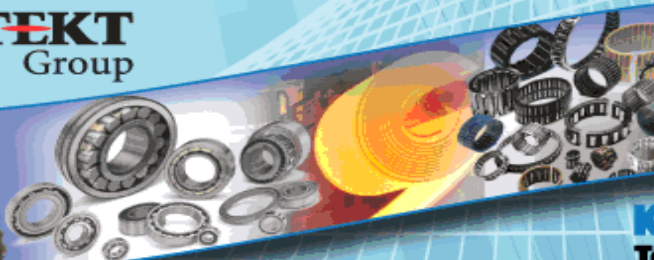


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Senior Design Project

Automated High Volume Bearing Bore Gage

Concept Design Review

Team 22

Seth Norman - *Project Manager (EE Lead)*

Eric Allgeier - *Webmaster*

Kevin Flemming - *Treasurer*

Matthew Boler – *ME Lead*

Christopher Proffett - *Sponsor Liaison*

Team Sponsor

Robert Potts (KOYO Bearings)

Team Advisor

Dr. Cartes

Instructors

Dr. Shih

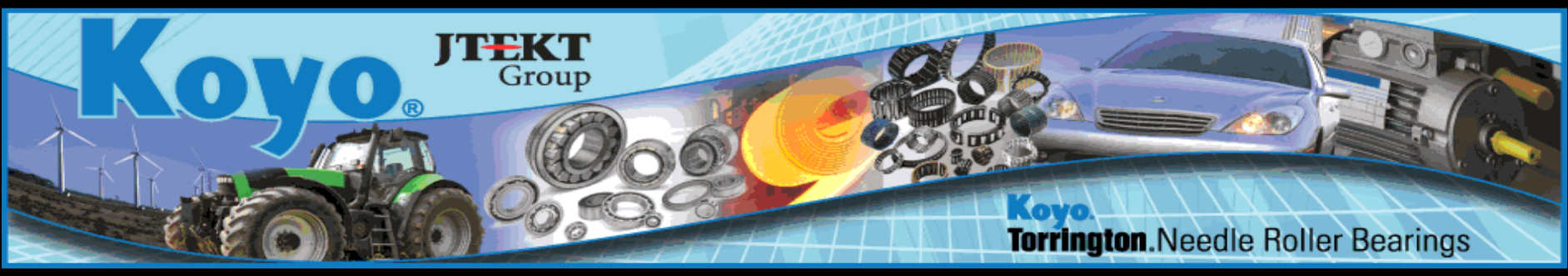
Dr. Amin

Dr. Franks



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Agenda

- Project Objectives
- Fall/Spring Schedule
- Design Concepts
- Component Details
- CAD Drawings
- Bill of Materials
- Conclusion



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Automated Bearing Bore Gage

- Measures bore sizes
- Determines pass or fail

Problem Statement

- Update the automated bearing bore gage
- Maintain measuring quality and sampling rate
- Allow for networking with Koyo

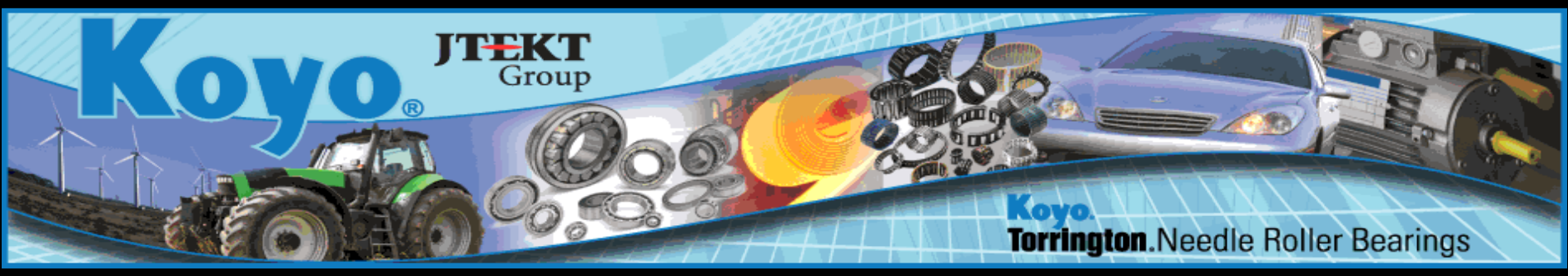
Objectives

- New GUI
- Replace electrical components
- Keep existing pneumatic system and PLC



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Fall/Spring Schedule

November / December

1. Submit our design to Koyo Bearings.
2. Order all parts needed for the design.
3. Create Project Objectives for Spring Semester.

January

6. Remove old electrical components from the machine
7. Install new components

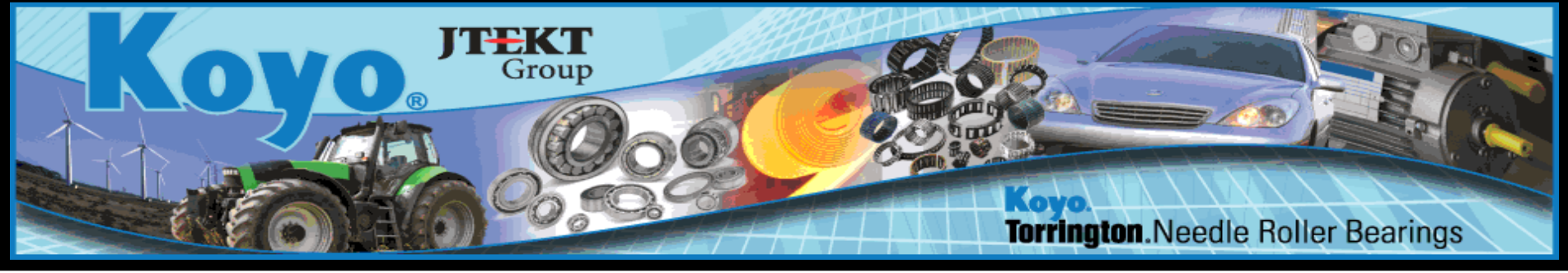
February / March

8. Program and test all components.

April

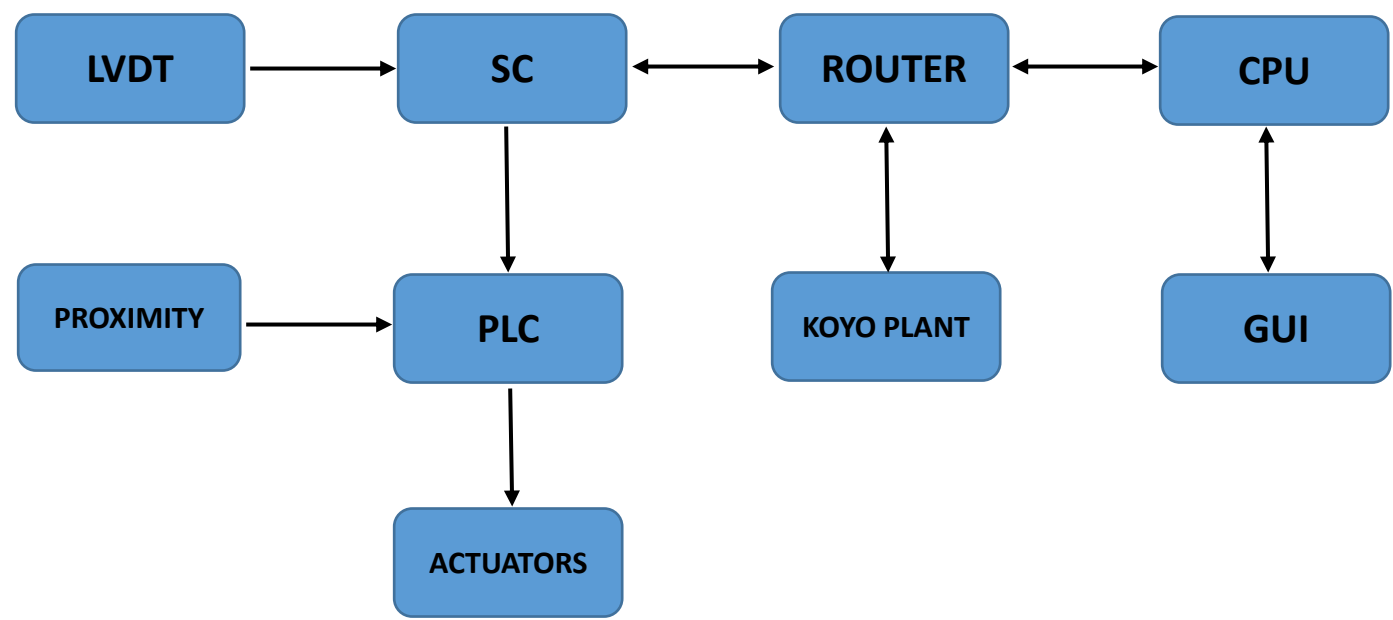
- 9 Debug





Design Concept

Uses only a signal conditioning module in conjunction with the PLC and CPU.

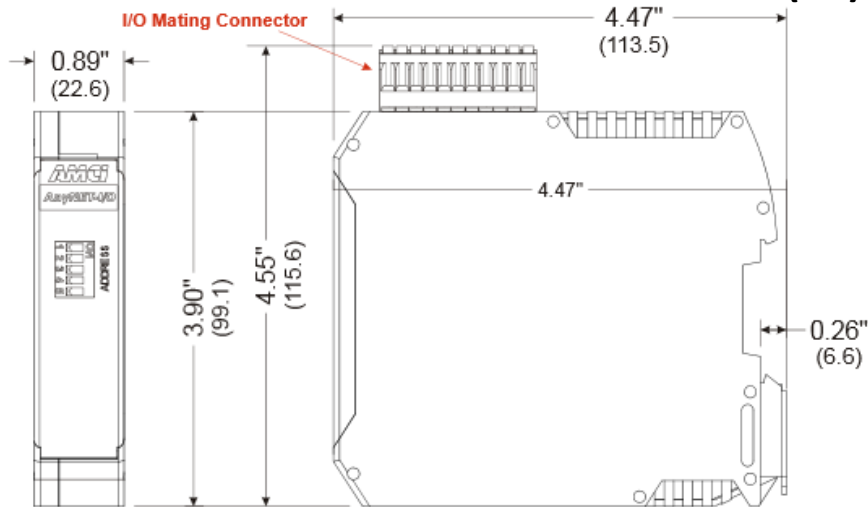


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LVDT AC Signal Conditioner (SC)



- The LVDT will be excited with 4V at 4 kHz.
- Receive size through a differential voltage.
- Export the data through the Ethernet port to the PLC and CPU.

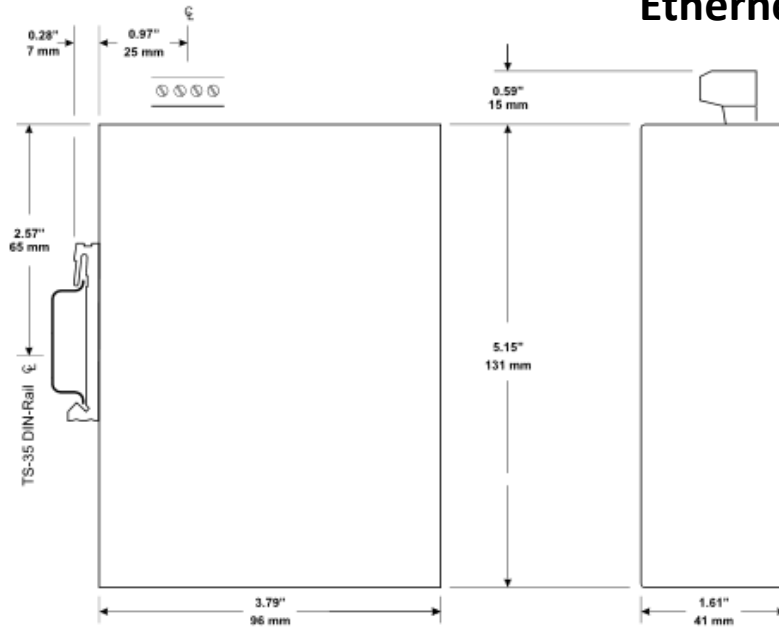


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Ethernet Router



- CTRLink Ethernet Router
- 4 Port 10/100 Mbps LAN Switch.
- 1 Port 10/100 Mbps WAN
- Uses Ethernet to link and network all devices to KOYO Plant

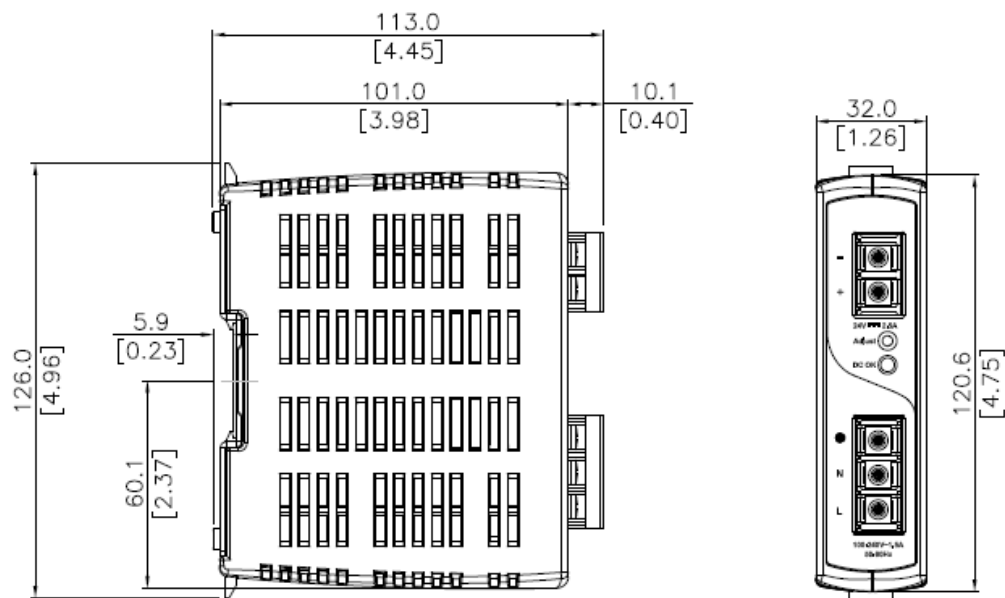


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24 VDC Power Supply



- 24VDC Power Supply used to power the LVDT signal conditioner and the router.

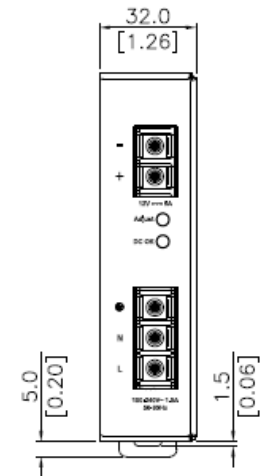
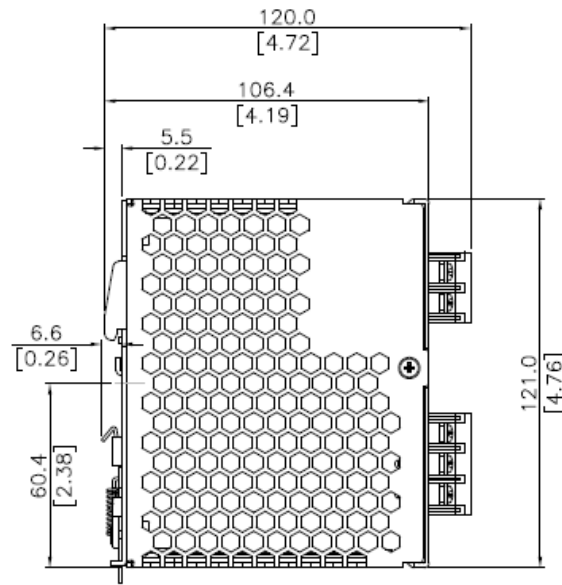


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12 VDC Power Supply



- 12 VDC Power Supply used to power the monitor



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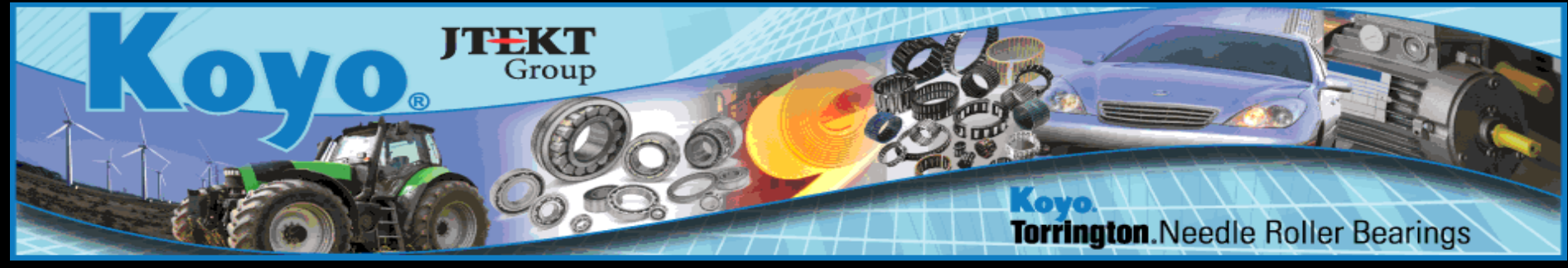
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CPU – Lenovo ThinkCentre M92p



- The CPU will be used to collect data from the SC.
- From this data, a histogram will be developed for the plant operator and machine operator convenience.
- CPU will be used to interface between the touch screen monitor and the SC.
- CPU will be used to calibrate the SC for the maximum and minimum bearing size.
- Windows 8 operating system for ease of touch screen





Touch Screen

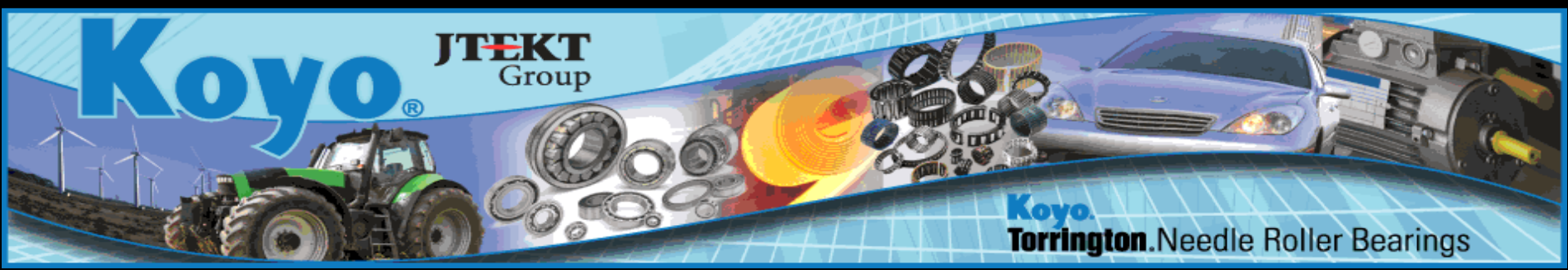
ELO 1537L 15" LCD

- Connects to the CPU via USB and VGI
- Ease of operation through touch screen



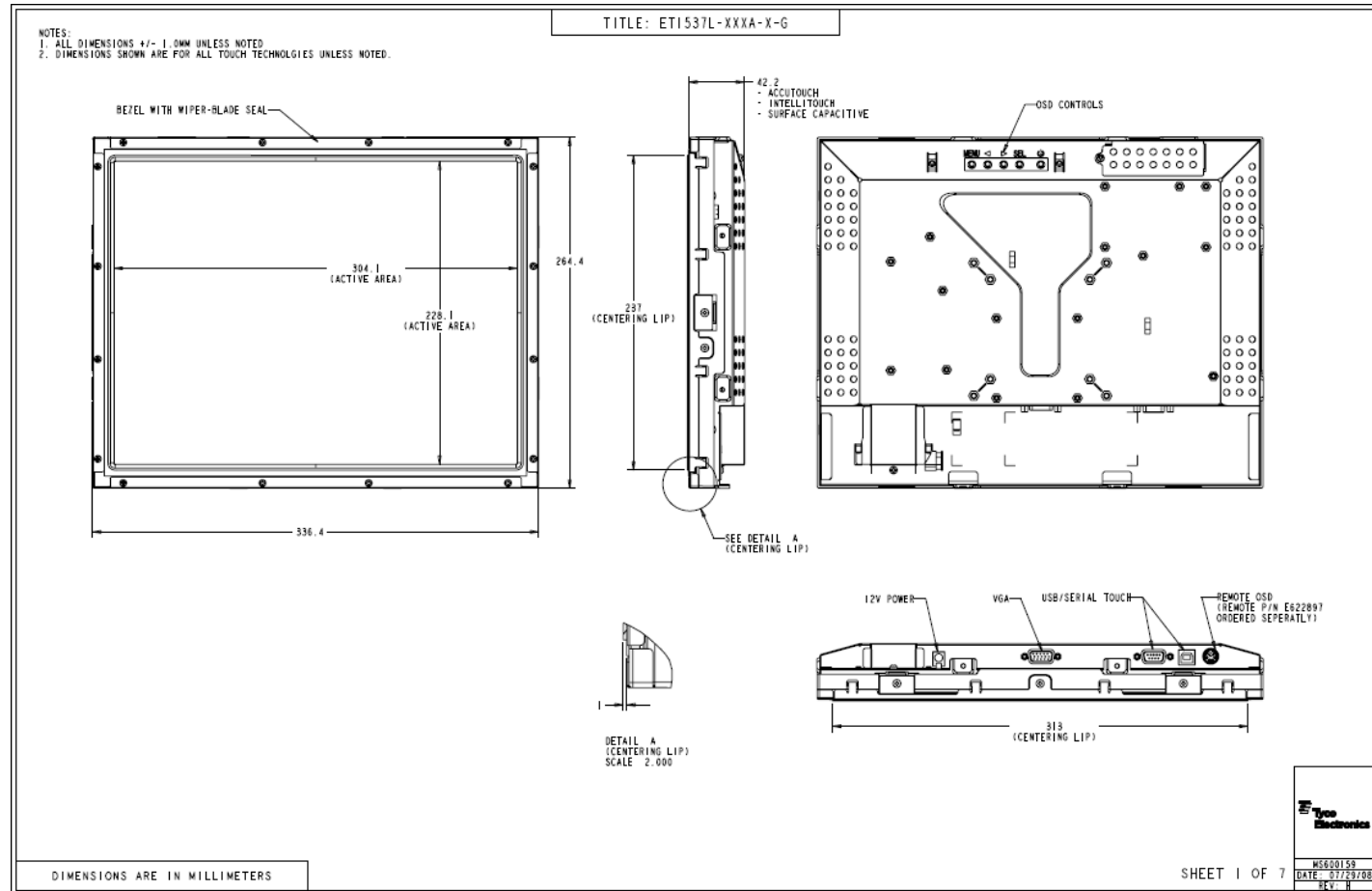
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Touch Screen

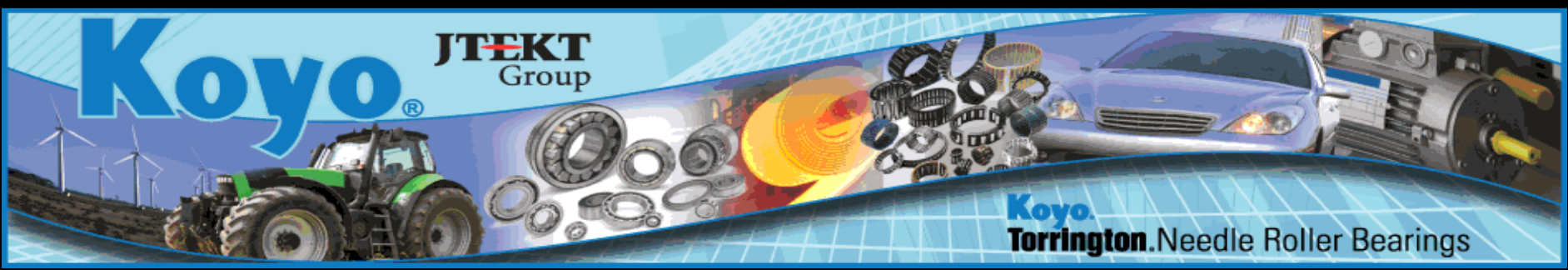


E-Tec
Electronics

ME600159
DATE: 07/23/08
REV: H

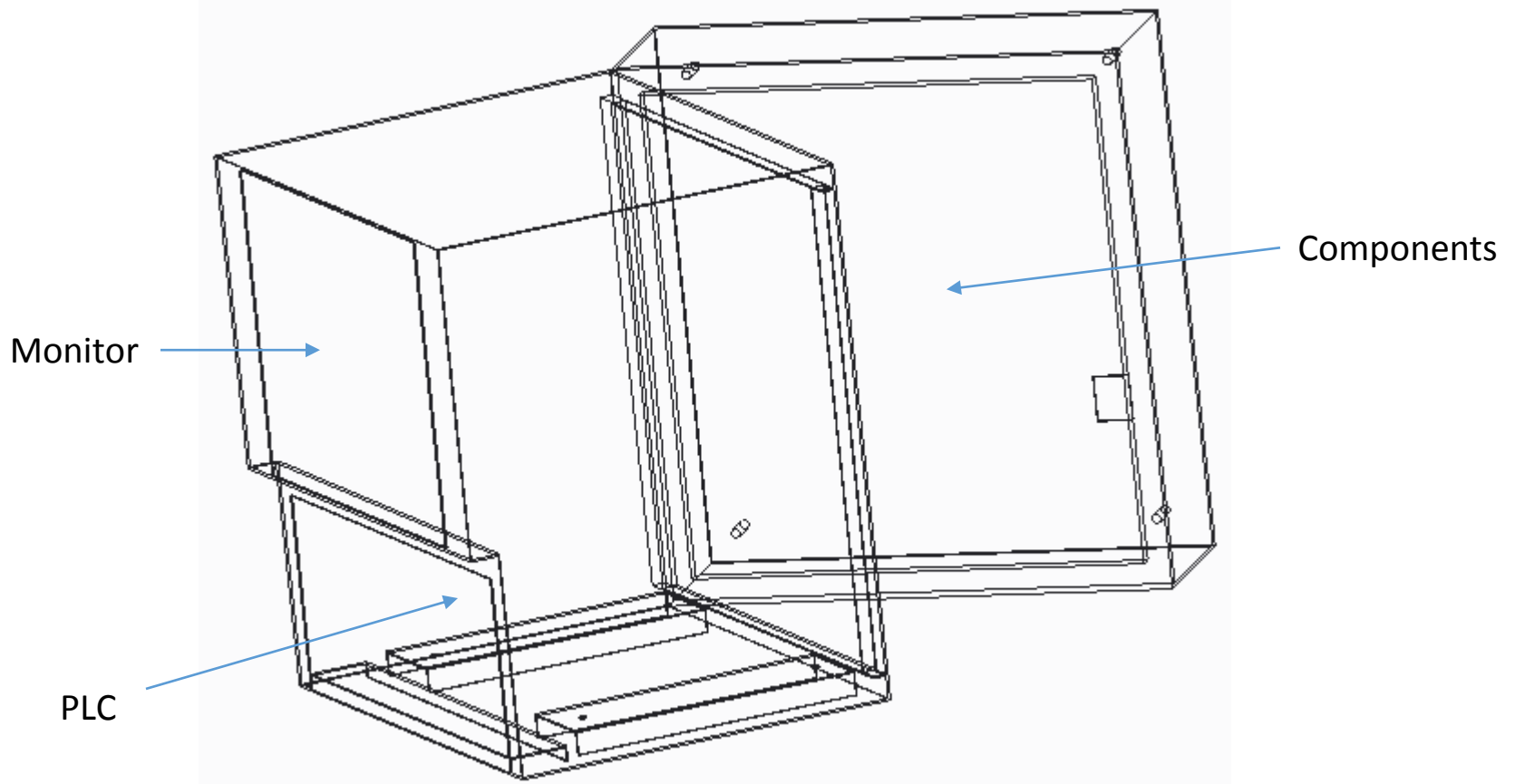
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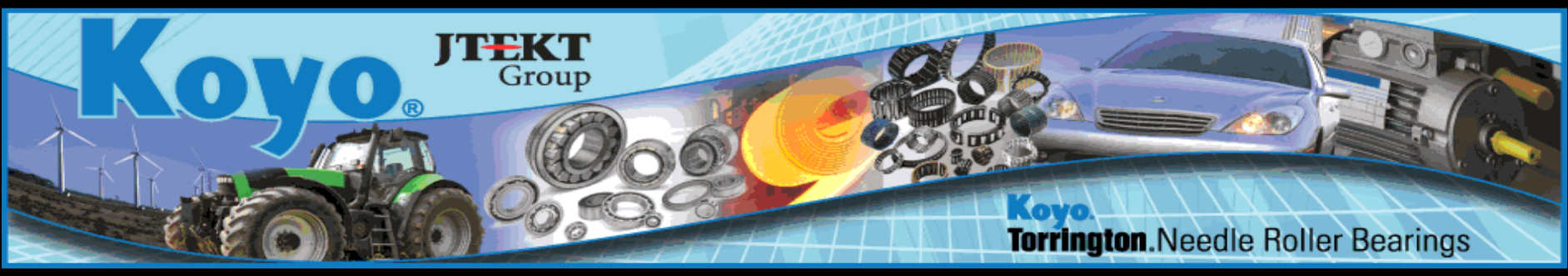
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Housing Cabinet



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PLC and Software

- SLC 500 gives us Ethernet capability .
- Rugged industrial standard
- Program software will be RSLogix500
- 16 node, 120 VAC discrete input.
- 8 node, 120 VAC discrete output.



Allen-Bradley SLC 500

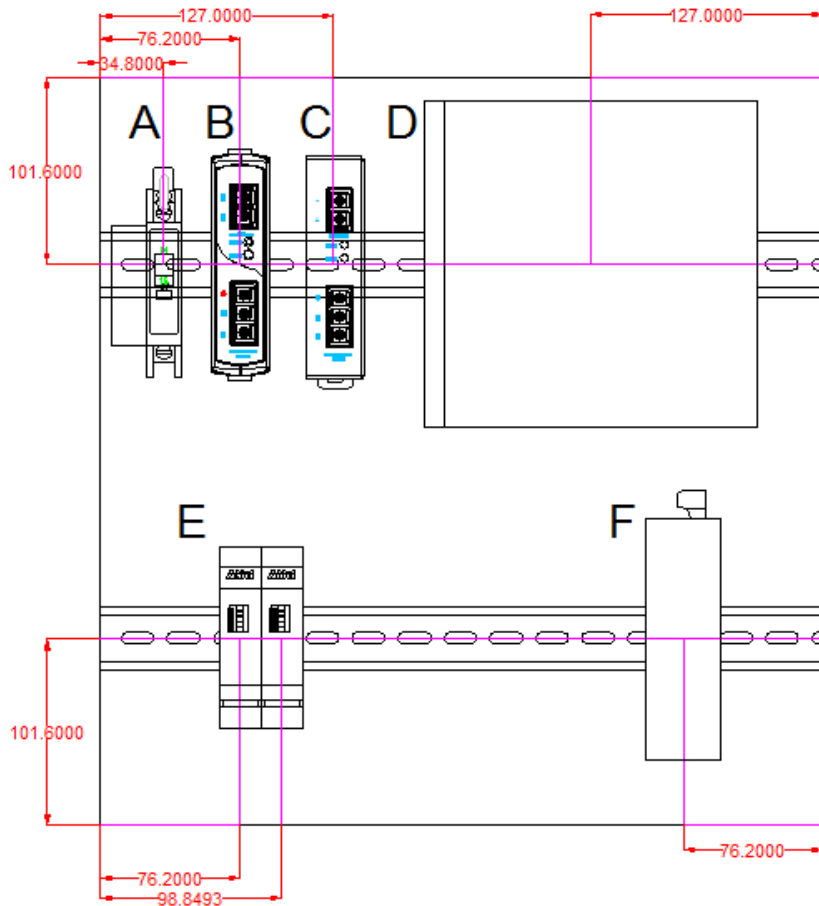


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Component Layout



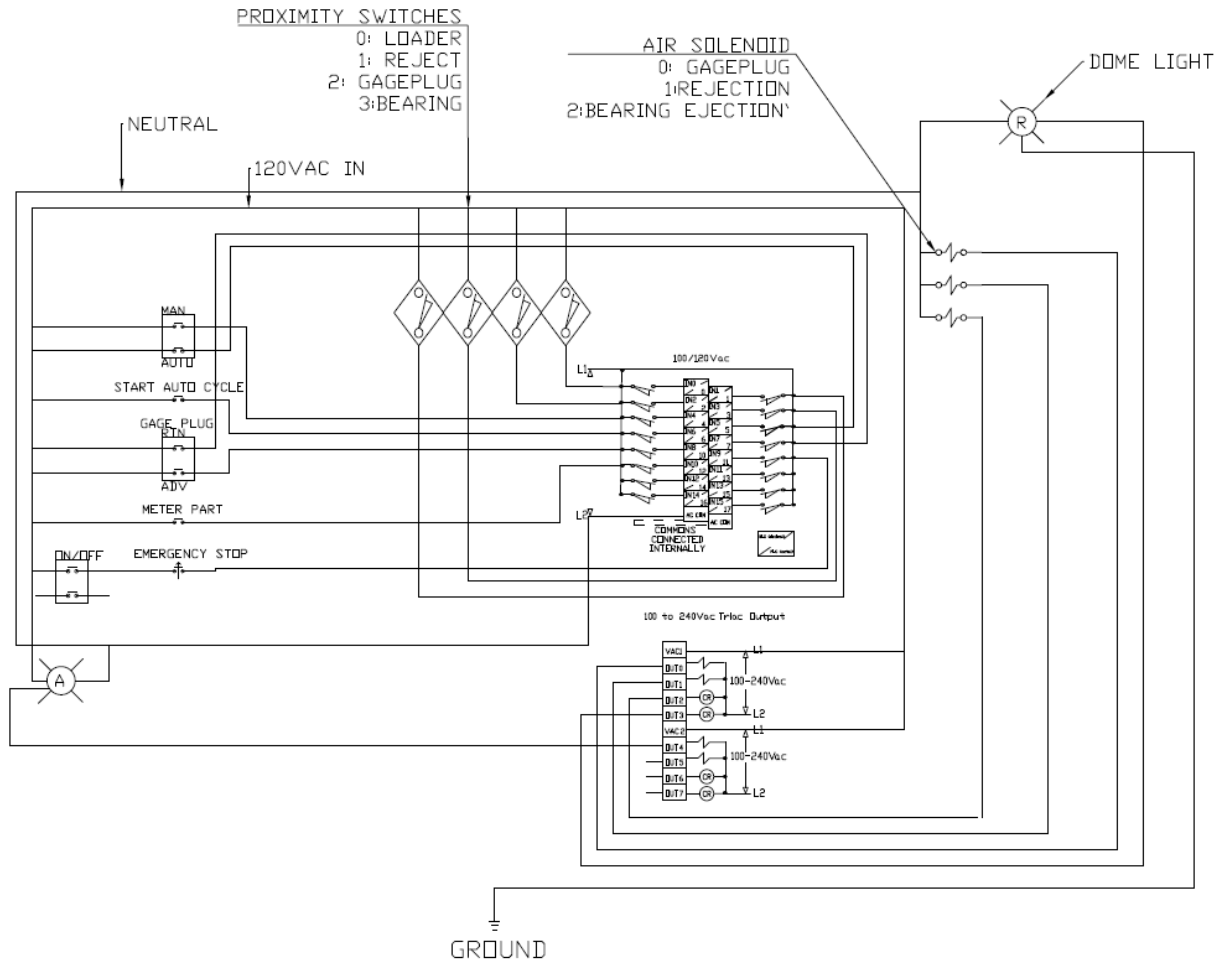
	Part
A	Square D, 10 A single pole breaker
B	12VDC 60W Power Supply
C	24VDC 60W Power Supply
D	ThinkCentre M92p, CPU
E	ANR2 LVDT Signal Conditioner
F	10/100 Ethernet Router

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Electrical Schematic



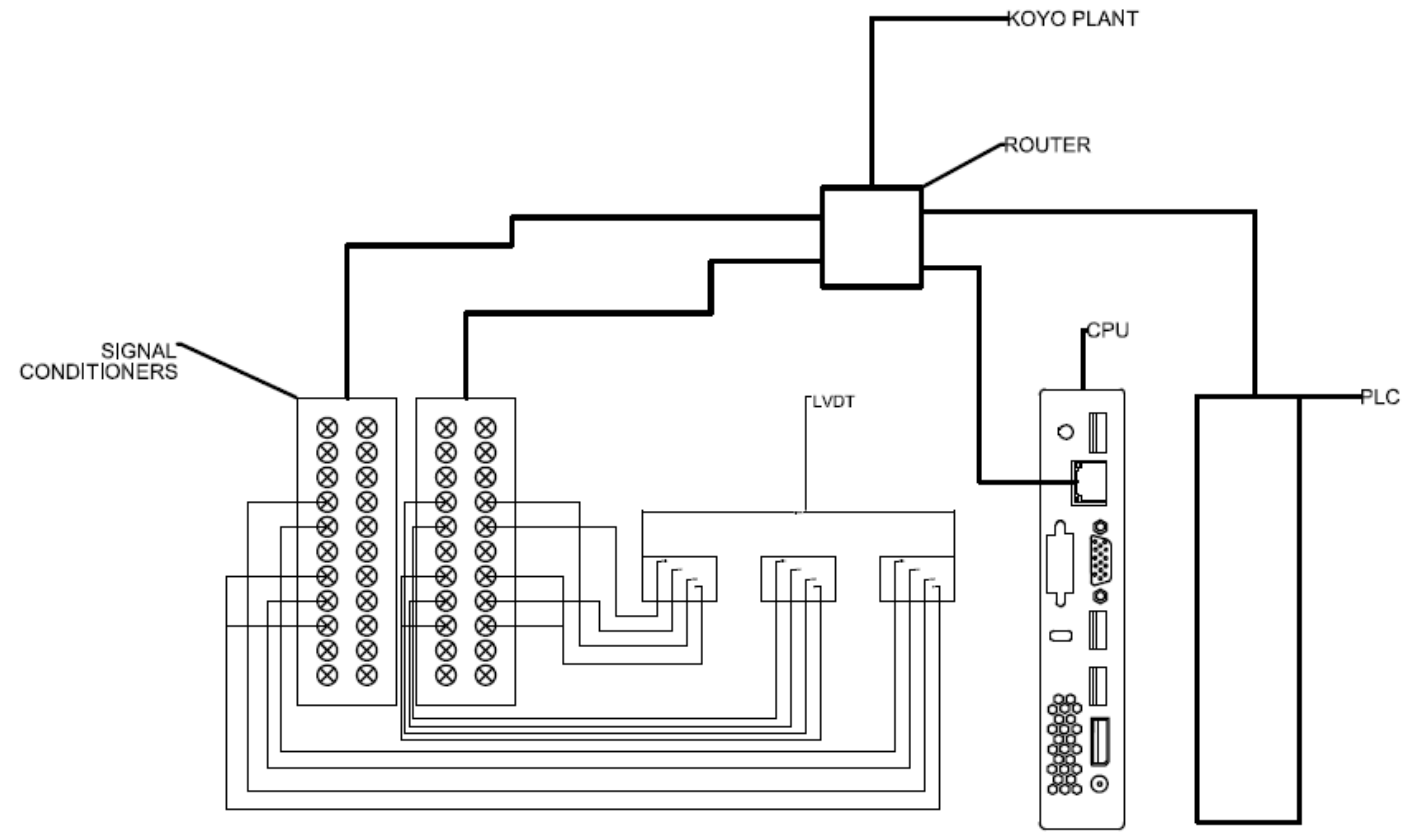
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Electrical Schematic



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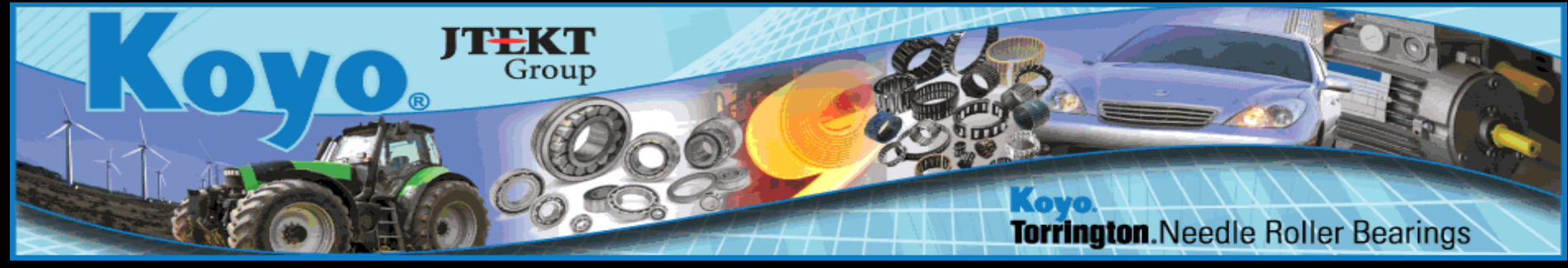
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Bill of Materials

Device	Part Number	Unit Price (\$)	Quantity	Price (\$)
PLC - Chassis	1746-A4	*	1	*
PLC – CPU/Ethernet Module	1746	*	1	*
PLC – Input Module AC	1746-IA16	*	1	*
PLC – Output Module DC	1746-OA8	*	1	*
PLC - Software	RSLogix 500	2050.00	1	2050.00
Signal Conditioner	ANR2	895.00	2	1790.00
Power Supply 24V	PSB24-060-P	28.00	1	28.00
Power Supply 12V	PSB12-060	37.25	1	37.25
Router	CTR-Link EIPR-E	299.00	1	299.00
Monitor	ELO 1537L	527.00	1	527.00
Circuit Breakers	QUO110	30.65	1	30.65
Misc. (DIN Rail...)	TBD	TBD	TBD	~100.00
Total			11	\$4861.90

* Provided by KOYO

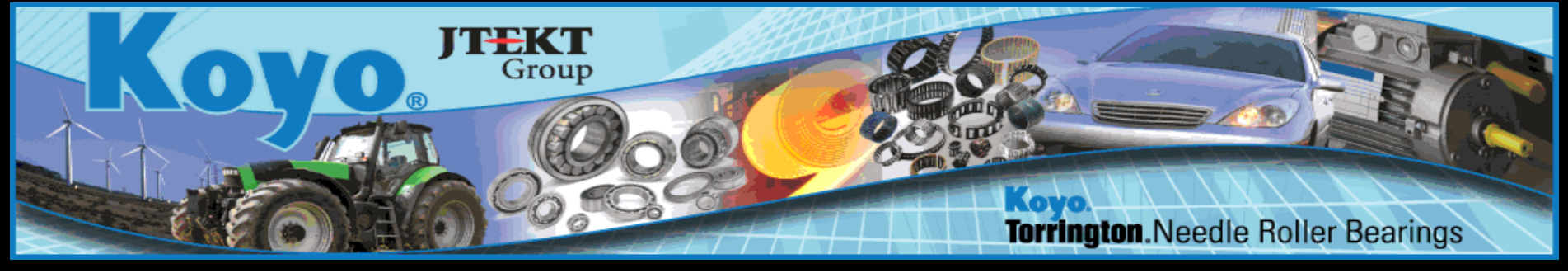




Conclusion

- Mechanical aspects meet Koyo Bearing's standards
- Update the electronic components of an Automated Bearing Bore Gage
- Getting final approval of bill of materials from Koyo to order parts
- Assembling the parts and setting up the internal network





Questions and Comments

References

http://eng.fsu.edu/me/senior_design/2014/team22/

