KinetSync-NB Ô

Brushless Synchronous Motor Controller

Instruction Manual

Program Revision: Mod ___

Factory Pre-Programmed Password:
[FWD-BACK-INC-DEC]

c UL us LISTED

Kinetics Industries Inc.
140 Stokes Avenue
Trenton, N.J. 08638

phone: 609-883-9700
fax: 609-883-0025
info@kinetics-industries.com

Proprietary Information

This manual has been furnished as a guide for the operation and maintenance of the product manufactured by Kinetics Industries, Inc. as described herein. The information is provided to owners of this equipment for this purpose and is not to be used for any other purpose. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of Kinetics Industries, Inc.

Copyright © 2002 Kinetics Industries, Inc. All rights reserved

KinetSync-NB™ *by Kinetics Industries Inc.*

140 Stokes Avenue
Trenton, New Jersey 08638

Table of Contents

***KinetSync-NB* Functions and Description** **page 2**

***Synchapp-NB* Brushless Synchronous Motor Exciter/Application System** **page 3**

***Synchapp-NB* and *KinetSync-NB* Connections** **page 3**
- **Required Motor Starter Control Inputs** **page 3**
- **Output Connections to the Motor Starter** **page 3**
- **Internal Connections between SVR and *KinetSync-NB*** **page 4**
- ***KinetSync-NB* Control Connection Layout figure** **page 4**

Installation
- **Receipt Inspection** **page 5**
- ***KinetSync-NB* Dimensions and Panel Cutout** **page 6**
- **Electrical Installation** **page 7**

Typical *Synchapp-NB* & *KinetSync-NB* Schematic Drawings
- **Sheet 1 – *Synchapp-NB* SVR Regulated Exciter Rectifier** **page 8**
- **Sheet 2 – KinetSync-NB Controller** **page 9**

***KinetSync-NB* Ratings and Specifications** **page 10**

Sequence of Operation of *KinetSync-NB* controller **page 11**
- **Mod H Operating Sequence** **page 12**
- **Mod C Operating Sequence** **page 13**
- **Mod ID1 & ID2 Operating Sequence** **page 14**

***KinetSync-NB* LCD Display Screen and Messages** **page 15**
- **Figure - LCD Display Annunciation Locations** **page 15**
- **Normal Operating Status Messages** **page 15**
- **Fault Messages** **page 15**
- **Digital Input Codes** **page 16**

***KinetSync-NB* Touch Pad and LCD Display**
- **Touch Pad Functional Description** **page 17**
- **Touch Pad Layout Figure** **page 17**
- **Fault Acknowledge and Reset Function** **page 18**

Viewing *KinetSync-NB* Timer and Meter Settings **page 18**

Adjusting *KinetSync-NB* Timers and Meter Settings **page 19**
- ***KinetSync-NB* Timer Descriptions** **page 20**
- **Adjusting Metering Display Calibration** **page 22**
- **Scaling Factors and Offsets** **page 23**
- **Power Factor Scaling Factors** **page 23**
- **KinetSync-NB Metering Parameters** **page 24**

KS_Parm Program Description **page 25**

Trouble shooting Guide for *KinetSync-NB* **page 26**
- **Additional KinetSync-NB Troubleshooting Notes** **page 29**

How to Get Assistance **page 31**
Standard Statement of Warranty and Limitation of Liability **page 31**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

The *KinetSync-NB*™ *Functions* and Description

- **The KinetSync-NB monitors the starting and running condition of a Brushless synchronous motor.**
- **It provides control of the Exciter Field Rectifier of the motor to apply DC power to the Rotating Field Exciter and thereby the Motor Field at the proper time during motor starts.**
- **The KinetSync-NB provides annunciation of the Motor Starting and Running Sequence, Motor Power Factor, and the Exciter Field Rectifier DC Volts and Amperes.**
- **It provides protection against various motor excitation malfunctions while starting or running the motor and annunciates the problems which include:**
  - **DC present on the Exciter Field Rectifier at the incorrect time**
  - **Failure to move out of a locked rotor condition after motor start**
  - **Exciter Field Rectifier DC power not present when required**
  - **Failure to achieve motor synchronization – Incomplete Sequence**
  - **Loss of Field after achieving motor synchronization**
  - **Low Motor Power Factor or impending Pull-Out of Synchronous running operation**
- **The *KinetSync-NB* provides a power factor vernier signal to its integrated companion Kinetics SVR-Type Regulated Exciter Field Rectifier to maintain a preset motor power factor under varying loads and conditions.**
- **With an operational fault, the *KinetSync-NB* shuts down the motor (via the FAL relay), annunciates the fault (both audibly and visually), and then provides, via its front Touch Pad, the ability to at first acknowledge the fault, and then reset the control.**
- **It maintains a record of the last five faults, including the fault identity and the date and time of fault. This fault record is accessible via the RS232 serial port using Kinetics' KS_Parm Windows PC software.**
- **The *KinetSync-NB* provides for access to its internal sequencing timer settings and meter parameters by using either the Touch Pad on the face of the *KinetSync-NB* or KS_Parm software. Modifying the settings using the faceplate Touch Pad requires the user to enter the Touch Pad Password. *Note: The touch-pad is locked out while the motor is running; therefore, no modifications can be made using the Touch-Pad during motor operation.* Modifying these same settings on-line, using the Kinetics' KS_Parm software, can be done whether the motor is running or not.**
- **The *KinetSync-NB* provides remote annunciation of motor achieving synchronization via *KinetSync-NB* FAX relay dry contact.**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Synchapp-NB Brushless Synchronous Motor Exciter/Application System

The *KinetSync-NB*™ controller, when operating in conjunction with the Kinetics Industries SVR-type SCR regulated rectifier, provides a complete, integrated, static excitation system. The Kinetics SVR regulator accepts and provides the necessary I/O signals for the integrated operation and control of the brushless synchronous motor. This combination constitutes the *Synchapp-NB* excitation system.

The *KinetSync-NB* can function adequately with other regulator/exciters but care must be exercised that the signal parameters are compatible and properly interfaced.

Synchapp-NB and *KinetSync-NB* Connections

On complete integrated systems inside *Kinetics* enclosures, all internal control connections between the *KinetSync-NB* and the SVR regulator are factory pre-wired. On open panel systems, where the *KinetSync-NB* and *Kinetics* SVR Rectifier are supplied as separate pieces, all control connections are made using SVR Terminal strip(s) and the Input and Output Terminal strips of the *KinetSync-NB* except for the connection of the Hall Effect Current and Voltage Transducers. Special cables, with custom plugs, are provided to connect the Hall Effect Voltage and Current Transducers from the Rectifier Power Board to headers on the rear panel of the *KinetSync-NB*.

All *Kinetics Synchapp-NB* systems are provided with Input/Output Terminal strip locations where Customer Control Connections are made.

Required Motor / Motor Starter Customer Control Inputs:

- **One N.O. dry contact which closes upon motor start – (52M)**
- **One N.O. dry contact which closes upon "Motor Full Volts" (if used)**
- **PT signal from A-B phase PT**
- **CT signal from C phase CT**
- **Synchronizing Signal (if used) – tachometer or other signal**

Output Connections to the Motor / Starter:

- **Motor Field Excitation DC power from the SVR rectifier**
- **FAL N.O. contact, (energized when OK), for use in motor contactor stop circuit. If circuit breakers with shunt trips for stop are used for motor starting, the optional "open when OK" FAL N.C. contact can be used.**
- **56K Repetitive Motor Restart Lockout contact to series with Start circuit**
- **FAX relay contacts for remote "Motor Synchronized" annunciation**

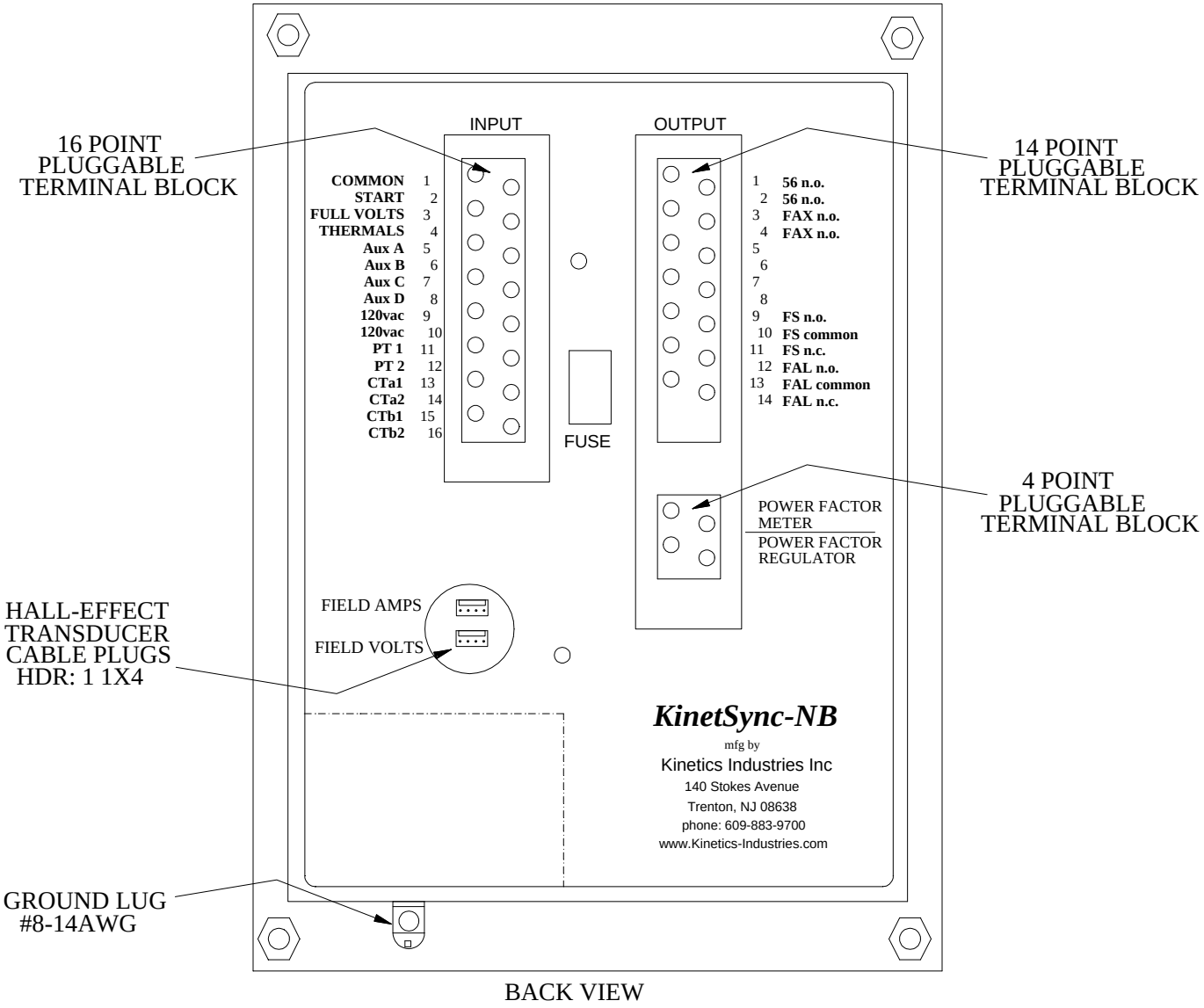
KinetSync-NB™ *by Kinetics Industries Inc.*

140 Stokes Avenue
Trenton, New Jersey 08638

Internal Connections between SVR regulator and *KinetSync-NB* include:

- **120VAC control power (if separate from main power input)**
- **Thermal or overload contacts**
- **PT signal from phase A-B**
- **Aux CT signals from auxiliary CTs**
- **FS relay contacts to control SVR rectifier "ON" function**
- **P.F. vernier signal to SVR rectifier for P.F. regulation of motor**
- **Exciter Field Rectifier Voltage and Current signals from Hall Effect Transducers**
- **56K relay contacts for "Repetitive Restart" Motor Lockout function**

KinetSync-NB Control Connections Layout



BACK VIEW

Installation

The Kinetics Industries *KinetSync-NB* Controller is available as part of an integrated Kinetics Synchronous Motor Field Application System or as separate panel-mounted sequencing control and protection device for use with a third party Field Exciter/Regulator.

When part of a Kinetics Synchronous Motor Field Application System, the *KinetSync-NB* can be supplied either as a pre-mounted component on a stand-alone Kinetics system enclosure or as a separate panel-mounted piece included along with a field regulator panel for mounting in existing switchgear cabinets.

Receipt Inspection

When supplied as a separate, panel-mounted, component, the *KinetSync-NB* box should be unpacked, inventoried, and checked for any apparent shipping damage as soon as possible after receipt. All shipping damage found should be documented and reported to the shipping carrier and Kinetics Industries.

Your *KinetSync-NB* package should include (at a minimum) a *KinetSync-NB* Controller, a package of pluggable (input/output) terminal strip blocks, and a copy of this Instruction Manual.

Mounting the *KinetSync-NB*

This section provides the information for installing the *KinetSync-NB* into a metal cabinet panel (or door).

Before mounting the *KinetSync-NB*, you must prepare the cutout location. Prepare the mounting hole for the controller case in the existing door or panel to the dimensions shown on the *KinetSync-NB* Dimension and Panel Cutout Drawing. (see page 6)

Prior to installing the *KinetSync-NB* into the panel cutout, remove the mounting hardware from the four bolts located on the back of the *KinetSync-NB* faceplate at the four corners. Save this hardware to secure the controller to the panel after it is in place.

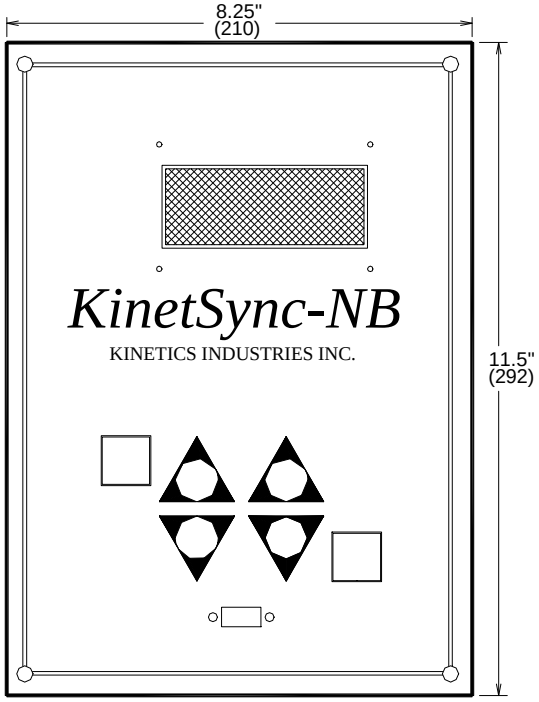
Insert the *KinetSync-NB* case into the panel cutout from the front, making sure that the controller LCD display screen faces out. (It may be necessary to tilt the case top forward slightly to insert the bottom ground lug into the prepared cutout first before sliding the remainder of the controller case completely into place).

Re-install the mounting hardware onto the four mounting bolts from the rear of the panel and tighten to secure the Controller in place. The *KinetSync-NB* is now installed and ready for wiring.

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

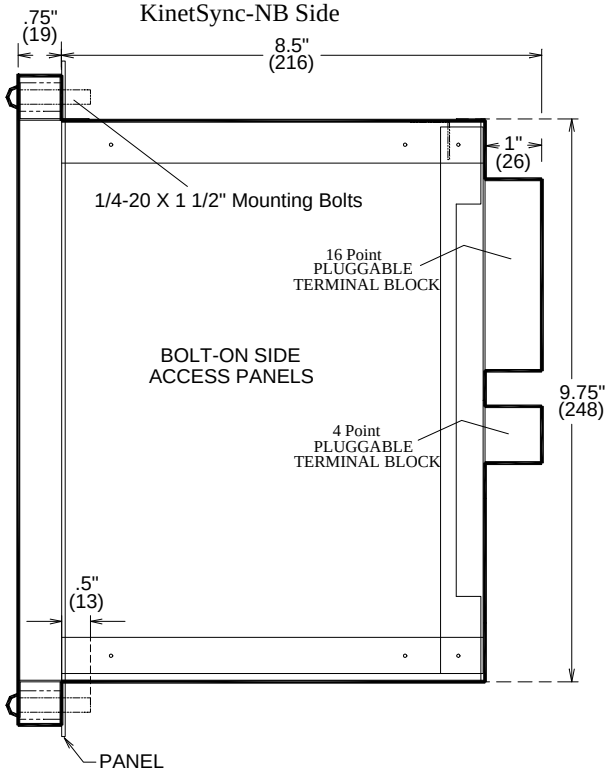
KinetSync-NB Dimensions and Panel Cutout

KinetSync-NB Front

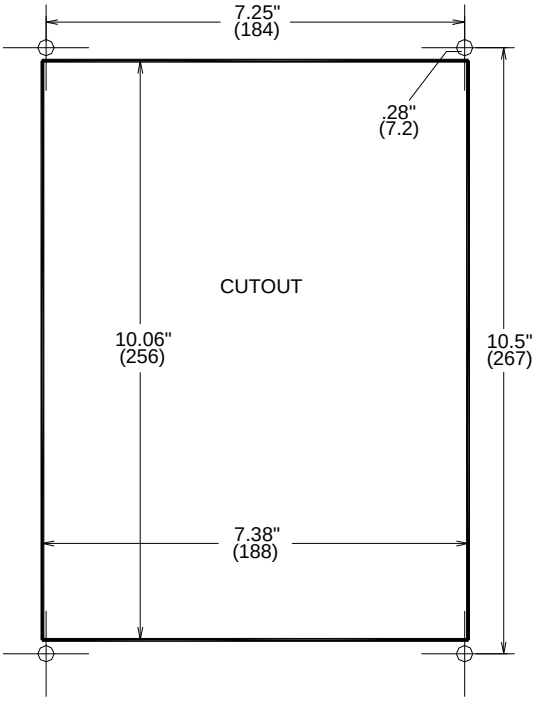


TOUCHPAD MEMBRANE HAS GROUNDED RFI & EMI SHIELD

KinetSync-NB Side



KinetSync-NB Panel Cutout



Electrical Installation

Grounding

The *KinetSync-NB* must be properly grounded to system ground via the ground lug located on the bottom of the Controller case.

Input Control Connections

- **Start - Motor "ON" Contact Input (M "aux" contact)**
- **Full Volts - Reduced Voltage Start: "Full Volts" Contact Input**
- **Thermals - Thermal Protection Circuit Input (Jumper Input when Not Used)**
- **120vac - Control Power Input**

Motor Starter PT and CT Connections

The *KinetSync-NB* is designed to work from a 120vac Potential Transformer (PT) secondary voltage and a 5amp Current Transformer (CT) secondary signal feeding a Kinetics PT/CT Input Module that, in turn, connects to the Controller PT and CT inputs. The Motor PT and CT connections must be made in the correct motor phase configuration for the proper operation of the *KinetSync-NB* Controller Power Factor Circuitry.

The *KinetSync-NB* requires that the PT and CT signals be connected in quadrature.

Possible correct PT/CT combinations:

CT phase C	**PT phase A-B**
CT phase A	**PT phase B-C**
CT phase B	**PT phase C-A**

Field Amps, Field Volts Discharge Amps Transducer Connections

The Field Amps, Field Volts and Discharge Amps connections on the back of the *KinetSync-NB* are designed to operate with Kinetics-provided Hall Effect isolating transducers and cables.

Relay Output Connections

- **56 - Repetitive Restart Interlock Contact - Closed = ok to start**
- **FAX - "Motor Synchronized" Output Annunciation Contact**
- **FS - Exciter Field Application Contact - to "Energize Field"**
- **FAL - System Fault or Trip Contacts - n.o. Opens on Fault**

Power Factor Control Connections

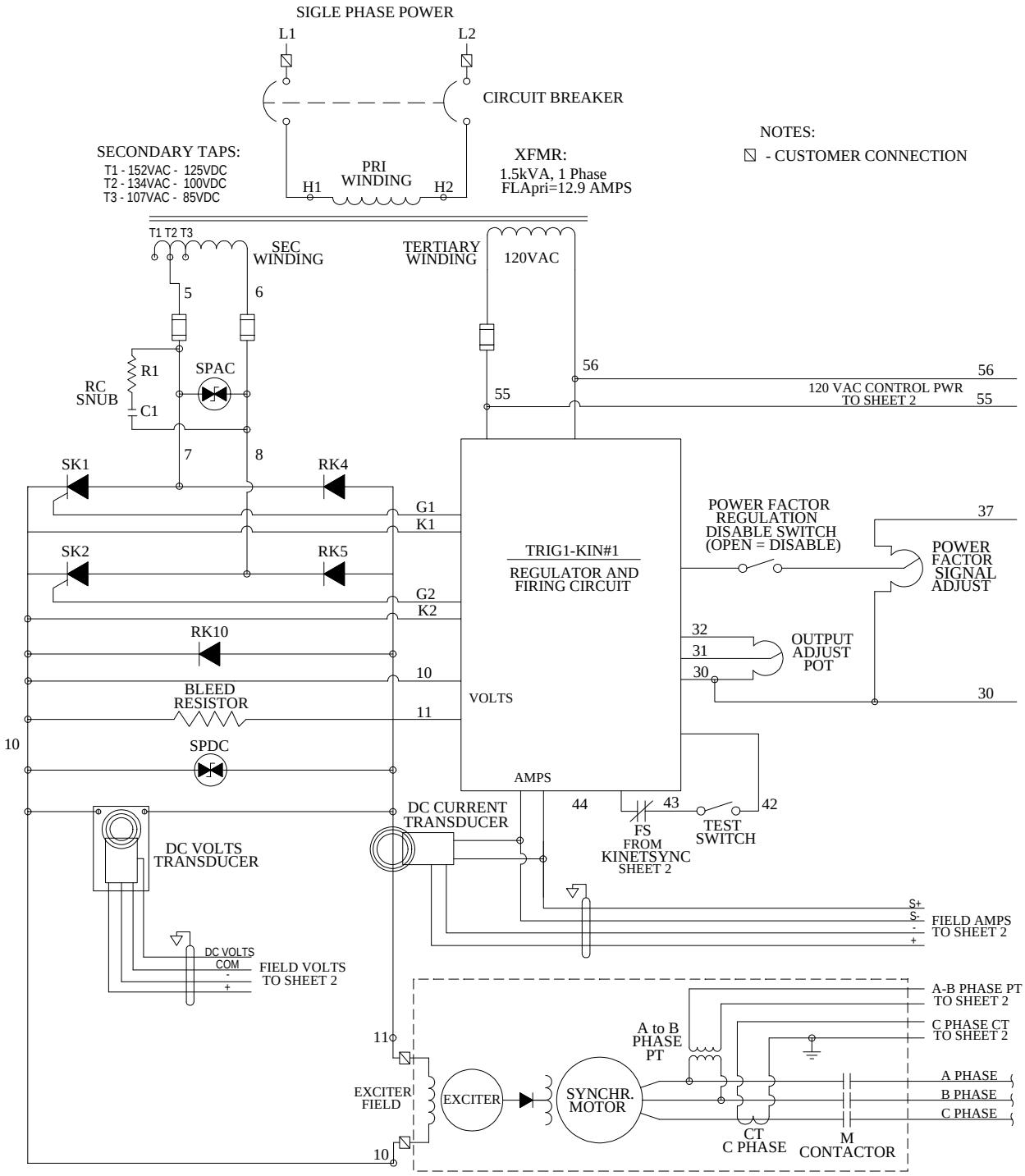
- **Power Factor Meter - Output to Kinetics Power Factor Meter**
- **Power Factor Regulator - Power Factor Regulation Signal Output (-5.0V - +5.0V analog signal from 0.2 Lagging to 0.2 Leading)**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Typical Synchapp-NB & KinetSync-NB Schematic Drawings

This figure is a typical schematic drawing presented for descriptive purposes only. See your exciter Operation and Maintenance Manual for your system-specific schematics.

Sheet 1 – *Synchapp-NB* SVR Regulated Exciter Rectifier

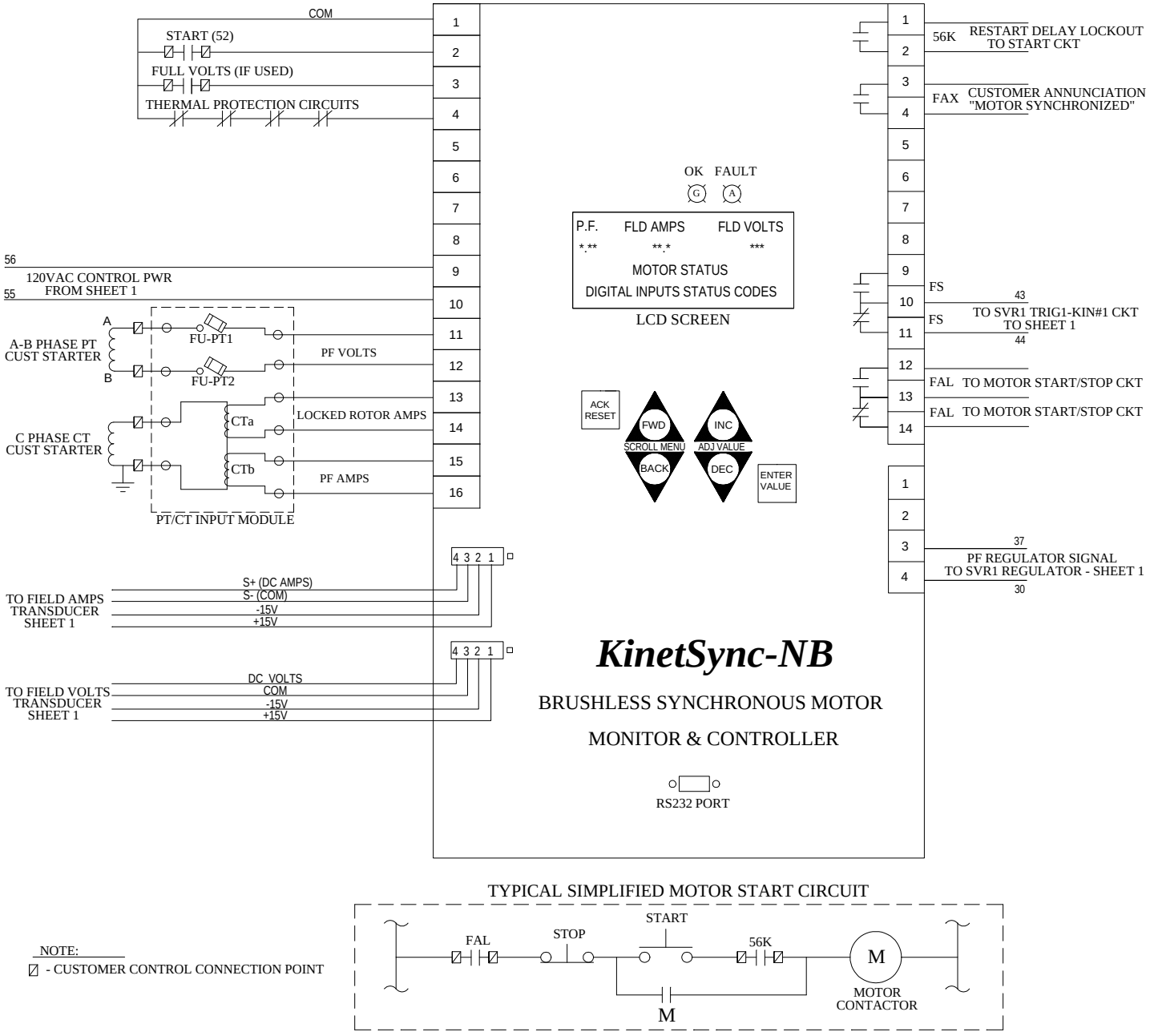


KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Typical Synchapp-NB & KinetSync-NB Schematic Drawings

This figure is a typical schematic drawing presented for descriptive purposes only. See your exciter Operation and Maintenance Manual for your system-specific schematics.

Sheet 2 – *KinetSync-NB* Controller



TYPICAL SIMPLIFIED MOTOR START CIRCUIT

NOTE:
☑ - CUSTOMER CONTROL CONNECTION POINT

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

KinetSync-NB™ Ratings and Specifications

Power: 120VAC, 1 Phase, 60 Hertz 1.0Amp
Line Fuse: 1.5Amp, 125VAC, Plug-in-type, 10KAIC @ 125VAC

Motor Starter Metering inputs for power factor readout and control:
Use PT/CT input module
PT: phases A-B – 120VAC to 240VAC -- .03 VA burden @ 120vac
CT: 5 amp secondary to PT/CT input module -- .02 VA burden 50/60 Hz

Power factor readout and regulator power factor control vernier signal
-0.2 (lag) to 1.0 to +0.2 (lead) – LCD digital display [*.] corresponds to:**
-2.8VDC to 0.0V to +2.8VDC – 5 Kohm load – vernier power factor signal to regulator

Controller Switch Inputs:
Dry contacts or transistor input – (collector sinking configuration) – Vce 15VDC

Controller Output Contacts:
All relays have form C contacts rated 6A continuous at 120VAC/240VAC/24VDC
Relays FAL and FS have all connections brought to Output Terminal strip
Relays 56K, FAX and Aux Relays 3 and 4 only have type A (n.o.) contacts accessible by Output Terminal strip

Exciter Field Rectifier Volts and Current Transducers:
Designed to operate with Hall Effect isolating transducers (2500 VAC rms isolation) either incorporated in Exciter Field Rectifier or provided separate for installation.
Rectifier Volts: Rated VDC → 4.0VDC input to *KinetSync-NB – digital display* **.*
Rectifier Amps: Rated ADC → 4.0VDC input to *KinetSync-NB – digital display* ***

Environment:
Designed for convection-cooled enclosures
Ambient temperatures: -20ºC to +50ºC:
Humidity: 0-95% non-condensing

Specifications subject to change without notice

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Sequence of Operation of *KinetSync-NB* Controller

This Section identifies the different variations of the *KinetSync-NB* program available for use with the different types of Brushless Motor Exciter "on-shaft" electronics.

The Kinetics *KinetSync-NB* Controllers are available with different software versions, or "Mods" for use with different types of Brushless Exciters. The different synchronizing methods used on Brushless Synchronous Motor Exciters must be matched with the correct version of the *KinetSync-NB* software for the controller to work correctly. Because of this variation in the "on-shaft" brushless exciter synchronizing techniques, a certain amount of knowledge about the specific Rotating Brushless Exciter type is often required prior to ordering the Kinetics system.

The *KinetSync-NB* Mod H programming is used for Brushless Rotating Exciters that require its "Exciter Field Winding" to be energized immediately at start or after a "fixed time delay" with no other external signals or timers influencing the motor synchronizing sequence.

The *KinetSync-NB* Mod C programming is similar to the Mod H program except that Mod C also incorporates an additional external Synchronizing Permissive Signal. After the "fixed time delay" has timed-out, the *KinetSync-NB* will NOT energize the Exciter Field Rectifier until after this Synchronizing Permissive Signal exceeds its "Turn On" threshold. (An example of an external signal source is a rotor tachometer providing a signal proportional to rotor speed as the motor accelerates).

The *KinetSync-NB* Mod ID1 and Mod ID2 programming is only used on Brushless Rotating Exciters that have "on-shaft" electronics that require the Exciter Field Rectifier to be energized at a specific rotor angle. These models monitor the Rotating Exciter Fields for "reverse induced voltage signals" that provide an indication of rotor speed and position. Use of these *KinetSync-NB* versions requires EXACT knowledge of the type of "on-shaft" electronics used in the Rotating Exciter. See the Mod ID1 and ID2 Operating Sequence description below for additional information.

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Detailed Sequences of Operation for *KinetSync-NB* Variations

Mod H Operating Sequence:

Incorporating a (fixed time) 'Apply Timer':

- **When control power is applied, the *KinetSync-NB* checks for starting conditions. If OK, closes the FAL output contact and displays the "OK to Start" message on the LCD screen.**
- **Starting the motor closes the Start Contact input to the *KinetSync-NB* and the Controller starts the pre-programmed "Apply Delay Timer" to delay energizing the (SVR) Exciter Field Rectifier. For Brushless Exciters that require the Exciter Field Rectifier to be energized immediately, this "Apply Delay Timer" is set to Zero.**
- **After a "motor start" indication, the *KinetSync-NB* monitors the Motor Armature Circuit to guard against stalled rotor problems. The Controller watches Armature Current for an indication of a drop from Locked Rotor Amps to a (nominal) point of 90% of the Locked Rotor value within a pre-programmed time (normally set for 3 sec). If the *KinetSync-NB* does not detect this decrease in Armature Current, it indicates a "Locked Rotor" fault and trips the motor.**
- **When the "Apply Delay Timer" has timed out, the *KinetSync-NB* closes the FS Relay output to the Exciter Field Rectifier and applies DC power to the Rotating Exciter Field.**
- **After closing the FS Relay output, the *KinetSync-NB* must see DC amps at the output of the Exciter Field Rectifier within a preset time (normally 3 sec); if not, it indicates a "No DC Amps" fault, tripping the motor.**
- **After a motor start indication, the *KinetSync-NB* waits a pre-programmed time allotted for the on-shaft electronics to apply DC to the motor field to synchronize the motor. If Motor Power Factor does not display an acceptable improvement within this time to signify synchronization, the controller indicates an "Incomplete Sequence" fault and trips the motor.**
- **If Motor Power Factor does improve above the acceptable threshold, the *KinetSync-NB* displays the "Motor Running" message on the LCD screen.**
- **On Reduced Voltage Start motors, after a "motor start" indication, the *KinetSync-NB* looks for the "Full Volts" indication contact to close during the start sequence. If this contact fails to close within a pre-programmed time, the controller indicates an "Incomplete Sequence" fault and trips the motor. If a Reduced Voltage starter is NOT used, a jumper should be permanently installed between the "FULL VOLTS" input and Common (Input terminals 3 and 1).**
- **After Synchronization, if the Exciter Field Rectifier Current drops below a preset minimum level, a "No DC Amps" fault is indicated and the motor is tripped.**
- **After Synchronization, the Motor Power Factor drops below a preset lag level, a "Low Power Factor " fault is indicated and the motor is tripped.**
- **After a Motor Stop, if the Motor Restart Interlock timer (56K) has not yet timed out then the "OK to Start" function is disabled and the Restart Delay Lock" is displayed until the Motor Restart timer times out.**

Mod C Operating Sequence:

Incorporating an "Apply Timer" and a Synchronizing Permissive Signal:

- **When control power is applied, the *KinetSync-NB* checks for starting conditions. If OK, closes the FAL output contact and displays the "OK to Start" message on the LCD screen.**
- **Starting the motor closes the Start Contact input to the *KinetSync-NB* and the Controller starts the pre-programmed "Apply Delay Timer" to delay energizing the (SVR) Exciter Field Rectifier.**
- **After a "motor start" indication, the *KinetSync-NB* monitors the Motor Armature Circuit to guard against stalled rotor problems. The Controller watches Armature Current for an indication of a drop from Locked Rotor Amps to a (nominal) point of 90% of the Locked Rotor value within a pre-programmed time (normally set for 3 sec). If the *KinetSync-NB* does not detect this decrease in Armature Current, it indicates a "Locked Rotor" fault and trips the motor.**
- **After the "Apply Delay Timer" has timed out, the *KinetSync-NB* waits for an External Synchronizing Permissive Signal input voltage to exceed its "Turn On" threshold value.**
- **Upon seeing the Synchronizing Permissive Input, the *KinetSync-NB* closes the FS Relay output to the Exciter Field Rectifier and applies DC power to the Rotating Exciter Field.**
- **After closing the FS Relay output, the *KinetSync-NB* must see DC amps at the output of the Exciter Field Rectifier within a preset time (normally 3 sec); if not, it indicates a "No DC Amps" fault, tripping the motor.**
- **After a motor start indication, the *KinetSync-NB* waits a pre-programmed time allotted for the on-shaft electronics to apply DC to the motor field to synchronize the motor. If Motor Power Factor does not display an acceptable improvement within this time to signify synchronization, the controller indicates an "Incomplete Sequence" fault and trips the motor.**
- **If Motor Power Factor does improve above the acceptable threshold, the *KinetSync-NB* displays the "Motor Running" message on the LCD screen.**
- **On Reduced Voltage Start motors, after a "motor start" indication, the *KinetSync-NB* looks for the "Full Volts" indication contact to close during the start sequence. If this contact fails to close within a pre-programmed time, the controller indicates an "Incomplete Sequence" fault and trips the motor. If a Reduced Voltage starter is NOT used, a jumper should be permanently installed between the "FULL VOLTS" input and Common (Input terminals 3 and 1).**
- **After Synchronization, if the Exciter Field Rectifier Current drops below a preset minimum level, a "No DC Amps" fault is indicated and the motor is tripped.**
- **After Synchronization, the Motor Power Factor drops below a preset lag level, a "Low Power Factor " fault is indicated and the motor is tripped.**
- **After a Motor Stop, if the Motor Restart Interlock timer (56K) has not yet timed out then the "OK to Start" function is disabled and the Restart Delay Lock" is displayed until the Motor Restart timer times out.**

Mod ID1 and ID2 Operating Sequence:

Incorporating utilization of reverse induced pulsing for synchronizing

- **When control power is applied, the *KinetSync-NB* checks for starting conditions. If OK, closes FAL contact and gives "OK to Start" message on LCD screen**
- **Starting the motor closes the start contact; the *KinetSync-NB* begins to track the frequency of the reverse induced field voltage pulses.**
- **When the frequency of the pulse time periods drops to less than 5 Hz, the *KinetSync-NB* looks for the next pulse to coordinate closing the FS Relay output to the Exciter Field Rectifier to apply DC power to the Rotating Exciter Field.**

    - **Mod ID1 programming logic is used when the on-shaft Rotating Exciter Discharge SCR is "shunt-connected" to the Motor Field. This Mod ID1 *KinetSync-NB* Controller will apply DC to the Rotating Exciter Field when this Discharge SCR is "OFF".**

    - **Mod ID2 programming logic is used with a "series-connected" on-shaft Rotating Exciter Discharge SCR configuration. The Mod ID2 *KinetSync-NB* Controller will apply DC to the Rotating Exciter Field when this Discharge SCR is "ON".**

- **After closing the FS Relay output, the *KinetSync-NB* must see DC amps at the output of the Exciter Field Rectifier within a preset time (normally 3 sec); if not, it indicates a "No DC Amps" fault, tripping the motor.**
- **After a "motor start" indication, the *KinetSync-NB* waits a pre-programmed time allotted for the on-shaft electronics to apply DC to the motor field to synchronize the motor. If Motor Power Factor does not display an acceptable improvement within this time to signify synchronization, the controller indicates an "Incomplete Sequence" fault and trips the motor.**
- **If Motor Power Factor does improve above the acceptable threshold, the *KinetSync-NB* displays the "Motor Running" message on the LCD screen.**
- **On Reduced Voltage Start motors, after a "motor start" indication, the *KinetSync-NB* looks for the "Full Volts" indication contact to close during the start sequence. If this contact fails to close within a pre-programmed time, the controller indicates an "Incomplete Sequence" fault and trips the motor. If a Reduced Voltage starter is NOT used, a jumper should be permanently installed between the "FULL VOLTS" input and Common (Input terminals 3 and 1).**
- **After Synchronization, if the Exciter Field Rectifier Current drops below a preset minimum level, a "No DC Amps" fault is indicated and the motor is tripped.**
- **After Synchronization, the Motor Power Factor drops below a preset lag level, a "Low Power Factor " fault is indicated and the motor is tripped.**
- **After a Motor Stop, if the Motor Restart Interlock timer (56K) has not yet timed out then the "OK to Start" function is disabled and the Restart Delay Lock" is displayed until the Motor Restart timer times out.**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

KinetSync-NB LCD Display Screen and Messages

- **During normal operation, the first two lines of the LCD show Motor Power Factor, Rectifier/Exciter DC Field Amps and Rectifier/Exciter DC Field Volts.**
- **The third line of the LCD shows System "Status" or "Fault" Messages.**
- **The fourth line of the LCD displays Digital Codes indicating the "real time" ON/OFF status of selected digital inputs during operation.**

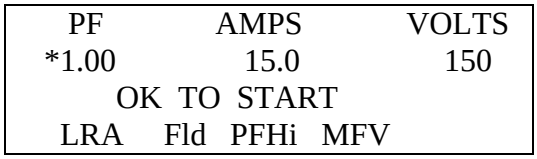


Figure - LCD Display Annunciation Locations
The * in the PF display indicates "-" when lag and "+" when lead

Normal Operating Status Messages:

"<u>OK to Start</u>" - *KinetSync-NB* detects no faults and system is prepared for Motor Start.
"<u>Motor Synchronizing</u>" – Motor Start detected – *KinetSync-NB* system is monitoring motor starting sequence for possible faults as the motor accelerates and synchronizes.
"<u>Motor Running</u>" – Motor has come up to synchronizing speed, field has been applied, power factor and exciter field current are within operating limits and motor is operating OK.
"<u>Motor Stopped</u>" – The *KinetSync-NB* has detected a normal Motor Stop.
"<u>Restart Delay Lock</u>" – Motor has stopped and 56K Repetitive Restart Motor Lockout timer has not yet timed out allowing motor to be restarted.
"<u>Motor Fault</u>" – A Motor Fault has been detected and the *KinetSync-NB* is in Fault Shutdown mode. See concurrent Fault Message.

Fault Messages:

"<u>DC On Before Start</u>" – *KinetSync-NB* has detected Exciter Field Rectifier output volts before the system has called for it.
"<u>Low PF Before Start</u>" – *KinetSync-NB* has detected a poor lagging power factor prior to receiving a motor start signal input.
"<u>Low Power Factor</u>" – If this fault occurs during the motor start sequence, the *KinetSync-NB* has sent a turn-on signal to the Exciter Field Rectifier and has detected no improvement in Motor Power Factor to indicate that the motor has synchronized. After the motor has synchronized, this fault message indicates that the *KinetSync-NB* has sensed Motor Power Factor has dropped below the preset low power factor threshold. This is an indication of improper motor operation or excitation and the possibility of a pull out of synchronization.
"<u>No LRA Dropoff</u>" – On start, the motor armature CT current signal has not dropped below a preset "Locked-Rotor" threshold level within the preset time interval from Start.

"No Fld Amps (Sync)" –This fault occurs during the motor start sequence when the *KinetSync-NB* has sent a turn-on signal to the Exciter Field Rectifier and has detected no Rectifier Current within a preset time interval.
"No DC Fld Amps (Run)" – This fault message indicates that the *KinetSync-NB* detected a loss of Exciter Field Rectifier current while them motor was running synchronized.
"Motor Hi Temp" – The *KinetSync-NB* has detected a high temperature fault indication from the external thermal protection circuit.
"Incomplete Sequence" – The Motor has not completed one or more of the steps required in its start up sequence within the preset allotted start time.
"Shorted Diode" – The *KinetSync-NB* has detected a possible shorted diode in the "on-shaft" electronics of the Brushless Motor Exciter.
"Open Diode" – The *KinetSync-NB* has detected a possible open diode in the "on-shaft" electronics of the Brushless Motor Exciter.

Digital Input Codes:

"LRA"- Armature Locked Rotor Amps signal – displayed when the Motor Armature CT signal strength is below the value seen during a "Stalled Rotor" condition. This Input Display should turn off, for only a moment, at motor start and then reappear as rotor accelerates
"Fld" - Exciter Field Rectifier Amps signal - displayed when the Exciter Field Rectifier Current exceed the minimum current threshold level
"PFHi" - Synchronized Motor Power Factor signal – displayed when Motor Power Factor is better than minimum preset lagging power factor trip point, is displayed when the power factor is OK or high
"MFV" - Motor Starter Full Volts Signal – displayed if Full Volts Contact "Closed" Signal is present (If Reduced Voltage Start is NOT used this signal input should be jumpered "ON" permanently between Input Terminal 1 to 3)

Special Codes for mod ID1 and ID2 programs:

"p" - Induced pulses are being detected on Exciter Field
"I" - Indicates that Interval Timer has been activated
"n" - Indicates that Notch Timer has been activated

Special Codes for mod C program:

"T" - Indicates external Synchronizing Signal is present. This input should turn on when the motor is up to speed and ready to synchronize, at which point the *KinetSync-NB* energizes the Exciter Field Rectifier.

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

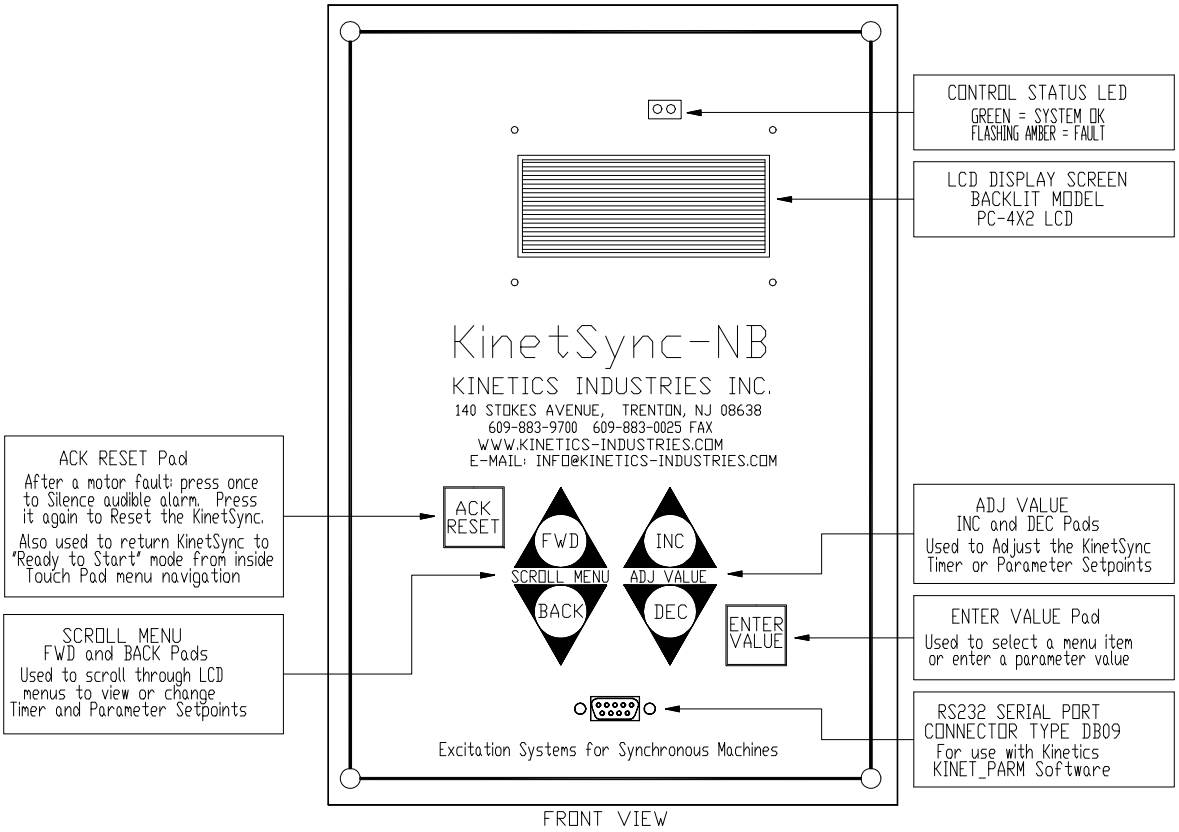
KinetSync-NB Touch Pad and LCD Display

KinetSync-NB Touch-Pad and LCD Display Functional Description

The Touch Pad and LCD on the face of the *KinetSync-NB* has three major functions.

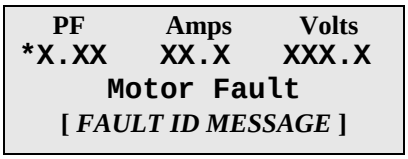
1. **The Touch Pad is used to Acknowledge and provide a Reset function for Excitation or Control Sequence faults from the *KinetSync-NB* operating logic microprocessor after the controller alarms and shuts down the system.**
2. **The Touch Pad can be used to review the present settings of the *KinetSync-NB* timing functions and metering parameters.**
3. **With the entry of the system password, the Touch Pad can be used to modify or adjust the *KinetSync-NB* timing functions and metering parameters.**

<u>The *KinetSync-NB* Touch-Pad is NOT functional during motor running operation</u>.



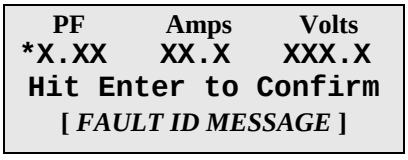
Fault Acknowledge and Reset Function

When a fault occurs, the *KinetSync-NB* annunciates on its LCD screen that a "MOTOR FAULT" has occurred, identifies the fault on the LCD screen, and provides a shutdown or fault signal to the motor AC controller. It also provides a shutdown signal to the Exciter Field Rectifier, sounds an audible alarm, switches the Control Status LED indicator from a steady Green to a flashing Amber LED. Finally, the *KinetSync-NB* Touch Pad is activated for Acknowledgement of the fault and System Reset.

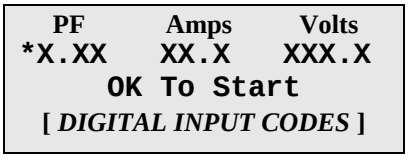


With the *KinetSync-NB* in the Fault condition, pressing the Touch Pad <ACK/RESET> turns off the audible alarm but otherwise leaves all else in the fault condition.

Touching the Touch Pad <ACK/RESET> a second time displays "HIT ENTER TO CONIRM." on the LCD screen. The operator should read and record the fault for future analysis.



Pressing the <ENTER VALUE> Touch Pad enters a RESET signal to the microprocessor, to reset the *KinetSync-NB* and bring the controller back to the start up condition.



Viewing *KinetSync-NB* Timer and Meter Settings

The "VIEW SETTINGS" mode can be enabled when the *KinetSync-NB* is in the "OK to Start" mode as displayed on the LCD screen, the motor is not running, and power is applied to the control system.

Pressing either the <FWD> or <BACK> Scroll Menu pads on the Touch Pad will bring up the "ADJUST TIMERS" menu on the LCD screen.

Touching either the <FWD> or <BACK> pads again will scroll to the remaining menus, which are "ADJUST SCALING" and "ADJUST TIME/DATE"

To view timer settings, press the <ENTER VALUE> Touch Pad when the display reads "ADJUST TIMERS." Similarly, to view metering scaling parameters, press the <ENTER VALUE> pad when the scrolling is on "ADJUST SCALING".

When the Touch Pad <ENTER VALUE> pad is pressed with "ADJUST TIMERS" displayed, the first timer and its time setting is then displayed. (NOTE: All timer set points are in milliseconds)

To view the next timer, press the Touch Pad <FWD> pad again and the next timer setting will be displayed. Hitting the <BACK> pad will scroll the display back

one item. Similarly, the Meter Scaling parameters can be viewed.

To EXIT "VIEW SETTINGS" Mode:

Pressing the <ACK/RESET> Touch Pad while viewing Timer or Scaling set points in "VIEW SETTINGS" mode will put the *KinetSync-NB* back into the "OK TO START" mode.

Adjusting the *KinetSync-NB* Timers and Meter Settings

In order to modify the existing settings, it is required to know the *KinetSync-NB Password*. This system password is programmed into the controller using the KS_Parm programming software. A standard password is programmed into the unit at the factory. (*This factory-programmed password is listed on the title page of this instruction book*) It can be changed using the KS_Parm software installed on a Windows PC computer. See the manual section describing the KS_Parm software.

To adjust timer values or meter scaling, proceed as described above in "*Viewing KinetSync-NB Timer and Meter Settings*". Scroll through the Timers or Meter Scaling selections until the item you want to change appears on the LCD screen and then press the <ENTER VALUE> Touch Pad for the "ADJUST SETTINGS" mode.

```
12:01:01          12/31/01
Kinetics KinetSyncNB
    Adjust Timers
LRA Dropoff:          2000
```

A cursor will appear highlighting the right-most digit in the parameter set point. Press either the <INC> or <DEC> "Adjust Value" Touch Pads to incrementally increase or decrease the numerical value of this set point.
(Note: All timer settings are shown in millisecond [.001 sec] units while meter scaling set points are in .001 increments)

The set point digit highlighted by the blinking cursor will be the one modified by pressing the <INC> or <DEC> Touch Pad.

Example:
Press <INC> <INC> <INC>

```
12:01:01          12/31/01
Kinetics KinetSyncNB
    Adjust Timers
LRA Dropoff:          2003
```

Pressing the <BACK> Touch Pad will move the cursor to the left one place.

Example:
Press <BACK> <BACK>
Press <DEC> <DEC> <DEC> <DEC>

```
12:01:01          12/31/01
Kinetics KinetSyncNB
    Adjust Timers
LRA Dropoff:          1603
```

Similarly, pressing the <FWD> Touch Pad will move the cursor to the right. This function allows for either coarse or fine adjustment of the parameter set point.

When the desired new set point has been achieved, press the <ENTER VALUE> Touch Pad to enter the new setting. The LCD will now prompt you to: "ENTER PASSWORD".

```
12:01:01          12/31/01
Kinetics KinetSyncNB
Enter Password:
LRA Dropoff:          1603
```

At this point, enter the programmed 4-Digit *KinetSync-NB Password* (A combination of the "SCROLL MENU" and "ADJ VALUE" Touch Pads) and then press the <ENTER VALUE> Pad again. The new set point value will be entered into the *KinetSync-NB* memory and the system returns to "ADJUST SETTINGS" mode with the new set point displayed. You can now use the <FWD> or <BACK> Touch Pads to scroll another parameter to adjust. (*If the new set point changes back to the original value when the <ENTER VALUE> Pad was pressed, then the wrong KinetSync-NB Password was entered and the modification process must be repeated.)*

To NEGATE a changed setting before you press <ENTER VALUE> (to enter the password), press the <ACK/RESET> Pad and the program will return to the "ADJUST SETTINGS" mode menu.

To EXIT "ADJUST SETTINGS" Mode:

Pressing the <ACK/RESET> Touch Pad while in the "ADJUST TIMERS", "ADJUST SCALING" or "ADJUST TIME/DATE" modes will put the *KinetSync-NB* back into the "VIEW SETTINGS" mode. Pressing the <ACK/RESET> once again returns the KinetSync-NB to the "OK TO START" mode.

KinetSync-NB Timer Descriptions

The following is a description of the programmable timers that can be accessed via the *KinetSync-NB* LCD using the Touch Pad controls.

Locked Rotor Amps Dropoff Timer:
Motor Armature Amps must drop below the "Locked Rotor" threshold within this time after a Motor Start or else a "No LRA Dropoff" Fault results.

Field Current Timer:
Exciter Rectifier Field Current must be detected within this time after the *KinetSync-NB* turns on the Field Rectifier or a "No Fld Amps (Sync)" Fault result

Synchronizing Timer:
Motor Power Factor improvement must be detected within this time after the *KinetSync-NB* turns on the Exciter Field Rectifier. This improvement is a positive indication of motor synchronization and if it doesn't occur a "Low Power Factor" Fault results

Incomplete Sequence Timer:
The motor must start up and properly synchronize within this time after a Motor Start or else an "Incomplete Sequence" Fault results. This timer is usually set

longer than the normal time required to start-up the motor.

Motor Restart Interlock Timer: (56K)
This timer is started when a motor start indication is received. The *KinetSync-NB* will not allow another motor start until this timer has timed out.

Field Current Fault Timer:
After the motor is synchronized, a loss of Exciter Field Rectifier current cannot exceed this time duration or a "No DC Fld Amps (Run)" fault results.

PF Pullout Fault Timer:
After the motor is synchronized, a low (Lagging) Motor Power Factor indication cannot exceed this time duration or a "Low Power Factor" Fault results

Shorted Diode Fault Timer:
After the motor is synchronized, an indication of a shorted "on-shaft" Exciter Diode *(from the optional Kinetics Diode Monitor Package)* cannot exceed this time setting or a "Shorted Diode" Fault results

Open Diode Fault Timer:
After the motor is synchronized, an indication of an open "on-shaft" Exciter Diode *(from the optional Kinetics Diode Monitor Package)* cannot exceed this time setting or an "Open Diode" Fault results

Motor Stop Timer:
After a normal Motor Shutdown, this is a delay before enabling the "DC On Before Start" Exciter Rectifier Current Fault.

Thermal OverLoad Timer:
A high temperature indication has been detected in the external Thermal Protection Circuit for longer than this timer duration

FldApp Timer:
This timer is started at Motor Start and is a programmed-in delay before the *KinetSync-NB* energizes the Exciter Field Rectifier output

Adjusting Meter Display Calibration

The *KinetSync-NB* displays three operating Meter Parameters while running:

- **Exciter Field DC Volts**
- **Exciter Field DC Amps**
- **Motor Power Factor**

These three parameters are continuously updated during Run Mode and their values are displayed on the second line of the LCD screen.

```
 PF      Amps     Volts
*X.XX    XX.X     XXX.X
      OK to Start
 [ DIGITAL INPUT CODES ]
```

Each Meter Display has an adjustable programmed *Scaling Factor* and an *Offset* for calibration. These programmed values are adjusted by either using the front *KinetSync-NB* Touch Pad or the optional *Kinetics* KS_Parm Windows software.

Exciter Volts and Amps Calibration

The Volts and Amps signals are provided to the controller from Hall Effect transducers on the Rectifier/Exciter output. For 125VDC Brushless exciters the Hall Effect transducer ratios are normally:

150VDC → 4 VDC input to the *KinetSync-NB* A/D converter

15 ADC → 4 VDC input to the *KinetSync-NB* A/D converter

To adjust the Metering Calibration of the *KinetSync-NB* Display you must enter the "ADJUST SCALING" mode. This mode can be accessed when the *KinetSync-NB* is in the "OK to Start" mode on the LCD screen, while the motor is not running, and power is applied to the control system.

Pressing either the <FWD> or <BACK> Scroll Menu pads on the Touch Pad will bring up the "ADJUST TIMERS" menu on the LCD screen. Pressing the <FWD> or <BACK> Pads at this point will scroll to the additional "ADJUST SCALING" and "ADJUST TIME/DATE" screens.

To enter the "VIEW SCALING" mode, press the <ENTER VALUE> Touch Pad when the display reads "ADJUST SCALING."

```
[TIME]                [DATE]
Kinetics KinetSyncNB
   Adjust Scaling
[PARAMETER]:[SET POINT]
```

Pressing the <FWD> or <BACK> Touch Pads will now scroll through the different meter calibration parameters for the *KinetSync-NB* LCD Display. When the Meter Parameter you wish to modify is displayed, press the <ENTER VALUE> Touch Pad again to enter the "ADJUST SCALING" mode.

A cursor will appear highlighting the right-most digit in the Parameter set point.

```
12:01:01              12/31/01
Kinetics KinetSyncNB
   Adjust Scaling
DC Volts SF:          1050
```

Press either the <INC> or <DEC> "Adjust Value" Touch Pads to incrementally increase or decrease the numerical value of this highlighted digit or move the cursor right or left using the <FWD> and

<BACK> pads to affect either a coarse or fine numerical adjustment.

Finish by pushing the <ENTER VALUE> Touch Pad and you will be prompted to enter the Password as described in the "Adjust Timers" section of this manual.

Scaling Factors and Offset

The Scaling Factor for each of the *KinetSync-NB* input parameters is based on a 10VDC max input providing a screen annunciation of the entered scaling factor. (A Scaling Factor of 500 with 10VDC Field Volts signal input yields 500VDC on the LCD screen for exciter Volts).

If the Volts Transducer ratio is 150V = 4V then the calculated scale factor is:

10*150/4 = 375

Thus, a 10V input signal yields 375 VDC

And:

A 4V input signal will display 150 VDC.

If the Field Current Transducer ratio is 15A = 4V then the calculated scale factor would be:

10*15/4 = 37.5

Thus, 10V would give 37.5 ADC

And:

A 4V input will display 15 ADC

The Volts and Amps Display parameters each include an Offset (Zero) adjustment to compensate for any analog amplifier interface variations. This Offset is the programmed value, which will yield a Zero output on the LCD when the Input signal (Field Volts or Amps) to the *KinetSync-NB* is shorted. This offset value is typically in the range of 90 to 110 for both Volts and Amps.

Power Factor Scaling Factors

Unlike the Volts and Amps displays, the Power Factor value is dual polarity to reflect that this parameter can be either Leading (positive) or Lagging (negative). The *KinetSync-NB* internal Power Factor Circuit generates a voltage signal which corresponds to motor power factors from zero power factor "Lagging" to zero power factor "Leading." Like the Field Amps and Field Volts inputs, the Power Factor display has Scaling Factor and Offset adjustments to compensate for analog amplifier interface variations.

This offset is the numerical value that will display a 1.0 on the LCD when the internal Power Factor Circuit signal output to the

***KinetSync-NB A/D converter* is shorted to provide an absolute zero or null signal. This Power Factor Offset value is normally in the range of 1900 to 2100 for the Power Factor display.**

The *KinetSync-NB* internal Power Factor Circuit Amplifier output signal ranges from -3 VDC at 0.00 Lag power factor to +3 VDC at 0.00 Lead power factor. This signal has a sine wave profile based on the sine of the motor power factor angle. The *KinetSync-NB* processor converts this input signal to the equivalent power factor value (i.e. cosine of power factor angle) that it then displays on the LCD. The scaling factor is based on 5 volts full scale input. The algorithm used is:

(P.F.out) * (P.Fs.f.) / 5 = SINE(P.F.angle)

P.F. Display = COS(arcsine(P.F.angle))

Where:

P.F.out = Power Factor Circuit output
P.F.s.f. = Power Factor Scaling Factor
P.F.angle = Motor Power Factor Angle
P.F. Display = LCD Power Factor value

Note: *The Power Factor Scaling Factor and Offset can vary over a wider range than that of the Volts or Amps parameters as the 5 volts input is only a nominal value.*

The above calculation provides a ballpark adjustment level but the best calibration is provided by scaling to the values shown below:

Internal P.F. Circuit calibration:

-2.4 VDC → -.6 pf
-1.8 VDC → -.8 pf
***0.0 VDC → 1.0 pf**
+1.8 VDC → +.8 pf
+2.4 VDC → +.6 pf

KinetSync-NB Metering Parameters

The following is a list of the programmable Metering Calibration parameters that can be accessed via the *KinetSync-NB* LCD using the Touch Pad controls.

DC Field Volts Scaling Factor

DC Volts Offset

DC Field Amps Scaling Factor

DC Field Amps Offset

Power Factor Circuit Scaling Factor

Power Factor Circuit Offset

KS_Parm Program Description

The KS_Parm program is available from Kinetics Industries, as a *KinetSync-NB* accessory, to aid the user in obtaining optimum usage from this controller.

The same Touch Pad parameter viewing and modification functions described above are available using the KS_Parm program on a Windows PC computer connected via a serial connection to the RS232 serial port on the front of the *KinetSync-NB.*

Additional Functions of the KS_Parm program include:

- **Changing or setting the access password for the *KinetSync-NB***
- **Modifying the time and date settings for the *KinetSync-NB* fault review table**
- **Reviewing the fault history of the *KinetSync-NB***
- **Ability to review and change settings while the *KinetSync-NB* is in operating mode (while the motor is running)**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Trouble Shooting Guide for *KinetSync-NB*Ô

LCD Alarm Message:	Possible Cause:	Action Required:
DC On Before Start ***KinetSync-NB detects Exciter field current without the motor running***	**1. Rectifier "Test/Run" Switch in "Test" position and SVR Exciter Field Rectifier has a DC output** **2. Incorrect FS Relay connection**	**- Move "Test/Run" switch to "Run" position and reset controller.** **- Check FS Relay wiring at *KinetSync-NB* Output Terminal strip connection (points 10 and 11) and at SVR Rectifier Input Terminal strip**
Low PF Before Start ***KinetSync-NB detects a poor lagging power factor before receiving a motor start signal input***	**1. Motor Start contact signal problem. Possible incorrect or bad connection**	**- Check Motor Start contact signal connection to *KinetSync-NB* at Input Terminal strip connection (points 1 and 2) and remotely.** ***Contact should close at the beginning of the motor startup sequence.***
No LRA Dropoff ***KinetSync-NB detects signals characteristic of a Locked Rotor Fault – (Continuing High Armature Amps)***	**Motor rotor stalled or not accelerating properly during motor start.** **Locked Rotor Amps drop off timer set point is too short**	**- Check the condition of motor load bearings and/or other conditions that would affect the free turning of the motor rotor** **- Increase LRA Dropoff Timer set point slightly**
No Fld Amps (Sync) ***KinetSync-NB fails to detect Exciter Field Rectifier current after sending a "turn-on" signal to the Exciter*** **No DC Fld Amps (Run)** ***KinetSync-NB detects loss of Excitation Amps while synchronized*** **(Continued)**	**1. SVR rectifier output not adjusted properly.** **2. Incorrect Field Circuit Transducer cable connection on back of *KinetSync-NB*** **3. Incorrect FS Relay connection** **4. No Rectifier Output** **5. No Field Current, open Field circuit at SVR output, motor Exciter Field, or leads**	**- Place "TEST/RUN" switch in "TEST" position and adjust the SVR Output Adjust Pot to get rated field amps from rectifier. Return switch to "RUN" position and RESET *KinetSync-NB* Controller** **- Check that the Kinetics Field Current Transducer Cable is properly plugged in to "FIELD AMPS" location on back of *KinetSync-NB* case and at the SVR Field Amps Hall Effect Transducer** **- Check FS Relay wiring at *KinetSync-NB* Output Terminal strip connections (points 10 and 11) and at SVR Rectifier Input Terminal strip.** **- Check the *KinetSync-NB* Output Terminal strip is properly seated in terminal strip receptacle** **- Troubleshoot Exciter Field Rectifier to get proper output voltage and current** **- Check and correct Exciter Field circuit wiring.** **- Confirm Exciter Field leads properly connected to SVR rectifier output**

--	--	--
No DC Fld Amps (Run)* **** Fault occurs only when PF Regulation Switch is closed (Enabled)***	*** Power Factor regulation signal polarity is incorrect**	**- Check that the *KinetSync-NB* Displayed Power Factor varies as described below in "Low Power Factor" fault section (correct if necessary)** **- Check PF Regulator Signal wiring connections between *KinetSync-NB* output and SVR Input Terminal Strip (see electrical schematic drawings)**
Low Power Factor *(During Start)* ***KinetSync-NB fails to detect improvement in motor power factor after sending a "turn-on" signal to Exciter*** **** The KinetSync-NB LCD should display a negative (LAG) power factor value during motor starts (prior to motor synchronization) This PF value should increase in a positive direction upon synchronization. After synchronization, the motor power factor can be adjusted Leading (positive) by increasing field excitation and Lagging (negative) by decreasing excitation*** ***A positive (LEADING) power factor prior to synchronizing indicates incorrect PT and CT phasing that must be corrected.***	**1. SVR rectifier (Exciter Field Rectifier) output set too low** **2. Motor shaft load too great for motor to pull in to synchronization** **3. Incorrect motor starter voltage and current signal connections. (PT and CT signals not connected correctly or to correct phase at the Motor Starter, SVR Input, or *KinetSync-NB* Input)**	**- Check and/or adjust SVR rectifier output as described above in "No Field Current" Fault (#1)** **- Reduce motor loading during starts or unload motor until after synchronization** **- Check the condition of motor load bearings and/or other conditions that would affect the free turning of the motor rotor** **- Check that the motor PT and CT signals are connected to correct phases (normally PT = phase A and B; CT = phase C.)** **- Check that the motor PT/CT wiring is correct to the SVR rectifier Input Terminal strip PT and CT connection points and connected properly** **- Check the *KinetSync-NB* Input Terminal strip PF Volts and PF Amps connections (points 11-12 and 15-16) are connected properly** **- Check the *KinetSync-NB* Input Terminal strip is properly seated in terminal strip receptacle** **- Check that PT fuses are OK and disconnects are closed** **** If the motor starter PT and CT phase connections are confirmed correct as described above and the LCD power factor is discovered to be opposite of that expected, (see description at left) then reverse the wires at the KinetSync PF Amps input on the Input Terminal strip (points 15-16) * This procedure should only have to be performed during system commissioning***
Low Power Factor *(After Synchronized)* **** Fault occurs during normal motor running*** **(continued)**	**1. Motor has pulled out of synchronization due to excessive overload** **2. SVR rectifier (Exciter) output set too low**	**- Check the condition of motor load bearings and/or other conditions that would affect motor loading** **- Adjust SVR rectifier output as described above in "No Field Current" Fault (#1)**

Low Power Factor ***(After Synchronized) continued.*** ***KinetSync-NB detects low (Lagging) power factor while synchronized that indicates improper motor operation or excitation*** -- **** Fault occurs only when PF Regulation Switch is closed (Enabled)***	**3. Motor Field circuit problem (see No Field Current) above** -- **4. Incorrect motor starter voltage and current signal connections. (PT and CT signals not connected correctly or to correct phase at the Motor Starter, SVR Input, or *KinetSync-NB* Input)** **5. Power Factor regulation signal polarity is incorrect**	**- See "No Field Current Fault" above for checks and remedies** -- **- See "Low Power Factor Fault" above for checks and remedies** **- With PF Regulation Switch open (Disabled), Check that the *KinetSync-NB* Displayed Power Factor varies as described above in "Low Power Factor" fault section (correct if necessary).** **- If *KinetSync* Power Factor Display varies correctly, check PF Regulator Signal wiring connections between KinetSync-NB output and SVR Input Terminal Strip (see electrical schematic drawings)**
Motor Hi Temp -- **** Alarms Immediately upon energizing KinetSync-NB*** -- **** Alarms occur while the system/motor is running***	**1. SVR Regulated Exciter Over-temperature** -- **2. Broken signal continuity in External Thermal Protection circuit** -- **3. SVR Exciter operating above rated output and/or ambient temperature** **4. Bridge semiconductor or fuse open (unbalanced bridge current)**	**If no thermal protection devices are being used, install a jumper on the Thermal Circuit input to the *KinetSync-NB* Input Terminal strip (points 1 and 4)** -- **- Check the Thermal Protection circuit connections at the *KinetSync-NB* Input Terminal strip (points 1 and 4) and at the SVR Input Terminal strip for continuity.** **- Check that KinetSync-NB Input Terminal strip is properly seated in terminal strip receptacle** -- **- Do not exceed SVR nameplate ratings** **- Check for blocked airflow inputs or outputs on SVR enclosure** **- Check SVR Bridge for blown power fuses**
Incomplete Sequence ***KinetSync-NB detects improper or incomplete motor start sequence***	**Reduced Voltage Starter Motor Full Volts contact did not close or Input signal not received** ***Motor "Full Volts" contact should close when a reduced-voltage-starter switches to full armature volts*** **2. Incorrect Incomplete Sequence Timer**	**- Check Motor "Full Volts" starter contacts and connections to *KinetSync-NB* Input Terminal strip (points 1 and 3)** **- Check that the *KinetSync-NB* Input Terminal strip is properly seated in terminal strip receptacle** ***When reduced voltage starter "Full Volts" contact function is not used, install a permanent jumper on the KinetSync-NB Input Terminal strip (between points 1 and 3)*** **- Check that Incomplete sequence timer set point is longer than delay for Full Volts Contact closing**

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Additional *KinetSync-NB* Troubleshooting Notes

The following is an additional list of possible problems which might occur during installation, startup, or during operation due to external circumstances.

1. The *KinetSync-NB* LCD screen is not illuminated and there is no readout
Possible cause: 120vac control power may not be reaching *KinetSync-NB* controller

Action: Check *KinetSync* Input Terminal strip connections (points 9-10) for 120vac control voltage
Check that Input Terminal strip is properly seated in terminal strip receptacle
Check that the Input Fuse on back of *KinetSync-NB* is good and is properly seated in place.
(Input Fuse is tan rectangular piece protruding through upper center of back cover)

2. No DC Amps or DC Volts display on LCD when Exciter is on ("Test/Run" Switch in "Test")
Possible cause: SVR Rectifier has no output
Field Volts or Amps Hall Effect Transducer signal connection is not effective

Action: Troubleshoot SVR Rectifier for "No Output" fault
Check that Field Volts and Current Transducer Cables are installed properly and connecting plugs are properly seated at *KinetSync-NB* and at Hall Effect Transducers.

3. No *KinetSync-NB* controller action when motor starts
Possible Cause: Incorrect Motor Start contacts connection between Input terminals strip 1 and 2

Action: Check *KinetSync-NB* Input Terminal strip connections (points 1 and 2) (Motor Start Input)
Check *KinetSync-NB* Input Terminal strip is properly seated in terminal strip receptacle
Check Motor Start contacts of Motor Starter and associated wiring to *KinetSync-NB*

4. Motor can still be started even when *KinetSync-NB* LCD displays "Restart Delay Lock"
Possible cause: 56K Relay contacts are not connected properly in Motor Start / Stop circuit

Action: Check *KinetSync-NB* Output Terminal strip is properly seated in terminal strip receptacle
Check *KinetSync-NB* Output Terminal strip connections (points 1 and 2) (56K N.O. contact)
Check that 56K Relay output function is wired in series with Motor "Start / Stop" circuit

5. Motor won't start even though *KinetSync-NB* LCD displays "OK to Start"
Possible causes: 56K Relay contacts are not connected properly in Motor "Start / Stop" circuit
FAL Relay contacts are not connected properly into Motor "Start / Stop" circuit

Action: Check *KinetSync-NB* Output Terminal strip is properly seated in terminal strip receptacle
Check *KinetSync-NB* Output Terminal strip connections (points 1 and 2) (56K N.O. contact)
Check that 56K Relay output function is wired in series
Check *KinetSync-NB* Output Terminal strip connections (points 12-13) (FAL N.O. contact)
Check that FAL Relay output function is wired in series with Motor "Start / Stop" circuit or in parallel with Breaker Trip circuit (if used).

**** The FAL relay is a fail-safe (fails de-energized) relay. FAL N.O. contacts (Output points 12-13) are used with electrically held starters while FAL N.C. contacts (Output points 13-14) are to be used when mechanically held circuit breakers using tripping coils are used for tripping motor.***

6. With motor running, placing the Power Factor Control Switch in "Enable" mode reduces Exciter Field current abruptly and *KinetSync-NB* trips motor on either "No DC Field Amps" or "Low Power Factor" Fault

Possible cause: Polarity of power factor signal from *KinetSync-NB* to rectifier regulator is incorrect
Motor Starter PT and CT signals not connected correctly or to correct phase at the Motor Starter, SVR Input, or *KinetSync-NB* Input)

Action: With motor running in Power Factor "Disabled" mode, vary Field Exciter Current with Operator's Output Adjust pot: as current decreases, the Power Factor display should go less leading (less +) or more lagging (more -). At unity Power Factor (1.0), the motor Armature Current should be at some minimum level that increases as you vary the Motor Power Factor in either a leading or a lagging direction. If the *KinetSync-NB* Power Factor display and motor Armature Current react in this manner, the signal polarity is OK and the output from *KinetSync* Power Factor terminal strip (points 3 and 4) may be reversed. If the *KinetSync-NB* Power Factor display does not react as described above, there is a possible polarity or phase problem with the CT and PT connections from the starter. (see below)

The KinetSync-NB requires that the CT and PT signals be in quadrature

Possible correct combinations:

CT phase C	**PT phase A-B**	**** Standard connection configuration**
CT phase A	**PT phase B-C**	
CT phase B	**PT phase C-A**	***** Undesired connection for open-delta PT configurations**

If the PT and CT configuration is correct (as shown above), and the *KinetSync-NB* Power Factor display varies opposite than described, then reverse the PF Amps CT input wires at the *KinetSync-NB* Input Terminal strip (points 15-16). Confirm proper Power Factor Display behavior by running motor and varying Field Exciter Current as described above. * This procedure should only have to be performed once during system commissioning and the connections left unchanged thereafter.

How to Get Assistance

For technical or application assistance:

Email: Info@Kinetics-Industries.com
Fax: Engineering Assistance at Kinetics Industries, Inc. 609-883-0025
Phone: 609-883-9700 Normal business hours are 8:00AM to 4:30PM EST

Mailing and/shipping address:

Kinetics Industries, Inc.
140 Stokes Avenue
Trenton, N.J. 08638

When contacting for any reason concerning a particular system, the following information concerning the system is necessary:

System Model Number, System Number, and Nameplate Data
Customer/Purchaser Name and Address
Date of purchase and Date of commissioning
If an operational problem, include:

- **A list of the last fault readouts and annunciation**
- **A description of the problem and/or symptoms.**

STANDARD STATEMENT OF WARRANTY AND LIMITATION OF LIABILITY

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.

Kinetics' liability on any claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the sale of Kinetics' equipment shall in no case exceed the total price paid to kinetics for such equipment.

The foregoing warranty is in lieu of any other warranty or obligation, expressed or implied, and no liability is assumed by Kinetics Industries, Inc. except as is expressly stated above.

It is expressly understood and agreed that Kinetics makes no warranty with respect to any equipment not manufactured by Kinetics or with respect to any components of Kinetics' equipment manufactured by others. In all such cases, the Buyer shall rely solely on the warranty of the manufacturers of such equipment of component, if any.

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in components and programming, nor does it provide for every possible contingency in connection with installation, operation and maintenance. Features may be described herein that are not present in all physical components and logical sequence configuration. Kinetics Industries, Inc. makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein.

Notes:

Notes:

Copyright © 2002 Kinetics Industries, Inc.

KinetSync-NB™ ***by Kinetics Industries Inc.***
140 Stokes Avenue
Trenton, New Jersey 08638

Brushless Synchronous Motor Controller
Instruction Manual

Manufacturers of:

- **SCR Exciter Regulators**
- **Line Regulated Diode Rectifiers through 2000KW**
- **SCR Regulated Rectifiers through 2000KW**
- **Synchronous Generator Excitation Systems**
- **Dry type transformers**
- **Magnet Power Supplies**
- **Fuseless Flux Forcing Magnet Rectifiers**
- **Elevator Power Rectifiers**
- **Crane Power Supplies**
- **Third Rail Powered Emergency Motor Generator Systems**

Phone: 609-883-9700 sales ext 122
Fax: 609-883-0025
Email: Info@Kinetics-Industries.com