Kinetics ***Industries Inc.***

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Operation and Maintenance Manual

For

Kinetics Models:

KSR6C007PM11O

Output: 7.5 KW, 125 VDC, 60 amps DC
Input: 103VAC, 3 phase, 60 Hz, 9.4 KVA, 52.7 Amps

KSR6F017PM11O

Output: 17 KW, 125 VDC, 136 amps DC
Input: 103VAC, 3 phase, 60 Hz, 21.25 KVA, 110 Amps

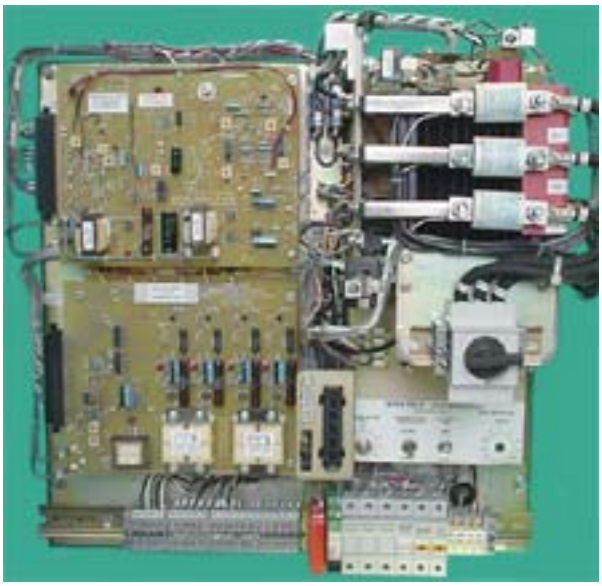
KSR6C015PM22O

Output: 15 KW, 250 VDC, 60 amps DC
Input: 205VAC, 3 phase, 60 Hz, 8.75 KVA, 52.7 Amps

KSR6F034PM22O

Output: 34 KW, 250 VDC, 136 amps DC
Input: 205VAC, 3 phase, 60 Hz, 2.5 KVA, 110 Amps

Exciter Regulators for Brush Type Synchronous Motors



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These regulators are designed for maximum output at 40'C ambient. When installing the regulator in an enclosure, either with other equipment or alone, adequate ventilation must be provided to prevent exceeding this operating ambient temperature.

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Proprietary Information

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Equipment manufactured by Kinetics Industries, Inc., is guaranteed for a period of one year from date of shipment against defects in materials and/or workmanship and to operate in accordance with our proposals, specifications and nameplate data under conditions of proper installation, rated load, environment and usage. Any defects in materials and/or workmanship will be repaired or replaced at our option, F.O.B. our plant or, at our option, in the field under straight time conditions. Kinetics shall in no event be responsible for special, indirect, or consequential damages, nor for repairs or replacements made by others without written authorization of Kinetics. Correction of defects by repairing or replacing shall constitute the fulfillment of Kinetics warranty.

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This product utilizes high gain analog and digital circuitry. Operation of high power radio transmitters in the immediate vicinity may create false triggering of control circuits. Although efforts to immunize the circuitry against external RFI sources have been taken, the system is not warranteed to be totally immune.

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For
Kinetics KSR6 Exciter Regulator

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Description of Kinetics KSR6 Exciter Regulator

The Kinetics type KSR6 exciter regulator is a three phases, six pulse, SCR controlled rectifier with embellishments for primary use as a brush type synchronous motor exciter and application control. The power semiconductor pak consists of a six-pulse SCR bridge rectifier with commutating or free–wheeling device to provide both rectification with freewheeling current ripple suppression, output control, and static application of field excitation. A pair of back-to-back SCRs is provided for control of the field discharge resistor. The rectifier bridges are either convection cooled or forced air cooled, dependent upon KVA and voltage rating.

The KSR6 can be provided with a Din rail mounted, three-pole no-fuse disconnect on the AC input to the Rectifier Bridge. This is normally provided if there is no other convenient AC disconnect in the system such as when fused medium voltage EPTs are used with the regulator.

The basic standard exciter design is for three phase, 103 or 205 VAC input, dependant upon output voltage (either 125 VDC or 250 VDC). The isolation Exciter Power Transformer (EPT) is not included as part of the KSR6 regulator and must be provided separately. The regulator is equipped with a control power transformer to provide the control power required for the unit and fan power when utilized.

The input to the power rectifier has been fused with current limiting, semiconductor fuses. AC input noise and transient suppression is provided by both an R-C snubber network and an MOV (metal oxide varistor). An MOV and a heavy bleed resistor provide DC or output suppression. The power semiconductor package is mounted on an extruded aluminum heat sink for thermal dissipation and is rated at 1500 PRV to withstand inductive transients. Isolating, Hall effect, DC voltage and current sensors are mounted on the power pak.

Control and triggering of the power SCRs are incorporated in several printed circuit boards. The RF3 ckt is the controlling element of the regulator. This circuit provides the signal mixing and logic to adjust the signal to the SCR triggers to maintain the desired exciter output under changing conditions. The circuit also provides static current limit and IOC (immense over-current) protection for the regulator and the motor field. Two trigger generator boards, TRIG3-*-CA and TRIG3-*-CK, provide the phased SCR triggers based upon the signal output of the RFG board. The exciter operates normally as a voltage regulated device. When power factor control is desired, the power factor signal is used as a vernier signal in co-ordination with the voltage regulation to maintain motor power factor at a desired level. The power factor signal required is a plus/minus signal from lead to lag with a null at 1.0 power factor. (The *KinetSync-SR* or *Kinetics PFSensor* controls provide such a signal.)

The back-to-back Discharge SCRs are controlled by both the SYNTRIG circuit which provides electronic triggering to the discharge SCRs when activated and by a totally static, zener diode controlled crowbar circuit, which provides discharge SCR firing when the discharge voltage exceeds a predetermined level, even if the SYNTRIG circuit fails to function. This is an important function as it provides added assurance that the motor field discharge path is secure.

The KSR6 regulator is provided with a CT/PT input module. This module is a termination point for customer CT and PT signals required for motor power factor calculation. When the regulator is used in conjunction with either the *KinetSync-SR* controller/monitor or the *Kinetics PFSensor module* as an excitation system, these controllers will use these signals to generate regulating power factor signals to the KSR6 regulator.

The KSR6 regulator provides its own regulated reference voltage. An operator's potentiometer is located remotely for manual adjustment of the regulator output. For remote control, an external reference signal of the correct polarity and magnitude can be utilized and interjected into the wiper arm-com terminals (31-30). By external switching, the regulator can be controlled by either the manual pot or the remote reference signal.

The control panel of the regulator has the following controls:

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- **Power Factor Set potentiometer – used to adjust sensitivity of regulator to remote power factor signal (If the regulator is used with power factor controller such as a *KinetSync-SR* or *Kinetics PFSensor*)**
- **Power Factor Regulator Enable-Disable switch (if regulator is used with power factor controller such as a *KinetSync-SR* or *Kinetics PFSensor*)**
- **Rectifier Test Switch (Test-Run) for test operation of the rectifier from the control panel without activating external controlling elements such as a KinetSync-SR or running the motor.**
- **Mounting position for Output Set reference pot when it is desired to be internal rather than external**

Connections to Kinetics KSR6 Exciter Regulator

When used with *KinetSync-SR* controller/monitor

Input Power:
Three phase power is connected to Terminals L1 and L2 at terminals provided on the input to the regulator power fuses. If a no fuse disconnect switch is provided, the input three phase connections are made to the input side of the disconnect switch which is mounted just below the power pak.

Output:
The exciter DC output is provided at lugs 10 (+) and 11 (-) located on the output of the power rectifier and are located at the top of the power pak.

Discharge Resistor:
The discharge resistor is not part of the regulator but provision has been made for connecting the discharge resistor to the regulator at lugs 11 (-) and 10D (+). These lugs are located at the top of the power pak.

Control:
A multi-conductor receptacle is provided for use with an umbilical multi-conductor control cable, which plugs directly onto a *KinetSync-SR* controller/monitor for brush-type synchronous motor control. This cable provides the necessary connections between the *KinetSync-SR* and the regulator for activating the regulator output at the correct time, turning off the discharge SCRs and turning on the free-wheeling SCRs, monitoring the motor field volts and amps, monitoring the power factor, protecting against field failure, pulling- out of synchronization, and failure to synchronize, annunciation of synchronization, time lock-out of re start, and trip of motor on any control failure.
A second multi-conductor receptacle is provided for connection to the reference setting potentiometer and a power on indicator normally mounted on enclosure door.

A Din rail mounted terminal strip is provided at the bottom of the panel for customer Start contact connection (terms 55 and 57), and customer motor controller interaction contacts including re-start timed lockout (56K terms 80and 81), remote synchronization annunciation (FAX terms 82 and 83) and field failure (FAL- form c contacts terms 84, 85,and 86) interlock with motor trip circuit.

The PT/CT input module provides terminals for connecting the customer phase A-B PT connections and the phase C CT connection. (Kinetics provides aux CTs mounted on a jumper between the input CT terminals, which have less than 1 ma CT burden)

The Hall effect Discharge current, Voltage and current transducers connect to the *KinetSync-SR* via transducer sensor cables with plug-on terminations supplied with the *KinetSync-SR*.

When used Alone with No External Control/Monitoring:

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Input Power:
Three phase power is connected to Terminals L1 and L2 at terminals provided on the input to the regulator power fuses. If a no fuse disconnect switch is provided, the input three phase connections are made to the input side of the disconnect switch which is mounted just below the power pak.

Output:
The exciter DC output is provided at lugs 10 (+) and 11 (-) located on the output of the power rectifier and are located at the top of the power pak.

Discharge Resistor:
The discharge resistor is not part of the regulator but provision has been made for connecting the discharge resistor to the regulator at lugs 11 (-) and 10D (+). These lugs are located at the top of the power pak.

Control:

A multi-conductor receptacle is provided for use with an umbilical multi-conductor control cable, which can go to an auxiliary control panel or other than a *KinetSync-SR* controller/monitor for brushless synchronous motor control. This cable would be a customized cable for whatever interfacing is necessary to the external controls. To lock off the regulator from providing SCR triggers, it is necessary to provide a shorting means for wires 43 and 44 which show on the schematic as normally closed FS contacts at the RF3 ckt. If the regulator field discharge control and the free wheeling SCRs are to be utilized a means must be utilized to activate these triggers by a dry contact for each device connected via the umbilical connection (pts 84-85 and 86-87). If no auxiliary controls are utilized, the wires can be shorted via a dummy plug on the output receptacle and the regulator can be controlled on-off manually by utilizing the regulator test switch on the regulator control panel. A second multi-conductor receptacle is provided for connection to the reference setting potentiometer and a power on indicating light normally mounted on enclosure door or the potentiometer can be mounted on the position for it on the regulator control panel. .

The PT/CT input module provides terminals for connecting the customer phase A-B PT connections and the phase C CT connection. (Kinetics provides aux CTs mounted on a jumper between the input CT terminals, which have less than 1 ma CT burden). If no power factor control or protection is being utilized, there is no connection required to these terminals. If either the *Kinetics PFTRP* (power factor trip relay) or *PFSensor* (power factor transducer) are used then the PT and aux Pt signals can be obtained from the umbilical plug).

When used with External Control/Monitoring:

The KSR6 is adaptable for use with other controlling schemes and the interconnection between these schemes and the KSR6 can be accomplished by utilizing the connections available on either of the output receptacles and/or the DIN rail terminal strip at the bottom of the regulator panel.

Input Power:
Three phase power is connected to Terminals L1 and L2 at terminals provided on the input to the regulator power fuses. If a no fuse disconnect switch is provided, the input three phase connections are made to the input side of the disconnect switch which is mounted just below the power pak.

Output:
The exciter DC output is provided at lugs 10 (+) and 11 (-) located on the output of the power rectifier and are located at the top of the power pak.

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Discharge Resistor:
The discharge resistor is not part of the regulator but provision has been made for connecting the discharge resistor to the regulator at lugs 11 (-) and 10D (+). These lugs are located at the top of the power pak.

Control:

A multi-conductor receptacle is provided for use with an umbilical multi-conductor control cable, which can go to an auxiliary control panel or other than a *KinetSync-SR* controller/monitor for brush type synchronous motor control. This cable would be a customized cable for whatever interfacing is necessary to the external controls. To lock off the regulator from providing SCR triggers, it is necessary to provide a shorting means for wires 43 and 44 which show on the schematic as normally closed FS contacts at the RF3 ckt. If the regulator field discharge control and the free wheeling SCRs are to be utilized a means must be utilized to activate these triggers by a dry contact for each device connected via the umbilical connection (pts 84-85 and 86-87). If no auxiliary controls are utilized, the wires can be shorted via a dummy plug on the output receptacle and the regulator can be controlled on-off manually by utilizing the regulator test switch on the regulator control panel. A second multi-conductor receptacle is provided for connection to the reference setting potentiometer and a power on indicating light normally mounted on enclosure door or the potentiometer can be mounted on the position for it on the regulator control panel. .

The PT/CT input module provides terminals for connecting the customer phase A-B PT connections and the phase C CT connection. (Kinetics provides aux CTs mounted on a jumper between the input CT terminals, which have less than 1 ma CT burden). If no power factor control or protection is being utilized, there is no connection required to these terminals. Note: The auxiliary CTs provided on the module are selected for use with a *KinetSync-SR* and may or may not be suitable for alien controllers.

Description of Operation of KSR6 Regulator

Power is applied to the regulator when the AC input circuit breaker is closed. The regulator is in an "OFF" condition (no SCR triggers) until the RF3 circuit is activated by opening the shorting means for wires 43 and 44 (when a relay is utilized this is the notated NC FS contacts)

The KSR6 regulator is a closed loop regulator. The reference signal, set by the reference setting potentiometer, is an "ON" signal. The loop is closed on the regulator output voltage. These two signals are compared at the summing junction and the result provides the triggering to the power SCRs to turn on and control the regulator output. If power factor control is utilized the power factor signal is fed into this same junction and compared with the reference and feedback signals at the summing junction. Adjusting the amplitude of the "ON" signals correspondingly adjusts the output of the regulator.

The regulator provides both static switching and regulation of the load. Disabling the SCR triggers turns off the regulator output.

Description and Adjustment of RF3E-B1N02N-HS-S Regulator and Logic Circuit

Control of the triggering of the power SCRs is accomplished by the RF3E-B1N02N-HS-S circuit board. The RF3E-B1N02N-HS-S circuit acts as the controlling element of the closed loop regulated exciter. This circuit provides the signal mixing and logic to adjust the SCR triggers to maintain the desired exciter output under changing conditions. The circuit also provides static current limit and IOC (immense over current) protection for the regulator and the motor field. The exciter operates normally as a voltage regulated device. When power factor control is desired, the power factor signal is used as a vernier signal in co-ordination with the voltage regulation to maintain motor power

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factor at a desired level. The power factor signal required is a plus/minus signal from lead to lag with a null at 1.0 power factor. (The *KinetSync-SR* or *Kinetics PFSensor* controls provide such a signal.)

The RF3E-B1N02N-HS-S circuit has two isolated and regulated power supplies, which provide operational voltage for the circuit elements and the reference voltage for the setting potentiometer.

The reference signal is interjected into the logarithmic ramp generator (pts 31(tp 6A) -30(tp22), which provides an adjustable timed rate of field change to a reference input change. The output of the ramp generator is applied to the summing junction.

The feedback signal (regulator volts) is interjected into the feedback co-ord array (DC Volts (tp9)- COM (tp10) whose output is compared with the reference signal at the summing junction.

If power factor regulation is desired the power factor signal is also interjected (pts 51 (tp3)- 35(tp5) into the summing junction. (the power factor signal must be a plus/minus signal with null at 1.0 power factor)

The output of the summing junction is applied to the error amplifier. The output of the error amplifier is output to the Trig3 circuits (33(tp17)-32(tp4)) create the properly phased triggers for the SCRs. The amplitude of the regulator amp output sets the phasing of the SCR triggers.

The current protective circuits provide current limiting and IOC by effectively either reducing the regulator output (current limit - analog reduction) or shorting the regulator amp power input (IOC - latching function with LED indication). A current signal is provided by the Hall effect sensor on the power pak. This signal is interjected into the current protective circuit (DC Amps (tp16)- COM (tp5)).
Current limit - the current signal is amplified in the signal amplifier and compared against a preset reference signal. The output is then applied to the current limit comparator. If the amplified signal is greater than the current limit set point, a CL "on" is applied to the optical coupler (OTR-1), which turns on the optical transistor (OTR-1) reducing the error amplifier output.
IOC - the current signal is compared against a preset reference signal. The output is then applied to the IOC comparator. If the amplified signal is greater than the reference set point, an IOC "on" is applied to the IOC delay amplifier. (this delay amplifier allows a time delay before activating IOC). After the IOC delay the IOC "on" is applied to the optical coupler (OSK1), which turns on the optical SCR (OC3) shorting the regulator amplifier power input bus and providing an IOC LED indication. The SCR is a latching device. Once activated, power must be removed from the RF3E-B1N02N-HS-S circuit for IOC reset.

TRIG3 -*-CK and TRIG3 -*-CA Trigger circuits.

The trigger circuits consist of individual phase trigger pulse generators, which feed optical couplers to create isolated power SCR triggers for each SCR. The trigger pulse generators are ramp and pedestal circuits to provide the SCR trigger phase control. The output of the RF3 circuit provides the pedestal, which adjusts the pulse position of the amplifier. The outputs of the trigger pulse generators are placed on isolating optical SCRs to, in turn, fire the trigger pulse amplifiers providing isolated SCR triggers of the proper phasing to control the SCR's outputs. (Longer phase delay means shorter SCR conduction time and thus lower regulator output.

SYNTRIG Circuit

The SYNTRIG circuit has four isolated power supplies generating four isolated SCR gates, two for the Discharge SCRs and two for the Free-wheeling SCRs. The gates can be triggered by either a closed dry contact or a static element in the 'ON' position. Normally dry contacts are provided by the *KinetSync-SR* (programmed close at start DST for the discharge SCRs and programmed open at stat FWT for the free-wheeling SCRs). These circuits must be activated at the proper timing for proper synchronous motor controlling.

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Adjustments:

Adjust rate of reference input adjustment - adj P9 cw to slow down the ramp -Logarithmic Ramp Gen -accel

Adjust maximum output of regulator - adj P3 cw to increase regulator output for a given reference input - MAX

Adjust activation point of Current Limit - adj P6 cw to increase current limit point - CUR LIM
(Standard factory setting is 125% of rated amps)

Adjust IOC set point - adj P5 cw to raise IOC operating point - IOC
(Standard factory setting is 150% of rated amps)

Adjust stability of regulator - adP4 cw to increase gain of signal amplifier (proportional gain) - SENS
- adj P10 cw to decrease time of response (differential/integral gain) - STAB

Adjustment procedures:

RF3E-B1N02N-HS-S

Adjusting maximum output of regulator.

- **Set the Reference Setting Potentiometer to minimum**
-
- **Activate the regulator (this can be done with or without load)**
- **Raise Reference Setting Potentiometer to maximum position. If output is not correct for the voltage input, adjust P3 (MAX) until proper output voltage is achieved.**
  (Standard factory adjustment is to 125 VDC with 103 VAC input and 250VDC with 205 VAC input)

Adjusting Current Limit point:

To make this adjustment a load must be applied to the regulator suitable to achieve the desired current limit point at some position below max voltage.

The current limit point can be seen as the point where current caps even with an increase in the Reference Setting Potentiometer position.

- **Set the Reference Setting Potentiometer to minimum**
- **Activate the regulator**
- **Raise Reference Setting Potentiometer until the desired current limit point is achieved**
  (If the current limit point is achieved before max voltage is achieved and you want to increase the activation point, simply adjust the CUR LIM adj pot until the desired point is obtained.)
  (If the current limit point is not achieved before max voltage is achieved and you want to increase the activation point, you will have to change the load.
  (If the current limit point is achieved before max voltage is achieved and you want to decrease the activation point, simply adjust the CUR LIM adj pot until the desired point is obtained.)
  (If the current limit point is not achieved before max voltage is achieved and you want to decrease the activation point, simply adjust the CUR LIM adj pot until the desired point is obtained.)

Adjusting IOC point:

To make this adjustment a load must be applied to the regulator suitable to achieve the desired IOC point at some position below max voltage. You will have to disable the current limit control before making this adjustment as the current limit will activate before the IOC and therefore not normally allow you to reach the IOC point. Note: to reset after IOC activation you must remove power.

NOTE: The factory IOC setting (150% rated amps) is the maximum it should be set. Raising the IOC setting above this point leaves the regulator subject to damage and any warranties will be voided.

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The IOC activation is indicated by the IOC LED illuminating

- **Set the Reference Setting Potentiometer to minimum**
- **Activate the regulator**
- **Raise the Reference Setting Potentiometer until the desired point of IOC trip is achieved**
  (If the IOC point is achieved before max voltage is achieved and you want to decrease the activation point, then adjust the Reference Setting Potentiometer to the desired current point and then adjust IOC until the IOC trips and the LED illuminates.)
  (If the current limit point is not achieved before max voltage is achieved and you want to decrease the activation point, you will have to increase loading (decrease resistance))

Adjusting regulator stability:

Normally these adjustments should only be made by trained regulator personnel.
Pots P4 and P10 adjust the proportional gain and the time slope of the regulator.
They are somewhat interactive and adjust the bode interactive point of the regulator. The adjustment, if required, should be made on start-up by the start-up engineer and it is not recommended that any adjustments be made by non-trained personnel.

TRIG3 -*-CK and CA Trigger circuits.

There are two potentiometer adjustments on each phase channel for balancing of the trigger outputs. These adjustments have been factory set and the potentiometers sealed. They should not be field adjusted by untrained personnel. Doing so can void regulatory warranties.

SYNTRIG Circuit

There are no adjustments on this circuit board

Notes on drawings included in this manual:

The schematic and connection drawings included in this manual are for standard basic use with a *KinetSync-SR* controller. If the KSR6 regulator is used with other control systems or customer or system requirements make modifications to these drawings necessary they will be supplied as addendums to this manual.

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Trouble Shooting Guide

Symptom: No output
Possible Causes:

- **No line power or open circuit breaker - Restore line power or reset and close circuit breaker**
- **Open Power Fuses (FU1-FU2-FU3) Check for load shorts - clear and replace fuses**
- **Open control power fuse Fu21 Check for shorts, clear and replace fuses**
- **Open control power fuse Fu10,11,12 Check for shorts, clear and replace fuses**
- **Open heat sink thermal - Normally due to cooling fan failure or overload**
- **No reference signal Open control fuse, shorted wiring to pot, defective Trig1 ckt**
- **Defective Semi-conductors Check for load shorts and open power fuses then replace**
- **Regulator not activated Check remote control ckt and that FS contacts (NC) are activated**

Symptom: Volts won't reach max
Possible Causes:

- **Output overload and regulator is in current limit Check for shorts on output- possible motor on-shaft electronic problems**
- **One Power Fuse open - check all fuses, check for shorts or shorted SCR, clear and replace fuse**
- **One phase out on input - check incoming power feed and correct**
- **Incorrect reference signal - check reference setting pot and reference input signal**
- **Defective Trigger ckt1 or open or shorted SCR gate - Ascertain triggers are present on SCR gate (Are all trigger LEDs on TRIG3 ckts illuminated?)**

Symptom: Volts turn full on - no control
Possible Causes:

- **Loss of Feedback check to see that volts transducer output to RF3 is there (pts tp9-tp10)**
- **Defective Volts transducer or open wiring - replace transducer or repair wiring**

Symptom: Open Power Fuses
Possible Causes:

- **Shorts on output**
- **Shorted semi-conductors - some motors, when their on-shaft electronics fail, can produce high inductively coupled transients through the exciter to the regulator. This condition is normally indicated by a shorting of the free wheeling diode. Protection for the rectifier can be helped by incorporating a VERY heavy bleed but has the problem of preloading the regulator.**

Symptom: tripped IOC
Possible Causes:

- **Shorts on output of regulator - possible failure of on-shaft motor electronics**

Symptom: Regulator in Current Limit
Possible Causes:

- **Overload**

Symptom: Shorted Free Wheeling SCRs or SPdc
Possible Causes:

- **High discharge volts caused by open discharge path on motor start or stop - check field discharge path to be assured is functioning properly. Inspect crowbar circuit (failure should show blown components)**
- **Failure of discharge SCR gating - do LEDs illuminate before drive starts and turn off after field application? Possible back control circuitry or defective SYNTRIG ckt.**

Symptom: Regulator turns off on thermal
Possible Causes:

- **Insufficient ventilation**
- **Fan fuse or Fan failure**

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Bill of Materials and Recommended Renewal Parts

Description	Part Identity	Part Number	No. in Exciter	Used In	Rec. Min. Spares
No Fuse Disconnect Switch	Disconnect Switch	DSW3P125A600V-DH	1	Optional	0
Dual SCR Module	SK 1-13	SKKT116PM	5	All	3
Pos/Neg Bus Assy	Pos/Neg Bus Assy	KAC005SSBUSASSY	1	A - C	0
Pos/Neg Bus Assy	Pos/Neg Bus Assy	KAC005SSBUSASSY	2	B - D	0
Fuse to Pak Bus	Fuse to Pak Bus	KAC005b03.5BUP	3	All	0
Power Semiconductor Fuse	FU 1,2,3	FU30QX150	3	B - D	6
Power Semiconductor Fuse	FU 1,2,3	FU30QX60	3	A - C	6
Heat Sink	Heat sink	HHSK-P3x7BA	1	All	0
Control Power Transformer	CPT	B.100Z61ACO-FUSE	1	All	1
Ac Transient Supp Ckt	MOV/SNUB	MOV/SNUB-25L40	1	All	1
Bleed Resistor	Bleed	RE225W-0500.0	1	All	1
Crowbar Module	Crowbar Module	Crowbar-1000	1	C - D	0
Crowbar Module	Crowbar Module	Crowbar	1	A - B	0
DC Amps Sensor	DC Current Transducr	BHAL200-S	1	B - D	0
DC Amps Sensor	DC Current Transducr	BHAL100-S	1	A - C	0
DC Shunt	DC Shunt	MES1505	1	All	0
DC Volts Sensor	DC Voltage Transducr	HE-Volts	1	C - D	0
DC Volts Sensor	DC Voltage Transducr	HE-Volts-150	1	A - B	0
Sensor Junction Bd.		HE-JUNCTION	1	All	0
Trigger Ckt - Com Anode	1/2 of TRIG6	TRIG3-1CA	1	A - B	1
Trigger Ckt - Com Cathode	1/2 of TRIG6	TRIG3-1CK	1	A - B	1
Trigger Ckt - Com Anode	1/2 of TRIG6	TRIG3-2CA	1	C - D	1
Trigger Ckt - Com Cathode	1/2 of TRIG6	TRIG3-2CK	1	C - D	1
Reference Circuit	RF3E	RF3E-B1N02N-HS-S	1	All	1
Disc & Free-Wheeling Gates	SYNTRIG CKT	SYNTRIG3	1	All	1
PF Enable Switch	PF Reg - man/auto	TOGSPST06A1	1	All	0
Toggle Switch	Test Switch	TOGDPST10A2	1	All	0
Ckt Board Mtg Kit		CIR HDWE KIT 2BD	2	All	0
DC Output Lugs		HRL B-4B	2	B - D	0
DC Output Lugs		HRL02-4B	2	A - C	0
Disc Resistor Lugs		HRL02-4B	2	All	0
Ground Lug		HRL A-4B-1	1	All	0
Panel		BS20X20KS-SR	1	All	0
DC Surge Suppressor	SPDC 2*series	VP51H500	2	All	0
PT/CT Input Module	PT/CT Input Assy	Pt/CT-INPUT-SR	1	All	0
Control/trigger Fuses	Fu 10,11,12	FU25X2-TRM	3	All	6
Control/trigger Fuse Block		FUB3-30-60USM	1	All	0
Control Fuse	Fu 21	FU25X1.25-TRM	1	All	2
Control Fuse Block		FUB1-30-60USM	1	All	0
Terminal Block		TB8M50AG	32	All	0
Terminal Ends		TB8M-END SECTION	3	All	0
Ground Terminal		TB8M-GRND	1	All	0

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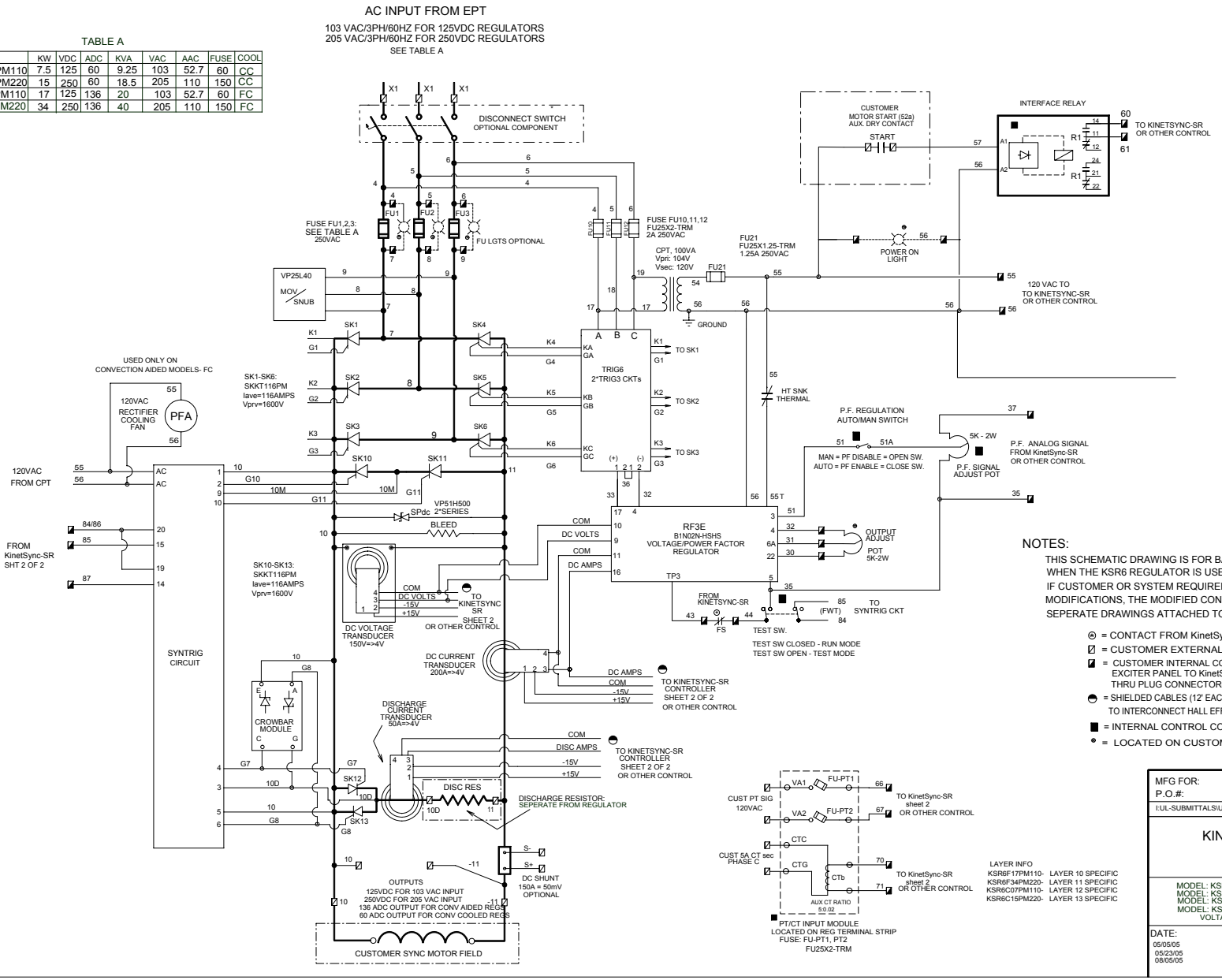
Description	Part Identity	Part Number	No. in Exciter	Used In	Rec. Min. Spares
DIN Mtd Relay	R1 Relay	REISO2NO/NC-1DIN	1	All	1
Umbilical Receptacle-30		WHPLUGSR30	1	All	0
Umbilical Receptacle-16		WHPLUGSR16	1	All	0
Umbilical Cable Assy	**KinetSync-SR cable	WHPLUGSR30P/12FT	1	All	0
Umbilical Cable Assy	**KinetSync-SR cable	WHPLUGSR16P/12FT	1	All	0
Heat Sink Thermal Sw	Heat Sink Thermal	TH212NC	1	All	0
Fan-Convection Booster	PFA	PFA	1	B - D	1
Fan Guard		PFA-CD551	1	B - D	0
FAN Cord		PFA-CD552	1	B - D	1
Fan Standoffs		STND2120	4	B - D	0

Coding of 'Used In' Column

A	**KSR6C07PM11O**	**7KW**	**125VDC**
B	**KSR6F17PM11O**	**17KW**	**125VDC**
C	**KSR6C15PM22O**	**15KW**	**250VDC**
D	**KSR6F34PM22O**	**34KW**	**250VDC**

TABLE A

MODEL	KW	VDC	ADC	KVA	VAC	AAC	FUSE	COOL
KSR6C07PM110	7.5	125	60	9.25	103	52.7	60	CC
KSR6C15PM220	15	250	60	18.5	205	110	150	CC
KSR6F17PM110	17	125	136	20	103	52.7	60	FC
KSR6F34PM220	34	250	136	40	205	110	150	FC



NOTES:

THIS SCHEMATIC DRAWING IS FOR BASIC STANDARD OPERATION WHEN THE KSR6 REGULATOR IS USED WITH A KinetSync-SR CONTROLLER. IF CUSTOMER OR SYSTEM REQUIREMENTS NECESSITATE OPERATIONAL MODIFICATIONS, THE MODIFIED CONTROL FUNCTIONS WILL BE PROVIDED ON SEPERATE DRAWINGS ATTACHED TO THIS MANUAL.

- ⊖ = CONTACT FROM KinetSync-SR MODULE
- ☐ = CUSTOMER EXTERNALCONNECTION
- ◪ = CUSTOMER INTERNAL CONNECTIONS FROM EXCITER PANEL TO KinetSync-SR AND ANNUNCIATIONS THRU PLUG CONNECTOR-WIREHARNESS
- ◓ = SHIELDED CABLES (12' EACH) SUPPLIED BY KINETICS TO INTERCONNECT HALL EFFECT TRANSDUCERS TO KinetSync CONTROLLER
- ■ = INTERNAL CONTROL COMPONENT
- ⊙ = LOCATED ON CUSTOMER ENCLOSURE DOOR

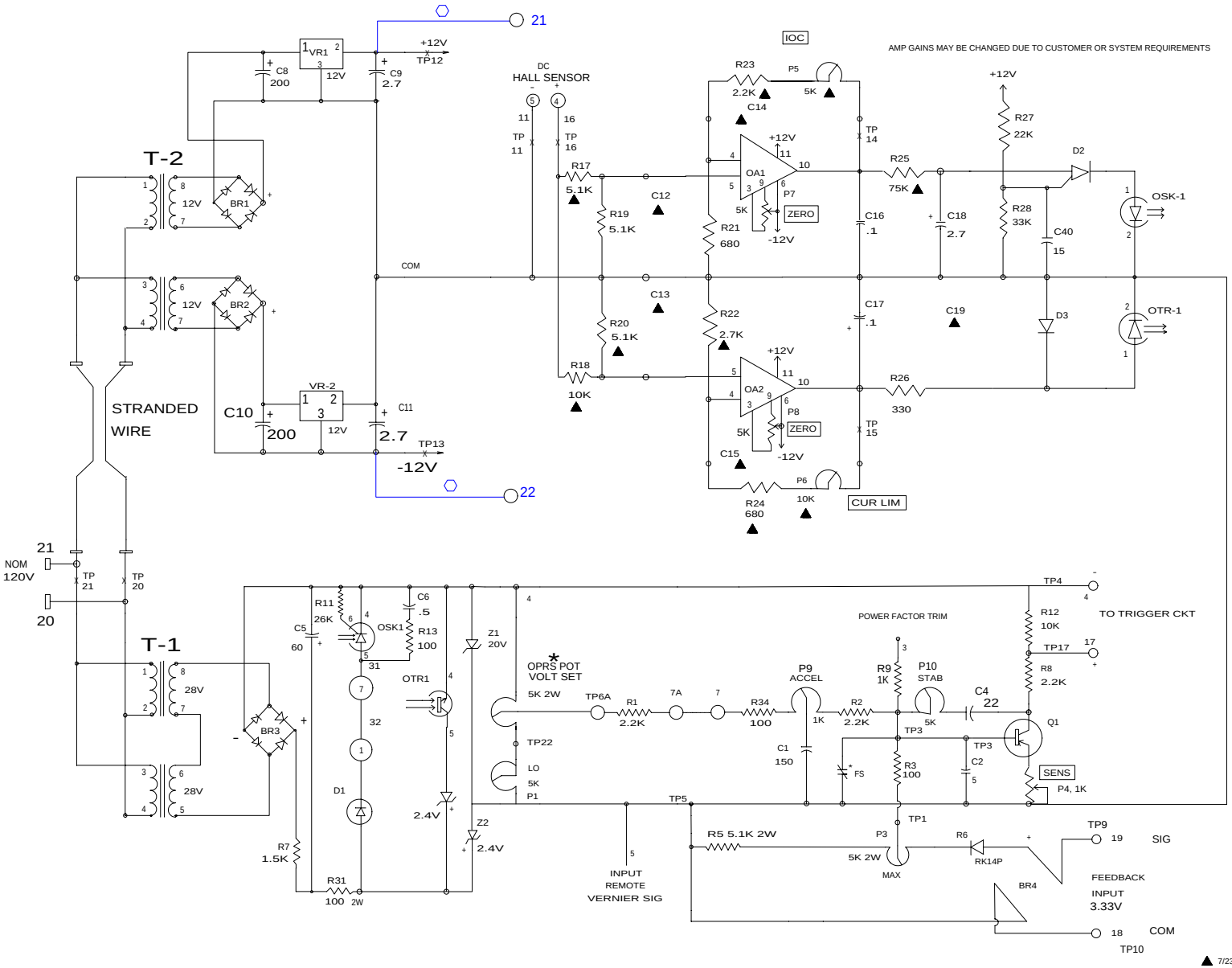
MFG FOR:
P.O.#:
I:\UL-SUBMITTALS\UL-SR\KSR6----PM--O UNIVERSAL
REV: A

KINETICS CONTROL SYSTEMS
140 STOKES AVENUE
TRENTON, NEW JERSEY

MODEL: KSR6C07PM110, 7.5KW,103/3/60 TO125VDC, 52 .8AMPS
MODEL: KSR6C15PM220, 15KW, 205/3/60 TO 250 VDC, 52. 8AMPS
MODEL: KSR6F17PM110, 17KW, 103/3/60 TO125 VDC, 136 AMPS
MODEL: KSR6F34PM220, 34KW,205/3/60 TO250 VDC, 136 AMPS
VOLTAGE REGULATED EXCITER WITH P.F. CONTROL

DATE:	DRAWN BY:	SYSTEM No.:
05/05/05 05/23/05 08/05/05	F.RABULAN R SECREST	UNIVERSAL

SHEET 1 OF1



CKT NUMBER	22 PIN CONN PIN NUMBER
32	1
7A	2
5Z	3
16	4
11	5
3	6
31	7
6A	8
E	9
4	10
7	11
5	12
17	13
22	14
TP3	15
30	16
	17
10	18
9	19
	20
12	21
13	22

NOTES:

ALL RESISTORS ARE 1/2 W UNLESS OTHERWIZE STATED

ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE NOTED

RF3E-B1N02N-HSHS

FL: _____ V => _____AMPS

CL: _____ V => _____AMPS

IOC: _____ V => _____ AMPS

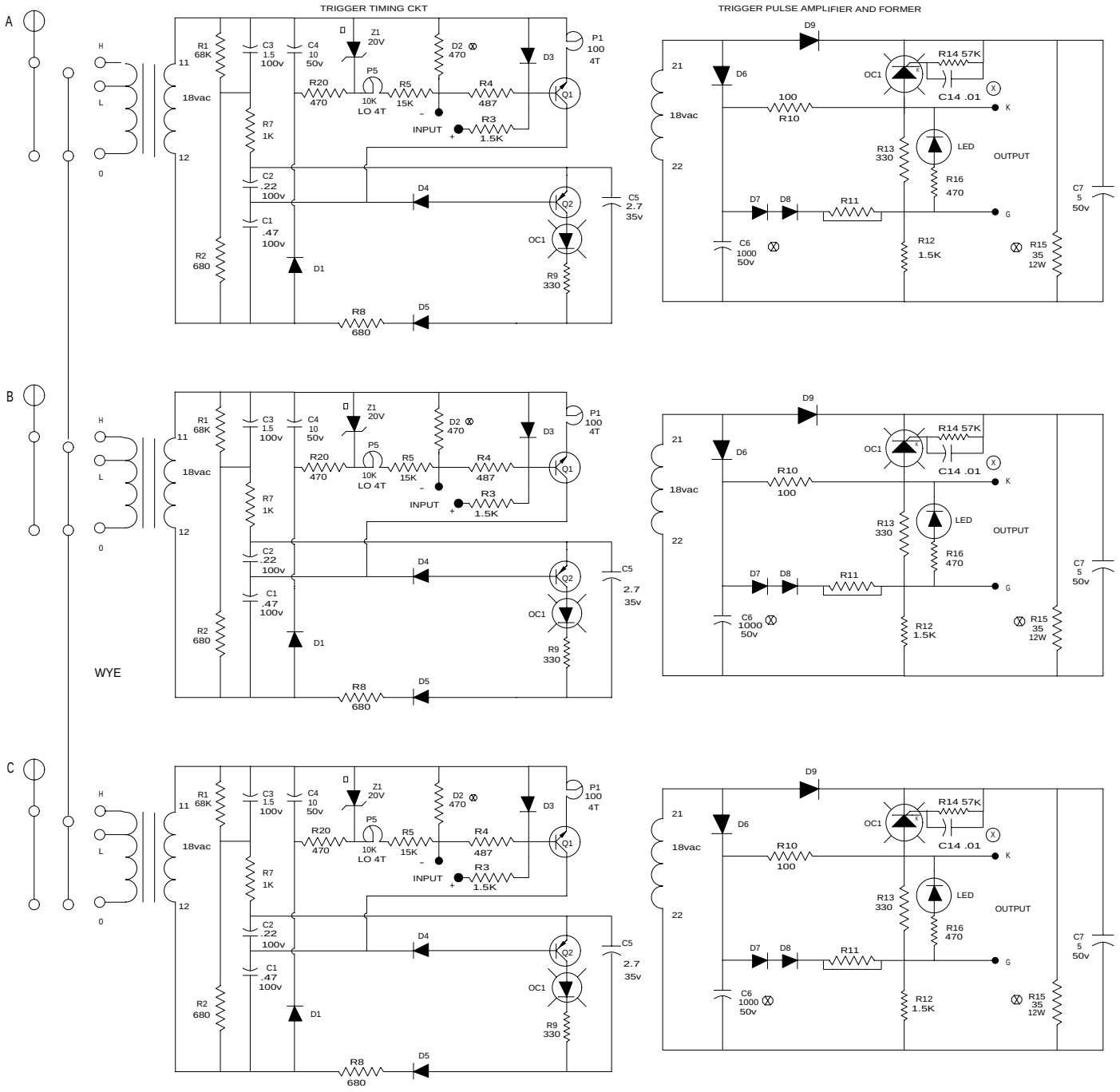
▲ 7/23/2006 MOD

KINCODE: I:\UL-KINETICS EXCITERS\SR SUBMITTAL\RF3E-B1N02N-HSHS

KINETICS CONTROL SYSTEMS
140 STOKES AVENUE
TRENTON, NEW JERSEY

REFERENCE CKT RF3E-B1N02N-HSHS

DATE:	DRAWN BY:	SYSTEM NO.
03/28/05 07/1/05 07/23/2006	F.RABULAN R,. SECREST	UNIVERSAL
		SHEET 1 OF 1



NOTES:

JUMPERS ARE INSTALLED ON TRANSFORMER PRIMARIES

TO CONNECT FOR HIGH OR LOW VOLTS AND TO INVERT TRIGGER POLARITIES TO PROVIDE EITHER COM KATHODE OR COM ANODE TRIGGER

THREE TRIGGER INPUTS ARE PARALLED TO +/- INPUT TERMINALS

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE NOTED

COMPONENTS ARE LABLED WITH A,B,OR C SUBSCRIPTS

(X) ADDED 11/87/87 rhs

(XX) CHANGED 1/10/90 RHS

REV 2/28/91 R. SECREST

KINCODE G:\CKT\TRIG3

KINETICS CONTROL SYSTEMS

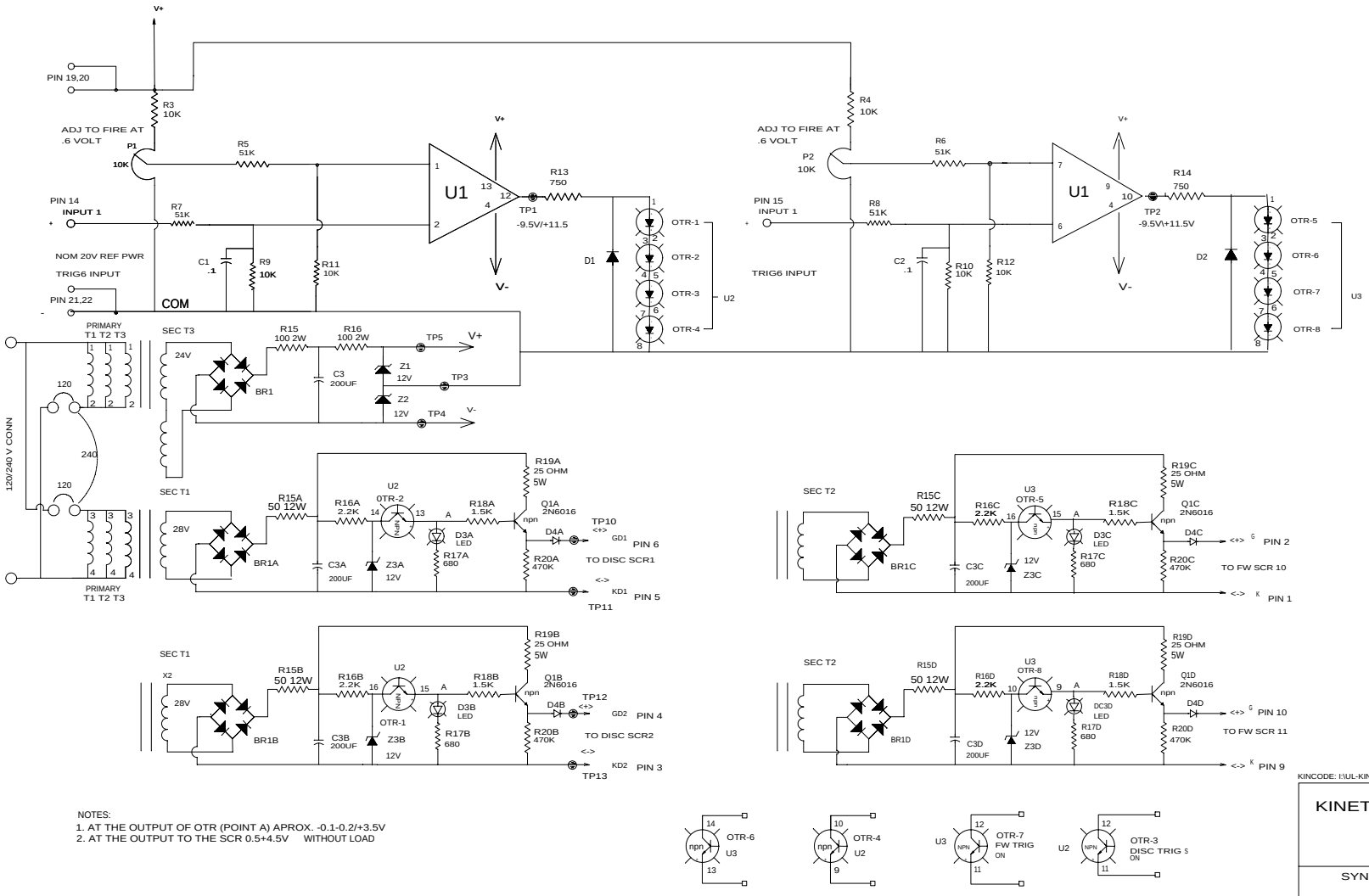
140 STOKES AVENUE

TRENTON, NEW JERSEY

TRIG3-CA\CK-HC HI CURRENT TRIGGER CIRCUIT

DATE:	DRAWN BY:	SYSTEM DWG NO.:
08/22/01 11/15/02	R SECREST	UNIVERSAL

SHEET 1 OF 1



NOTES:
1. AT THE OUTPUT OF OTR (POINT A) APROX. -0.1-0.2/+3.5V
2. AT THE OUTPUT TO THE SCR 0.5+4.5V WITHOUT LOAD

□-SOLDER PADS

KINCODE: I:\UL-KINETICS EXCITERS\SR SUBMITTAL\SYNTRIG-2-7-23-2006

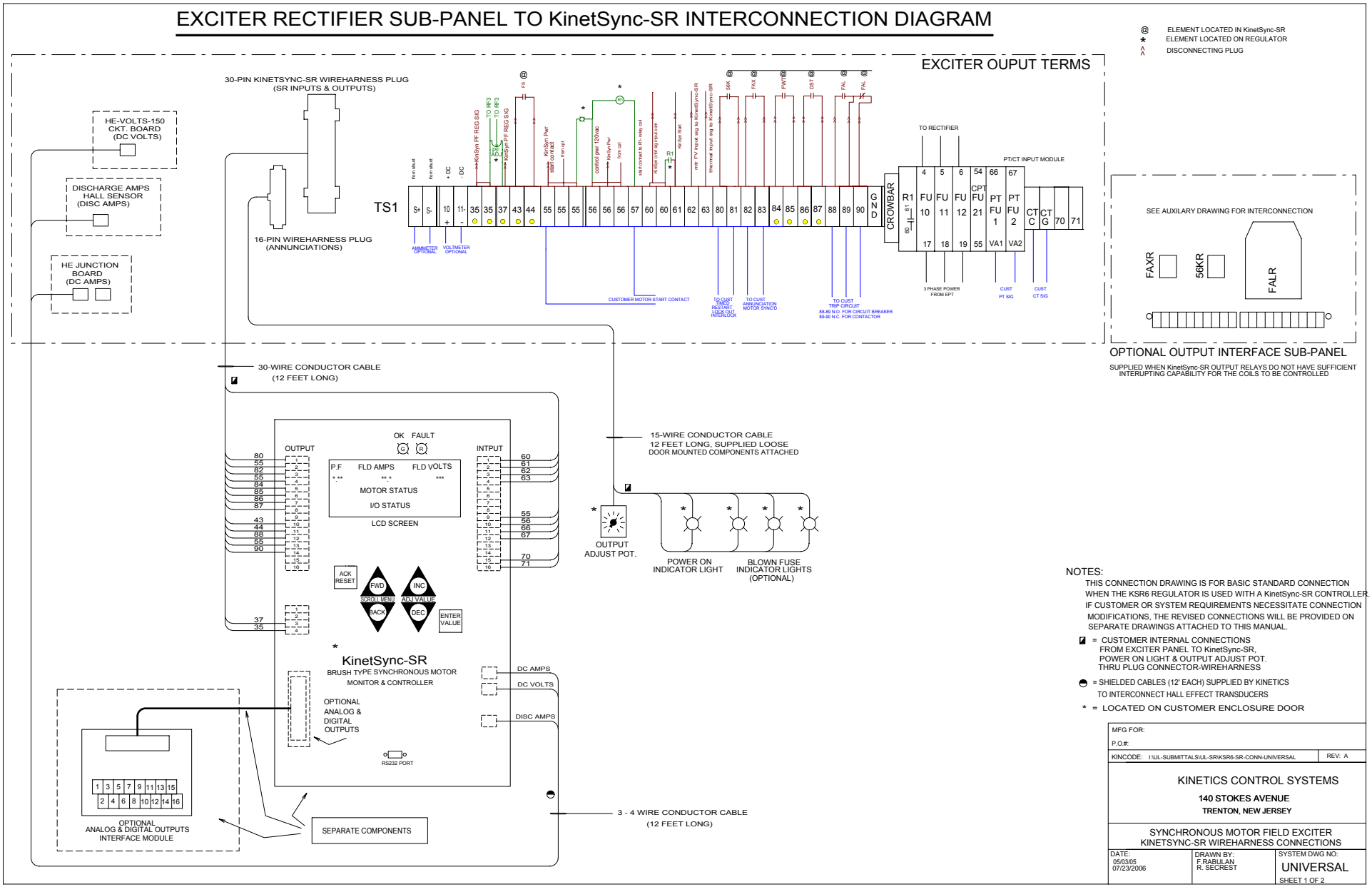
KINETICS CONTROL SYSTEMS
140 STOKES AVENUE
TRENTON, NEW JERSEY

SYNCHAPP TRIGGERING CIRCUITS
SYNTRIG3

DATE	DRAWN BY	SYSTEM
04/16/02 07/13/04 07/15/04	F.RABULAN A.FELDMAN	UNIVERSAL

SHEET 1 OF 1

EXCITER RECTIFIER SUB-PANEL TO KinetSync-SR INTERCONNECTION DIAGRAM



NOTES:

THIS CONNECTION DRAWING IS FOR BASIC STANDARD CONNECTION WHEN THE KSR6 REGULATOR IS USED WITH A KinetSync-SR CONTROLLER. IF CUSTOMER OR SYSTEM REQUIREMENTS NECESSITATE CONNECTION MODIFICATIONS, THE REVISED CONNECTIONS WILL BE PROVIDED ON SEPARATE DRAWINGS ATTACHED TO THIS MANUAL.

◪ = CUSTOMER INTERNAL CONNECTIONS FROM EXCITER PANEL TO KinetSync-SR, POWER ON LIGHT & OUTPUT ADJUST POT. THRU PLUG CONNECTOR-WIREHARNESS

◓ = SHIELDED CABLES (12' EACH) SUPPLIED BY KINETICS TO INTERCONNECT HALL EFFECT TRANSDUCERS

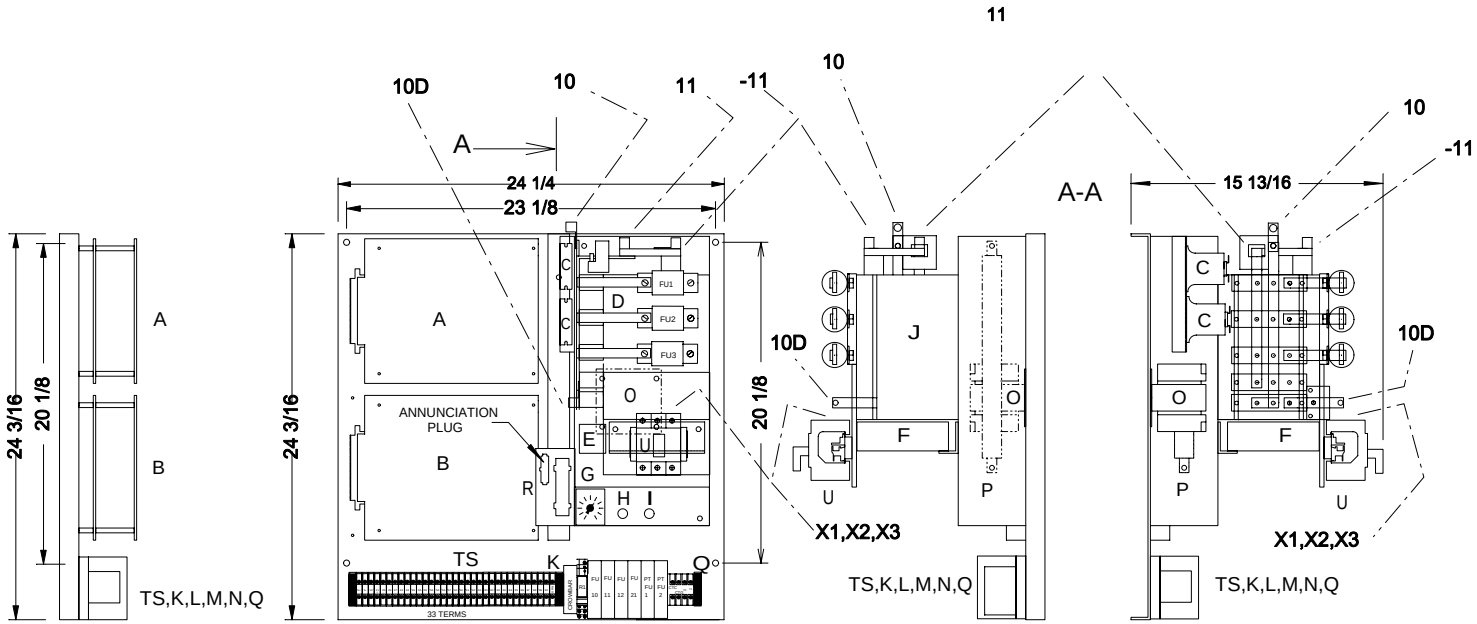
* = LOCATED ON CUSTOMER ENCLOSURE DOOR

MFG FOR:
P.O.#:
KINCODE: I:\UL-SUBMITTALS\UL-SR\KSR6-SR-CONN-UNIVERSAL REV: A

KINETICS CONTROL SYSTEMS
140 STOKES AVENUE
TRENTON, NEW JERSEY

SYNCHRONOUS MOTOR FIELD EXCITER
KINETSYNC-SR WIREHARNESS CONNECTIONS

DATE:	DRAWN BY:	SYSTEM DWG NO:
05/03/05 07/23/2006	F.RABULAN R. SECREST	UNIVERSAL SHEET 1 OF 2



COMPONENT DESCRIPTION LEGEND

A = REF3 CKT BD TOP - TRIG3-CA CKT BD BOTTOM
B = SYNTRIG CKT BD TOP - TRIG3-CK CKT BD BOTTOM
C = SPDC
D = HEATSINK WITH SCR'S, FU1,2,3 FUSES & DC SHUNT
E = HE JUNCTION BD
F = SCR'S HEATSINK COOLING FAN
G = POWER FACTOR SET POTENTIOMETER
H = POWER FACTOR REGULATION SWITCH
I = RECTIFIER TEST SWITCH
J = SPAC CKT BD & HE-VOLTS-150 CKT. BOARDS
K = GROUND TERMINAL BLOCK - DINRAIL MOUNTED
L = CROWBAR - DINRAIL MOUNTED
M = R1 RELAY
N = FU10/11/12/21 FUSES - DINRAIL MOUNTED
O = CPT - MOUNTED UNDER COMPONENT BACKSHEET
P = BLEED REISISTOR MOUNTED UNDER COMPONENTS BACKSHEET
Q = PT/CT INPUT MODULE WITH FUSES FU-PT1,2
R = WIREHARNESS PLUG MODULE BRAKET
S = INTERPOSING RELAY CIRCUIT CARD SYNREL-1
U = EXICTER AC DISCONNECT SWICTH

TS = CUSTOMER TERMINAL BLOCKS - 33 TERMINALS
WD = WIRE DUCT

POWER CONNECTION DESCRIPTION LEGEND

X1,X2,X3 = EXCITER AC INPUT CONNECTION (102VAC/3PH/60HZ, 106.1 AMPS)

10 = POS OUTPUT CONNECTION TO CUSTOMER SYNC MOTOR FIELD
-11 = NEG OUTPUT CONNECTION TO CUSTOMER SYNC MOTOR FIELD
10D & 11 = DC OUTPUT CONNECTIONS TO DISCHARGE RESISTORS
X1,X2,X3,10,-11,10D & 11 CONNECTIONS (#2-#14 AWG)

CONTROL PANEL ESTIMATED WEIGHT: 60lbs
CONTROL PANEL IS GOLD CHROMATE PLATED FINISH
(4) 1/2" DIA. MOUNTING HOLES FOR MOUNTING IN CUSTOMER EXISTING ENCLOSURE

MFG FOR:
P.O.#:
KINCODE: I:\UL-SUBMITTALS\UL-SR\KSR6 REG MECH CONST | REV: B

KINETICS CONTROL SYSTEMS
140 STOKES AVENUE
TRENTON, NEW JERSEY

REGULATOR MECHANICAL CONSTRUCTION

DATE:	DRAWN BY:	SYSTEM NO:
05/05/05 07/23/2006	F.RABULAN R. SECREST	UNIVERSAL SHEET 1 OF 1

Kinetics ***Industries Inc.***

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UL and Canadian UL Compliance- file number E302181 issued 2005-12-22

These units have been submitted to UL Laboratories for examination and testing in compliance with the requirements of the Standard for Power Conversion Equipment in effect as of the date of the UL Testing Labs report (2005-12-22).

Short circuit tests were performed on submitted equipment and were found to be in accordance with the requirements in UL 508C.

These same units have been examined and tested by UL laboratories and are certified to be in conformance with Canadian National Standard C22.2.

The following information and markings are provided herein to comply with the applicable UL and Canadian standards.

1. **"Use minimum 75'C wire only"**

2. **"Use copper conductors only"**

3. **Torque Markings:**
   Model KSR6C007PM11O
   Disconnect Switch: "Tighten terminals to 50 lb-in"
   Output Lug: "tighten terminals to 50 lb-in"

   Model KSR6F017PM11O
   Disconnect Switch: "Tighten terminals to 50 lb-in"
   Output Lug: "tighten terminals to 120 lb-in"

   Model KSR6C015PM22O
   Disconnect Switch: "Tighten terminals to 50 lb-in"
   Output Lug: "tighten terminals to 50 lb-in"

   Model KSR6F034PM22O
   Disconnect Switch: "Tighten terminals to 50 lb-in"
   Output Lug: "tighten terminals to 120 lb-in"

4. **"Suitable for use on a circuit capable of delivering not more than 5.0 KA rms symmetrical amperes", where "@@@" is the input voltage of the device. This marking also includes the maximum voltage rating of the device.**

5. **"Integral solid state short circuit protection does not provide circuit protection. Branch circuit protection must be provided in accordance with the National Electric Code and any additional local codes."**

6. **"These devices provide solid state motor overload protection at 130% of FLA"**

Model differences – All KSR6 models are similar except for the overall ratings, base dimensions and heat sinks

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Operation and Maintenance Manual

For

Kinetics Models

KSR6C07PM11O
KSR6 F17PM11O
KSR6C15PM22O
KSR6F34PM22O

Exciter Regulators for Brush Type Synchronous Motors -

dtd 07/2006

Manufacturers of

- **SCR Exciter Regulators**
- **Line Regulated Diode Rectifiers through 2000 KW**
- **SCR Regulated Rectifiers through 2000 KW**
- **Synchronous Generator Excitation Systems**
- **Dry Type Transformers**
- **Magnet Power Supplies**
- **Flux Forcing Magnet Rectifiers**
- **Select-a-Pick Variable Voltage Magnet Rectifiers**
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