Plutonium Immobilization Can Loading Preliminary Specifications

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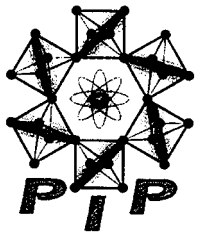

Plutonium Immobilization

Can Loading Preliminary Specifications (U)

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SUMMARY

The Plutonium Immobilization Facility will immobilize plutonium in ceramic pucks and seal the pucks inside welded cans. Remote equipment will place these cans in magazines and the magazines in a Defense Waste Processing Facility (DWPF) canister. The DWPF will fill the canister with glass for permanent storage. This report discusses the Plutonium Immobilization can loading preliminary equipment specifications and includes a process block diagram, process description, equipment list, preliminary equipment specifications, plan and elevation sketches, and some commercial catalogs. This report identifies loading pucks into cans and backfilling cans with helium as the top priority can loading development areas.

BACKGROUND

The Plutonium Immobilization Plant (PIP) design will minimize operator exposure and prevent the spread of contamination. To accomplish these goals, a system must package contaminated ceramic pucks in clean containers and not release contamination. Traditional methods of removing plutonium from process gloveboxes in preparation for packaging involves the use of manual bagout procedures utilizing plastic bags. This method is not acceptable in the Plutonium Immobilization Plant. Engineers at the Savannah River Site (SRS) developed a system for removing plutonium from a glovebox directly into an all metal, welded, leaktight container, free of external contamination. The process, known as bagless transfer, utilizes a Tungsten-Inert-Gas (TIG) welding process to seal radioactive material in a can. The process then separates the transfer can from the glovebox environment while maintaining glovebox and can integrity. A semi-automated bagless transfer unit is in operation at the Savannah River Site FB-Line Plutonium Facility. The Plutonium Immobilization Can Loading operations will use this system as a baseline.

PLUTONIUM IMMOBILIZATION REQUIREMENTS

The Plutonium Immobilization Plant must produce approximately 560 pucks per day to meet production requirements. The can loading system must be able to automatically load at least 24 pucks per hour into puck cans. Remote equipment will load the puck cans into magazines and load the magazines into racks inside the DWPF canisters. The DWPF fills the canisters with at least 91 inches of glass which must surround the puck cans, magazines, and racks.

Normal can loading system operations will be performed remotely, but maintenance and repairs will be performed manually. The can loading system design shall minimize the amount of equipment in the containment, minimize the complexity of the equipment in the containment, minimize required maintenance, and design the equipment for glovebox repair and replacement.

PROCESS BLOCK DIAGRAM

Attachment 1 is the can loading process block diagram and it shows the detailed can loading process steps. The process block diagram is based on the can loading steps contained in the Plutonium Immobilization Plant, First Stage Immobilization, Process Flow Drawing (P-10, Rev. A, 7/8/98).

PROCESS DESCRIPTION

Attachment 2 shows the can loading concept elevation view, Attachment 3 shows the can loading glovebox plan view, Attachment 4 shows the bagless transfer enclosure plan view, and Attachment 5 shows a can loading isometric view. The following paragraphs describe the can loading process.

A tray of pucks enters the can loading glovebox on a magnetically coupled transport cart and the tray staging system lifts the tray from the cart. The puck robot (Cartesian type) uses a vacuum cup on a 40 inch pipe to remove the pucks from the tray and load them in the puck can. The cart moves the empty tray from the tray staging system to the elevator. The puck robot can remove pucks from trays at either lift station and the cart can move one tray under a second tray at a lift station. This will allow the system to load pucks while the cart removes an empty tray and brings a new tray to the tray staging system.

The puck robot places the helium hood over the can plug. The helium hood then grabs the can plug using a vacuum cup. The puck robot places the helium hood over the puck can and the helium hood seals to the can. The helium hood removes the air from the can, fills the can with helium, and inserts the plug into the can. The bagless transfer system welds the plug to the can wall, and cuts the can and plug leaving the can stub in the sphincter seal.

The bagless transfer can holder lowers the can and the can robot swipes approximately 80% of the can exterior for transferable contamination, fixed contamination is expected in the weld area. The can robot loads the swipe in a swipe counter and seals the counter. After the counting is complete and the transferable contamination level is verified to be below the allowable limit, the can robot removes the can from the bagless transfer can holder, places it in the helium bell jar leak detector to ensure the weld is leak tight, and seals the detector. After the leak test is complete, the can robot places the can in a rack on the magnetically coupled transport cart and the can leaves the bagless transfer enclosure.

New swipes and new cans, manually pre-loaded with plugs, are placed in a rack external to the bagless transfer enclosure. The magnetically coupled transport cart brings the rack of cans and swipes to the bagless transfer enclosure. The can robot removes the cans and swipes from the rack and places them in storage areas. The can robot places used swipes on the rack and the magnetically coupled transport cart will remove the swipes from bagless transfer enclosure. The can robot moves a new can from storage into the bagless transfer can holder and then the bagless transfer system raises the can. The previous can stub is pushed by the new can into the can loading glovebox and the puck robot places the stub on an empty tray. The empty tray and can stub leave the loading glovebox on the magnetic coupled transport cart. The stub is taken to the elevator and then to the waste handling glovebox. The puck robot removes the can plug from the new can and the loading process resumes.

While the puck can is in the bagless transfer system, operators will use cameras and welder feedback to determine can weld failures. The bagless transfer machine will push cans that experience weld failures up into the sphincter seal exposing the weld area above the sphincter seal. Dedicated actuators will place the can cutter over the exposed can and the can cutter will cut the can below the weld area. This cut will be in the void space above the pucks. The dedicated actuators will remove the can cutter and the puck robot will remove the can top and the

pucks from the damaged can. The bagless transfer can holder will push the empty failed can up into the sphincter seal. The can robot will place an empty can in the bagless transfer can holder and the can holder will use the empty can to push the failed can into the can loading glovebox. The transfer carts will remove all pucks and cut can pieces from the can loading glovebox and all loaded cans from the bagless transfer enclosure. The cut can pieces and any can stubs will be sent to the waste handling glovebox. These items will have sharp edges and will require special handling procedures if they are manually processed. Operators will manually perform any system maintenance including sphincter seal replacement.

The can robot will place cans that fail the swipe test in a decontamination chamber. After completing the decontamination process, the decontamination chamber will rotate the can while the can robot will swipe the can again for transferable contamination. If the can passes the swipe test, the can robot will place the can in the leak test chamber and process the can as described above. If the can fails the second swipe test, the can robot will place it in the bagless transfer can holder. The bagless transfer can holder will push the failed can up into the sphincter seal and this will push the stub into the can loading glovebox. The puck robot will place the stub on an empty tray and the can robot will load a new can into the bagless transfer can holder. The bagless transfer can holder will push the failed can into the sphincter seal exposing the top 3 inches of the can above the sphincter seal. The puck robot will process these reject cans in a similar manner as the weld failure cans described above.

The can robot will move cans from the leak detection chamber to the bagless transfer can holder that fail the leak check/weld inspection. The bagless transfer can holder will push the failed can up into the sphincter seal and this will push the stub into the can loading glovebox. The puck robot will place the stub on an empty tray and the can robot will load a new can into the bagless transfer can holder. The bagless transfer can holder will push the failed can into the sphincter seal exposing the top 3 inches of the can above the sphincter seal. The puck robot will process these reject cans in a similar manner as the weld failure cans described above.

CAN LOADING EQUIPMENT

Table 1 shows the Can Loading equipment list, an estimated cost, and a potential vendor for each equipment item. The following paragraphs describe the preliminary specifications for each.

Table 1 - Can Loading Equipment

Item	Est. Cost	Potential Vendor
Can Loading Glovebox		Walker Stainless Equipment Co.
Magnetically Coupled Tray Elevator		Custom EES Design
Magnetically Coupled Transport Cart		Custom EES Design
Magnetically Coupled Tray Staging Sys.	$22K	Custom EES Design
Puck Robot	$35K	Motionex, Inc.
Helium Hood	$20K	Custom EES Design
Puck Lifting Tool	$1K	Custom EES Design
Failed Can Cutter	$22K	Tri-Tool Inc.

Table 1 - Can Loading Equipment (cont.)

Item	Est. Cost	Potential Vendor
Bagless Transfer Enclosure		Walker Stainless Equipment Co.
Can Welder	$30K	Arc Machines Inc.
Can Cutter	$22K	Tri-Tool Inc.
Can Holder	$5K	Custom EES Design
Can Robot	$65K	Reis Robotics
Helium Leak Detector Chamber		Custom EES Design
Helium Detector (Mass Spectrometer)	$30K	Varian Associates
Swipe System		EES & Eberline Instruments
Can Decontamination System		Modified Commercial
Magnetic Coupled Transport Cart		Custom EES Design
Control System		Modified Commercial

Can Loading Glovebox

The can loading glovebox shown in Attachment 2 will allow pucks to enter on transport trays through an airlock, contain the equipment to load pucks into cans, and support the bagless transfer sphincter seal. The glovebox will be approximately 60 inches long, 48 inches wide, and 60 inches high. The glovebox requires several gloveports, removable panels, and extensive shielding. The glovebox will be fabricated to form approximately 7.5 inch thick walls made from 304 stainless steel, lead, water extended polyester (WEP), and an outer layer of stainless steel. The glovebox will be designed to hold a slight negative pressure, approximately 0.5 inches of water, and conform to appropriate American Glovebox Society (AGS-1994-G001, Guidelines for Gloveboxes) and SRS glovebox standards. The glove box will be designed with continuous welds, rounded corners, High Efficiency Particulate Air (HEPA) filters on the inlets and exhaust, push through exhaust filters, and in general complexity will be minimized.

Magnetically Coupled Tray Elevator

The magnetically coupled tray elevator will raise and lower transport trays from the transport cart to the overhead material transport system. Transport tray concepts hold up to 20 one pound pucks. The tray will weigh approximately 10 pounds, so the tray elevator must be able to lift a 30 pound payload. The elevator size will be driven by the transport tray size. The transport tray is approximately 20 inches by 20 inches, so the elevator shaft will be about 24 inches by 26 inches. It is driven magnetically using a self-locking lead screw inside the vertical shaft magnetically coupled through the containment wall to a drive motor outside the containment. Limit switches and home switch are also outside the containment. Maximum single lift height is 72 inches. The maximum payload is 200 pounds, but may be less depending upon the tray handling option chosen. No motors, switches, electronics, or actuators shall be located within the containment structure. Drive system components may be located beneath the elevator shaft or above it. The tray elevator parts will be fabricated from 304 stainless where possible and all moving parts will be covered where possible.

Magnetic Coupled Transport Cart System

A wheeled cart within a glovebox line transports a standard payload bidirectionally between elevator and tray staging system. The cart will be sized for the required payload, but is nominally 18 inches square. The payload footprint is approximately 20 inches square. The cart requires a fixed track on the glovebox floor with clear space between the tracks over the entire track run. All tracks will be seal welded to the glovebox floor. The maximum single cart run is 50 feet. The maximum vertical profile (i.e. floor to top of cart) of an empty cart including the track shall be no more that 4 inches. The cart bottom shall have a platen with magnetic iron spaced 1/16" from floor. This should be compliant to maintain the stated air gap for the length of travel. The drive system is a linear actuator beneath the glovebox floor with permanent magnets that couple magnetically to the cart's iron platen. Magnets are held 1/16" from glovebox floor with compliant roller carriage. The total gap from magnets to magnetic iron (i.e. air gaps and floor thickness) shall be approximately 0.3125 inches. The number of magnets and iron strips, size, spacing, etc. is dependent upon payload requirements, but it is anticipated that the coupling mechanism footprint will be 8 inches x 18 inches. The cart payload will be approximately 30 pounds. No motors, electronics, switches, or actuators associated with the cart system shall be located within the glovebox, and this will facilitate maintenance. The transport cart parts will be fabricated from 304 stainless steel where possible.

Tray Staging System

The tray staging system will be two tray lift stations. Each station will lift a puck transport tray, by the outer edges, from the transport cart to stage the tray (see attachment 6). The puck robot can access pucks on either tray and the transport cart can pass under an occupied lift station to access the other lift station. Transport tray concepts hold up to 20 one pound pucks and the tray will weigh approximately 10 pounds, so the tray staging lift units must be able to lift a 30 pound payload. The tray lift station size will be driven by the transport tray size. The transport tray is approximately 20 inches by 20 inches, so the tray lift stations will be about 18 inches long by 30 inches wide by 10 inches tall. The lift height will provide sufficient clearance for the cart carrying a tray to move under a lifted tray. The tray staging system parts will be fabricated from 304 stainless steel where possible and all moving parts will be covered when possible. The magnetically coupled lift stations design will allow the drive motors to be outside the containment for easier maintenance and cleaning.

Puck Robot

The puck robot, Cartesian type, will use a puck lifting tool to lift pucks from the transport trays and place them in the puck can. The puck robot will also handle can stubs, reject cans, and the helium hood. The puck robot's maximum payload will be the 30 pound puck can. The puck robot requires three degrees of freedom, X - Y - Z, and a gripper. The X axis will provide 52 inches of travel, the Y axis will provide 40 inches of travel, and the Z axis (up and down) will provide 40 inches of travel. These travel limits will allow the puck robot to fit inside the 60 inch long by 48 inch wide by 60 inch tall can loading glovebox. Each axis requires a repeatability of +/- 0.010 inches and a velocity range from 0 to 8 inches/second.

The gripper will lift the following items; the puck lifting tool, helium hood, puck cans, and can stubs. Each item has a 3 inch outer diameter or will have a 3 inch outer diameter lifting point, so

the gripper will always grab the same shape. The puck robot and gripper parts will be fabricated from 304 stainless steel where possible and all moving parts will be covered and sealed where possible.

Attachment 7 is a robot specification. This system will test and demonstrate the puck robot functions described in this report. The robot will be ordered in September of 1998 and tested in early 1999.

Helium Hood

The helium hood will fill the puck can with helium and insert the can plug, see attachment 8. The helium hood will perform the following operational steps. First, the hood will grab the can plug with a vacuum cup. Second, the puck robot will place the hood on the puck can. Third, the helium hood will seal to the puck can and pull a vacuum on the puck can. Fourth, the hood will insert helium into the can. Fifth, the hood will place the can plug into the can. The FB-Line bagless transfer system pulls a vacuum to 20 inches of mercury on the product can, backfills with +3 psi of helium, pulls the vacuum a second time, and backfills with helium again to ensure helium is in the product can. The can loading helium hood will be able to duplicate this. The helium hood requires position feedback (+/- 0.05 inches) and force control on the can plug insertion actuator to ensure the plug is inserted to the proper position. The hood requires an umbilical cord to supply the vacuum lines, helium lines, and plug insertion actuator power and position feedback cables. The helium hood parts will be fabricated from 304 stainless steel where possible.

Puck Lifting Tool

The puck lifting tool will be used by the puck robot to pick up pucks and place them inside the puck can. The lifting tool will carry one puck at a time, so the maximum payload will be approximately one pound. The lifting tool will be a hollow pipe approximately 44 inches long. The lifting tool lower 30 inches must fit inside the 2.88 inch inner diameter by 30 inch long puck can. The lifting tool will have a vacuum cup on the lower end and a 3 inch diameter grab point on the top end. The 3 inch diameter section will allow the robot gripper to firmly hold the tool. This grab point will be the top 4 inches of the tool and will never enter the puck can. The puck lifting tool will be fabricated from 304 stainless steel. The lifting tool requires an umbilical cord to provide the vacuum line for the vacuum cup.

Failed Can Cutter

The failed can cutter will cut open cans that fail in the welder or fail the leak check. Failed cans will be pushed up into the sphincter seal exposing the weld approximately 3 inches above the sphincter seal and dedicated actuators will place the failed can cutter over the exposed can. The failed can cutter will be a commercially available pipe cutter sized to cut 3 inch outer diameter thin walled pipe. The can cutter parts will be fabricated from 304 stainless steel where possible and all moving parts will be covered when possible. The can cutter will require an umbilical cord to provide power to the can cutter.

Bagless Transfer Enclosure

The bagless transfer enclosure will contain the bagless transfer system, the can robot, the helium leak detector chamber, the swipe counter, decontamination chamber, and a transfer cart. The enclosure will be similar to a hood with the doors closed during normal operation. The enclosure will be sealed and vented during normal operations, but it will have an automated door to allow filled cans to leave on the transfer cart and several manual doors for maintenance. The enclosure is sealed to prevent contamination spread in the event the bagless transfer sphincter seal fails. The enclosure will be vented to the facility hood exhaust system and HEPA filters will isolate the enclosure from the hood exhaust duct work. The enclosure walls may require shielding to protect operators, but that will be determined later. The enclosure will be approximately 72 inches long, 48 inches wide, and 60 inches high. The enclosure will be fabricated from 304 stainless steel.

Can Welder

The can welder will weld the can plug to the can wall from outside the can. The FB-Line bagless transfer system uses a commercially available TIG welder by Arc Machines Inc., as will the can loading bagless transfer welder. The welder will be sized to fit around a 3 inch outer diameter can and the welding head must be compatible with the 0.040 inch thick 304L stainless steel can wall and 0.125 inch thick 304L stainless steel hollow plug. See attachment 9 for details.

Can Cutter

The can cutter will cut the puck can and hollow plug in the weld area to separate the can of pucks from the stub. The FB-Line bagless transfer system uses a commercially available Tri-Tool Inc. pipe cutter, as will the can loading bagless transfer cutter. The cutter will be sized to clamp around the 3 inch outer diameter cans and cut through the 0.040 inch thick can wall and the 0.125 inch thick hollow plug wall. The can and plug will be fabricated from 304L stainless steel. See attachment 9 for details.

Can Holder

The can holder will support, raise, and lower the puck cans while they are in the bagless transfer system. The can holder will also hold and rotate the can while the can robot swipes the can for transferable contamination. The can holder maximum payload will be a filled 25 pound puck can plus the force required to push the can through the sphincter seal. The can holder will be shaped like a cup and sized to hold a 3 inch outer diameter can. The holder will have enough clearance to allow the can robot to remove the cans from the can holder. The can holder parts will be fabricated from 304 stainless steel where possible. See attachment 9 for details.

Puck Can

Attachment 10 shows the empty 3 inch diameter by 30 inch long puck can and all the dimensions, surface finishes, and tapers. These details are based on the FB-Line bagless transfer can and lessons learned from producing these cans. Attachment 11 shows the puck can hollow plug details. Attachment 12 shows the 3 inch diameter by approximately 20 inch long sealed can details.

Can Robot

The can robot will load and unload puck cans in the bagless transfer system, maneuver swipes over the puck cans, load and unload swipes in the swipe counter, load and unload cans in the decontamination chamber, load and unload cans in the leak detector, and place puck cans on the transfer cart. The can robot maximum payload will be the 25 pound fully loaded puck can. The can robot requires 6 rotational degrees of freedom (DOF) and a gripper. The six DOFs allows the robot to maneuver the swipe over the cylindrical can surface and to load and unload puck cans at various stations. The can robot will need a minimum radial reach of 30 inches. This will allow the robot to reach all the stations inside the bagless transfer enclosure. A preliminary market search revealed that commercially available 6 DOF robots with a 25 pound payload have a radial reach greater than 5 feet. The can robot must perform the required tasks within the 72 inches long, 48 inches wide, and 60 inch tall bagless transfer enclosure. The can robot requires a repeatability of +/- 0.020 inches and each DOF requires a velocity range from 0 to 40 degrees/second. The can robot will be fabricated from 304 stainless steel where possible and sealed where possible to prevent contamination from infiltrating the system.

The gripper will hold 3 inch diameter puck cans and can swipes. Since swipes are typically very thin and hard for a gripper to handle, large swipes or a swipe holder will be used. The gripper parts will be fabricated from 304 stainless steel where possible and all moving parts will be covered where possible.

Helium Leak Detector Chamber

The helium leak detector chamber will perform leak checks on the puck cans after they are welded by the bagless transfer system. The chamber will be sized to hold the 3 inch outer diameter by 20 inch long (nominally) puck can. The chamber will be opened and closed by the can robot or dedicated actuators. The chamber will open so that the can robot can easily load and unload puck cans in the chamber. The chamber must seal well enough to perform hundreds of helium leak checks before the seal system fails. The chamber and associated pump system will pull a vacuum sufficient for the helium detector. The helium leak detector chamber parts will be fabricated from 304 stainless steel where ever possible and all moving parts will be covered when possible.

Helium Detector

The helium detector will analyze the gasses from the helium leak detector chamber. If helium is detected above a specified leak rate, the can will fail the leak/weld inspection. The detector will be a commercially available mass spectrometer calibrated for helium. The detector will be located outside the bagless transfer enclosure.

Swipe System

The swipe system will be used to detect and verify that transferable contamination levels on the can are below allowable limits. The swipe counter will perform radiation counts on the puck can swipe pads. The swipe counter will be a commercially available unit sized to count swipes that the can robot can easily handle. The swipe counter will be opened and closed by the can robot or dedicated actuators. The swipe counter will require adequate shielding to perform radiation counts within a few feet of pucks. Since swipes are typically very thin and hard for a robot

gripper to handle, large swipes or a swipe holder will be used. The swipe counter and swipe holder parts will be fabricated from 304 stainless steel where possible.

Can Decontamination System

The can decontamination chamber will remove transferable contamination from puck cans that fail the smear test to levels below allowable limits. The chamber will be sized to hold the 3 inch outer diameter by 20 inch long (nominally) puck can. The chamber will be opened and closed by the can robot or dedicated actuators. The chamber will rotate the can to allow the can robot to swipe the can exterior for transferable contamination. The can robot must be able to easily load and unload puck cans in the chamber. The chamber must seal well enough to perform hundreds of cleanings before the seal system fails. The can decontamination chamber parts will be fabricated from 304 stainless steel where possible and all moving parts will be covered where possible. The cleaning method, such as CO_2 snow, will be compatible with the 304 stainless steel puck cans and chamber. Waste from the decontamination chamber is not addressed in this report.

Magnetically Coupled Transport Cart

The magnetic coupled transport cart will remove full puck cans, one at a time, and used swipes from the bagless transfer enclosure and bring empty cans, up to three at a time, and new swipes to the enclosure. The cans and swipes will be placed in a special rack and the transfer cart will move this rack. The rack will hold up to 3 cans in the vertical position and a cartridge of swipes. A full puck can weighs about 25 pounds, the rack will weigh approximately 20 pounds, and the swipe cartridge will weigh about 5 pounds, so the transport cart must be able to handle a 100 pound payload. The rack and transport cart parts will be fabricated from 304 stainless steel where ever possible. The magnetically coupled cart design will allow the drive system and other components to be installed outside the enclosure for easy maintenance and cleaning. The cart and cart rails will be the only system parts inside the enclosure.

An alternate method to move full puck cans from the enclosure to the product NDA area and deliver new cans and swipe supplies to the enclosure is an Automatic Guided Vehicle (AGV). Existing facility layout requires at least one right angle move during transport. Transport distance (NDA area to bagless enclosure) ranges from 20 feet to 55 feet. Each bagless enclosure needs to be serviced 9 to 10 times per day for can removal. Bagless enclosures and NDA area are assumed to be on same level. Maximum payload transfer is 100 pounds (three full cans, carrier, and swipes).

Since the bagless transfer enclosure is a clean area, there is no advantage in using the magnetically coupled cart. In addition, since this is a floor level installation, installing the drive system would require a raised bed. An AGV would avoid door transition problems and leave the area unobstructed for personnel egress. The low transfer rate (approximately 30 puck can transfers per day or 10 transfers/day/system x 3 systems) indicates that one AGV could be used. Existing layout has the bagless transfer robot at floor level, so a low profile AGV is preferable.

Control System

The can loading control system will interface on a high level with other facility computer systems such as; the Material Control & Accountability system and the inter-glovebox transport system.

The control system will interface on a high level with the can loading puck robot controller and the can robot controller. The control system will interface on a low level with the tray elevator, transfer carts, airlock doors, lift stations, etc. A high level computer interface is the exchange of complex or multi-step commands like; send more pucks or load a new can. A low level computer interface is the exchange of simple or single step commands like; run the cart motor clockwise or stop the cart motor. The can loading control system will allow single point of control for the entire system.

Can Loading is viewed as one unit operation for the overall Pu Immobilization process control. Although the overall process control has not been conceptualized, a concept for controlling can loading operations has been developed that envelopes each piece of equipment within the unit operation and also allows for interface with an upper level process control system. Although each piece of equipment within the can loading operation has not been developed, this overall architecture can serve as a blueprint for equipment development that would allow for systematic equipment integration at a future time. Each block in attachment 13 is described below.

Unit Operation Computer: Using a single PC to control all equipment within can loading allows integration of loading operations under single point operator control. This also allows flexibility in interfacing to the process control computer system. Each piece of equipment is conceptualized as PLC or computer based motion controllers with appropriate local interlocks, etc. Interfacing with the PC is via a controller bus (RS232, RS 423, etc.). Many commercial motion controllers allow easy bus communications options (e.g. Compumotor's daisy chained RS232). Since the robots have not been selected these are shown as a separate communications bus. An additional bus is shown specifically for instrumentation (weld monitoring, nuclear counting instrumentation, etc.). The instrumentation bus can also be a serial bus such as used for the motion controllers. Conceptually three separate busses are shown, but all equipment could physically be on one common bus. Commercial software will be necessary to allow for operator interface programming, unit operation specific data base programming, equipment controller communication, and specific application programming for each piece of equipment within this unit operation. Important "up front" decisions need to be made regarding programming and control if this concept is used. First the operating system (Windows, NT, other) needs to be determined. Then the decision as to how to implement specific application programming (Labview, Visual Basic, other) needs to be made. Finally, the I/O communications buses hardware and communications standards (robot control, controller, and instrumentation) needs to be specified so that each piece of equipment can interface to the PC.

Robot Controllers: The two robots are viewed as having locally programmed robotic move functions that are invoked as necessary by the Unit Operation PC. Palletizing, puck loading into cans, can movement are examples of locally programmed functions. Many commercial robot controllers offer serial or Ethernet communication links for integration into this unit cell concept.

Bagless System: This concept is based on the current SRS bagless system utilizing commercial motion controllers for vertical can positioning and welder/cutter vertical positioning. This could be a dual axis commercially available controller. Auxiliary equipment such as can clamps, welder clamshell control, etc. can be controlled via digital I/O available on these motion controllers. The welding operation itself is actually controlled via a commercial fully integrated welding system. Modifications from the current bagless control system include integrating the weld monitoring

instrumentation (currently a strip chart recorder) into the Unit Operation computer and moving the functionality of the existing dedicated control panels to the Unit Operation computer.

Transport Cart/Elevator System: This concept is based on existing work done for pit manufacturing using magnetically coupled drive systems. The cart and elevator motion controllers have preprogrammed motion sequences for moving to loading/unloading points, etc. The Unit Operation computer invokes these sequences and coordinates motion with the other unit operation equipment as needed. An alternative scheme is not to include this system as part of this unit operation, but instead to include all facility cart and elevator movement under control of an independent "traffic control" computer with each Unit Operation computer requesting movements as needed.

Air Locks/Isolation Door: An air lock will be used in the can loading glovebox when accessing the elevator. An isolation door will be used in the bagless transfer enclosure when moving completed cans out of this unit operation to storage or the NDA area. Controlling the air locks and isolation door will be under control of a dedicated PLC. The PLC would control door movement, valving for required purging/filling air lock, and guaranteeing proper air lock operation using interlocks, pressure and flow sensors, etc. Since air locks will be used throughout the facility, this approach allows easy integration of the air lock system into other unit operations. Again, the air lock control can be included as part of the "traffic control" computer described above since door operation is tightly coupled with transport cart/elevator/AGV operation.

Swipe Counter: This system has not been conceptualized, but would probably include at least one actuator for moving a counting chamber door or lid, sensors for interlocks, and commercial radiation counting instrumentation. A PLC can be used to provide the interlocked door operation. The counting instrumentation would be interfaced with the Unit Operation computer via instrumentation bus.

Leak Detector: This system has not been designed, but a similar PLC based system to the swipe counter is envisioned for controlling mechanical actuators, gas and vacuum valving, and interlocks. Leak detection instrumentation would also need to be interfaced to the Unit Operation computer.

Can Cutter: This system has not been designed, but it is anticipated that three motion controllers would be needed for the clamping, rotation, and cutter head motors. Additional functionality would be necessary to integrate sensors and interlocks. Commercially available motion controllers provide this functionality.

Lift Stations: One or two tray lift stations may be necessary to provide interim tray storage. These stations lift the tray off the cart, thus freeing the magnetic cart for additional work. One dual axis commercial motion controller can be shared for the two lift stations. Depending upon the design chosen, this could be a motor controller or PLC controlling air cylinders.

Tray Reader/Can Reader: Material tracking will require that the ability to track puck transfer trays and bagless cans be included. The Unit Operation computer will need to have instrumentation for reading product identification numbers (e.g. bar code reader or OCR reader) for both the puck transfer trays within the can loading glovebox and the puck cans. The type of

identification numbering has not been determined. One reader will be required in the glovebox and one reader in the bagless transfer enclosure.

DEVELOPMENT AREAS

The following issues require further development to ensure a successful Pu Immobilization can loading system.

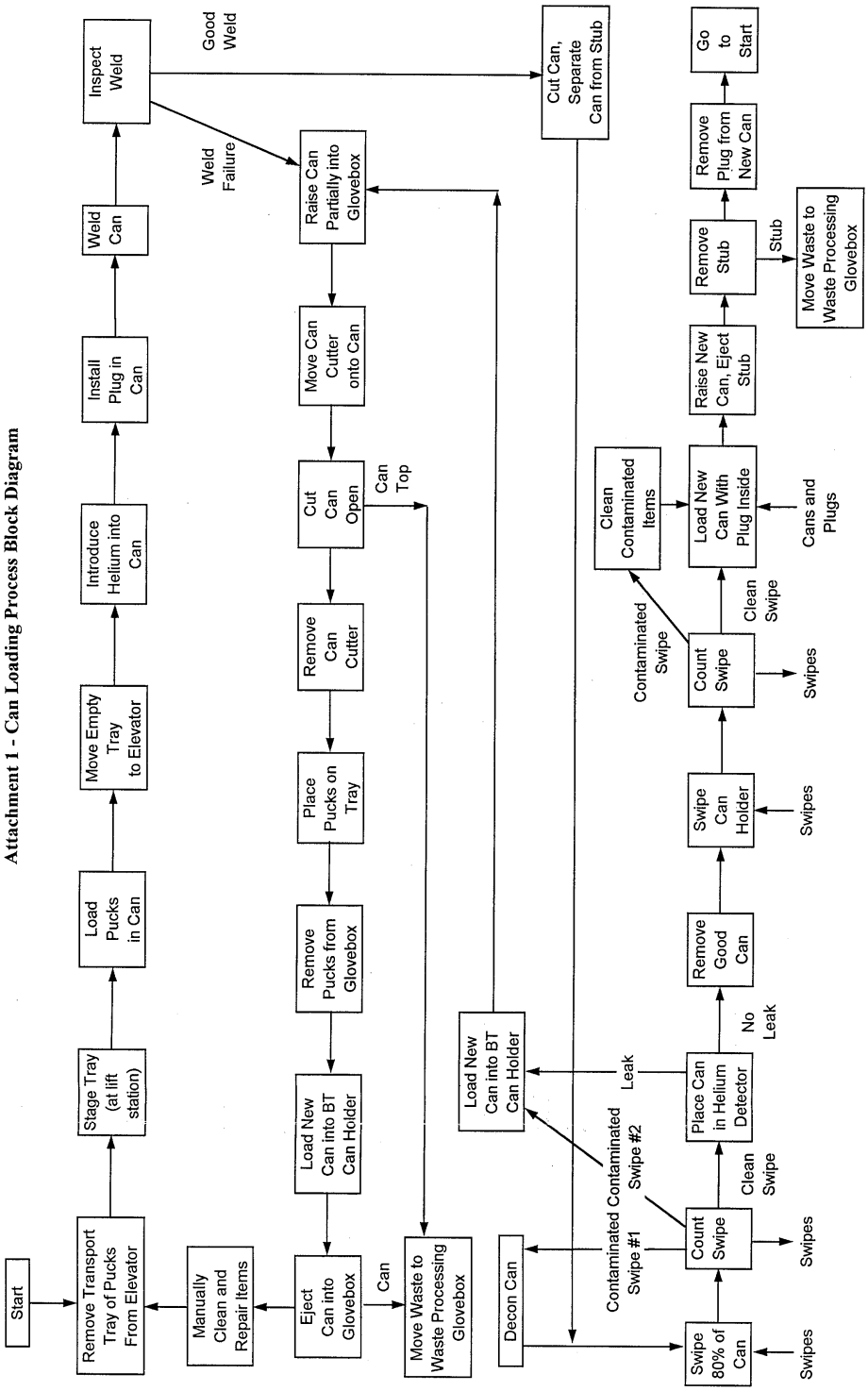
High Priority
1. Load pucks in cans
2. Fill can with helium and insert plug
3. Tray staging system
4. Handling pucks from reject cans
5. Handle full cans (load bagless transfer, leak detector, etc.)

Low Priority
1. Modify current bagless transfer design
2. Can swiping
3. Helium bell jar for leak detection
4. Cut open reject cans
5. Handle waste (stubs, reject cans)

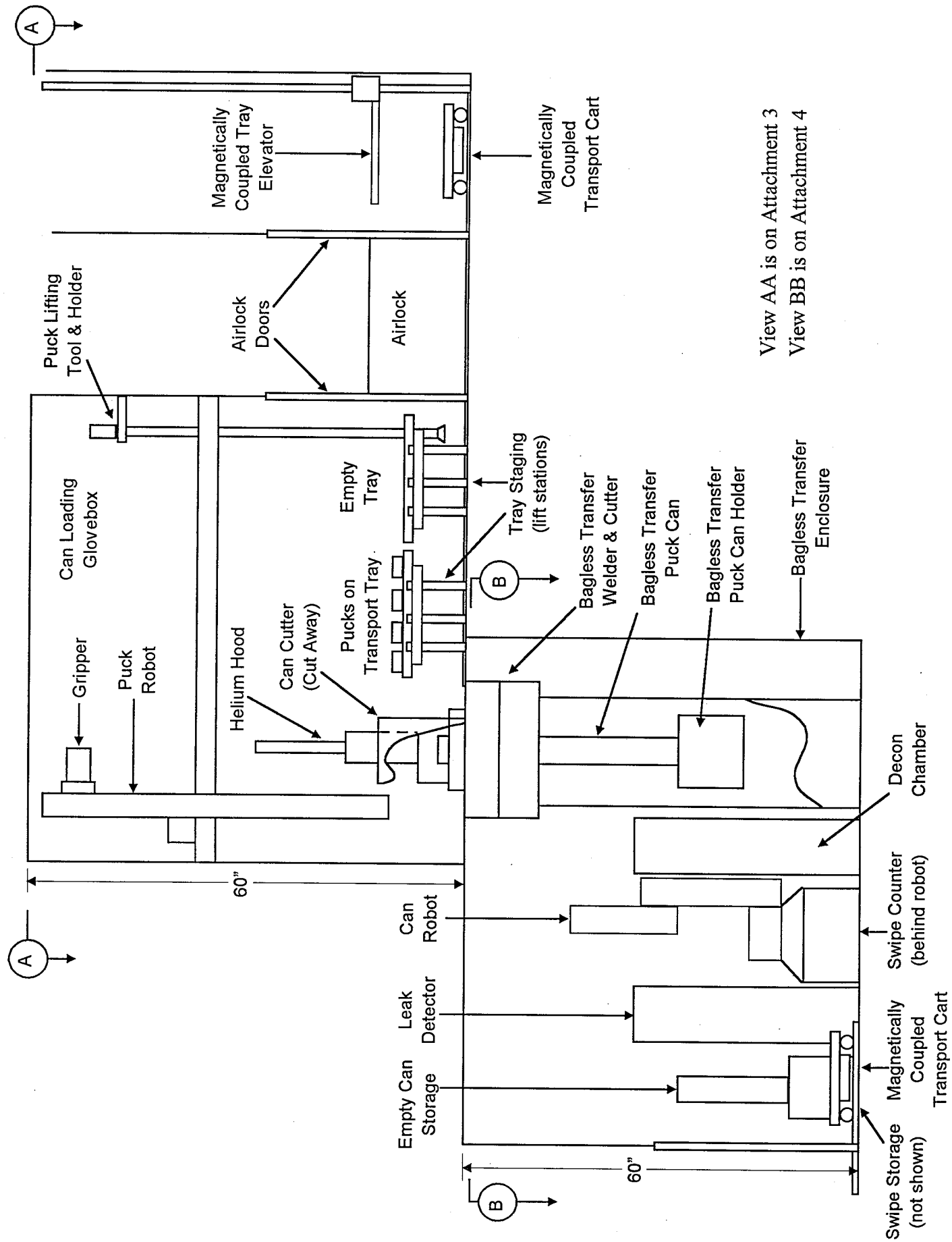
CONCLUSIONS

This report discusses the Plutonium Immobilization can loading preliminary specifications. The process block diagram, see attachment 1, details the required can loading steps and is based on the Plutonium Immobilization Plant, First Stage Immobilization, Process Flow Drawing. The process description discusses the steps required to process pucks and the steps to handle some process failures. The can loading equipment section describes the preliminary equipment requirements, some estimated costs, and potential vendors. Attachments 2 through 5 show the can loading conceptual design plan and elevation views. Attachments 6 through 14 show equipment details and attachment 15 contains vendor information about some of the commercially available equipment. The equipment items discussed in this can loading preliminary specification must be tested, integrated, and demonstrated to ensure a successful Plutonium Immobilization can loading system.

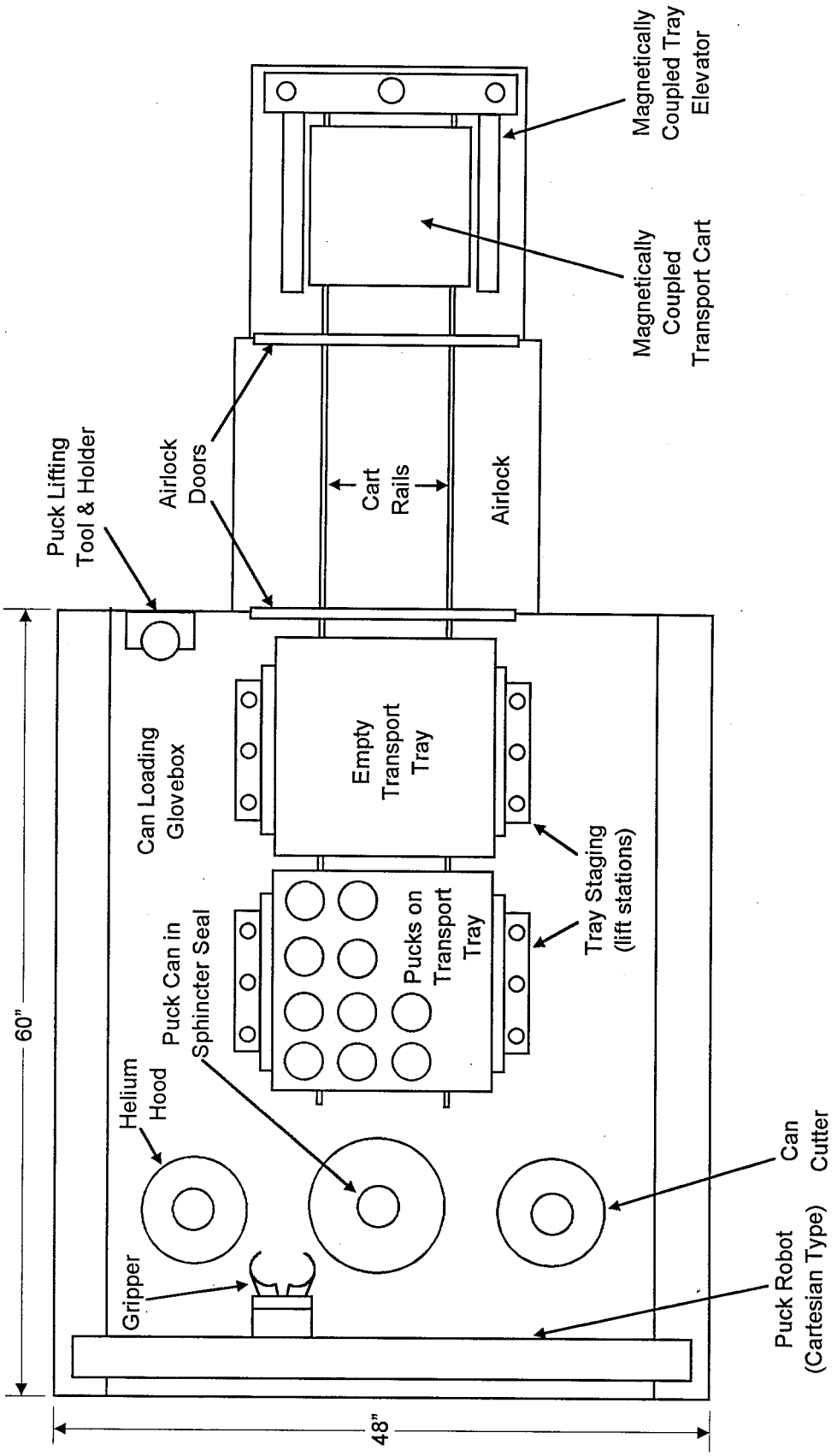
Attachment 1 - Can Loading Process Block Diagram



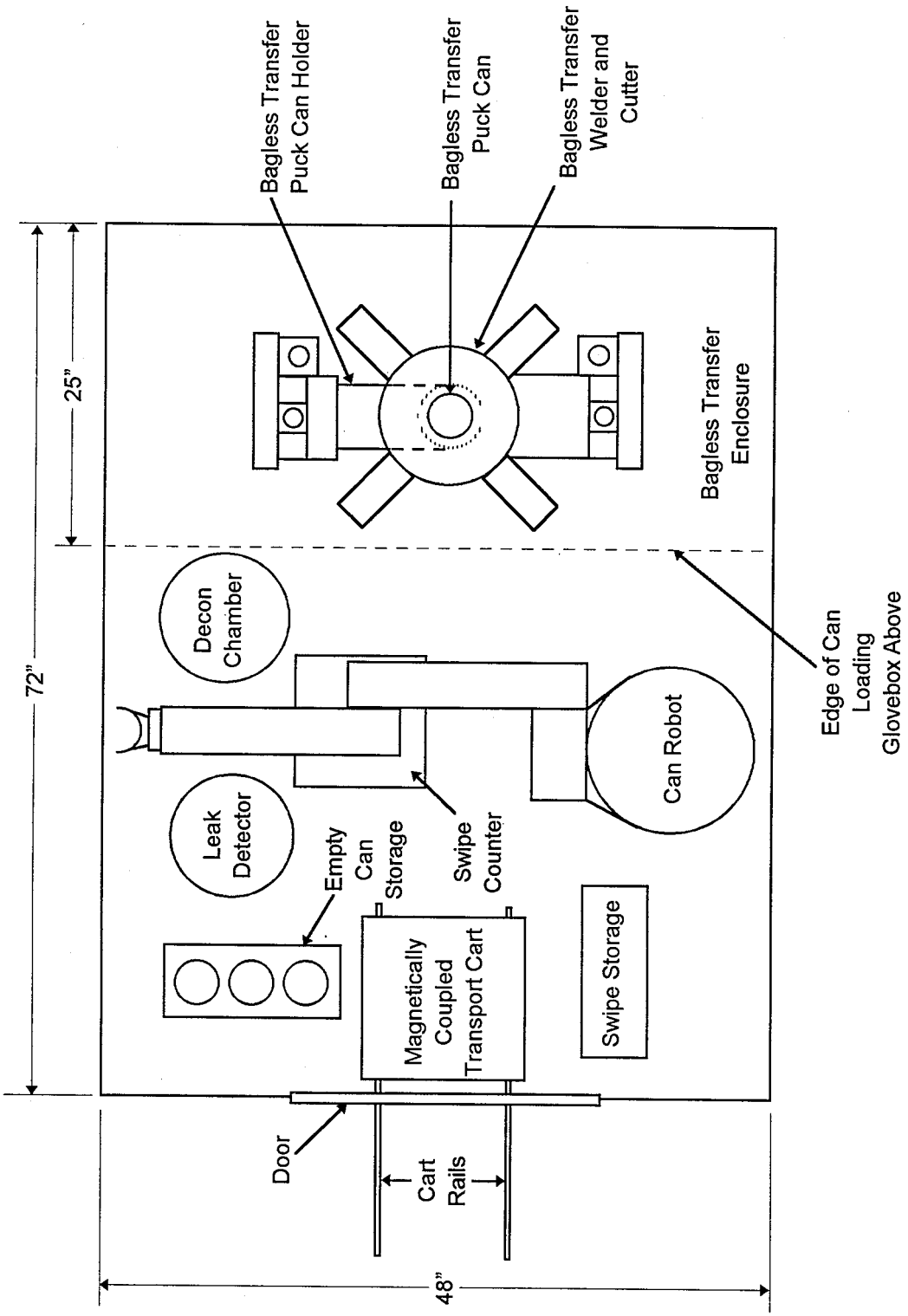
Attachment 2 - Can Loading Elevation View



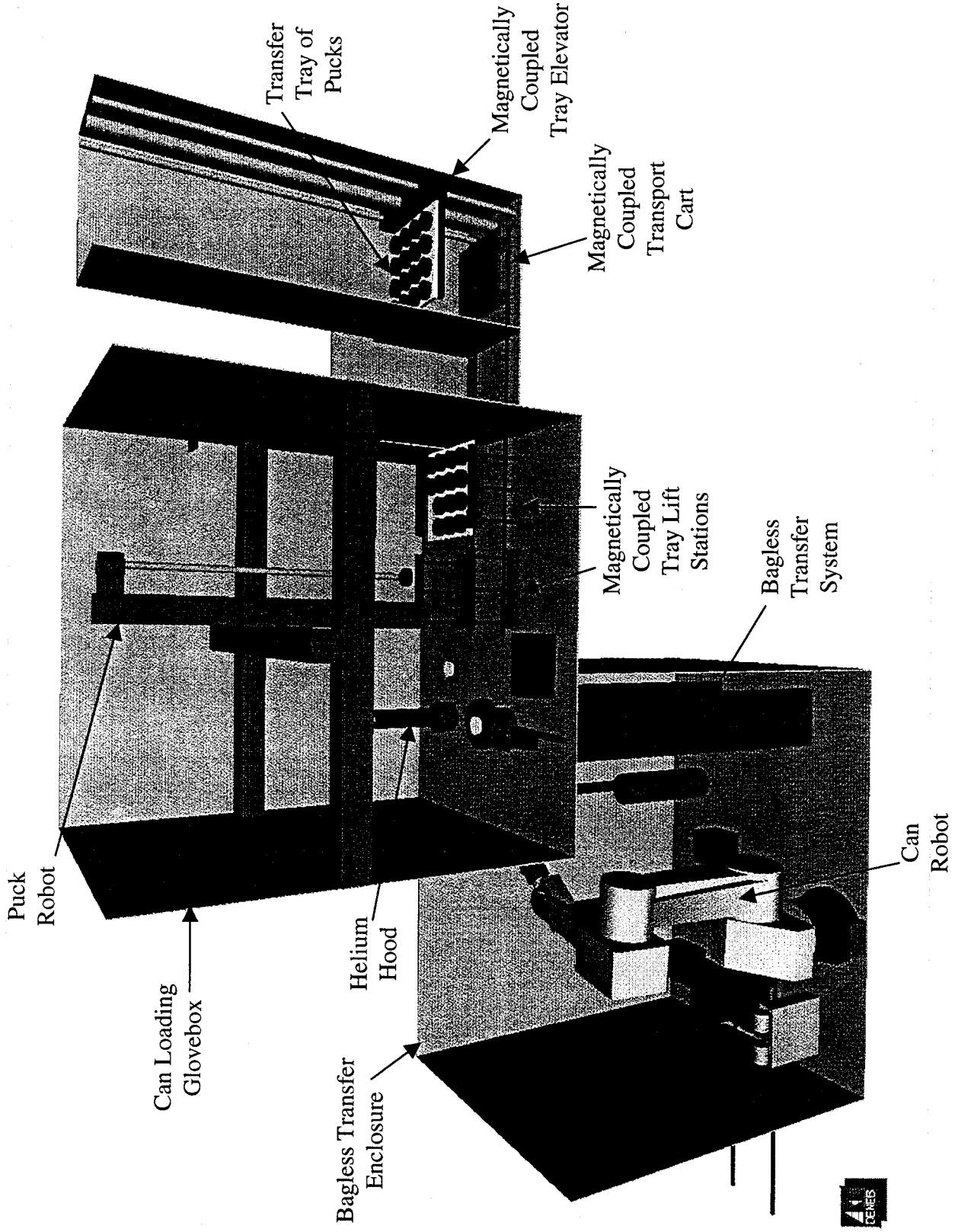
Attachment 3 - Can Loading Plan View AA
Can Loading Glovebox



Attachment 4 - Can Loading Plan View BB
Bagless Transfer Enclosure



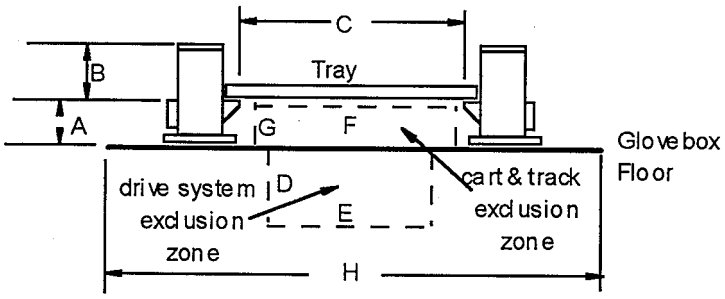
Attachment 5 - Can Loading Isometric View

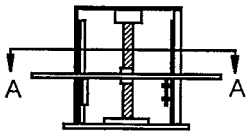


Attachment 6 – Tray Staging Details

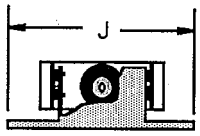
Description	Dimension	Value
Bottom travel limit	A	4 inches
Length of lift	B	6 inches
Clear span width	C	22 inches
Outside exclusion area height	D	8 inches
Outside exclusion area width	E	16 inches
Inside exclusion area width	F	20 inches
Inside exclusion area height	G	4 inches
Glovebox floor width	H	48 inches
Lift finger tray engagement length	J	18 inches
Tracking*		1/16 inch
velocity		0.5 ips – 1.5 ips

* Tracking is maximum difference in vertical positioning between synchronized lifts at any time.





Lift Station Side View



Section A-A

Cost of such a unit (a unit consists of two synchronized lifts driven by one drive system) is as follows:

Description	$
Mechanical and electrical Design	7000
Mechanical fabrication of lift unit	2400
Cable fabrication	500
Motor/drive	1200
Integration & Testing	2500
Total (first unit)	13600
Total (each successive unit)	6600

Attachment 7 - Plutonium Immobilization Puck Robot Specification

Requirements

Design, fabricate, test, and deliver a Can Loading Robot system per this specification and the enclosed figures. The system will consist of a Cartesian robot (X, Y, and Z), gripper, puck lifting tool, twenty pucks, a puck holder, a puck can, a test load can, and control system. This test unit will prove concepts, which will eventually be incorporated into a new production facility.

Background

The Savannah River Site (SRS) will dispose nuclear materials by immobilizing the material in ceramic pucks, placing the pucks into metal cans, placing metal cans into metal wire magazines, and placing the magazines into the Defense Waste Processing Facility (DWPF) canisters. DWPF canisters are filled with glass and permanently stored. The Can Loading Robot discussed in this document will be used to test the concept of loading ceramic pucks into metal cans.

Operation Description

Figure 1 shows the Can Loading Robot elevation view and Figure 2 shows the plan view. Figure 3 shows the puck and puck lifting tool details. The can robot will use the puck lifting tool to lift pucks from the puck holder and load them in the puck can. The robot must be able to access all pucks on the puck holder and stack twenty pucks in the puck can.

Puck Robot Specifications

- The robot requires three axes, 52.0 inches of X travel, 40 inches of Y travel, and 40 inches of Z travel (vertical).
- Gripper shall hold 3 inch outer diameter cylindrical payloads. All payloads will be 3 inch cylinders in the vertical position (cylinder long axis in vertical position). Maximum payload will be 30 pounds.
- All cables and air lines must be contained in a cable management system that prevents cables from being damaged during normal operations.
- Repeatability requirements (see Acceptance Requirements) :

  X +/- 0.010 inches
  Y +/- 0.010 inches
  Z +/- 0.010 inches

- Linear joint velocities shall be adjustable from 0.0 to 8.0 in/sec (minimum) with a 4 pound payload (1 pound puck, 3 pound lifting tool) and gripper weight. Linear joints velocities shall be adjustable from 0.0 to 2.0 in/sec (minimum) with a 30 pound payload (30 pound can) and gripper weight. Linear joint accelerations and decelerations shall be adjustable from 0.0 to 2.0 in/sec^2 (minimum). Required velocities and accelerations are individual joint speeds, not tool tip speed.

Attachment 7 - Plutonium Immobilization Puck Robot Specification

- The X, Y, and Z joints will have user definable force limits (hardware to limit motor current will be acceptable).
- Construction materials will be selected to meet load and other requirements. Wood will not be acceptable. Stainless Steel is preferred.
- Service environment: Indoors with temperatures ranging from 20 to 120 degrees Fahrenheit and 0% to 100% humidity.
- The system will have a minimum of two emergency stop buttons, one near the control computer and one near the robot. The emergency stop circuit shall allow SRS to add additional emergency stop devices.
- The system will include the control for the gripper and the puck lifting tool vacuum.
- The system will have a minimum of sixteen extra digital inputs and sixteen extra digital outputs. The two emergency stops, gripper controls, and vacuum controls shall be independent from these inputs and outputs.
- The control system will have a manual, teach, and playback modes at the minimum. The teach and playback modes shall allow for a minimum of 200 points in each program. The system shall allow editing, or reteaching, of intermediate program points.
- The system will include the lifting tool, vacuum cup (max. diameter 2.60 inches), fittings, hoses, and vacuum source. The supplier can assume 80 psi air supply at SRS, but must provide similar air at supplier facilities for the acceptance tests (see Acceptance Requirements).
- The puck can, puck holder, and associated support structures shall be removable, i.e. bolted not welded.
- The puck can will have a removable bottom. This will allow pucks to be removed easily.
- The system shall allow space on the right side (+X direction) for a conveyer system and automated door. This space shall be 30 inches wide (centered in Y direction) and 30 inches high (bottom at base plate). The conveyor is not part of this procurement.
- The system shall run from a maximum of 120 VAC, 20 amps, 60 Hz, single phase electrical circuit(s) and 80 psig, 20 scfm air supply.

Optional Items

1. The quotation will include a separate price for an optional integrated vision system. This system will include the hardware (camera, lights, power supplies, interface boards, cables, etc.) and software that will acquire an image of the pucks on the puck holder and generate robot commands that allow the robot to automatically pick up the pucks and place them in the puck can.

Design Review

After SRS awards a Can Loading Robot contract, the supplier shall begin the design process. A complete design package including drawings, calculations, specifications, etc. shall be submitted to SRS for review and comments. The supplier will resolve all comments and SRS shall accept all

Attachment 7 - Plutonium Immobilization Puck Robot Specification

comment resolutions. This review shall happen at the suppliers facilities. SRS shall provide a written design acceptance letter before the supplier shall begin procurement or fabrication activities.

Acceptance Requirements

An SRTC engineer shall witness the unit in operation at the supplier's facility. This will include the following demonstrations.

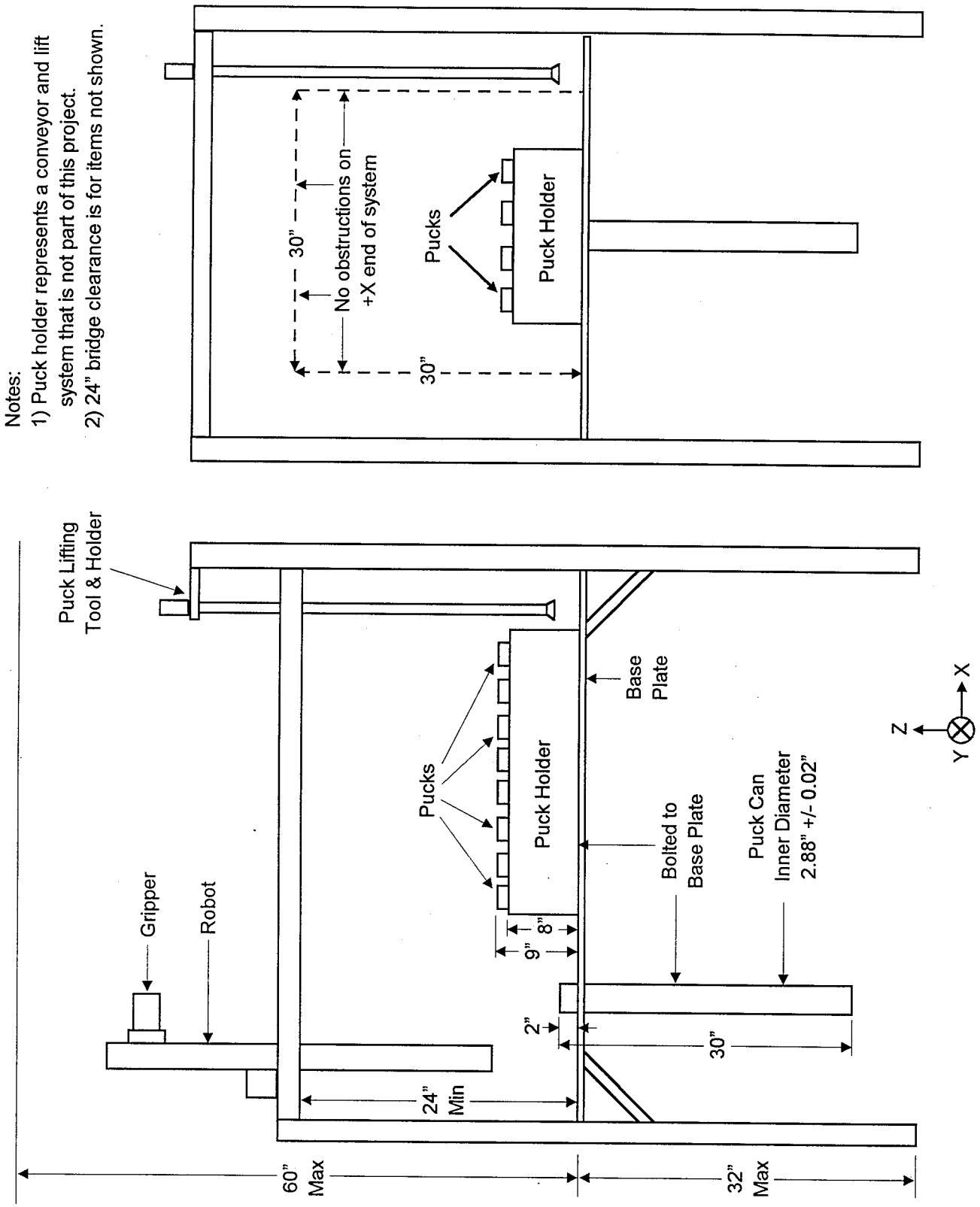
1) Moving all three axes through a full range of motion under a full load. The load will be 30 pounds, 20 inches long, 3.0 inches in diameter, fabricated from 304 stainless steel, and have a 2b or 30 micro inch surface finish. The supplier will fabricate the load for this test (a 3" OD pipe with weights inside is acceptable). Joint velocities and accelerations can be slow for this demonstration, 2.0 inches/second and 2.0 inches/second^2.

2) Demonstrating the repeatability under full load. The load will be 30 pounds, 20 inches long, 3.0 inches in diameter, and fabricated from stainless steel. The supplier will fabricate the load for this test (re-use load from test #1). The repeatability demonstration will include:
   1- move robot to point #1 (X1, Y1, Z1),
   2- measure from robot to reference point (s),
   3- move robot to point #2 (X2, Y2, Z2),
   4- move robot to point #1 (X1, Y1, Z1),
   5- measure from arm to reference point (s), and
   6- the difference in measurements should be within the repeatability requirements.
   Point #1 and point #2 will be determined before the test begins. The test shall be repeated five times with different points for each test. The system must successfully pass all five tests in succession to successfully meet this requirement. If the system fails an early test, corrective actions will be made and the five tests will start again.

3) Automatically load pucks into the puck can. Twenty supplier fabricated pucks will be placed on the puck holder and the robot will load all the pucks into the puck can. If the vision system is not included in the purchase, puck positions can be marked on the puck holder and the pucks manually placed on the puck holder. If the vision system is included in the purchase, then the pucks will be randomly placed (grid pattern with 0.5 inch spacing between pucks) on the puck holder and the system will automatically load the pucks into the puck can. Twenty pucks must be placed in the puck can for one successful loading cycle. This test will consist of ten consecutive load cycles without failure (200 pucks) at a minimum rate of 4 pucks per minute. The maximum acceptable drop for each puck will 0.25 inches. If a puck drops more than 0.25 inches from the vacuum cup during the test, the entire test must be repeated. If a puck gets wedged or stuck in the can before the proper height is obtained, the entire test must be repeated. The pucks may touch the can wall during the test, but this is not recommended.

Attachment 7 - Plutonium Immobilization Puck Robot Specification

Figure 1 - Puck Robot Elevation View



Attachment 7 - Plutonium Immobilization Puck Robot Specification

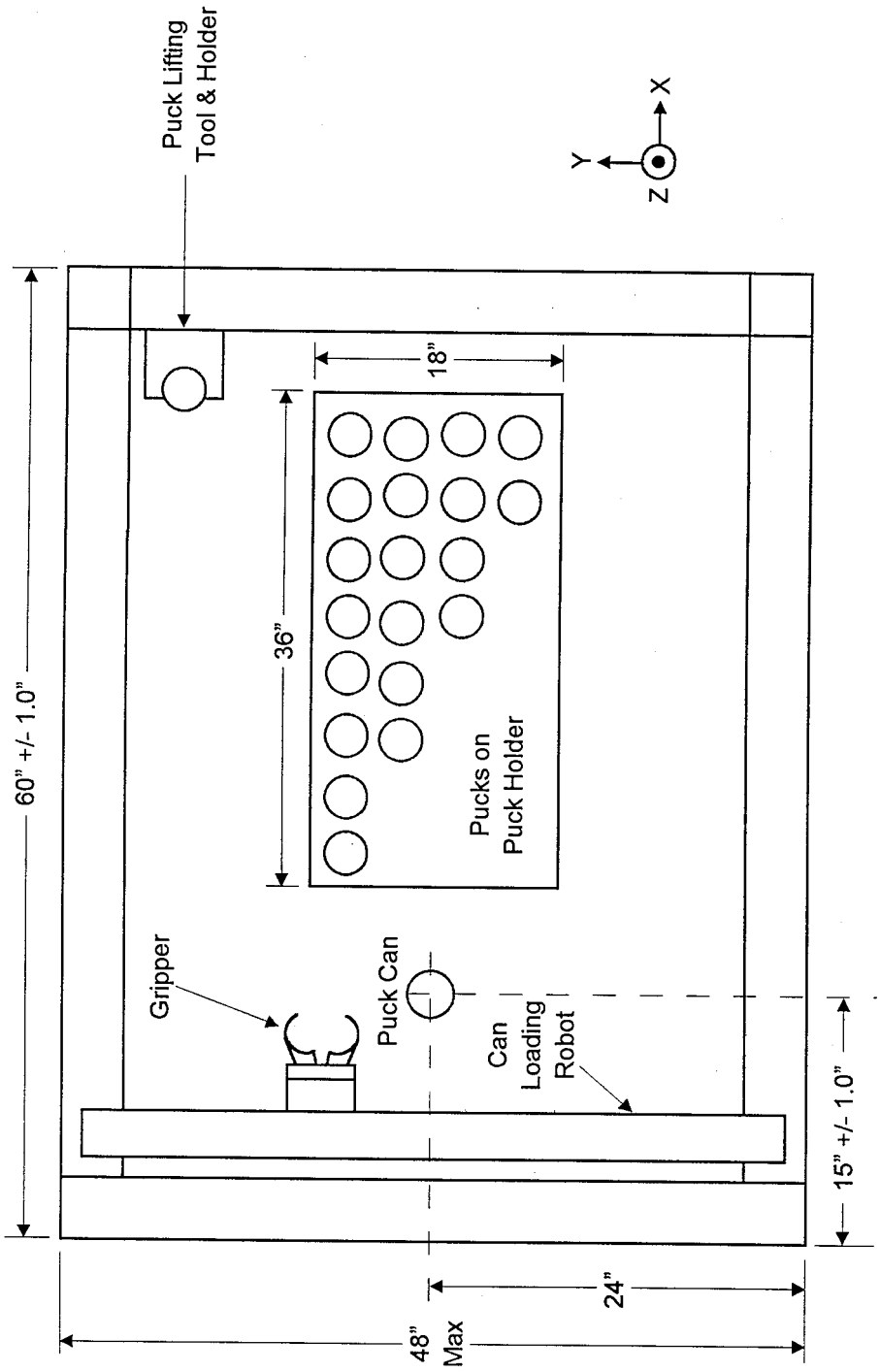
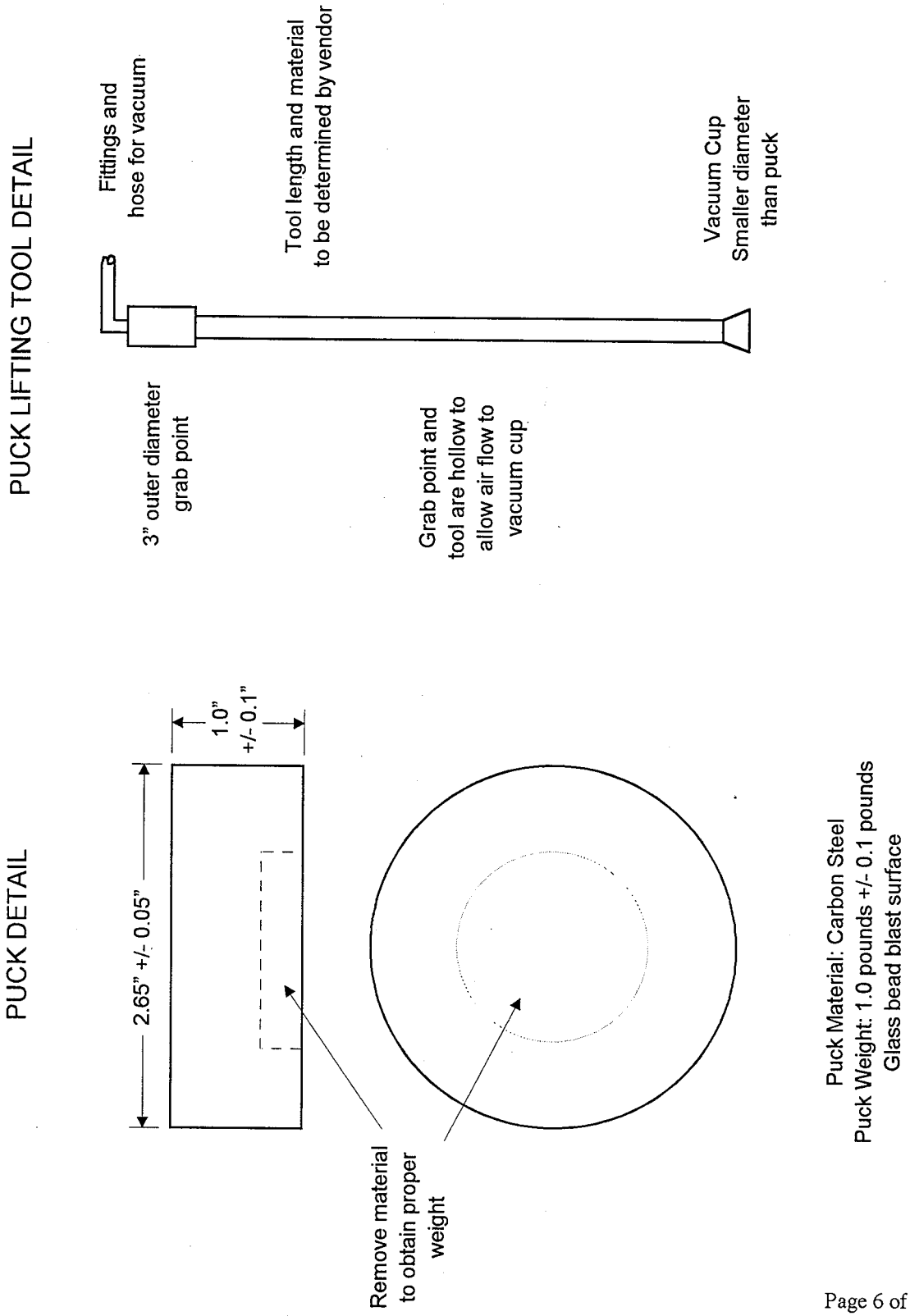


Figure 2 - Puck Robot Plan View

Notes:
1) Puck holder represents a conveyor and lift system that is not part of this project.

Attachment 7 - Plutonium Immobilization Puck Robot Specification

Figure 3 - Puck Detail and Puck Lifting Tool Detail



Attachment 7 - Plutonium Immobilization Puck Robot Specification

Plutonium Immobilization Puck Robot Vendors

Menziken Automation
6900 G. Northpark Blvd
Charlotte, NC 28269
704-598-3660
James Hronek

Rexroth Automation Systems
14001 South Lakes Dr.
Charlotte, NC 28273
704-583-3266
Mark Simpson

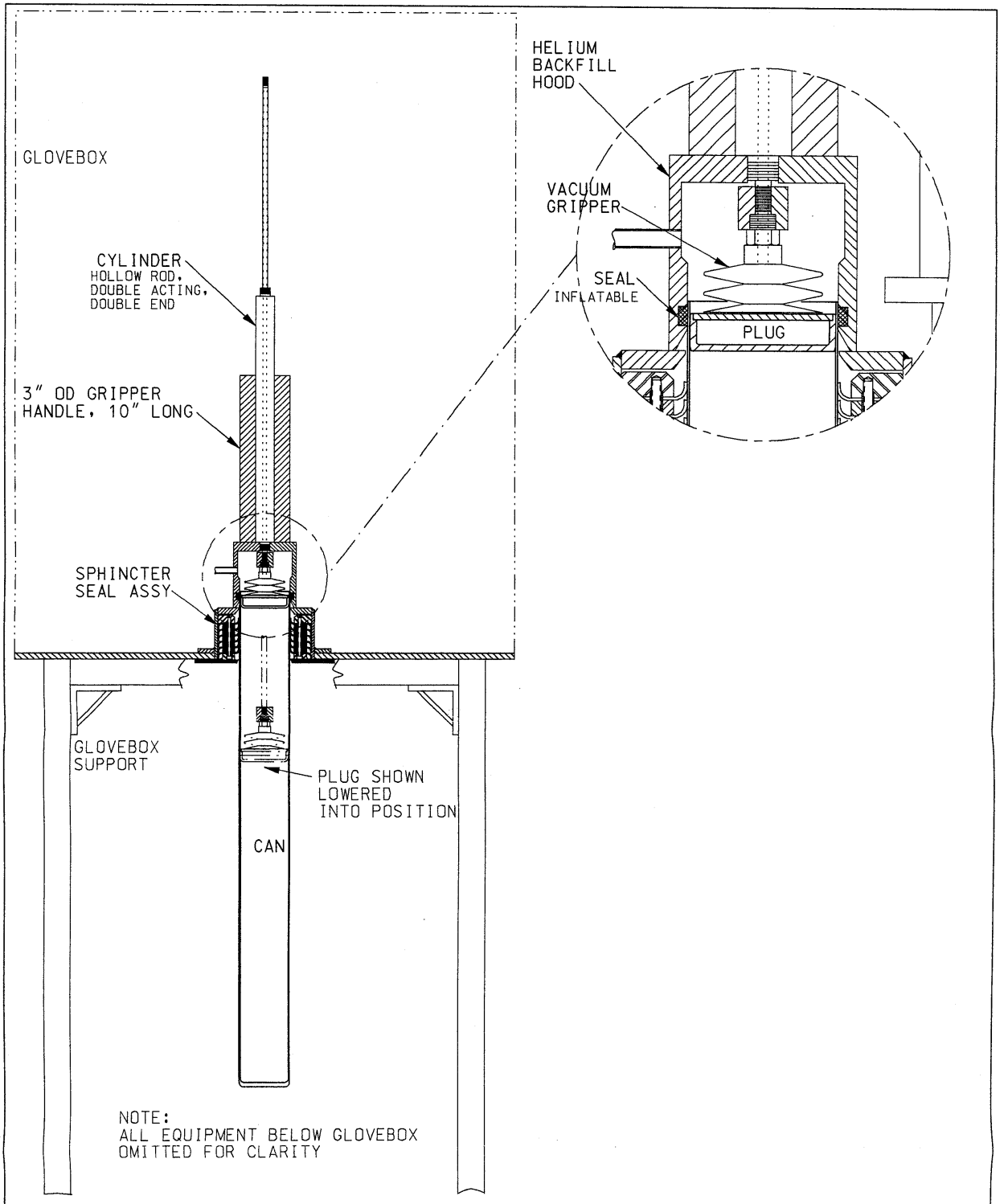
Motionex Inc.
PO Box 241429
6010 Kenley Lane
Charlotte, NC 28224-1429
704-523-2222
Jim Bowser, Atlanta, 404-467-0003

Advanced Automation Systems
17 Haywood Road
Greenville, SC 29607
864-627-0900

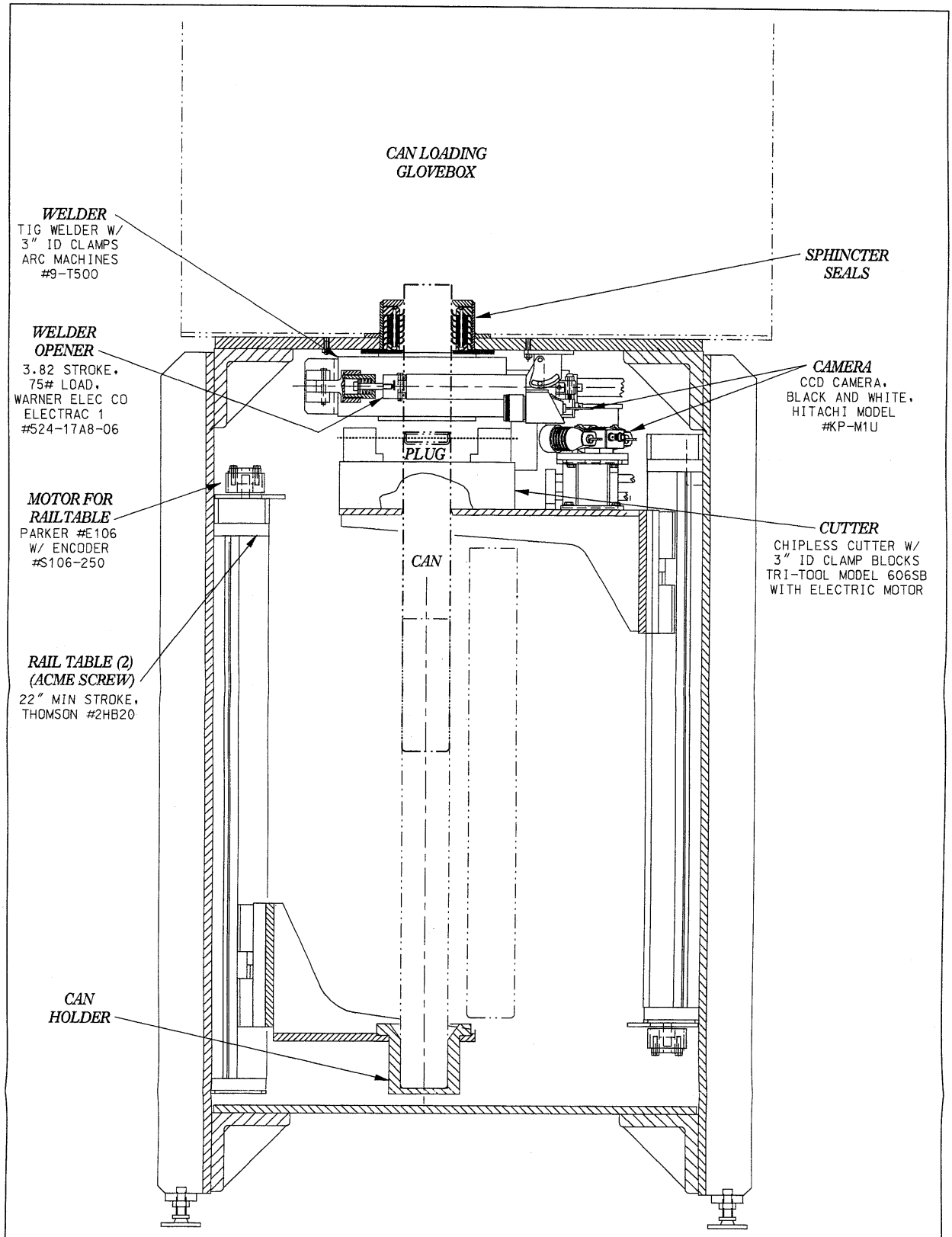
Bertlecamp Automation
1208 St. Johns Road
Irmo, SC 29063
800-251-9134 x143
Scott Hornsby

Cross Fluid Power
243 Amber Sky Drive
Inman, SC 29349
864-599-0491
Phil Nichols

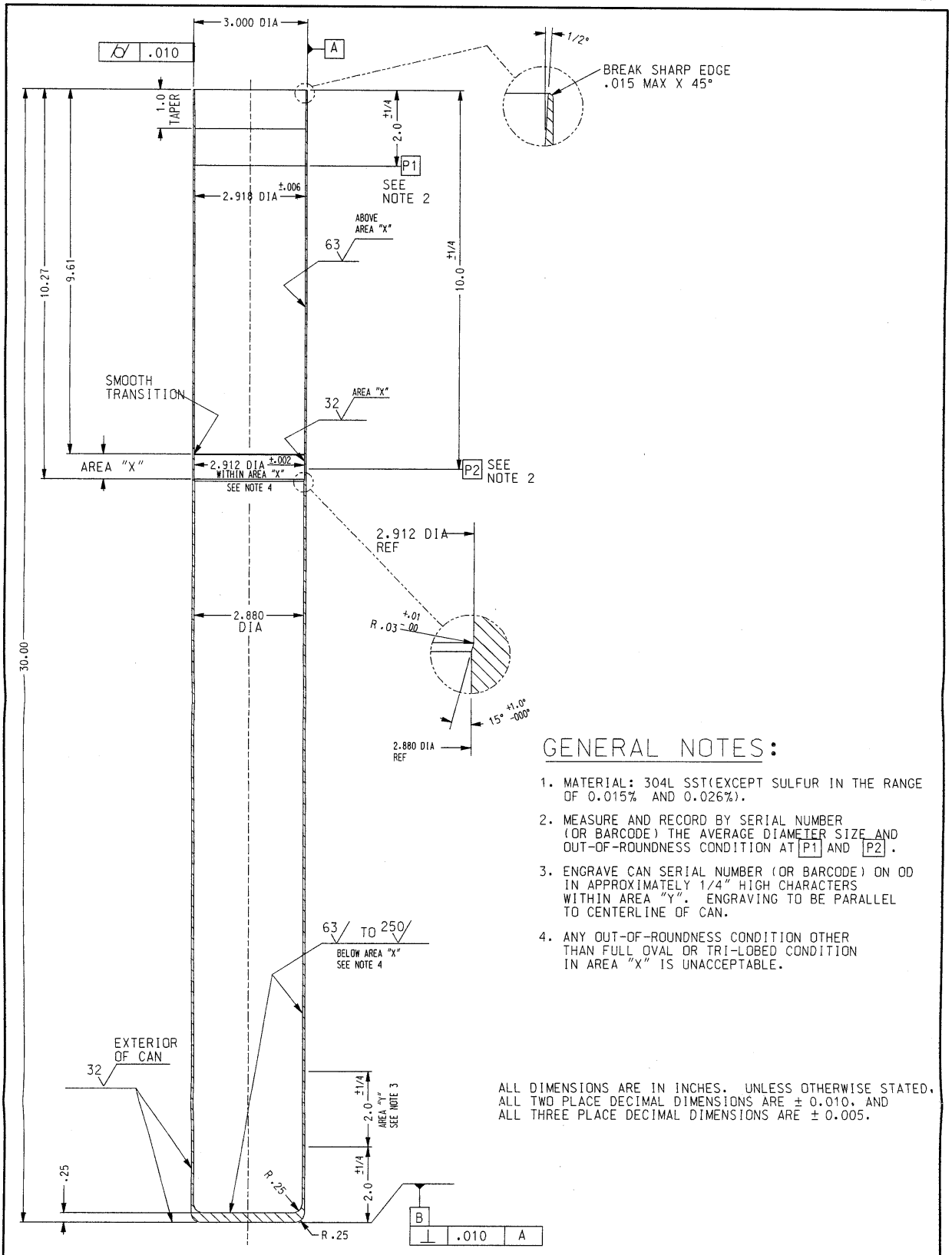
Ram Center Inc.
5140 Moundview Drive
Red Wing, MN 55066
800-257-3785



DESIGNED BY		WESTINGHOUSE SAVANNAH RIVER COMPANY
ENGINEER		WESTINGHOUSE ELECTRIC CORP | SAVANNAH RIVER SITE
DRAWN BY		3" DIA BAGLESS TRANSFER
REVIEWED BY	DATE	HELIUM BACKFILL ARRANGEMENT
REVIEWED BY	DATE	DATE 08-17-98 | SCALE NONE | DWG NO | REV



DESIGNED BY		WESTINGHOUSE SAVANNAH RIVER COMPANY	
ENGINEER		WESTINGHOUSE ELECTRIC CORP	SAVANNAH RIVER SITE
DRAWN BY		3" DIA BAGLESS TRANSFER	
REVIEWED BY	DATE	BAGLESS TRANSFER ARRANGEMENT	
REVIEWED BY	DATE	DATE 08-17-98 / SCALE NONE / DWG NO / REV	

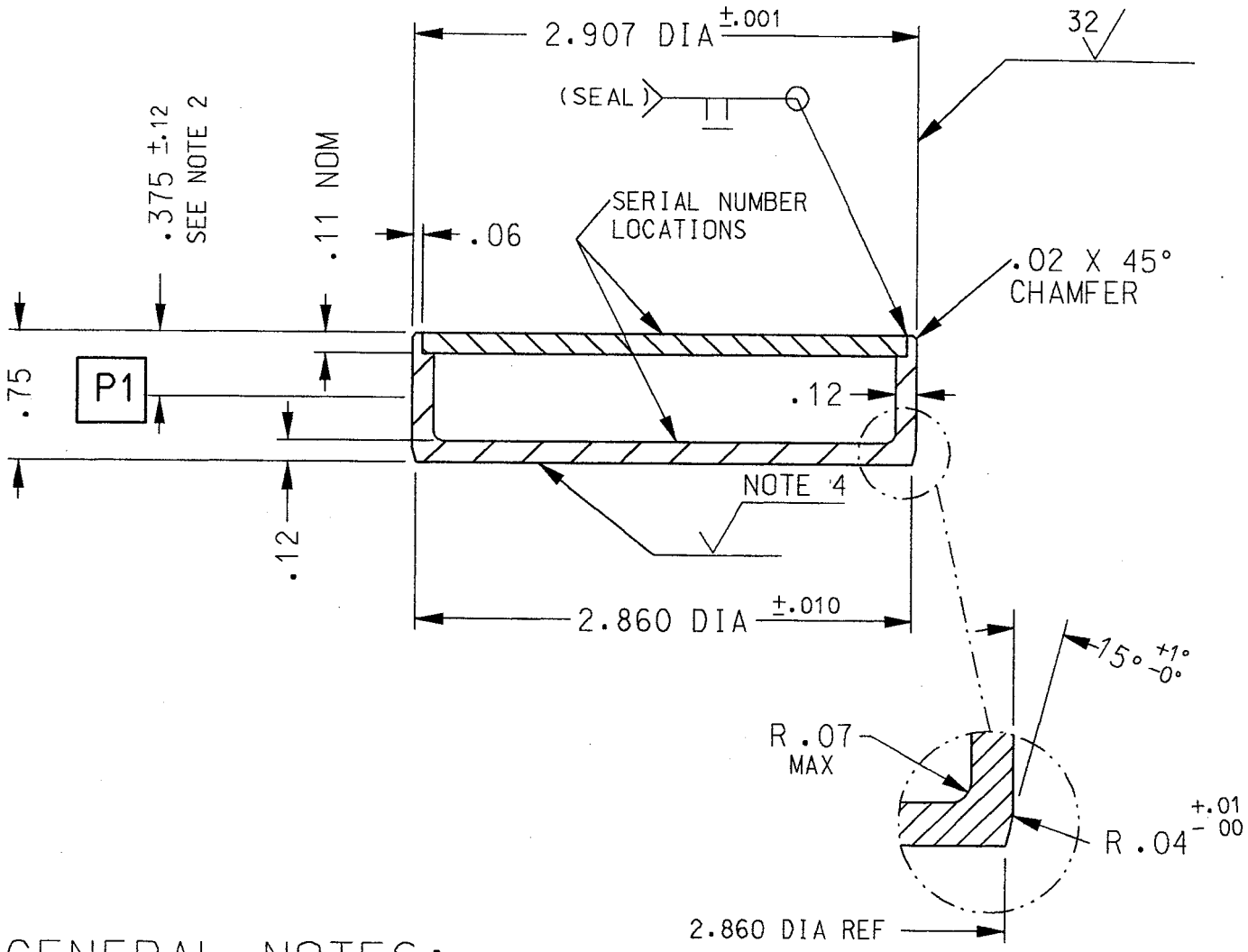


GENERAL NOTES:

1. MATERIAL: 304L SST(EXCEPT SULFUR IN THE RANGE OF 0.015% AND 0.026%).
2. MEASURE AND RECORD BY SERIAL NUMBER (OR BARCODE) THE AVERAGE DIAMETER SIZE AND OUT-OF-ROUNDNESS CONDITION AT P1 AND P2.
3. ENGRAVE CAN SERIAL NUMBER (OR BARCODE) ON OD IN APPROXIMATELY 1/4" HIGH CHARACTERS WITHIN AREA "Y". ENGRAVING TO BE PARALLEL TO CENTERLINE OF CAN.
4. ANY OUT-OF-ROUNDNESS CONDITION OTHER THAN FULL OVAL OR TRI-LOBED CONDITION IN AREA "X" IS UNACCEPTABLE.

ALL DIMENSIONS ARE IN INCHES. UNLESS OTHERWISE STATED, ALL TWO PLACE DECIMAL DIMENSIONS ARE ± 0.010, AND ALL THREE PLACE DECIMAL DIMENSIONS ARE ± 0.005.

DESIGNED BY		WESTINGHOUSE SAVANNAH RIVER COMPANY	
ENGINEER		WESTINGHOUSE ELECTRIC CORP	SAVANNAH RIVER SITE
DRAWN BY		3" DIA BAGLESS TRANSFER	
REVIEWED BY	DATE	3" DIA X 30" LONG CAN DETAIL	
REVIEWED BY	DATE	DATE 08-17-98 / SCALE NONE / DWG NO / REV	

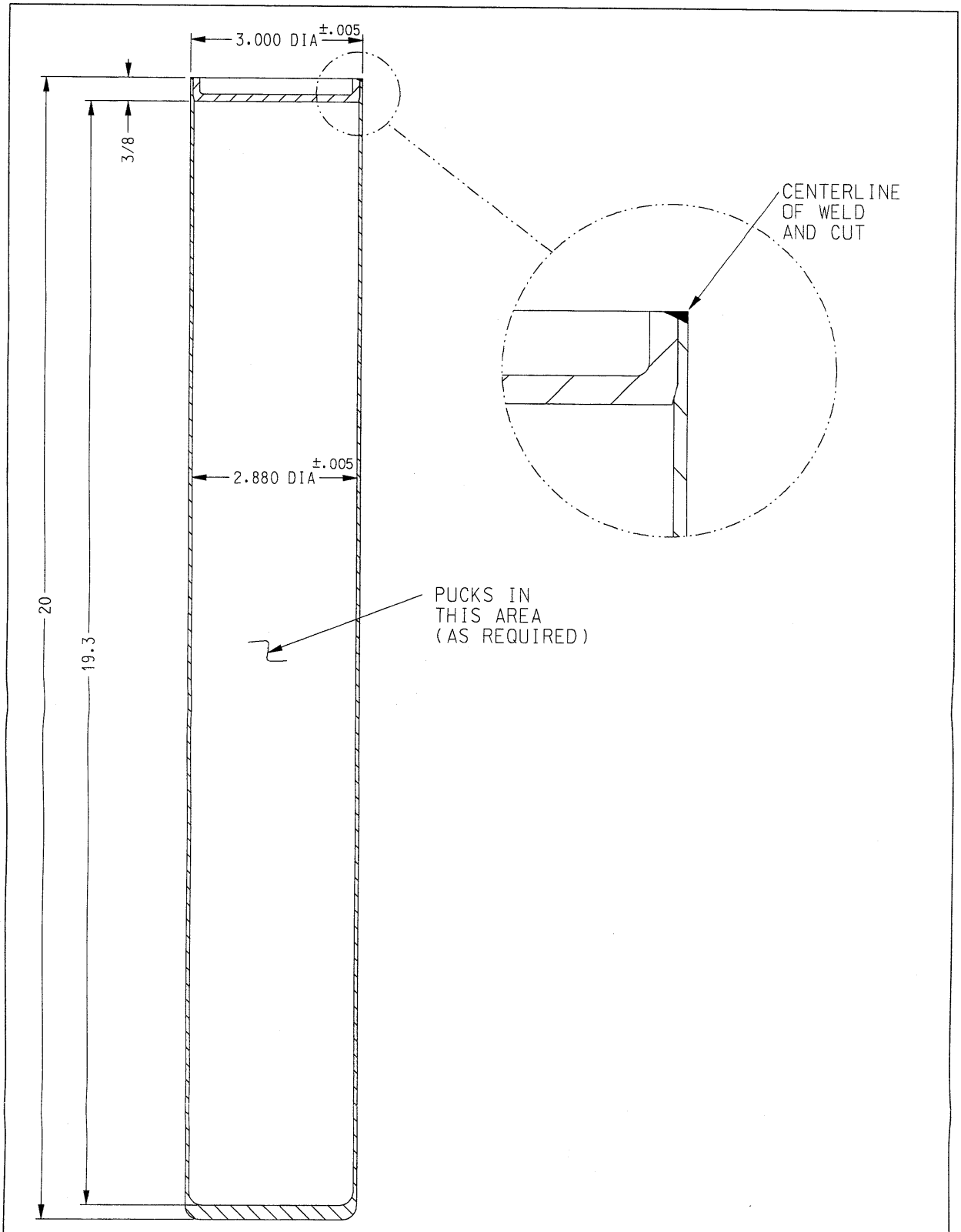


GENERAL NOTES:

1. MATERIAL: 304L SST (EXCEPT SULFUR IN THE RANGE OF 0.015% AND 0.026%).
2. MEASURE AND RECORD BY SERIAL NUMBER OR BARCODE THE AVERAGE DIAMETER SIZE AND OUT-OF-ROUNDNESS CONDITION AT P1.
3. MATERIALS MUST BE CLEAN AND FREE OF OILS INSIDE PRIOR TO WELDING: FINISHED PLUGS MUST BE CLEAN AND FREE OF OILS INSIDE AND OUT PRIOR TO SHIPMENT.
4. SEAL WELD TO BE MADE PRIOR TO MACHINING OUTSIDE DIAMETER.

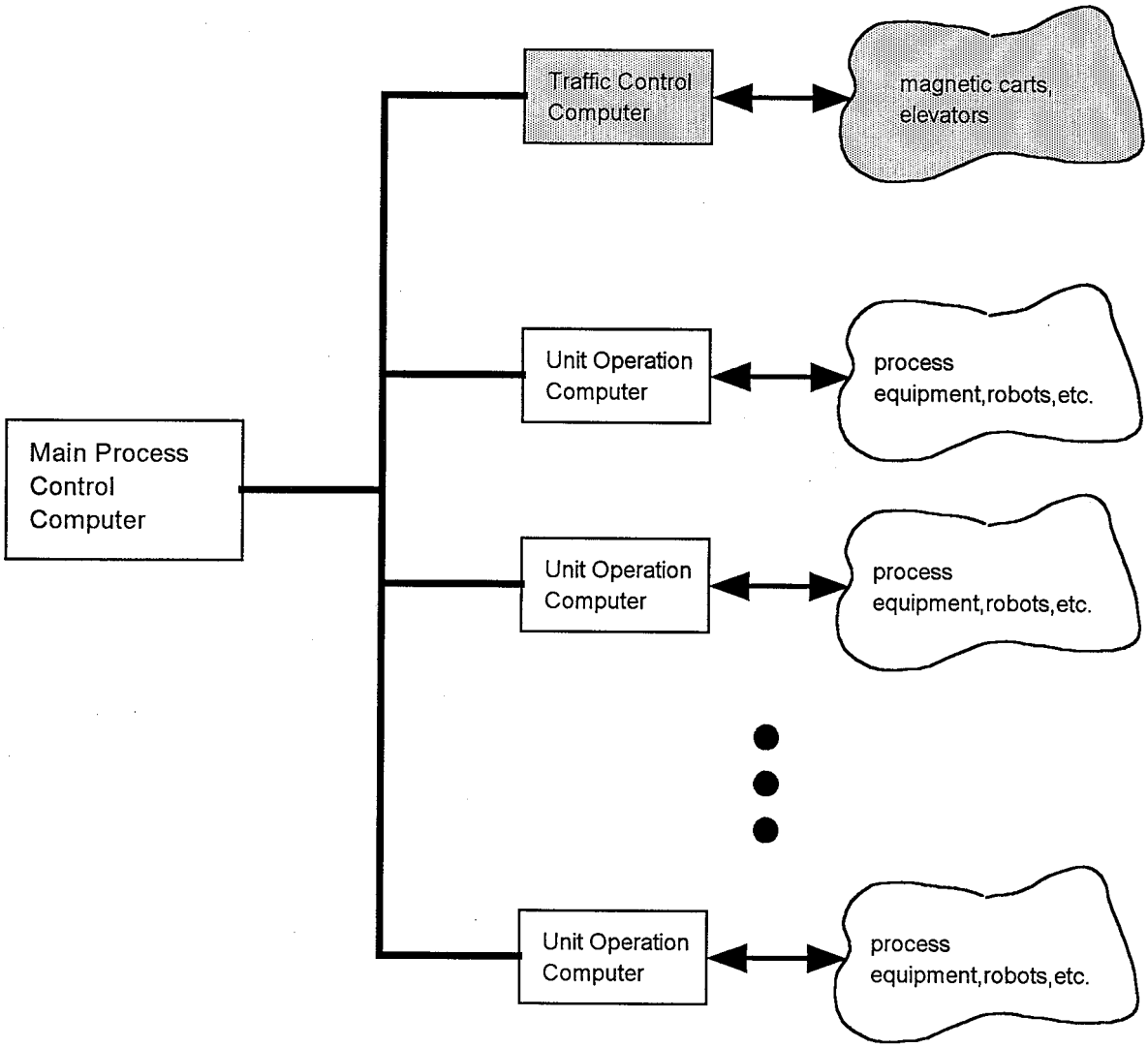
ALL DIMENSIONS ARE IN INCHES.
ALL TWO PLACE DECIMAL DIMENSIONS ARE ± 0.010.

DESIGNED BY		WESTINGHOUSE SAVANNAH RIVER COMPANY
ENGINEER		WESTINGHOUSE ELECTRIC CORP / SAVANNAH RIVER SITE
DRAWN BY		3" DIA BAGLESS TRANSFER
REVIEWED BY	DATE	WELDED HOLLOW PLUG
REVIEWED BY	DATE	DATE 08-17-98 / SCALE NONE / DWG NO / REV



DESIGNED BY		WESTINGHOUSE SAVANNAH RIVER COMPANY		
ENGINEER		WESTINGHOUSE ELECTRIC CORP	SAVANNAH RIVER SITE	
DRAWN BY		3" DIA BAGLESS TRANSFER		
REVIEWED BY	DATE			
REVIEWED BY	DATE	SEALED CAN DETAIL		
		DATE 08-17-98	SCALE NONE	DWG NO / REV

Attachment 13 - PLutonium Immobilization Facility Process Control Concept



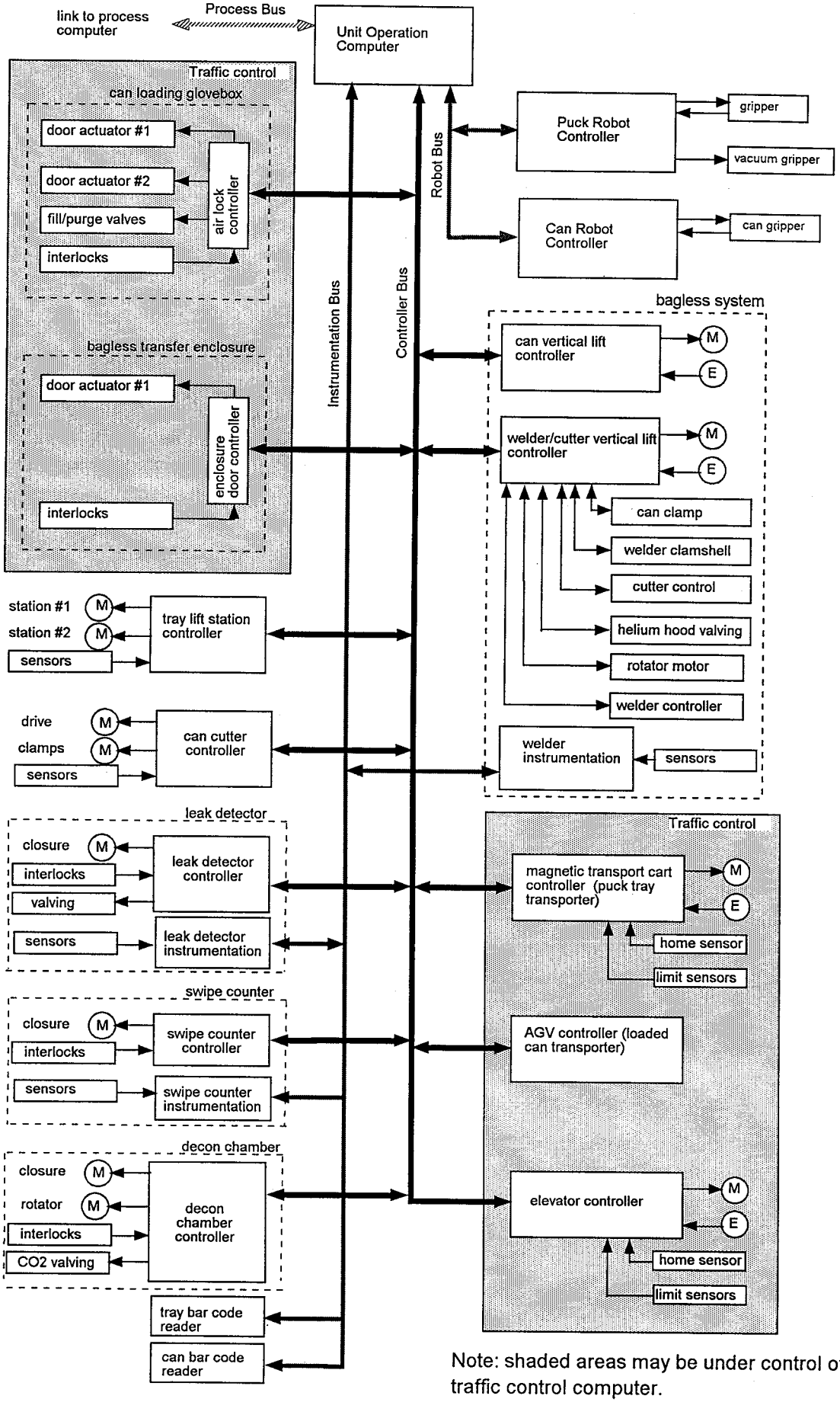
Process Control Computer Functions:

- o product tracking database
- o coordinate unit operations
- o report generation
- o accountability

Unit Operations Computer:

- o can loading operation
- o can-in-canister operation
- o NDA operation
- o press/furnace operation

Attachment 14 - Can Loading Control System Concept



Note: shaded areas may be under control of traffic control computer.

Attachment 15 - Vendor Catalogs

Item	Potential Vendor
Can Loading Glovebox	Walker Stainless Equipment Co. *
Magnetically Coupled Tray Elevator	Custom EES Design
Magnetically Coupled Transport Cart	Custom EES Design
Tray Staging System	Custom EES Design
Puck Robot	Motionex, Inc. *
Helium Hood	Custom EES Design
Puck Lifting Tool	Custom EES Design
Failed Can Cutter	Tri-Tool Inc. *
Bagless Transfer Enclosure	Walker Stainless Equipment Co. *
Can Welder	Arc Machines Inc. *
Can Cutter	Tri-Tool Inc. *
Can Holder	Custom EES Design
Can Robot	Reis Robotics *
Helium Leak Detector Chamber	Custom EES Design
Helium Detector (Mass Spectrometer)	Varian Associates *
Swipe System	EES, Eberline, Ludlum, & Technical Associates *
Can Decontamination System	Modified Commercial
Magnetic Coupled Transport Cart	Custom EES Design
Can and Swipe AGV	Panasonic *
Control System	Modified Commercial

* Vendor information included

WALKER STAINLESS EQUIPMENT

- CAN LOADING GLOVEBOX
- BAGLESS TRANSFE ENCLOSURE

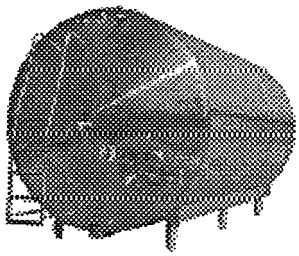
A CARLISLE COMPANY

625 STATE STREET
NEW LISBON, WI 53950

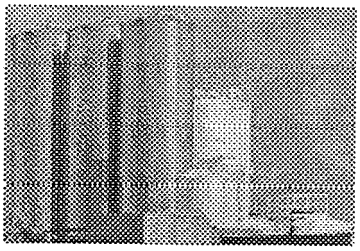
WWW.WALKERSTAINLESS.COM

800-419-3005

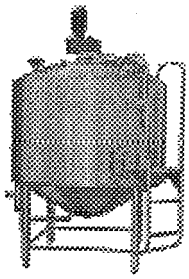
SERVING THE DAIRY, FOOD, BEVERAGE AND PHARMACEUTICAL INDUSTRIES FOR OVER 50 YEARS



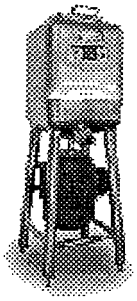
Horizontal Tanks



Silo Tanks



Processing Tanks

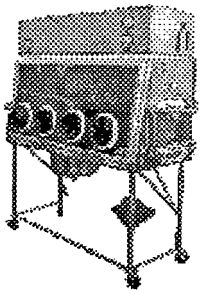


Liqui - Mixers

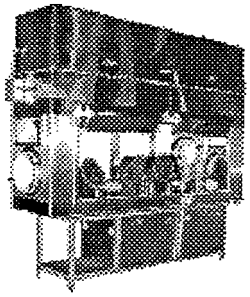
STATIONARY PRODUC

Stationary Products Group specializes in the engineering, design, fabrication, sales and se of processing and storage equip

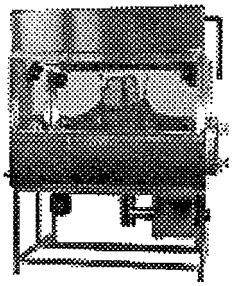
For more complete product information, please visit **SPG**.



Containment Systems



Aseptic Processing



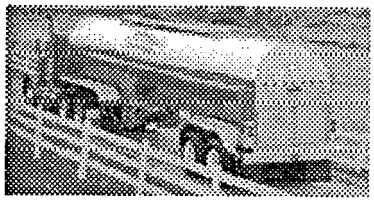
Lab Testing Systems

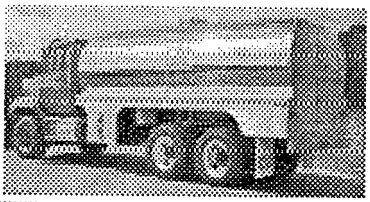
BARRIER TECHNOLOG

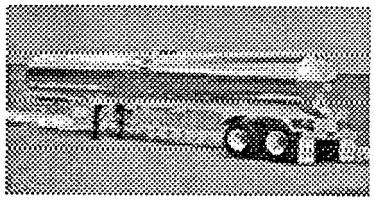
Barrier Technology Group desig and fabricates sophisticated, hig quality barrier equipment for th Pharmaceutical, Biotechnology, Chemical and Nuclear Industrie

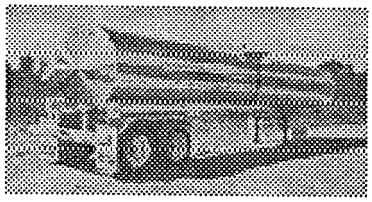
For more complete product information, please visit **BTG**.

GLOVEBOX & ENCLOSURE









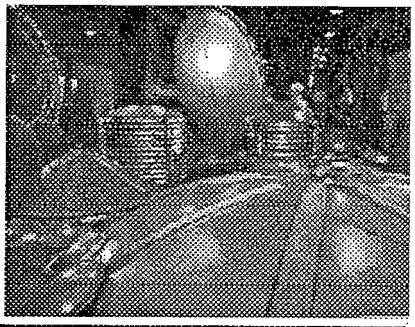
Transport Tanks

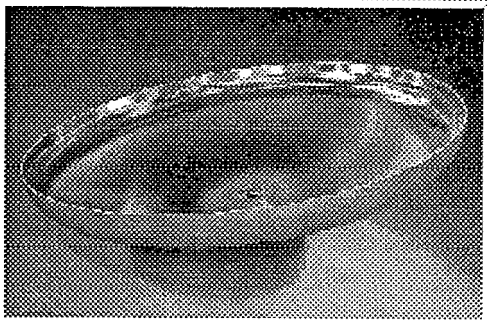
Bulk Pickup Tanks

TRANSPORTATION

Transportation Group offers tru mounted and trailerized transportation tanks in standard customized designs. The Walke nameplate is worth more...when buy, use or trade.

For more complete product information, please visit **TRAN**





STAINLESS STEEL COMPONENTS

Stainless Steel Components Gro fabricates and supplies a wide variety of tank heads in various shapes, sizes, thickness' and fini that meet industry standards suc ASME, 3A, USDA and DOT.

For more complete product information, please visit **SSCG**.

GLOVEBOX + ENCLOSURE

WALKER

A CARLISLE COMPANY

Barrier Technology Group Products

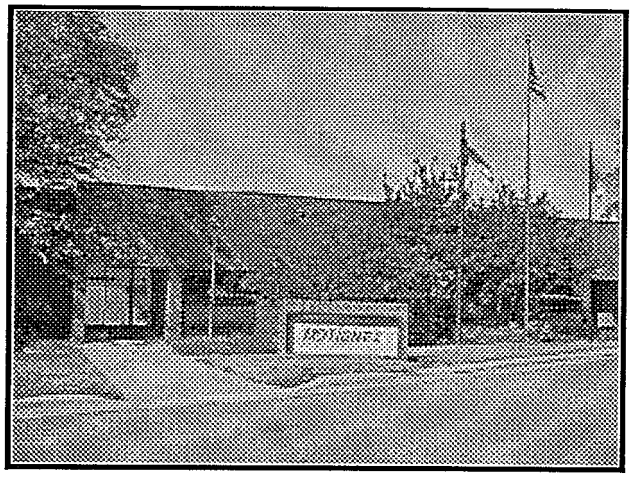
Products from Walker's Containment Systems, Aseptic Processing and Lab Testing Systems are all designed and fabricated in our New Lisbon, Wisconsin facility. Available features include:

- 304 Stainless Steel Framework
- 316L Stainless Steel Enclosure and Product Contact Surfaces
- Stainless Steel Valving
- Laminated Safety Glass or Polycarbonate Viewing Windows
- All Welds Free of Cracks and Crevices, Ground Smooth and Polished to <= 35 RA Finish
- Internal Surfaces are Polished to a #4 Sanitary Finish (<= 25 RA Finish)
- Chemical Resistant Gasketing
- Chemical Resistant Half-Suits, Sleeves and Gloves
- Glove Change Schemes for Both Sterile and Containment Applications
- Airtight Access Doors
- RTP Flanges in a Variety of Sizes
- 99.99% Efficient HEPA Filters for Particles of 0.3 Microns
- Minimum Air Exchange Rate of 60-80 Air Changes/Hour
- Automated VHP Sterilization
- Chemical Indicator Testing
- Positive or Negative Pressure Systems
- Unidirectional (Laminar) or Non Directional Air Flow
- Environmental Control (RH, O_2)
- Exterior Mounted Lighting
- Microprocessor or PLC Controlled Blower System, High/Low Pressure Set Points, Visual & Audible Alarm Systems, Etc.
- Connections for H_2O_2 and Chlorine Dioxide Vapor Sterilization
- Electrical, Pneumatic or Manual Lifting Systems to Raise/Lower Enclosure Height
- Interfaces with Steam Sterilizers, Lyophilizers, Ovens, Incubators, Tanks, Bins, Etc.
- Enclosure of Machinery (Liquid & Powder Filling Machines, Tablet Presses, Mills, Sifters, Etc.)

Contact Information

For further information, please contact BTG Sales at:

Telephone
USA - 800-356-5734 Ext. 292
Int'l - 608-562-3151 Ext. 292
FAX
USA and Int'l - 608-562-5956
Postal address
625 State Street, New Lisbon, WI 53950 USA
Electronic mail
General Information: btgsales@walker.carlisle.com



Motionex, Inc.

P.O. Box 241429

6010 Kenley Lane (28217)

Charlotte, NC 28224-1429

PUCK ROBOT SYSTEM.

For Application Engineering, Order Placement, or Customer Service Call:

800/476-4450 Toll free from within the U.S.A.
704/523-2222
704/523-6500 FAX
motionex@motionex.com E-mail

Download a map to Motionex-Charlotte

[Return to Home Page] [Request Litertature]

Puck Robot

Motionex Line Card

[Request Literature] [Request Quotation] [Return to Home Page] [Contact Motionex]

Quick Reference

Stepper Motors, Servo Motors, Drives, Controls & Accessories

[Quick Reference] [Home Page] [Request Literature]

Parker Compumotor (Additional information about Compumotor)

- Microstepping Motors, Drives, Controls for both single and multiple axis applications
- Brushless Servo Motors, Drives, Controls for both single and multiple axis applications
- OEM Components for high volume servo and stepper applications
- Visit Compumotor's Home Page

Parker Digiplan

- Microstepping Motors, Drives, Controls for single axis applications
- Rack Mount Stepper and Servo Systems

American Precision Industries (API)

- Microstepping Motors, Drives, Controls for both single and multiple axis applications
- Brushless Servo Motors, Drives, Controls for both single and multiple axis applications
- OEM Components for high volume stepper applications
- Visit API's Home Page

Reliance Electro-Craft

- Brushless Servo Motors, Drives, Controls for single axis applications
- Brushed Servo Motors, Drives, Controls for single axis applications

Emerson EMC (Additional Information on Emerson)

- Brushless Servo Motors, Drives, Controls for single and multiple axis applications
- Application Specific Program Modules for simple programming
- Visit Emerson's Home Page

PICK ROBOT

Industrial Devices Corporation

- Stepper Motors, Drives, Controls for single and dual axis applications
- Servo Motors, Drives, Controls for single axis applications
- DC Motors, Drives, Controls for single axis application
- Planetary and Spur Precision Gearheads for high efficiency low backlash applications
- Mechanical Actuators
- Visit IDC's Home Page

Galil Motion Control

- Single and Multi-Axis Stepper and Servo Controllers
- Stand-alone, PC (ISA) Bus, PC/104 Bus, VME Bus, and STD Bus based controllers
- MS Windows-based Tuning and Programming Software
- Visual Basic Tool Kit, CAD-To-Motion Software, G-Code Translator

Empire Magnetics (RADIATION HARDEND MOTORS)

- Stepper, Servo, and AC Motors for Harsh Environments
- Gearboxes for Harsh Environments
- Visit Empire Magnetics' Home Page

Ormec

- High Performance Multi-axis Servo and Machine Controller Systems
- System Programming and Integration Services
- Visit Ormec's Home Page

Trilogy

- Linear Servo Motors
- 15 to 1000 lbs. force
- Accelerations up to 15 g's
- Visit Trilogy's Home Page

Bayside Controls Inc. (Additional Information on Bayside)

- Precision Planetary and Spur Gearheads for high torque, low backlash, and high efficiency applications
- Custom Gearheads with quick delivery
- Washdown and Vacuum Rated Gearheads
- Visit Bayside's Home Page

Mechanical Positioning Equipment and Components

[Quick Reference] [Home Page] [Request Literature]

Parker Daedal (Additional Information on Daedal)

- Single and Multiple Axes Positioning Systems
- Acme Screw, Ball Screw, and Belt Drive Systems

PUCK ROBOT

- Rotary Tables
- Custom Positioning Systems
- Manual Positioning Stages and Micrometer Stages
- Visit Daedal's Home Page

Parker Hauser

- Custom High Speed Linear Positioners
- Custom High Speed Gantry Positioning Systems
- Long Travel, High Payload Capacity Positioners
- Modular Design
- Special Vertical Belt Drive Positioners
- Infinite Stroke Length External Drive Units

Parker AAD

- ISO Size Rod Type Electric Cylinders
- Electro-Mechanical Acme and Ball Screw Drive Assemblies
- High Thrust and High Speed Performance
- Stepper and Servo Drive Systems

Parker ParFrame

- Aluminum Extrusion Sturctural Frame Work Components
- Custom Enclosures, Machines Guards, and Frameworks
- Modular Building Components

LinTech

- Single and Multiple Axes Positioning Systems
- Acme Screw, Ball Screw, and Belt Drive Systems
- Rotary Tables
- Custom Positioning Systems
- Visit Lintech's Home Page

Thomson Micron

- True Precision Planetary Gearheads
- In-Line, Right Angle, and Standard NEMA sizes
- Low Backlash, High Efficiency
- Visit Micron's Home Page

Industrial Devices Corporation (IDC)

- Rod and Rodless Electric Cylinders
- Stepper, Servo, and DC Motors, Drives, and Controls
- Spur and Planetary Gearheads
- Visit IDC's Home Page

Ball Screws & Actuators

- Ball Screws, Ball Nuts, Bearings, and Accessories
- Acme Screws, Plastic Nuts, Bronze Nuts, Bearings, and Accessories

Pick Robot

- Complete Ball Screw Assemblies with screw, nut, rails, and motor mounts
- System Capabilities

IKO

- Large Selection of Square Rails
- Superior Quality and Quick Delivery
- Drop-in Replacements for Competitive Lines

Micro Slides

- Precision Motorized Linear Stages
- X, X-Y, Rotary, and Open Frame Systems
- Cross Roller Bearing Design
- One Micron Linear Accuracy
- Visit Micro Slide's Home Page

Simplex UNILIFT

- Worm Gear Actuators
- High Thrust and Load Capacities, from 0.5 to 100 tons
- Verticle Lift Applications
- Ball and Leadscrew Drive Assemblies

Dover Instruments

- Precision Air Bearing Stages
- X and X-Y systems
- 300 mm Wafer Applications
- Visit Dover's Home Page

Zero-Max

- Servo Class Couplings
- Zero Backlash, Flexible Couplings
- Visit Zero-Max' Home Page

Photoelectric & Laser Sensors, PLC's, Feedback Transducers, Linear and Rotary Encoders

---

[Quick Reference] [Home Page] [Request Literature]

Aromat/NAIS/Matsushita

- Photoelectric Sensors and Switches
- Fiber Optic Photoelectric Sensors and Switches
- Analog Laser Displacment Sensors
- Programmable Logic Controllers (PLC's) Micro PLC's and Rackmount Models
- Green Power Motor Contactors and Starters
- Timers and Counters

Puck Robot

- OEM Relays and Limit Switches
- Visit Aromat's Home Page

SUNX (Additional information on Sunx)

- Photoelectric Sensors and Switches
- Fiber Optic Photoelectric Sensors and Switches
- Hight Speed Fiber Optic Sensors
- Laser Thru Beam Analog Sensors
- Ultraviolet Sensors
- Ultrasonic Sensors
- Digital Pressure and Vacuum Sensors
- Image Sensors
- Visit Sunx' Home Page

Takikawa Engineering

- Non-contact, High Accuracy Laser Thru-beam Micrometers
- Sub-micron Resolution, One Micron Accuracy
- Scanning Units Range in Size from 1 to 300 mm beam widths
- Outside Diameter Control, Surface Variation Detectors, and Surface Defect Detectors

Keyence Corporation

- Photoelectric Sensors and Switches
- Fiber Optic Sensors and Switches
- Laser Fiber Optic Switches
- Micro Programmable Logic Controllers (PLC's)
- Laser Gauging and Displacement Sensors

Danaher Controls

- Dynapar, Veeder-Root, Eagle Signal
- Absolute and Incremental Rotary Encoders
- Electronic & Mechanical Totalizers and Counters
- Programmable Preset and Batch Counters
- Electronic Timers
- Proximity Sensors and Relays
- Visit Danaher's Home Page

Sony Precision Technology

- Linear Encoders and Linear Feedback Transducers
- Digital Gauging Probes (Additional information on probes)
- Single and Multiple Axis Displays
- Rotary Encoders
- Visit Sony Precision Technology's Home Page

MTS Temposonics

- Linear Feedback Transducers
- Linear Potentiometer Replacements
- Analog and Digital Outputs

Puck Robot

- Displays, Programmable Limit Switches, and Custom Transducers
- Visit Temposonics' Home Page

Dynamic Research Corporation (DRC)

- Incremental Rotary Optical Encoders
- Incremental Linear Optical Encoders
- Absolute Rotary Optical Encoders
- Touch Probes

Heidenhain

- Incremental Rotary Optical Encoders
- Incremental Rotary Optical Encoders
- Touch Probes
- Digital Readouts

Safety Light Curtains, Safety Interlock Switches, Safety Mats, and Profiling Scanners

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[Quick Reference] [Home Page] [Request Literature]

STI; Scientific Technologies Inc.

- Safety Light Curtains
- Safety Mats
- Palm Switches
- Safety Interlock Switches
- Optical Scanners
- Photoelectric Scanners
- Wireless Communication Links
- Visit STI's Home Page

Industrial Computers, Man-Machine Interfaces, Operator Interfaces

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[Quick Reference] [Home Page] [Request Literature]

Xycom Industrial Computers. (Additional information on Xycom)

- 19" Rack or Panel Mount Industrial Computers and Monitors for Harsh Environments
- Operator Interface Workstations with drivers for all PLC's
- NEMA 4/12 Workstations (CRT and Flat Panel)
- NEMA 4/12 Workstations with Touchscreen (CRT and Flat Panel)
- Visit Xycom's Home Page

Texas Microsystems, Inc.

- 19" Rack-mount or Bench-top Industrial Computers for Harsh Environments

PUCK ROBOT

- Choice of Passive Backplane Computer Chassis with up to 20 ISA Slots
- Single Board Computer Cards Based on 80386, 80486, or Pentium Processors
- PCI Based 486 and Pentium Systems
- Rack-mount Monitors

MiTac Industrial Computers

- Industrial Computers for Harsh Environments
- 19" Rack-mount or Bench-top Passive Backplane Computer Chassis with up to 14 ISA Slots
- Small Footprint "Shoebox" Passive Backplane Computer Chassis with up to 14 ISA Slots
- Single Board Computer Cards Based on 80386, 80486, or Pentium Processors
- PCI Based Chassis and Pentium CPU Card
- NEMA 4/12 Rack Mount Monitors

Aluma Industrial Computers

- Low Cost 19" Rack-mount Industrial Computers
- Systems Based on 80386, 80486, or Pentium Processors, PCI or VL-Bus
- Industrial Pointing Devices and Keyboards
- Rack Mount Monitors
- Flat Panel Monitors
- Monitors with Touchscreen
- Rack-mount Keyboards
- Rack-mount UPS
- Removable Hard Disk Drive Kits

Fieldworks, Inc.

- Lightweight, Ruggedized Mobile Laptop Industrial Computers
- 6 Half-size (or 3 full-size) ISA Expansion Slots
- Optional Integral CD-ROM
- Magnesium Alloy "Spaceframe" Chassis
- Sealed Mouse Pad Input Device
- Type 2.0 PCMCIA Slot
- Dual-scan Color Display (Optional TFT)
- Visit Fieldworks' Home Page

Eason Technology, Inc.

- Intelligent Operator Interfaces with Digital and Analog I/O, PLC interfaces, MS-Windows based Programming Software
- Operator Interface for Compumotor Controllers (replicates RP-240)
- PLC Interface with MS-Windows based Icon Programming Software works with most PLC's
- All Interfaces Include NEMA 4 Rugged Cast Front Housing, Bright High Contrast CCF Backlit Display, 28 Large Full Travel Keys
- Visit Eason's Home Page

Burr-Brown Intelligent Instrumentation Inc.

- Low Cost Operator Interfaces w/wo Bar Code Reader Inputs (Micro Terminals)
- Network Node Operator Terminals (LanPoint)
- Time and Attendance Terminals (TimePoint)
- PC Expansion Bus and Chassis

Soft PLC, Soft HMI, Data Aquisition and Process Control Software

Puck Robot

[Quick Reference] [Home Page] [Request Literature]

Steeplechase

- Visual Logic Controller (Soft PLC)
- Deterministic Real-Time Control
- Continues machine control even in the event of hard disk failure or Windows crash
- Visual Flow Chart or Ladder Logic Programming
- Integrated HMI Graphical Operator Interface Development Software
- Integrated Real-Time Simulation Capability
- Supports most I/O and data networks
- Visit Steeplechase's Home Page

USDATA FactoryLink ECS (Additional Information about USDATA)

- HMI (Human Machine Interface), SCADA, and MES development software
- Mulitplatform support including Windows NT, Windows 95, UNIX, etc.
- New easy to use development environment
- Visit USData's Home Page

Intelligent Instrumentation Inc.

- Visual Designer- Windows-based Graphical Application Generator for PC-based Data Acquisition
- Data Acquisition Boards in ISA, EISA, Micro Channel, Mac II NuBus, PCMCIA, and Parallel Port Form Factors
- Analog Input Boards
- Digital I/O Boards
- Multifunction Boards with Digital and Analog I/O
- Signal Conditioning and Termination Products
- Lifetime Warranty on Hardware

Industrial High Speed Bar Code Scanners

[Quick Reference] [Home Page] [Request Literature]

Microscan

- High Speed Fixed Mount Bar Code Scanners for Industrial Applications
- Moving Raster Scanners
- Moving Beam Scanners
- Fixed Beam Scanners
- Visit Microscan's Home Page

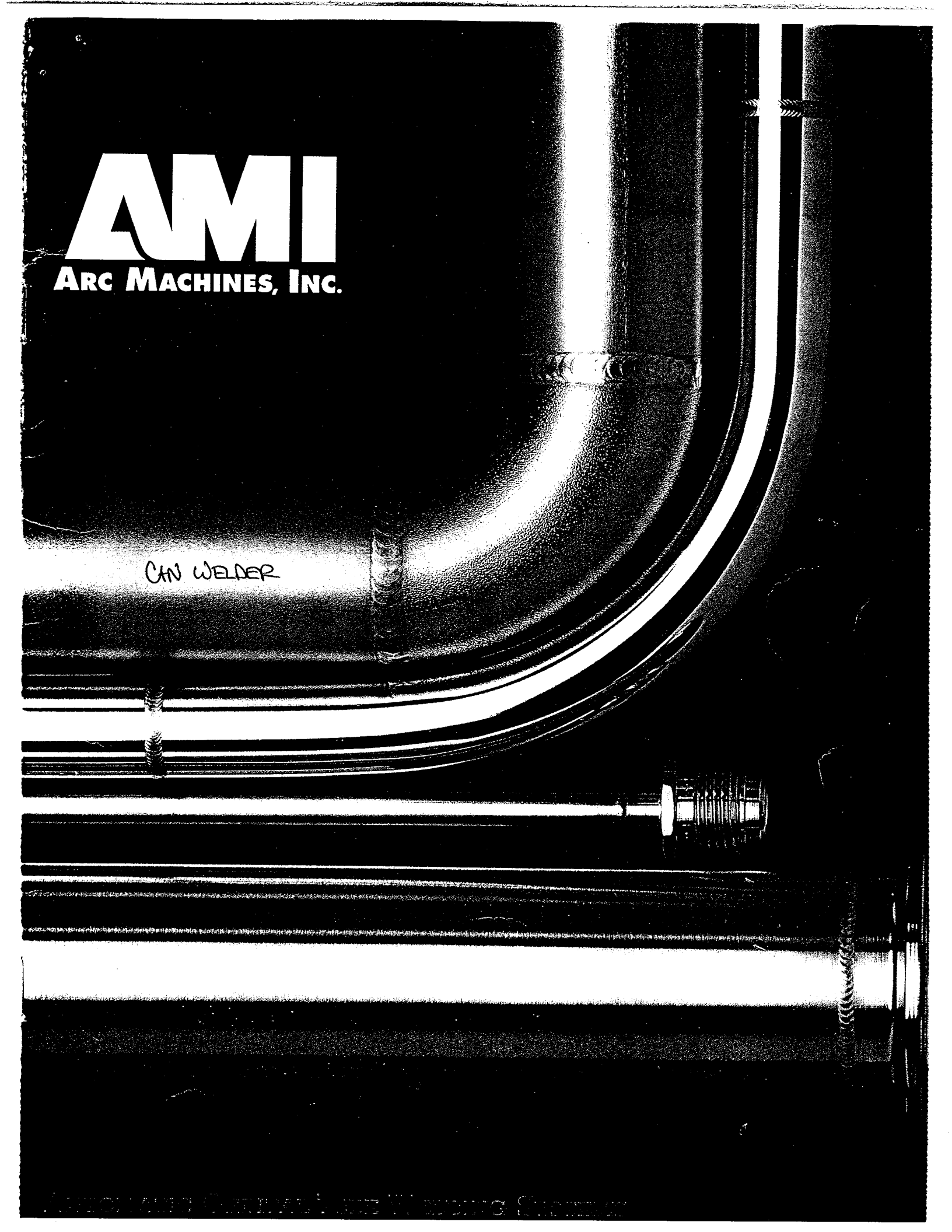
LazerData

- Fixed Mount and Hand Held Bar Code Scanners for Industrial Applications
- Omidirectional Scanners
- Raster Scanners
- Airline Baggage Sortation Scanners
- Automatic Vehicle Indentification Scanners

Tri Tool Inc.
3806 Security Park Drive
Rancho Cordova, CA 95742-6990
916-351-0144

Failed Can Cutter and Can Cutter

Low Profile Clamshell, Model 606SB
Electric Drive Kit for 600SB Clamshell, P/N 0500123
Chipless Sever Module, Model 600SB-CSM, version TT-3106


AMI
ARC MACHINES, INC.
CAN WELDER

Arc Machines, Inc.

TUBE WELD HEADS

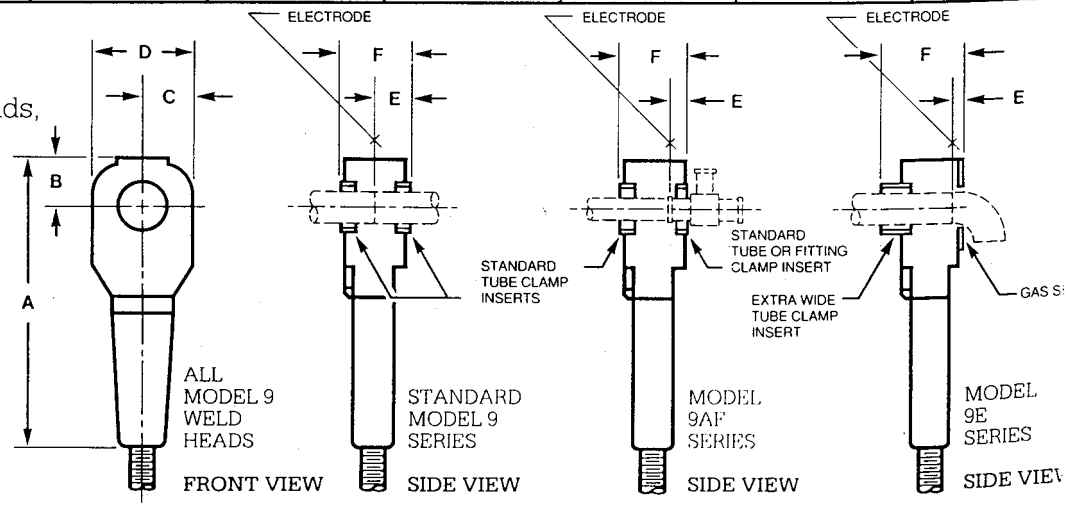
MODEL 9 SERIES

CAN WELDER

WELD HEAD MODEL NO.	TUBE/PIPE O.D. RANGE	DIMENSIONS					
		A	B	C	D	E*	F
9-500	.125"-.500" 3.2-12.7mm	9.60" 243.8mm	.96" 24.4mm	1.29" 32.7mm	2.58" 65.5mm	.25" 6.35mm	.480" 12.2mm
9AF-750	.125"-.750" 3.2-19.0mm	11.29"	1.19"	1.38"	2.75"	.70" 17.8mm	1.40" 35.5mm
9AFM-750	.125"-.625"					.25"	1.29"
9E-750	3.2-16.0mm	286.7mm	30.2mm			6.3mm	32.7mm
9AF-900	.125"-.840" 3.2-21.3mm	11.38" 289.0mm	1.28" 32.5mm	35.0mm	69.8mm	.81"/1.12" 20.6/28.4mm	2.12"/2.25" 53.8/57.1mm
9-1500	.250"-1.500" 6.3-38.1mm	12.97"	1.88"	2.00"	4.00"	1.41" 35.8mm	2.81" 71.4mm
9AF-1500	.250"-1.000" 6.3-25.4mm					.85"/.96" 21.6/24.4mm	2.72" 69.1mm
9E-1500	.250"-1.315" 6.3-33.4mm	329.4mm	47.7mm	50.8mm	101.6mm	.37" 9.4mm	3.375" 85.7mm
9-2500	.750"-2.500" 19.0-63.5mm	15.75"	2.62"	2.88"	5.75"	1.72" 43.7mm	3.44" 87.4mm
9AF-2500	.750"-2.000" 19.0-50.8mm					1.00" 25.4mm	3.38" 85.8mm
9E-2500	.750"-2.375" 19.0-60.3mm	400.0mm	66.5mm	73.1mm	146.0mm	.37" 9.4mm	4.47" 113.5mm
9-3500	1.000"-3.500" 25.4-88.9mm	16.75"	3.12"	3.63"	7.25"	1.72" 43.7mm	3.44" 87.4mm
9E-3500	1.000"-3.250" 25.4-82.5mm	425.4mm	79.2mm	92.2mm	184.1mm	.37" 9.4mm	4.75" 120.6mm
9-4500	1.500"-4.500" 38.1-114.3mm	19.00"	4.25"	4.50"	9.00"	2.00" 50.8mm	4.00" 101.6mm
9E-4500	1.500"-4.000" 38.1-101.6mm					.37"	5.02"
9ER-4500	1.500"-4.500" 38.1-114.3mm	482.6mm	107.9mm	114.3mm	228.6mm	9.4mm	127.5mm
9-7500	2.875"-7.500" 73.0-190.5mm	21.94"	5.68"	6.12"	12.25"	2.16" 54.8mm	4.32" 109.7mm
9E-7500	2.875"-6.625" 73.0-168.3mm	557.3mm	144.3mm	155.4mm	311.1mm	.53" 13.4mm	5.22" 132.6mm

*Consult Arc Machines, Inc. for alternate 'E' dimension weld heads, or additional specifications.

Specifications subject to change without notice.



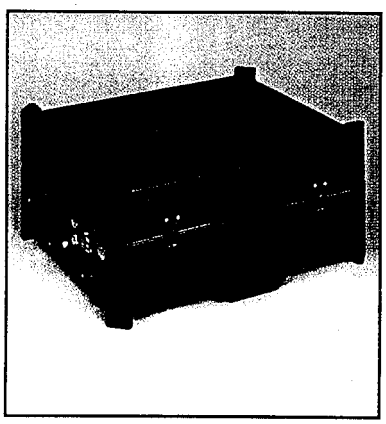
CAN WELDER

ARC MACHINES, INC. MODEL 207

MICROPROCESSOR CONTROLLED POWER SUPPLY

The Arc Machines, Inc. Model 207 is a 100 / 150 amp pre-programmed / programmable power supply and controller capable of welding tubing and thin wall pipe. Welds produced by this machine meet or exceed the specifications required by industries as diverse as: semiconductor, food, dairy, pharmaceutical, aerospace, heat exchanger and nuclear.

Up to 100 different welding schedules may be stored in its memory for rapid access. High-integrity, sanitary welds are easily reproduced at the touch of a button.



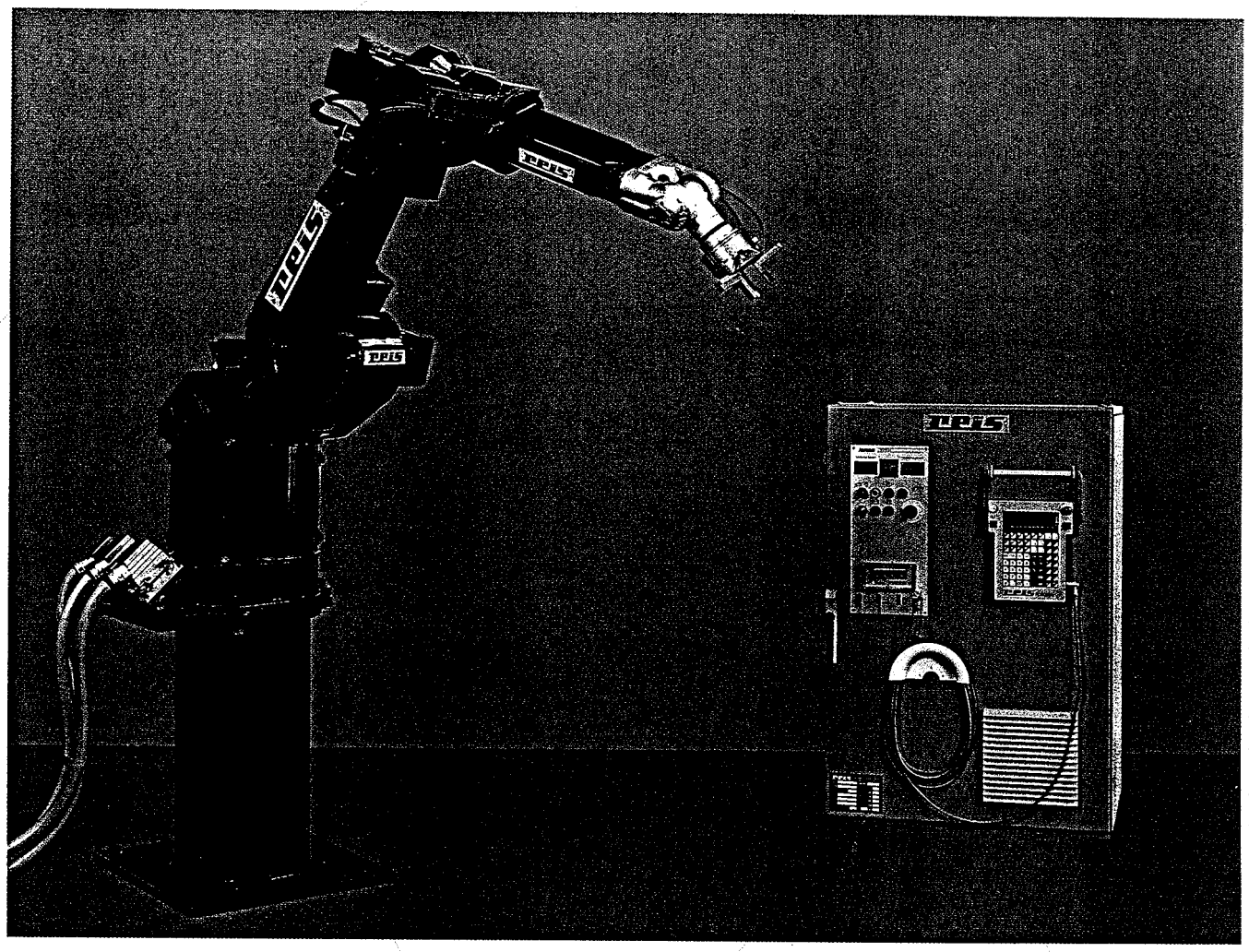
Some of the many features and benefits of the Model 207 include:

- Ease of operation. Standard software prompts the operator in English, French, German, Norwegian, Swedish and Japanese. Spanish is pending.
- Key switch locks out unauthorized personnel.
- Weld program transfer capability for multiple-system job sites.
- Control panel features soft-touch membrane switches, which are dust / moisture proof and accepted for cleanroom use.
- Compatible with all Arc Machines' orbital fusion weld heads (such as the Model 9 or 96) as well as a fixtured machine torch or a manual torch for hand welding.
- Operates on any voltage from 100 to 240 VAC, single phase, 50 / 60 Hz.
- Optional remote operator's pendant allows welding function overrides and gives the operator access to any four predetermined welding schedules up to 100 feet from the Model 207.
- Only microprocessor-controlled power supply of its kind with a two year warranty.

CAN ROBOT

Reis Robots and Systems

With acknowledged competence and experience we solve your automation tasks completely. Leading technology - future-oriented and flexible.



A new dimension in technology and price.

There are excellent reasons to choose Reis:

Leading robot, control and systems technology

Turnkey solutions ready for operation, all made by one source

Low-cost, comprehensive service for the life of the product

Security for the future with REIS' intensive research and development

Great experience in all important industrial areas

First-class references due to durable quality

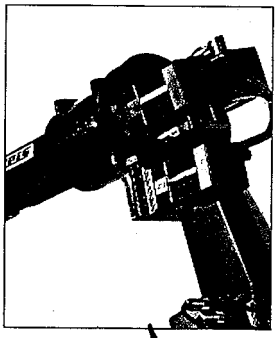
A wide variety of robots offer the optimum solution to any automation requirement

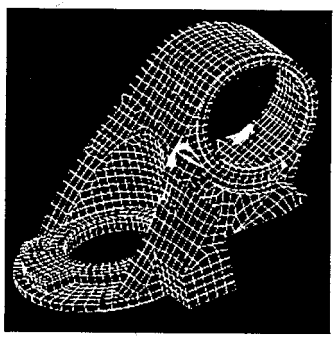
reis

Reis Robots: Advantages due to performance and ease of use

High-quality machine construction, heavy duty controller, precise sensorics and easy programming assure quality and highest uptime.

CAN ROBOT





Advantages:

- **FEM-optimized modular design**
- **High rigidity**
- **AC servo drives**
- **All axes equipped with brakes**
- **Easy to service, exchange of components within minutes**
- **Absolute resolver position measuring system**
- **Enclosed drives**

		RV6	RV6L	RV16
Velocities	A1-A3	140°/s	140°/s	140°/s
	A4,A5	270°/s	270°/s	270°/s
	A6	400°/s	400°/s	270°/s
Max. payload		6 kg	6 kg	16 kg
Additional load on axis 3		10 kg	10 kg	10 kg
Operating range in mm	A	715	715	715
	B	1960	2160	1970
	C	1735	1935	1735
	D	222	422	232
	E	785	903	712
	F	1525	1725	1535
	G	3050	3450	3070
	H	3470	3870	3470
Motion range	A1:	330°	330°	330°
	A2:	165°	155°	155°
	A3:	270°	270°	270°
	A4:	360°	360°	360°
	A5:	246°	246°	246°
	A6:	720°	720°	720°
Repeatability	+/-	0,05 mm	0,05 mm	0,05 mm
Connected load		2,2 KVA	3,7 KVA	3,8 KVA
Weight (w/o controller)		200 kg	230 kg	230 kg

REIS-ROBOTstar IV:

Important control functions:

- **Automatic program adaptation**
- **Error-tolerant path measuring system**
- **Programmable control behavior**
- **Multi axes' transformation**
- **Workpiece interpolation**
- **Arc sensor**
- **Automatic tool center point measurement**
- **Process Data Acquisition**
- **Online parameter optimization**
- **Online position correction**
- **Online speed correction**

and many other important functions

Hardware configuration:

- Modular multi-processor system with VME-bus
- Expandable processing capacity

Controllable axes: 6 up to 18 max.
Storage capacity: 128 kB up to 2 MB/ 1600 to 8000 space points
Battery-backed memory

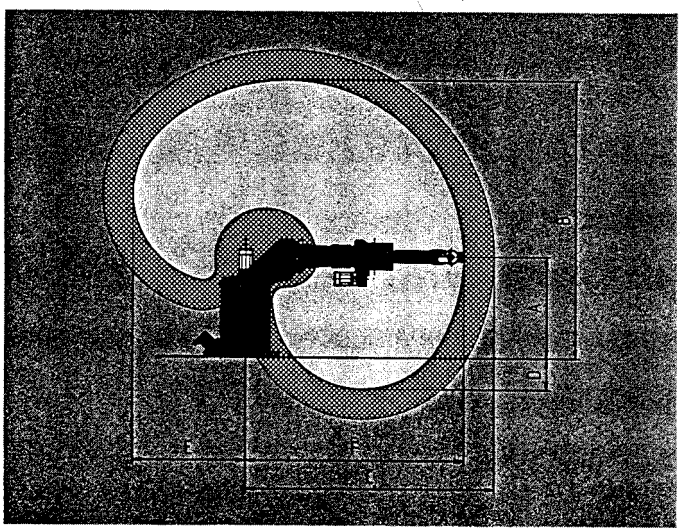
Interfaces:
Digital inputs/outputs: 16 up to max. of 96
Analog inputs/outputs:
expandable up to 4 resp. 8
Serial interfaces: RS232/RS422
Sensor interfaces: for laser scanners, vision systems, analog sensors and search sensors

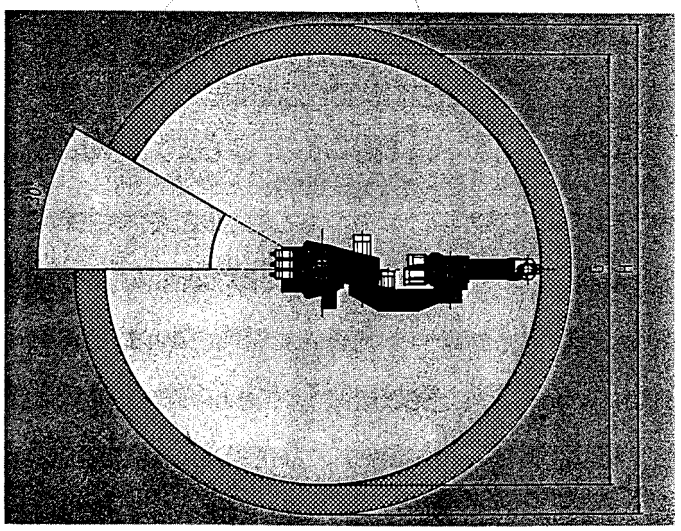
Storage:
3.5" disk, DNC-computer, Offline PC
Optional printer interface

Movements:
PTP (point-to-point):
Distance-synchronized axis interpolation
CP-linear/circular:
Straight-line and circular interpolation with selectable mode of continous correction of the tool orientation
CP-operation with additional axes' transformation for up to 18 axes

Programming:
Teach-in coordinate systems: Controllable via movement keys or joystick: axis coordinates, cartesian world, tool and rotary table coordinates.

Programming method:
Interactive teaching with portable teach pendant, numeric input, offline programming at a PC using CAD-data (optional), graphical offline programming and simulation with ROBCAD.





Work envelope with gripper length 300.

Subject to change without notice.

OUR NEW AREA CODE IS
847
EFFECTIVE: 1-20-96

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1320 HOLMES RD.

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BOB VANZIC

HELIUM DETECTOR
(MASS SPEC)

varian

vacuum products

1-800-882-7426

installation, operation, and maintenance instructions

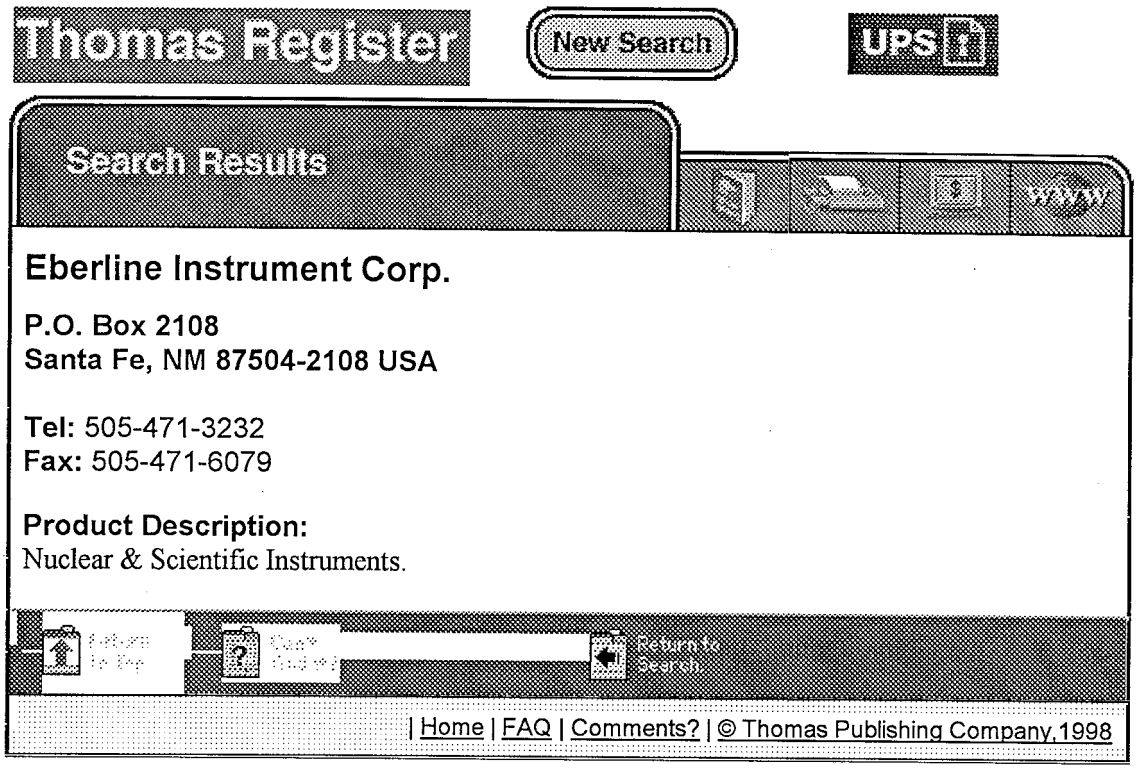
947/948 AUTO-TEST LEAK DETECTOR

MANUAL NO: 6999-09-700F

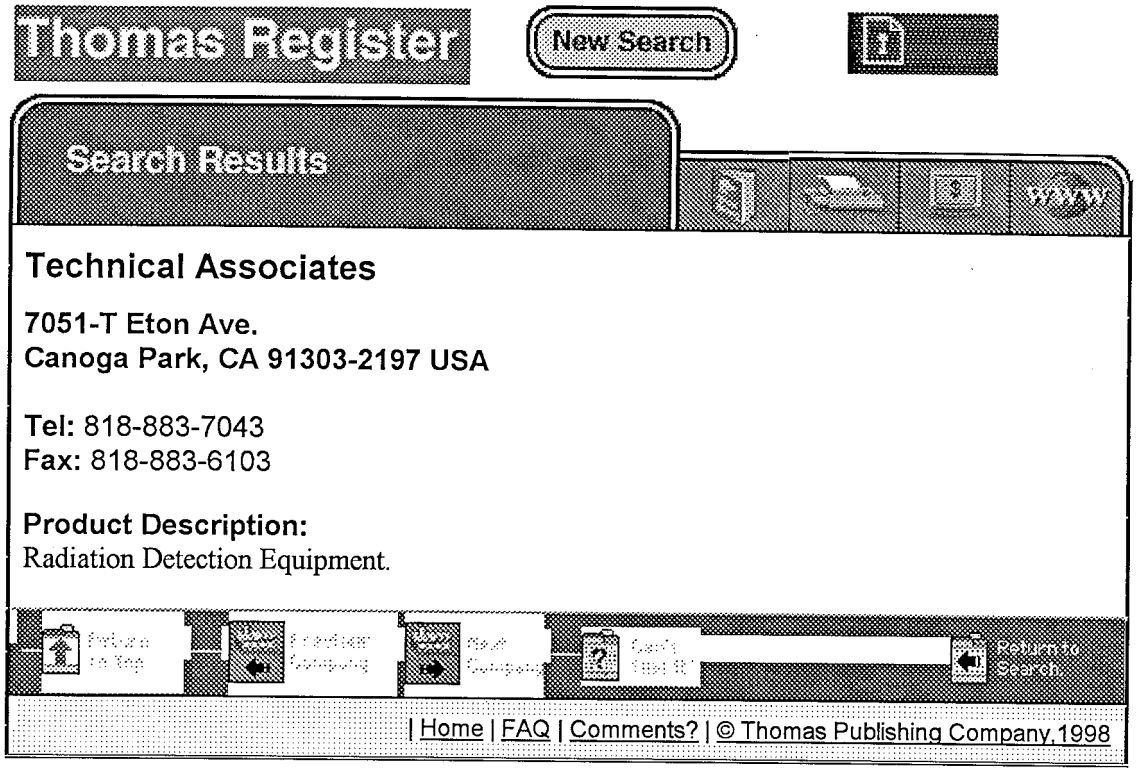
ISSUED: JULY 1985

CHANGED: MARCH 1987

varian/vacuum products/121 hartwell avenue/lexington/massachusetts 02173/(617) 861-7200



ALPHA DETECTOR, MODEL RD-14



BETA + GAMMA DETECTOR,

MODEL LS6

COUNTER (FOR EITHER DETECTOR), MODEL 1000

Panasonic

Automatic Guided Vehicle

'97 Catalogue
TI-622-0697

CAN AND SWIPE TRANSPORTER

Panawagon *S Series*

FW-C50S/C55S/C60S/C65S

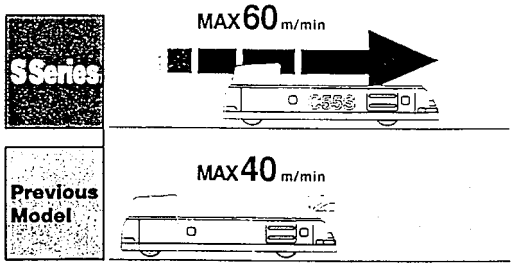
CAN TRANSPORTER

Basic Features Smooth and efficient operation.

Quicker

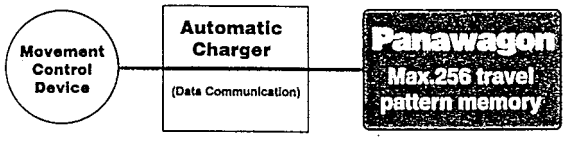
Rated Speed 60m/min.

The new S Series is significantly quicker than the previous model, and has variable speed settings. This type of flexibility allows for lower overall material handling costs.



256 Travel Patterns

A maximum of 256 travel patterns can be stored in Panawagon's internal memory. The movement control device makes travel management convenient and easy.



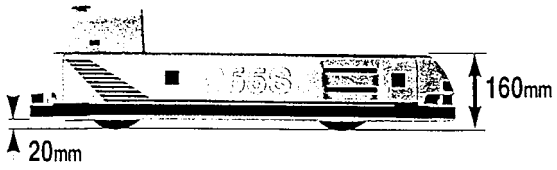
Improved Work Environment

Quieter Operation

Noise levels have been reduced 30%.

Compact Design

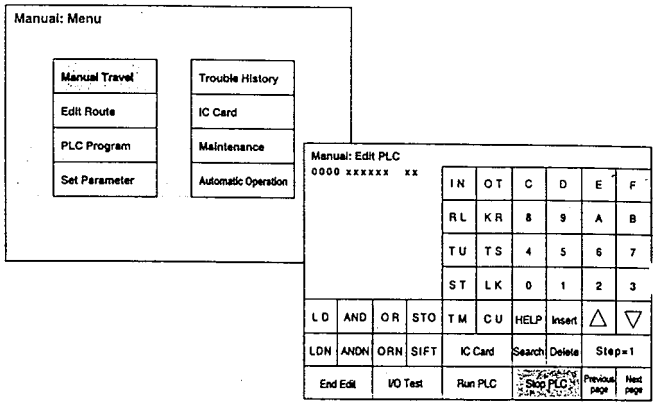
The rational design allows Panawagon to be used even in non-manufacturing environments, such as hospitals and offices.



User Friendly

Graphic Control Panel (GCP) FW-UG01

Optimizes system integration time and maintenance, such as input and modification of program, and conducting functional tests of Panawagon.



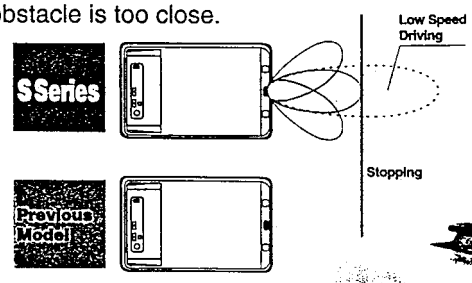
Common Sequence Language Input

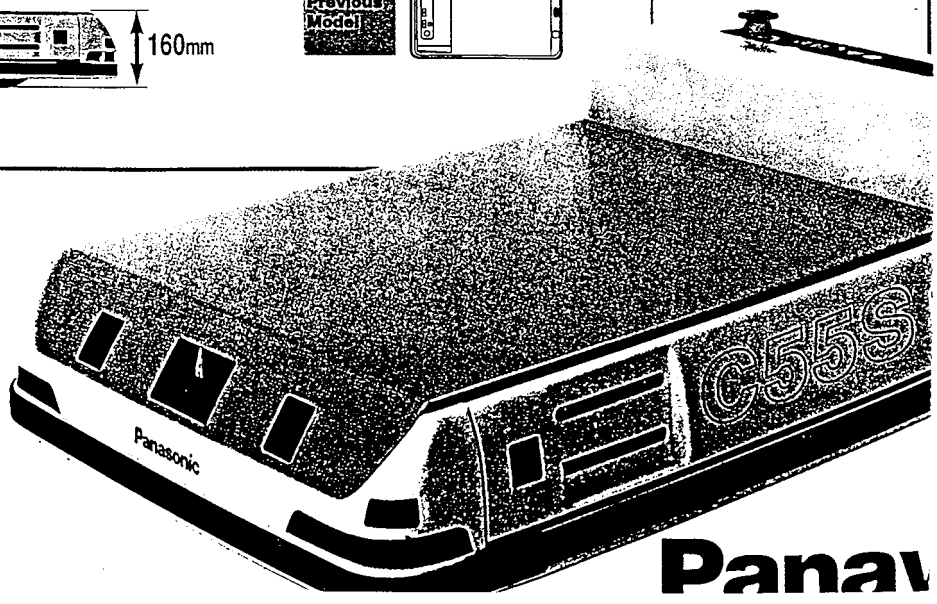
PLC programs are easily input.

Reliable Safety

Dual distance approach detection sensor

When detecting obstacles, Panawagon first slows down upon approach, and then stops when the obstacle is too close.





Panav

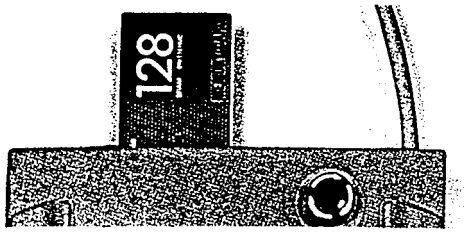
AUTO CHANGE AGV $38K CAN TRANSPORTER

Optional Features For even more system flexibility

[IC Card] FW-UG02

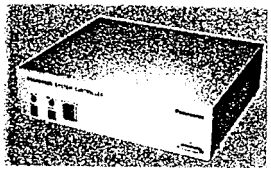
$430

Insert the IC card into the GCP to save PLC programs, traveling data and movement control.



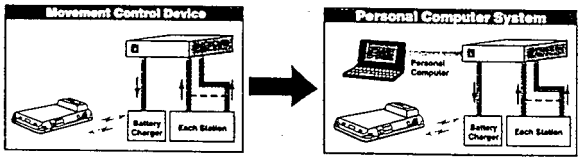
[Movement Control Device]
FW-Y100 Series

Controls Panawagon allocation and charging. Capable of accepting a maximum of 32 station transport requisitions per device. A maximum of 256 patterns of requirements are available by adding the optional expansion unit.



[Personal Computer System]
FW-X101 Series

Connection between personal computer and movement control device makes possible high-level and multiple requirements, such as traveling history, etc.



[Support Software]
FW-X301 Series

Allows easy creation, modification and printing of traveling data, when connected to personal computer*.

* For applicable type of personal computer, please contact our sales office.

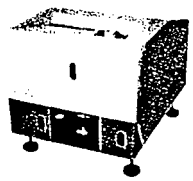
Peripheral Options

Simplified Controller
(Optical Communication Unit)
Receives transport requisition from each station and allocates Panawagon accordingly. Appropriate for control of Panawagon with external battery charging.

NM-5841 NM-5841C

Automatic Battery Charger
Charges Panawagon automatically in a short time, allowing 24-hour operation.

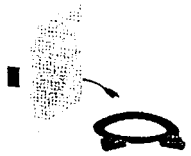
FW-B241 (24V)



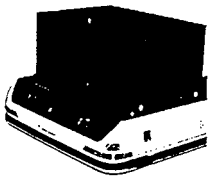
Optical Communication Unit (SIO)
$4K

Connects to personal computer with RS-232C, which can indicate travel data from the controlling personal computer and transmit all information back to the personal computer.

NM-5845



External Battery Mount
Enables Panawagon to carry large-capacity battery. Continuous traveling time is about 8-hour per charge.



Optical I/O Unit (PIO)
Parallel I/O unit to exchange control signals between Panawagon and conveyor station or automatic door, etc. Can make the peripheral equipment more efficient.

NM-5846A
With cable

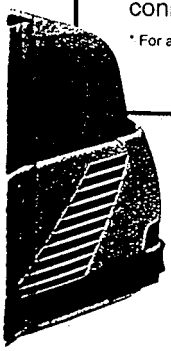
Blocking Controller
Helps prevent trouble, such as collision of Panawagon with automatic doors or traversing single lines.

PIO box is required.

NM-5848A/B
Master

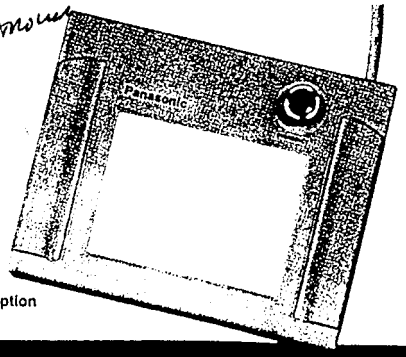
PIO box
Optical PIO unit and box casing.

NM-5844
Slave



FW-U603E COMMANDER 4K

TOTAL COST W/ SIO, COMMANDER $45K



Option

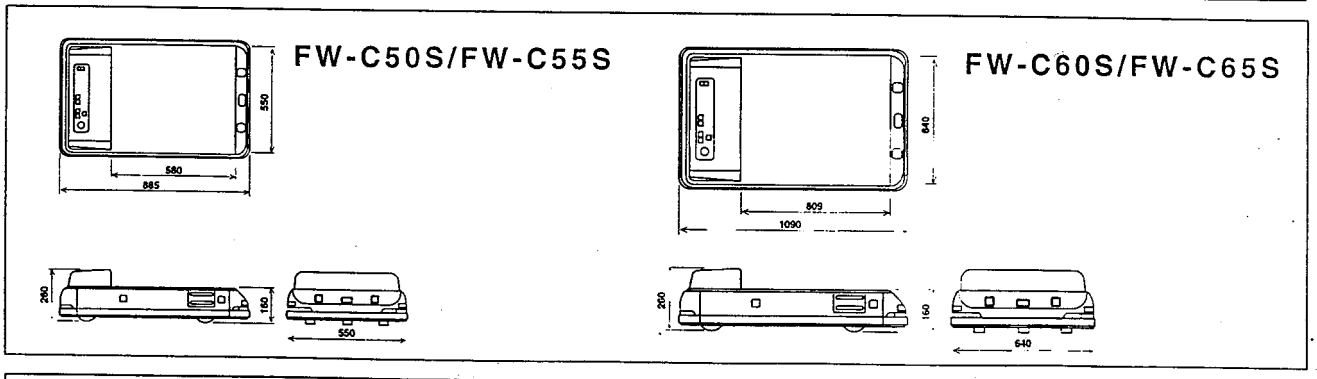
BATT. CHARGER

lagon S Series Graphic Control Panel (GCP)

Specifications

CAN TRANSPORTER

	FW-C50S	FW-C55S	FW-C60S	FW-C65S
Rated power supply	Battery : DC24V (using 2 batteries FW-BAT17), Automatic charger system : (Mounted charger system is optional.)			
Rated load capacity	1000N (227Lb.) : Including conveyor weight (In case of adding conveyor, etc., load capacity is reduced by its weight.)			
Vehicle weight	600N (138Lb.)	635N (144Lb.)	6715N (162Lb.)	715N (162Lb.)
Gross vehicle weight	1600N (364Lb.)	1600N (364Lb.)	1715N (389Lb.)	1715N (389Lb.)
Guidance system	Optical guidance (Magnetic guidance system is optional.) : Use traveling tapes specified by manufacturer.(Aluminum or stainless)			
Drive method	Front wheel drive			
Steering method				
Front wheel steering	●	●	●	●
Rear 2 wheel steering (spin turn/sliding)	—	●	—	●
Traveling type				
Forward/Divergence	●	●	●	●
Spin turn/Slide	—	●	—	●
Backward (Optional)	—	●	—	●
Rated speed	60m/min. (Variable, Low/Mid/High speed 6~60m/min., can be selected. Direct selection of speed is also available.)			
Min. turning radius	400mm	400mm	600mm	600mm
Safety device	Approach detection device (for person/object) Approach detection device (In case of meeting another Panawagon on the same line.) Contact bumper Emergency stop button Warning device (melody in traveling/alarm in warning) Direction indicator (blinker)			
Control system	Address recognition : Marked tape count up system No. of traveling routes : 256 patterns (total 8000 marks)			
Sequence (PLC) functions	Input : 16 points, Output : 12 points (Expansion by input 8 points and Output 4 points are optionally available.) Program : Reduced type of Panadac 7000, In case of using GCP (optional), programming with Max. 2000 steps available. Memory : RAM (battery back up), IC card (inserted into GCP : optional)			
Communication	Fixed point, optical communication method			
Operating environment	32°~104°F (0°~40°C) (Interior, non-condensing and non-freezing)			
Dimensions :	885 (L) x 550 (W) x 260 (H) (transfer height 160mm)		1090 (L) x 640 (W) x 260 (H)	



34"L X 22"W X 10"H

⚠ For your own safety, please read and follow operating instructions carefully.

Panasonic

Specifications and descriptions in this catalog are subject to change without notice.

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(06) 949-6727

AGV PRODUCTS, INC.

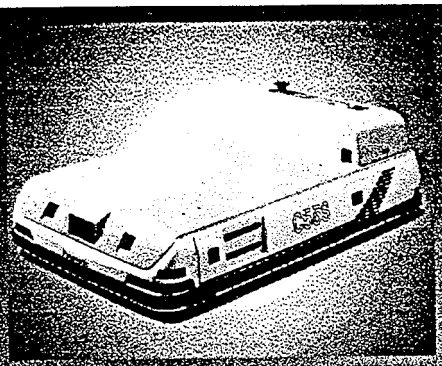
8000 Tower Point Drive • Charlotte, NC 282
Telephone (704) 845-1110 • FAX (704) 845-1

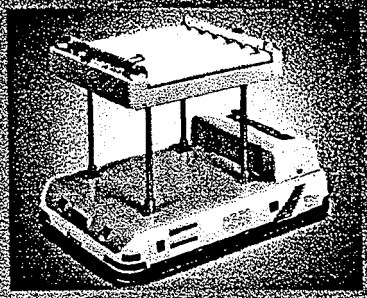
CAN TRANSPORTER

Introducing the

Panasonic Panawagon

The New Generation J Series Panawagon is a Powerful, Compact, and User Friendly AGV to Ensure Smooth and Effective Operation.





C55 with Conveyor Deck

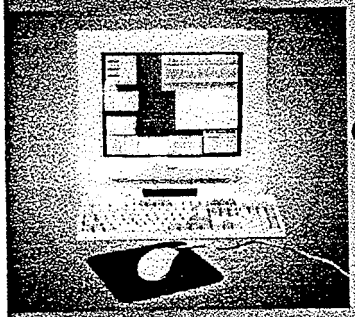
Highly Mobile Four DirectionalTravel Capability

Flexible 24 Hour Available with Automatic Charging

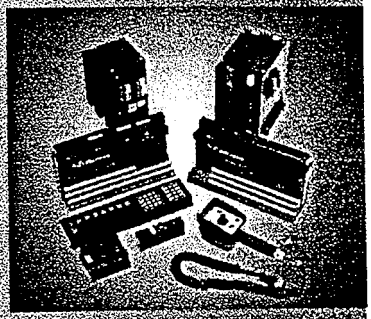
User Friendly *Touch Screen Control Panel*

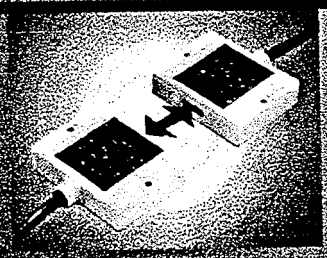
Compact *100kg (220lbs.) Capacity*

AGV Products, Inc. carries a complete line of state-of-the-art AGV control components.



Our AGV control software, TRACE, is a comprehensive real-time AGV system controller which runs on any PC compatible computer under Windows NT™ and uses a SQL compliant database.



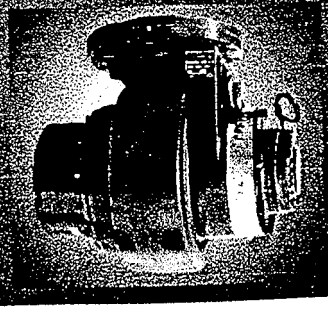


Factory Automation Devices

Look to AGV Products for the latest in sophisticated Infrared Communication Devices, Collision Sensors, ID Systems, and Precision Measuring Devices from HOKUYO.

DC Motor Drives

AGV Products is the exclusive North American Distributor of METALROTA integrated DC motors, gear reducers, and wheels. Over 30 different models are available with [illegible] to 26,000lbs and speeds to 10 miles/hour. [illegible] mounting packages also available.



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