

**NORTHLINE INDUSTRIAL REPAIR INC. 2013**

**Automation Repair  
and Sales**

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls



**INDUSTRIAL REPAIR SERVICE  
& EQUIPMENT SALES**

Northline Industrial, Inc.  
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Redford, MI 48239

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**Automation Repair  
and Sales**

- Electronics
- Robotics
- Servo motors
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- HMI / Displays
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- PLCs
- Light Curtains
- Inverter Drives
- AC/DC Drives
- Welders
- Process Controls

# Northline Industrial Inc.

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## ABB S4 IRB1400 Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

3HNE00312-1 Teach Pendant  
DSCQ-236D Servo Amp  
DSQC-314A Servo Supply  
DSQC-258 Logic Supply

### Control Cards

DSQC-239  
DSQC-223  
DSQC-315  
DSQC-256  
DSQC-325  
DSQC-323  
DSQC-335

Below is Northline's ABB S4 with IRB1400 manipulator robot system. This controller first produced in 1992 is capable of controlling up to 6 servo axis. This control has a large install base in the welding and pick-and-place markets. Our test system allows us to support dynamic repair and testing on S4 integral components such as the teach pendants, servo controllers, power supplies, auxiliary modules and servo motors. Repaired equipment is energized and system-tested to ensure a quality repair.



*Contact your Northline sales representative for all  
of your repair needs.*

## ABB S4C IRB2400 Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

3HNE-00313-1 Teach Pendant  
DSQC-345B Power Supply  
DSQC-346C Servo Amp  
DSQC-346E Servo Amp  
DSQC-374 Logic Supply

### Control Cards

DSQC-373  
DSQC-323  
DSQC-361

The ABB S4C is a multi-processor compact controller offering high performance with quick acceleration and deceleration of the servo axis. This flexible system is found in many weld, paint, and industrial pick-and-place material handling applications. Northline has the ability to repair and dynamically load-test the major components of this system. We support repairs on system components such as the control processors, teach pendants, power supplies, servo motor and servo control modules. Dynamic system testing is accomplished by installing your repaired part into our system to ensure a quality repair.



*Contact your Northline sales representative for all  
of your repair needs.*



## ABB S4C+ Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

This is Northline Industrial's ABB S4C+PC robot system. This ABB controller is totally PC-based. An integral computer has all the necessary S4C+PC software preloaded. This allows the robot to operate with all the accuracy of the previous ABB hardware controllers along with the ease and reliability of a PC. The S4C+PC can be connected via Ethernet so coordinating factory tasks is simple and efficient. Dynamic testing is the only truly valid diagnostic-test, ensuring a quality repair. So contact your Northline sales representative today for all of your ABB S4C+PC service needs.

### Capabilities Include:

Teach Pendants:  
3HNE Series

Power supplies:  
3HAC Series  
DSQC Series

Drive Boards:  
3HAB Series  
DSQC Series



Contact your Northline sales representative for all of your ABB S4C+ repair needs.

## Welder Repair

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

Let Northline Industrial be your source for repair of your inverter-duty and resistance weld equipment. Northline is a Factory-Authorized Service Center for Lincoln Electric weld equipment. In addition to Lincoln Welders, Northline has the experience and training to repair most major brands of weld equipment. From wire-feeders to entire robotic weld cells, Northline can refurbish and give new life to your repairable assets. System-testing is an important part of our service-philosophy and a service report is included with every repair. We perform load-bank and live weld testing to ensure a quality repair.



### Capabilities Include:

#### Lincoln Electric

- SMAW
- GTAW
- GMAW
- Multi-Process
- Multi-operator
- Advanced Process
- Robotic
- Automation
- Submerges Arc
- Wirefeeders
- SemiAutomatic
- Wirefeeders
- Hobart

#### Medar

- Robotron
- Square D
- Miller Electric
- Syncrowave Series
- Spectrum Series
- Delta Weld Series
- Invision Series
- Auto Delta Series
- Axxess Series
- Millermatic Series

#### Capabilities Include:

- MIG Welders
- TIG Welders
- Stick Welders
- Electrically driven Welders



Lincoln Authorized Service:

<http://www.lincolnelectric.com/>

*Contact your Northline sales representative for all of your Welder repair needs.*

## Berger Lahr Power Drive

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

### Capabilities Include:

Drive  
**WD5-008 Series**  
Motor  
**VRDM Series**  
Encoder  
**50-500**

Northline Industrial now has the ability to dynamically test Berger-Lahr WD5-008 series stepper-motor drives and the associated components. In addition, our system has an integrated “rotation monitoring” encoder option that is mounted to the Berger Lahr’s five-phase stepper-motor. Our Berger-Lahr system supports logic-input levels of both 5VDC and 24VDC and input voltage power levels of both 115VAC and 220VAC. Contact your Northline Industrial Sales Representative for all of your Berger-Lahr repair and service needs.



Contact your Northline sales representative for all of your Fanuc Powermate D repair needs.



## Large Eddy Current Dynamic Load System

### Automation Repair and Sales

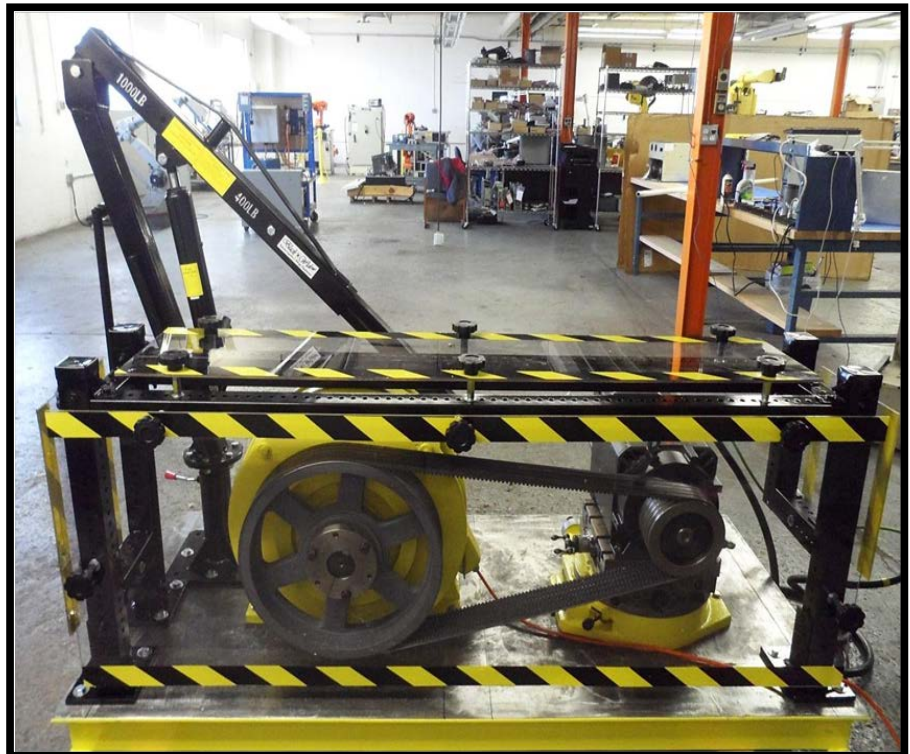
Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

High Current Dynamic  
Testing For:

Servo Motors  
Spindles Motors  
Servo Drives  
Spindle Drives

This is Northline Industrial's **Dynamic Load Testing System**. It utilizes an large industrial "Eddy Current" Brake in order to provide a fully adjustable linear load on to various "servo" and "spindle" motors. Virtually any motor, servo or spindle, can be mounted to the load systems X-Y rotary table. From there it can be precisely positioned into proper alignment with the Eddy Current Brakes pulley sheave. The system has an integrated hydraulic crane to ease in the motor exchange process. This system was specifically designed to draw higher levels of "load current" through servo and spindle drive modules and power supplies. This will ensure a quality repair that can withstand the rigors of day to day factory operations.



*Contact your Northline sales representative for all  
of your repair needs.*



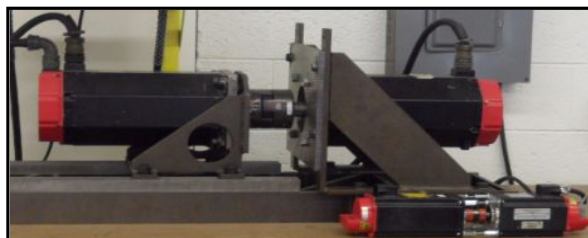
## Small HP Dynamic Load System

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

**Adjustable**  
**Amplifier**  
**Loading**

Northline can also provide load-testing for your Fanuc servo amplifiers with our “Dynamic Load Control” station. Various-sized motors can be easily connected to a “Load” motor. The load motor generates voltage that can be applied to a resistor bank capable of handling up to 24K watts of power. The amount of voltage applied to the resistor bank can be adjusted from 0 to 100% thru PWM circuitry designed by Northline engineers. This allows us to load almost all Fanuc servo amplifiers up to their full ratings, providing true “System Testing”.



*Contact your Northline sales representative for all of your repair needs.*

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 Web : [www.northlineindustrial.com](http://www.northlineindustrial.com)

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 Fax : 313-537-9895

## Fanuc Powermate CNC

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

### Capabilities Include:

A06B-6057	A06B-6096
A06B-6058	A06B-6097
A06B-6066	A06B-6098
A06B-6077	A06B-6102
A06B-6078	A06B-6110
A06B-6079	A06B-6111
A06B-6080	A06B-6114
A06B-6081	A06B-6117
A06B-6082	A06B-6120
A06B-6083	A06B-6121
A06B-6085	A06B-6124
A06B-6087	A06B-6127
A06B-6088	A06B-6140
A06B-6089	A06B-6141
A06B-6090	A06B-6150
A06B-6091	A06B-6151
A06B-6092	
A06B-6093	

Northline Industrial introduces repair and testing capabilities on our uniquely designed Fanuc Powermate Series test station. This extremely flexible test system has the ability to dynamically test almost all of the Fanuc A06B family of power supplies, spindle and servo amplifiers including Fanuc's fiber-optic controlled equipment. This encompasses hundreds of model numbers and allows for full load, closed-loop simulation of factory conditions. Please contact us if you have questions about our testing procedures or the types of equipment we can repair for you.



*Contact your Northline sales representative for all of your Fanuc Powermate CNC repair needs.*

## Fanuc Powermate D

### Automation Repair and Sales

Electronics  
 Robotics  
 Servo motors  
 Spindle Motors  
 CNC  
 HMI / Displays  
 Operator Stations  
 Monitors  
 PLCs  
 Light Curtains  
 Inverter Drives  
 AC/DC Drives  
 Welders  
 Process Controls

### Capabilities Include:

A06B-6057	A06B-6085
A06B-6058	A06B-6087
A06B-6066	A06B-6088
A06B-6077	A06B-6089
A06B-6078	A06B-6090
A06B-6079	A06B-6091
A06B-6080	A06B-6092
A06B-6081	A06B-6093
A06B-6082	A06B-6098
A06B-6083	A06B-6102

This is Northline Industrials “Fanuc Powermate D Control System”. It was designed to be used as a CNC control for multiple series of Fanuc servo drive systems with either the “Type A” or “Type B” PWM signal control interfaces.

Legacy drives as old as the A06B-6057 “L Series” types and newer types such as the A06B-6093 “Beta” servo drives can all be tested with this newly developed Fanuc NC control system. In addition, this system can control either the 200V standard or 400V HV types of devices.



*Contact your Northline sales representative for all of your Fanuc Powermate D repair needs.*



## Fanuc Powermate Di

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

A06B-6077  
A06B-6078  
A06B-6081  
A06B-6082  
A06B-6083  
A06B-6087  
A06B-6088  
A06B-6091  
A06B-6092  
A06B-6093  
A06B-6096  
A06B-6097  
A06B-6098  
A06B-6102

This is Northline Industrials “Fanuc Powermate Di Control System”. It was designed to be used as a CNC control for multiple series of Fanuc servo drive systems with the Fanuc fiber optic “FSSB” servo control interface. This system can control the older Alpha “6096” series of FSSB servo drives as well as the new Alpha i Series. In addition, this new Fanuc Alpha i control system is equipped with an integrated AC serial spindle control. Either serial or fiber optic spindles can be fully tested with this system. As always, this system can control either the 200V standard or 400V HV types of devices.



*Contact your Northline sales representative for all  
of your Fanuc Powermate Di repair needs.*



## Fanuc RJ2 with S-420i Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

A16B-3200-0040 CPU  
A16B-1212-0871 PSU  
A06B-6076-H101 Servo Amp  
A05B-2301-C300 Teach Pendant  
A20B-1006-0290 Op Interface

Below is Northline Industrial's Fanuc RJ2 Controller with a S-420i Manipulator. This Test Fixture is used to provide a source of quality repair and support of the integral components of the RJ2 controller. CPU's, powers supplies, servo controllers, teach pendants, I/O modules and servo motors can all be energized and system tested with this fixture. This test system provides our customers a means of timely repair and test on their parts....maximizing customer machine uptime and production!



*Contact your Northline sales representative for all of your repair needs.*

## Fanuc Rj3iB Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

#### Teach Pendant

A05B-2301-C370

#### CPU

A16B-3200-0412

#### E Stop PCB

A05B-2452-C473

#### Servo Amp

A16B-2000-0062

#### Motors

A860-2014-T301

A06B-0267-B604

A860-2010-T341

Northline Industrial's Fanuc RJ3iB robot control system features a Fanuc R-2000iA robot manipulator and is software-ready for testing the new Fanuc "i-Pendants"! The RJ3iB controllers are on the leading-edge of today's robot technology. These new Fanuc controllers utilize "Six Pack" servo-drive modules so changing them out is easy and efficient. Over 300lbs. of dead weight attached to the front of the R2000iA robot provides a full dynamic load-test for the servo drive modules. Contact your local Northline sales representative today for all of your Fanuc RJ3iB service needs.



Contact your Northline sales representative for all of your Fanuc RJ3iB repair needs.

## Fanuc R30iA

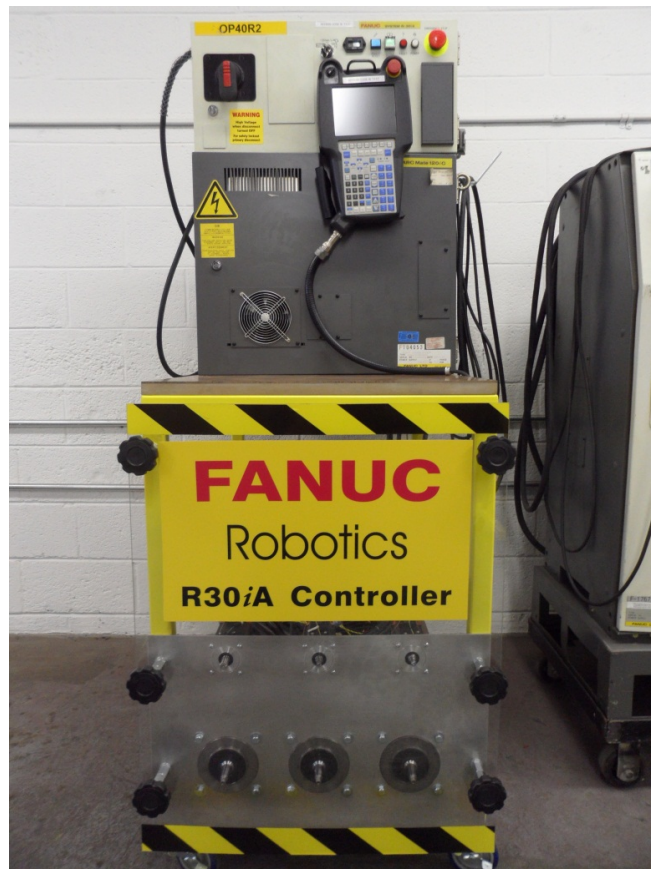
### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

CPU Drive Board  
A16B-3200-0600  
Devicenet PC Board  
A16B-2203-0910  
Servo Drive  
A06B-6107-H002  
Cooling Module  
A05B-2501-C312  
Fanuc iPendant  
A05B-2518-C200

Northline now repairs and tests components out of Fanuc Robotic's latest control system, the R30iA. This robotic control is found throughout the manufacturing industry in assembly, dispensing, paint, welding, and machine-tending applications. With our new test-stand we have the capacity to system test the R30iA controller, power supply, I/O, manipulator servo motors, associated PCBs and Fanuc's new iTouch 4D Teach Pendant. Please contact your Northline Industrial Representative for your Fanuc CNC repair needs.



*Contact your Northline sales representative for all of your Fanuc R30iA repair needs.*

## Indramat Multiseries Test System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

TVM  
TDM  
TDA  
TVR  
TVD  
DDS  
DKS  
KDA  
KDS  
KDV  
KDR

This is Northline Industrials “Indramat Multi Series Diagnostic Test System”. It was designed to dynamically run and test many of Indramat’s newer and legacy servo products with either the analog or SERCOS control interfaces. Many devices from Indramat’s ANAX, DIAX01, DIAX02 and DIAX03 series can be fully functionally and dynamically tested.



*Contact your Northline sales representative for all  
of your Indramat repair needs.*



## Indramat TRANS01/DSC Diagnostic Test System`

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

#### Controllers

TRANS01

#### Servo Drive Modules

DSC1

DSC3

This is Northline Industrials Indramat TRANS01 / DSC Diagnostic Test System. It was designed to dynamically test the Indramat TRANS01 controllers and the DSC1.X or the DSC3.X servo drive modules. This TRANS01 / DSC diagnostic station operates as a closed loop control system in order to ensure a complete and accurate test every time. Special diagnostic programs have been written in order to verify that all I/O signals are operational.



*Contact your Northline sales representative for all  
of your Indramat repair needs.*

## Indramat DIAX04/IndraDrive

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

#### System Components

Teach Pendant, MRC JZCN  
Amplifier, CACR  
Motors, SGMP  
Power Supply, CPS

#### System Modules/PCB

JANCD-MCP01  
JANCD-MIF01  
JANCD-MI004  
JANCD-MSV01B  
JANCD-MRY01B-1  
JANCD-MEW02-1

The Indramat DIAX04 and IndraDrive M series are a modular compact ac servo drive that integrates motion control, spindle control, amplifier, power supply and I/O in a single, compact unit. Northline Industrial now has the ability to load-test completed repairs and test SERCOS communication on the Indramat DIAX04 and IndraDrive series with our newly developed diagnostic test center. Many devices from Indramat's DIAX04 and IndraDrive series can be fully functionally and dynamically tested. Please contact your Northline Representative for more details.



*Contact your Northline sales representative for all of your Indramat DIAX04 IndraDrive repair needs.*

## Indramat SERCOS Interface System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

Shown below is Northline Industrial's New Fiber optic Indramat SERCOS Interface System. SERCOS (Serial Real-Time Communication System) is a globally standardized open digital interface for communicating between industrial controls, motion devices and I/O. Our test fixture allows us to dynamically test Indramat power supplies, servo drives and motors on completed repairs. This unit complements our dynamic testing capabilities and ensures a quality repair every time.



### Capabilities Include:

#### Sercos Indramat Testing for:

DIAX-03 Family  
DIAX-04 Family  
IndraDrive Family

*Contact your Northline sales representative for all of your repair needs.*

## Light Curtains

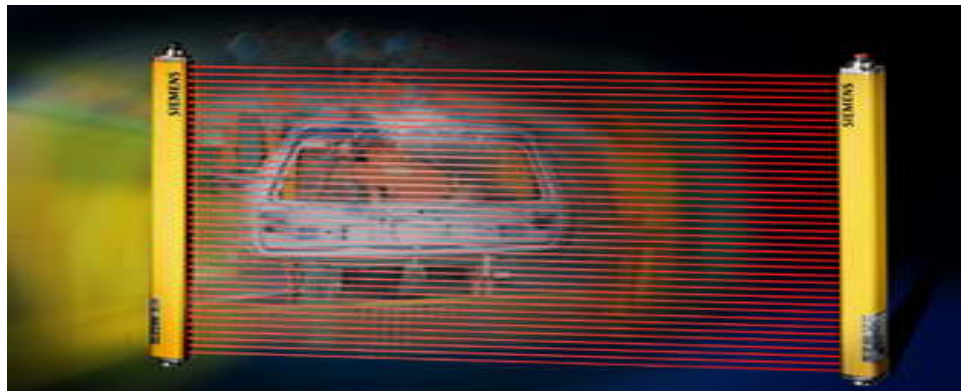
### Automation Repair and Sales

Electronics  
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 Servo motors  
 Spindle Motors  
 CNC  
 HMI / Displays  
 Operator Stations  
 Monitors  
 PLCs  
 Light Curtains  
 Inverter Drives  
 AC/DC Drives  
 Welders  
 Process Controls

### Capabilities Include:

SICK Optic  
FGS  
MGS  
STI /OMRON  
MS4600  
MS4300  
MS4600  
Allen Bradley  
440L GuardShield  
Dolan Jenner  
Honeywell

Light Curtains protect workers from injury and machines from damage with a non-contact screen of light and photo electric diodes. Northline has the capabilities to repair and test your safety devices such as industrial light curtains and opto-electric safety equipment. All the devices are repaired with OEM components and dynamically tested at our facility. Northline also inventories units available for direct purchase. Do not leave your machine safety in question. Contact your Northline sales representative for your Light Curtain Repairs.



*Contact your Northline sales representative for all of your Light Curtain repair needs.*



## Motoman MRC w/SK16

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

#### System Components

Teach Pendant, MRC JZCN  
Amplifier, CACR  
Motors, SGMP  
Power Supply, CPS

#### System Modules/PCB

JANCD-MCP01  
JANCD-MIF01  
JANCD-MI004  
JANCD-MSV01B  
JANCD-MRY01B-1  
JANCD-MEW02-1

**This is Northline Industrial's Motoman MRC  
with SK16 Manipulator Robot System.**



This complete robot system allows for diagnostic and dynamic load-testing of the component parts that make up the system (see components on the left). This is the only valid system-test that ensures a quality repair on your Motoman MRC amplifier, power supply, teach pendant, and other system components.

*Contact your Northline sales representative for all  
of your Motoman MRC SK16 repair needs.*

## Motoman NX Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

Teach Pendant  
Yasnac NX JZRCR  
PC Servo Control  
JZNC  
Motors  
SGMRS  
SGMPH  
Power Supply  
JZNC  
JZRCR  
Yaskawa I/O  
JZNC  
Servo Packs  
SGDR Type CNP6 CNP4  
Converter  
SDGR

This is Northline Industrial's Motoman NX with EA1400N Manipulator Robot System. This system allows for dynamic system-testing of our component repairs. This includes repair/testing capabilities on the Yasnac touchscreen teach pendants, Yaskawa power supplies, PC servo controller, servo packs and I/O. Dynamic-system testing is the only test that ensures a quality repair every time. Contact your Northline sales representative for all your Motoman NX EA1400N service!



*Contact your Northline sales representative for all of your Motoman NX repair needs.*

## Nachi AR52/SA160F Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

AR-52-Kunit Power Unit  
RAX11 19-98030041 Drive  
ROP501 Teach Pendant  
MFM552HIV Motor  
MDM212HIV Motor  
FJK2005A Logic Supply

This is Northline Industrials new Nachi AR52 Controller with SA160F Robot Manipulator System. This Test Fixture allows us to dynamically system test the AR52 controllers integral components including teach pendants, power supplies, servo amplifiers and logical control components. Once repairs are completed, they are system tested to ensure the repairs meet or exceed OEM specifications.



*Contact your Northline sales representative for all  
of your repair needs.*



## Nachi AX-C /AX-MV6 Robot System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

L8800J Servo Drive  
L8811 Power Supply  
L8810 Logic Supply  
L8800F Weld Process  
L9110C I/O Board  
Teach Pendant  
AXTP-DDON-UC08R

This is Northline Industrial's Nachi AX-C Robot Test System with an AX-MV6 robot manipulator. This fixture allows for dynamic system testing of system sub-components that include the teach pendant, power supplies, servo controls and CPU modules. Energizing the parts after a repair is the only way to ensure a quality repair every time. Customer uptime is our primary concern. With our Nachi AX-C Test System, we can assure a timely repair and a quality test of your Nachi parts.



*Contact your Northline sales representative for all  
of your Nachi repair needs.*



## Allen Bradley PLC

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

CPU Processor  
I/O  
PLC Modules  
Power supply  
CNC  
Multilayer PCB  
Relay Logic

Northline Industrial has the capacity to troubleshoot, repair, and perform closed-loop testing on your Allen Bradley PLC components. All units are disassembled, inspected for damage and serviced by an experience Repair Technician. High failure components are replaced as a preventative measure. Communication, Power Supplies, I/O, and Logic are tested under power in a mutli-rack environment to simulate factory conditions. This allows us to test your parts the way you use them and provide a quality repair the first time, every time. Review the next page for a full list of component-part capabilities on repair-and-test. Contact your Northline Industrial Representative for all of your Allen Bradley PLC repair needs.



*Contact your Northline sales representative for all  
your PLC repair needs.*

## Allen Bradley PLC

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

### Capabilities Include:

**CPU Processor**  
**I/O**  
**PLC Modules**  
**Power supply**  
**CNC**  
**Multilayer PCB**  
**Relay Logic**

Rack	Family	Processor	Power Supply	IO Type	IO Models
1	PLC-5 Classic	1785-LT*	1771-P3	Digital I/O	1771-IBD
		1785-LT2	1771-P4		1771-OBDB
		1785-LT3	1771-P4S*		1771-OQ16
		1785-LT4	1771-P7		
			1771-P7S		
2	PLC-5 Enhanced	1785-L11B	1771-P3	Digital I/O	1771-IA
		1785-L20B	1771-P4		1771-IAD
		1785-L30B	1771-P4S		1771-IAN
		1785-L40B*	1771-P7*		1771-OAD
		1785-L60B	1771-P7S		1771-ODC
		1785-L80B			1771-OD16
		1785-L40E			1771-OW
		1785-L60E			1771-OX
3	PLC-5 Enhanced	1785-L11B	1771-P3	Analog I/O	1771-IFC
		1785-L20B	1771-P4		1771-IFE
		1785-L30B	1771-P4S		1771-IXE
		1785-L40B	1771-P7*		1771-OFB
		1785-L60B*	1771-P7S		1771-OFE1
		1785-L80B			1771-OFE2
		1785-L40E			Specialty I/O 1771-VHSC
4	Remote I/O	1771-ASC	1771-P1	Digital I/O	1771-IA
		1771-ASB*	1771-P2*		1771-OA
5	SLC 500 Fixed	1747-L20C		Digital I/O	1746-IA8
					1746-OX8

*Contact your Northline sales representative for all your PLC repair needs.*

## Allen Bradley PLC

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

### Capabilities Include:

**CPU Processor**  
**I/O**  
**PLC Modules**  
**Power supply**  
**CNC**  
**Multilayer PCB**  
**Relay Logic**

Rack	Family	Processor	Power Supply	IO Type	IO Models
6	SLC 500 Modular	1747-L511	1746-P1	Digital I/O	1746-IA16
		1747-L514	1746-P2*		1746-OA16
		1747-L524	1746-P3		1746-OW16
		1747-L531	1746-P4		1746-OW16
		1747-L532			
		1747-L533			
		1747-L541		Analog	1746-NI4
		1747-L542*			1746-NIO4V
		1747-L543			1746-NO4V
		1747-L551			1746-NR4
		1747-L552			
		1747-L553			
7	SLC RIO	1747-ASB		Digital I/O	1746-IB8
					1746-IB16
				1746-P1	1746-IG16
				1746-P2*	1746-IO12
				1746-P3	1746-IV16
				1746-P4	1746-OB8
					1746-OB16
					1746-OV16
					1746-OW8
8	MicroLogix 1000	1761-Lxxxxx			
	MicroLogix 1200	1762-Lxxxxx			
	MicroLogix 1500 CPU	1764-LRP			
		1764-LSP*			
	MicroLogix 1500 Base	1746-24xxxx*			
		1764-28xxxx			

*Contact your Northline sales representative for all your PLC repair needs.*

## Allen Bradley PLC

### Automation Repair and Sales

- Electronics
- Robotics
- Servo motors
- Spindle Motors
- CNC
- HMI / Displays
- Operator Stations
- Monitors
- PLCs
- Light Curtains
- Inverter Drives
- AC/DC Drives
- Welders
- Process Controls

### Capabilities Include:

- CPU Processor
- I/O
- PLC Modules
- Power supply
- CNC
- Multilayer PCB
- Relay Logic

Rack	Family	Processor	Power Supply	IO Type	IO Models
9	SLC-100 CPU	1745-L10x			
	SLC-100 Expansion	1745-E10x	*		
	SLC-150 CPU	1745-L15x	*		
	SLC-150 Expansion	1745-E15x			
10	PLC 2/20	1772-LF			
		1772-LE			
	PLC2/30	1772-LH*	1772-P2*		
		1772-LI	1772-P4		
		1772-LG*			
	PLC2/x0 Memory	1772-Mxxx			
11	PLC-2/x0 Local I/O	1771-AL*	1771-P1	Digital I/O	1771-IA
		PLC-2 Mini	1771-LNx	1771-P2*	
	1771-LV				1771-IG
					1771-IGD
				1771-IQ	
				1771-OA	
				1771-OB	
				1771-OG	
			1771-OGD		

*Contact your Northline sales representative for all your PLC repair needs.*



## Servo Motors

### Automation Repair and Sales

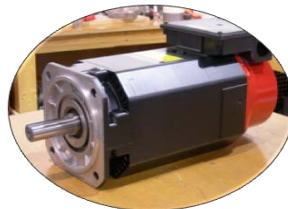
**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

### Capabilities Include:

- AC Servo Motors
- Brushless DC Servomotors
- AC Spindle Motors
- Induction Motors
- DC Motors
- Robotic Wrists

An experienced technician is assigned the responsibility of servicing your repair; they will perform a number of computer, mechanical as well as technical base steps. Each repair goes through a systematic process: disassembling, cleaning, evaluating, assembling, aligning / synchronizing and testing. Once the technician has completed the repair, it is sent to quality control (QC) for final inspection and testing. A summarized report accompanies each job and outlines the initial test results at incoming, replacement and repair of defective components, cause of failure, bench and system test results. Common Manufacturers Supported:

- |                                 |                      |
|---------------------------------|----------------------|
| • Allen Bradley • ABB           | • Fanuc • Emerson    |
| • Indramat • Fanuc              | • Pacific Scientific |
| • Siemens • Panasonic           | • ABB • Baumuller    |
| • AEG • Fuji                    | • Bautz • Mitsubishi |
| • Cincinnati Milicron • Yaskawa | • Emerson            |
| • Gettys                        | • Giddings & Lewis   |
| • Gould                         | • Industrial Drive   |
| • Kollmorgen                    | • Lenze              |
| • Moog                          | • MTS                |
| • Parker                        | • Whedco             |



*Contact your Northline sales representative for all of your Servo Motor repair needs.*

## Servo Motors

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

- AC Servo Motors
- Brushless DC Servomotors
- AC Spindle Motors
- Induction Motors
- DC Motors
- Robotic Wrists

**Abb • Elmo**  
3HAB  
3HAC  
8C Series  
PS Series

**AEG**  
120 Series  
R Series  
S Series

**AB Reliance**  
1326AB  
1326AD  
1326AS  
1326DP  
F Series  
H Series  
LD Series  
N Series

**Baldor**  
BSM,M  
**Elwood Getty's •**

**Gould**  
120 Series  
R Series  
Alpha αis  
Alpha α(HV)i  
Alpha α(HV)is

**GE Fanuc**  
Alpha α  
Alpha αi  
Alpha αis  
Alpha α(HV)i  
Alpha α(HV)is  
Alpha αM  
B, βi, βis

MTR-3S  
MTR-3T  
S Series  
SL Series  
Spindle  
α Spindle  
H Series  
SW Series

**Giddings & Lewis**  
FSM Series  
HSM Series  
NSM Series  
YSM Series

**GE Fanuc**  
Alpha α  
Alpha αi  
Alpha αM  
B, βi, βis

MTR-3S  
MTR-3T  
S Series  
SL Series  
Spindle  
α Spindle  
H Series  
SW Series

**Giddings & Lewis**  
FSM Series  
HSM Series  
NSM Series  
YSM Series

**Indramat • Rexroth**  
MAC Series  
MDD Series  
MHD Series

IMKD Series  
**Industrial Drive •**  
**Inland**

B Series  
TT Series  
TTBL Series

**Ingersoll Rand**  
E-2630 "R"  
E-3340 "U"

**Kollmorgen**  
**Goldline**  
AKM Series  
B Series  
BH Series  
M Series  
MH Series

**Lenze**  
MCA Series  
MCS Series  
MDFKS Series  
MDSKS Series  
MDFQA Series

**Modicon**  
120 Series  
Cyberline R Series  
Cyberline S Series

**Sew Eurodrive**  
F Series  
K Series  
R Series  
S Series

**Siemens**  
1FK6 Series  
1FK7Series

*Contact your Northline sales representative for all of your Servo Motor repair needs.*

## Siemens 611 AC Servo Control System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

Infeed Power Module  
6SN1145 (Entire Series)

Power Amplifier Module  
6SN1123(Entire Series)

Control Card Modules  
6SN1118 (Analog and  
Universal Series OD and  
OG series)

This is Northline Industrial's Siemens 611 AC Servo Control System. This system was designed to provide all the necessary life support for larger Siemens 6SN1145 and 6SN1123 infeed and power modules. The test station utilizes an integral "Siemens 611 Universal" control card that is capable of controlling up to two servos, spindle or induction axis. All facets of the 611 Universal card can be properly tested. There are dozens of 6SN1118 control cards for the 611 series and Northline is continually adding more cards to our dynamic testing capabilities. This system is used in conjunction with Northline's "Dynamic Load System" in order to ensure a quality repair every time. Please contact us if you have questions about our testing procedures or the types of equipment we can repair for you.



*Contact your Northline sales representative for all of your Siemens 611 repair needs.*

## Square D EQ5300 Resistance Weld Control

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

EQ5300 Timer  
52046-124-50 SCR Firing PCB  
52046-117-51 SCR Power ASSY  
RT-108 I/O  
DN-108 I/O  
C1600 Panel  
C1700 Panel

This is Northline Industrials Square D EQ5300 Resistance Weld Control System. The Square D EQ5300 is a 60Hz based resistance weld system. It is used in many robotic and fixtured station weld applications. The EQ5300 is adaptable to multiple communications interfaces types allowing for the greatest versatility. Repairable asset items for this weld system include the EQ5300 weld timer module, the 52046-124-50 SCR firing PCB, the 52046-117-51 SCR Power Assembly, RT-108 & DN-108 discrete I/O modules as well as the C1600 & C1700 Data Entry Panels. Contact your Northline Industrial sales representative today for further information.



*Contact your Northline sales representative for all of your Square D Weld Control repair needs.*



## STI Opto Shield OS3101

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

This is the STI OptoShield **OS3101** series of laser safety scanner. It is used in a variety of safety and control applications such as in automatic guided vehicles as well as high tech factory safety devices. Northline Industrial's OS3101 diagnostic system utilizes STI's **RM-2AC** safety interface monitoring module. The RM-2AC coupled with dedicated custom made control interfaces will ensure a valid diagnostic test every time. Consult your local Northline Industrial sales representative for service details on the STI OptoShield OS3101 Series of laser scanners today!

### Capabilities Include:

OS3101

RM-2AC Safety Interface



*Contact your Northline sales representative for all of your STI Optoshield repair needs.*

## Ultra Sonic Seal Weld System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

HC740 Controller  
Powersupply

This is Northline Industrials Sonics “Ultra Sonic Seal Welder System”. It is an ultrasonic weld system that generates high frequency vibrations that will weld plastic materials together. They are used in industry to seal bags, weld seams, perforate and shear off plastic material. This particular system is a smaller ultrasonic power supply that produces a high-voltage power signal at a frequency of 20kHz to 40kHz. The ultrasonic transducer will then convert these high frequency pulses into the mechanical vibrations necessary for welding plastic.



*Contact your Northline sales representative for all of your Ultra Sonic Welder repair needs.*

## Precision Spindle Repair

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

Blanchard	Kingsbury
Browne &	Landis
Sharpe	Makino
Bryant	Mori-Seiki
Chiron	Pratt &
Cincinnati	Whitney
Doall	Parker
Dumore	Majestic
Excel	Pope
Excello	Precise
Fanuc	Rigid
Franz Kessler	Rockwell
GMN	Setco
Gros-ite	Taft Pierce
Heald	Voumard
Ingersoll	

**Belt Driven**



**Lathe**



**Boring**



**Motorized**



**Gear Driven**



**High Speed**



**Block Type**



**Grinding**



**Milling**



**Machine Tool**



Northline is proud to offer repair of your of precision, high speed, high frequency, and belt driven spindles—serving the automotive, machine tool, and aerospace industries. Northline can improve your capabilities and productivity and lower your maintenance costs. Skilled technicians will provide quality repairs promptly and accurately with complete diagnostic documentation.



- In-depth Inspection/analysis
  - Written Repair Quotes
  - Obsolete Parts Manufactured
  - Precision Surface Grinding
  - Worn component replacement
  - Vibration Analysis
- Comprehensive Final Analysis
  - Vibration Spectrum Reporting
  - SKF Certified Technicians
  - Routine & Emergency rebuilds
  - Custom Modifications
  - Fast Turnaround , Guaranteed Quality

*Contact your Northline sales representative for all of your Spindle repair needs.*

## Surplus Equipment Sales

### Automation Repair and Sales

**Electronics**  
**Robotics**  
**Servo motors**  
**Spindle Motors**  
**CNC**  
**HMI / Displays**  
**Operator Stations**  
**Monitors**  
**PLCs**  
**Light Curtains**  
**Inverter Drives**  
**AC/DC Drives**  
**Welders**  
**Process Controls**

With a large warehouse of surplus inventory, and numerous industry partnerships, we are able to source legacy, current production, and OEM obsolete equipment. Our industry-leading repair lab supports testing of the Surplus Spares we sell. Popular manufactures inventoried such as Allen Bradley, Fanuc, and Indramat. Northline Industrial offers a one year in-service warranty on all surplus items.

**Northline specializes in finding obsolete and hard-to-find automation parts.**



### Manufacturers Supported:

**Allen Bradley**  
**Cutler Hammer**  
**Eaton**  
**Fanuc**  
**General Electric**  
**Indramat**  
**Modicon/SQD**  
**Miller**  
**Reliance**  
**Sick Optic**  
**Sola**  
**Siemens**  
**Yaskawa**

**Upgrading your System? We can help by selling the equipment you are removing from service while providing cost savings on the new equipment you require.**



Please visit our E-bay store using the Link below. If you do not see your item listed, please contact your Northline Sales Representative. We are purchasing new inventory every day.

E-bay Store Link: <http://stores.ebay.com/Northline-Industrial/>

Email Surplus Sales: [sales@northlineindustrial.com](mailto:sales@northlineindustrial.com)



**LCD CONVERSIONS**

**Automation Repair and Sales**

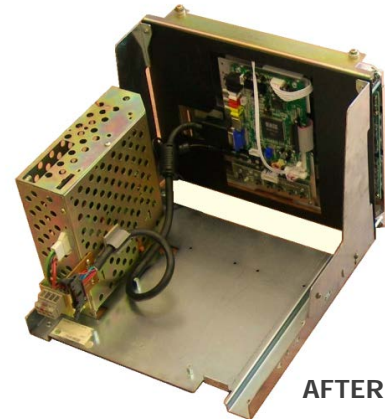
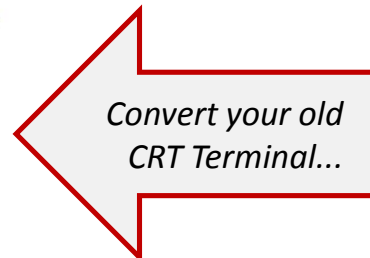
- Electronics
- Robotics
- Servo motors
- Spindle Motors
- CNC
- HMI / Displays
- Operator Stations
- Monitors
- PLCs
- Light Curtains
- Inverter Drives
- AC/DC Drives
- Welders
- Process Controls

**Capabilities Include:**

- CRT-to-LCD Retrofit
- LCD Integration
- Slow-Scan
- Auto-Sync



BEFORE



AFTER

**The benefits to a conversion are as follows:**

- Less energy required to run (lower operating cost).
- Converted units weigh less (easier installation).
- LCDs emit less heat (extending component life).
- Cost-effective solution (compared to new).

*No panel modifications are required to mount a converted unit. No supply voltage, communications port, or cable modifications are required. Just plug the cables from your existing system into the unit and you're up-and-running!*

## Display Repair

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

CRT-to-LCD Retrofit  
LCD Integration  
Slow-Scan  
Auto-Sync



Northline has the repair and test capabilities on the following Manufactures and Series:



ABB	ProFace
Advantage Electronics	Proto Trak
Allen Bradley	Samsung
Automation Direct	Siemens
Buehler	Selti Elettronica
Cincinnati Milacron	Sharp
Modicon	Star
Cutler Hammer	TCP Total Control Products
GE Fanuc	Tecnel
KME	Toshiba
Kristel	Totoku Electric Co.
Mass Multimedia	Wells- Gardner Electric
Motorola	Excel
Nortech Engineering	

*Contact your Northline sales representative for all of your Display Repair needs.*

## Dry Ice Blasting

### Automation Repair and Sales

- Electronics
- Robotics
- Servo motors
- Spindle Motors
- CNC
- HMI / Displays
- Operator Stations
- Monitors
- PLCs
- Light Curtains
- Inverter Drives
- AC/DC Drives
- Welders
- Process Controls

Northline Industrial has put together a unique and efficient welder cleaning program, a crucial step in preventative maintenance. Our program is lead by a team of highly-skilled and licensed weld technicians. We cost effectively clean, inspect and repair individual welders in large quantities. This Non-abrasive “no contact cleaning” reduces downtime and returns a “like new” finish to equipment. As time progresses, epoxy sealer and weld slag build up on robots and other automated weld equipment. This reduces the range of motion, overall effectiveness of equipment and can lead to service maintenance issues. Traditional scraping and wiping of equipment is inefficient and can result in damage to sensors and wiring. In addition, dry ice blasting cleans proximity switches and other confined or hard to reach areas. Dry ice blast cleaning is non-conductive, non-abrasive and generates no additional waste. Our process will effectively clean weld line equipment quickly; therefore reducing downtime. Please contact your Northline Representative for more information



Welder Programs



Dry Ice Blasting

Our Dry Ice Blast Cleaning uses a solid CO<sub>2</sub>, a non-abrasive media that won't damage equipment. The solid CO<sub>2</sub> ice pellets are blasted at high speeds using compressed air, disintegrating on impact, resulting in the surface being cleaned, lifting dirt and contaminants off the under-lying surface .

### Capabilities Include:

- Weld-Line Cleaning
- Mould Remediation
- Fire Restoration
- Food Processing
- Paint Removal
- Automotive Industry
- Electrical Panels
- Plastics Manufacturing
- Printing Industry
- General Maintenance
- Exhaust Fans



**Decreased Downtime.**  
Our fast and effective services will be sure to decrease your downtime!



**Environmentally Friendly.**  
Trying to go green? All of our services are environmentally friendly!



**Minimal Residual Clean-Up.**  
Dry ice blasting leaves no waste.



**Fast and Effective.**  
We guarantee. Remember, decreased downtime results in increased productivity.



**Eliminates Risk of Damage.**  
We tailor our cleaning to suit your application, no damaged equipment.



**Cleaning for any Application.**  
services allow us to tailor a cleaning solution for any application.

Cleaning Method	Secondary Waste	Electrically Conductive	Abrasive	Toxic	Effectiveness
Dry Ice	No	No	No	No	Excellent
Sand Blasting	Yes	No	Yes	*	Good
Soda Blasting	Yes	No	Yes	*	Good
Water Blasting	Yes	Yes	No	*	OK
Solvents/Chemicals	Yes	N/A	No	Yes	Limited
Power Tools	No	N/A	Yes	N/A	Limited
Hand Tools	No	N/A	Yes	N/A	Limited

\* Upon contact, traditional blasting materials become contaminated when used to clean hazardous substances and objects. These blasting materials are also then classified as toxic waste and require appropriate safe disposal.



## Mitsubishi CNC Diagnostic Test System

### Automation Repair and Sales

Electronics  
Robotics  
Servo motors  
Spindle Motors  
CNC  
HMI / Displays  
Operator Stations  
Monitors  
PLCs  
Light Curtains  
Inverter Drives  
AC/DC Drives  
Welders  
Process Controls

### Capabilities Include:

MDS-B-CV-XXX  
MDS-B-CVE-XXX  
MDS-B-V1-XX  
MDS-B-V2-XXXX  
MDS-B-SP-XXX  
MDS-C1-CV-XXX  
MDS-C1-V1-XX  
MDS-C1-V2-XXXX  
MDS-C1-SP-XXX  
Currently setting up  
for the:  
MDS-CH-V1-XX  
MDS-CH-V2-XXXX

The Mitsubishi MDS (Servo/Spindle) drive units are widely used in the machine tool industry. In response to the increased need for a quality repair source, Northline has developed the Mitsubishi MDS 200V Series/C64 CNC Diagnostic Test System. This system allows us to dynamically test Mitsubishi servo, spindle, and power supply units. It's design allows for quick parts substitutions and full functional-testing as a definitive check of a quality repair.



*Contact your Northline sales representative for all  
of your repair needs.*



## Shipping Instructions – US Customers

### Examples of items that might be shipped in standard boxes:

Drives (small to medium - light)  
PLC (most)  
Terminals (small to medium)  
Amplifiers  
Power Supplies  
Boards  
Light Curtains (short to medium)  
Servo Motors (small)

### Examples of items that might need to be shipped in non-standard boxes (unusual-size or double-walled box):

Drives (medium to large - heavy)  
Welders (small)  
Terminals (large/heavy)  
Power Supplies (very large/heavy)  
Light Curtains (long to very-long)  
Servo Motors (medium)

### Examples of items that might need to be shipped on a pallet:

Drives (large to very large)  
Welders (medium to large)  
Power Supplies (very large/heavy)  
Spindle Motors  
Servo Motors (large to very large)

### **Our Shipping Address\*:**

Northline Industrial, Inc.  
12238 Woodbine  
Redford, MI 48239

*\*No RMA is required! A Work Order # will be assigned upon receipt of the unit at Northline.*

### **Please provide the following with your shipment:**

1. Purchase Order/Job Reference or Packing List.
2. Contact information (phone, address, etc.).
3. Indicate if the repair is a RUSH.
4. We encourage a problem description or symptom be included (if known).

### **Packaging and Shipping Tips:**

1. Always use packing material when shipping in a box. DO NOT ship items loose in a box!!
2. DO NOT package large, heavy items with smaller, light-weight items.
3. Consider the weight of the item when selecting a package-type...heavy items (more than 70 lbs) should be secured to a pallet/skid for truck delivery.
4. Double-walled boxes offer more strength and protection than single-walled boxes.