g		GE Industria	al Systems	Function	al Testing Spe	ecification
	Renewal Ser Louisville,K\			LC	OU-GED-IC3650N	IISC
		Test Procedure fo	or Miscellaneou	s IC3650 card	s	
DOCUM	MENT REVISION STATUS	: Determined by the last er	ntry in the "REV" ar	nd "DATE" colum	ın	
REV.		DESCRIPTION			SIGNATURE	REV. DATE
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DATE 09/18/	/02	DATE	DATE		DATE 10/16/02	

LOU-GED-IC3650MISC
REV. A

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Renewal Services
Louisville, KY

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Functional test procedure for a Card

1. SCOPE

1.1 This is a functional testing procedure for a Card.

2. STANDARDS OF QUALITY

2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

3. APPLICABLE DOCUMENTS

- **3.1** The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.
 - 3.1.1 259A2101 Test Instruction for IC3655A117
 - 3.1.2 PGEI-1430 LodTrak Calibration Instructions

4. **ENGINEERING REQUIREMENTS**

- 4.1 Equipment Cleaning
 - **4.1.1** Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to the local documented procedures for cleaning guidelines.
- 4.2 Equipment Inspection
 - **4.2.1** Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:
 - 4.2.1.1 Wires broken or cracked
 - 4.2.1.2 Terminal strips / connectors broken or cracked
 - **4.2.1.3** Loose wires
 - 4.2.1.4 Components visually damaged
 - 4.2.1.5 Capacitors leaking
 - 4.2.1.6 Solder joints damaged or cold
 - 4.2.1.7 Circuit board burned or de-laminated
 - 4.2.1.8 Printed wire runs burned or damaged

5. **EQUIPMENT REQUIRED**

5.1 The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1		Fluke 85 DMM (or Equivalent)
1		LodTrak Calibration Box

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6. TESTING PROCESS

6.1 Setup

6.1.1

Note:

6.2 IC3650SODB

6.2.1 .

6.3 IC3650SODC

6.3.1

6.4 IC3650SPUA

6.4.1

6.5 IC3650SRDG

6.5.1

6.6 IC3655A117

6.6.1

6.7 IC3655A137

6.7.1

6.8 ***TEST COMPLETE ***

7. NOTES

GE Industrial Systems Renewal Services Louisville, KY

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9-18-02; 9:03AM;GE INDSYS 502 493 0640 CONT. ON SHEET. 2 TITLE Instructions for LodTrak Card Calibration Using the Portable Calibration Box FIRST MADE FOR GENERAL OPERATING PROCEDURE The portable calibration box is intended for calibrating the Overload, Overload/ Overtemperature, Unbalance and Ground Fault functions of a LodTrak motor protection relay. A circuit card containing electronic components is installed in the box and should remain there permanently. On no account should any of the sealed trim potenticmeters of this card be adjusted. Space is provided for a relay driver card and a function card, to be provided by the LodTrak relay under test. Asvisic Cardsare withdrawn from the relay and also from the calibration box using the card builter provided. IT IS IMPORTANT THAT POWER BE REMOVED FROM THE RELAY. BEFORE CARDS ARE REMOVED. A SWITCH MARKED "CARD POWER" IS PROVIDED ON THE CALIERATION SOX. THIS SWITCH SHOULD ALWAYS BE IN THE OFF POSITION WHEN CARDS ARE EITHER SEING INSERTED OR WITHDRAWN. Prior to using the calibration box it should be connected to a standard !15V 60Hz supply, the main power switch turned on and the equipment allowed to warm up for approximately 10 minutes. Operation of the equipment for calibrating individual card functions is described in the following pages. After individual card calibration all cards should be replaced in the CORRECT relay base, care being taken to ensure that they are Properly seated. A functional test should be done on the complete relay as follows. Push the test button of each function card in turn and check that the trip and aiarm relays pick up and that all latching relays <u>latch</u> after the button has been released. Check also that the appropriate annunciator lamps light and PRINTST DRAWN BY CHECKED BY ENGINEERING LAB PGE1-1430 D. R. BOOTHMAN P. ERNST

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GE Industrial Systems Renewal Services Louisville, KY Page 5 of 16

PGE1-1430	FIRST MADE FOR	
that the trip lamps	latch. (Note there is some delay in operation of the test	
📳 글로토인 - 그리아 아마트링 보위에 했습니다	그는 사람이 하는 사람들이 하는 사람들이 되었다. 그는 사람들은 사람들은 사람들이 되었다. 그는 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은	1
	d, the trip signal produced by other cards should be immed	ati A
A. <u>Overload Card</u> (IC3650S0DBI)	
1. Set controls as	fallows C	
"UNBALANCE" swi	tch - "F.L. AMPS"	
	entiomater – CCW	
"CURRENT INPUT"	BANK - BUT IN FANT IN BELIEF IN FRANKE IN FOUND IN BELIEF IN FANT IN FANT IN FANT IN FANT IN FANT IN FANT IN F	R
1、这个一点写《新春春记》	"EMPERATURE" - "F.L. AMPS"	
."FUNCTION"		
	- "OVERLOAD"	K
	is the state of the contact of the counter clock	<u> </u>
with a company of the contract	themp). Turn "TRIP LEVEL" adjustment on card to 100%.	
Clip orange Jumper le	ad to Car lead nearest to card front (first scrape off	
transparent varnish t	o ensure good contact). Now insert both overload and rela-	
	appropriate slots, using sufficient force to ensure good	2
	insert jumper lead plug into socket marked "JUMPER". of overload card R36 \$R37 fully CCW (obset 15 Torns)	
Turn card power switch	of overload cord 1236 827 fully CCW (about 15 Turns)	
Z. Adjust "CURRENT IN	NPUT" controls until digital meter displays the desired	
	tween 2.0 and 5.0 amps). Turn "OVERLOAD/OVERTEMPERATURE"	養
witch to "ADJUST F.L.	" then push "FAST CAL" buffon on card and hold while	16
	entiometer clockwise. When a trip is indicated, back off	
37 CCW until relay re	leased then <u>very slowly</u> turn CW again until relay just	
rips. (Further rotat	ion than is necessary to just cause the relay to trip will	1.
esult in the relay be	ing set at too low a value)	40
		製み
		V
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	AM; GE INDSYS	;502 493 0640 # 4/ 13
PGE1-1430	Instructions for LodTrak Card C. Portable Calibration Box	7807 GERGET
·	FIRST MADE FOR	
	L Ke	N STAFFOR
<i></i>	•	
3. Turn "OVERL	OAD/OVERTEMPERATURE" switch to "L.R. A	MPS" and adjust "CURRENT
INPUT" controls	until digital meter displays the desi	red locked rotor current.
(Between 12 and	30 amps if locked rotor current is six	x times full load current)

trimpot CW until the digital display reads the value given by table 1, below,

for the desired maximum stall time. (This operation will approximately set

the desired stall time).

TABLE 1

1.8525 @30 Amps

maximum [3.75 ultimate TRIP]
Adjustment [10 Sec @ 15 Amps]

TIME (sec)	METER READING	TIME (sec)	METER READING	TIME (sec)	METER READING
5	TH) 226	10	058 116	20	OST 062
5.5	103 206	11	053 106	21	029 258
6	395- 190	12	e49. 098	· 22	223 056
6.5	-038 /76	13	045 090 e 87	23	-927 054
7	082 164	/3, d 14	042 084	24	£28 052
7.5	476 152	15	040. 080	25	925 0,50
8	072 144	.16	652 074	25	02 4 048
8.5	668 136	17	035 070	28	023.096
9	€64 128	18	0= 068	30 .	021 042
9.5	067 122	:9	. 032 064	1(G 3	019
				49.3	019

4. Turn "OVERLOAD/OVERTEMPERATURE" switch to "TIME". Press and hold down the yellow "TIME" button. Card will now experience a simulated locked rotor and after trip will display the time taken to trip. Releasing the button resets

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BOOTHMAN	P. ERNST	_ENGINEERING_LAB	PGE1-1430	
*		PETERBOROUGH PLANT	CONT. ON SHEET. 4 SH.	но. З

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GE Industrial Systems Renewal Services Louisville, KY Page 7 of 16

PGE1-1430	Portable Ca	libration B	ox			
F0E1-1400	FIRST MADE FOR	·		•	•	,
			·	·		
the circuit and, aft	ter a wait of	ten seconds	. the butto	n mav be d	lepressed ar	ain ·
					· .	-
to repeat the test.	If the Time	raken to tr	ip is too l	ong turn F	G6_CW_a lit	tle .
and repeat the test.	. If the time	is too shou	turn R36	CCW. Rep	eat until t	he
time to trip is with						
				•		
5. Turn card power	switch to "OFF	Ett. Remove	cards and	iumner fra	m Overteed	-
J. Total card posici	3411011 10 011	1 11011010	cards and	Jamber 110	iii Over road	
card.					·	REVI
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	RNST	ENGINEER			-1430 _	
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	9-18-02; 9:03AM;GE	INDSYS :502 493 0640 # 6/ 13	
		Portable Calibration Sox	. !
	PGE1-1430	FIRST MADE FOR School On By 1960	_
J	TP 7-18	meter 20tol 9:04n 5ft top 0 14:05 5it 106:5V	_
•		WIRES TEST JACKS TO PINS	
	8. OVERLOAD/OVERTEMP	ERATURE CARD (IC3652SODC)	ě.
	1. Set controls as f	ollows Peneil	t.
	"UNBALANCE" swi	tch - "F.L. AMPS"	į
	o "UNBALANCE" pot	entiometer - CCW Nomings	
	"CURRENT INPUT"	- Both CCW	
	"OVERLOAD/OVERT	EMPERATURE" - "F.L. AMPS"	-
	"FUNCTION"	- "OVERLOAD/OVERTEMPERATURE"	
	Insert both Overload/	Overtemperature and relay driver cards in their appropriate	
	slots and apply suffi	cient force to ensure good contact in their sockets.	
		", "RUN" and "STALL" trimpots fully CW (approximately 15	
	turns). TURN CARD FO	WER SWITCH TO "ON". Chick miter of 400 \$ 150°	
		Souch ATD-10.6 148 Jacker	
	2. (CMIT IF NO ALAFM	FUNCTION IS REQUIRED). Chick wiving to fact factor	-
		decade switch the resistance equivalent to the desired	-
	Alarm temporature		
		120°C Resistance	
	Example:	E.g. Switch Setting Switch Setting 200 1 20	
	V megraconistis.	SCDC1 - 10 Ω Copper 013.7 Ω Nickel (GE or Edison #7)	
		SODC3 - 100 Ω Platinum 4.1 on p.16 of 64H	-
	For other types or te	emperatures refer to published resistance tables, Turn	٤
	"ALARM" por CCW until	alarm lamp lights. Turn CW until lamp goes out then	
	slowly CCW again uni	il lamp just lights again.	-
Ā			-
	AND AND BLOCK TO THE OWNER OF THE PARTY OF T	ICE" decade switch for the resistance equivalent to the	-
	desired trip temperate	These cal, should be on	
	The second section of the sect	e stomers order responsition	
4 16 16 16 16 16 16 16 16 16 16 16 16 16	May	TE KEWHOTE IT CALIBVATED MY	The section of
	BOOTHIAN P. EF	INST ENGINEERING LAB PGET-	
304	72	PET PRORUUGH PLANT CONT.	'n.,

GE Industrial Systems Renewal Services Louisville, KY

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;502 493 0640 instructions for Logirak Card Calibration Using the Fortable Calibration Box PGE1-1430 135=14,25 FIRST MADE FOR -17 130°0 Example: Switch Setting SODC1 - 10 Ω Copper 014.D-129:76 SCDC2 - 120 Ω Nickel (GE or Edison #7) SODC3 - 100 Ω Platinum 150.2 for other types or temperatures refer to the published resistance tables Turn "TRIP" pot CCW until trip lamp lights. Turn CW until lamp goes out then slowly CCW again until lamp just lights up again. REVISIONS 4. Set "RTD RESISTANCE" decade switch for the resistance equivalent to 40°C Switch Settida SODC1 - (10 Ω) Copper 010.6 SODC2 - 120 Ω Nickel SODC3 - 100 Ω Platinum 150-0-152.13 #### //JJ4 Adjust "CURRENT INPUT" controls until digital mater displays the desired full load current, (between 2.0 and 5.0 amps). Turn "OVERLOAD/OVERTEMPERATURE" switch to "ADJUST F.L." and rotate "RUN" trim potentiometer on card until display reads 05.0. What ever customer request for F.C. current Turn "OVERLOAD/OVERTEMPERATURE" switch to "L.R. AMPS". Adjust "CURRENT INPUT" controls until digital meter displays the desired locked rotor current (between 12 and 30 amps if locked rotor current is six times full load current) Turn "OVERLOAD/OVERTEMPERATURE" switch to "ADJUST La." and turn "STALL" pot on card until meter displays the number from the chart below for the desired maximum stall time. (This operation will approximately sat the desired stallina). The number shown is for 10-0 Cu RTD. It will vary from NI & FE RID'S 13.7 - 14.1 CHECKED BY PGE1-1430 ENGINEERING LAB BCOTHMAN P. ERNST PETEREORGUGH CONT. ON SHEET. 7

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· <u>· </u>		Ins	tructions f	or LodTra	ak Card Ca	libration U	sing the	2
:EI-1	430	Por	table Calib	ration &	<u> </u>	0		
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				•		a se	·	
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	RTD T	RIP TEMP	TIME	RTD TE	RIP TEMP	TIME	RTD TF	NP TEMP
- }	130°	RIP TEMP 155°C	(sec)	130°C	155°C	(sec)	130°C	155°C
- 1	999	1247	10	522	651	20	284	355
- 1	913	1138	11	479	597	21	273	340
- 1								l
I	840	1048	(12)	443	552	22	263	328
	779	972	13	412	514	23	253	316
	727	906	14	386	481	24	245	305
- 1	121	900	14		401	24	ر242	303
1	681	849	15	363	453	25	237	296
- 1	641	800	16	343	428	26	230	287
1	-							
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	575	717	18	311	387	28	217	271
	547	602	10	207	770	70	206	257
.	547	682	19	297	370	30	206	257
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;502 493 0640

Wait ten seconds then push
6. Turn "OVERLOAD/OVERTEMPERATURE" switch to time. Wait ten seconds then push and hold yellow "TIME" button. Card will experience a simulated locked rotor
and hold yellow "TIME" button. Card will experience The seconds, the and after the trip the meter will display the time taken to trip. Releasing the and after the trip the meter will display the time taken to trip. Releasing the
and after the trip the meter will display the time to ten seconds, the button resets the circuit card and timer and, after a wait of ten seconds, the
button resets the circuit card and fimer and, and the time taken is too short button may be depressed again to repeat the test. If the time is too
then rotate the stall pot CW a little and repeat the test. If the time is too
then rotate the stall pot CW a little and to trip is within acceptable long rotate the pot CCW. Repeat until the time to trip is within acceptable
limits.

				طسيدون	+0	"OFF".	Remove	C3LC2.
-	THE	card	power	SWITCH	10	•		

TO 11 1
7
1000

D. R. BOOTHMAN P. ERNST PETERPOROLICH CONT. OF THE PROPORTION OF T

Make sure the RTD setting is your for Timing calibration. Too Low settents causes AN INCREASE IN Time. Too High settings CHUSES A SECREASE IN TIME.

70% 21 TP% 21 TP1 22 TP2 34 TP7 18 g

LOU-GED-IC3650MISC REV. A

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9-18-02; 9:03AM; GE INDSY	Portable Calibration	irak Card Cali	;502 493 0840 <mark>bration Using the</mark>	# 10/ 13
9	FIRST MADE FOR		ruplate.	e e e e e e e e e e e e e e e e e e e
8				
C P PHASE MARRA MARS CARD		A	~ ~	
C.X PHASE UNBALANCE CARD	₩ -	A 04	See e	151081
1. Set controls as follo	ows	3.347108	USA	(Mangage)
"UNBALANCE" switch	- "UNBAL"	Stefn 3.3	902 2.92	(UN BAL)
"UNBALANCE" potenti	ometer - CCW	#2. 2.07	X 0% = 4	N.V.
TCURRENT INPUT	- Both CCW	33	LA = DIFF	us prosil
"OVERLOAD/OVERTEMPE	RATURE" - "F.L. AMPS"	#3. DIFF X	3.3	ALARM 678
L "FUNCTION"		7	3.3	STIREVE
Clower	1044	/ . "ab/"	Pointing dayin	37t.
7	, sei	IKIP LEV" adju	stment on card	
to desired trip level (sca			is infinitely.	
adjustable within this ran	SOM WAN INSELL DOLL	unbalance and	9 30% & CCW 15 . I relav driver	toward 10
cards in their appropriate	slots and apply suff	icient force t	O ABSUFO soud	
contact in their sockets.	Rotate both trimacts	fully CV (
turns). Turn card power s	vitch to "ON"		roximately 15	
The second second	•	•		. 2/2
2. Adjust "CURRENT. INPUT"	controls until digit	al meter disola	avs the docinal	
tull load current. Check t	hat "UNBALANCE" poter	utiometer is i	idead (LL earlieg	
then rotate CW until digita	I meter displays the	moduced and	ideed fully CCM	en
equivalent to the unbalance	level required	reduced value	of current	
equivalent to the unbalance from 2 to 6 Amp	iover required for t	ultimate trip o	f the relay.	120
腰			No. 1	
and unbalance to trip		AL PA	· (c) 3.0	21 -1-
then meter should read 90% o	of 5 amps = 4.5 amps)	3.8 meg.	Xin	
Now rotate the trim pot (R85) on unbalance card	(the trimpot or	the left)	
rip lamp lights.	Turn CW until lamp go	es out then el	owly cou	
until lamp just lights. Not	e that if the "UNBALA	NCE" notantia	owiy cow again	
cked off fully CCW then si	owly CW again the at	acm law-	elet is now	
	· -gain, ind di	arm ramp WITE	light first at	
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	1	PLANT	CONT. ON SHEET.9	พ. หอ์. 3

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r-1430	Instructions for LodTrak Card Calibration Using the	
DF	FIRST MADE FOR	
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37 of the trip value	V. T.	
The alarm function is	included) then the trip lamp will light at the level	
-73	ted. Now turn the "UNBALANCE" potentiometer fully normal och 7: me Celay:	
ADD JUMPE	Che tole 7: me Notation OCW 2.031	
	1 de la companya della companya della companya de la companya della companya dell	
. Turn "UNBALANCE" swite	th to "1.5 x F.L." then adjust "Ourse	
ntil digital meter reads	ch to "1.5 x F.L." then adjust "CURRENT INPUT" controls	
0 12	d value 1.5 times the full that	.(
THE REPORT OF THE PARTY OF THE	rotate clamp trimpot (R82, the trimpot on Review	
he right) slowly CCW unt:	the trimpot on Tasur	SIONS
	ins reading on the digital and	10.13
educe. Meter will be incli	then come had here Look for a steady decrease	
	24 Ex the whom to the	
Turn card power switch	to "OFF". Remove cards and replace T3-T4 jumper on	Ì
balance card.	T3-T4 jumper on	
Jun	- Poruses all Dis	1
	- Power off, Rit winger book in	i
CH	etting R82	j
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Jo line	he check trip set unbalance witch to	
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	9-18-02;	9:03AM;GE INDSYS		;502 493 0640 —— CONT. ON SHEET. F	# 12/ 13 \
PORTABLE CAIDFRAIL ORD (IC36505GDBI/2) Set controls as follows "UNBALANCE" switch "UNBALANCE" potentiometer "CURRENT INPUT" "OVERLOA/OVERTEMPERATURE "FIL. AMPS" "OVERLOA/OVERTEMPERATURE "FIL. AMPS" "OVERLOA/OVERTEMPERATURE "FIL. AMPS" "FUNCTION" "OVERLOA/OVERTEMPERATURE "FIL. AMPS" "FUNCTION" "GROUND" "FUNCTION" "GROUND FAULT CARD (1025 TIT) POTENTIAL OF THE WORLD AND THE W		1	for LodTrak Card Calibra	tion Using the	
GROUND FAULT CARD (1C3650SGDB1/2)' Set controls as follows "UNBALANCE" switch "UNBALANCE" switch "UNBALANCE" potentiometer "COW CCW THEN COW THEN SAME ONT ENTITY POTENT "UNTY COMIT CONTICUE TO THE POSE ONT TH	or t - Provin			TOIL COUNTY THE	•
Set controls as follows "UNBALANCE" switch "UNBALANCE" potentiometer "COM COW THEN CONTINUENT TO MY TO THE POST OF THE POST	5E - 100 - 1	FIRST MADE FOR			<u> </u>
Set controls as follows "UNBALANCE" switch "UNBALANCE" potentiometer "COM COW THEN CONTINUENT TO MY TO THE POST OF THE POST				·	
Set controls as follows "UNBALANCE" switch "UNBALANCE" potentiometer "CURRENT INPUT" Both CCW "FILL AMPS" "OVERLOAD/OVERTEMPERATURE "FILL AMPS" AT GTO CF Trip rending thing the form on the content of the desired ground trip level range and turn the content of the desired ground trip level range and turn the round fault level potentiometer fully CW. Insert the ground and relay driver and in their appropriate slots using sufficient force to ensure good contact of the card sockets. Turn card power switch to "ON". Adjust "CURRENT INPUT" controls until digital meter displays the desired ground fault current to trip. Now turn the trip level adjustment on the card lowly CCW until the trip lamp lights. Sack off the "CURRENT INPUT" control willy CCW then slowly increase again. Firstly the alarm function is included, hen the trip iamp will light at the level for which the card was calibrated. Turn card power switch to "OFF". Remove cards.	. GROUND FAULT (CARD (IC3650SGDB1/2	Togale su	To 1 IF Tri	Pis
"UNBALANCE" switch "UNBALANCE" potentiometer "UNBALANCE" potentiometer "CCW CCW TTHEW CONTILLER THEN TONN CANTENT INPOT "CURRENT INPUT" Both CCW AT 679 of Trip rending to the potentione of the CCW CCW TTHEW CONTILL TRIP poes "CURRENT INPUT" Both CCW AT 679 of Trip rending to the potentione of the CCW CCW TTHEW CONTILL TRIP poet "CURRENT INPUT" "GROUND" "FUNCTION" "FUNCTION" "FUNCTION" "FUNCTION" "FUNCTION" "FORCE "FO	. Set controls	s follows	•	•	
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at the range switch for the desired ground trip level range and turn the round fault level potentiometer fully CW. Insert the ground and relay driver ands in their appropriate slots using sufficient force to ensure good contact the card sockets. Turn card power switch to "CN". Adjust "CURRENT INPUT" controls until digital meter displays the desired SAAP round fault current to trip. Now turn the trip level adjustment on the card lowly CCW until the trip lamp lights. Back off the "CURRENT INPUT" control willy CCW then slowly increase again. Firstly the alarm lamp will light at Saar for the current required to trip (if the alarm function is included), then the trip lamp will light at the level for which the card was calibrated. Turn card power switch to "OFF". Remove cards.	ر "OVERLOAD/O۱	ERTEMPERATURE - "	F.L. AMPS" digiTAL	WHS SOU HA	for Trip
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TABLE 1 (Cont'd) STALL SETTINGS USE FOR 3ϕ OVERLOAD CARD

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		1.0	034	30	021	-
9	064	10	034	11 -	1	ı
9.5	061	19	032			

TABLE 2 STANDARD RTD'S USED WITH LODTRAK (Resistance in Ohms)

				2	į
TEMPERATURE	10 OHM COPPER	100 OHM PLATINUM	CGE 100 OHM NICKEL	CGE OR EDISON 120 OHM NICKEL	
· 2 0	9.04	100.00	100.00	120.00	
10	9.42	103.96	105.97	127.17	11:
72 20	9.81	107.92	112.10	134.52	100
30	10.19	111.86	118.38	142.06	
10	10.58	115.78	124.83	149.79	
50	10.97	119.70	131.45	157.74	
	11.35	123.60	138.25	165.90	
70° 70°	11.74	127.50	145.21	174.25	
80	12.12	127.7	152.37	182.84	
90 90	12.3	135.25	159.67	191.64	
100	12,90	139.11	167.20	200.64	
110	13.28	142.95	174.87	209.85	
1/2 120	13.67	(146,79	182.74	219.29 224.13	
125 130	14.06	148.7	190.80	228.96 234.80	
35 140	14.25	152.5	199.04	238.35 23.390	
150	14.83	156.32 158.22	207.46	248.95 254.13	
, 55 160	15.025	162.01	216.03	259.30	
170	15.61	165.79	224.92	269.91	
180	16.00	169.55	233.97	280.77	
190	16.39	173.30		291.96	
200	16.78	177.04		303.46	

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8. Oscilloscope Verification Examples:

Fig. 1

Fig. 2