DC Servo Motor Driver

Purchase Guide
and
Operation Manual

CDS-E Series

CDS SERVO

DC BRUSHED SERVO MOTOR DRIVER
CDS-E SERIES

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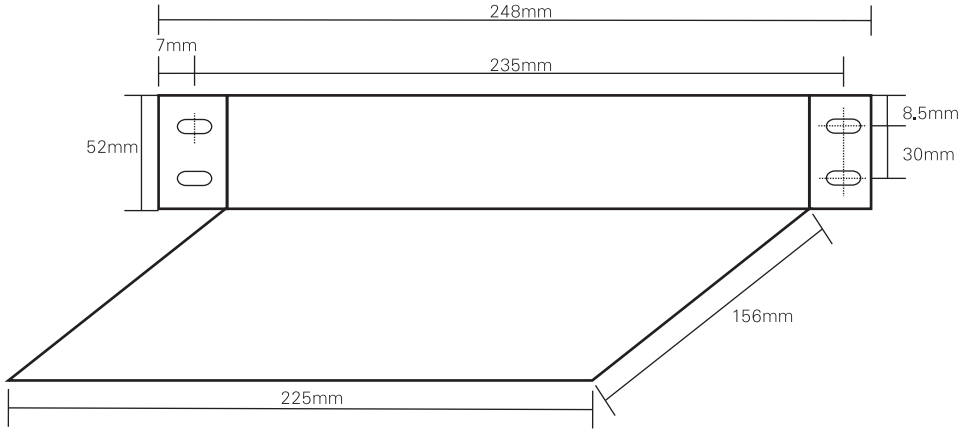
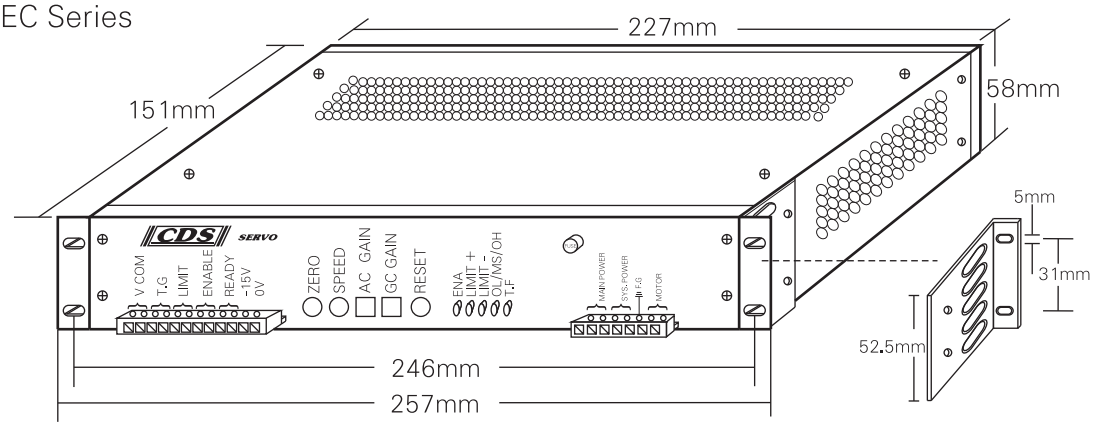
INSTALLATION

EL Series



EC Series



Notices for installation environment:

(1) The ambient temterature shall not exceed the limit of 0~50℃.
(2) The relative humidity shall not exceed the limit of 10~90%RH (not dew).
(3) Environment with corrosive and inflammable gases shall be avoided.
(4) Environment with dust, salt ,and ferrousdust shall be avoided.
(5) Environment possible for water,oil and chemical spray shall be avoided.
(6) No big vibration and impaction.
(7) Good ventilation is required.

TABLE OF SPECIFICATIONS

SPEC \ MODE		CDS-EW		CDS-EW		CDS-EW		CDS-EW
		0510	0515	0710	0715	1010	1015	1510
CONT. CURRENT (A) RMS		5		7		10		15
PEAK CURRENT (A) PEAK		13		16		20		23
CONT. OUTPUT DCV RMS		100	150	100	150	100	150	100
MAX. OUTPUT DCV RMS		113	180	113	180	113	180	113
NET WT. (KG)	EL	1.2		1.2		1.2		1.2
	EC	1.7		1.9		1.9		1.9

Functions of options and specifications
(Refer to the instruction of options before selection)

Type Code :

CDS -05 10 F E □ W

- Appearance { C : With Case / L : L board Without case
- Option Code F : Trip-ff protection at Abnormal Feedback.
- Continuous Voltage (DC)
- Continuous Current (DC)
- Series Title

Example : CDS - 05 10 F EL

Specifications of this driver :
Continuous Current : 5A (Peak Current : 13A)
Continupus Voltage : 100VDC (Maximum Voltage 113VDC)
Trip-off Protection at Abnormal Feedback
EL : L board without case

NOTE OF SPECIFICATIONS

●**Type of Control :** PWM effective switching frequency of :

CDS-0510E & CDS-0515E	20KHZ
CDS-0710E & CDS-0715E	20KHZ
CDS-1010E & CDS-1015E	16KHZ
CDS-1510E	16KHZ

●**Entry of Speed Command :** DC±10V /Rated Speed.

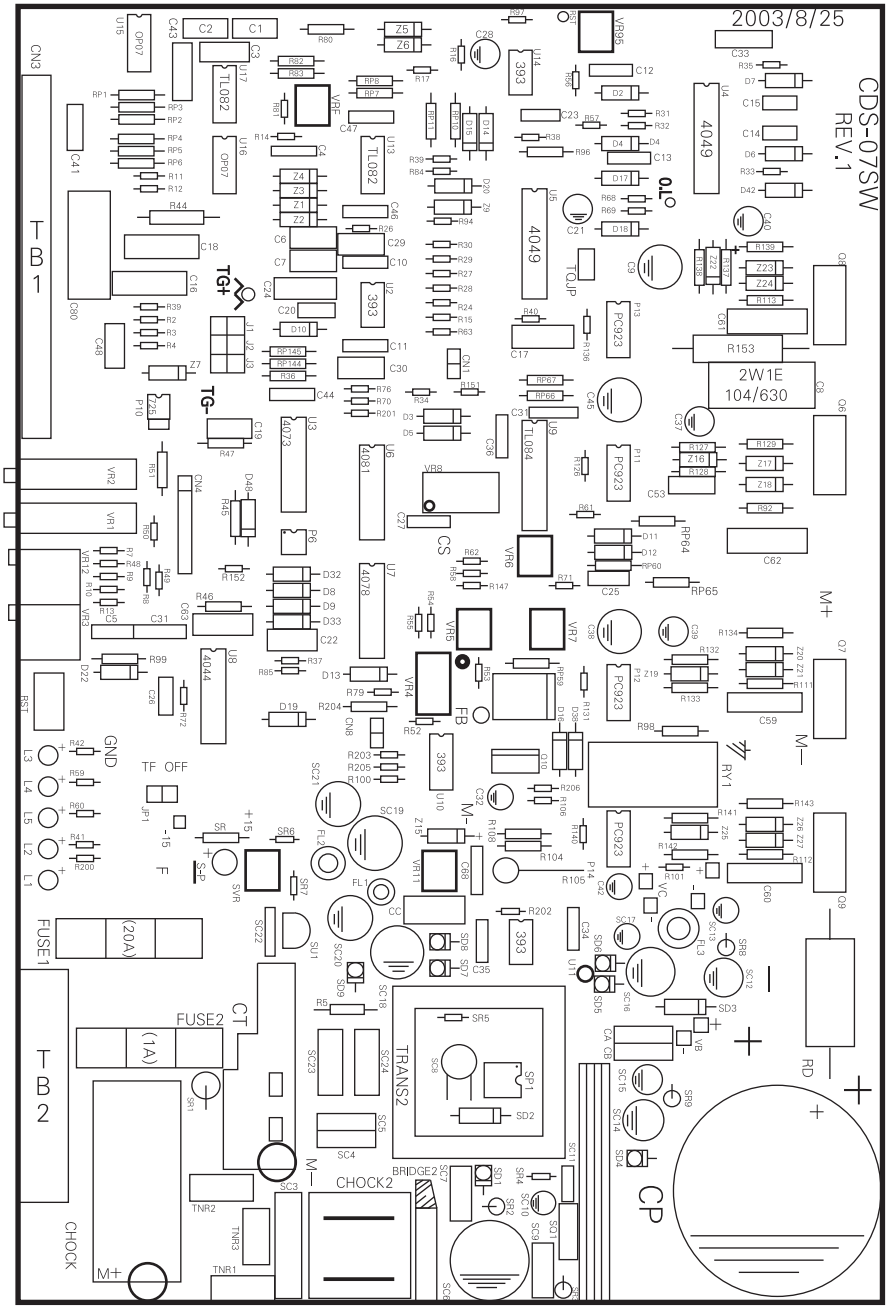
●**Voltage Feedback Gradient DC :** 7V/1000 rpm
9.5V/1000 rpm
13.5V/1000rpm
(It can be selected by JUMPS in PC board.Other custom-made specifications can also be accepted.)

●**Variance ratio of rotating speed under 0.1%**
(variance ratio of load : 0~100%)

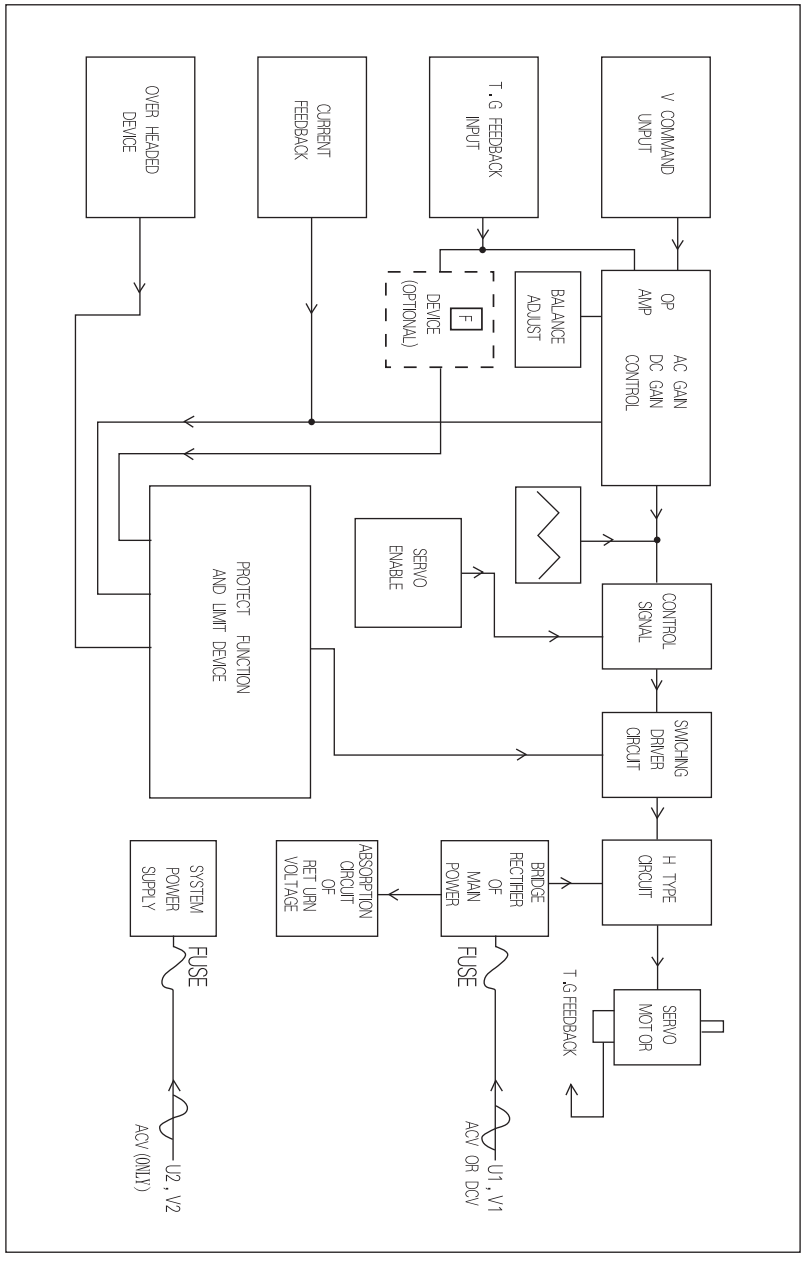
●**Standard Protection Device :**
Overloading,overheated in the driver,short-circuit in the motor, regenerative voltage absorption circuit.

●**Option F:** Trip-off Protection at Abnormal Feedback.
(Especially for the link between PC board and master board. Refer to page 23)

CDS-EW : CIRCUIT BOARD COMPONENTS LAYOUT DIAGRAM



Block diagram



INSTRUCTION OF POWER SUPPLY

Supplying AC power to CDS-E Series shall be fine since the Series is equipped with built-in rectifying system. On the panel board of driver : U1V1 is the main power, U2V2 is power supply terminal of control system.

Specifications of Supply Voltage			
TB2 (Please refer the page 8)	U1 V1	EXAMPLE : CDS - □□10 FECW Input voltagr 30~70VAC (max.tolerance 15% or below) EXAMPLE : CDS-□□15 FECW Input voltagr 30~7110VAC (max.tolerance 15% or below)	
	U2 V2	AC110V ， 50/60HZ Max. allowable change: AC90V~128V	Input current 0.7A (min) or higher

Note :

(1) Voltage stabilizer should be installed in environment with great current and voltage variance.
(2) The driver will trip-off if breaking occure on the main input current and voltage of U1V1 alone (the T.F. LED on the panel board lights up). After the problem is corrected,the power will be supplied through automatic reset. If the power supply is over AC80V,the rectifying system or power unit may be damaged. In case that the power supply is below or upon critical AC25V, voltage decrease may occur during heavy load. So the driver may not be able to run smoothly owing to the abnormal feedback. (The motor will vibrate with low frequency, make noises, or stop intermittently.) In more serious cases, the situations shall be deem as breaking on U1.V1, leading to the tripping-off of T,F with lit LED. After the problem is corrected, the power will be supplied through automatic reset.
(3) If the power supply for the control system, U2,V2, is over AC128V, it may cause damages to internal elements. If the power is below AC90V, the driver can not operate. (If the power supply is about the lower critical limit, unstable enable may occur intermittently).
(4) Generally speaking, power improvement device (e.g. : isolated transformer) should be installed at the front end of main power supply in order to improve the quality of supplied power.
(5) Proper treatments should also be performed in environment with worse quality of power supply for better performance. For example, the power input terminal should not be for use with other equipment; cables with strong signal interference should avoid from put in same wireduct and should be grounded accurately; or filter and surge absorber should be installed otherwise.

SELECTION AND MATCH OF SPEED FEEDBACK VOLTAGE

(While it is ready to leave the factory, otherwise, T/G gradient will be set at 7V/1000rpm)

TACHOGENERATOR (T.G.) can be adopted for the speed feedback of CDS-E Series. Analog voltage input (F/V) converted from Frequency can also be used. Three corresponding specifications are frequently adopted for standard product.
Three optional sockets are separately placed on the PC board for each suitable return voltage, as follows :

7V/1000rpm	9.5V/1000rpm	13.5V/1000rpm
J1	J2	J3

If the motor is equipped with TG device internally, the conduit socket on the PC Board should be selected based on the TG specifications of motor and should be installed by short-circuit plate.

Note :

(1) In case that the specifications of feedback voltage does not correspond to those set up in the driver, the matching of revolution of the motor will be difficult. If necessary, please pay attention to maximum speed of motor, not to run over-speed.

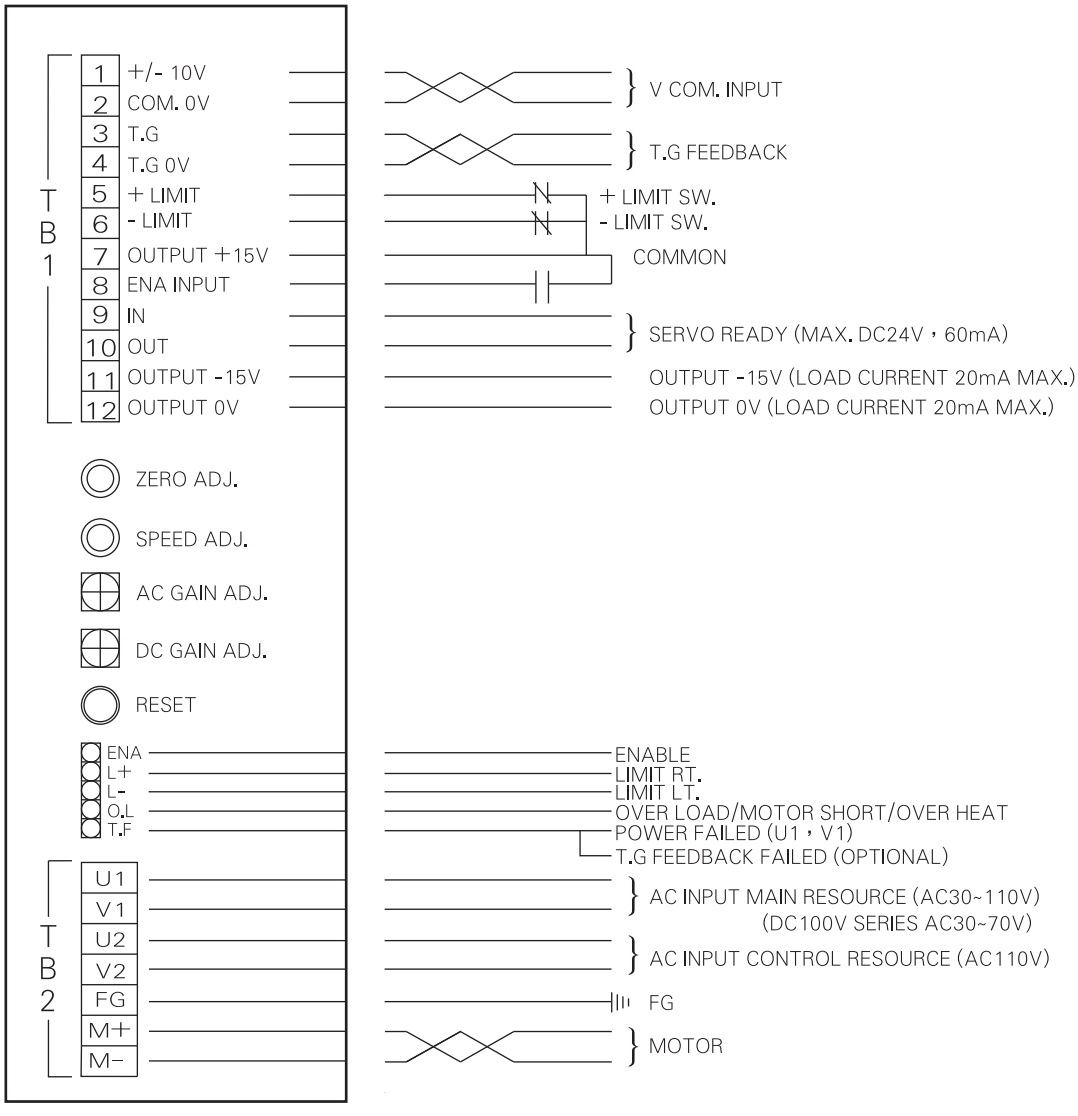
(2) The maximum feedback voltage shall not exceed 70VDC. It will damage the elements inside the feedback system otherwise.

(3) Two or more types of corresponding specifications should not be installed at the same time.

(4) Diagram of JUMPER selected for specifications of feedback voltage, as the page 4.

SIGNAL DESCRIPTION DIAGRAM (CDS-E)

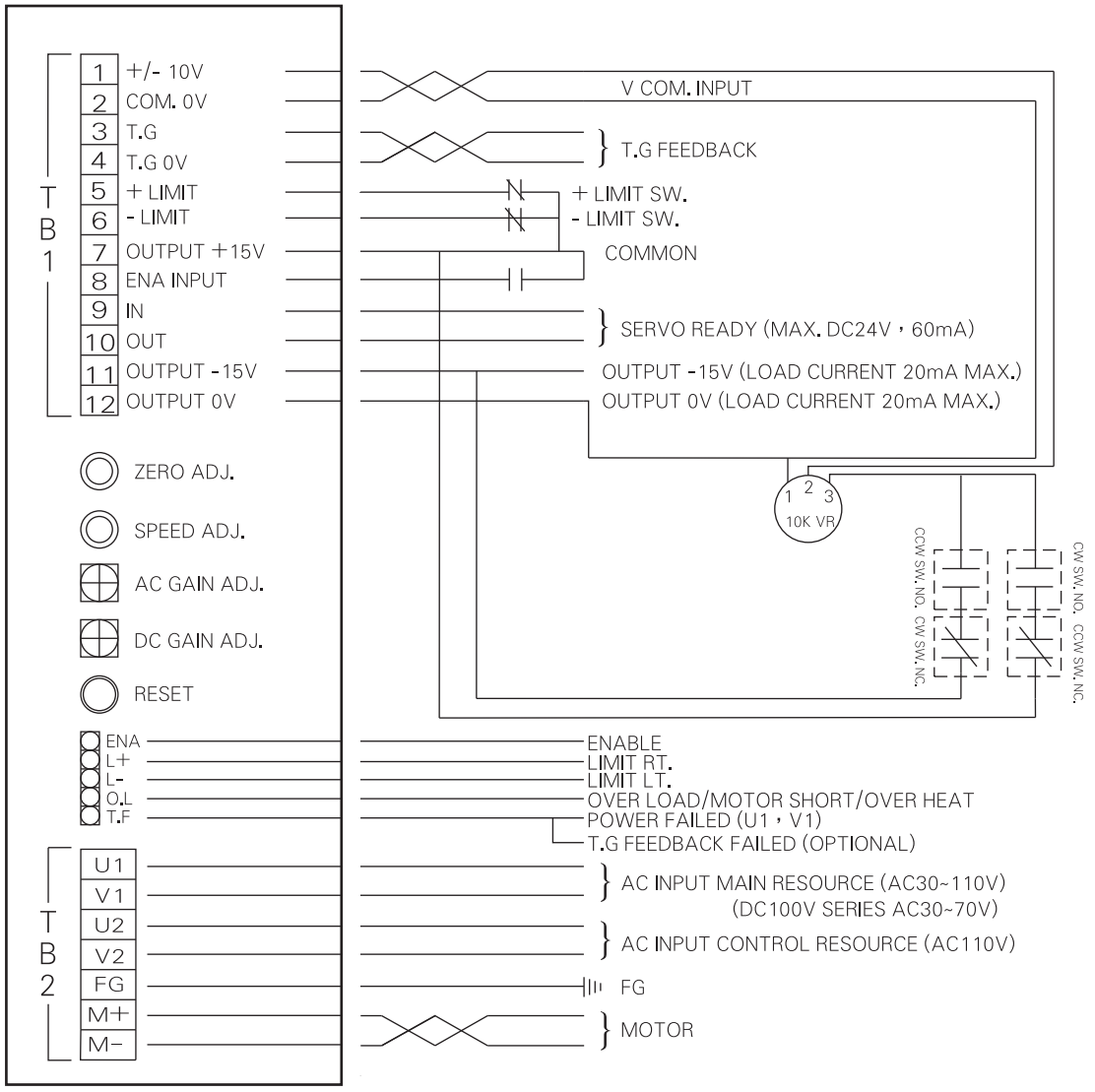
CDS-E SERVO DRIVER
SIGNAL DESCRIPTION



REMARK : UNLESS SPECIFIED, ABOVE FIGURE ALL SIGNALS ARE DCV.

DESCRIPTION DIAGRAM OF VR SPEED ADJUSTMENT WIRING (CDS-E)

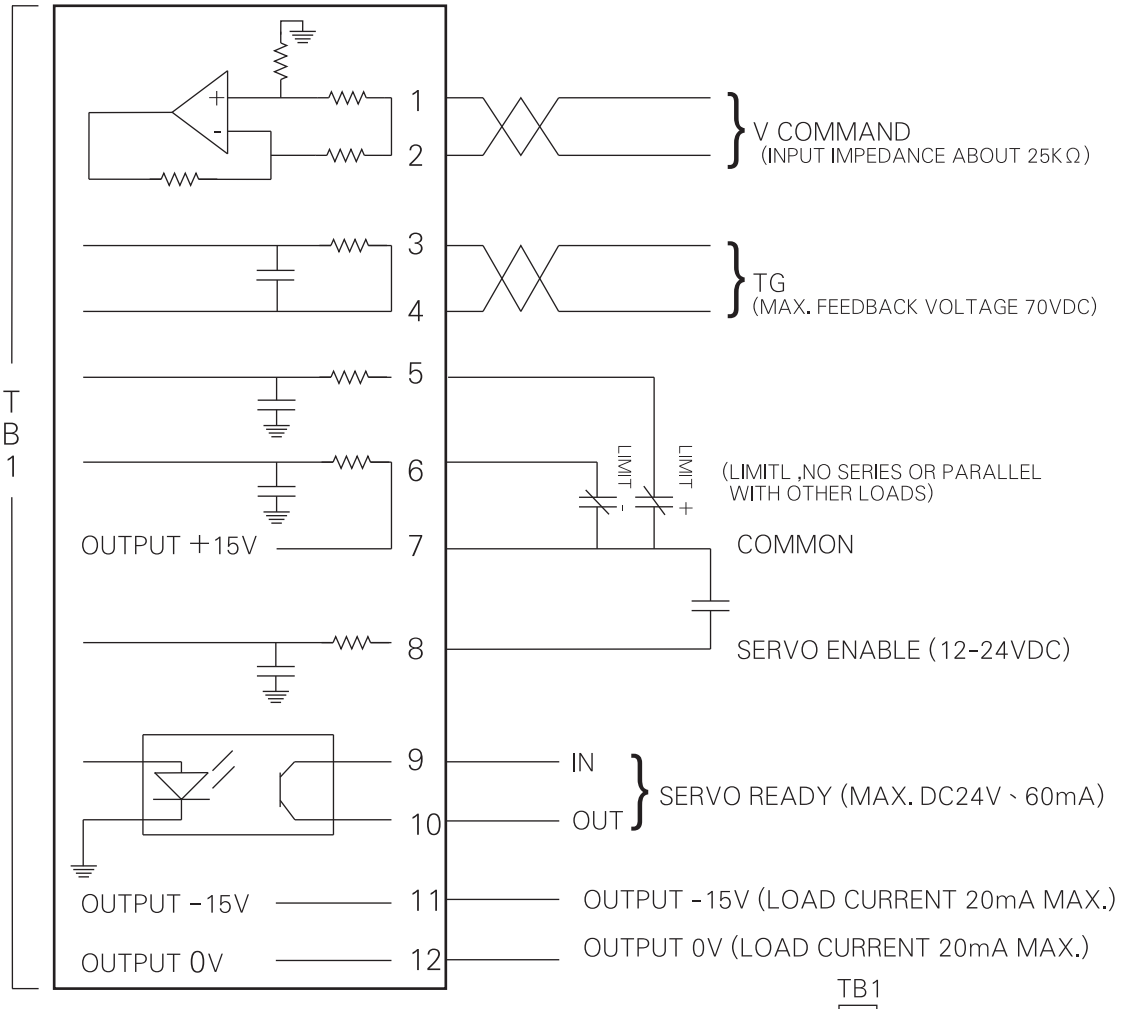
CDS-E SERVO DRIVER V SERIES SIGNAL DESCRIPTION



REMARK : UNLESS SPECIFIED, ABOVE FIGURE ALL SIGNALS ARE DCV.

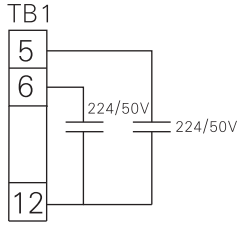
APPENDIX OF SIGNAL DESCRIPTION
CDS-E-TB1 I/O TERMINAL WIRING DIAGRAM

CDS-E SERVO DRIVER V SERIES



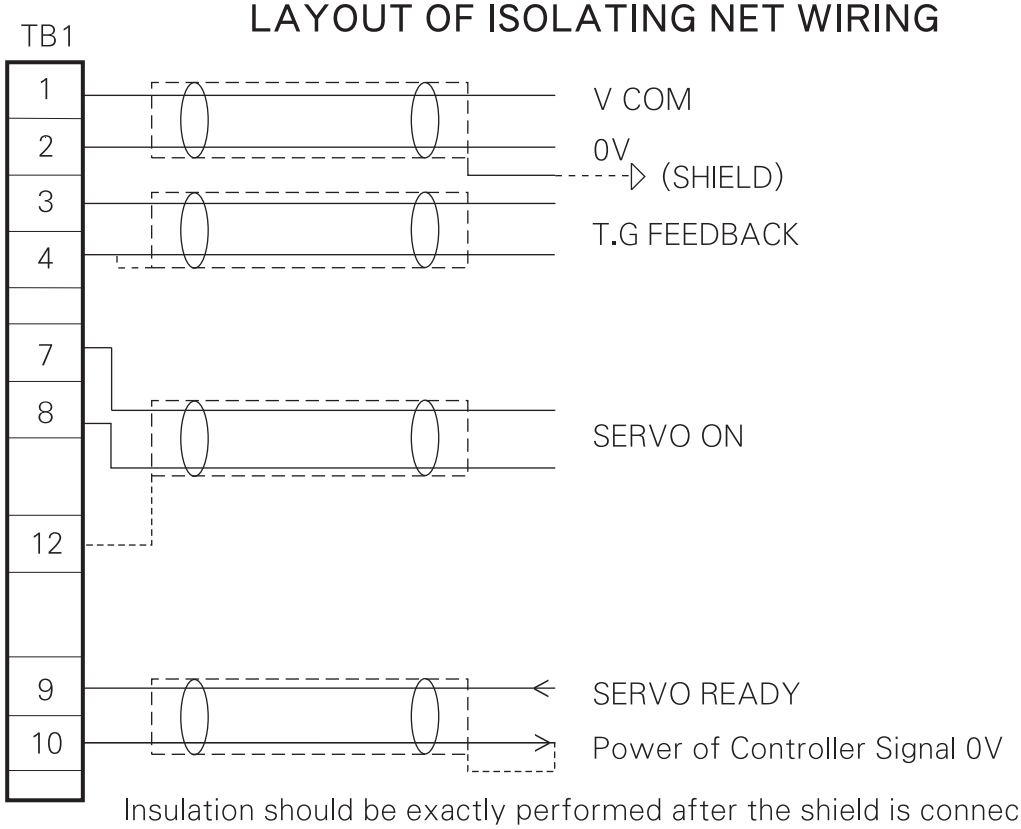
REMARK :

※ The above figure shall use DCV as unit.
※ If the Limit is longer than 10m, and please use 224/50v condenser to connect 5th, 6th PIN and 12th PIN of TB1 in parallel.
※ If ENA is using the external power, do not connect the 7th PIN of TB1 in the servo driver.



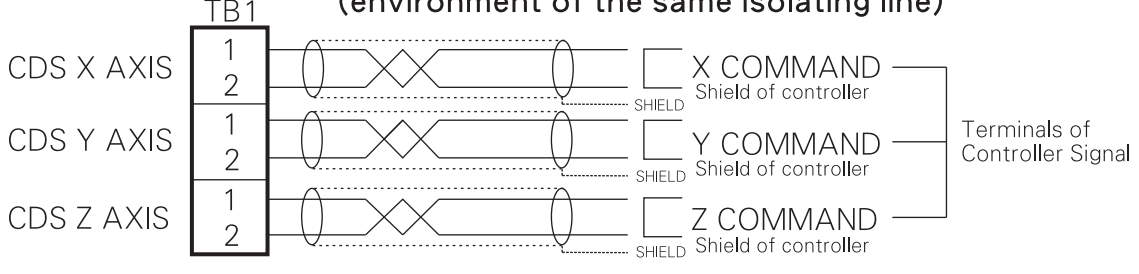
APPENDIX OF SIGNAL DESCRIPTION

LAYOUT OF ISOLATING NET WIRING



Insulation should be exactly performed after the shield is connected.

Digram of Multi-axlia Wiring (environment of the same isolating line)



Insulation should be exactly performed after the shield is connected.

APPENDIX：SIGNAL INSTRUCTION PIN NO.1 AND 2 OF TB1

The input command of speed voltage ,DC±10V,makes the set value of "SPEED" adjustment button and the 10V command correspond.
Normally it is from the command terminal of controller to the command input terminal of driver (PIN No.1 and 2 of TB1).
The isolating line with isolating net should be adopted to perform direct input through the shortest channel (junction transfer should be avoided). The quality of command voltage should be properly maintained.
If interfered by impure signals, the motor would vibrate with high frequency or unusual floating might occur upon HOLDING.

APPENDIX：SIGNAL INSTRUCTION PIN NO.3 AND 4 OF TB1

If the motor is equipped with T′G inside, the isolating line and net should be adopted for the TG cable to perform direct input to PIN No.3 and 4 of TB1 through the shortest channel (junction transfer should be avoided).
The quality of speed feedback voltage should be properly maintained.
If interfered by impure signals, the motor would vibrate or unusual floating condition of OFFSET, or even too weak for HOLDING , might occur.
The body of TG should also be maintained properly.
Oil, humidity, or unusual object should also be avoided.

Note：
Short-circuit should be prevented between the T.G cable and housing. Otherwise, it may lead to faulty detection of the system or unusual lighting of LED lights on the panel board.

APPENDIX：LIMIT SIGNAL INPUT END PIN NO.、5、6、7 OF TB1

This limit control always in normal close status If this function is not required, please short-circuit these 3 points and insulate them properly.

Note：

1. **Limit wiring please don′t series or parallel with other loads.**
2. **Simultaneously, the 7th pin supply the signal to the 8th pin (ENAINPUT).**

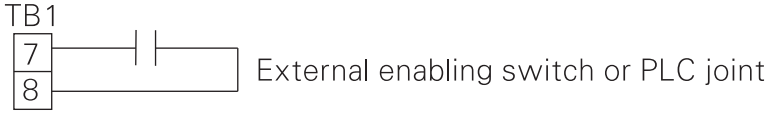
WIRING EXAMPLES OF SIGNAL INSTRUCTION OF SERVO ENABLE

EXAMPLE : PIN NO. 7 AND 8 OF TB1

Connecting these two points means "SERVO ON", while disconnecting means "SERVO OFF".

(Refer Example 3 and 4-B for enabling through external signal)

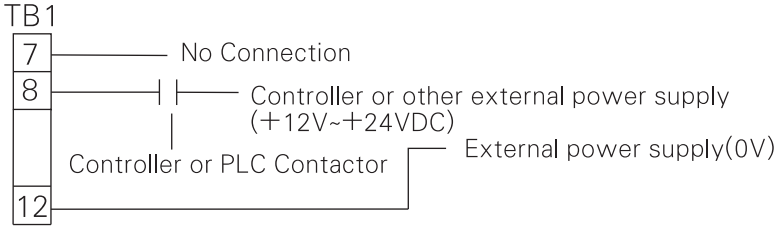
Example 1 : Direct Enabling :



Example 2 : Enabling Controlled by Relay Transfer :

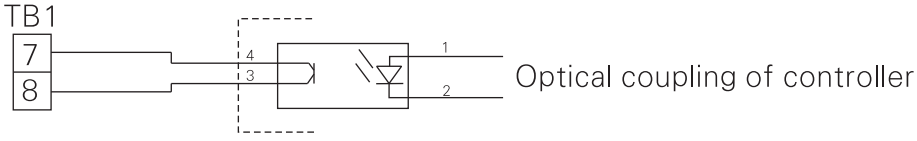
Advantage : The Relay can placed close to the driver to avoid unnecessary interference caused by wiring.

Example 3 : Enabling through External Signal

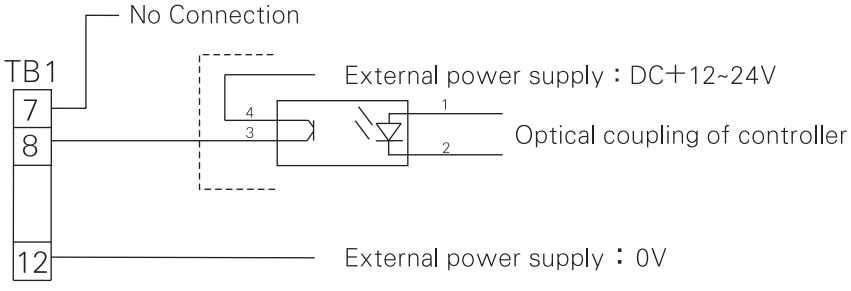


Example 4：Enabling Through Optical Coupling of Controller

A. Using the power supply of the driver



B. Using External power supply



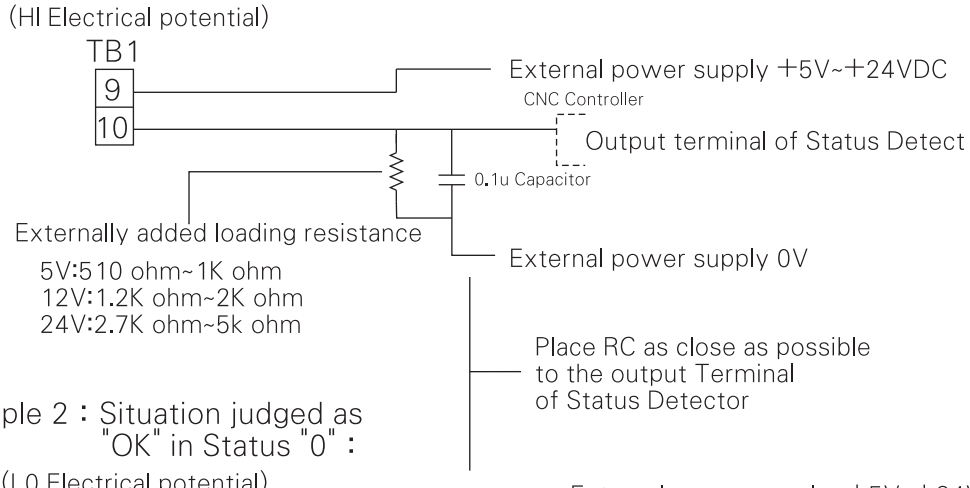
Note：
Special attention should be paid to the driving power of optical coupling in order to avoid situations which can not be enabled.
Refer to the following example for the input current needed for pin No.8
Above 4.5mA while the external power supply is 12VDC.
Above 6mA while the external power supply is 15VDC.
Above 10mA while the external power supply is 24VDC.

WIRING EXAMPLES OF SIGNAL INSTRUCTION OF SERVO REDAY

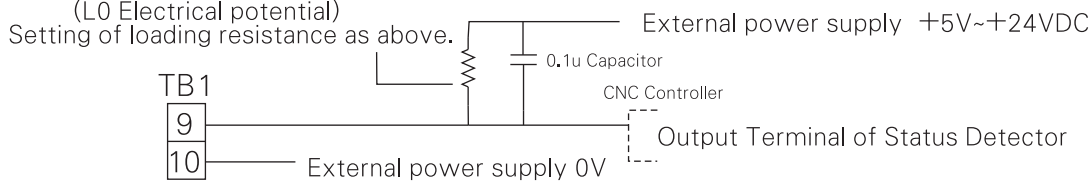
EXAMPLE : PIN NO.9 AND OF TB1

This is a self-diagnosis function of the driver.If the driver trips off or fails, these two points will break for the convenience of control system judgement.
(Pay attention to the direction of current)

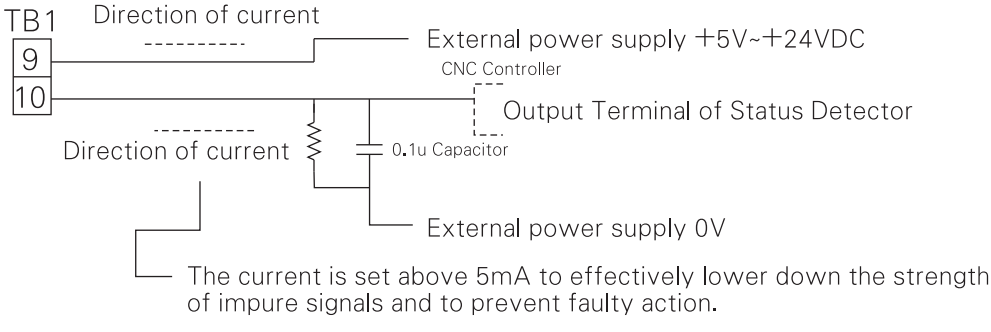
Example 1 : Situation judged as "OK" in Status "1" :



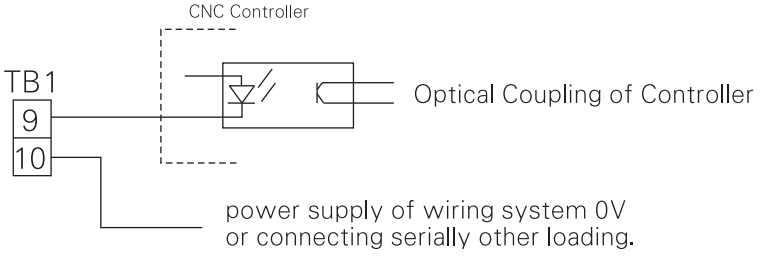
Example 2 : Situation judged as "OK" in Status "0" :



NOTE : Example 1 and 2

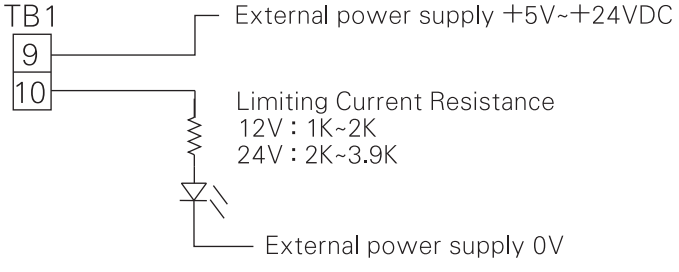


Example 3：Situation for Optical Coupling Motion of Controller：

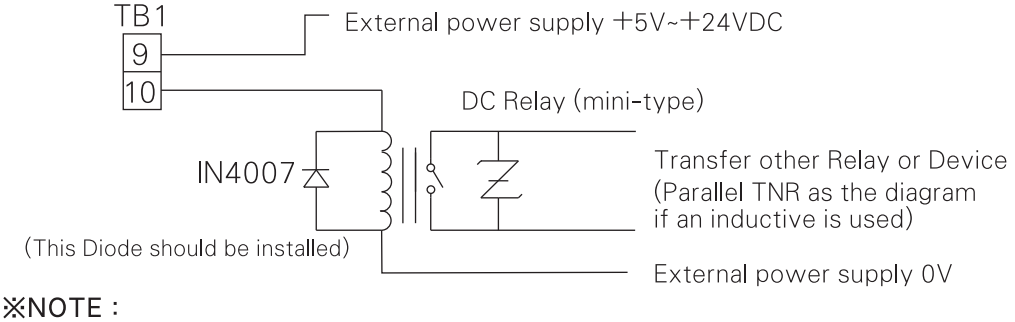


Example 4：Situation for Externally added Display or Alarm Device：

A. LED Display



B. Lights or Other Alarm Device, through Relay Transfer Method (DC Relay below 24VDC)



※NOTE：
The coil current of relay shold be confirmed because the input current for pin NO.9 and 10 should not exceed 60mA. Calculation of coil current of relay：

Continuous current of coil÷direct current resistance of coil (refer to the stated value or measured by triple-usage voltmeter)=coil current
E.g：If the continuous current of coil is 24V,direct current resistance of coil is 500 ohm. Then the value of coil current should be
24÷500=0.048(A)=48mA
Which means this Relay is appropriate.

Protective Functions and Status Instructions (LED Indicator)

(1) ENA Enabling Display (LED ON)：Enable driver's function.

(2) L+ Prositive Limit Display(LED ON)：
Indicate positive rotation limit is achieved,allow reverse roation only (RESET function is ineffective)

(3)L- Negative Limit Display (LED ON)：
Indicate negative rotation limit is achieved,allow reverse rotation only (RESET function is ineffective)

(4) O.L Overload Display and it's Reason(LED ON)：
These instructions includes O.L.、M.S. and O.H instructions.
(Please refer to page 24 Trouble-Shooting)

(A) O.L (Overload Display)

1. Overloading for a long-period of time
2. Loading exceeds the continuous current.(5~6 sec.)
3. Inappropriate acceleration/deceleration.
4. Loading exceeds the max current.(1.6 sec.)

(B) M.S (Motor Short-circuit Display)

1. Motor short-circuit.
2. Motor cable M+、M- short-circuit.
3. Motor malfunction.
4. Motor brushes were invaded by outside objects (The brush shall be disassembled and cleaned up.)
5. Impural signals are strong, the motor's F.G connections shall be inspected.

(C) O.H (Driver Overheated Display)

Note：80℃ over , below 65℃ will automatically reset.

1. The tempersture of operating environments is too high or poor ventilation (add fans to improve ventilation).
2. Overloading for a long-period of time (improper overload position adjustment).
3. Driver doesn't match with the specification of the motor.(The continuos current of the motor is bigger than that of the driver.
4. Regenerative voltage is abnormal (Deceleration time is too short.).

(5) T.F Abnormal Speed feedback Display (LED ON) :

Trip-off protections of abnormal speed feedback can be classiffollied into the following two categories.

(The trip-off protection at uncontrolled speed is OPTIONAL, the corresponding model code is F.)

1. First category : when the power supply voltages of main power U1,V1 reach lower limits, the trip-off protections will be activated (T.F LED on). The disconnection of main power supply is also included in this protetion function. When the fuses of main power on panel board is burn down or have connection problems or the voltage is close to or below AC25V, then motor will vibrate or accompanied with noises and intermittent stops in preliminary stage. If severly, it will treat as U1,V1 short -circuit and cause the trip-out T.F LED light on. After conditions being solved, reset to enabling automatically.(Build-in standard type).

Note : Main power fuse locates at the panel(Fuse 1 locates at L board), if fuse burns once heavy load applied,please check fuse specification. On the other hand, if fuse burns once load applied or Power on, and fuse likely to be seriously burned, it is potentially, the rectifier inside driver is damaged, please send to us for repairement.

2. Second category : trip-off protection at uncontrolled speed with T.F LED light on (the function of OPTIONAL F shall be installed if needed). Whether the function F is equipped or not, please refer to the instruction of trip-off protection on page 22. You can take it as the identification of operational abnormality or, if you're still doubtful of the listing items in the instructions, you can purchase the protective device at any times afterward. And please refer to the F function installation diagram of PC board on page 23 to customize installation by yourself, or to send it back to us to install for you. After problem is solved, don't forget to press RESET button for enabling reset function.

Note : Normally, when servo driver enable, T.F. Indicator light on, and motor complete motionless . It apperars and can be judged U1.V1. power supply ceased, fuse open, M+.M- wiring mistake or motor out of order. On the other hand, when driver enable, motor runs instantaneously then stop, at this time indicator of T.F. light on.It apperears and can be judged, T.G. wiring open, T.G wiring shorted or T.G. malfunction.

Adjustment Instructions (setting knobs on panel board) (please refer to adjustment instructions appendix)

1.ZERO Voltage Adjustment (also called Balance Adjustment and OFFSET Adjustment) (18-rotation type of long micro-variable resistor) :

When V command is setup to 0, the motor shall be in HOLIDING status. If rotation still occurs, the setting knob shall be adjusted either in clockwise or counterclockwise direction to set motor's speed to be zero.(If OFFSET floats abnormally, the voltage command and the isolation effect of speed feedback signal shall be inspected or improved.)

2.SPEED Adjustment (18-rotation type of long micro-variable)(Proportion Gain) It is internal speed defined adjustments, in other words, speed instructions from the external shall be limited here as maximum speed limit.

Clockwise direction=decelerate rotation speed
Counterclockwise direction = accelerate rotation speed

3.AC.G Dynamic Respond Adjustment (250° rectangular micro-adjustment Variable resistor.)
When the speed of motor comes into stable status (forexample : accelerate to constant speed or reduce speed to 0 at the fixed point), owing to different moment of inertia and the resonance frequency of motors, the following situations might occur :

1. When speed changes into stable status, the swinging and rushing phenomena or shaking occur during operation. It is due to motor's dynamic gain being too low. Please adjust AC.G in clockwise direction until the phenomena will not occur again.
2. When speed changes into stable status, but motor has humming sound (The motor and driver will be overheated if the sound continues). It is due to motor's dynamic gain being too high. Please adjust AC.G in counterclockwise direction until the humming sound stops. But it shall not be over-adjusted or, otherwise when in fixed points, it will be rushing and shaking again.

Clockwise direction = increase gain
Counterclockwise direction = decrease gain

(In order to enhance the dynamic following precision and operation stability,the adjustments of AC.G shall comply with GAIN values.)

4.DC.G Adjustment of Servo Response (250° rectangular micro-variable resistor) :

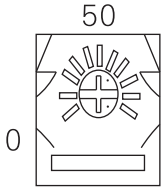
When delivered from factory, the response was set in the maximum value. If the machine vibrate dramatically during start-up and stop operation, or if the high frequency trembling and overheating occur in un-loaded holding status, the response can be reduced to release the above phenomena. But if the value is adjusted too low, the condition of poor response and weakenholding can be occure. (The signal interference of voltage command and speed feedback signals will often cause high frequency trembling, therefore, the isolation measures shall be properly performed before adjusting response.)

Clockwise direction = increase response
Counterclockwise direction = decrease response

(In order to increase the positioning precision and the stability of motor's HOLDING status, the adjustments of AC.G shall comply with GAIN values.)

Appendix of Adjustments Instructions

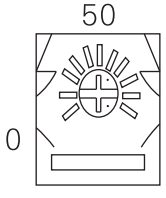
AC.G Dynamic Response Adjustment



If the motor is purchased from our company, it shall be set in optimal condition when delivered from factory. However, if the motor is purchased through other sources, it will be set in 50% position.

Note : Each model's loading conditions are different, for better soothing motion and higher dynamic following precision, it shall be referred to the previous page of " Dynamic Respones Adjustments " for adjustment.(Before adjusting, the proper RPM shall be defined)

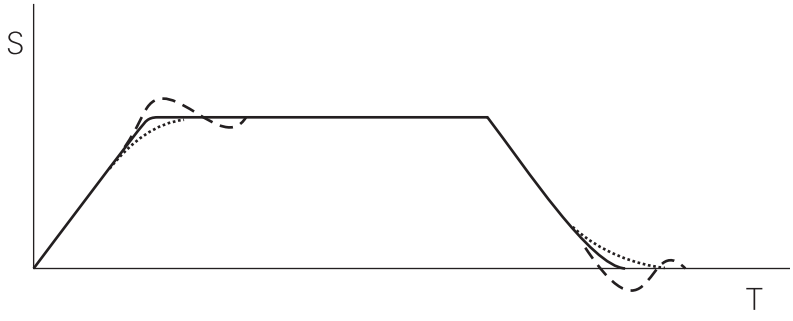
DC.G Servo Response Adjustment



If the motor is purchased from our commpany, it shall be set in optimal condition when delivered from factory. However, if the motor is purchased through other sources, it will be set in 100% position. (The maximum stiffness)

Note : Occasions of friction coefficient is different, for better position precision and motor's stability, it shall be referred to the previous page of " Servo Stiffness Adjustment " for proper adjustments.

AC.G Adujstment Reference Diagram

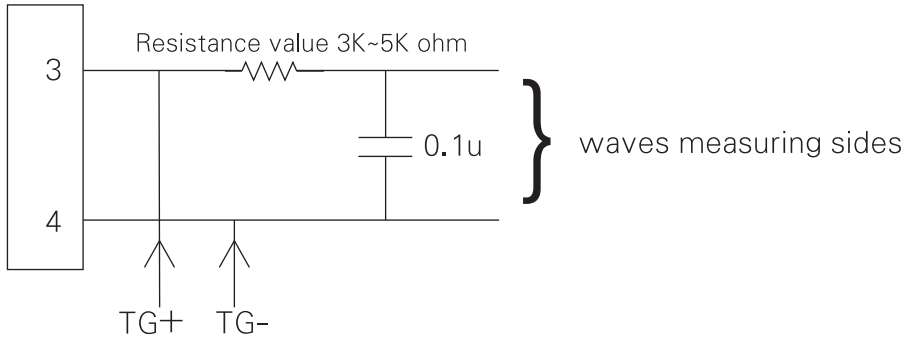


- - - - - - - - - - - - - Strategy : Rotate in clockwise direction to increase GAIN value and to improve the overriding phenomena in the left figure.

——————————— Fair

..... Strategy : Rotate in counter clockwise direction to decrease GAIN and to improve Lagging phenomenon in the left figure.

NOTE : Suggested measuring methods Illustrations



Trip-off protection at abnormal feedback：option F (OPTIONAL)

To those control systems that cannot provide protection of trip-off at feedback abnormal or can not provide trip-off protections in the overall process：

Example：the protection of trip-off at feedback abnormal cann't provided before setting controller's variables, or, system's detective function is ineffective when the controller loses of control,etc. For the above conditions, user must use this function to further protect the safety of operators and machine.

The F function display is installed in (T.F) and the LED indicator is commonly indicates several functions. The following conditions can lead to trip-off at feedback abnormal (T.F light on)：

(after the conditions are resolved, push RESET button to restart the enabling function.)

1. T.G wire +/- connected wrongly：kicking or short moving and then stopped, the T.F light on.
   (If without F function, kicking will continue and T.F ineffective.)

2. T.G wire +/- short-circuit：kicking or short moving and then stopped, the T.F light on.
   (If without F function, kicking will continue and T.F ineffective.)

3. T.G wiring disconnected ：kicking or short moving and then stoped, the T.F light on.
   (If without F function, kicking will continue and T.F ineffective.)

4. T.G out of order (T.G voltage signals no output or unstable stop-and-continue outputs)：
   kicking or short moving and then stopped, the T.F light on.
   (If without F function, kicking will continue or intermittent kicking , T.F ineffective.)

5. F/V function out of order (digital devices to convert into analog signals)：
   kicking or short moving and then stopped, the T.F light on.(If without F function, shaking will continue, especially in low speeds, or continuous kicking, T.F ineffective.)

6. F/V poor signals (digital devices to convert into analog signals)：
   kicking or short moving and then stopped, the T.F light on.(If without F function, shaking will continue, especially in low speeds, or continuous kicking, T.F ineffective.)

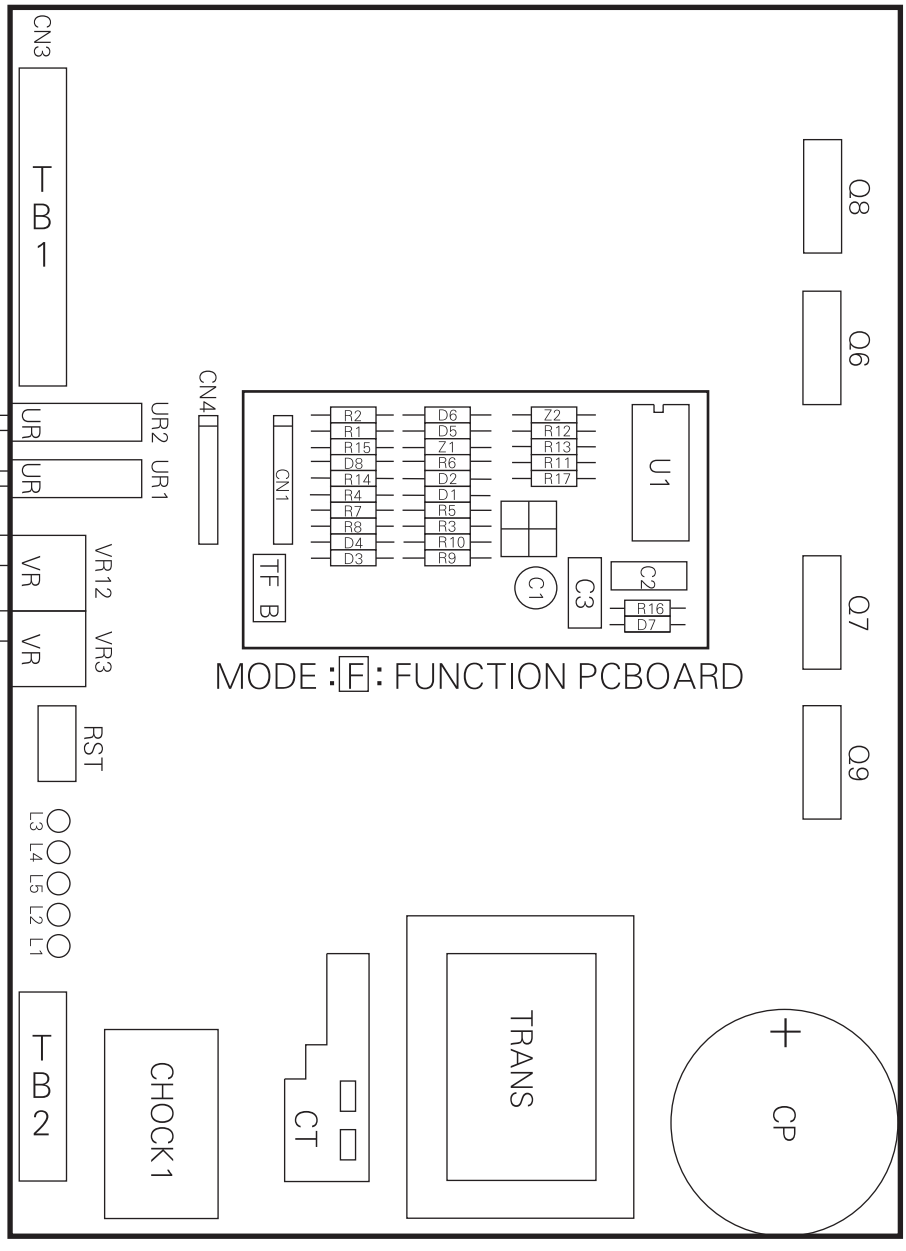
7. M+, M- poor output wiring or disconnected：motor cannot move, T.F light on
   (If without F function, the panel board is normal, but motor is motionless intermittent stopping, T.F ineffective.)

8. Motor damaged：e.g. armature breakdown, poor armature, and armature with excess wear, or oil invading to motor brushes or T.G brushes which makes motor motionless or speeds unstable, motor instantly trip-off and T.F light on.
   (If without F function , speed will be uncontrollable and motor cannot lock, floating continuously, T.F ineffective)

Note：for those without F function, please refer to the above instructions and page 18,item 5 abnormal speed feedback, to handle the inspection and identification of normal conditions.

Please refer to the next page to obtain the PC board layout illustration of F function.

STANDARD FUNCTION :
FEED BACK FAILED (OPTIONAL) MODE : F



MODE : F : FUNCTION PCBOARD

Trouble-shooting

To provide detailed explanations of previous instructions, most of the inspection and disposition instructions of abnormal operation are described in previous pages. The following descriptions shall only provide as references as inspecting procedures of abnormal condition. If you have further questions, please fax them directly to our service section with the number of 886-4-22830909, the service personnel shall provide prompt services.

Cannot Operate	All LED lights are off	(1) Please refer to the power supply instructions on page 6 to ensure supplying power is accordant with specification. (2) please refer to page 4, inspect the fuse on PC panel board is normal or not. (3) The 7th (+15V) and the 8th PIN (-15V) of TB1 don't be connected with the 4th or the 12th PIN of TB1.
	ENA light on	indicate the function is enabled : (1) inspect command voltage is normal or not. (2) the speed of driver was adjusted to be 0.
	L+ or L- light on	indicate the limitation in that direction is achieved and can only rotate reversibly. If there is no need to use the function, the 5th and 6th PIN of TB1 shall-circuited.
	O.L light on M.S light on O.H light on	These instructions include O.L、M.S and O.H light instructions. Please follow the instructions to inspect the problems. (1) When ENA light is on, please refer to the 4-B on page17. (motor short circuit instructions.) (2) Light on in turning or motor run negatively after the command, take effect for a short time after pressing RESET . Please refer the item 4-A of page 17. (3) Reset negatively, while turning a length of time. Please refer the item 4-C of page 17.
	T.F light on	refer to the item 5 on page 18 and page 22. If the function is not added in, you still can follow this instruction to inspect and identify the problems.
	All the M.O.H,L+,L- lights on	Please check out the drive of FG wiring condition. (FG of motor should connected them individually.)

Trouble-shooting

Kicking	(1) If added F function, kicking shall be stopped and T.F light on. If kicking continues, inspect command voltage is normal or not. (2) If without F function, T.F light off. But whether have the F function or not ，please refer to the item 5 on page 18 and page 22 to inspect command voltage in normal conditions or not.
High Frequency Vibration	(1) Refer to the item 3 on page 19,item 4 on page 22. (2) The high frequency vibration will damage motor and its ofetime. please pay attention on this problem.
Motor Continuous Shaking	(1) Please refer to the item 3 on page 19, the item 4&7&8 on page 22. (2) For using F/V to replace T.G ： if the linear manipulation of current signal is poor or GAIN values setting is abnormal, it shall be shaking on and, if severely, be swinging back and forth.
Motor Continuous Swinging	(1) Refer to the item 8 on page 22. (2) Refer to the item 3-1 on page 19. (3) If there is severe OFFSET deviation, refer to the item 1 on page 19 to adjust and modify. (4) Voltage command abnormal. (5) DC.G abnormally strong , it shall be reduced to improve.
Poor Positioning Precision	(1) Refer to the item 4 on page 19. (2) Refer to the item 3 on page 19, slightly increase AC.G can improve It .(over-adjusted shall be avoided, otherwise the motor will have high frequency vibration.) (3) In spect transmission mechanisms. (4) The matching of motor specification is proper or not.
Zero Shifted	(1) Check the T.G. and V-COM signal wire are separate. (2) Give the signal-phase command, when V-COM's deviation is too large. (3) Check that the adjustment of driver Zero and DC Gain is proper or not. (First, adjustment DC GAIN to test the response of motor, them adjust ZERO till stable.)

CDS SERVO

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