- Panel mount cutout, 7.15” x 5.25”.
- 4 Channels of analog input, either 4-20 mA, 0-5VDC, 0-10VDC, ±5VDC, 20 mV, 100 mV
- 4 channels of analog output.
- 4 channels of quadrature input (x1, x2, x4), 10kHz Bandwidth
- 4 channels of isolated digital I/O. SPDT dry contact.
- +5/+12/+24 VDC count sensor excitation.
- Visual setpoint alarms.
- Separate diagnostics screen.
- 1 Isolated RS-485 serial port.
- 1 Auxiliary RS-232 serial port.
- 1 USB Port
- 1 Ethernet port, 10 base-T
- On board CF disk
- Output Alarms can be assigned to any parameter at any setpoint through the front panel menu interface.
- Designed for Class 1 Div 2 applications, approval pending.
- Universal usage, local and remote

All programming functions required to set or change units, alarm limits, silence external alarms, and reset payout readings are available through the LCI-90’s five front panel pushbuttons. Even diagnostic information (raw counts) is available in this manner to the winch operator - there is no need to access the rear of the display.

3.0 SYSTEM ADDITIONS

3.1 Standard Stainless Steel Rear Enclosure & Gimbal Mount

MTNW offers a white, powder coated stainless steel rear enclosure for gimbal bracket mounting of the LCI-90i display, providing watertight protection for the rear of the display.

1. WinchDAC SCADA Software

This Winch Monitoring and Data Logging Software were developed specifically for use with the LCI-90i display. It is a versatile platform that displays line tension, payout, and speed with data logging and setup storage capabilities for winch and wire rope applications.

In addition to providing a local visual display of the wire rope parameters, each LCI-90 will echo the data, for all three parameters and alarm conditions, out on the isolated RS-485 serial communication port or the Ethernet port. This port is used to communicate the wire rope parameters to both the central master computer and also any remote monitoring computer.

The WinchDAC SCADA (referred to as the GUI – or Graphical User Interface) provides winch operators an indication of the line parameters for any active LCI local on the serial network. It is a very versatile platform that allows winch operators the ability to configure the winch monitoring requirements without any custom software, making it easy to add winch images, bar graphs or general images per user needs. All local displays are displayed at the same time on the main runtime screen. Additional details for a specific local LCI can be viewed by pulling down the winch's name from the pull down menu. The GUI can be installed on any PC that is connected to the RS-485 serial network or Ethernet intranet.

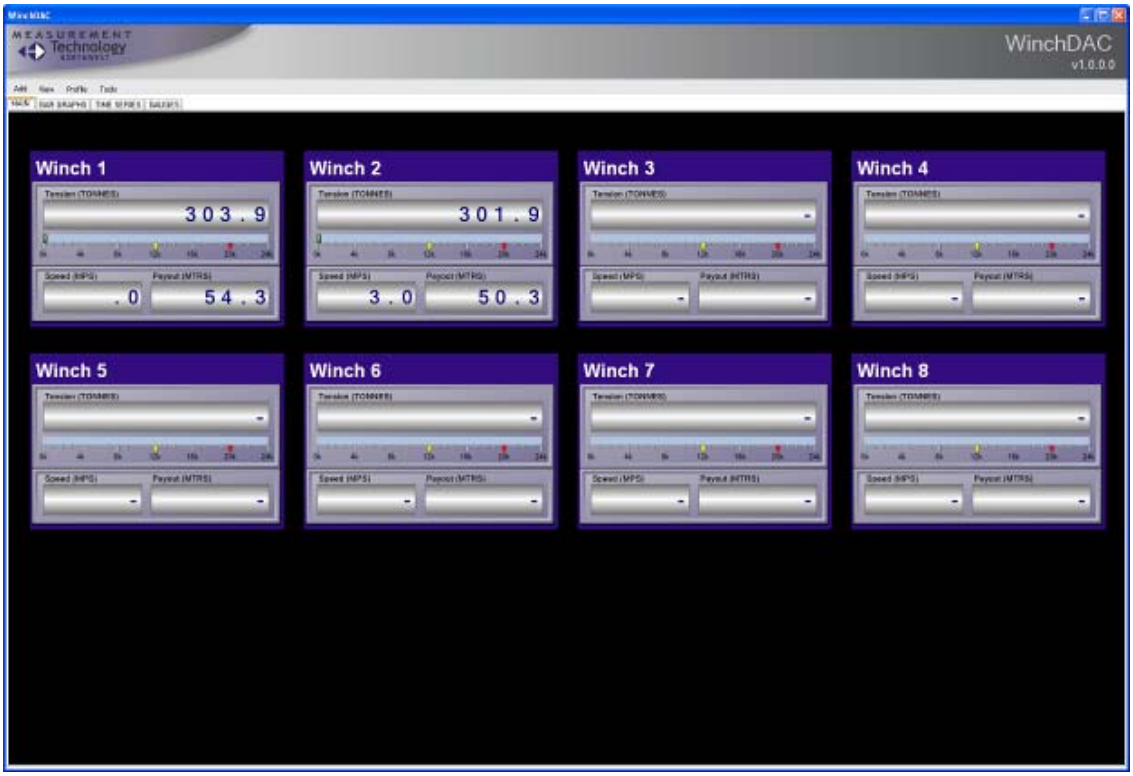

Figure 1. WinchDAC Main Run Time Screen

The winch icons can be grabbed by the cursor and moved around for initial screen setup. The
WinchDAC software allows the operator to view and log data from any active winch display connected to the network – at one central PC location. The software polls each active local LCI display for parameter information.

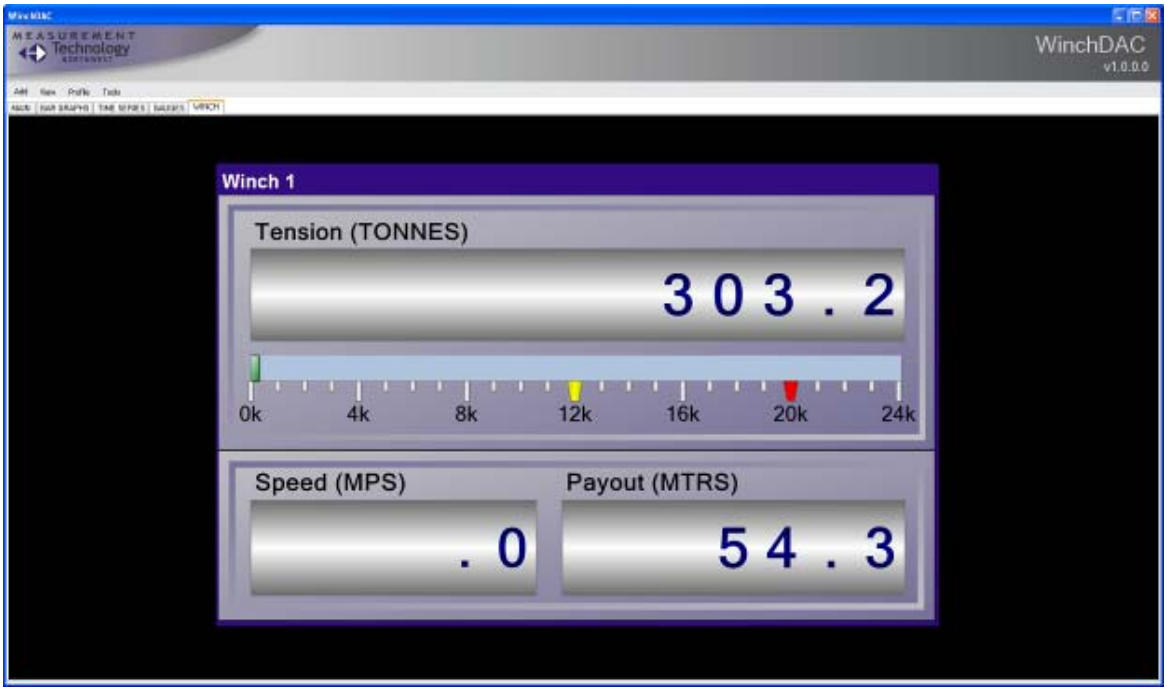

Figure 2. Winch Image Icon

WinchDAC's graphical interface shows at a glance winch speed, tension, and payout readings as well as alarm status, and all charts feature user-set parameter scaling and real time graphical display.
When the operator select a winch name from the pull down menu, there is an opportunity to view specific information for that LCI display, after the operator confirms a desire to leave the main screen. Three screens then appear, showing the speed, tension, and payout parameters for that particular winch.
WinchDAC charts feature user-set scaling and an intuitive display of any or all winch parameters. The operator can choose to view a screen with bar graphs, or a line graph that displays any winch parameter verses time.

Both visual and audible alarms are available. Visual alarms use winch icon color bar changes to indicate high or low alarm conditions. The vertical bar graphs will also change color indicative of the alarm condition. Alarm values can be easily be adjusted at the local LCI or back at the central WinchDAC PC computer.

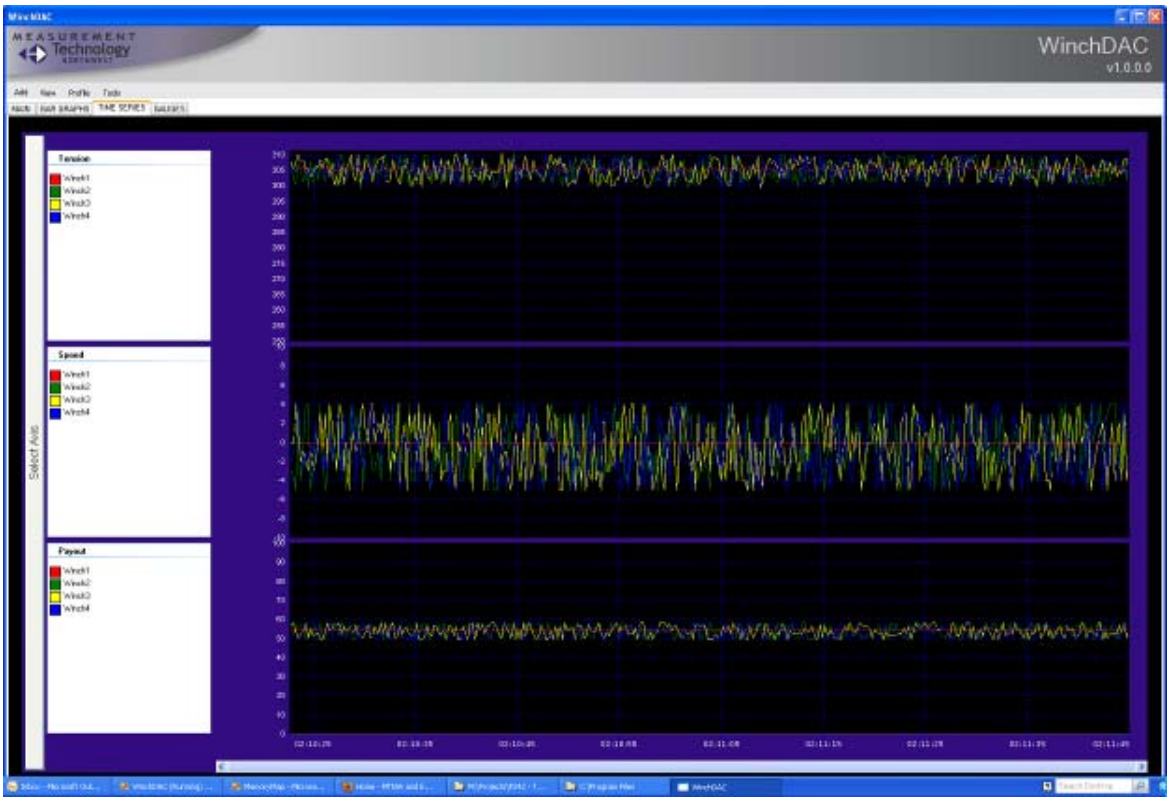

Figure 5. Detailed Winch View – Line Graphs

WinchDAC software automatically tracks values experienced during a given time period, and its single point marker tool allows the operator to scroll through the chart and see the exact values experienced at any point in time. WinchDAC automatically logs and summarizes data, giving operators the ability to replay the time history plot for any parameter from the cast.

Once WinchDAC has booted it will poll each local LCI display for its version number, and compare it to the version number stored for that display (each LCI display has its calibration and setup data stored in a setup array that resides in non-volatile memory. Each time an operator changes units, recalibrates, or changes any setting within the display, a version register is incremented). The setup array for each display is stored to disk and is available for editing and downloading at any time.

Any attempt to leave the runtime screen will prompt the operator to confirm. Also, any action that will stop data-logging or change normal runtime actions will prompt the operator to confirm. If WinchDAC loses serial communications with any LCI display the program will time out (after 1 failed polling attempt), and that winch's display icon will be turned to grey.

Data Logging:

Parameter data from each LCI display is stored to disk immediately – the data is not held in any temporary buffer. This protects the data in case of computer or software problems. Time stamps from the computer clock are included. Data logging is initiated by the operator at startup and continues until stopped. Files are named by date and

user defined text field. Unless changed by the operator, new data files will have the same name as the initial one, with revised date and time information.

Figures 6 & 7. Detailed Views – Vertical Bargraphs & Analog Dials

4.0 PRICING

Quote #L959-11-10 – Ships: Polar Star, Healy, & Polar Sea

Polar Sea

Item	Qty	Price (each)	System Total
LCI-90i	5	$3,800.00	$19,000.00
LCI-90i – Spares	2	$3,800.00	$7,600.00
LCI-90i Enclosures & Bracket	5	$300.00	$1,500.00
AC Power Supply Upgrade	5	$330.00	$1,650.00
WinchDAC Software	1	$3,000.00	$3,000.00
Documentation	Lot	$1,000.00	$1,000.00
Onsite Labor for Installation, Calibration & Commissioning	5	$1,500.00	$7,500.00
Total			$41,250.00

- Shipboard wiring can be reused unless data network is switched to Ethernet

Healy

Item	Qty	Price (each)	System Total
LCI-90i	8	$3,800.00	$30,400.00
LCI-90i – Spares	2	$3,800.00	$7,600.00
AC Power Supply Option	8	$330.00	$2,640.00
LCI-90i Enclosures & Bracket	2	$300.00	$600.00
Analog Meters	2	$750.00	$1,500.00
WinchDAC Software	1	$3,000.00	$3,000.00
Documentation	Lot	$1,000.00	$1,000.00
Onsite Labor for Installation, Calibration & Commissioning	7	$1,500.00	$10,500.00
Total			$57,240.00

- Shipboard wiring can be reused unless data network is switched to Ethernet

Polar Star

Audit not completed			

Notes:

No budget for travel, installation assumed to be in Seattle, WA, USA.

DELIVERY: LCI-90i Displays with enclosures: 1-2 weeks
(*FOB: Seattle, USA*)

WARRANTY**:** One (1) year parts and labor, all work to be done at MTNW's Seattle facilities.

TERMS: Net 30

5.0 TERMS AND CONDITIONS OF SALE

Technical Support

- MTNW offers full technical support (via phone, fax, and e-mail) on operation, data analysis, and maintenance for all our equipment at no charge.
- On-site training and support is available at our standard day rate plus expenses.
- There may be a nominal fee for extensive or priority technical support.

Warrantee Terms

- For MTNW manufactured devices, we offer a 1 year comprehensive parts and labor warrantee on all faulty components returned to MTNW freight prepaid.
- MTNW will repair or replace faulty components and pay return freight at the same level as shipment to MTNW.
- On-site warrantee service outside of the Seattle, WA region will be performed if customer pays expenses associated with travel including but not limited to airfare, lodging, rental vehicle, and food.
- Extended warrantee and service plans are available.
- For equipment not manufactured by MTNW manufacturer's warrantee terms will be in effect unless explicitly stated otherwise.

Purchase Terms

- Net 30 Terms.