GETTING STARTED

THIS USERS MANUAL COVERS IMS MODELS
IMS-0013 ⇨ IMS-0372

The chart below shows the major activities necessary to install and commission the IMS Series starter. It is recommended that all users refer to at least the sections listed, before commencing work. First time users of soft start technology, or the IMS are strongly encouraged to read this Users Manual completely prior to installation or commissioning.

PHYSICALLY INSTALL THE STARTER

refer sections :

Physical Specification

⇩

CONNECT DESIRED POWER CIRCUIT

refer sections :

Electrical Connection (Power Circuits)

⇩

CONNECT DESIRED CONTROL CIRCUIT

refer sections :

Electrical Connection (Control Circuits)

⇩

COMMISSION STARTER

refer sections :

Commissioning Procedure
IMS Programming Procedure
Trouble Shooting

SECTION 1 CAUTION STATEMENTS

Details possible causes of equipment damage

SECTION 2 GENERAL DESCRIPTION

Overview of IMS Series

SECTION 3 IMS FEATURE DESCRIPTIONS

- Controlled Current Soft Start
- Uni-Stop Soft Stop
- Thermal Model (Overcurrent Protection)
- Phase Loss Protection
- Phase Sequence Protection
- Thermistor Protection
- Electronic Shearpin Protection
- Auxiliary Trip Input
- Local/Remote Operation
- Start, Stop, Reset Inputs
- Indicators
- Relay Outputs
- Prestart Circuit Analysis & Configuration
- Auto-configuration

SECTION 4 ELECTRICAL SPECIFICATION

- IMS Connection Detail Schematic
- General Specification
- Continuous Current Ratings
- Bypassed Current Ratings

SECTION 5 PHYSICAL SPECIFICATION

- Dimensions
- Weights
- Mounting Precautions
- Ventilation : Mounting In Vented Enclosures
- Ventilation : Mounting In Non-ventilated Enclosures
- Typical Layout Drawings
- Control Terminations
- DIP Switch Set Up Panel

SECTION 6 ELECTRICAL CONNECTION (POWER CIRCUIT)

- 3 Wire Motor Connection
- 6 Wire Motor Connection
- Line Contactors
- Semiconductor Fuses
- Bridging Contactors
- Power Factor Correction
- Phase Sequence

SECTION 1 CAUTION STATEMENTS

Overview : This section highlights potential causes of equipment damage

Content :

CAUTION

This caution symbol is used throughout the IMS Manual to draw special attention to activities which may result in equipment damage. A summary of these cautions is listed below.

Such Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is therefore the installers responsibility to adhere to all instructions in this manual, to follow good electrical practice and to seek advice before operating this equipment in a manner other than as detailed in this manual.

- Ensure that the IMS is completely isolated from the power supply before attempting any work on the unit.
- Entry of metal swarf into the cabinet can cause equipment failure.
- Do not apply voltage to the IMS control input terminals. These are active 24VDC inputs and must be controlled with potential free circuits.
- Do not connect Power Factor Correction capacitors to the output of the IMS. If static power factor correction is employed, it must be connected to the supply side of the IMS.
- Before installing the IMS without a line contactor ensure such connection meets local regulations and by-laws.
- If installing the IMS within a non-ventilated enclosure a by-pass contactor must be utilised to prevent excessive heat build-up.
- Do not utilise the 6 Wire Motor Connection format without using a line contactor or no volt release circuit breaker.
- If installing a by-pass contactor ensure phase connections are correctly made

  ie L1-T1, L2-T2,L3-T3, or

  1-2, 3-4, 5-6

SECTION 2 GENERAL DESCRIPTION

Overview : This section provides overview of IMS Series

Content :

General Description

The IMS Series is a microcontroller based soft start motor starter.

The IMS Series soft starters provide start and stop control as well as motor protection. The units are available in either an IP00 format for installation into other enclosures, or with an IP23 enclosure extension making the units suitable for wall mounting.

This Users Manual covers IMS Series models IMS-0013 thru IMS-0372.

In operation the IMS Series provides :

- improved soft start of motor and load
- reduced starting current
- improved soft stop of motor and load
- motor thermal modeling
- phase sequence protection
- phase loss protection
- electronic shear pin protection
- motor thermistor protection

In addition, installation, commissioning and maintenance is made easy by the IMS's many other sophisticated functions which enhance performance and reliability and make the equipment suitable for optimising practically all motor starting applications.

- automatic motor connection analysis and configuration
- automatic phase sequence analysis and configuration
- automatic supply voltage analysis and configuration
- automatic frequency analysis and configuration
- Uni-Start soft start
- current limiting
- trip output (changeover)
- line contactor control
- by-pass contactor control
- Uni-Stop soft stop
- simple, accurate and repeatable programming procedures
- diagnostic fault display

SECTION 3 IMS FEATURE DESCRIPTIONS

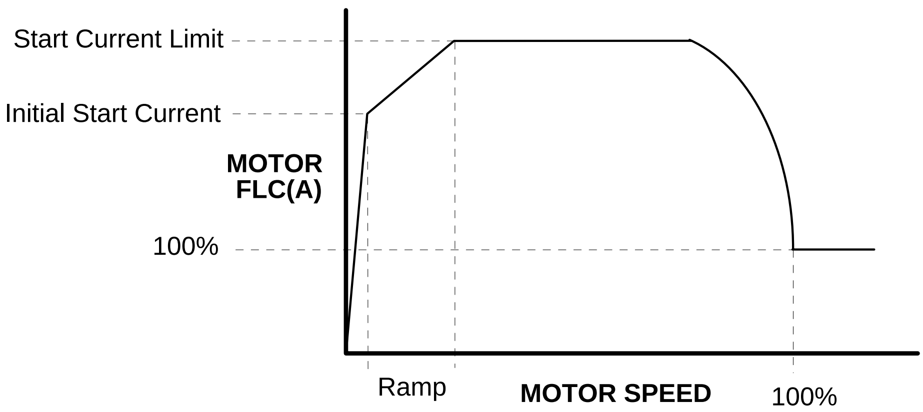
Overview : This section describes the purpose and operation of each feature of the IMS Series Starters.

Content :

Controlled Current Soft Start

The IMS provides a controlled current soft start. Motor starting current is raised to an ***Initial Start Current*** level and then ramped up to the user set ***Start Current Limit***. Starting current remains at the programmed set point until full speed is approached and the current falls to run current levels.

A key feature of the IMS is the inclusion of Uni-Start technology. Uni-Start is an advanced method of control which dynamically adjusts starter output to match the motor characteristics as they change during starting and stopping. Uni-Start Control is operative in both start and stop modes. This feature eliminates the motor instability sometimes experienced with ordinary soft start systems. Uni-Start provides particular advantage in pumping applications where both starting and stopping times can be adjusted to minimise fluid hammer without the need for dedicated 'pump start' units.



The required setting for the ***Start Current Limit*** is installation dependent and should be set such that:

a. at a minimum the motor is supplied start current sufficient to enable it to produce adequate torque to easily start the connected load.
b. desired starting performance is obtained.
c. IMS ratings are not exceeded.

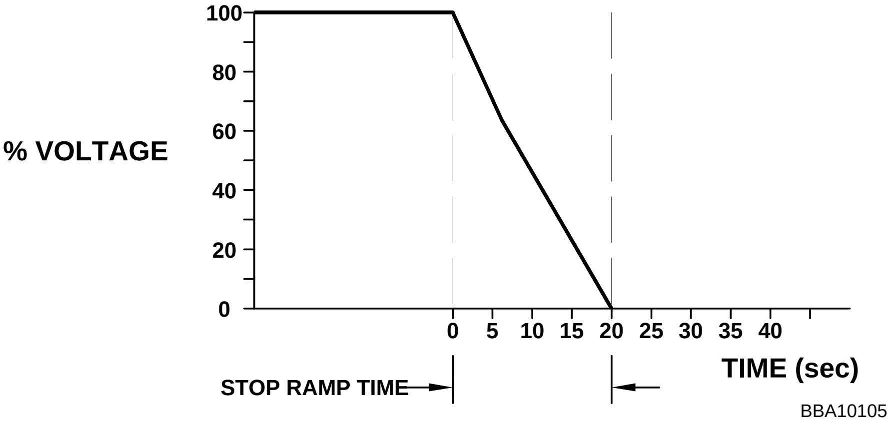
Uni-Stop Soft Stop

The IMS Series soft starters are equipped with a user selectable and adjustable Uni-Stop soft stop function (0s - 62s). Uni-Stop Soft Stop, when enabled, reduces the voltage applied to the motor, causing the motor to stall and decelerate to zero speed. The effect of this is to add inertia to the load and thereby reduce the rate of deceleration.

Uni-Stop Soft Stop technology dynamically adjusts starter output to match the motor characteristics as they change during stopping.

Uni-Stop Soft Stop eliminates the motor instability sometimes experienced with ordinary soft start and soft stop systems. Uni-Stop provides particular advantage in pumping applications where both starting and stopping times can be adjusted to minimise fluid hammer without the need for dedicated 'pump soft start' units.

If utilising the Uni-Stop Soft Stop function and a line contactor, the contactor must not be opened until the end of the stop ramp time.



Thermal Model (Overcurrent)

Advanced motor overload protection is provided by the IMS which models motor temperature.

Set for the connected motor’s FLC, the thermal model continually calculates motor temperature, even when the motor is not running. This ensures good protection while still enabling the motor to work to its maximum capacity during both start and overload conditions.

When commissioning, or re-commissioning after removal of control voltage from the IMS, verify that the motor is cold before starting the motor to ensure accurate thermal modeling.

The thermal model is compromised if the motor is operated outside its specification. i.e. ambient temperature is in excess of rated ambient, motor cooling fan is blocked or inoperative etc. Motor Thermistor protection should be used to detect such abnormal conditions.

Phase Loss Protection

Phase Loss Protection protects the motor against loss of a phase, either before or after the starter.

Sensitivity is reduced during starting and stopping to accommodate the discontinuous waveform.

Phase Sequence Protection

To prevent damage from reverse motor rotation caused by incorrect phase sequence of the incoming electrical supply, IMS Series starters provide User Selectable Phase Sequence protection.

Thermistor Protection

PTC Motor thermistors, if fitted in the motor, may be directly connected to IMS.

If motor thermistors are not connected, the thermistor inputs terminals must be linked (B4,B5). The thermistor circuit should be run in screened cable and must be electrically isolated from earth and all other power and control circuits.

Threshold resistance - 1800 ohms
Thermistor Current - less than 1.5mA

Electronic Shearpin

The IMS provides an Electronic Shearpin protection function which trips the starter if motor current exceeds a pre-programmed maximum current.

Electronic Shearpin protection can be used to detect changes in motor loading which may indicate the motor is about to jam, thereby allowing the starter to trip and prevent mechanical damage to the motor, drive chain and/or machine.

The Electronic Shearpin Protection is enabled once the motor has reached full speed and operates at 300% FLC. This setting is appropriate for the majority of installations but can be field adjusted if required. Refer to Appendix F.

Auxiliary Trip Input

The IMS can be remotely tripped by closing the Auxiliary Trip Input (C53,C54).

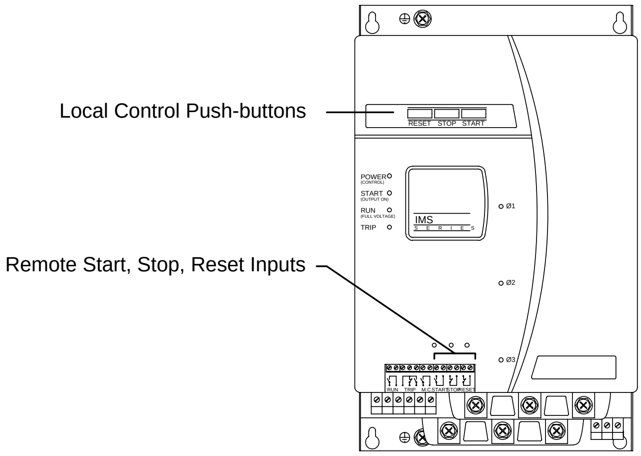
This input enables additional protection devices, such as undercurrent relays, low level probes, vibration switches etc., to be directly interfaced with the IMS. This simplifies control circuitry as the IMS functions as the sole point of connection for any external control circuitry.

Local/Remote Operation

Operation of the IMS can be controlled from either the local Start/Stop/Reset push-buttons, or via remote control inputs (C23,C24,C31,C32,C41,C42). Selection of local or remote mode is made by switching the Local/Remote control input (C63,C64)

The IMS responds to only the selected control inputs at any one.

Local Control : Open
Remote Control : Closed

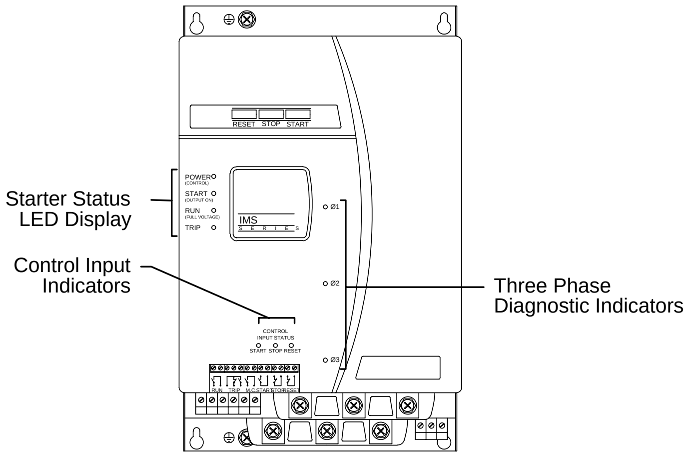


Start, Stop, Reset

IMS Series starters provide control inputs for remote Start, Stop and Reset. Refer to section 7 for further information.

Indicators

Three groups of indicators are offered by the IMS to provide information on starter, control input and power supply status.



A. Status LED Panel

1. Power (Yellow) : Control voltage is present.
2. Start (Green) : The IMS is supplying voltage to the output, and the Main Contactor (M.C.) relay is closed. The starter may be in the soft start, run or soft stop modes.
3. Run (Green) : The IMS is supplying full output voltage, and the Run relay is closed.
4. Trip (Red) : The IMS has tripped and the Trip relay has operated.

B. Control Input Indicators

1. Start (Yellow) : Indicates the remote Start input is closed.
2. Stop (Yellow) : Indicates the remote Stop input is closed.
3. Reset (Yellow) : Indicates the remote Reset input is closed.

The Control Input Indicators show the state of the remote Start/Stop/Reset inputs, they do not indicate the state of the Local Start/Stop/Reset push buttons.

C. Three Phase Diagnostic Indicators

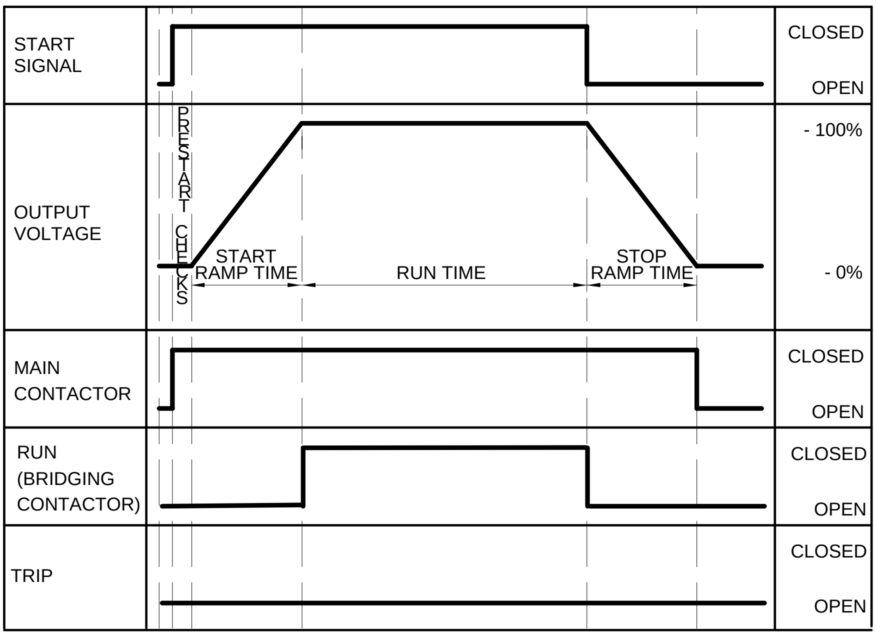
The three phase indicator LEDs indicate the voltage differential between the input and output voltage on each phase of the starter. Under normal conditions all three LEDs will be illuminated when the starter is in the OFF condition and will gradually dim as the output voltage increases during a start. The LEDs will completely extinguish when the IMS is delivering full output voltage.

1. When the unit is powered up but not running, the three LEDs should glow with equal brightness.
2. If the output voltage is not present on one or more phases, the corresponding LED will not glow.
3. If the output is open circuit on one or more phases, the corresponding LED will not glow.
4. If the voltage is low on one phase, one or more LEDs will glow at only reduced brightness.
5. If the IMS is incorrectly connected in the Six-Wire configuration, one or more LEDs will glow at only reduced brightness.
6. If an SCR has failed short circuit, the corresponding LED will not glow.

Relay Outputs

IMS Series starters provide three relay outputs.

- Main Contactor Control (M.C.)
- Run
- Trip

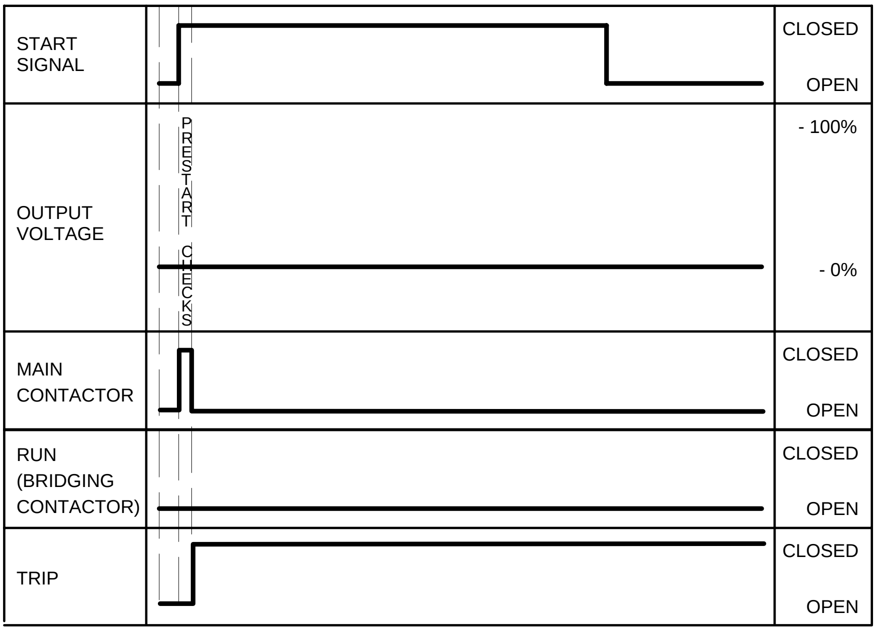


Prestart Circuit Analysis & Configuration

To prevent damage from incorrect installation or supply problems the IMS Series starters perform an automatic system analysis before each start. Tests include :

- Motor circuit
- Motor connection configuration
- Frequency range
- Voltage range
- Supply circuit
- Phase Sequence

Upon successful completion of the tests voltage is applied to the motor.



Auto-configuration

The IMS Series automatically determines the motor connection, supply frequency, supply voltage & phase sequence and configures the internal parameters for correct operation, or inhibits operation if a problem is detected.

At start, the soft starter is able to determine and configure for 3 Wire or 6 Wire operation. The IMS will auto-adjust for 50Hz (± 2Hz) or 60Hz(± 2Hz) and will operate for line input voltages as follows :

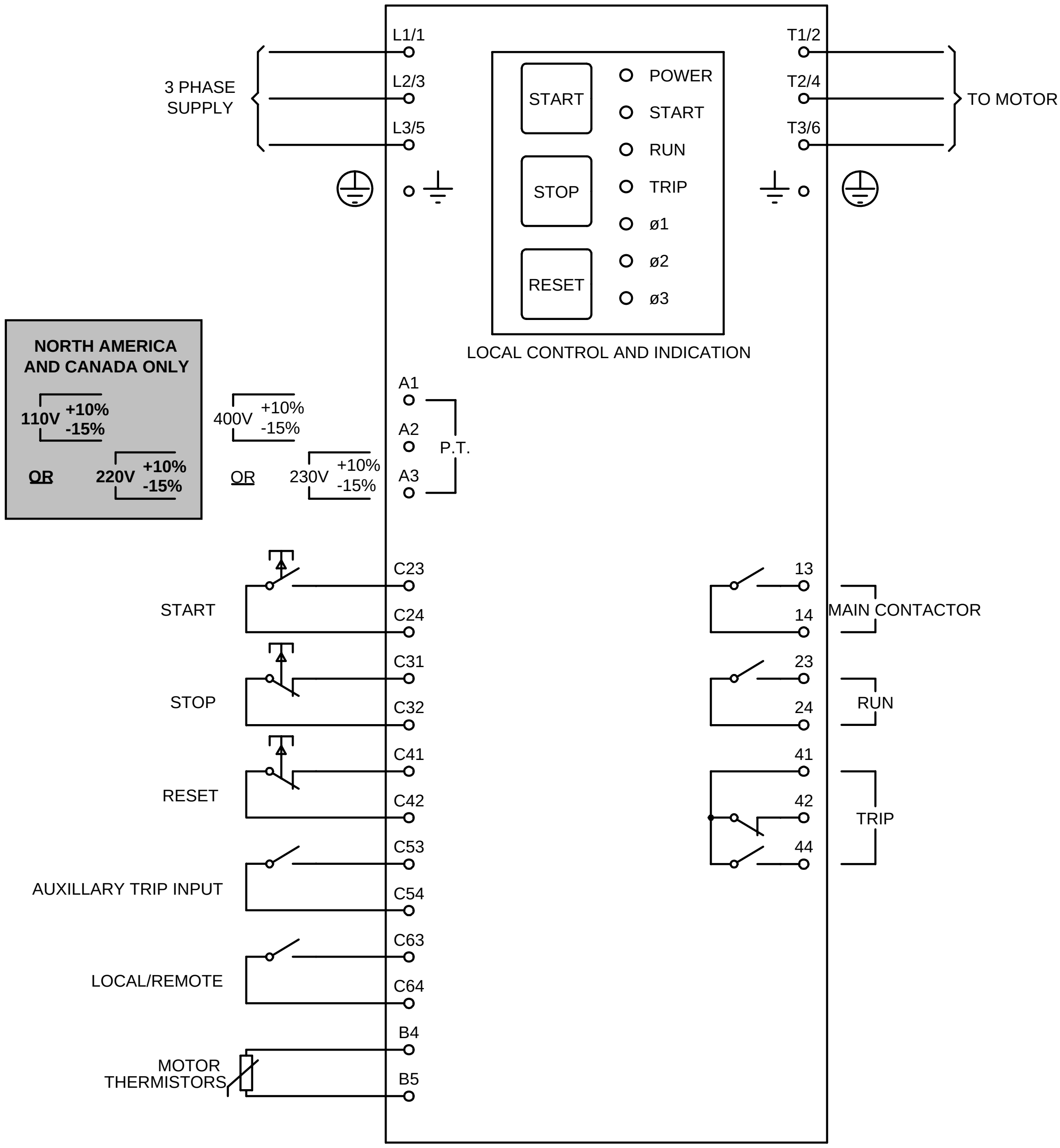
3 wire connection : 220 VAC to 600 VAC
6 wire connection : 220VAC to 440 VAC

SECTION 4 ELECTRICAL SPECIFICATION

Overview : This section details the general electrical specification of the IMS Series Starters.

Content :

IMS CONNECTION DETAIL



SPECIFICATIONS The following specifications are common to all models:-

Power Circuit:	Reverse parallel connected thyristors (full wave control)
Supply Voltage:	200 VAC to 600 VAC (3 Wire) 200 VAC to 440 VAC (6 Wire) Consult local representative for other voltages
Supply Frequency:	48Hz to 52Hz, 58Hz to 62Hz
Control Voltage:	230/400V +10%/-15% or 110/220V +10%/-15% Refer Marking On Equipment
Current Rating:	Refer to Table Of Ratings overleaf
Motor Connection:	3 Wire or 6 Wire
Control Inputs:	Active 24 VDC, 8mA approx (C23,C24) Start (C31,C32) Stop (C41,C42) Reset (C53,C54) Auxillary Trip Input (C63,C64) Local/Remote
Relay Outputs:	5A @ 250VAC/360VA, 5A @ 30VDC Resistive (13,14) Main Contactor Control (N.O.) (23,24) Run (Bridging Contactor Control) (N.O.) (41,42,44) Trip (C/O)
Indicators:	Starter Status - Power On - Start - Run - Trip Control Input Status - Start - Stop - Reset Three Phase Diagnostic Indicators - Phase 1, Phase 2, Phase 3
Environmental:	Degree of Protection: IP00 Form Designation: Form 1 Rated Insulation Voltage: 2 kV Rated Impulse Voltage: 2 kV Pollution Degree: 3 Rated Short-circuit Current: 50 kA Equipment Class (EMC): Class A. This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.
Ambient Temperature:	0°C to 45°C (Operating) -5°C to 65°C (Storage)
Approved To:	UL508 CSA 22.2 No 14. C✓ (CISPR-11) CE (IEC947-4-2)

CONTINUOUS RATINGS

	60% DUTY CYCLE (Off Time = 145 seconds)					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 10 Starts/Hr AC53a 3-10:60-10		300% x FLC, 30 Sec 10 Starts/Hr AC53a 3-30:60-10		450% x FLC, 30 Sec 10 Starts/Hr AC53a 4.5-30:60-10	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	13	12	12	12	9	8
IMS-0025	25	24	23	22	17	16
IMS-0034	34	33	31	30	23	22
IMS-0039	39	37	36	34	26	25
IMS-0055	55	53	53	51	37	35
IMS-0073	73	69	69	66	48	46
IMS-0080	80	77	76	72	53	51
IMS-0126	126	120	114	108	82	78
IMS-0136	136	130	124	118	88	84
IMS-0158	158	151	152	145	106	101
IMS-0193	193	185	184	177	130	124
IMS-0223	223	213	212	204	149	143
IMS-0264	264	255	251	242	176	170
IMS-0372	372	355	344	328	243	231

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

	70% DUTY CYCLE (Off Time = 108 seconds)					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 10 Starts/Hr AC53a 3-10:70-10		300% x FLC, 30 Sec 10 Starts/Hr AC53a 3-30:70-10		450% x FLC, 30 Sec 10 Starts/Hr AC53a 4.5-30:70-10	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	12	12	12	11	9	8
IMS-0025	24	23	23	22	16	16
IMS-0034	33	31	30	28	22	21
IMS-0039	37	35	34	32	25	24
IMS-0055	55	52	52	50	37	35
IMS-0073	71	68	68	64	48	45
IMS-0080	79	75	74	71	53	50
IMS-0126	121	115	110	104	80	76
IMS-0136	131	125	120	114	86	82
IMS-0158	156	149	150	143	105	100
IMS-0193	190	183	182	175	129	124
IMS-0223	219	210	210	201	148	142
IMS-0264	260	251	248	239	175	168
IMS-0372	362	346	336	321	239	228

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

	80% DUTY CYCLE (Off Time = 73 seconds)					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 10 Starts/Hr AC53a 3-10:80-10		300% x FLC, 30 Sec 10 Starts/Hr AC53a 3-30:80-10		450% x FLC, 30 Sec 10 Starts/Hr AC53a 4.5-30:80-10	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	12	12	12	11	8	8
IMS-0025	24	22	22	21	16	15
IMS-0034	31	29	28	27	21	20
IMS-0039	36	34	33	31	24	23
IMS-0055	54	51	52	49	36	35
IMS-0073	70	66	66	63	47	45
IMS-0080	77	73	73	70	52	49
IMS-0126	115	110	105	100	78	74
IMS-0136	126	120	116	110	84	80
IMS-0158	154	147	148	142	104	99
IMS-0193	188	180	180	173	128	123
IMS-0223	217	208	207	198	146	140
IMS-0264	256	246	244	235	173	167
IMS-0372	352	335	328	312	235	224

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

	90% DUTY CYCLE (Off Time = 35 seconds)					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 10 Starts/Hr AC53a 3-10:90-10		300% x FLC, 30 Sec 10 Starts/Hr AC53a 3-30:90-10		450% x FLC, 30 Sec 10 Starts/Hr AC53a 4.5-30:90-10	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	12	11	11	11	8	8
IMS-0025	23	22	21	20	16	15
IMS-0034	29	28	27	26	21	20
IMS-0039	34	32	31	30	24	23
IMS-0055	53	50	51	48	36	34
IMS-0073	68	65	65	62	46	44
IMS-0080	75	71	71	68	51	49
IMS-0126	109	104	101	96	75	71
IMS-0136	120	115	111	106	82	78
IMS-0158	151	144	146	139	103	98
IMS-0193	185	178	178	171	127	121
IMS-0223	213	203	204	196	145	138
IMS-0264	251	242	240	231	171	165
IMS-0372	340	324	318	303	230	219

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

BYPASSED RATINGS

	2.5 STARTS PER HOUR					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 2.5 start/Hr AC53b 3-10:1430		300% x FLC, 30 Sec 2.5 start/Hr AC53b 3-30: 1410		450%, x FLC,30 Sec 2.5 start/Hr AC53b 4.5-30: 1410	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	14	14	14	13	10	9
IMS-0025	31	30	29	28	20	19
IMS-0034	47	45	44	42	30	29
IMS-0039	52	50	48	46	33	32
IMS-0055	59	56	57	54	39	37
IMS-0073	79	76	75	72	52	49
IMS-0080	88	84	83	80	57	55
IMS-0126	160	153	144	138	99	95
IMS-0136	160	153	145	139	100	95
IMS-0158	166	159	160	153	110	105
IMS-0193	202	194	194	187	135	130
IMS-0223	237	227	226	218	157	150
IMS-0264	282	272	269	259	186	179
IMS-0372	418	400	387	370	266	254

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

	10 STARTS PER HOUR					
	Light Load		Medium Load		Heavy Load	
	300% x FLC, 10 Sec 10 starts/Hr AC53b 3-10:350		300%, 30 Sec, 10 start/Hr 10 starts/Hr AC53b 3-30:330		450%, 30 Sec, 10 start/Hr 10 starts/Hr AC53b 4.5-30:330	
	40°C	45°C	40°C	45°C	40°C	45°C
IMS-0013	14	14	13	13	9	9
IMS-0025	30	29	27	26	18	18
IMS-0034	45	43	39	37	26	25
IMS-0039	50	47	43	41	30	28
IMS-0055	59	56	56	53	38	37
IMS-0073	79	75	73	70	50	48
IMS-0080	87	83	81	77	56	53
IMS-0126	155	148	133	127	91	87
IMS-0136	157	150	138	132	95	90
IMS-0158	165	158	158	151	108	104
IMS-0193	201	193	191	184	133	127
IMS-0223	235	226	222	213	153	147
IMS-0264	280	270	263	254	182	175
IMS-0372	413	395	373	357	256	245

Multilpy by 1.5 for 6 Wire (Inside delta Connection) current rating.

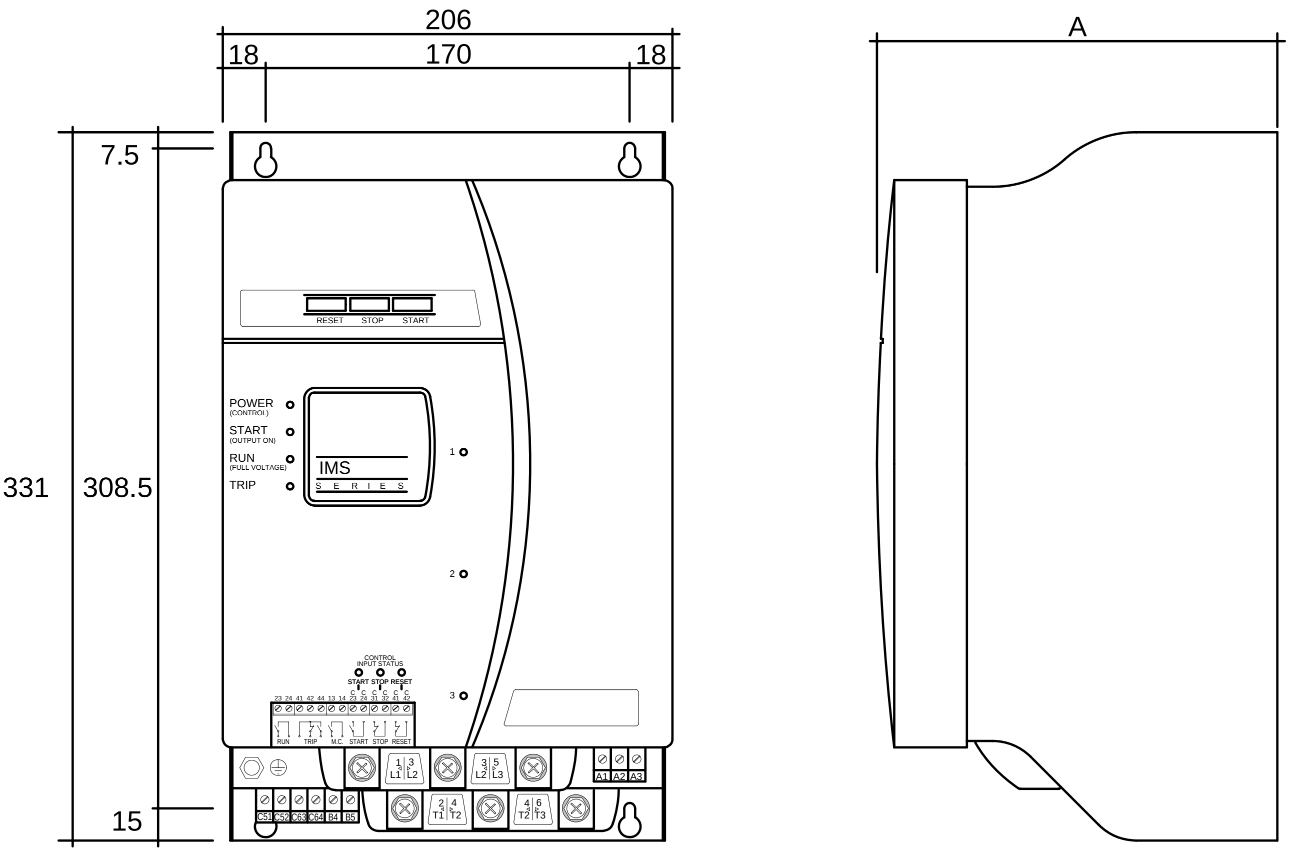
SECTION 5 PHYSICAL SPECIFICATION

Overview : This section details the mounting and ventilation requirements for the IMS Series Starters.

Content :

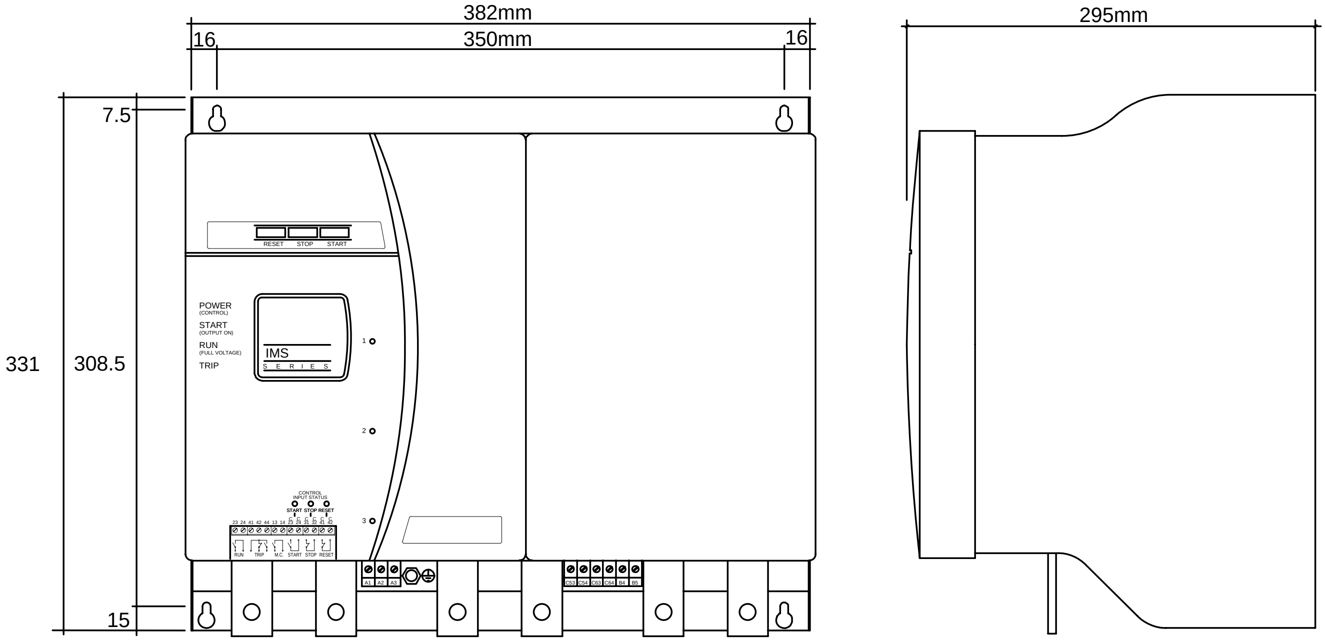
Dimensions

IP00 - PANEL MOUNT OPTION



DIMENSION A (mm)	
IMS-0013, IMS-0025, IMS-0034, IMS-0039	180
IMS-0055, IMS-0073, IMS-0080, IMS-0126, IMS-0136	250

IP00 - PANEL MOUNT OPTION



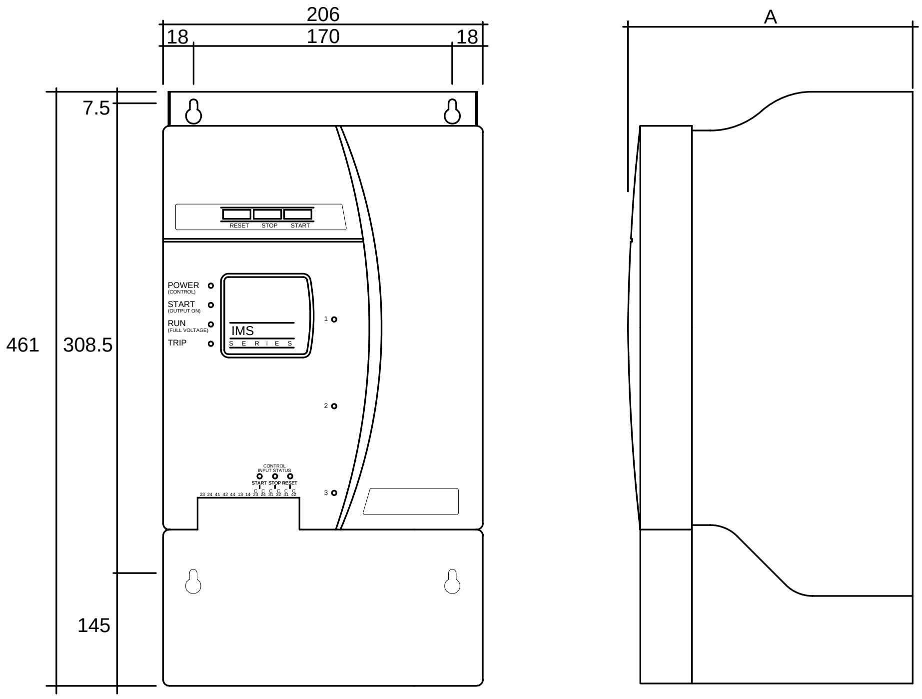
IMS-0158, IMS-0193, IMS-0223*, IMS-0264*, IMS-0372*

* Note: Current Transformers (3) for Models IMS-0223, IMS-0264 & IMS-0372 are supplied loose. Refer to Section 6 :‘Current Transformer Installation’ for connection detail.

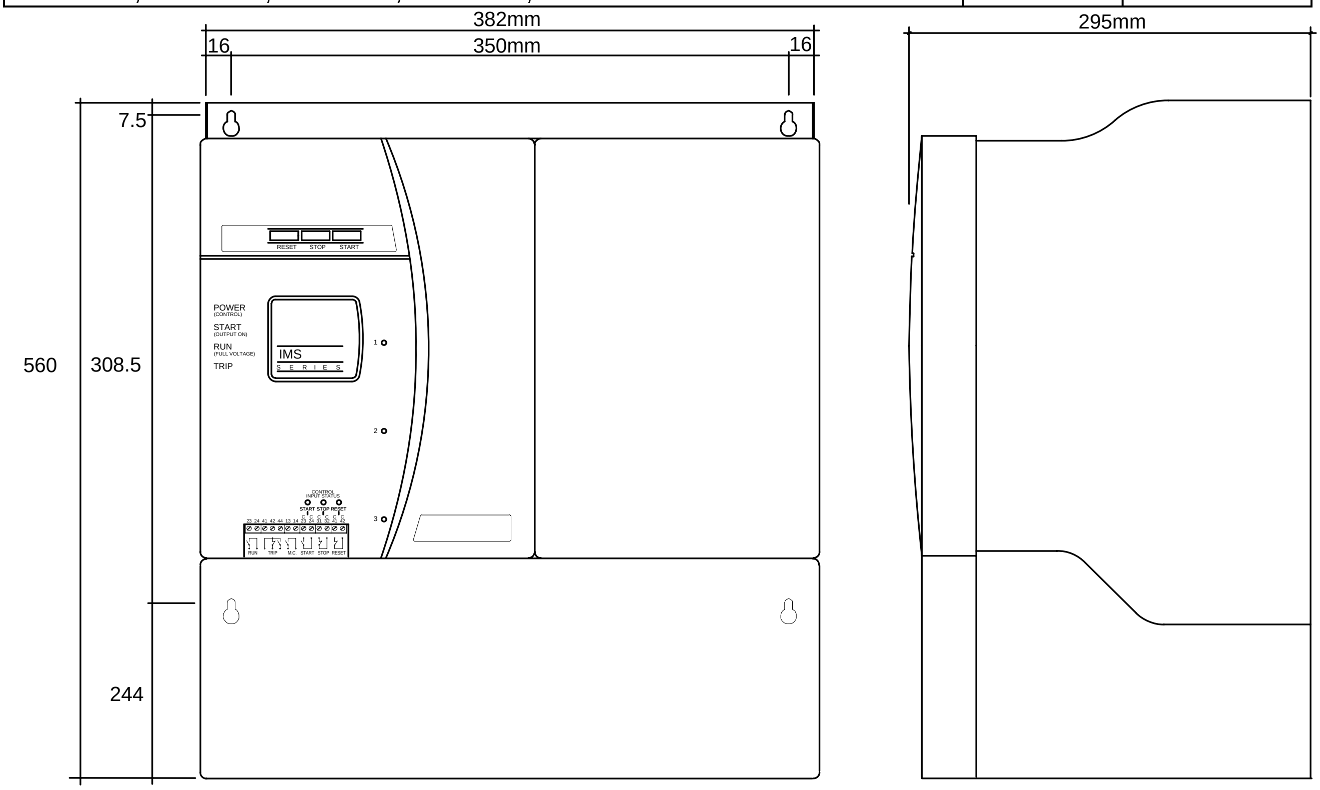
Current Transformers for all other IMS models are internal and do not require external mounting.

Wall Mounting The IMS

The IMS can be fitted with an additional Enclosure Extension making the unit IP23 and suitable for wall mounting. The Enclosure Extension is supplied seperately.



	A	Extension Part No.
IMS-0013, IMS-0025, IMS-0034, IMS-0039	180	9FWM1
IMS-0055, IMS-0073, IMS-0080, IMS-0126, IMS-0136	250	9FWM2



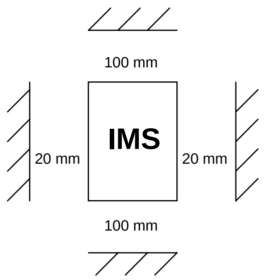
	Extension Part No.
IMS-0158, IMS-0193, IMS-0223, IMS-0264, IMS-0372	9FWM3

Weights

MODEL	KG
IMS-0013	7
IMS-0025	7
IMS-0034	7
IMS-0039	7
IMS-0055	11
IMS-0073	11
IMS-0080	11
IMS-0126	12
IMS-0136	12
IMS-0158	21
IMS-0193	21
IMS-0223	22
IMS-0264	23
IMS-0372	23

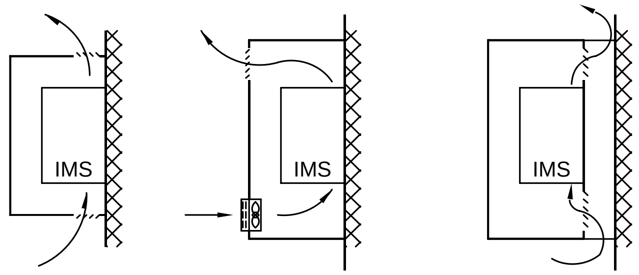
Mounting Precautions

Do not mount in direct sunlight
Do not locate near heat radiating elements
Mount the IMS vertically
Allow clearance for ventilation
Do Not Obstruct Cooling Airflow



Ventilated Enclosures

When mounting a soft starter, or any other equipment which generates heat, into a vented enclosure there must be sufficient airflow through the enclosure to prevent excessive heat build up within the enclosure.



Soft starters dissipate approximately 4.5 watts per line amp. The following table shows the airflow required to limit internal temperature rise of an enclosed housing a soft starter to +5°C or +10°C.

Where additional heat sources (contactors, cables, isolators etc.) are also housed in the enclosure, airflow will need to be increased accordingly.

MOTOR AMPS	HEAT DISSIPATION (@ 4.5 watts / Amp)	Airflow m^3/minute For:	
		5^oC Rise	10^oC Rise
10	45	0.5	0.2
20	90	0.9	0.5
30	135	1.4	0.7
40	180	1.8	0.9
50	225	2.3	1.1
75	338	3.4	1.7
100	450	4.5	2.3
125	563	5.6	2.8
150	675	6.8	3.4
175	788	7.9	3.9
200	900	9.0	4.5
250	1125	11.3	5.6
300	1350	13.5	6.8
350	1575	15.8	7.9
400	1800	18.0	9.0
450	2025	20.3	10.1
500	2250	22.5	11.3
550	2475	24.8	12.4
600	2700	27.0	13.5

Non-ventilated Enclosures

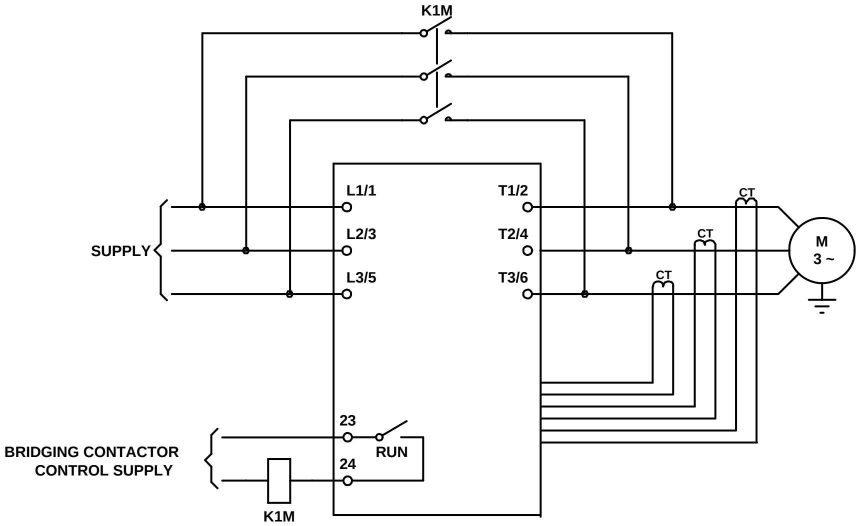
If the IMS is to be mounted in a non-ventilated enclosure a bridging contactor should be employed to eliminate heat build up in the enclosure.

The Bridging contactor can be AC1 rated as it only carries the running current of the motor.

- The bridging contactor should be controlled by the IMS Run output (23,24) and used to bridge out the SCRs once the motor has started by bridging between L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6.

CAUTION

IT IS IMPERATIVE THAT THE BRIDGING CONTACTOR CONNECTS L1/1 TO T1/2, L2/3 TO T2/4 AND L3/5 TO T3/6. ANY OTHER COMBINATION WILL CAUSE FUSE FAILURE, CIRCUIT BREAKER TRIP AND POSSIBLE SCR FAILURE.



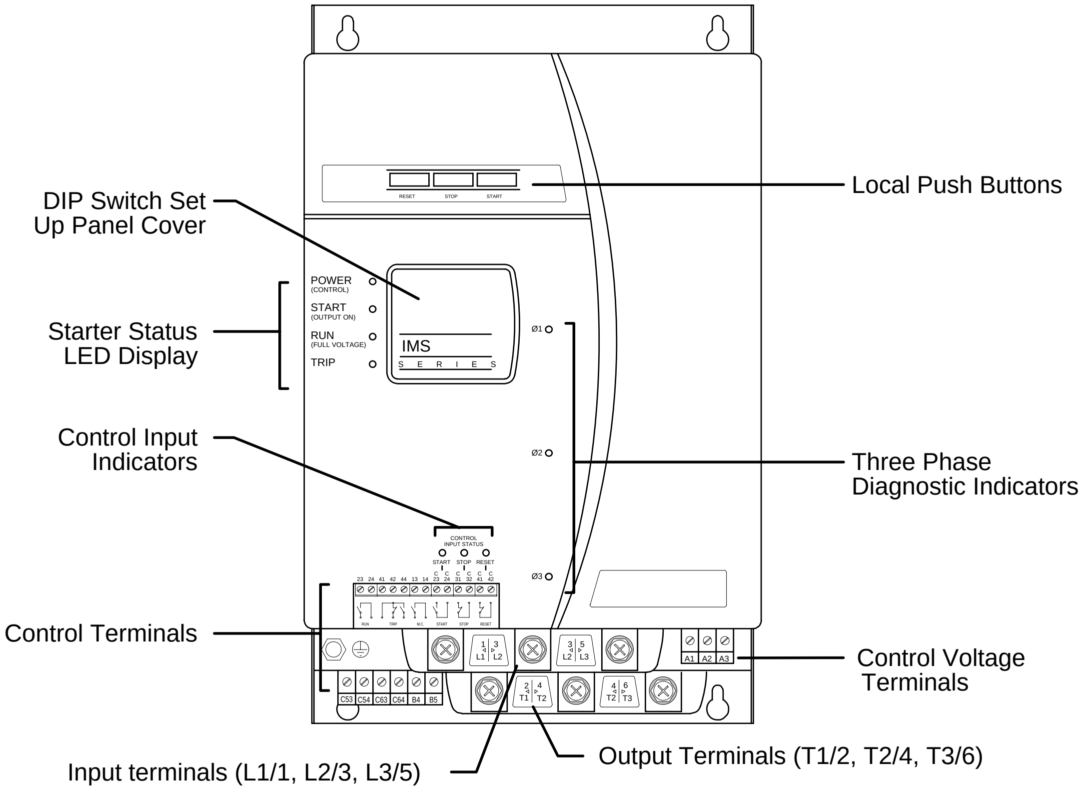
CAUTION

IN ORDER TO MAINTAIN IMS MOTOR PROTECTION FEATURES DURING BYPASSED OPERATION, THE IMS INTERNAL CTS MUST BE REMOVED AND MOUNTED EXTERNALLY SO THAT THEY MEASURE LINE CURRENT.
(REFER APPENDIX B FOR REMOVAL PROCEDURE)

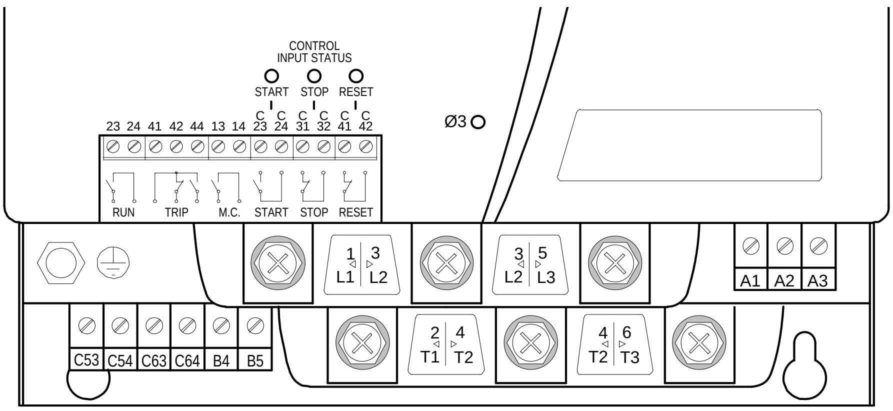
If using a bridging contactor

- Connect between the inputs and outputs of the IMS ensuring that with the contactor closed, L1/1 connects to T1/2, L2/3 connects to T2/4 and L3/5 connects to T3/6.
- Connect the coil of the bridging contactor through the IMS Run relay output to the control voltage.
- Remove the IMS's internal CTs and mount them remotely so that they measure line current. (Refer Appendix B for CT removal procedure)

Typical Layout



Control Terminations



SECTION 6 ELECTRICAL CONNECTION (POWER CIRCUIT)

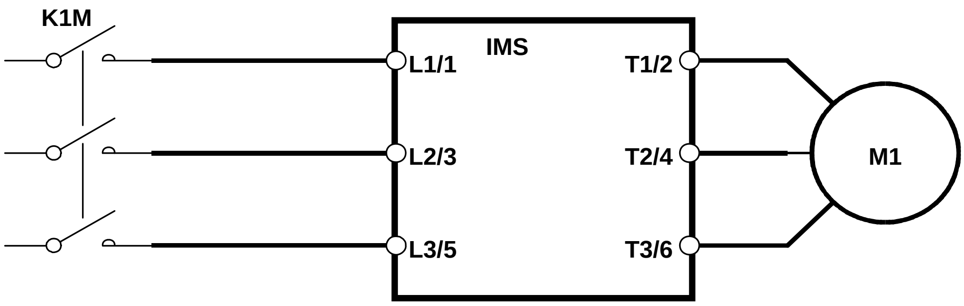
Overview : This section details the various power circuit configurations possible with the IMS Series Starters.

Content

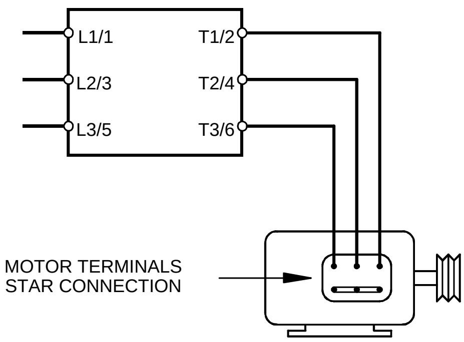
Motor Connection

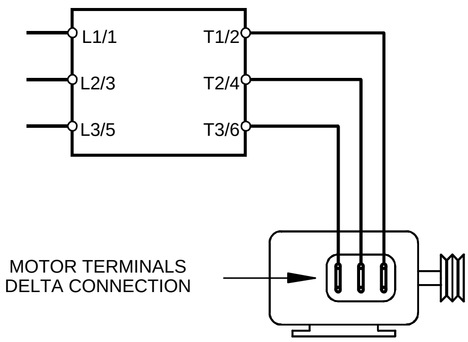
The IMS can be connected to control a variety of different motors in a number of different circuit configurations.

3 Wire Motor Connection

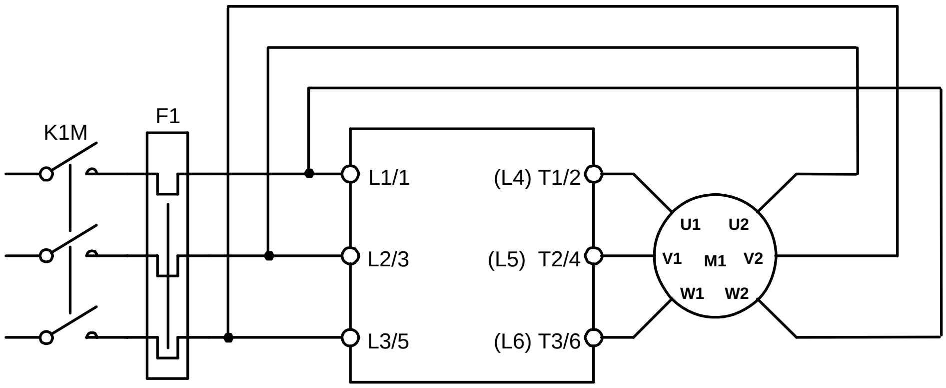


The IMS may be connected to motors designed for star operation or for motor designed for delta operation, so long as the motor is appropriate for the supply voltage.

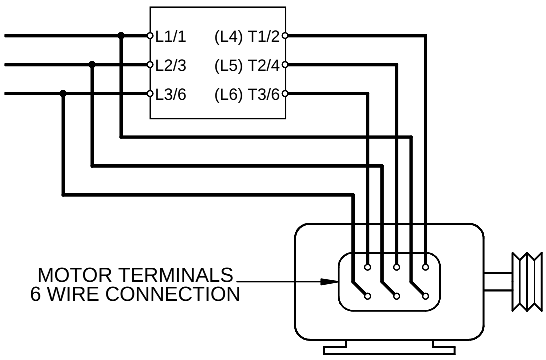




6 Wire Motor Connection



Connect the three OUTPUT terminals (T1/2, T2/4, T3/6) of the IMS to the motor windings ensuring that the connections are made to one end of each winding only. It is imperative to connect the output of the IMS to the same end of each winding and this is usually marked on the motor terminations.



The six terminations to the motor windings are usually arranged in two rows of three so that the links can be fitted across from the top three terminations to the lower terminations. In this case connect the IMS to the top terminations only. Connect the other three motor terminals to the input of the IMS in a manner that connects the end of each winding to a different phase from the input.

This is easiest achieved by replacing each delta link in the motor terminal box by one phase of the controller.

For example if the delta links are fitted U1-V2,V1-W2,W1-U2

- Connect the incoming phases to L1/1,L2/3,L3/5 on the IMS.
- Connect the IMS to the motor. T1/2-U1, T2/4-V1, T3/6-W1
- Connect the other motor terminals to the IMS input. V2-L1/1, W2-L2/3, U2-L3/5

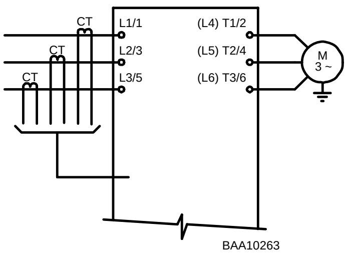
CAUTION

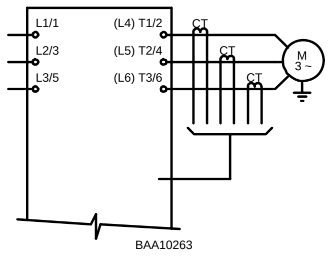
SIX WIRE CONNECTION SHOULD NOT BE MADE WITHOUT USE OF A LINE CONTACTOR AS THE MOTOR REMAINS CONNECTED TO THE SUPPLY EVEN WHEN THE STARTER IS SWITCHED OFF

Current Transformer Installation

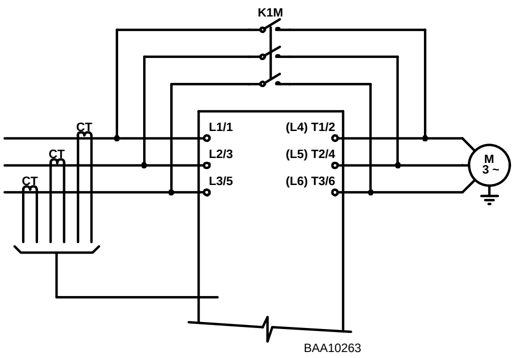
Current Transformers (3) for models IMS-0223, IMS-0264 & IMS-0372 are supplied loose and must be mounted as shown below.

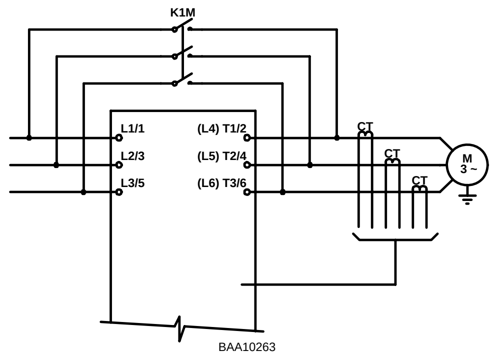
3 Wire Connection - Non By-passed



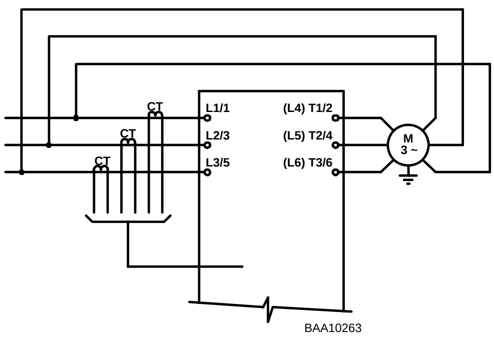


3 Wire Connection - Bypassed

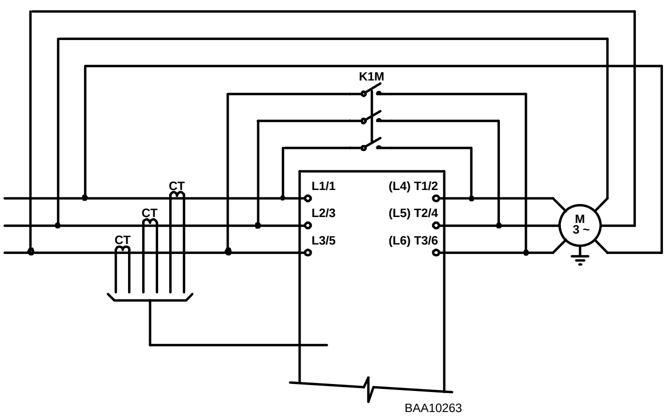




6 Wire - Non By-Passed



6 Wire - By-Passed



Line Contactors

The IMS is designed to operate with or without a line contactor. In many regions there is a statutory requirement that a line contactor be employed with electronic motor control equipment. From a safety point of view, this is the preferable option, however is not necessary for starter operation.

The IMS can directly control a line contactor via the Main Contactor Control output (13,14).

As an alternative to a line contactor, either a circuit breaker with a no volt release coil operated by the IMS trip output (41,42,44), or a motor operated circuit breaker can be considered.

If a motor operated circuit breaker is used as a line contactor, the potential delay between the breaker being told to close and phase power being applied to the IMS could cause the IMS to trip on installation faults. This can be avoided by closing the motorised breaker directly and using the breakers auxiliary contacts to control the IMS.

Semiconductor Fuses

Fast acting semiconductor fuses can be used with the IMS to reduce the potential of damage to the SCRs from transient overload currents. Refer to your starter supplier for semiconductor fuse selection advice.

Bridging Contactors

If the IMS is to be mounted in a non-ventilated enclosure a bridging contactor should be employed to eliminate heat build up in the enclosure.

Bridging contactor can be AC1 rated as it only carries the running current of the motor.

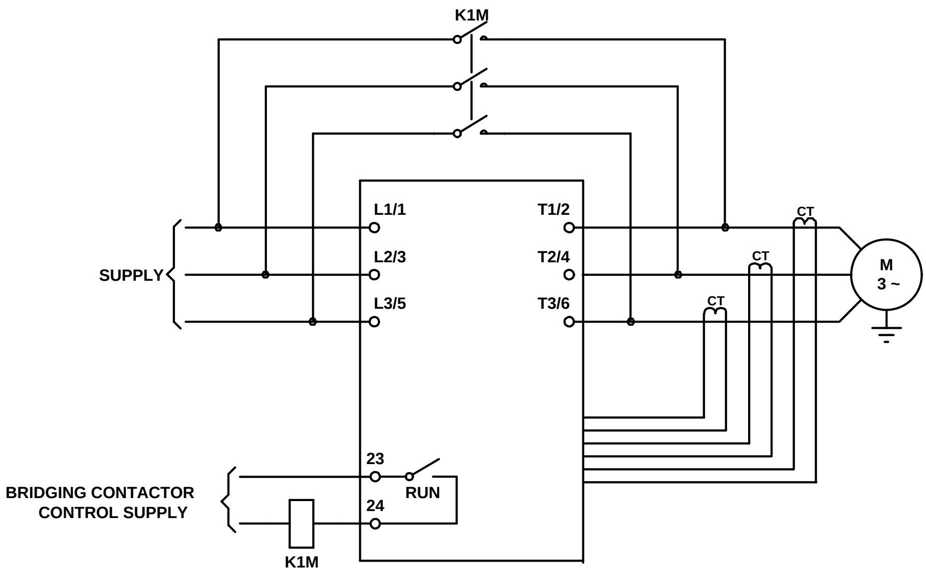
The bridging contactor should be controlled by the IMS Run output (23,24) and used to bridge out the SCRs once the motor has started by bridging between L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6.

CAUTION

IT IS IMPERATIVE THAT THE BRIDGING CONTACTOR CONNECTS L1/1 TO T1/2, L2/3 TO T2/4 AND L3/5 TO T3/6. ANY OTHER COMBINATION WILL CAUSE FUSE FAILURE, CIRCUIT BREAKER TRIP AND POSSIBLE SCR FAILURE.

CAUTION

IN ORDER TO MAINTAIN IMS MOTOR PROTECTION FEATURES DURING BYPASSED OPERATION, THE IMS INTERNAL CTS MUST BE REMOVED AND MOUNTED EXTERNALLY SO THAT THEY MEASURE LINE CURRENT.
(REFER APPENDIX B FOR REMOVAL PROCEDURE)



If using a bridging contactor

- Connect between the inputs and outputs of the IMS ensuring that with the contactor closed, L1/1 connects to T1/2, L2/3 connects to T2/4 and L3/5 connects to T3/6.
- Connect the coil of the bridging contactor through the IMS Run relay outputs to the control voltage.
- Remove the IMS's internal CTs and mount them remotely so that they measure line current. (Refer Appendix B for CT removal procedure)

Power Factor Correction

If static power factor correction is employed, it must be connected to the supply side of the soft starter.

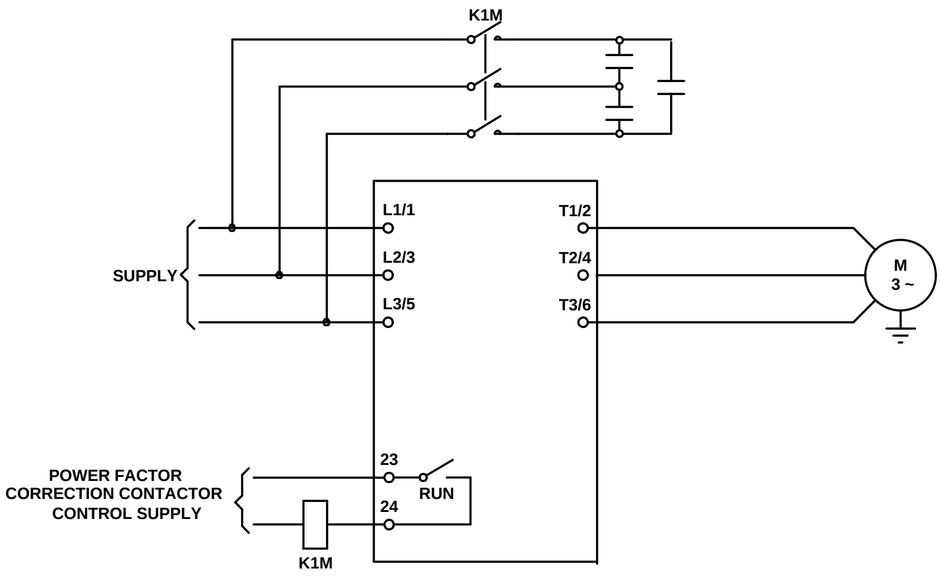
CAUTION

UNDER NO CIRCUMSTANCE SHOULD POWER FACTOR CORRECTION CAPACITORS BE CONNECTED BETWEEN THE SOFT STARTER AND THE MOTOR.

Ideally power factor correction capacitors should be connected to the supply via a dedicated contactor which is energised once the motor has started.

Adding power factor correction capacitance to an inductive supply forms a resonant circuit. This resonant circuit can produce high ringing voltage that can damage the soft starter and other equipment connected to the same supply. Connecting power factor correction capacitors to the supply after the motor has started ensures the supply is loaded and dampens the ringing voltage.

This contactor may be controlled using the IMS Run relay (23,24).



Phase Sequence

The supply may be connected to the starter in any phase sequence. However the IMS starters Phase Sequence Protection feature may be used to prevent motor rotation in the reverse direction caused by a negative phase sequence on the IMS input.

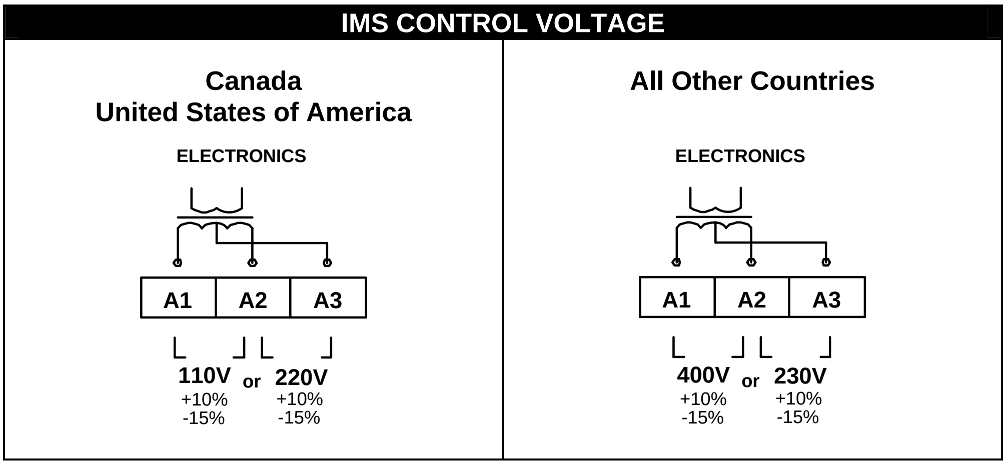
SECTION 7 ELECTRICAL CONNECTION (CONTROL CIRCUIT)

Overview : This section details the connection of control voltage to the IMS Starters as well as describing the IMS's various control inputs and outputs. Additionally, typical connection schematics are provided.

Content :

IMS ELECTRONICS & FAN SUPPLY

The IMS must be supplied with control voltage which controls both the electronics and cooling fans (if fan cooled). Refer to labeling on the IMS for control voltage options.



Control Inputs

The IMS incorporates the following control inputs.

Start (C13,C14)

- Active 24 VDC
- Operate with potential free circuit

  Four Wire Control : The start circuit must be closed fleetingly to start the motor. The start signal is latched internally by the IMS until either the starter trips or the stop circuit is opened.

  Two Wire Control : In a two wire non latching circuit the start input is linked and the IMS is controlled by closing and opening the stop input.
- Contacts used for controlling this input should be low voltage, low current rated. (Gold flash or similar)

Stop (C21,C22)

- Active 24 VDC
- Operate with potential free circuit. (Must be closed for the IMS to operate)
- Contacts used for controlling this input should be low voltage, low current rated. (Gold flash or similar)

Reset (C31,C32)

- Active 24 VDC
- Operate with potential free circuit. (Must be closed for the IMS to operate). Closed circuit to Open circuit transition resets the IMS
- Contacts used for controlling this input should be low voltage, low current rated. (Gold flash or similar)

Auxiliary Trip Input (C53,C54)

- Active 24 VDC
- Operate with potential free circuit. (Must be open for the IMS to operate).
- Contacts used for controlling this input should be low voltage, low current rated. (Gold flash or similar)

Local/Remote (C63,C64)

- Active 24 VDC
- Operate with potential free circuit.
- Contacts used for controlling this input should be low voltage, low current rated. (Gold flash or similar)

Control Input wiring should be run separately from power wiring to prevent noise and possible induced voltage.

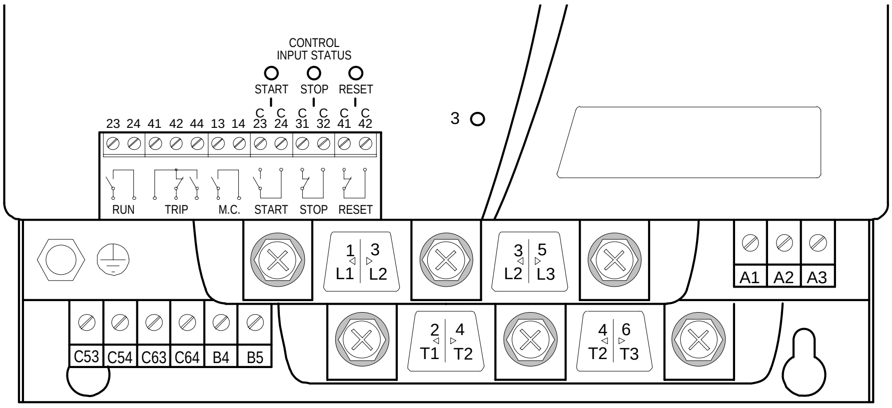
CAUTION

VOLTAGE MUST NOT BE APPLIED TO THE CONTROL INPUT TERMINALS. APPLICATION OF VOLTAGE IS LIKELY TO CAUSE EQUIPMENT DAMAGE.

Operational Overview (Control inputs.)

1) OFF mode.	In the OFF mode, the starter microcomputer monitors the START, STOP, RESET and keypad inputs. a) If the RESET input is open circuit, the IMS will ignore all other inputs. b) If the STOP, START and RESET are closed, the starter will enter the PRESTART mode. NB. The START input is only monitored in the OFF mode and SOFT STOP mode.
2) PRESTART mode.	In the PRESTART mode, the main contactor is closed, the starter microcomputer executes a number of measurements, and depending on the results of these, either auto configures itself and enters the START mode, or trips on an installation or phase sequence fault.
3) START mode	In the START mode, the starter microcomputer monitors the STOP and RESET. a) If the STOP is open and the RESET is closed, the starter enters the SOFT STOP mode. b) If both the STOP and the RESET are open, the starter will immediately stop and enter the OFF mode. c) If the output voltage from the starter reaches full voltage, the starter will enter the RUN mode.
4) RUN mode	In the RUN mode, the starter microcomputer monitors the STOP and RESET. a) If the STOP is open and the RESET is closed, the starter enters the SOFT STOP mode. b) If both the STOP and the RESET are open, the starter will immediately stop and enter the OFF mode.
5) SOFT STOP mode	In the SOFT STOP mode, the starter microcomputer monitors the START, STOP and RESET. In SOFT STOP mode, the output voltage is reduced at the rate determined by the stop time parameter. (soft stop) a) If the stop time parameter is zero, the starter immediately enters the OFF mode. b) If both the STOP and the RESET are open, the starter will immediately stop and enter the OFF mode. c) If the START and STOP are closed, the starter enters the START mode. d) As the output voltage approaches zero, the starter enters OFF mode.
6) TRIP mode	In the TRIP mode, the starter microcomputer monitors the RESET input. In TRIP mode, SCR conduction is inhibited. a) If the RESET is closed, the starter enters the OFF mode.

Control Outputs The IMS incorporates the following control outputs



Main Contactor (13,14)
- Potential Free, Normally Open Relay Contact
- Closes when the IMS receives start signal, opens when IMS stops applying voltage to the motor and when the IMS Trips
- Designed to control operation of a line contactor if fitted to the input of the IMS. This function is particularly useful when utilising the Soft Stop function and a line contactor, as it closes the contactor on start and opens the contactor at the end of the ramp down period.

Run (23,24)
- Potential Free, Normally Open Relay Contact
- Closes when IMS is applying full line voltage to the motor.
- Designed to control a bridging contactor, if fitted, and/or as an Off-Load control output for compressors, conveyors, pumps etc.

Trip (41,42,44)
- Potential Free, Changeover Relay Contacts
- Changes state when the IMS is in the tripped state.

Starter Operation (Relay outputs.)

1) OFF mode.	In the OFF mode, the Main Contactor and Run relay outputs are in their normally open state and the trip relay is in the normal state also.
2) PRESTART mode.	In the PRESTART mode, the main contactor is closed, the starter microcomputer executes a number of measurements, and depending on the results of these, either auto configures itself and enters the START mode, or trips on an installation or phase sequence fault.
3) START mode	In START mode, the Main Contactor relay is closed. a) If the output voltage from the starter reaches full voltage, the starter will enter the RUN mode.
4) RUN mode	In RUN mode, the Main Contactor relay is closed, and the Run relay is closed.
5) SOFT STOP mode	In SOFT STOP mode, the Run relay is open. The Main Contactor relay is closed. The output voltage is reduced at the rate determined by the stop time parameter. (soft stop) a) If the stop time is zero, the starter immediately enters the OFF mode. b) As the output voltage approaches zero, the starter enters OFF mode.
6) TRIP mode	In TRIP mode, the Main Contactor and Run relays are open and the Trip relay changes state. SCR conduction is inhibited. a) If the RESET is closed, the starter enters the OFF mode.

Typical Installation Formats

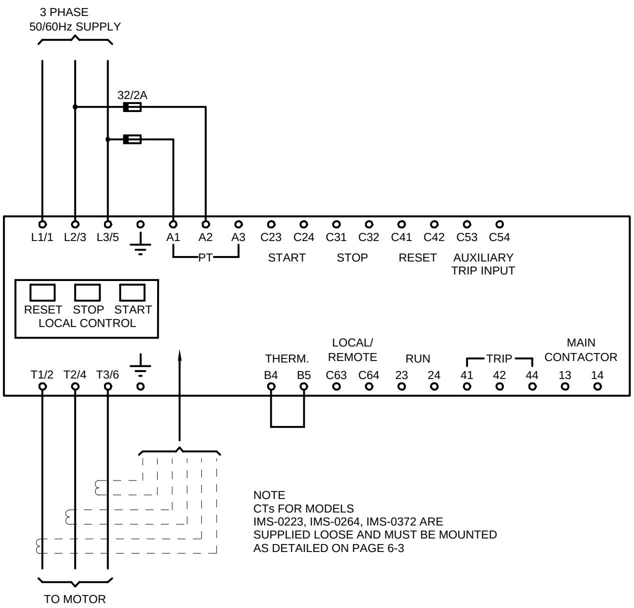
The IMS Series starters may be connected and controlled in a wide variety of ways. Five common application formats are detailed in the following application examples.

If none of these options fully meets application requirements further study of this Users Manual should enable custom design of an appropriate circuit.

APPLICATION 1: A standalone application where the IMS is installed without any other circuitry and motor operation is controlled using the IMS Start/Stop/Reset push-buttons.

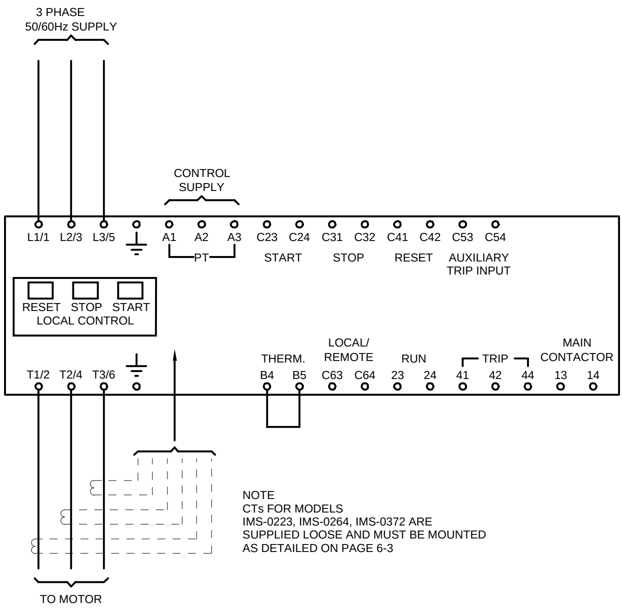
Line Feed Control Voltage

IMS control voltage may be sourced directly from the incoming supply where the supply voltage is compatible with one or other of the IMS control voltage inputs. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



Independently Feed Control Voltage

IMS control voltage may be supplied from an independent supply. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



INSTALLATION PROCEDURE

1. *Models IMS-0223, IMS-0264, IMS-0372 Only*: : Mount & connect Current Transfromers (3). Refer page 6-3
2. Connect line voltage to the soft starter input terminals (L1/1, L2/3, L3/5).
3. Connect the motor to the soft starter output terminals (T1/2, T2/4, T3/6).
4. Connect control voltage to the soft starter Power Transformer.
5. Starter performance may be adjusted using the DIP SWITCH panel on the Main Control Module. Refer to the Initial Set Up Procedure section of this manual for adjustment procedure.

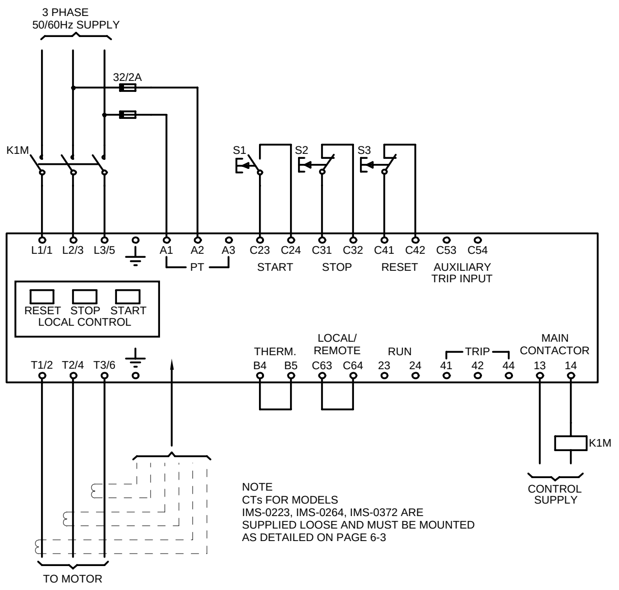
NOTES

1. The motor can be started and stopped using the IMS local control panel.
   - Operating the start button initiates a start by causing the soft starter to apply power to the motor.
   - Pushing the stop button causes the soft starter to stop/soft stop the motor.
2. Operation without a line contactor is allowed in some countries. Ensure that local regulations permit operation without a line contactor before using this circuit.
3. Use only three wire motor connection when applying the soft starter without a line contactor.
4. Trip states may be reset, and fault indication cleared by :
   - Operating the reset push-button.
   - Removal of control voltage from the soft starter.

APPLICATION 2: A typical application where the IMS controlled by remote Start/Stop/Reset push buttons, is applied with a line contactor which is controlled by the IMS M.C. contact.

Line Feed Control Voltage

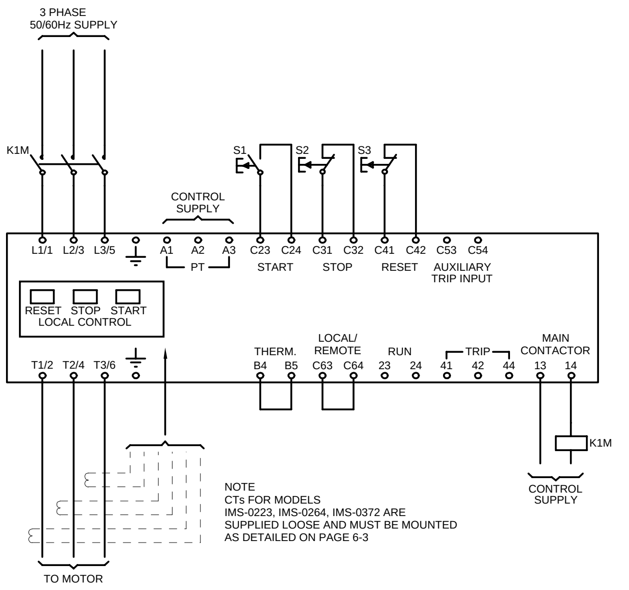
IMS control voltage may be sourced directly from the incoming supply where the supply voltage is compatible with one or other of the IMS control voltage inputs. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



LEGEND	
A1	IMS SOFT STARTER
K1M	LINE CONTACTOR
S1	START PUSHBUTTON
S2	STOP PUSHBUTTON
S3	RESET PUSHBUTTON

Independently Feed Control Voltage

IMS control voltage may be supplied from an independent supply. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



LEGEND	
A1	IMS SOFT STARTER
K1M	LINE CONTACTOR
S1	START PUSHBUTTON
S2	STOP PUSHBUTTON
S3	RESET PUSHBUTTON

INSTALLATION PROCEDURE

1. *Models IMS-0223, IMS-0264, IMS-0372 Only*: : Mount & connect Current Transfromers (3). Refer page 6-3
2. Connect line voltage to the soft starter Input terminals (L1/1, L2/3, L3/5), via an appropriate line contactor.
3. Connect the motor to the soft starter output terminals (T1/2, T2/4, T3/6).
4. Connect control voltage to the soft starter Power Transformer.
5. Connect control circuitry as shown.
6. Starter performance may be adjusted using the DIP SWITCH panel on the Main Control Module. Refer to the Initial Set Up Procedure section of this manual for adjustment procedure.

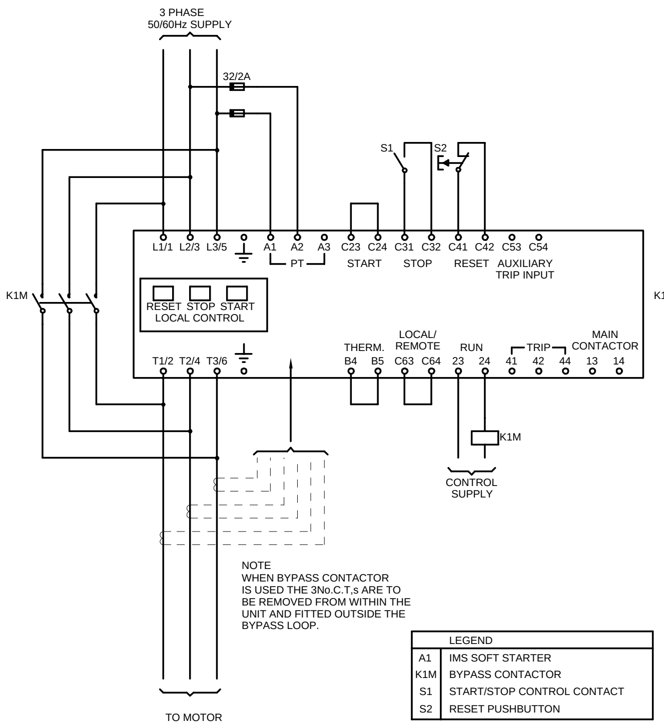
NOTES

1. The IMS is in the Remote control mode. The motor can be started and stopped using the remote start/stop push-buttons.
   - Operating the start button initiates a start by causing the soft starter to close the line contactor and applying power to the motor.
   - Pushing the stop button causes the soft starter to stop/soft stop the motor.
2. Trip states may be reset, and fault indication cleared by :
   - Operating the remote reset push-button.
   - Removal of control voltage from the soft starter.

APPLICATION 3: A typical application where the IMS, controlled via a remote two wire start circuit, is bypassed during run. (Note: the IMS CTs have been externally mounted to keep all protection features operative when the IMS is bypassed.)

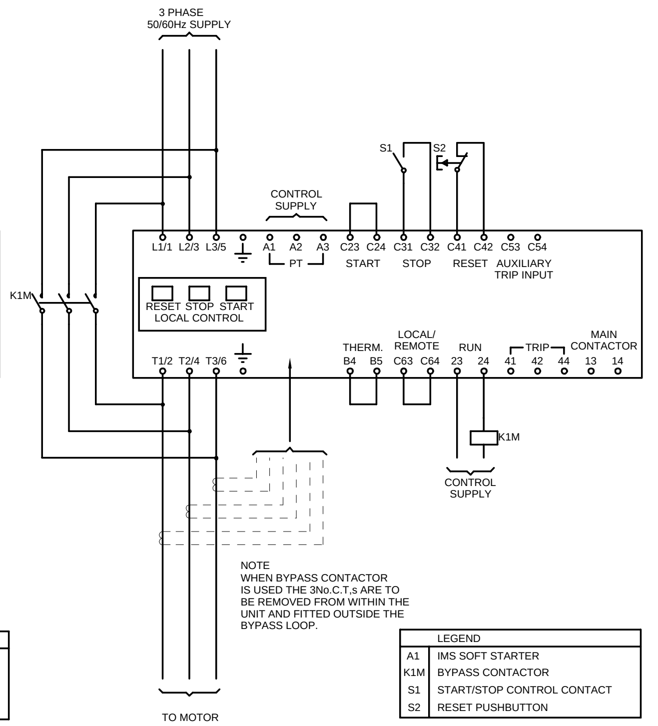
Line Feed Control Voltage

IMS control voltage may be sourced directly from the incoming supply where the supply voltage is compatible with one or other of the IMS control voltage inputs. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



Independently Feed Control Voltage

IMS control voltage may be supplied from an independent supply. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



INSTALLATION PROCEDURE

1. Remotely mount & connect Current Transfromers (3). Refer Appendix B
2. Connect line voltage to the soft starter input terminals (L1/1, L2/3, L3/5).
3. Connect the motor to the soft starter output terminals (T1/2, T2/4, T3/6).
4. Connect the bypass contactor to bridge between L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6.
5. Connect control voltage to the soft starter Power Transformer.
6. Connect control circuitry as shown.
7. Starter performance may be adjusted using the DIP SWITCH panel on the Main Control Module. Refer to the Initial Set Up Procedure section of this manual for adjustment procedure.

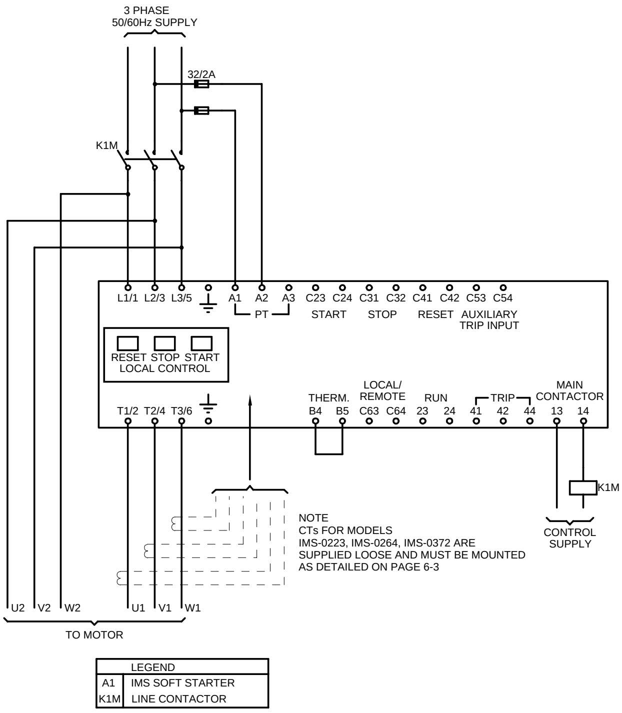
NOTES

1. The motor can be started and stopped using the remote two wire control circuit.
   - Closing the S1 contact initiates a start causing the soft starter to apply power to the motor.
   - Opening the S1 contact causes the soft starter to stop/soft stop the motor.
2. Once full voltage is applied to the motor the IMS closes the bridging contactor.
   - To retain IMS motor protection when the bypass contactor is closed the IMS CTs must be externally mounted. (Refer Appendix B)
3. Operation without a line contactor is allowed in some countries. Ensure that local regulations permit operation without a line contactor before using this circuit.
4. Use only three wire motor connection when applying the soft starter without a line contactor.
5. Trip states may be reset, and fault indication cleared by :
   - Operating the remote reset push-button.
   - Removal of control voltage from the soft starter.

APPLICATION 4: A typical application where the IMS, controlled by local Start/Stop/Reset push buttons, is used to control a motor connected in 6 Wire (Inside Delta) configuration. (Note: a line contactor must also be used when connecting motors in six wire configuration so that voltage is removed from all motor terminals when in the off state).

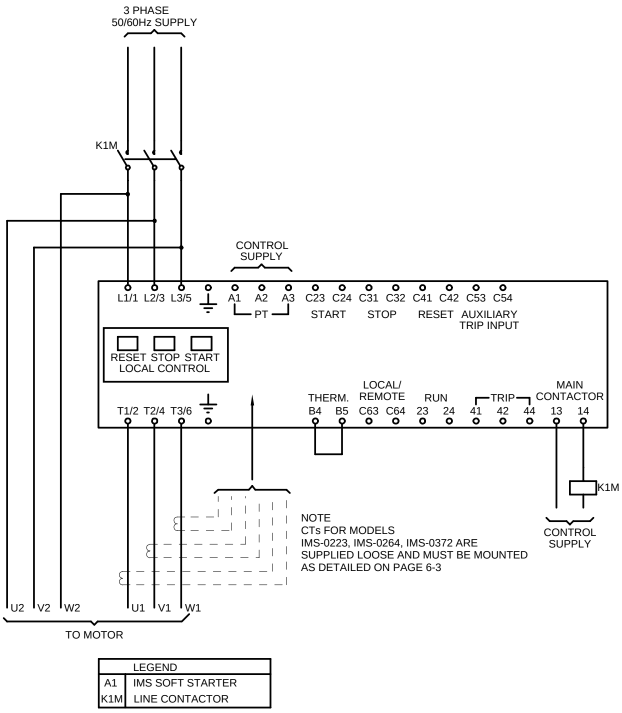
Line Feed Control Voltage

IMS control voltage may be sourced directly from the incoming supply where the supply voltage is compatible with one or other of the IMS control voltage inputs. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



Independently Feed Control Voltage

IMS control voltage may be supplied from an independent supply. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



INSTALLATION PROCEDURE

1. *Models IMS-0223, IMS-0264, IMS-0372 Only*: : Mount & connect Current Transfromers (3). Refer page 6-3
2. Connect line voltage to the soft starter input terminals (L1/1, L2/3, L3/5), via an appropriate line contactor.
3. Connect each end of one motor winding to the soft starter output terminals (T1/2, T2/4, T3/6) and the other end to a different phase of the incoming supply.
4. Connect control voltage to the soft starter Power Transformer.
5. Connect control circuitry as shown.
6. Starter performance may be adjusted using the DIP SWITCH panel on the Main Control Module. Refer to the Initial Set Up Procedure section of this manual for adjustment procedure.

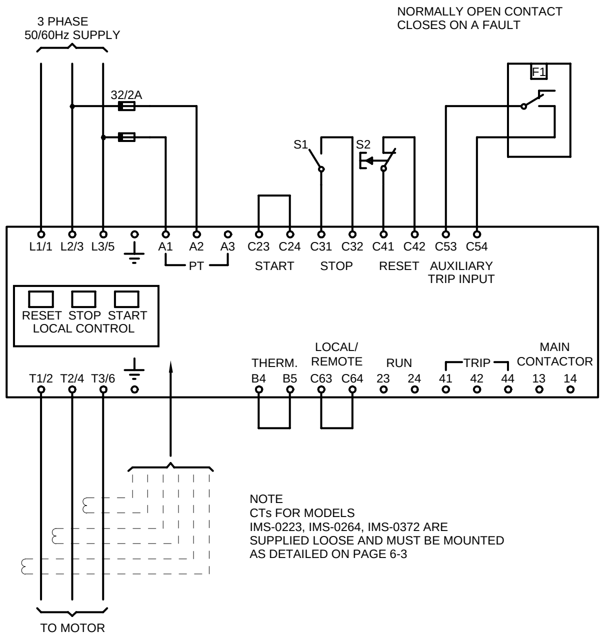
NOTES

1. The motor can be started and stopped using the IMS local control panel.
   - Operating the start button initiates a start by causing the soft starter to close the line contactor and apply power to the motor.
   - Pushing the stop button causes the soft starter to stop/soft stop the motor.
2. Trip states may be reset, and fault indication cleared by :
   - Operating the remote reset push-button.
   - Removal of control voltage from the soft starter.
3. A line contactor must be used when utilising the six wire configuration.

APPLICATION 5: A typical application where the IMS is installed with an undercurrent protection relay, and motor operation is controlled via a remote two wire signal.

Line Feed Control Voltage

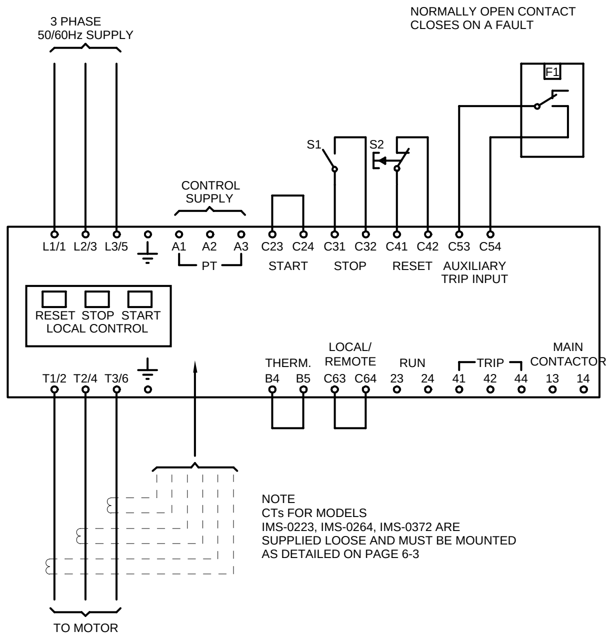
IMS control voltage may be sourced directly from the incoming supply where the supply voltage is compatible with one or other of the IMS control voltage inputs. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



LEGEND	
A1	IMS SOFT STARTER
F1	FAULT RELAY (N/O CONTACT)
S1	START/STOP CONTROL CONTACT
S2	RESET PUSHBUTTON

Independently Feed Control Voltage

IMS control voltage may be supplied from an independent supply. Refer Control Voltage options marked on the unit or refer page 7-1 of this manual.



LEGEND	
A1	IMS SOFT STARTER
F1	FAULT RELAY (N/O CONTACT)
S1	START/STOP CONTROL CONTACT
S2	RESET PUSHBUTTON

INSTALLATION PROCEDURE

1. *Models IMS-0223, IMS-0264, IMS-0372 Only*: : Mount & connect Current Transfromers (3). Refer page 6-3
2. Connect line voltage to the soft starter input terminals (L1/1, L2/3, L3/5).
3. Connect the motor to the soft starter output terminals (T1/2, T2/4, T3/6).
4. Connect control voltage to the soft starter Power Transformer.
5. Connect control circuitry as shown.
6. Starter performance may be adjusted using the DIP SWITCH panel on the Main Control Module. Refer to the Initial Set Up Procedure section of this manual for adjustment procedure.

NOTES

1. The motor can be started and stopped using the remote two wire control circuit.
   - Closing the S1 contact initiates a start causing the soft starter to apply power to the motor.
   - Opening the S1 contact causes the soft starter to stop/soft stop the motor.
2. Operation of the Undercurrent relay will cause the starter to trip and bring up the Auxiliary Trip indication.
3. Operation without a line contactor is allowed in some countries. Ensure that local regulations permit operation without a line contactor before using this circuit.
4. Use only three wire motor connection when applying the soft starter without a line contactor.
5. Trip states may be reset, and fault indication cleared by :
   - Operating the remote reset push-button.
   - Removal of control voltage from the soft starter.

SECTION 8 COMMISSIONING PROCEDURE

Overview : This section details commissioning procedures for an IMS installation.

Content :

PRE-COMMISSIONING CHECKS

STEP	CHECK
1	Ensure that the correct model has been supplied as ordered for the application.
2	Inspect the starter and report any visible signs of damage to the unit.
3	Verify that the control circuit is a) suitable for the application b) compatible with the IMS control philosophy.
4	Cooling of the IMS is important for the long term reliability. Ensure that the ventilation is appropriate for the application and that the IMS cooling fans are not obstructed. If the IMS is not bypassed during run, ensure that there is provision for sufficient passage of air out of the enclosure to cool the unit. This may require forced ventilation of the enclosure.
5	Check that the Electronics PT input is connected to a control supply, using either terminals A1 and A2, or A2 and A3. NB ONLY TWO TERMINALS ARE TO BE CONNECTED!
6	Following the starter adjustment procedures, detailed in section 9 of this manual, set the starter for the desired starting parameters.

COMMISSIONING PROCEDURE

STEP	CHECK
1	Ensure the enclosure is free of metallic swarf and wire offcuts.
2	Before connecting the output terminals to the motor, carry out an insulation test of the motor windings to earth. The reading should be in excess of 10 Megohms. If practical, an insulation test between windings should also be carried out.
3	Connect the output terminals to the motor.
4	Ensure that the voltage applied to the isolator is correct and that all three phases are present.
5	Ensure that the incoming supply is connected to L1/1, L2/3 and L3/5.
6	Ensure that all the main power terminations are tight.
7	Apply power to the IMS electronics PT input, and ensure that the POWER LED on the IMS control panel illuminates.
8	Ensure that all fans are running freely (fan cooled units only).
	If the IMS is installed with a bypass contactor, ensure that: a. The contactor is bypassing the appropriate terminals on the IMS. L1/1 must connect via the bypass contactor to T1/2, L2/3 must connect via the contactor to T2/4, and L3/5 must connect via the contactor to T3/6. If the IMS is incorrectly bypassed, damage to the starter can result. b. The IMS CTs have been removed from their normal location within the starter, and mounted remotely and are monitoring line current. (Refer appendix B for procedure)
9	Ensure that the IMS is in the local mode. (C63, C64 Open)
10	Connect an ammeter in the circuit to display the current during start. A sufficiently rated Clamp type meter would be satisfactory.
11	Ensure that the motor, couplings and machine are ready for an attempted start.
12	Close the isolator and apply line voltage to the IMS.
13	Start the motor by pressing the IMS Start button and monitor the start current and the direction of rotation. If the direction of rotation is incorrect, stop the machine, isolate the starter and swap two phases on the input or the output of the starter.
14	Ensure the measured start current does not exceed the ratings of the IMS.
15	If a bypass contactor is employed, ensure that it closes once the motor has reached full speed and the start current has fallen.
16	Ensure that the motor and machine operate satisfactorily.

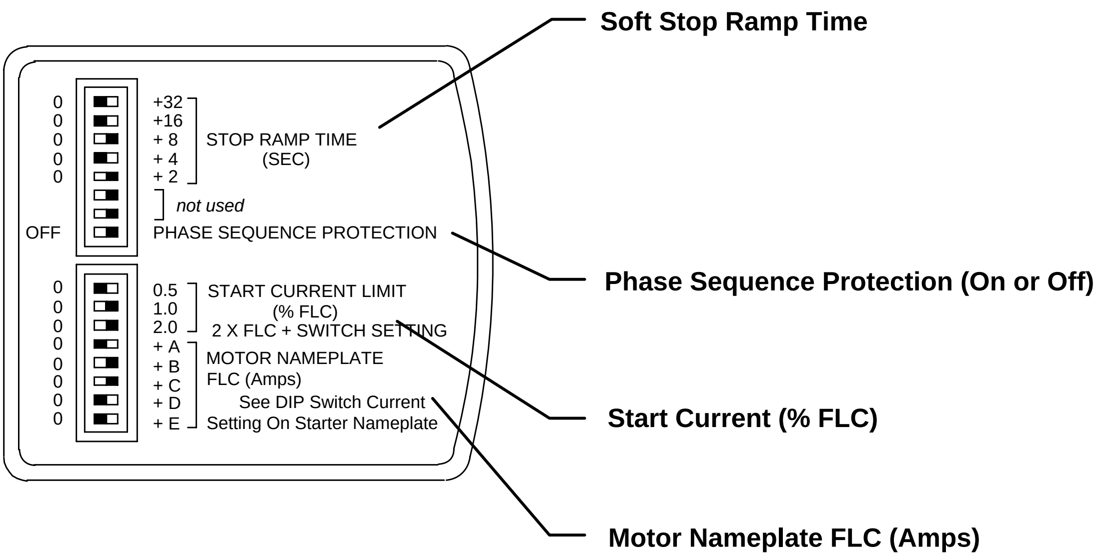
SECTION 9 IMS PROGRAMMING PROCEDURE

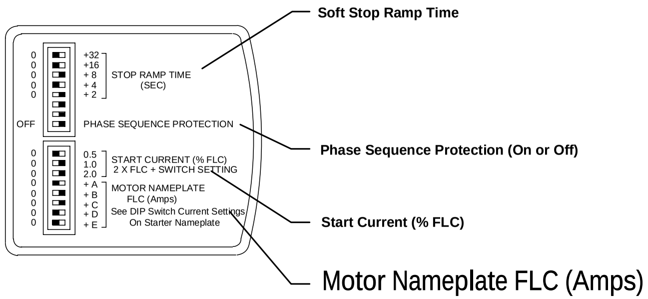
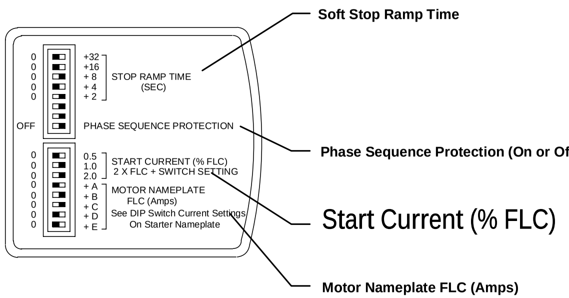
Overview : This section provides instruction adjustment of IMS start parameters.

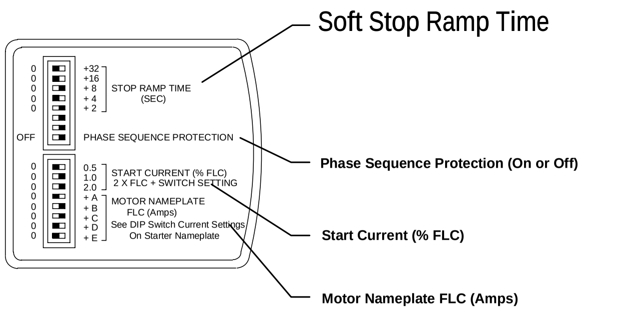
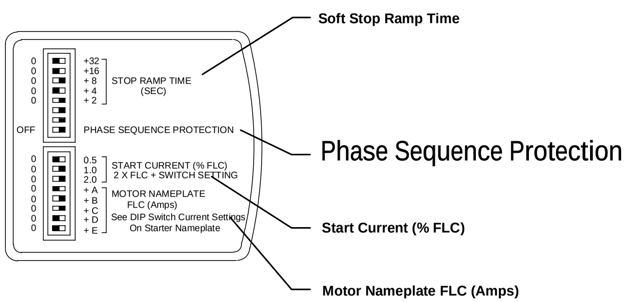
Content :

Overview of IMS Adjustment

The IMS is adjusted via a digital DIP Switch adjustment panel. The following adjustments may be made :



FUNCTION	PURPOSE	SETTING INSTRUCTIONS
	To set the IMS for the connected motor's nameplate Full Load Current.	Set the five (5) ***Motor Nameplate FLC*** switches to add up to the connected motor's nameplate Full Load Current. Current ratings for Motor Nameplate FLC switches are detailed on both the nameplate and ratings labels affixed to the case of the IMS. (Appendix A also details FLC switch weightings for all models) Note: ***Motor Nameplate FLC*** settings for Six Wire connections require no conversion to account for the inside delta connection. All necessary compensation is automatically performed by the IMS.
	Sets the level at which the IMS will limit motor start current.	Set the ***Start Current*** so that the motor can easily accelerate to full speed and to optimise start characteristics. The minimum selectable start current is 2 x FLC and is achieved with all three ***Start Current*** switches set to zero (0) To increase the start current above 2 x FLC, set the three (3) ***Start Current*** switches so that the combined switch value <u>plus</u> 2.0 x FLC is equal to the required start current level. Start Current can be set to a maximum of 5.5 x FLC however care must be taken not to exceed the ratings of the IMS as detailed on the ratings nameplate.

	To set the Stop Ramp Time if a Soft Stop is required.	Set the five (5) Stop Ramp Time switches to add up to the required stop ramp time. Set all switches off to defeat the Soft Stop function. The Stop Ramp Time setting should be adjusted to optimise stopping performance for the connected load. The time set does not dictate actual stopping time as this is dependent on the motor and load characteristics. The stop ramp time does however influence the deceleration rate of the motor and should be determined by experimentation.
	To activate the Phase Sequence Protection function if required.	Set the Phase Sequence Protection switch to activate or defeat the Phase Sequence Protection Function. Activate the Phase Sequence Protection function to prevent reverse motor rotation due to changes in the phase sequence of the incoming supply. Defeat the Phase Sequence protection function if reversing contactors are employed.

SECTION 10 TROUBLE SHOOTING GUIDE

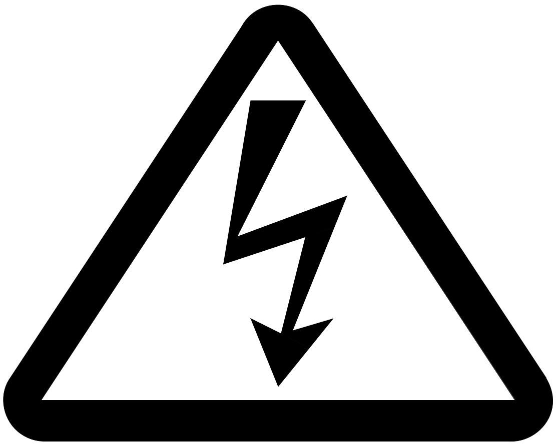
Overview : This section details the IMS diagnostic displays and provides assistance in identifying system faults.

Content :

READ MANUAL COMPLETELY PRIOR TO CONNECTING AND COMMISSIONING THIS EQUIPMENT

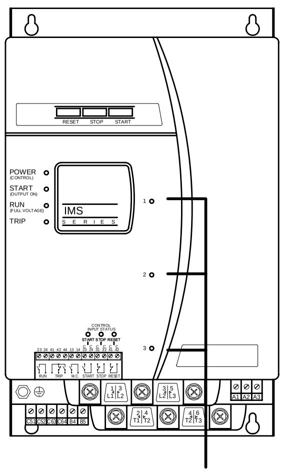
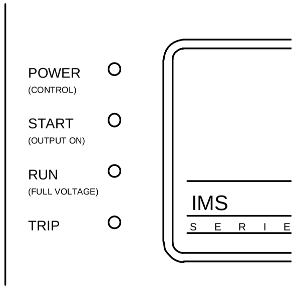
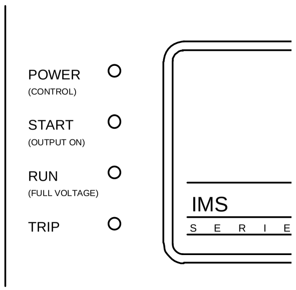
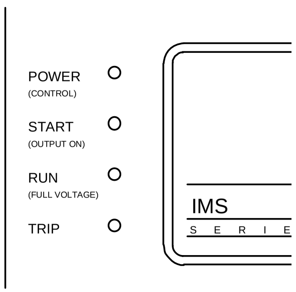
Fault finding and/or repair of this
equipment must be undertaken only by suitably
qualified personnel.

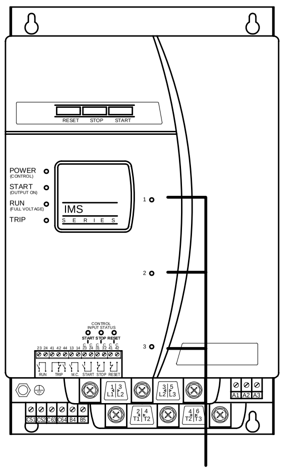
WARNING

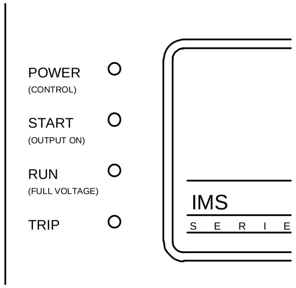


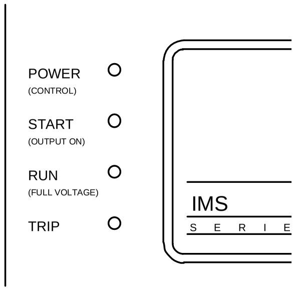
ELECTRICAL SHOCK HAZARD

ENSURE THE IMS IS COMPLETELY ISOLATED FROM THE POWER SUPPLY BEFORE ATTEMPTING ANY WORK ON THE UNIT

SYMPTOM / INDICATION		ACTION / TEST
Starter Trips - Three Phase Indicator LEDs <u>NOT</u> all illuminated or <u>NOT</u> glowing with equal brilliance.  THREE PHASE INDICATOR LEDS	Invalid Motor Connection - Installation Trip **FLASHING >>** **(x 1)**  	With voltage supplied to the input of the IMS, check the voltage, input to output, of each phase of the IMS. If the voltage measured on the phase which has the dim or extinguished LED is zero, low or not equal to the other phases, this indicates the potential for an incorrect motor connection. Verify the motor connection format referring to Section 6 of this manual.
	Missing Phase(s) - Installation Trip **FLASHING >>** **(x 1)**  	With voltage supplied to the input of the IMS, check the voltage, input to output, of each phase of the IMS. If the voltage measured on the phase which has the dim or extinguished LED is zero, low or not equal to the other phases, this indicates the potential for an electrical supply problem. Ensure three phases are present at the IMS input terminals. Ensure that the motor is correctly connected to the starter in a valid format. Ensure that each winding of the motor is continuous. Verify each circuit between the starter and motor.
	Failed SCR - Installation Trip **FLASHING >>** **(x 1)**  	With voltage supplied to the input of the IMS, check the voltage, input to output, of each phase of the IMS. If the voltage measured on the phase which has the dim or extinguished LED is zero, low or not equal to the other phases, this indicates potential for a failed SCR. Disconnect all connections to the IMS input and output terminals. Measure the insulation resistance of each phase in both directions with a 500V tester. The measured resistance should be approximately 33 Kohms. If the resistance is significantly less than 33Kohms, the SCR is likely to have failed. If the resistance is significantly higher than 33Kohms, the control PCB is likely to have failed.

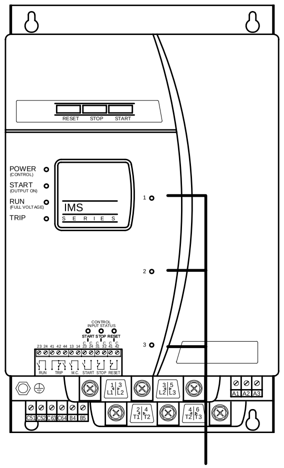
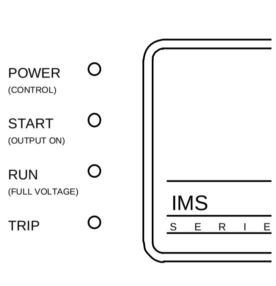
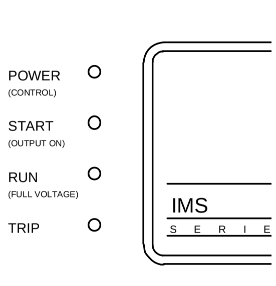
<table>
<tr><th colspan="2">SYMPTOM / INDICATION</th><th>ACTION / TEST</th></tr>
<tr><td rowspan="2">Starter Trips -
Three Phase Indicator LEDs all glow with equal brilliance.


THREE PHASE INDICATOR LEDS</td>
<td>Phase Sequence - Installation Trip


FLASHING >>
(x 1)</td>
<td>If not required, ensure the IMS's phase sequence protection is switched off and retry. It may be necessary to reverse the incoming phase sequence if phase sequence protection is required.</td></tr>
<tr><td>Frequency Out Of Range Trip - Installation Trip


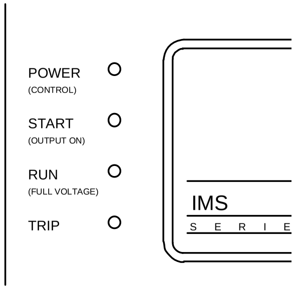
FLASHING >>
(x 1)</td>
<td>The IMS measures the supply frequency and expects this to be either:
a) 48 - 52Hz
b) 58 - 62Hz

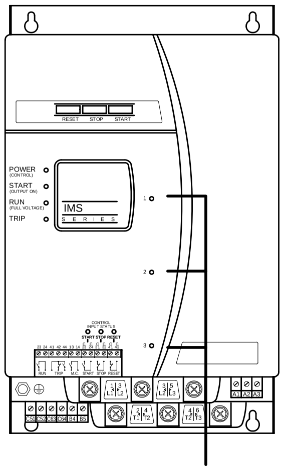
The most likely cause of problems are:
a) Loss of input three phase while motor is running.
b) Genset governor out of calibration.</td></tr>
</table>

SYMPTOM / INDICATION		ACTION / TEST
Starter Trips - Three Phase Indicator LEDs all glow with equal brilliance  THREE PHASE INDICATOR LEDS	Overcurrent Trip **FLASHING >> (x 2)**  	The IMS monitors the current drawn by the motor and mathematically models the expected motor temperature. The IMS will not allow a restart after an overcurrent trip until the thermal model has reached a temperature below the trip temperature. (NOTE: The motor must be allowed to cool sufficiently for a hot restart to occur. If the thermal margin is small, the motor may only get to part speed before re-tripping.) Most likely causes of problems are: a) motor overloaded b) motor FLC setting incorrect c) motor restarted too soon after stop or trip Check motor and/or load for cause of motor overload. Allow motor time to cool, reset and restart. Ensure the IMS Motor Nameplate FLC setting is correct for the connected motor. Ensure Start Current setting is adequate to allow the motor to easily accelerate to full speed. If an overcurrent trip occurs during acceleration and the motor was started from cold, refer to Appendix E for further information.
	Thermistor Trip **FLASHING >> (x 3)**  	The IMS monitors the thermistor input and will trip (or not restart) if there is a thermistor fault present. Most likely causes of problems are: a) hot motor (thermistors operating correctly) b) open circuit in thermistor circuit. c) thermistors not connected and no shorting link fitted Wait for motor to cool. If no motor thermistors are connected ensure that a link is fitted across IMS motor thermistor terminals (B4,B5). Check thermistor circuit.

SYMPTOM / INDICATION		ACTION / TEST
Starter Trips - Three Phase Indicator LEDs all glow with equal brilliance	Phase Imbalance Trip	The IMS monitors the current drawn on each phase and calculates the difference between the currents flowing on the three phases. The difference between the highest phase and the lowest phase is compared and a trip occurs if there is a continuous condition outside the preset limits.

FLASHING >>
(x 4)





THREE PHASE INDICATOR LEDS

Most likely causes of problems are:

a) one phase low in voltage
b) motor problem
c) loose cable or busbar joint
d) current additional to motor current passing through CTS

Ensure that all three phases are present at the IMS input. Measure phase to phase, and phase to neutral for each phase.

Ensure that the circuit from the IMS to the motor is complete.

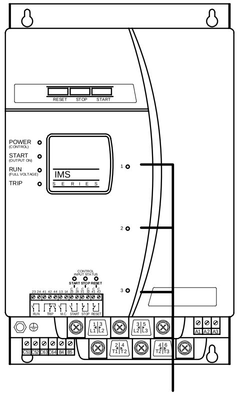
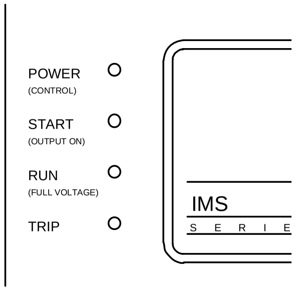
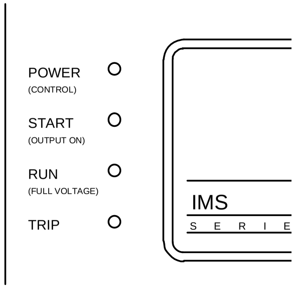
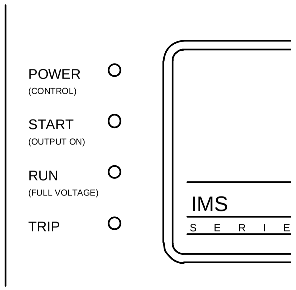
3 Wire Completely isolate the IMS from the supply and using a meter measure the circuit between each of the three outputs.

6 Wire Completely isolate the IMS from the supply and using a meter, measure the circuit between each of the outputs and inputs.

There should be NO circuits measured between the outputs, (T1/2-T2/4-T3/6). Note that it may be necessary to remove the control circuit fuses to isolate the fans from the inputs.

A circuit must be measured from each of the outputs to an input, but the input must not be on the same phase. Acceptable combinations are

T1/2-L2/3,T2/4-L3/5,T3/6-L1/1 or
T1/2-L3/5,T2/4-L1/1,T3/6-L2/3

SYMPTOM / INDICATION		ACTION / TEST
Starter Trips - Three Phase Indicator LEDs all glow with equal brilliance  THREE PHASE INDICATOR LEDS	Frequency Out Of Range Trip - Run Time  **FLASHING >>** **(x 5)**	The IMS measures the supply frequency and expects this to be either: a) 48 - 52Hz b) 58 - 62Hz The most likely cause of problems are: a) Loss of input three phase while motor is running. b) Genset governor out of calibration.
	Electronic Shearpin Tip  **FLASHING >>** **(x 6)**	The IMS monitors the current drawn by the motor and trips if the shearpin limit is exceeded. Most likely causes of problems are: a) motor severely overloaded b) driven load jammed c) power factor correction connected on output of IMS Check motor and load for cause of instantaneous overload. Reset and restart.
	Auxiliary Trip Input Operated  **FLASHING >>** **(x 7)**	Check the circuit connected to the IMS Auxiliary Trip Input circuit.

SYMPTOM	POSSIBLE CAUSE	ACTION / TEST
Power LED Does Not Illuminate	Incorrect Control Voltage	Ensure that the control voltage is present and correctly connected to the transformer inputs (A1& A2 **or** A2 & A3). This can be easily checked using an A.C.volt meter and measuring the voltages at the terminals. Voltages should correspond to those listed on the IMS control voltage labeling.
	Control Fuse Failure	Ensure that all fuses in the control and power circuits are intact.
	Transformer Failure	The integrity of the IMS PT can be checked by measuring the secondary voltage of the transformer. Remove the IMS cover to reveal the PT and unplug the white plug from the Main Control PCB. After confirming the correct voltage is applied to the input of the transformer, measure the AC voltage coming from the transformer. This should be 18VAC (±4V) between the two orange leads, and 9VAC (±2V) between the purple lead and each of the orange leads.
Motor Will Not Start	Control Circuit Fault	Check the Control Input Indicators above each of the control inputs and ensure they indicate the expected circuit status. The Stop and Reset circuits must be closed before the unit will accept a start input. Status of the control inputs can be independently verified using a volt meter and measuring across the terminals. If there is 24 VDC measured across either of the terminals when a start is called, the switch/control is connected incorrectly or is faulty.
	Incorrect Control Voltage	Ensure that the control voltage is present and correctly connected to the transformer inputs (A1& A2 **or** A2 & A3). This can be easily checked using an A.C.volt meter and measuring the voltages at the terminals. Voltages should correspond to those listed on the IMS control voltage labeling.
DOL or Uncontrolled Start	Power Factor Correction	Ensure that no Power Factor Correction capacitors are connected on the output of the IMS. This can cause starter damage. Power factor correction capacitors if fitted must be on the input side of the starter.
	CT's Not Connected	If Current Transformers were supplied loose (IMS-0223, IMS-0264, IMS-0372) or have been removed from the unit to allow for bypass starter connection check that they have been properly wired to the starter.

SYMPTOM	POSSIBLE CAUSE	ACTION / TEST
DOL or Uncontrolled Start (cont.)	Damaged SCR(s) or Firing Circuit	**1. Resistance Test:** This procedure verifies the off state resistance of the thyristors. If the power section of a thyristor fails it generally fails short circuit. Dependant upon the manner of installation conduct one of the following tests being sure to ensure that the motor is connected to the output of the starter at the time of test: a) <u>three wire installation on a supply with earthed neutral</u>: with three phase voltage on the input and the starter in the OFF mode, measure the voltage between the outputs and neutral (or earth). This should be <10 volts. b) <u>three wire installation on a supply with no neutral</u>: with three phase voltage on the input, and the starter in the OFF mode, measure the voltage from input to output on each phase, i.e. L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6. The voltages should be very close to equal. c) <u>six wire installation</u>: measure the voltage from input to output on each phase, i.e. L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6. The voltages should be very close to equal. In the event of poor test results the thyristor should be replaced. **2. Firing Circuit:** This test verifies proper firing of the thyristor gate circuits. These tests check the entire firing circuit including SCR, Firing Loom and PCB. All tests must be conducted with the Firing Looms plugged into the starter Main Control PCB. (Note: use only analogue measuring instruments) With both the supply and motor disconnected, and using a 500V insulation tester (low voltage ohm meters or multi-meters are not adequate), measure the resistance between the input and output on each phase. L1/1 - T1/2, L2/3 - T2/4, L3/5 - T3/6. The resistance should be close to 33KΩ. If less than 33KΩ, then there could be excess leakage through the SCRs. If greater than 33KΩ, then there could be a control PCB fault or firing loom fault. To discriminate between a PCB fault and a Firing Loom fault do the following: a) At the starter Main Control PCB, swap the Firing Loom Plug from the phase with the high resistance with a plug from one of the other phases. Repeat the measurement to determine if the high resistance phase has changed or remained as before. b) If the high resistance phase remains stationary, the Firing Loom is suspect and should be checked for loose connections or replaced. c) If the high resistance phase changes, the PCB may be at fault and should be replaced.

SYMPTOM	POSSIBLE CAUSE	ACTION / TEST
Motor Does Not Breakaway / Accelerate to full speed.	Insufficient Start Current	Increase the ***Start Current*** setting so that the motor can produce sufficient torque to accelerate the load to full speed. (NOTE: If the motor and load has previously accelerated to full speed at the existing ***Start Current*** setting, ascertain why start torque requirements have increased).
Motor does not rotate immediately a start is initiated.	Initial Start Current Setting Too Low.	The IMS Constant Current start mode includes a current ramp function which causes start current to be ramped up to the user set ***Start Current*** level over approximately 5 seconds. While appropriate for most applications, some loads may not begin to rotate immediately. If this is a problem either: a. increase the ***Start Current*** setting. b. adjust the current ramp setting by following the procedure detailed in Appendix C.
Soft Stop Does Not Function	Incorrect Stop Circuit	The soft stop function is not able to work if the start/stop circuit opens the contactor when a stop is called for. Refer to the example soft stop circuit earlier in this manual for correct circuit configuration.
	Stop Ramp Time Setting	Ensure that the Stop Ramp Time is set correctly. If all Stop Ramp Time switches are set to zero (0), no stop time has been specified and there will be no soft stop.
Erratic Motor Operation & Tripping	Large Starter Being Test On Very Small Motor.	Where very small motors are used to test operation of large starters there is possibility that the current drawn may insufficient to latch the starter thyristors. Increase motor size and or loading.

APPENDIX

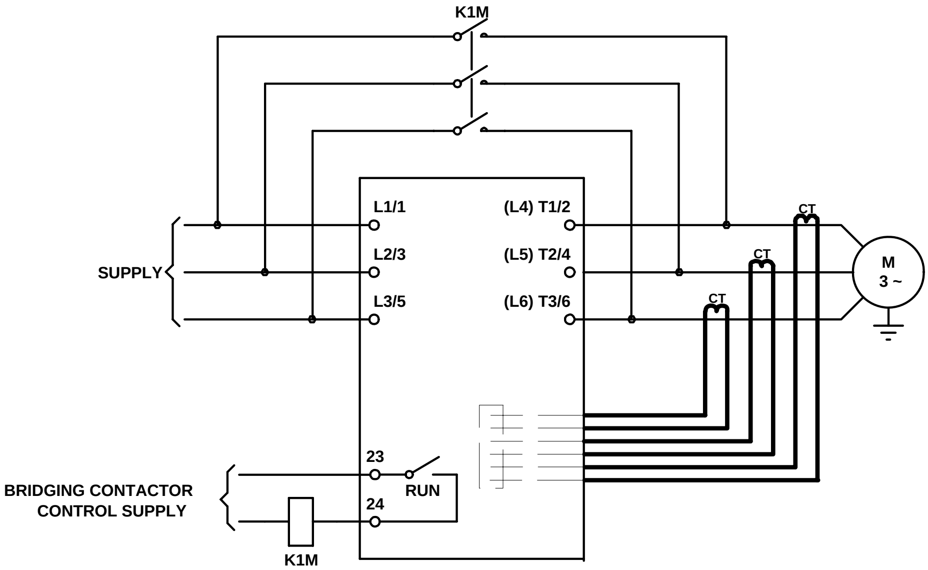
APPENDIX A. MOTOR NAMEPLATE FLC DIP SWITCH SETTINGS

	SWITCH SETTING (Amps)				
MODEL	A	B	C	D	E
IMS-0013	1	2	4	8	16
IMS-0025	2	4	8	16	32
IMS-0034	3	6	12	24	48
IMS-0039	3	6	12	24	48
IMS-0055	3	6	12	24	48
IMS-0073	4	8	16	32	64
IMS-0080	4	8	16	32	64
IMS-0126	8	16	32	64	128
IMS-0136	8	16	32	64	128
IMS-0158	8	16	32	64	128
IMS-0193	12	24	48	96	192
IMS-0223	16	32	64	128	256
IMS-0264	16	32	64	128	256
IMS-0372	20	40	80	160	320

APPENDIX B. REPOSITIONING OF IMS CTS FOR BYPASS OPERATION

In order to retain all protection features when bypassing an IMS starter it is necessary to remove and externally mount the internally mounted IMS Current transformers. Mounting the CTs remotely requires use of an ‘External Mount CT Wiring Loom’ (Part No: 9FLCE1).

NOTE: Current Transformers for models IMS-0223, IMS-0264, IMS-0372 are supplied loose and are already fitted with the ‘External Mount CT Wiring Loom’ (Part No: 9FLCE1). For these models simply mount and connect the Current Transformers.

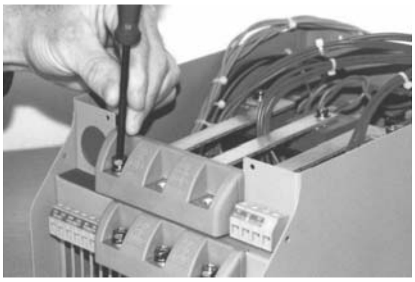
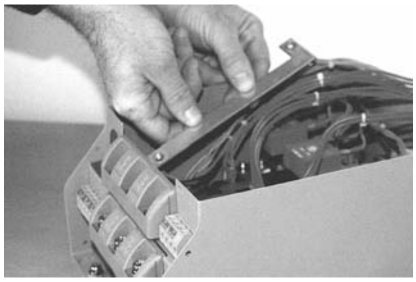


The IMS can be used with bypassed and without external mounting of the IMS CTs provided separate motor protection is provided.

Step 1. Undo the Control Module’s four fixing screws and detach it from the Power Assembly case being careful not to stress the wiring loom connections.

		
Undo Cover Screws	Lift Off Cover	Unplug All Loom Connections

Step 2. Remove the three input bus bars running from the input terminal block moulding to the CTs, by removing all six screws retaining the bus bars and then sliding them out of the moulding.

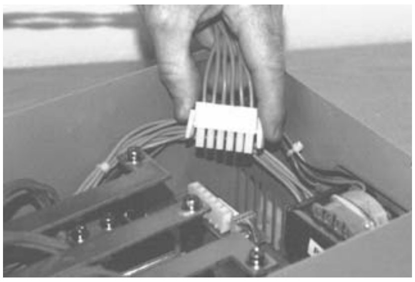
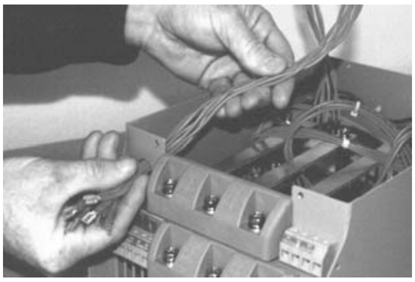
		
Remove Input Terminal Screws	Remove Bus Bar Fixing Screws	Slide Bus Bars Out Of Moulding

Step 3. Remove CTs by unplugging the white 6 way connector from the CT shunt PCB and lifting the CTs out of the unit.

 Unplug White 6 Way Connector	 Lift Out CTs	 IMS-0013~0039 - Discard CT mounting bracket. IMS-0055~0136 - Leave in place CT mounting bracket. IMS-0158~0193 - N/A

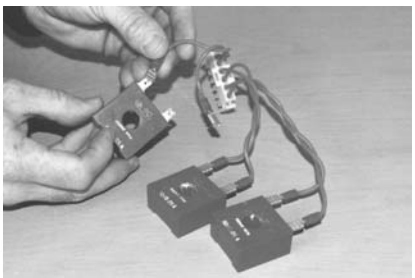
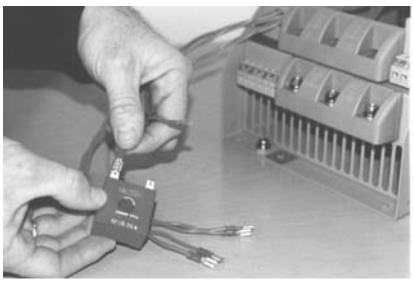
Step 4. Replace the three input bus bars removed in step 2. by reversing the procedure used to remove them.

Step 5. Install the ‘External Mount CT Wiring Loom’ (Part No: 9FLCE1) by plugging it’s six way connector into the CT shunt PCB, feeding it loose ends through the IMS case and securing with the cable gland supplied.

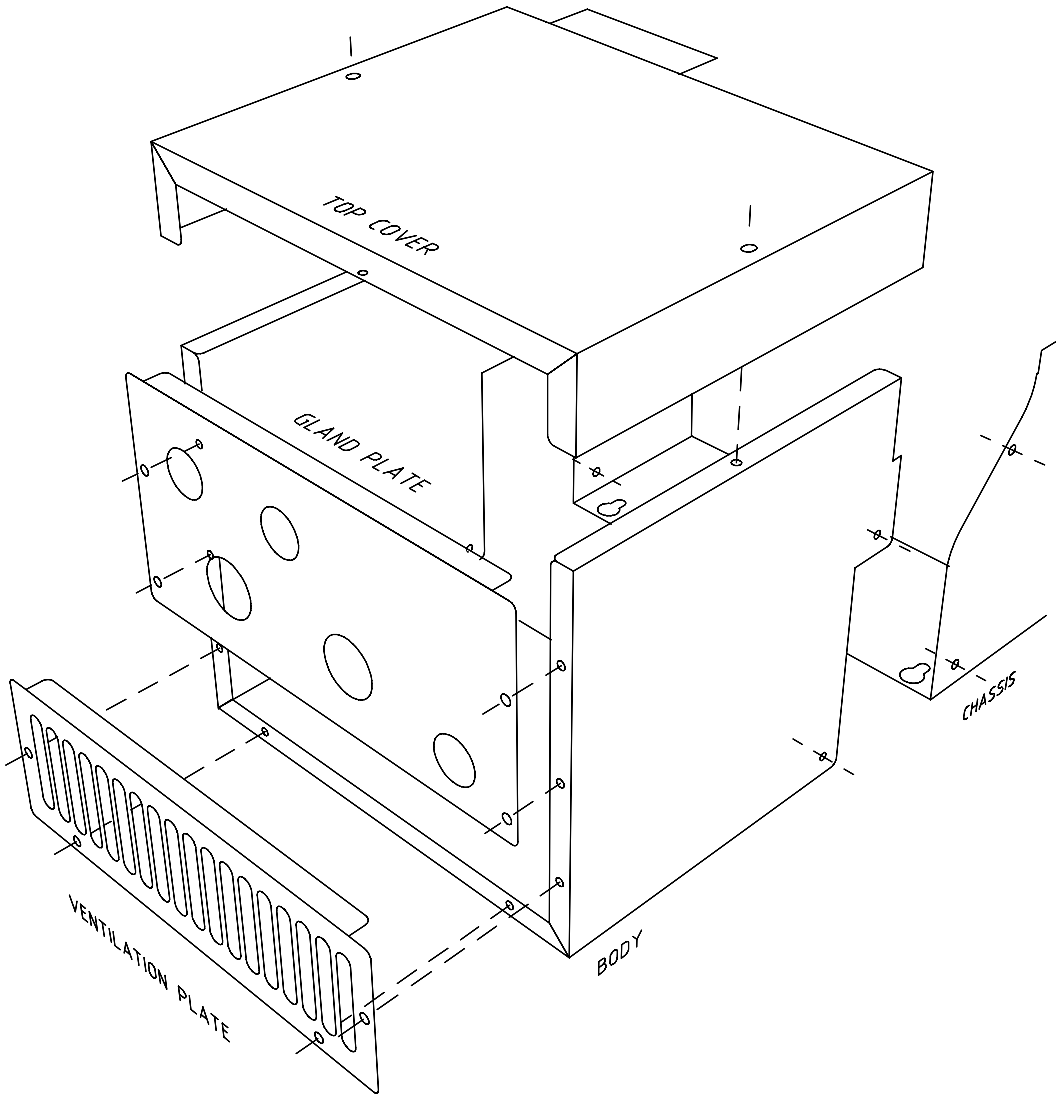
 Plug CT Wiring Loom Into CT Shunt PCB.	 Pass Loose End Of Wiring Loom Though Case Of IMS	 Secure CT Wiring Loom Using Cable Gland.

Step 6. Replace the IMS Control Module removed in step 1. by reversing the procedure used to remove it, being careful to ensure no wiring is pinched.

Step 7. Remove the short orange CT wiring loom from the CTs, and reconnect the new ‘External Mount CT Wiring Loom’ (Part No: 9FLCE1). The CTs can now be mounted outside the bypass circuit.

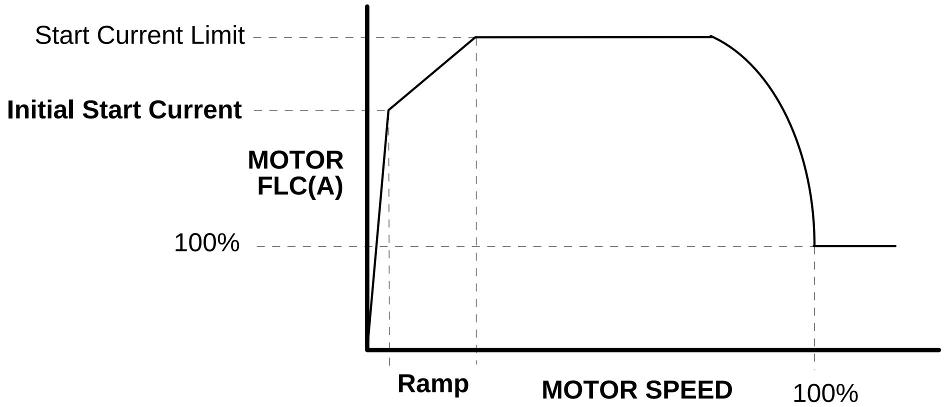
 Unplug Old Wiring Loom.	 Fit New Wiring Loom	 Mount CTs To Measure Line Current

APPENDIX C. FITTING IMS ENCLOSURE EXTENSION



APPENDIX D. ADJUSTMENT OF START CURRENT PROFILE

If required the IMS Start Current Profile can be adjusted. Both the Initial Start Current and Ramp are adjustable.

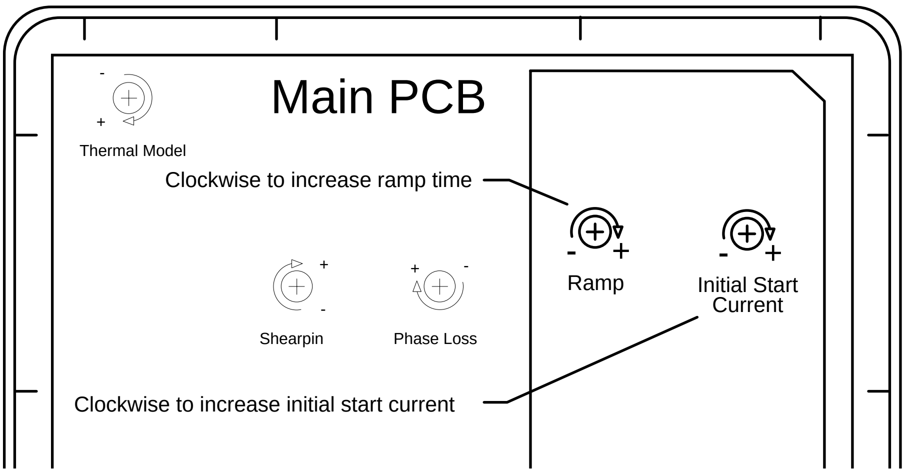


Use the following procedure to adjust the Start Current Profile to deliver the desired performance.

Step 1. Undo the Control Module's four fixing screws and detach it from the Power Assembly case being careful not to stress the wiring loom connections.

		
Undo Cover Screws	Lift Off Cover	Unplug All Loom Connections

Step 2. Adjust the Initial Start Current and/or Ramp potentiometers to achieve the desired Start Current profile.



Step 3. Replace the IMS Control Module removed in step 1. by reversing the procedure used to remove it, being careful to ensure no wiring is pinched.

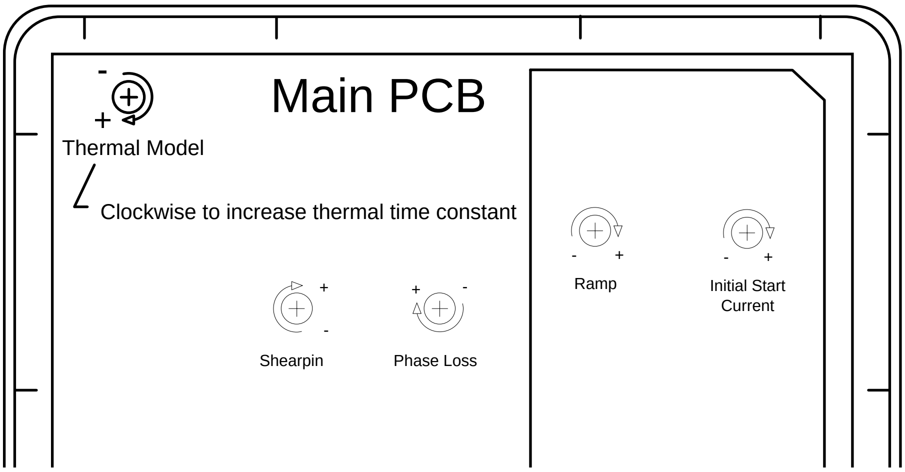
APPENDIX E. EXTENDING THE MOTOR THERMAL MODEL TIME CONSTANT

If required the Thermal Time Constant of the IMS Motor Thermal Model can be extended.

Step 1. Undo the Control Module's four fixing screws and detach it from the Power Assembly case being careful not to stress the wiring loom connections.

		
Undo Cover Screws	Lift Off Cover	Unplug All Loom Connections

Step 2. Adjust the Thermal Time Constant potentiometer.



Step 3. Replace the IMS Control Module removed in step 1. by reversing the procedure used to remove it, being careful to ensure no wiring is pinched.

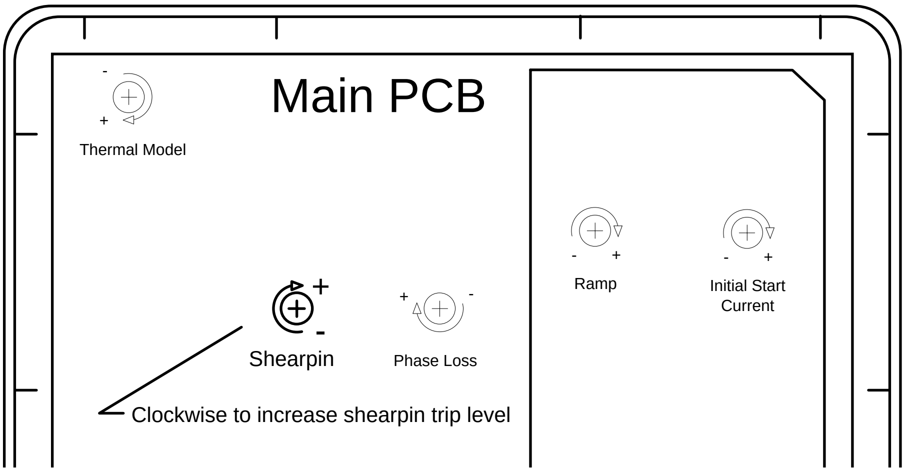
APPENDIX F. INCREASING THE ELECTRONIC SHEARPIN TRIP LEVEL

If required the trip level of the Electronic Shearpin function can be adjusted.

Step 1. Undo the Control Module's four fixing screws and detach it from the Power Assembly case being careful not to stress the wiring loom connections.

		
Undo Cover Screws	Lift Off Cover	Unplug All Loom Connections

Step 2. Adjust the Shearpin Trip level to the desired setting.



Step 3. Replace the IMS Control Module removed in step 1. by reversing the procedure used to remove it, being careful to ensure no wiring is pinched.

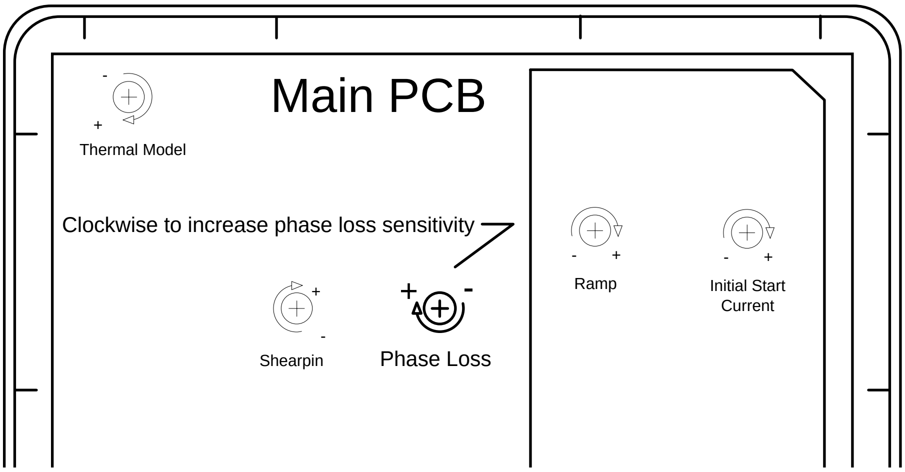
APPENDIX G. REDUCING PHASE LOSS SENSITIVITY

If required the sensitivity of the IMS Phase Loss Protection can be reduced.

Step 1. Undo the Control Module’s four fixing screws and detach it from the Power Assembly case being careful not to stress the wiring loom connections.

		
Undo Cover Screws	Lift Off Cover	Unplug All Loom Connections

Step 2. Adjust the Phase Loss sensitivity.



Step 3. Replace the IMS Control Module removed in step 1. by reversing the procedure used to remove it, being careful to ensure no wiring is pinched.

UNI-STOP SOFT STOP

ADDENDUM

This unit is equipped with a 124 second soft stop function. The following description and DIP Switch Adjustment Panel diagram replace the corresponding sections in the IMS Series Users Manual AMA00086.

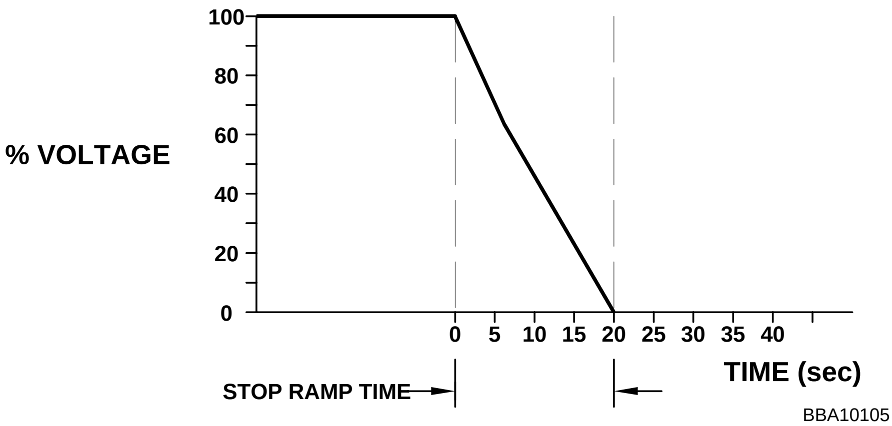
Uni-Stop Soft Stop

This IMS Series soft starter is equipped with a user selectable and adjustable Uni-Stop soft stop function (0s - 124s). Uni-Stop Soft Stop, when enabled, reduces the voltage applied to the motor, causing the motor to stall and decelerate to zero speed. The effect of this is to add inertia to the load and thereby reduce the rate of deceleration.

Uni-Stop Soft Stop technology dynamically adjusts starter output to match the motor characteristics as they change during stopping.

Uni-Stop Soft Stop eliminates the motor instability sometimes experienced with ordinary soft start and soft stop systems. Uni-Stop provides particular advantage in pumping applications where both starting and stopping times can be adjusted to minimise fluid hammer without the need for dedicated 'pump soft start' units.

If utilising the Uni-Stop Soft Stop function and a line contactor, the contactor must not be opened until the end of the stop ramp time.



Overview of IMS Adjustment

The IMS is adjusted via a digital DIP Switch adjustment panel. The following adjustments may be made :