tvc Controller Manual

TVL 151
ISSUE 3
07/91

DCRT DC TACHO FEEDBACK REGULATOR MANUAL

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I N D E X

Addendum

Fault Detect Circuitry

This circuitry associated with the FDR relay is primarily designed to monitor requested speed against the actual speed when the lift is running at speeds down to 30% of the contract speed. Should a discrepancy outside the tolerance of the setting of the FD-AWS potentiometer be sensed then the relay FDR will operate. Below the level of 30% of contract speed the action of the circuitry cannot be guaranteed to react to the loss of a tacho-generator input as due to the response time of the lift system the circuit has a window space to allow for a margin of error of that normally experienced when the lift starts.

The Fault Detect Circuitry is a utility circuit lending increased integrity to the regulator through its ability to monitor the pattern signal against the tacho-generator signal. It must never be considered to have the integrity of safety related items.

Regulators Issued with DCR5T Boards Version Onwards

Setting up the FDR circuitry on site requires the temporary linking out of the FDR relay contacts, see panel drawing or manual for location, and with the lift running at approximately 0.05 m/s adjust the FD-AWS potentiometer on card DCR5T clockwise until such time that the FDR LED just starts to illuminate. This is an ideal setting, however to prevent nuisance tripping the lift should be operated in Test Mode and Normal Mode ensuring that under all load and temperature conditions no nuisance tripping is caused. Should nuisance tripping be experienced the potentiometer FD-AWS should be turned anti-clockwise until nuisance tripping is eliminated.

On completion of setting remove the temporary link.

Tacho-Generator

Since the tacho-generator is essential to the correct operation of the regulator it is important that the following is observed,

1. For the guaranteed protection against the breaking of any tacho-linkage or belt
   a) A broken belt switch or similar device should be used and wired into the safety chain.
   b) Two tacho-generators independently driven using a comparitor circuit to validate the output of one tacho-generator against the other should be used. If the tacho-generators are a matched pair these may be connected in parallel.
2. For improved protection
   a) Two separate belts should be used. (This option would not protect against an electrical failure of the tacho-generator).
   b) The belt(s) should be regularly serviced.

Failure to provide protection against belt or linkage failure will reduce the integrity of any speed monitoring circuit placing the lift entirely at the disposal of other means of slowdown and stopping.

Please see data sheet entitled "Precautions when Using Tacho-Generators" and "Speed Monitor Unit General Precautions".

Panel Design Inherent Speed Limitations

In order to reduce the effect of a broken belt when the lift is in Normal Mode panel resistors GR1 and GR2 are designed to limit the lift motor speed to approximately 10% above the contract speed. When the lift is in Test Mode resistor GR4 should be set to restrict the Test Speed from rising above that specified by code.

Speed Monitoring Unit General Precautions

As in any speed regulating system the tacho-generator forms a key part of the integrity of the regulator. Ideally two separately driven tacho-generators should be used with their outputs connected in parallel. It is essential that the tacho-generators are matched and the drive to the tacho-generator is matched thus guaranteeing equal voltages from each tacho-generator.

Where TVL Speed Monitoring Units (SMU) are fitted it is strongly recommended that two separately driven tacho-generators are used. If the tacho-generators are used for both motor speed control and speed monitoring purposes then both tacho-generators should have dual outputs, each tacho-generator having one of its winding in parallel with the other tacho-generator winding thus forming two separate circuits that can be used for regulator and monitoring use.

The use of one tacho-generator with separately galvanically isolated windings whilst an improvement over the single tacho-generator will not afford the protection as the two tacho-generators.

Precautions When Using Tacho Generators

Application

The following applies to all TVLC regulator products using Tacho Generators for velocity feedback.

Reason

The regulator uses the feedback from the Tacho Generator as its velocity feedback and, via a high gain amplifier, amplifies the difference between the Tacho Generator feedback and the reference signal to control the speed of the motor. It is of paramount importance for the regulator system, in order to avoid ride and stability problems, that the following procedures are obeyed.

1) The Tacho Generator should be perfectly aligned with the high speed shaft.

2) Wherever possible the drive for the Tacho Generator should be taken from the motor high speed shaft via a self aligning coupling.

3) Where belt drives are used they should be of the seamless type, correctly tensioned and correctly tracked.

4) The Tacho Generator output ripple voltage due to miss-alignment should not exceed 150 mVolts. Output ripple voltages of this order or greater may be detected by the regulator and lead to a bad ride in the lift car.

5) The Tacho Generator screened cable should be run directly back to the controller without a break and routed away from cables carrying thyristor controlled currents or cables carrying currents of an inductive nature.

6) The Tacho Generator cable screen must be isolated at the Tacho Generator and earthed at the appropriate terminal on the controller.

Failing to comply with the above procedures may lead to bad rides in the lift car or system instability.

G. Malbon.

20/11/90

Speed Monitoring Unit General Precautions

Where TVLC Speed Monitoring Units (SMU) are fitted it is strongly recommended that these are connected to a separate galvonically isolated tacho generator winding. The use of the same tacho generator winding as used for the speed feed back signal inputting to the motor speed regulator is not permitted.

If the same tacho generator winding is used, the monitoring action of the Speed Monitoring Unit under certain circumstances will be impaired.

02/07/91

Introduction To Control System

The regulator is designed to give quality, closed loop control of normal inertia lift systems using the Ward Leonard control scheme.

The regulator is designed to control the motor generator field voltage and polarity for a given direction of hoist motor rotation when using a tacho feedback system.

The flow chart of the system is given in TVLD 161.

The motor generator, comprising of a prime mover and a DC shunt wound generator drives a DC hoist motor. The D.C. hoist motor in turn drives a tacho generator giving a precision feedback signal to the regulator minimising speed errors caused by varying machine characteristics associated with thermal conditions.

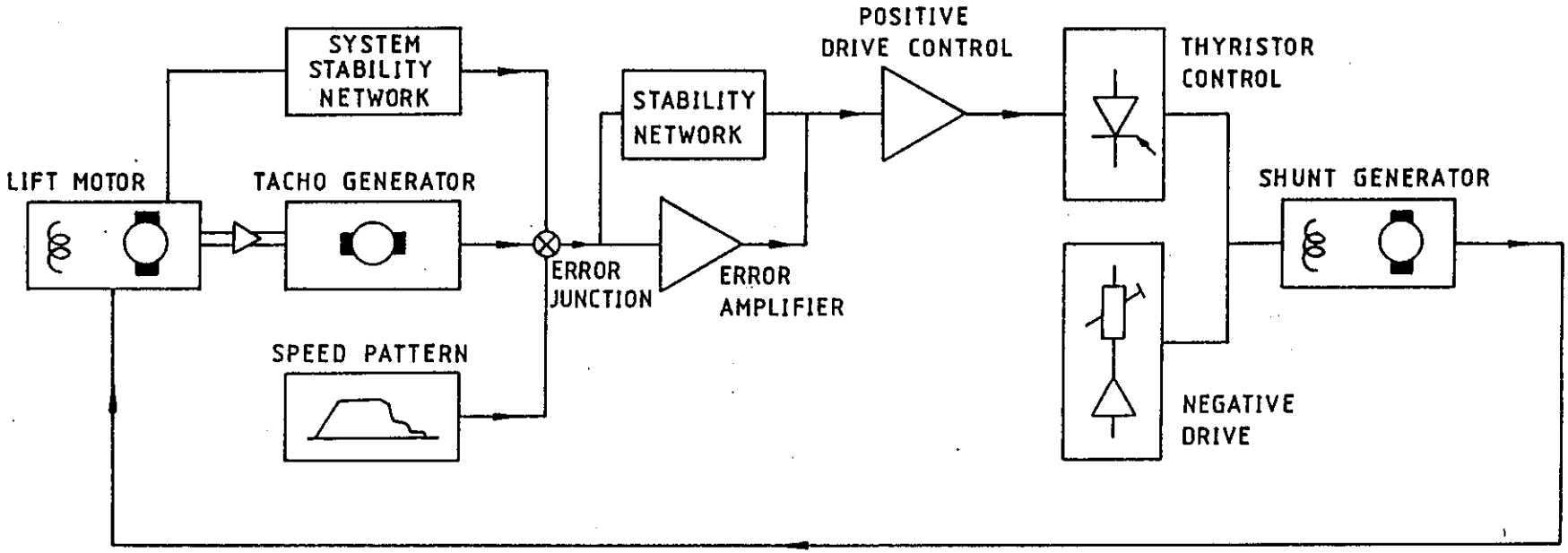
The speed pattern is derived from a regulated power supply to reduce target speed variations caused by supply fluctuation. Target speeds are obtained by a modified 'S' ramp to give smooth transitions between speeds.

An error summing junction compares the tacho generator voltage to the ramp/target voltage to give an error signal which is fed to, and amplified by, the error amplifier. Suitable non linear rate of change feedback is applied to the input of the error amplifier to ensure stability.

Dependent on the magnitude of the output signal from the error amplifier the appropriate firing signal is given to the thyristors and phase control of the generator field voltage takes place.

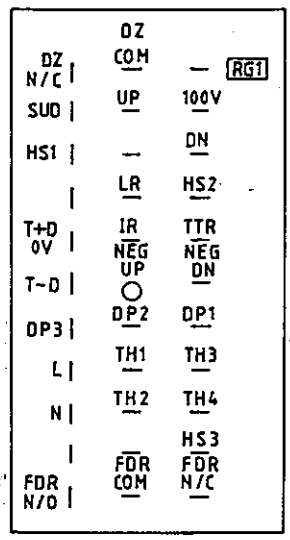
The biphase thyristor/diode configuration permits a negative drive current to circulate via the diodes in the generator field if no firing signals are applied to the thyristors.

The negative drive current opposes the generator residual voltage and is adjusted via external resistors to suit the requirements of the generator.

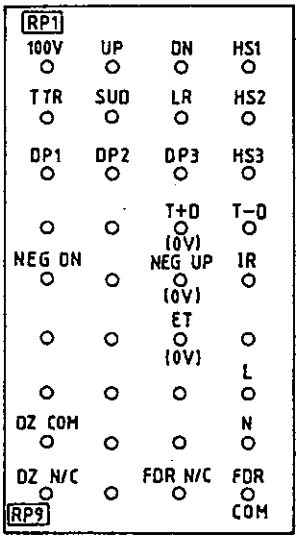


SYSTEMS FLOW CHART (TACHO DCT)	
DRN. G. MALBON.	TVLD 161
DATE. 27-1-89	

FLAT PIN SOCKET	ROUND PIN SOCKET	TERMINAL BLOCK	
RG1			—
RG2	RP8		DOOR ZONE/ SPEED CONTACT COMMON
RG3	RP9		DOOR ZONE/ SPEED CONTACT N/C
RG4	RP1		100V SUPPLY FOR RELAY SPEED LOGIC ON BOARD DC2
RG5	RP10		UP DIRECTION
RG6	RP11		INITIATION OF SPEED SELECTION
RG7	RP19		DN DIRECTION
RG8			—
RG9	RP28		HIGH SPEED 1
RG10	RP29		HIGH SPEED 2 IF ORDERED
RG11	RP20		LEVELLING SPEED
RG12	RP24		EARTH
RG13	RP2		TEST SPEED
RG14	RP32		IR (GA1)
RG15	RP22		TACHO + DOWN
RG16	RP5		LOOP VOLTAGE - DOWN
RG17	RP23		LOOP VOLTAGE - UP
RG18	RP31		TACHO - D
RG19	RP3		DAMPING STAGE 1 IF ORDERED
RG20	RP12		DAMPING STAGE 2 IF ORDERED
RG21	RP21		DAMPING STAGE 3 IF ORDERED
RG22		TH3	OUTPUT FROM REGULATOR
RG23		TH1	INPUT TO POWER SECTION OF REGULATOR
RG24	RP34		REGULATOR CONTROL SUPPLY VOLTAGE
RG25		TH4	OUTPUT FROM REGULATOR
RG26		TH2	INPUT TO POWER SECTION OF REGULATOR
RG27	RP35		REGULATOR CONTROL SUPPLY VOLTAGE
RG28	RP30		HIGH SPEED 3 IF ORDERED
RG29			—
RG30			—
RG31	RP27		FAULT DETECT CONTACT (N/C)
RG32	RP36		FAULT DETECT CONTACT COMMON
RG33			FAULT DETECT CONTACT (N/O)



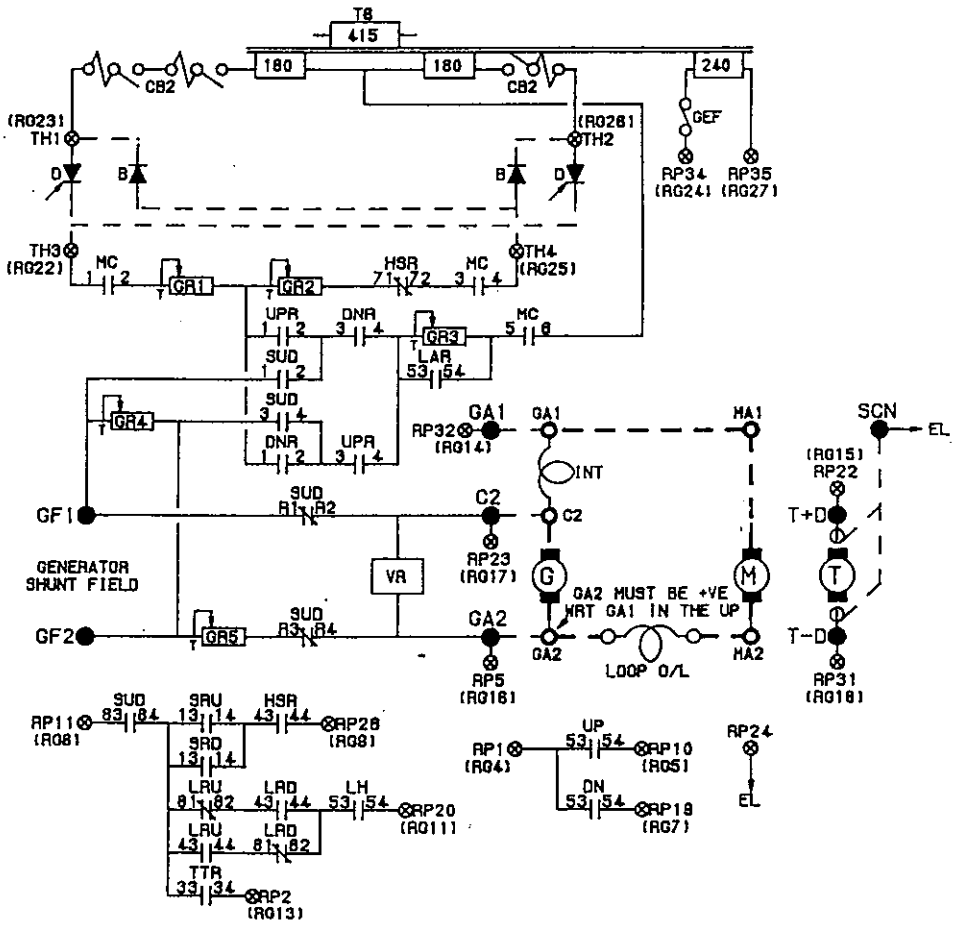
RG33 WAY SOCKET



RP36 WAY SOCKET

LEGEND.

DN	DOWN CONTACTOR
DNR	DOWN RELAY
HSR	HIGH SPEED RELAY
LAR	LIFT AVAILABLE RELAY
LH	LEVELLING HOLD RELAY
LRD	LEVELLING DOWN RELAY
LRU	LEVELLING UP RELAY
MC	MAIN CONTACTOR
SRD	SPEED DOWN RELAY
SRU	SPEED UP RELAY
SUD	GENERATOR SUICIDE RELAY
TTR	TEST RELAY
UP	UP CONTACTOR
UPR	UP RELAY



DRAWING No. TVLD127ETb	REV. A	RETRACED	DATE 22-5-89	TITLE. OFF BOARD SPEED AND DIRECTION SELECTION CIRCUITRY AND REGULATOR CONNECTIONS.	DRAWN. J.N.H.	CONTRACT No.
	REV. B		DATE		TRACED. 22-5-89	
	REV. C		DATE		PASSED.	

Sequence Of Events

Before the signal for the brake to lift is given the direction is set and the polarity of the generator field is chosen via off board relays. Upon selection of a speed the brake is lifted and the accelerating ramp is initiated. The lift thus accelerates smoothly and runs at the selected 'High Speed'.

When the lift is signalled to slow, via positional shaft equipment, the ramp starts to fall until 'Approach Speed' is obtained. At the same time as the 'High Speed' signal is lost the negative drive current is applied to reduce the effect of the positive drive current in the generator field. After a short dwell, levelling speed is selected via shaft position equipment and the lift slows to "Levelling Speed'.

Approximately 50 mm away from floor level the pattern is allowed to fall to 'Zero' speed where at floor level the brake sets and the speed signals are removed from the regulator.

At a given speed set by the site engineer the Door Zone/Speed Relay enables the doors to operate via external circuitry.

General Data

Dimensional Details

Type	Field Max. F.L.A.	Unit Size W/H/D mm	Unit Weight kg
DCRT	10	450/ 134 /295	4.5

Details of units above 10A are available on request.

General Parameters

Enclosure	1POO
Amb temperature range	O°C to +40°C
Preferred tacho input volts at maximum lift speed	60V
Preferred loop volts at maximum lift speed	200 - 300V
Power supply for regulator	240 / 1 / 50*
Power supply for thyristor configuration	Dependent on generator field voltage and current. C.T. ** Transformer required.
Contact ratings of FDR, DZR (i.e. fault detect and door zone relay contacts)	240V A.C. 5 amp res load

* Different power supplies readily accommodated.

** Centre tapped.

Purchasing Information

To assist in the selection of the unit the following information is provided.

Thyristor Configuration

DCRT — Offers a thyristor biphase module capable of giving full wave smooth control in the hoist motor drive mode plus a limited amount of reverse bias to assist in the brake mode. The regulator is suited to most applications where normal mechanical inertias and electrical time constant lift systems are involved.

Speed Options

The standard system is offered with five speeds:

1. High Speed 1
2. Approach
3. Levelling
4. Test
5. Zero

Two additional high speeds are available as an optional extra.

Deceleration Stages (British Market)

The standard system is offered with three deceleration ramps each independently adjustable:

1. From High Speed to Approach
2. From Approach to Level
3. From Level to Zero

Door Zone/Speed Monitor

To ensure that the lift doors cannot be opened if the lift is travelling above a preset speed (set by the site engineer) a speed sensing unit is fitted as standard with N/C relay contacts for inclusion in the door opening control circuitry.

Error Detect

Should the tacho voltage differ by a set value from ramp/target voltage an onboard relay will be operated and remain operated until manually reset. The contacts of this relay may be included in the safety chain circuitry.

Computer Card

In order to ensure that lift floor to floor times are maintained at a minimum, a computer card is available as an optional extra.

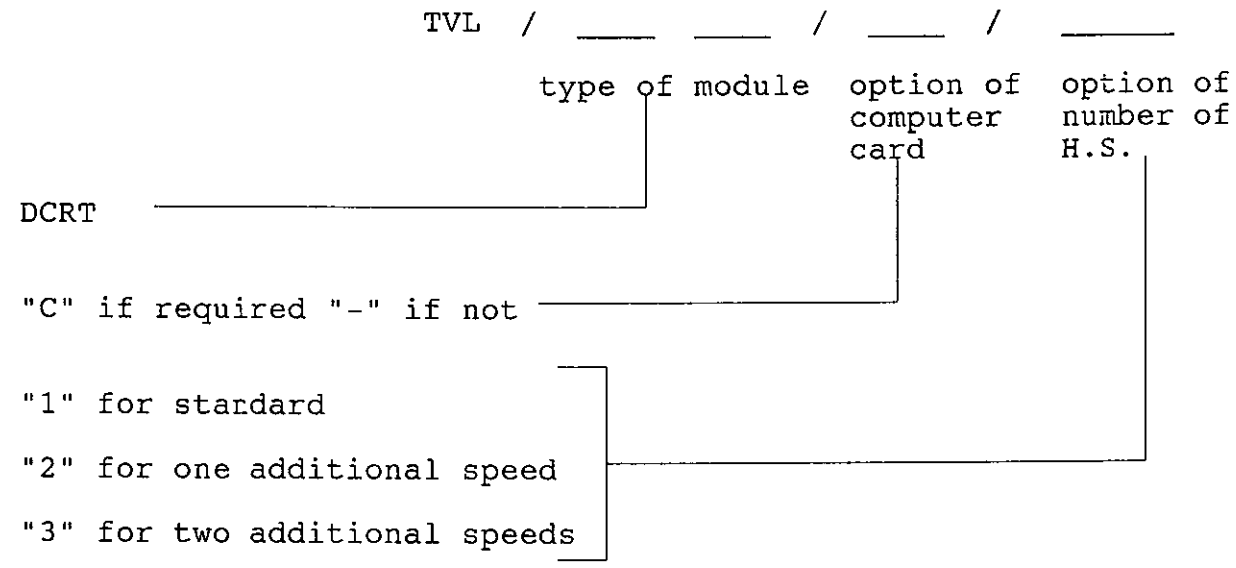
This card is offered as a plug in extra and can be purchased later to fit directly into the original basic unit without any regulator wiring change.

Ordering Nomenclature

To ensure that the correct TVL D.C. regulator is provided, the following is the minimum information which must be given to allow selection:

1. Type of module required.
2. Generator field volts for hoist motor top speed.
3. Generator field current for hoist motor top speed.
4. Whether hoist motor field forcing is used and if so when.
5. Generator field resistance.
6. Tacho voltage for hoist motor top speed.
7. Loop voltage for hoist motor top speed.
8. Power supply voltage and frequency.

Use of the following nomenclature/model number system when ordering will permit orders to be processed with the minimum of delay:-



e.g. TVL/DCRT/C/1

Additional Speed Profiles and Features

Standard Unit (American Market)

Deceleration from high speed to levelling speed is maintained by DEC1, deceleration from levelling to zero speed is maintained by DEC3. See TVLD 281 for speed profile.

Damping Unit (American Market)

Deceleration is maintained by DEC3 at all times. It has up to 3 additional damping speeds operating between level and zero speed. See TVLD281 for speed profile.

None Standard Speeds/Deceleration Features

Due to the design of the pattern generator card (DCR4) it is possible to accommodate a wide range of additional speeds and deceleration profiles. For further details please contact the factory.

DRAWING No. TVLD 281

REV.A	REV B	REV.C
DATE	DATE	DATE

TITLE. SPEED PROFILES SHOWING ACCEL & DECEL ADJUSTMENT POTENTIOMETER. DCRT

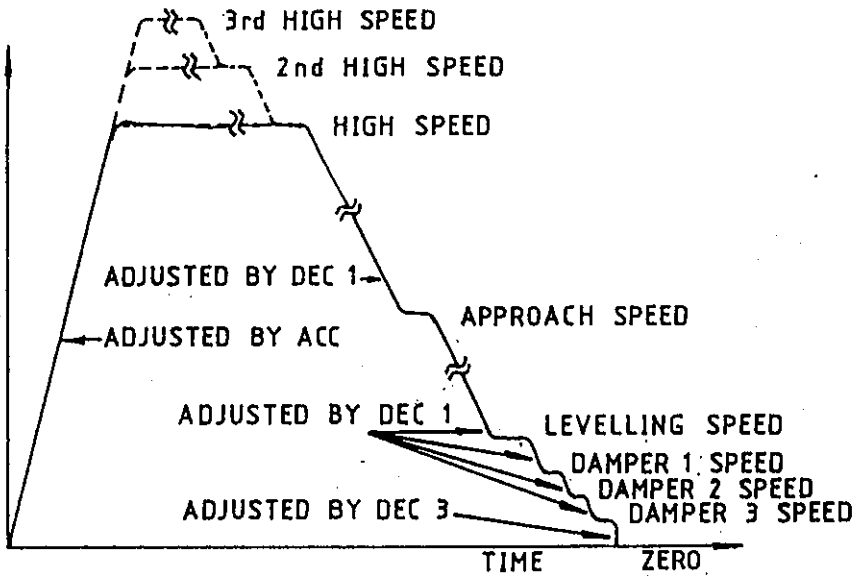
DRAWN. A.W.

TRACED. 19-12-89

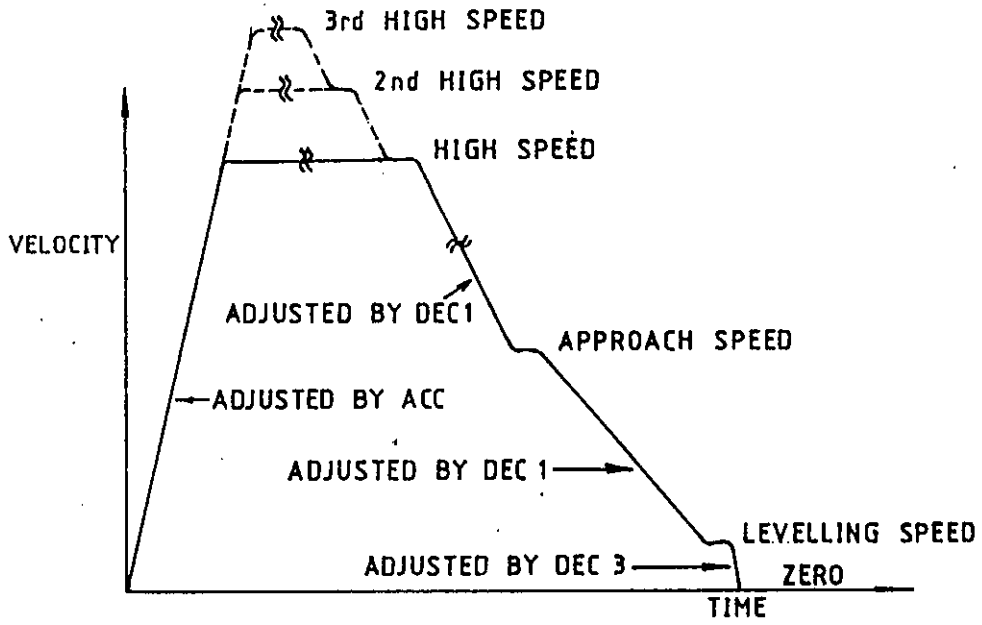
PASSED.

CONTRACT No.

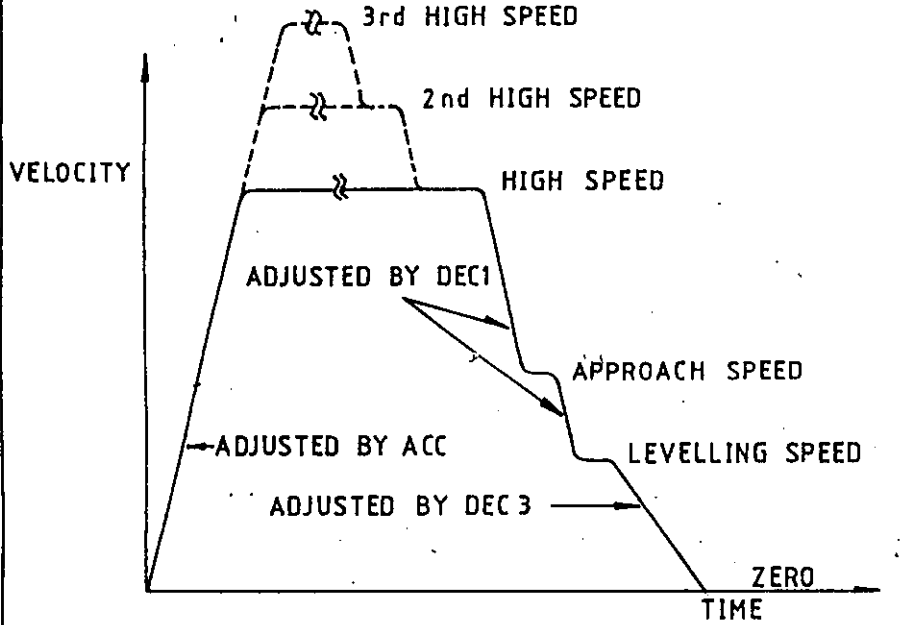
DAMPING (AMERICAN)



STANDARD (BRITISH)



STANDARD (AMERICAN)



Spares

Every unit has been thoroughly tested and uses high quality components throughout, offering maximum reliability. In the unlikely event of a breakdown, the modular construction of the unit allows for quick board/component replacement.

To minimise "shut down" time, all components including built up boards are carried in stock at the factory and to assist in ordering, a spares list is available.

N.B. When ordering replacement discrete components such as thyristors or diodes, full details should be supplied to ensure compatibility of electrical characteristics and mounting dimensions.

Component/Spares List

1.	DCR1	Door Zone/Power Supply Card
2.	DCR2	Relay logic/Speed Select Card
3.	DCR3	Firing/Monitor Card
4.	DCR4	Target and Ramp Card
5.	DCR5T	Control Card (Tacho)
6.	DC6	Computer Card
7.	DCR Tacho	Power Card
8.	DCRMB	Transformer and Card Socket Mother Board

Please refer to TVLD280 for relative positions of cards and components.

The company reserve the right to despatch component equivalents where a shortage exists.

Recommended Servicing Equipment

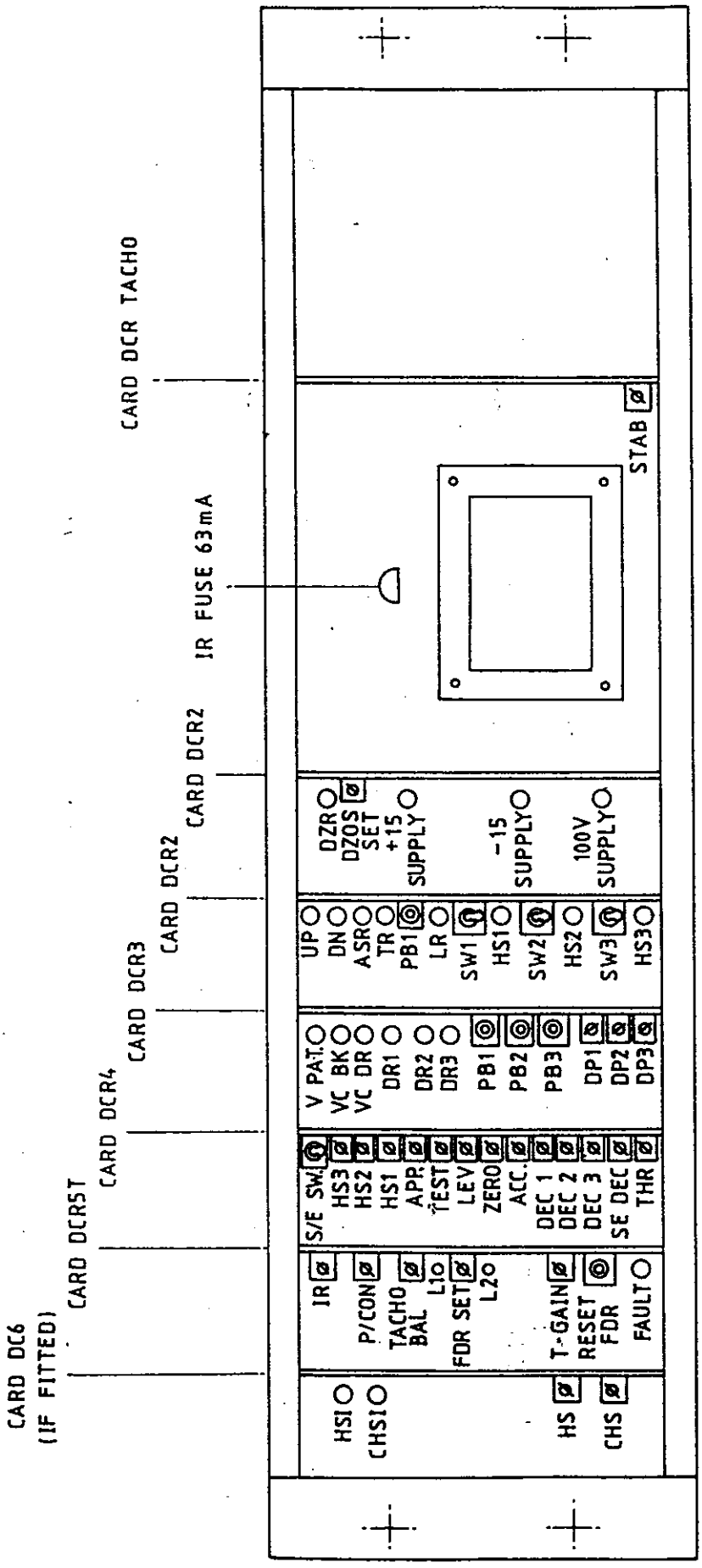
The D.C. Field Regulator uses on board visual monitoring devices to minimise the equipment required to monitor its performance.

To assist in maintaining the unit, the following tools and instruments are recommended:

1. Small screwdriver or trimmer tool

2. High resistance (20K ohm/V) A.C./ D.C. meter

3. Tacho 0 - 2000 r.p.m.



LEGEND

⊙ LIGHT EMITTING DIODE

MULTITURN POTENTIOMETERS

SWITCH

PUSHBUTTON

DRAWING No.				TITLE.	DRAWN. A.W	CONTRACT No.
TVLD 280	REV. A		DATE	MONITOR INDICATORS AND ADJUSTMENT POINTS DCRT	TRACED. 19-12-89	
	REV B		DATE		PASSED.	
	REV. C		DATE			

DRAWING No. **TVLD 279**	REV. A		DATE	TITLE. REGULATOR SCHEMATIC DCRT	DRAWN. A.W.	CONTRACT No.
	REV. B		DATE		TRACED. 19-12-89	
	REV. C		DATE		PASSED.	

The Cards and Their Functions

The card chart of the system is illustrated in TVLD279 .

A brief description and functions found on each card is outlined below:

CARD DCRMB — contains the isolating/step down transformer supplying:

1. 17V synchronising signal and rectifier.
2. 20V - 0 - 20V source for unreg. and reg. power rails.
3. 75V source for speed relay voltage.
4. IR fuse.

CARD DCR1 — contains the Door Zone/Speed circuitry plus all rectifying components for the 100V D.C. unregulated +25V D.C. unregulated and +15 D.C. regulated supplies.

CARD DCR2 — contains the systems relay speed logic circuitry allowing 5 speeds to be selected plus 2 additional high speeds if requested.

Switches and push buttons on this card offer the facility of manually inhibiting the speeds once High Speed 1 has been selected allowing the checking of Approach Speed (ASR) and Levelling Speed (LR) during site trimming.

Direction relays initiating the on card speed logic plus switching the attenuated and inverted tacho signal are also on this card.

CARD DCR4 — has all the potentiometers required for the adjustment of target speeds, acceleration ramp, 3 deceleration ramps (DEC1, DEC2, DEC3) and threshold. Upon selection of a speed registered on card DCR2 a target voltage is set and the acceleration ramp is enabled. The rate of rise of the acceleration ramp is adjusted by potentiometer ACC, and the rate of decay by the appropriate DEC potentiometer. Refer to Section III for specific deceleration potentiometer function

Note the state of the ramp/target volts is indicated by LED V.PAT on Card DCR3.

Mod 23/08/90

CARD DCR5T

contains the difference amplifier, stability circuits, error detect circuitry, control voltage circuitry an IR compensation potentiometer.

The tacho signal is received on pin 14 attenuated and sent to card DCR2 via pin 16 and 21 on card DCR5T for direction correction. The corrected signal is received on pin 15 and summed with the pattern signal received on pin 11. The difference is amplified by the error amplifier.

Should the tacho signal deviate from the ramp signal, or vice versa, by a pre-set amount. The error detect amplifier will change the state of one of two LED's (green when both tacho and pattern are balanced and red when an imbalance occurs). If one of the LED's changes to red, this will operate a fault detect relay with normally closed contacts connected to pin 4 and 5 which an be used to immobilize the drive system.

Incorporated in the fault detect circuit is a normally open contact of a second relay, which is energised when a direction is set by the DCR2 card.

Note the error detect amplifier is inhibited from operating if the lift well emergency stop button is pressed.

CARD DCR3

has mounted on it the special firing IC for the drive thyristors.

Since most of the control signals merge on this board it carries visual indicators relating to the pattern volts (V.PAT) and positive drive volts (VC. DR.).

Note: Where damping stages are required the relays are fitted to this board.

CARD DCR Tacho*

contains the positive drive thyristors, associated pulse transformer, snubber circuits and negative drive diodes.

The systems stability source is also contained on this board and is fed to the stability C/R network on card DCR5T pin 20 from pin 2 on the DCR Tacho.

* Caution should be exercised when working on this card since the heatsink is at high voltage potential.

Customer Adjustment Points

The finished unit has been factory tested and has all preset potentiometers set to initial run values.

To obtain the best performance from the unit, some site trimming of the following potentiometers may be required. For the location of the potentiometers please refer to TVLD280.

Card No.	Identification	Function
DCR4	HS3	Adjusts High Speed 3 target speed. Turn C.W. to increase speed.
	HS2	Adjusts High Speed 2 target speed. Turn C.W. to increase speed.
	HS1	Adjusts High Speed target speed. Turn C.W. to increase speed.
	APP	Adjusts Approach target speed. Turn C.W. to increase speed.
	TEST	Adjusts Test target speed. Turn C.W. to increase speed.
	LEV	Adjusts Levelling target speed. Turn C.W. to increase speed.
	DEC1	+Adjust rate of deceleration between HS1 and LEV. Turn C.W. to reduce deceleration time.
	DEC2	Not used.
	DEC3	+Adjusts rate of deceleration between LEV and ZERO. Turn C.W. to reduce deceleration time.

\+ For standard (British) profile only. Refer to Section 3c for other profiles.

Mod 23/08/90

	ZERO	Adjusts ZERO speed. Adjust until the motor is stationary.
	ACC	Adjusts the rate of acceleration. Turn C.W. to reduce acceleration time.
	SEDEC	Not used.
DCR5T	IR	Not normally used. Adjusts the degree of IR compensation i.e. reduces the effect of motor speed relative to load. To increase compensation turn C.W.
	P/CON	Sets an initial value of positive drive on the generator field. set too high may cause the drive motor to snatch on start. Turn C.W. to increase effect.
	TACHO BAL	Factory set.
	T-GAIN	Factory set.
	FDR SET	Adjusts the sensitivity of the error detect circuitry consistent with no nuisance tripping. Turn C.W. to increase sensitivity.
DCR1	DZR	Adjusts the voltage at which the Door Zone/Speed relay will pull in and drop out. When the adjacent LED is lit the contacts of the relay are closed.
DCR3 (damping units only)	DP1	Adjusts the DP1 (first damping stage) target speed. Turn C.W. to increase speed.

Mod 23/08/90

DCR3	DP2 (damping units only)	Adjusts the DP2 (second damping stage) target speed. Turn C.W. to increase speed.
	DP3 (damping units only)	Adjusts the DP3 (third damping stage) target speed. Turn C.W. to increase speed.
DC6 (if fitted)	HS	Prescales the target range over which the computer card is active. Should be set so that LED CHSI goes out just previous to the motor achieving maximum speed. Turn C.W. to increase speed before LED CHSI extinguishes.
	CHS	Adjusts the length of time that the computer influences the maintaining of HS1 if released by the off board speed control circuitry. Turn C.W. to increase time.

For the function of SW3, SW2, SW1 and PB1 please refer to Section 9a, Site Trimming Procedures.

Note: FACTORY SET POTENTIOMETERS ARE SEALED AND MUST NOT BE TOUCHED.

Visual Monitor Indicators

To assist in setting up and fault finding, the basic unit is fitted with 'Tell Tale' LED's shown in illustration TVLD280 (Section 7) which monitor the following:

Card No.	Identification	Function
DCR1	DZR	When lit indicates that Tacho generator voltage is below a set value and that Door Zone/Speed relay has 'dropped out'.
	+15V Supply	Lit when regulated +DC supply exists.
	-15V Supply	Lit when regulated -DC supply exists.
	+100V Supply	Lit when voltage supplying on board relays exists.
DCR2	UP	Must be lit when the UP direction is chosen.
	DN	Must be lit when the DN direction is chosen.
	ASR	Lit when HS1 has been selected or running at approach speed. Maintained until levelling speed is selected.
	TR	Lit when test speed is selected.
	LR	Lit when levelling speed is selected.
	HS1	Lit when High Speed is selected.
	HS2	Is lit when High Speed 2 is selected.
	HS3	Is lit when High Speed 3 is selected.

DCR3	V.PAT	Illumination is semi proportional to the ramp/target voltage. Indicates ramp build up on all speeds but particularly HS1.
	VC. DR	Illumination semi proportional to positive drive control voltage. Lit when positive drive is off.
	VC. BK	Illuminates but is not used.
	DR1 (damping units only)	Lit when first damping stage is selected via contacts of relay 2L.
	DR2 (damping units only)	Lit when second damping stage is selected via contacts of relay 3L.
	DR3 (damping units only)	Lit when third damping stage is selected via contacts of relay 4L or when relevelling is selected.
DC6 (if fitted)	HSI	Lit when HS1 is called for by off board contacts.
	CHSI	Lit when HS1 relay is being maintained by computer action.
DCR5T	FDR TRIP	Lit when either L1 or L2 has changed from green to red. Will remain lit until FDR. Reset push button is pressed.
	L1	Under normal conditions with the supply on. The LED will be green. This will change to red if the pattern is greater than the tacho.
	L2	Under normal conditions with the supply on. The LED will be green. This will change to red if the tacho is greater than the pattern.

Site Set Up Procedure

The instructions which follow are intended as a guide to site testing and trimming.

The commissioning engineer has the sole responsibility for taking adequate safety precautions during the carrying out of these procedures.

A. Preliminary Work

1. Check all safety circuits and ensure all safety circuits are in order.

2. Check all motor and generator connections are secure.
DISCONNECT THE BRAKE, OPEN THE LOOP CIRCUIT AND UNPLUG THE REGULATOR UNIT.
DISCONNECT ONE LEAD OF THE GENERATOR FIELD.

3. Remove connection GA1 marked IR at the controller.

4. Link out the F.D.R. (Fault Detect Relay) contacts FDR1 and FDR2 in the controller. Ensure lift doors are closed and remain closed by isolating relay coil OC.

5. Remove a lead from the negative drive limiting resistor GR2 to isolate the negative drive from the generator field.

B. Power Up

1. Check phase sequence relay in controller for phase sequencing. Correct if required.

2. Momentarily manually operate contact 'S' (STAR) to cause the motor generator to turn and check that direction of rotation agrees with machine manufacture data plate. If not, correct by changing over any 2 of the 3 incoming 3 phase leads at the generator drive motor.

C. Generator Suicide Polarity Check

1. With a voltmeter connected across the generator armature (GA1 and GA2) switch to Car Top Control and momentarily link TU to TUD in the controller. Observe the recorded voltage.

2. Briefly connect the generator shunt and ensure that the recorded voltage reduces to a value less than 2 volts. If the voltage increases reverse the generator shunt field leads and repeat the test.

D. Generator Field Polarity Check

1. With the voltmeter and lift controller as in C1 but with the regulator plugged in and shunt field connected momentarily link TU and TUD in the controller. Observe the recorded voltage.

2. If GA2 is negative with respect to GA1 reverse the polarity to the generator field and repeat the test.

E. IR Feedback Check

1. With the voltmeter on GA1 and C2 (positive to C2) switch to Car Top Test and momentarily link TU to TUD in the controller. Ensure that the recorded voltage is approximately zero or in any case very much smaller than the voltage across GA2 and GA1.

2. If not check the generator connections, correct then repeat test.

3. On satisfactory completion of IR feedback test REPLACE CONNECTION GA1 MARKED IR AT THE CONTROLLER.

F. Motor Field Adjustment

Adjust motor field excitation to the required contract data values. Generally the field may be energised by operating relays EXR and MR to give the standing field condition and with the additional operation of relay FF run field condition can be obtained.

G. Motor Polarity Check

1. With the voltmeter connected across the motor armature terminals at the controller (negative to MA1) release the brake and allow the empty car to the run up.

2. Ensure that MA2 is positive with respect to MA1. If not reverse the connections to the motor field.

H. Motor Tacho Polarity Check

1. With the voltmeter on T+D and T-D in the controller release the brake and allow the empty car to run up noting the voltmeter reading.

2. Ensure that T+D is negative with respect to T-D. If not reverse the Tacho leads to the controller.

I. Reverse Bias Adjustment

1. Ensure that all leads in the generator/motor loop and brake are fitted securely and that link FDR1 to FDR2 is still fitted. Fit the lead removed in A(5) back on GR2 ensuring it is secure.

2. Remove a lead from the generator current limiting resistor GR1 (isolating the regulator drive from the generator field) and with the car near the middle of the shaft link TU to TUD.

3. Adjust the bias resistor GR2 such that the lift car travels at approximately 5 f.p.m. in the Downward direction.

4. Refit the lead taken from GR1 in '2' and ensure it is secure.

J. Regulator Speed Trimming

1. Ensure that all leads to the motor generator loop and brake are fitted securely and that the link is removed from FDR1 and FDR2 in the controller.

2. TEST With the Car Top Test mode selected and the car near the bottom of the shaft link TU to TUD and adjust the motor speed to the required test speed by means of potentiometers marked 'TEST' on card DCR4 in the regulator.

* 3. APPROACH Remove link TU to TUD and select 'Normal' mode. WithSW3 and SW2 on card DCR2 in the regulator in the up (off) position, register a call to a penultimate floor. Once the lift is moving switch SW1 up and adjust Approach speed by means of potentiometer APP on card DCR4.

* 4. LEVEL Immediately after adjusting Approach speed press PB1 and adjust Levelling speed by means of potentiometer LEV on card DCR4.

* 5. ZERO Upon releasing PB1 adjust the lift until it is stationary by means of the ZERO potentiometer on DCR4.

6. HIGH SPEED 1 Release the lift by switching SW1 in the down (on) position and adjust the potentiometer HS1 on the card DCR4 to give the required speed. SW2 and SW3 should be up (off).

7. HIGH SPEED 2 With SW3 in the up position adjust the second high speed by means of potentiometer HS2 on card DCR4 until the correct speed is obtained. SW2 needs to be in the down (on) position if used.

8. HIGH SPEED 3 If the 2 additional high speeds are used register a call to a penultimate floor and with SW1, SW2 and SW3 in the down position adjust the third high speed by means of potentiometer HS3 on card DCR4.

NOTE: ALWAYS ENSURE THAT SWITCH HS1 IS IN THE ON POSITION BEFORE REPEATING THE CYCLE.

K. IR (LOAD) Compensation

Not Normally used. If used:-

1. Insert a car call to a penultimate floor (empty car up) and with a tachometer check and record the speeds noting that dwells exist at APPROACH and LEVEL.

2. Insert a car to the opposite penultimate floor (empty car down) and adjust the 'IR' potentiometer on DCR5T in the regulator to balance the speeds (particularly at levelling) to those recorded in K(1).

NOTE: IT IS ALWAYS BETTER TO UNDERCOMPENSATE THAN OVERCOMPENSATE WHEN USING THE 'IR' COMPENSATION POTENTIOMETER.

L. Acceleration

Adjust potentiometer ACC on DCR4 in the regulator to give the required acceleration.

M. Deceleration (Standard, British Units Only)

1. Run the lift and adjust potentiometer marked DEC1 to give a slight dwell at Approach Speed when the lift comes into floor.

2. Repeat (1) but this time adjust potentiometer DEC2 to give a slight dwell at level when the lift comes into floor.

3. Repeat (1) but adjust DEC3 to give the required deceleration from level to zero speed. (Normally adjusted fully clockwise).

For other deceleration rates, refer to Section 3c.

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N. Pre Condition

Observe the lift during its initial start and if it drops back increase the potentiometer P/CON on DCR5T. Should the lift start with a jolt reduce the P/CON potentiometer.

O. Stability

Run the lift at HIGH SPEED and adjust potentiometer marked STAB until any oscillations are eliminated.

NOTE: KEEP THE STAB POTENTIOMETER SETTING AS LOW AS POSSIBLE AS TOO MUCH STABILITY WILL MAKE THE LIFT RESPONSE SLUGGISH IN OPERATION.

P. Final Trimming

1. Ensure that the lift has been running continuously for at least half an hour.

2. Adjust the HIGH SPEED potentiometers to give required lift speed.

3. Adjust other speed potentiometers if required.

4. Ensure that slight dwells exist at APPROACH speed and LEVELLING. If not adjust the associated DEC potentiometer.

* DURING ADJUSTMENTS OF THESE SPEEDS ENSURE THAT THE NEGATIVE BIAS CIRCUIT IS OPERATIVE (NORMALLY REQUIRES AN HSR CONTACT LINKED ACROSS IN SERIES WITH NEGATIVE BIAS RESISTOR GR3).

The instructions that follow are applicable only to regulators fitted with computer card (DC6) i.e. Regulator Models TVL/-/C/-.

Q. Fitting Of Computer Card

After all previous procedures have been observed locate the Computer Card firmly into the correct position in the regulator rack (The card is fitted to the left of and adjacent to card DCR5T).

R. Computer Card Speed Adjustment (HS)

1. Ensure that potentiometers HS and CHS are adjusted fully anticlockwise.

2. Register calls between penultimate floors and note that LED indicators CHS and HS are illuminated whilst the lift is running upto and at High Speed.

   Adjust potentiometer HS such that the green LED indicator CHS extinguishes when the motor speed is approximately 95% of its High Speed Value.

S. Computer Card Time Adjustment

1. Determine the 2 adjacent floors with the shortest distance between them.

2. Register calls between the 2 floors selected in (1) and adjust potentiometer CHS until the time the lift travels at Approach Speed is short but consistent.

   (LED indicator CHS should extinguish a short time after) determined by potentiometer CHS, LED indicator HS has extinguished indicating that the computer card has released its hold of the appropriate HS relay fitted on card DCR2.

3. Check the action of the Computer Card between other adjacent floors. (Decreasing the time the lift runs at Approach Speed at these floors will possible cause the lift to rush floors when running between the floors determined in (1).

4. Ensure that the performance is consistent under all conditions.

TYPICAL TRIAL SLOWING DISTANCES

Listed are suggested trial slow down distances with regulator set for minimum round off and linear deceleration rate of approximately 0.8m/sec^2 and 1 m/sec^2.

CONTRACT SPEED m/sec	SLOW DOWN DISTANCE (mm) 0.8m/sec^2	1m/sec^2
0.30	347.00	330.00
0.40	449.00	429.00
0.50	564.00	538.00
0.60	692.00	659.00
0.70	831.00	790.00
0.75	905.00	860.00
0.80	983.00	933.00
0.90	1147.00	1086.00
1.00	1322.00	1251.00
1.10	1511.00	1426.00
1.20	1712.00	1613.00
1.25	1817.00	1710.00
1.30	1924.00	1810.00
1.40	2149.00	2019.00
1.50	2387.00	2238.00
1.60	2636.00	2469.00
1.70	2898.00	2710.00
1.75	3033.00	2835.00
1.80	3172.00	2963.00

It is recommended that the distances are tried on floors constituting an adjacent short floor run and then a multifloor run where the lift is able to obtain contract speed. On satisfactory results then other floor slowing vanes may be fitted in accordance with the previous dimensions.

NOTE: Use of the computer card/circuitry (where fitted) may be required on floor to floor runs where lift is unable to obtain contract speed before slowing signal to the regulator is invoked.

(See computer card/circuitry set up).