Equipping a Manlift with a ZENA mobile welding system

Engine direct belt drive or hydraulic drive?

Factories have been installing our welders on new lifts for a number of years and, during the same period, manlift owners have been retrofitting both hydraulic and belt drive welding systems to existing machines. Both recognize the huge benefits of having a high amp welder built into the lift rather. For example:

- No need for a tow around welder and a separate individual who's sole purpose is to move the welder and adjust the welder's controls.
- One machine to be rented -- with the additional revenue for a welder without the additional expense of ownership and maintenance.
- Better inherent reliability with only one engine to maintain.
- Virtually no vandalism to welding equipment -- equipment is "invisible" to the vandals.

Attempts to simply attach a separate engine driven welders to lifts help to some extent, but leave problems with vandalism, system control, and maintenance in place. Also a welder large enough to be of commercial benefit is quite difficult to so attach.

Likewise, using a shop welder (typically a wire feed unit) which is mounted in the boom area, powered by an AC generator mounted elsewhere on the lift, resolves some problems but leaves others -- vandalism, damage/premature equipment failure due to exposure to the elements, lack of sufficient power for welding, inability to do both stick and wire welding, loss of payload in bucket, etc.

It's easy to see why a powerful ZENA onboard welder makes so much sense.

However, depending on the method of installation chosen, the desired control system, and the quality of the installation, how the welder works and how much routine maintenance may be required to keep the welder running day in a day out in all sorts of weather and all sorts of environmental conditions can be come a big variable.

It usually seems to be less expensive on the front end to simply belt drive the unit from the existing engine. An certainly many more of our welders which are on lifts have been installed this way -- particularly factory installed units. Done right, you have a reliable welder with only the need to occasionally tighten or replace belts. (Use an automatic belt tensioner like our AI RT1001, and belt adjustment goes away and it becomes only a matter of routine belt replacement.) In a factory situation, purchasing multiple parts and installing them the same way on may lifts, it's hard to beat the belt drive version for economy. However, if you are retrofitting to varying equipment or a factory dealing with mid year engine model charges -- it makes sense to look at a hydraulic drive system.

There are a number of welder problems that have been brought to our attention by owners of man lifts factory equipped with ZENA mobile welders. These problems often result from weaknesses inherent in the installation method and/or bracketing components used in these lifts which may combine to cause unforeseen maintenance problems, typically belt and/or wiring related, as service hours build up.

For example, a failure to follow simple bracketing fabrication guidelines in our Operator's Manual can cause such problems. If the strength and/or longevity of materials selected for bracketing and drive components is inadequate for the strains placed upon them by a powerful welding system operating in a high temperature/high vibration less than satisfactory results will

be attained. Such problems do not necessarily prevent or inhibit welding performance, nor do they, in most cases, harm or substantially reduce the service life of the ZENA welding system components. However, they can cause owners to do more preventative maintenance than would be typically required for an identical ZENA welding system, properly installed, for example, on a free standing gas or diesel engine of similar size and power.

If you are a factory building fitting welders to equipment with common features/powerplants, or if you are retrofitting a single lift, for your own use, and you don't mind a bit of fabrication work (and/or possibly having a few parts made at a local machine shop), and can follow instructions carefully, the belt drive system will likely provide you with an excellent welder at the lowest possible cost. However, if you don't fit this criteria, or if you staff has little time for this sort of project we recommend fitting a hydraulically driven system.

Our second generation hydraulic drive welders have been specifically designed for **field retrofit** to, and use in, **all types and brands of hydraulically driven man lifts** -- particularly equipment which will see long term use in rental service and/for remote use construction equipment.

For the past 6 years, ZENA's hydraulic drive welding systems have always provided their owners with an inherently reliable and easy to install welder -- but one that still required some preventive maintenance, even if it was only for a periodic belt change. And, because of the compact closed case design (optimal for open air installation in automotive service vehicle application) component replacement in the field, however infrequent, could be difficult and/or time consuming. Our new hydraulic drive welders are, in this regard, completely different.

For example, assuming operation/installation in a relatively clean and well ventilated location, there is absolutely **no preventive maintenance required for hydraulic drive -- or for welding power generating components**.

- No belts to tighten;
- No pulleys to align;
- No engine specific considerations as to unit location/drive/engine compartment cooling, etc.;
- No brackets to fabricate, adjust or replace;
- Greatly simplified wiring -- less external components, less signal carrying conductors, shielding not required on long leads;
- Built-in troubleshooting diagnostics; etc.

Simply stated, we listened to customers who have been using our welders on commercial construction equipment and came up with a solution that provides the reliability desired with the capability to produce enough arc welding current (as much as 400A DC CONTINUOUSLY!) to satisfy virtually any commercial welding application, whether stick or wire feed -- or even gouging/cutting!

This welding system does not have to be factory installed. It can be retrofitted in a service shop by a competent technicians, following simple wiring/plumbing instructions, with appropriate knowledge of the specific hydraulic systems and wiring on any given piece of equipment.

In these second generation hydraulic drive welders, hydraulic motor to welder generator drive is by means of a sophisticated silent chain drive system, developed by a world leader in power transmission technology, Morse Industries, with **a mean time before failure of over twenty-**

thousand (20,000) hours! And, if it should ever become necessary to upgrade replace or service a welding power generator in the field the task is simply accomplished. For example, the process of removing and replacing the generator takes less than 10 minutes and requires only a small Allen wrench! In fact, a complete hydraulic generator assembly can be removed and/or replaced just about as quickly!

This is a welding system which has been designed to significantly outlive the equipment in which it is installed and to be easy to move to a new lift as the old lift is retired!

Sorry for the long "advertisement", but we are very proud of these welders!

Already own a ZENA system for your lift(s)-- take advantage of our upgrade offer!

We are so sold on the use of these hydraulic drive systems in lifts, that we are offering owners of lifts with mechanical drive ZENA units an upgrade path that allows them to convert their existing equipment into one of ZENA's second generation hydraulically powered 200A or 400A welding systems.

Lift owners with ZENA welders installed who choose to take advantage of this upgrade will be able use their existing ZENA generating and control components in their new hydraulic welders. Further, existing components so used will be factory tested and, if necessary, fully factory reconditioned as part of the upgrade, and the resulting hydraulic welding system will have a 3 year limited parts warranty (identical to that provided with brand new ZENA welding equipment).

Take a look at the following pages for tips to consider for belt drive installations as well as information on hydraulic system installation.

Key points to remember for direct/belt drive installations:

1) In many cases it's necessary to install a custom fabricated drive pulley in front of the existing engine crank pulley. DO NOT have this pulley fabricated from Aluminum. DO NOT use stamped/welded steel pulleys. Machine such pulleys from solid steel.

   Aluminum pulleys once worn even slightly allow significant belt slippage under welding loads (regardless belt tension), increased system vibration (contributing to premature bracket failure), and cause generally poor (and continuously deteriorating) welding performance.

   Also, slight flexing in flimsy pulleys, under load, can contribute to and/or exaggerate belt misalignment.

   It's also critically important that fabricated drive pulleys be properly centered on the crank shaft (measure perimeter with a dial gauge). Improper centering on the crank shaft can result in a noticeably eccentric egg shaped belt path in which belt cords are quickly torn apart by sharply increasing loads as the pulley's outside edge rotates towards and away from the welding generator's drive pulley.

   NOTE: We can provide copies of engine pulleys, if steel pulleys cannot be locally fabricated or are not available from any other. However, for a custom pulley in small quantities (say, 1-10 pcs.) expect individual pulley costs to exceed $200 with typical production lead times of about 2-4 weeks.

   NOTE 2: If copying a pulley (or creating a modified design part), the machine shop should use a carefully crafted drawing for the part(s) involved. And, care should be taken, before machining, to insure that the drawing does in fact represent the correct part(s) for the lift in question.

2) Check engine compartment temperatures in any area in which the generator may be installed prior to installation. If temperatures are high and/or if a good source of cooling air cannot be determined, a high volume electric engine compartment ventilating fan should be installed.

3) Insure adequate strength in all fabricated brackets.

   For example, our minimum recommended thickness for simple bracketing for the SR200.12 generator, in steel, is at least 3/8" for short bracket lengths and 1/2" or greater for longer bracket lengths/components.

   Proper engine to generator brackets MUST be strong enough to prevent ANY significant deflection and/or misalignment of the generator pulley to the engine drive pulley as belts are tensioned and as the welding generator is operated (measure with a dial gauge or other highly precise measurement tool).

   Specifically:

   a. The generator case/pulley centerline MUST remain parallel with the engine's drive pulley/crank shaft centerline for proper operation **without deviation** as belts are tensioned.

   b. Alignment between the V's of the engine's drive pulley and the generator's driven pulley must also be correct and remain correct as belts are tightened and during welder operation.

   c. In each case, individual component misalignment, in any axis, should not exceed a maximum of .005". In areas where multiple points of misalignment occur maximum misalignment, in any axis, should be held to the .005" specification.

4) With adequate bracketing strength insured, consider the installation of a spring loaded belt tensioner (a single tensioner is OK for systems with proper alignment and well matched belts -- twin tensioners allow replacement of one belt without the replacement of both). (Use our Fenner RT1001 or equivalent tensioner capable of providing 30 lb. of tensioning force to slack side of belt.)

   While not mandatory for proper operation, these devices can significantly improve belt life, reduce side loading on bearings, and can reduce belt related maintenance events.

5) Rather than attach welding cables larger than #1 Gauge to the 5/16" output terminals at the rear of the ZENA SR200.12 welding power generator fit, instead, a short length of #1 gauge cable (or 2 parallel lengths of #2 gauge cable) between the rear terminal of the generator and the larger welding cable.

   Cables larger than #1 gauge are relatively inflexible and can cause terminal loosening and/or terminal post damage due to engine vibration or ANY other cable movement which can be transmitted to the terminals due to improperly strain relieved, or too large/stiff cabling.

   Insure that the #1 cable length be sufficient to allow proper strain relief at the generator (cables should curve gently to be rigidly secured with properly sized insulated wire clamps to the generator bracketing before dropping to the bottom of the engine compartment and exit towards the boom.

   NOTE: Routing the welding cables so that they leave the very hot engine compartment area as close as possible to the generator is advisable to prevent unwanted welding power losses due to engine heat increasing cable temperature and, therefore, cable electrical resistance.

6) Regardless wiring size, make sure that your welding cable terminals are made to fit a 5/16" post. Using a terminal with an overlarge hole will cause loosening of the terminal and subsequent terminal arcing and then generator post failure.

Upgrade to a ZENA HW200F or HW400F Hydraulic Drive Welder (simple install, without rewiring):

HW200F and HW400F ZENA hydraulic drive welding power generator assemblies are fully compatible with existing ZENA welder wiring (assuming, in the case of the HW400F, that installed welding cables are proper gauge for this amount of current). Wired components do not have to be removed or relocated. All parts will function properly with the new hydraulic drive power generating unit.

1) Remove the existing SR200.12 generator and return it to the ZENA, Inc. factory for reconfiguration. Old bracketing and drive pulley can be left in place. The electric engine compartment cooling fan can be removed, but we recommend leaving it fully functional to protect other components and wiring installed in (and running through) this area of the lift.
2) If a 400A welding system is being installed, remove the existing WC.12RO control module from the lift and return it to the ZENA, Inc. factory for testing and/or replacement with a standard configuration ZENA WC.12RO welding power control module. Either a WC.12S slave power control module or (if desired by customer) an additional WC.12RO control module will be returned with the HW400F welding power generator assembly.
3) Attach the hydraulic generator assembly to a convenient boom lift location (typically as far as possible from the engine to minimize ambient air temperatures) following one or the other of the enclosed simplified hydraulic diagrams.

   NOTE: Two diagrams are provided. The first diagram, and the simplest, is the one which covers our recommended installation method. Installation of the hydraulic drive generator unit so that its base is **above** the top of the lift's hydraulic fluid reservoir. This the way to go, if at all possible -- simpler, quicker, no extra components required for generator system lubrication, etc.

   The second diagram illustrates what to do if the hydraulic reservoir fluid level above is above the bottom of the mounted hydraulic drive generator. In this case, the installation requires an external oiler pump and small reservoir to handle lubrication of the generator drive components.

3) Reconnect control leads, test, and return the lift to service.

Upgrade to or retrofit of a ZENA HW200F or HW400F Hydraulic Drive Welder (including rewiring/reconfiguration to existing control standard for this sort of equipment):

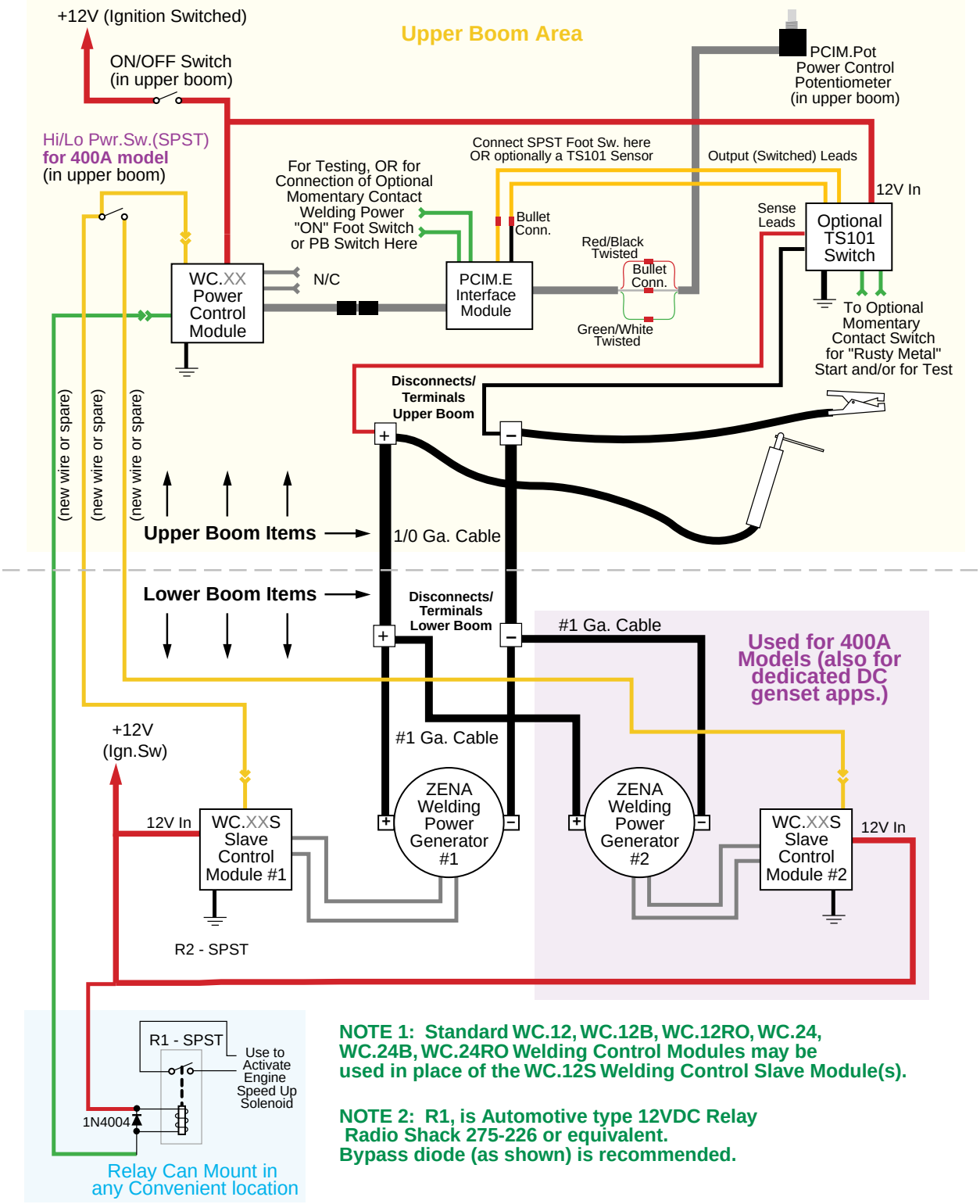
HW200F and HW400F ZENA hydraulic drive welding power generator assemblies are fully compatible with existing ZENA welder wiring (assuming, in the case of the HW400F, that installed welding cables are proper gauge for this amount of current). Wired components do not have to be removed or relocated. All parts will function properly with the new hydraulic drive power generating unit.

1) Remove the existing SR200.12 generator and return it to the ZENA, Inc. factory for reconfiguration. Old bracketing and drive pulley can be left in place. The electric engine compartment cooling fan can be removed, but we recommend leaving it fully functional to protect other components and wiring installed in (and running through) this area of the lift.
2) Remove the existing WC.12RO control from the lift and return it to the ZENA, Inc. factory for replacement with a standard configuration ZENA WC.12RO welding power control module.
3) Relocate the returned WC.12RO control module to the boom area per the enclosed wiring diagram.
4) Attach the hydraulic generator assembly to a convenient boom lift location (typically as far as possible from the engine to minimize ambient air temperatures) following one or the other of the enclosed simplified hydraulic diagrams.

   NOTE: Two diagrams are provided. The first diagram, and the simplest, is the one which covers our recommended installation method. Installation of the hydraulic drive generator unit so that its base is **above** the top of the lift's hydraulic fluid reservoir. This the way to go, if at all possible -- simpler, quicker, no extra components required for generator system lubrication, etc.

   The second diagram illustrates what to do if the hydraulic reservoir fluid level above is above the bottom of the mounted hydraulic drive generator. In this case, the installation requires an external oiler pump and small reservoir to handle lubrication of the generator drive components.
5) Complete rewiring of the lift as illustrated in the enclosed wiring diagram.
6) Test and return the lift to service.

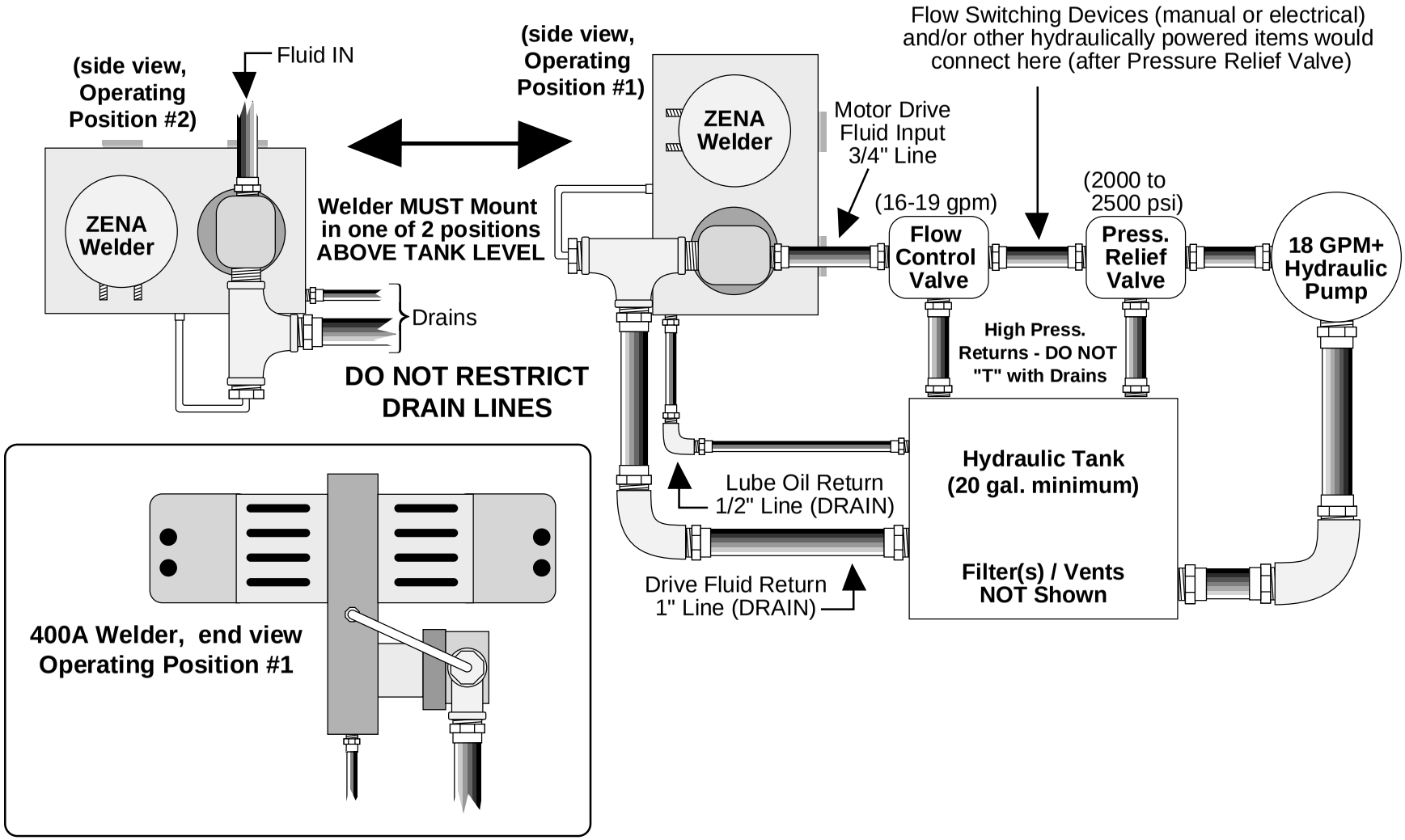
Wiring for a typical dual generator 200A/400A welding system -- engine driven OR hydraulic drive -- including ZENA HW200F & HW400F hydraulic drive welders for operation in a Man Lift Application



NOTE 1: Standard WC.12, WC.12B, WC.12RO, WC.24, WC.24B, WC.24RO Welding Control Modules may be used in place of the WC.12S Welding Control Slave Module(s).

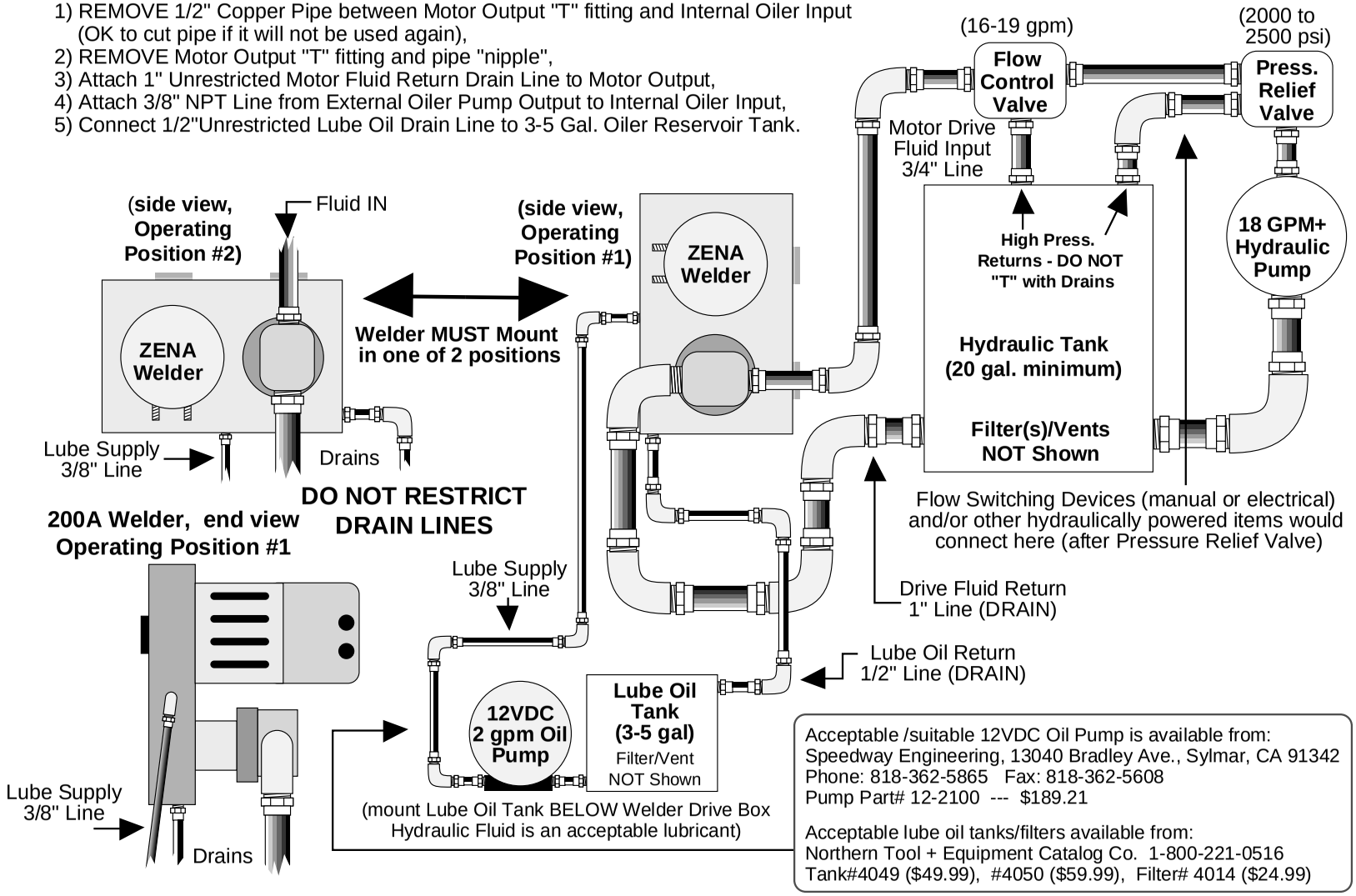
NOTE 2: R1, is Automotive type 12VDC Relay Radio Shack 275-226 or equivalent. Bypass diode (as shown) is recommended.

Typical ZENA™ Hydraulic Welder Hookup
Standard, Gravity Lube Oil Return Version
(Welder Drive Box ABOVE Hydraulic Reservoir Tank)



Typical ZENA™ Hydraulic Welder Hookup -- External Oiler Version
(Welder Drive Box BELOW OR LEVEL with Hydraulic Reservoir Tank)

To use an External Oiler:
1) REMOVE 1/2" Copper Pipe between Motor Output "T" fitting and Internal Oiler Input (OK to cut pipe if it will not be used again),
2) REMOVE Motor Output "T" fitting and pipe "nipple",
3) Attach 1" Unrestricted Motor Fluid Return Drain Line to Motor Output,
4) Attach 3/8" NPT Line from External Oiler Pump Output to Internal Oiler Input,
5) Connect 1/2"Unrestricted Lube Oil Drain Line to 3-5 Gal. Oiler Reservoir Tank.



Acceptable /suitable 12VDC Oil Pump is available from:
Speedway Engineering, 13040 Bradley Ave., Sylmar, CA 91342
Phone: 818-362-5865 Fax: 818-362-5608
Pump Part# 12-2100 --- $189.21

Acceptable lube oil tanks/filters available from:
Northern Tool + Equipment Catalog Co. 1-800-221-0516
Tank#4049 ($49.99), #4050 ($59.99), Filter# 4014 ($24.99)