NEL-SYSTEM

DR / HR8500-III

ALIGNER

TROUBLESHOOTING MANUAL

Note to Users

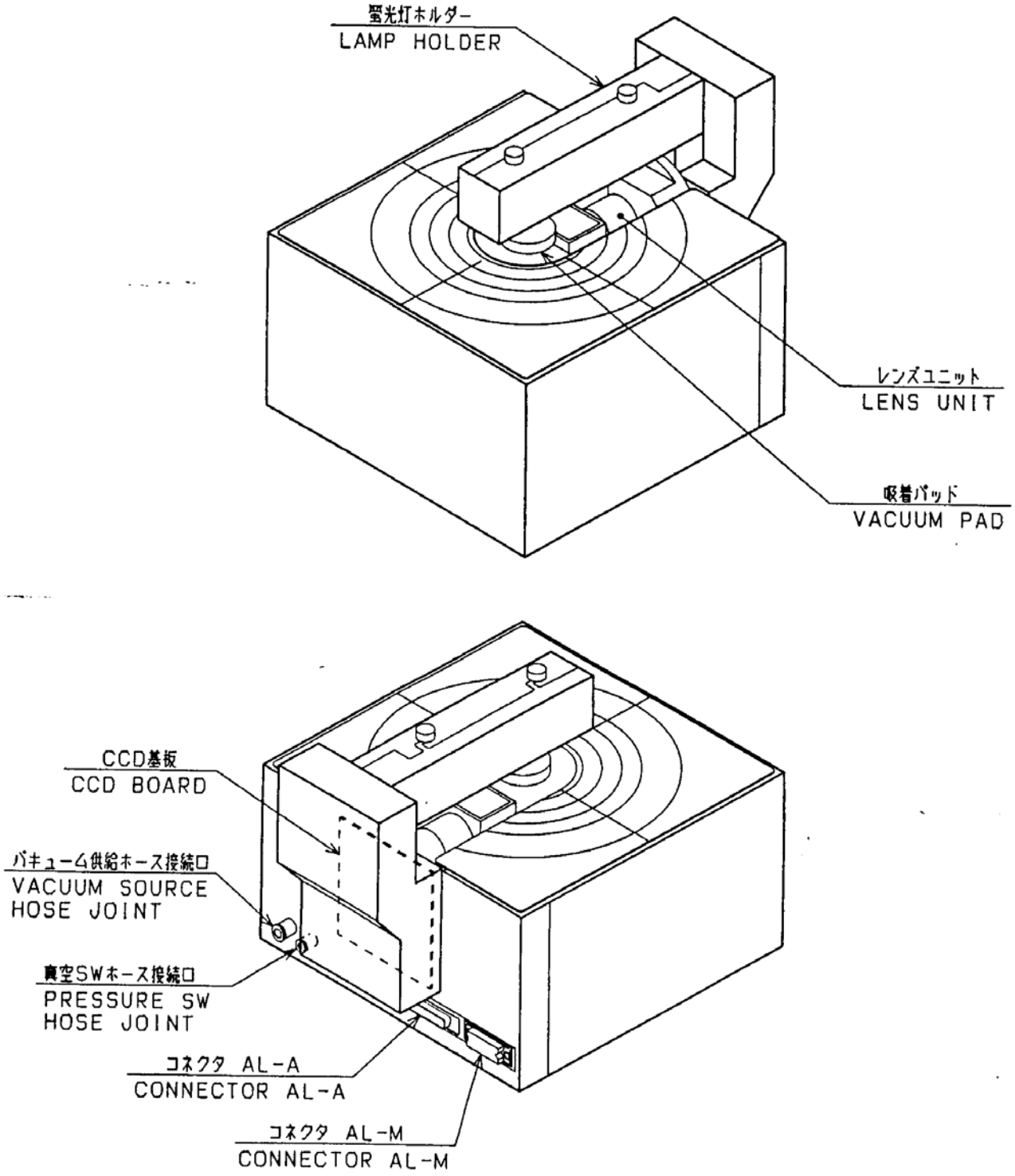
This manual contains explanation for the troubleshooting procedures of Aligner.
This manual is written for maintenance engineers.
You must read the DR/HR8500-III instruction manuals and this troubleshooting manual thoroughly before using the machine.

CONTENTS

1. Outline of Aligner

1.1 The external view of Aligner

The external view is as follows.



1.2 The internal structure of Aligner

The internal view of Robot is shown in the next pages.

Aligner has X, Y axes stage and a chucking pad stage located on the X, Y axes stage.

The chucking pad stage is moved in X, Y axes directions by X-axis and Y-axis stepping motors respectively.

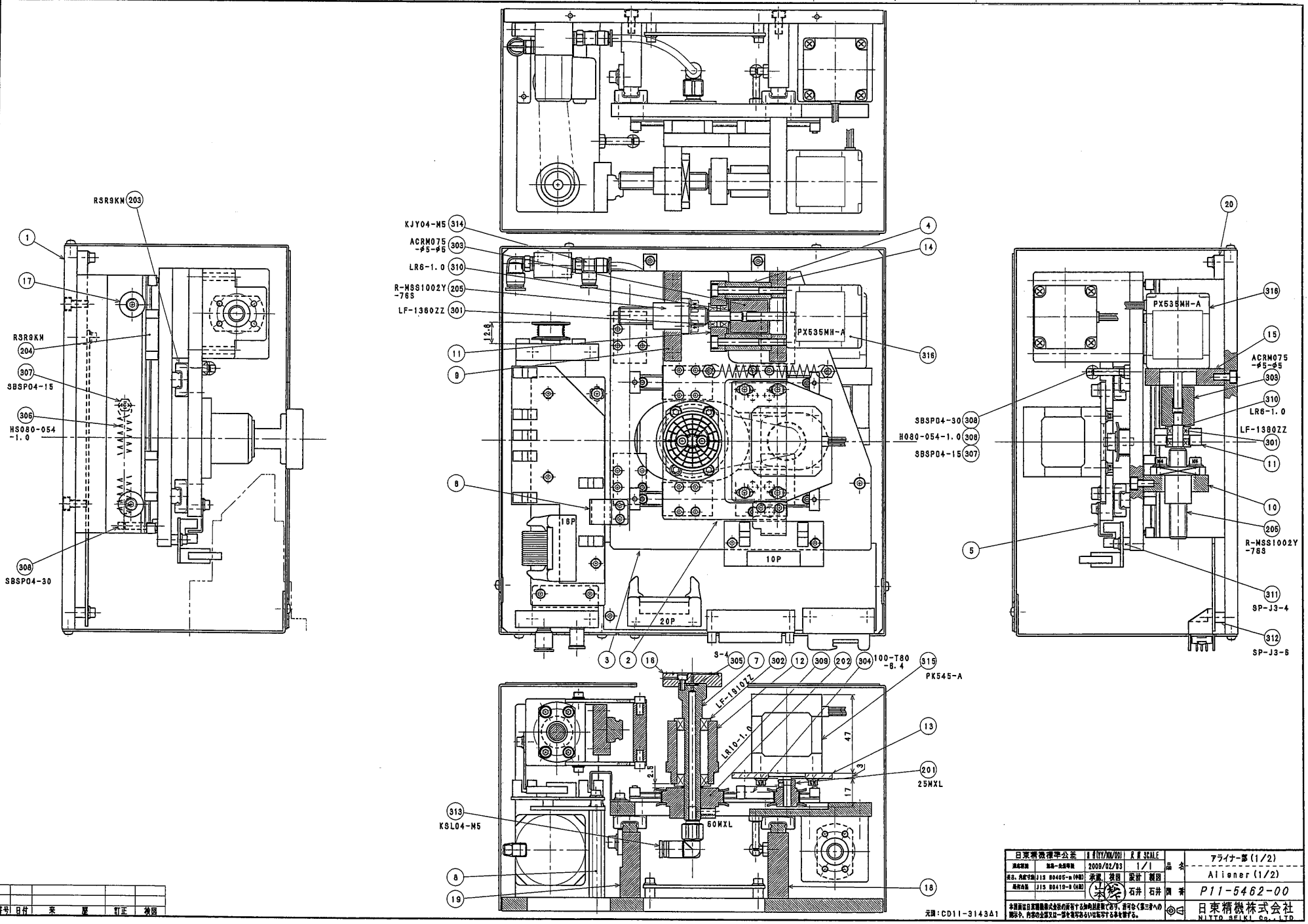
The chucking pad is turned in T-axis direction by T-axis stepping motor.

A wafer is chucked on the chucking pad by two solenoid valves mounted within and without Aligner.

Lens section, which is engaged to the AC motor by the boll screw, is moved by the AC motor.

A positioning of origin for the chucking pad stage and lens section are the origin sensors on the Y-axis sensor board and the size switching sensor board.

An aligner of O.F or V-notch is done by CCD line sensor.



記号	日付	来歴	訂正	検図

日東精機標準公差		年月日(YY/MM/DD)		R 尺 SCALE	品名	アライナー部(1/2)
適応範囲	製図一般寸法	2009/02/03		1/1		Aligner(1/2)
表示、角度寸法	JIS B0405-m(中級)	承認	検図	設計	製図	
幾何公差	JIS B0419-B(B級)			石井	石井	図番 P11-5462-00

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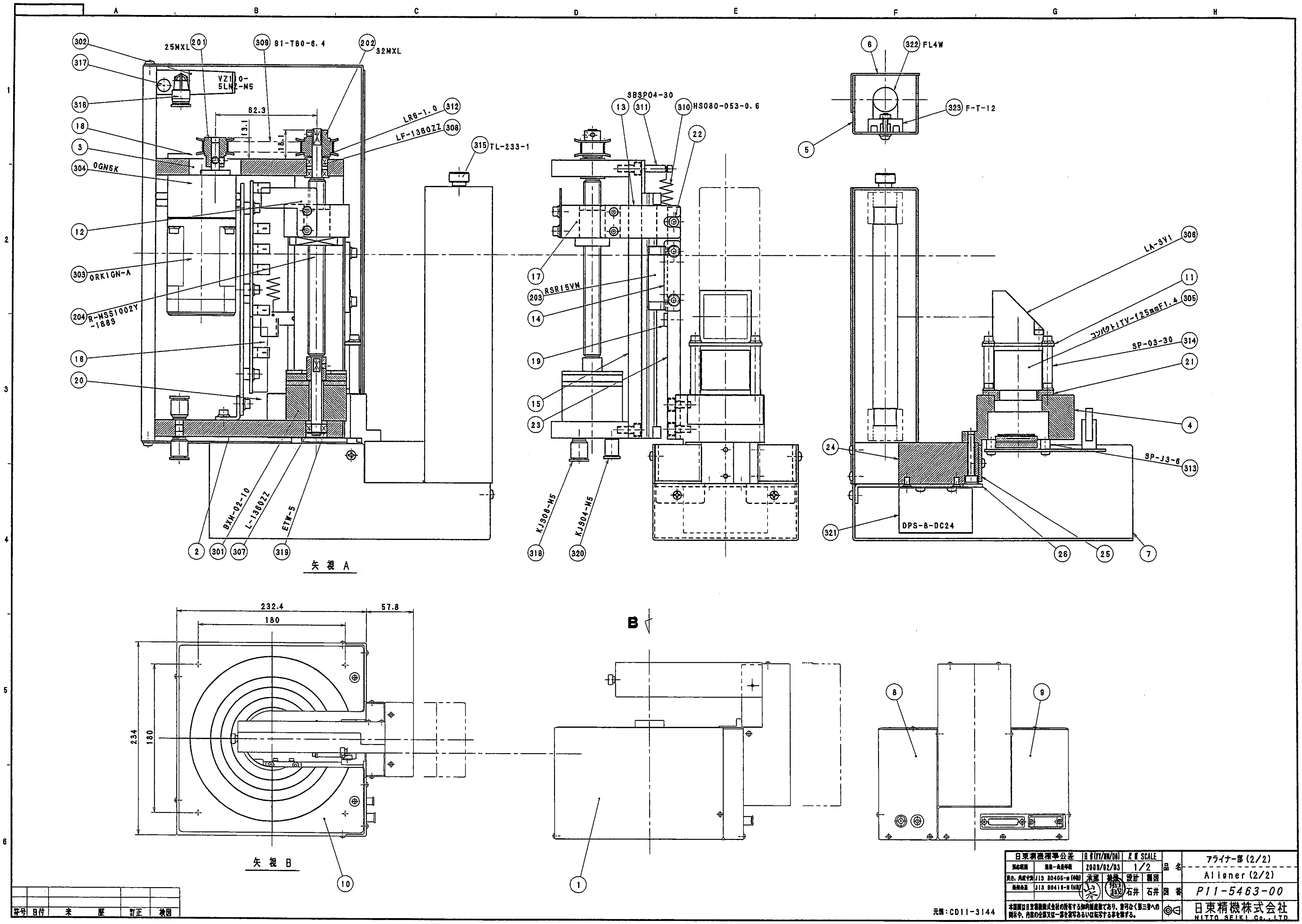
日東精機株式会社
NITTO SEIKI Co., LTD

元図:CD11-3143A1

Machine Type	DR/HR8500
Unit	ALIGNER
Drawing No.	P11-5462-00

No.	Part No.	Dwg No.	#	Part Name	Type	Manufacturer	Q'ty	メモ
001	22142901	CD22-1429-00	01	ﾍﾞｰｽﾌﾟﾚｰﾄ		日東	1	
002	3764250001	P37-6425-00	01	ﾃｰﾌﾞﾙ(A)		日東	1	
003	34872601	CD34-8726-02	01	ﾃｰﾌﾞﾙ(B)		日東	1	
004	43749601	CD43-7496-00	01	ｶﾗｰ		日東	4	
005	43749801	CD43-7498-01	01	遮光板(A)		日東	1	
006	43749901	CD43-7499-01	01	遮光板(B)		日東	1	
007	43750001	CD43-7500-01	01	ｼｬﾌﾄ		日東	1	
008	43750301	CD43-7503-00	01	ｾﾝｻｰｽﾃｰ		日東	1	
009	4979850001	P49-7985-00	01	ﾅｯﾄﾌﾞﾗｹｯﾄ(A)		日東	1	
010	4979830001	P49-7983-00	01	ﾅｯﾄﾌﾞﾗｹｯﾄ(B)		日東	1	
011	4375080101	CD43-7508-01	01	ﾍﾞｱﾘﾝｸﾞﾌﾞﾛｯｸ		日東	2	
012	43750901	CD43-7509-01	01	ﾍﾞｱﾘﾝｸﾞﾌﾞﾊｳｼﾞﾝｸﾞ		日東	1	
013	4972650001	P49-7265-00	01	ﾓｰﾀｰ取付板		日東	1	
014	43751101	CD43-7511-01	01	ﾓｰﾀｰﾌﾞﾗｹｯﾄ(A)		日東	1	
015	43751201	CD43-7512-00	01	ﾓｰﾀｰﾌﾞﾗｹｯﾄ(B)		日東	1	
016	4979880001	P49-7988-00	01	吸着ﾊﾟｯﾄﾞ		日東	1	
017	43759501	CD43-7595-00	01	ｽﾄｯﾊﾟｰ(A)		日東	2	
018	43760301	CD43-7603-00	01	ﾗｲﾅｰ(A)		日東	1	
019	43760401	CD43-7604-01	01	ﾗｲﾅｰ(B)		日東	1	
020	43763101	CD43-7631-00	01	ﾗｲﾅ		日東	1	
201	43749701	CD43-7497-02	01	駆動ﾌﾟｰﾘｰ	25MXL6.4-B	三ツ星	1	
202	43750701	CD43-7507-01	01	ﾀｲﾐﾝｸﾞﾌﾟｰﾘｰ(B)	60MXL6.4-B	三ツ星	1	
203	43749401	CD43-7494-00	01	LMｶﾞｲﾄﾞ	2RSR9KMA+115LM-Ⅱ	THK	2	
204	43749501	CD43-7495-00	01	LMｶﾞｲﾄﾞ	2RSR9KMA+155LM-Ⅱ	THK	2	
205	4979980001	P49-7998-00	01	ｽﾍﾞﾘﾈｼﾞ	R-MSS1002Y-76S	森本精密	2	
301	B30038			ﾍﾞｱﾘﾝｸﾞ	DDLF-1360ZZ	NMB	4	
302	B30144			ﾍﾞｱﾘﾝｸﾞ	DDLF-1910ZZ	NMB	2	
303	B52039			ｶｯﾌﾟﾘﾝｸﾞ	ACRM075-5-5	ﾐｷﾌﾟｰﾘ	2	
304	B45088			ﾀｲﾐﾝｸﾞﾍﾞﾙﾄ	100-T80-6.4	三ツ星	1	
305	B20043			Oﾘﾝｸﾞ	S-4(C0 0501A)	NOK	1	
306	A0000762			ﾊﾞﾈ	HS080-054-1.0	ｻﾝｴｽ	2	
307	B60019			ﾊﾞﾈ用ﾎﾟｽﾄ	SBSPO4-15	ﾐｽﾐ	2	
308	B84924			ﾊﾞﾈ掛ｹ	SBSPO4-30	ﾐｽﾐ	2	
309	B56021			ﾜｯｼｬ	LRB10-1.0	ﾐｽﾐ	1	
310	B56022			ﾜｯｼｬ	LRB6-1.0	ﾐｽﾐ	2	
311	B56015			ﾊﾟｲﾌﾟｽﾍﾟｰｻ	SP-J3-4	ﾐｽﾐ	5	
312	B56016			ﾊﾟｲﾌﾟｽﾍﾟｰｻ	SP-J3-6	ﾐｽﾐ	6	
313	B85011			ｴｱｰﾂｷﾞﾃ ｴﾙﾎﾞﾕﾆｵﾝ	KSL04-M5	SMC	2	
314	A0000763			ｴｱｰﾂｷﾞﾃ ｻｰﾋﾞｽﾁｰｽﾞﾕﾆｵﾝ	KJY04-M5	SMC	1	
315	A0004682			ｽﾃｯﾋﾟﾝｸﾞﾓｰﾀｰ	PK545-A	ｵﾘｴﾝﾀﾙ	1	
316	B06086			ｽﾃｯﾋﾟﾝｸﾞﾓｰﾀｰ	PX535MH-A	ｵﾘｴﾝﾀﾙ	2	

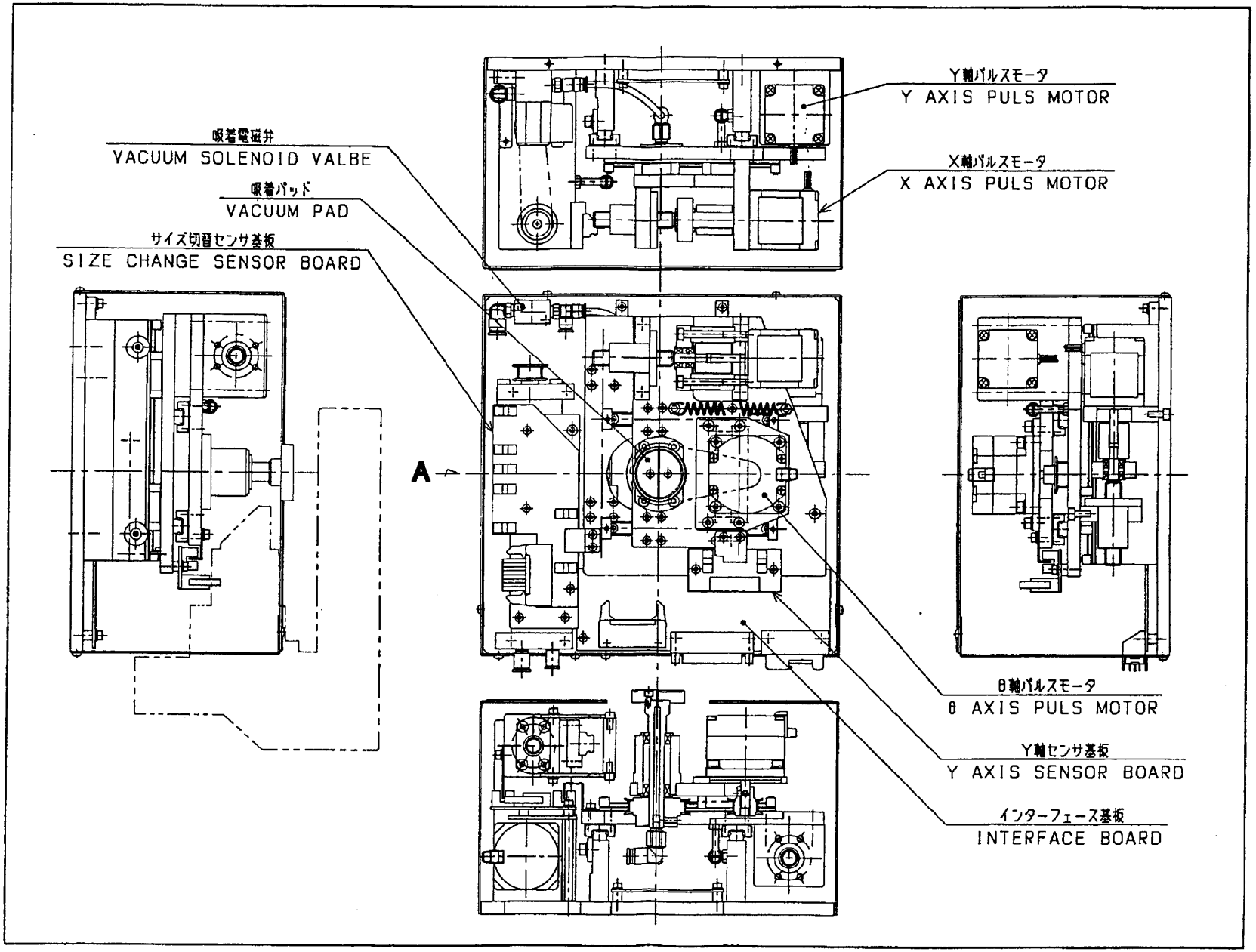


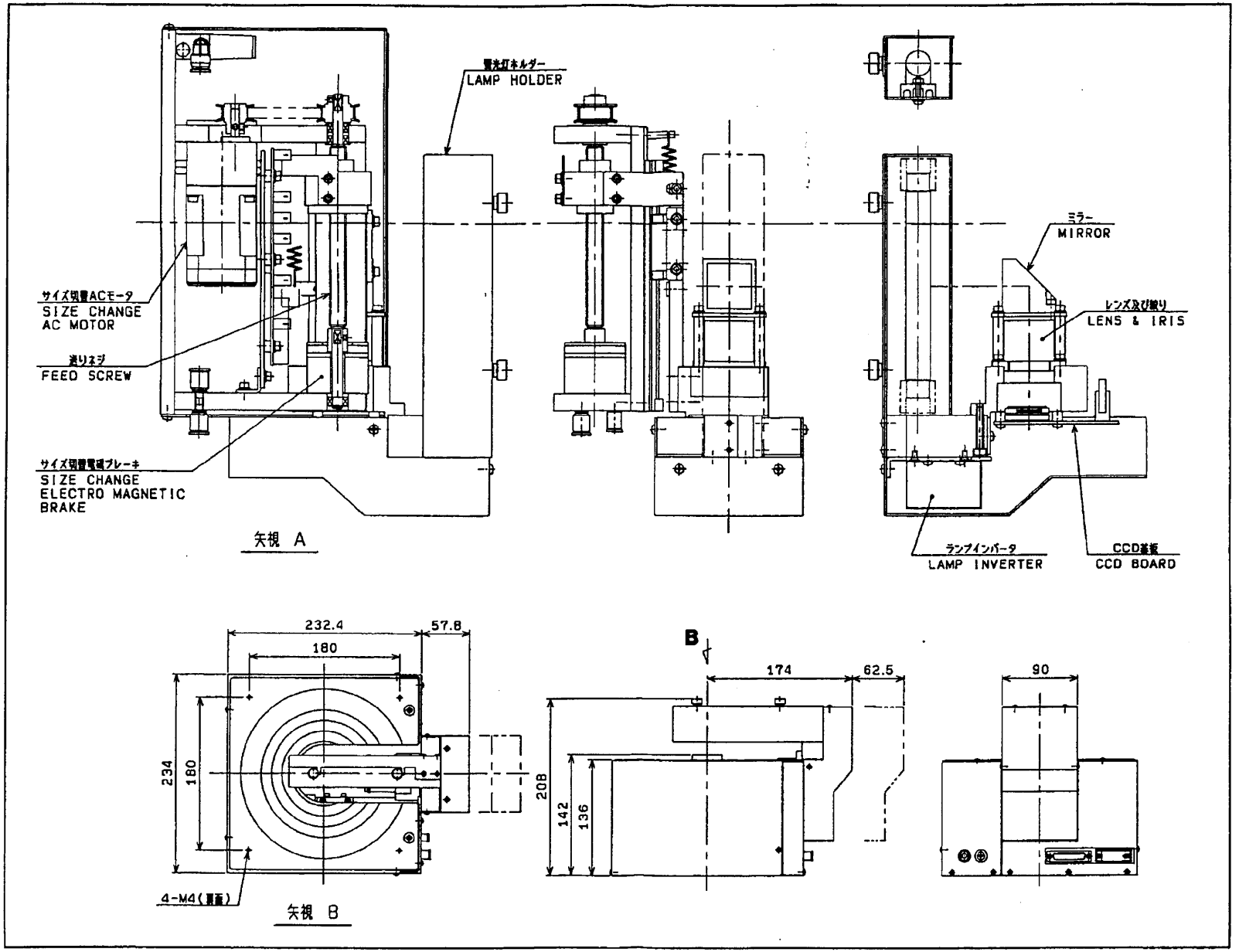
25MXL
VZ110-5LNZ-M5
S1-T80-6.4
32MXL
62.3
13.1
16.1
LRG-1.0
LF-1360ZZ
TL-233-1
OGN5K
ORK1GN-A
R-MSS1002Y-188S
BXM-02-10
L-1360ZZ
ETW-5
矢視 A
SBSP04-30
HS080-053-0.6
RSR15VN
KJ908-M5
KJ904-M5
FL4W
F-T-12
LA-SV1
コンパクトITV-f25mmF1.4
SP-03-30
SP-J3-6
DPS-8-DC24
232.4
57.8
180
234
矢視 B
B
元図:CD11-3144
日東精機標準公差
1/2
2009/02/03
アライナー部(2/2)
Aligner(2/2)
石井
P11-5463-00
日東精機株式会社
NITTO SEIKI Co., LTD
符号 日付 来歴 訂正 検図

Machine Type	DR/HR8500
Unit	ALIGNER
Drawing No.	P11-5463-00

No.	Part No.	Dwg No.	#	Part Name	Type	Manufacturer	Q'ty	メモ
001	22143501	CD22-1435-01	01	メインカバー		日東	1	
002	34872401	CD34-8724-02	01	スタンド(A)		日東	1	
003	34872501	CD34-8725-01	01	スタンド(B)		日東	1	
004	34875401	CD34-8754-03	01	CCDハウジング		日東	1	
005	36692801	CD36-6928-00	01	ランプカバー(A)		日東	1	
006	36692901	CD36-6929-00	01	ランプカバー(B)		日東	1	
007	3766690001	P37-6669-00	01	CCDカバー		日東	1	
008	34875801	CD34-8758-01	01	リアカバー(A)		日東	1	
009	34875901	CD34-8759-01	01	リアカバー(B)		日東	1	
010	34876001	CD34-8760-01	01	位置決板		日東	1	
011	43759201	CD43-7592-00	01	サイドビュープレート		日東	1	
012	43759301	CD43-7593-02	01	遮光板		日東	1	
013	43759401	CD43-7594-03	01	ジョイントプレート		日東	2	
014	43759601	CD43-7596-00	01	ストッパー(B)		日東	1	
015	43759701	CD43-7597-00	01	スライドベース		日東	1	
016	43759801	CD43-7598-01	01	センサーベース		日東	1	
017	4979800001	P49-7980-00	01	ナットブラケット(C)		日東	1	
018	43760001	CD43-7600-00	01	ナットプレート		日東	2	
019	43760101	CD43-7601-01	01	バネ掛けプレート		日東	1	
020	43760201	CD43-7602-01	01	ブラケット		日東	1	
021	43760501	CD43-7605-01	01	レンズマウント		日東	1	
022	43763001	CD43-7630-01	01	ジョイントピン		日東	2	
023	43762601	CD43-7626-01	01	スライドプレート		日東	1	
024	36693201	CD36-6932-00	01	ランプスタンド		日東	1	
025	43762801	CD43-7628-01	01	カバーブラケット		日東	1	
026	4973500001	P49-7350-00	01	ランプインバータ取付板		日東	1	
201	43749701	CD43-7497-02	01	駆動プーリー(A)	25MXL6.4-B	三ツ星	1	
202	43750601	CD43-7506-01	01	タイミングプーリー(A)	32MXL6.4-B	三ツ星	1	
203	43759001	CD43-7590-00	01	LMガイド	RSR15VMC1+150LHM	THK	1	
204	4979970001	P49-7997-00	01	スペリネジ	R-MSS1002Y-188S	森本精密	1	
301	B53059			デンジブレーキ	BXM-02-10 DC24V	ミキプーリ	1	
302	B11066			デンジベン	VZ110-5LNZ-M5	SMC	1	
303	B02004			リバーシブルモーター	0RK1GN-A	オリエンタル	1	
304	A0005178			ギヤヘッド	0GN5K	オリエンタル	1	
305	B80020			レンズ	コンパクトITV-F25MMF1.4	サカイガラス	1	
306	B25144			サイドビューアタッチメント	LA-SV1	サンクス	1	
307	B30035			ベアリング	DDL-1360ZZ	NMB	1	
308	B30038			ベアリング	DDLF-1360ZZ	NMB	2	
309	B45087			タイミングベルト	91-T80-6.4	三ツ星	1	
310	A0000761			バネ	HS080-053-0.6	サンエス	1	

311	B84924			ﾊﾞﾈ掛ｹ	SBSPO4-30	ﾐｽﾐ	1	
312	B56022			ﾜｯｼｬ	LRB6-1.0	ﾐｽﾐ	1	
313	B56016			ﾊﾟｲﾌﾟｽﾍﾟｰｻ	SP-J3-6	ﾐｽﾐ	4	
314	B56017			ﾊﾟｲﾌﾟｽﾍﾟｰｻ	SP-O3-30	ﾐｽﾐ	4	
315	B63131			ﾂﾏﾐﾂｷﾈｼﾞ	TL-233-1	栃木屋	2	
316	B17714			ｴｱｰﾂｷﾞﾃ ｴﾙﾎﾞﾕﾆｵﾝ	KJL06-M5	SMC	1	
317	B17303			ﾏﾌﾗｰ	AN120-M5	SMC	1	
318	B17706			ｴｱｰﾂｷﾞﾃ 6ｶｸｱﾅﾂｷﾊｰﾌﾕﾆｵﾝ	KJS06-M5	SMC	2	
319	B61014			Eﾘﾝｸﾞ	ETW-5(SUS)	落合	1	
320	B17704			ｴｱｰﾂｷﾞﾃ 6ｶｸｱﾅﾂｷﾊｰﾌﾕﾆｵﾝ	KJS04-M5	SMC	2	
321	E04447			ﾗﾝﾌﾟｲﾝﾊﾞｰﾀｰ	DPS-8-DC24	ｴｽﾃﾞﾝ	1	
322	B76141			ﾗﾝﾌﾟ	FL4W NS（白）	松下電器	1	
323	B76144			ﾗﾝﾌﾟｿｹｯﾄ	F-T-12	松下電器	2	


Y軸パルスモータ
Y AXIS PULS MOTOR
X軸パルスモータ
X AXIS PULS MOTOR
吸着電磁弁
VACUUM SOLENOID VALBE
吸着パッド
VACUUM PAD
サイズ切替センサ基板
SIZE CHANGE SENSOR BOARD
A
θ軸パルスモータ
θ AXIS PULS MOTOR
Y軸センサ基板
Y AXIS SENSOR BOARD
インターフェース基板
INTERFACE BOARD


蛍光灯ホルダー
LAMP HOLDER
サイズ切替ACモータ
SIZE CHANGE
AC MOTOR
送りネジ
FEED SCREW
サイズ切替電磁ブレーキ
SIZE CHANGE
ELECTRO MAGNETIC
BRAKE
矢視 A
ミラー
MIRROR
レンズ及び絞り
LENS & IRIS
ランプインバータ
LAMP INVERTER
CCD基板
CCD BOARD
232.4
57.8
180
234
180
4-M4(裏面)
矢視 B
B
174
62.5
208
142
136
90

1.3 Robot electrical and mechanical data

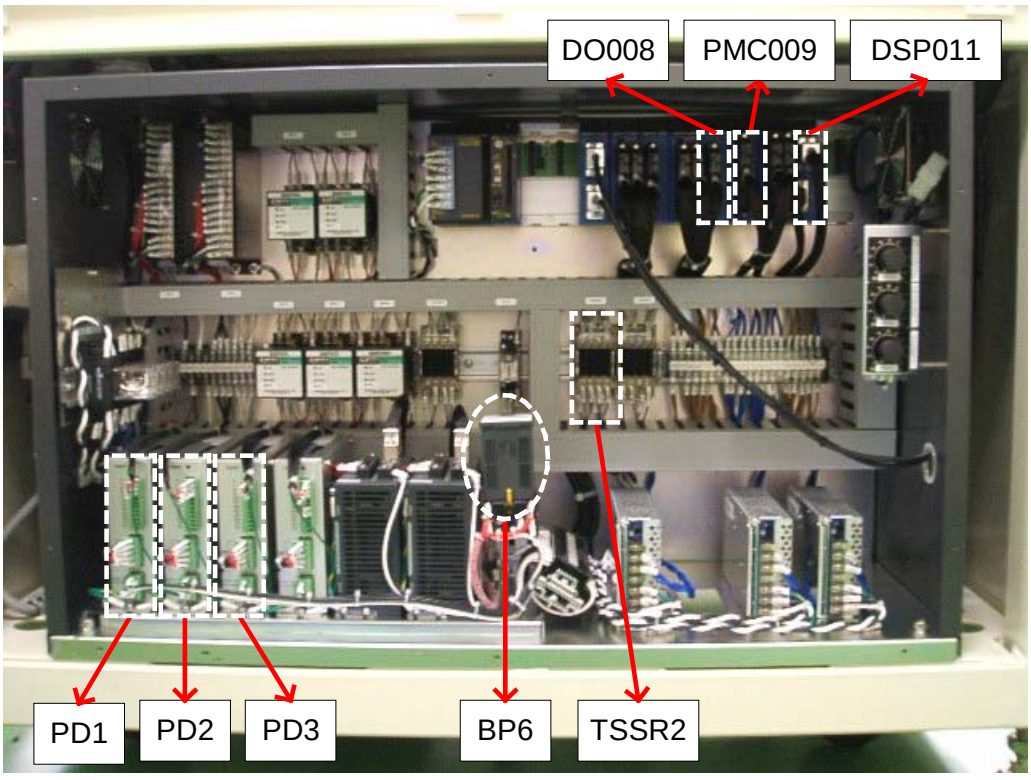
The robot operations are as follows.

	R-axis	Θ-axis	Z-axis
Maximum travel	230mm	333 degrees	185mm
Resolving power per pulse	0.0271mm (FULL)	0.0072 degrees (HALF)	0.0125mm (HALF)
Encoder count per pulse	1 count	1 count	0.5 count
Repeat accuracy	2μm	0.002 degrees	1μm

1.4 Hardware layout (Block diagram)

The layout in the control box and the connection between Aligner and the control box are as follows.
Block diagram is shown in the next page.

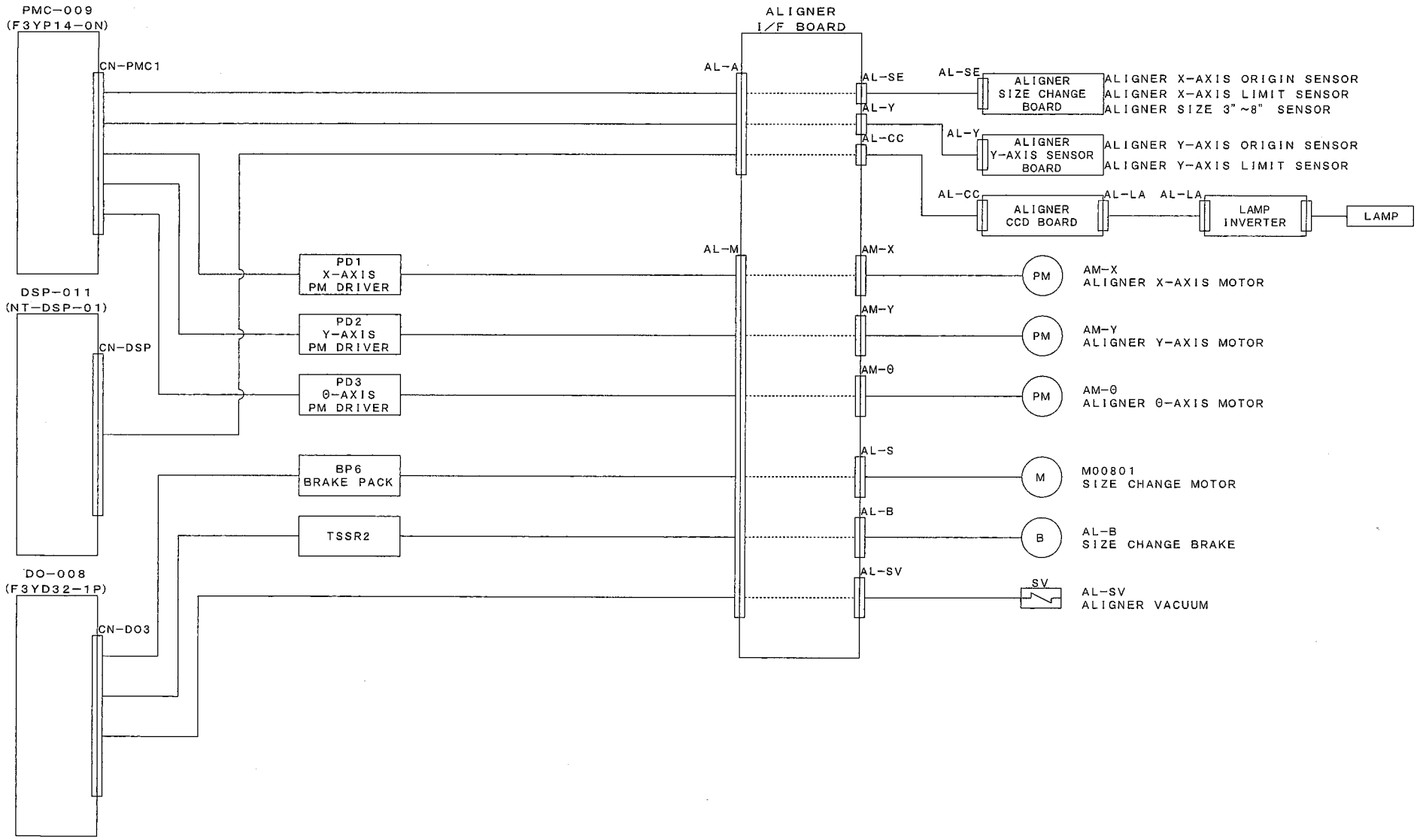
PD1: X-axis driver
PD2: Y-axis driver
PD3: θ-axis driver
BP6: Size-switching brake pack



PARTS LIST

rev.	Symbol	Description	Model	Maker	QTY	Parts No
	PMC-009	位置決めﾓｼﾞｭｰﾙ	F3YP14-0N	横河	1	E01712
	CN-PMC1	圧着ｺﾈｸﾀﾊｳｼﾞﾝｸﾞ	FCN-363J048	富士通	1	E09539
		ｺﾈｸﾀｶﾊﾞｰ	FCN-360C048-B	富士通	1	E09540
	AL-A	ｺﾈｸﾀ	HDBB-25P	ﾋﾛｾ	1	E09123
		D-SUBｶﾊﾞｰ	HDB-CTF	ﾋﾛｾ	1	E11056
	AL-SE	ｺﾈｸﾀ	PS-16SM-D4PI-ID	日本航空電子	2	E09070
	AL-Y	ｺﾈｸﾀ	PS-10SM-D4PI-ID	日本航空電子	1	E09068
	AL-M	ｺﾈｸﾀ	SC-1628	ﾋﾛｾ	1	E09142
		ﾌﾟﾗｸﾞｹｰｽ	P-1628A-CA(20)	ﾋﾛｾ	1	E09131
		ｺﾝﾀｸﾄ	SC-1600-112	ﾋﾛｾ	28	E09151
	AM-X,Y,θ	ｿｹｯﾄﾊｳｼﾞﾝｸﾞ	IL-5S-S3L-(N)	日本航空電子	3	E09067
	AL-S	ｿｹｯﾄﾊｳｼﾞﾝｸﾞ	IL-3S-S3L-(N)	日本航空電子	1	E09041
	AL-B,SV	ｺﾈｸﾀ	IL-2S-S3L(N)	日本航空電子	2	E09173
		ｿｹｯﾄｺﾝﾀｸﾄ	IL-C2-1-1	日本航空電子	22	E09043
		内作ｱﾗｲﾅ ｲﾝﾀｰﾌｪｰｽ基板	INTERFACE BOARD	日機	1	E02011
		ｱﾗｲﾅｰｻｲｽﾞ切替ｾﾝｻｰ基板	SIZE CHANGE BOARD(8″)	日機	1	E02017
		ｱﾗｲﾅY軸ｾﾝｻｰ基板	Y AXIS BOARD	日機	1	E02014
	PD1,2,3	ｽﾃｯﾋﾟﾝｸﾞﾓｰﾀｰﾄﾞﾗｲﾊﾞｰ	KR-525M	Kﾌﾟﾛｼﾞｪｯﾄ	3	E04554
	BP6	ﾌﾞﾚｰｷﾊﾟｯｸ	SBR501	ｵﾘｴﾝﾀﾙ	1	B05021
	C8	ｺﾝﾃﾞﾝｻ	CH18UL 1.8μF AC250V	ｵﾘｴﾝﾀﾙ	1	E05126
	DSP-011	DSP I/Fﾓｼﾞｭｰﾙ	NT-DSP-1	ｱﾙｺﾞｼｽﾃﾑ	1	E01737
	CN-DSP	ｺﾈｸﾀ	HD-15SP	ﾐｽﾐ	1	E09309
		ｺﾈｸﾀｶﾊﾞｰ	HDE-CTH	ﾋﾛｾ	1	E11065
	AL-CC	ｺﾈｸﾀ	PS-20SM-D4PI-ID	日本航空電子	2	E09069
	AL-LA	ｿｹｯﾄﾊｳｼﾞﾝｸﾞ	IL-3S-S3L-(N)	日本航空電子	1	E09041
		ｿｹｯﾄｺﾝﾀｸﾄ	IL-C2-1-1	日本航空電子	3	E09043
		ﾗﾝﾌﾟｲﾝﾊﾞｰﾀｰ	DPS-8-DC24	ｴｽﾃﾞﾝ	1	E04447
		ﾗﾝﾌﾟ	FL4W NS	松下	1	E07111
		ﾗﾝﾌﾟｿｹｯﾄ	E-T-12	松下	2	E09072
		ｱﾗｲﾅｰCCD基板	950217-1	日機	1	E02018
	DO-8	出力ﾓｼﾞｭｰﾙ	F3YD32-1P	横河	1	E01727
	CN-DO3	圧着ｺﾈｸﾀﾊｳｼﾞﾝｸﾞ	FCN-363J040	富士通	1	E09541
		ｺﾈｸﾀｶﾊﾞｰ	FCN-360C040-B	富士通	1	E09542

Type ； DR8500III / HR8500III	Ver ；	
MDNo. ；	Section ； Aligner(1/1)	DATE ； 2011/1/6



符号	日付	来歴	訂正	検図
1				

日付(YY/MM/DD)	承認	検図	設計	製図	尺度 SCALE
11/01/06	野村	池田	小島	小島	NTS

品名	図番
DR/HR8500Ⅲ STANDARD ELECTRIC WIRING DIAGRAM OF ALIGNER SCHEMATIC PAGE 1/1	P4A-3872-00

日東精機株式会社
NITTO SEIKI CO.,LTD

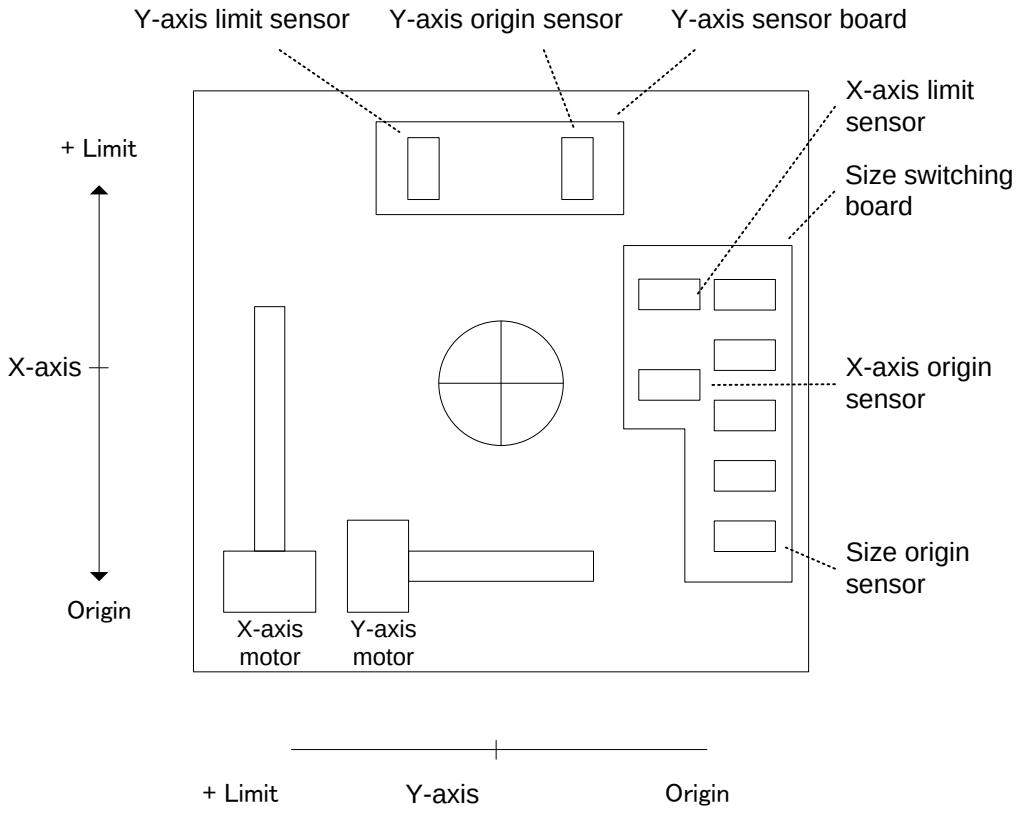
2. The principle of Robot

2.1 The process of resetting

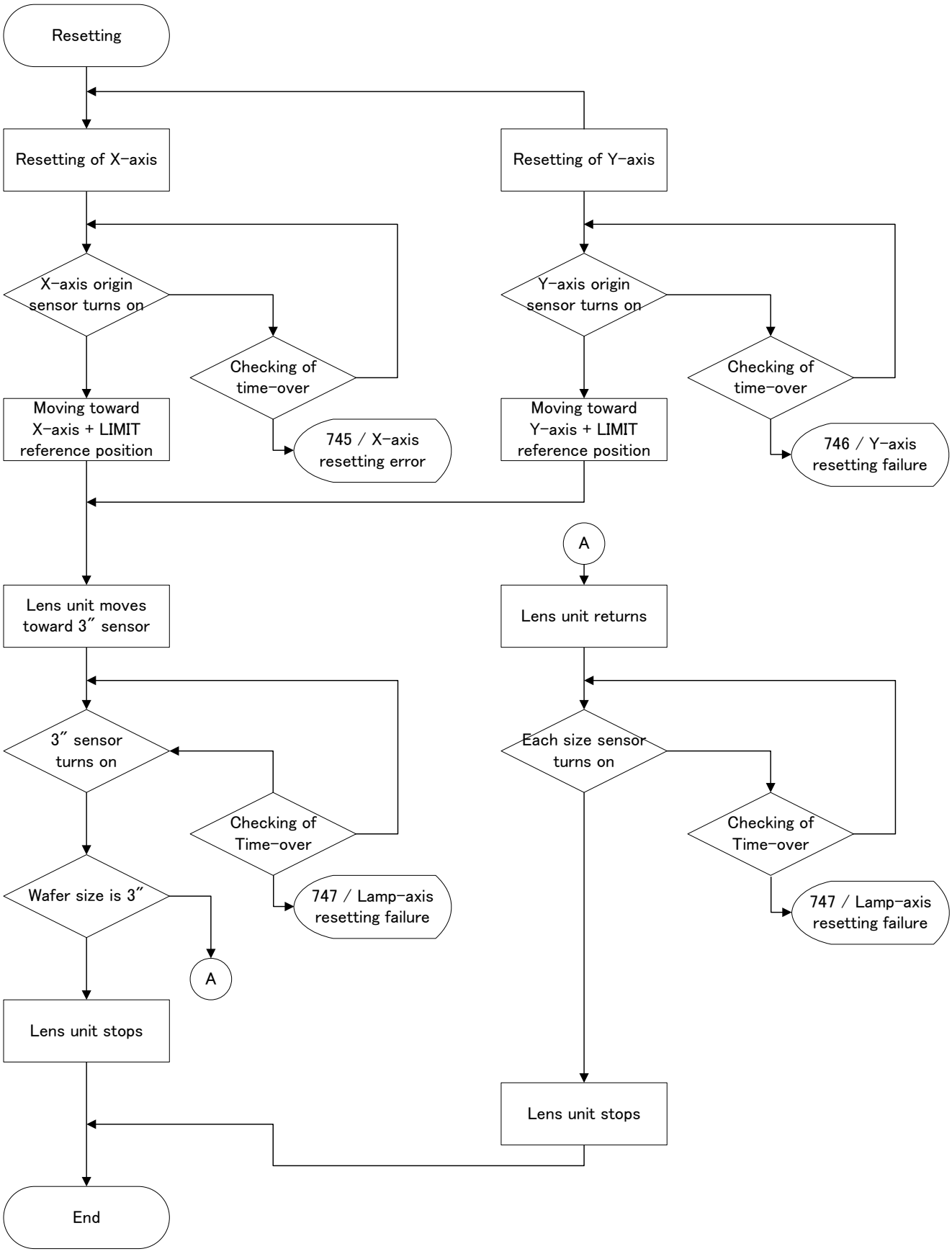
When resetting, the chucking pad moves to origin sensors of X and Y axes, and then moves to standby position for aligning of O.F, the lens section moves to the position for the specified wafer size.

The layout of the X, Y axes origin sensors and wafer size sensor is as follows.

The flow chart is shown in the next page.



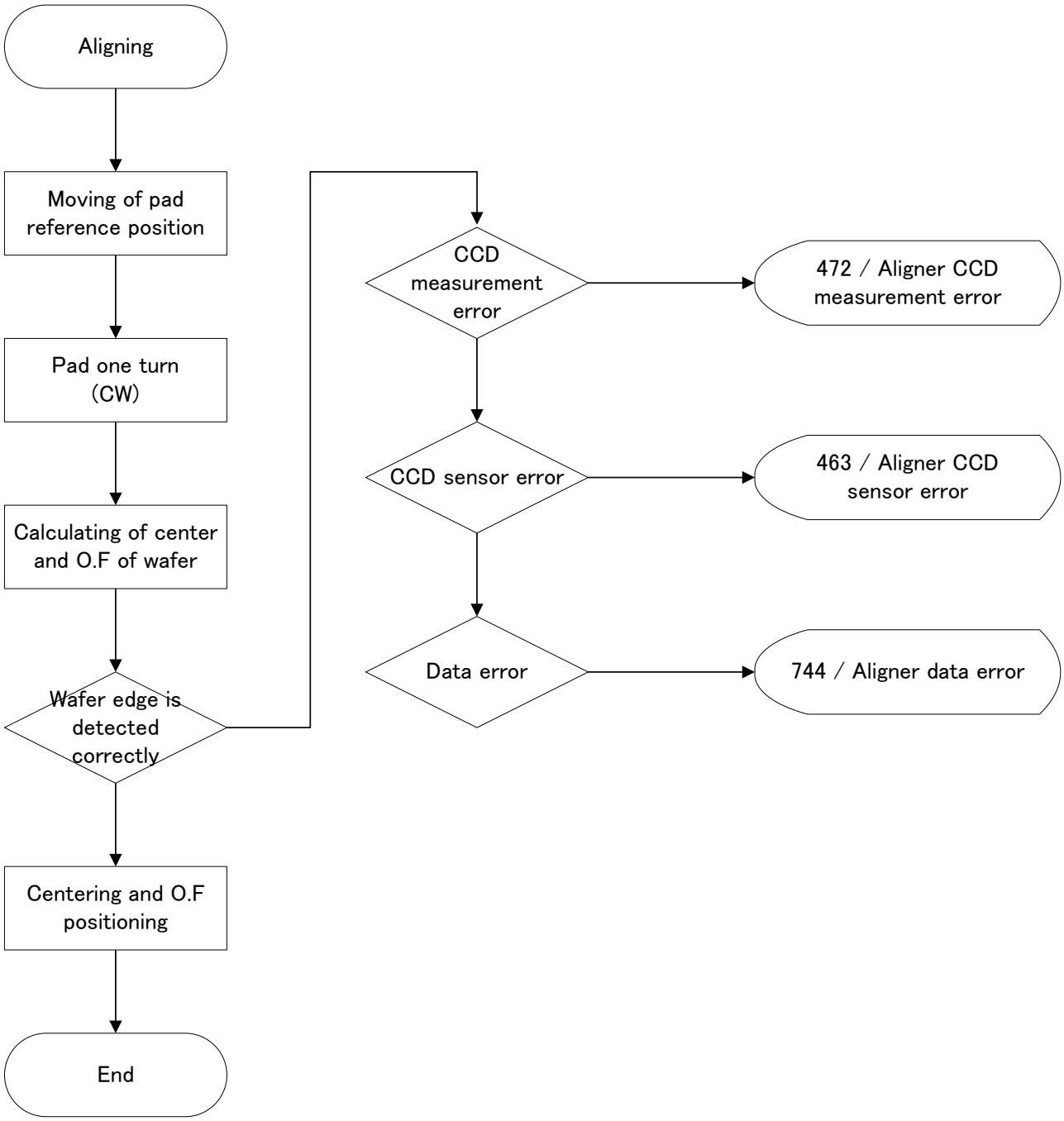
X-axis and Y-axis
Origin sensor position


Resetting
Resetting of X-axis
Resetting of Y-axis
X-axis origin sensor turns on
Checking of time-over
745 / X-axis resetting error
Moving toward X-axis + LIMIT reference position
Y-axis origin sensor turns on
Checking of time-over
746 / Y-axis resetting failure
Moving toward Y-axis + LIMIT reference position
A
Lens unit moves toward 3″ sensor
Lens unit returns
3″ sensor turns on
Checking of Time-over
747 / Lamp-axis resetting failure
Wafer size is 3″
A
Each size sensor turns on
Checking of Time-over
747 / Lamp-axis resetting failure
Lens unit stops
Lens unit stops
End

2.2 The process of aligning

When aligning, the chucking pad revolves one turn while chucking a wafer, and CCD line sensor detects the wafer edge.
The wafer's center and O.F (or V-notch) location are decided by calculating the edge data.

The flow chart of Aligner is as follows.



3. Electrical hardware

3.1 Pulse control module

Each axis stepping motor of Robot and Aligner are controlled by F3YP14-0N module (Yokogawa).
A manual for F3YP14-0N is shown the next page.

User's Manual

FA-M3 REVOLUTION

Positioning Modules (with Multi-channel Pulse Output) Model: F3YP14-0N, F3YP18-0N

IM 34M6H55-02E

YOKOGAWA ◆
Yokogawa Electric Corporation

IM 34M6H55-02E
1st Edition

Applicable Product

● Range-free Multi-controller FA-M3

Model : F3YP14-0N, F3YP18-0N
Name: Positioning Module (with Multi-Channel Pulse Output)

The document number and document model code for this manual are given below:
Refer to the document number in all communications; also refer to the document number or the document model code when purchasing additional copies of this manual.

Document No. : IM 34M6H55-02E
Document Model Code : DOCIM

Media No. IM 34M6H55-02E (CD) 1st Edition : Apr. 2002 (AR)

Important

■ About This Manual

- This Manual should be passed on to the end user.
- Before using the controller, read this manual thoroughly to have a clear understanding of the controller.
- This manual explains the functions of this product, but there is no guarantee that they will suit the particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.

■ Safety Precautions when Using/Maintaining the Product

The following safety symbols are used on the product as well as in this manual.

Danger. This symbol on the product indicates that the operator must follow the instructions laid out in this instruction manual to avoid the risk of personnel injuries, fatalities, or damage to the instrument. Where indicated by this symbol, the manual describes what special care the operator must exercise to prevent electrical shock or other dangers that may result in injury or the loss of life.

Protective Ground Terminal. Before using the instrument, be sure to ground this terminal.

Function Ground Terminal. Before using the instrument, be sure to ground this terminal.

Alternating current. Indicates alternating current.

Direct current. Indicates direct current.

The following symbols are used only in the instruction manual.

WARNING

Indicates a "Warning".

Draws attention to information essential to prevent hardware damage, software damage or system failure.

CAUTION

Indicates a "Caution"

Draws attention to information essential to the understanding of operation and functions.

TIP

Indicates a "TIP"

Gives information that complements the present topic.

SEE ALSO

Indicates a "SEE ALSO" reference.

Identifies a source to which to refer.

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety stated in this manual whenever handling the product. Take special note that if you handle the product in a manner other than prescribed in these instructions, the protection feature of the product may be damaged or impaired. In such cases, Yokogawa cannot guarantee the quality, performance, function or safety of the product.
- When installing protection and/or safety circuits for this product or the system controlled by it, the user should install them outside this product.
- If component parts or consumables are to be replaced, be sure to use parts specified by the company.
- If you want to use this product in a system which directly affects or threatens human lives and safety — such as nuclear power equipment, devices using radioactivity, railway facilities, aviation facilities and medical equipment, please contact your nearest Yokogawa Electric representative.
- Do not attempt to modify the product.

■ Exemption from Responsibility

- Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa Electric) makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- Yokogawa Electric assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

■ Software Supplied by the Company

- Yokogawa Electric makes no other warranties expressed or implied except as provided in its warranty clause for software supplied by the company.
- Use the software with one computer only. You must purchase another copy of the software for use with each additional computer.
- Copying the software for any purposes other than backup is strictly prohibited.
- Store the original media, such as floppy disks, that contain the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by Yokogawa Electric may be transferred, exchanged, or sublet or leased for use by any third party without prior permission by Yokogawa Electric.

■ General Requirements for Using the FA-M3

● Avoid installing the FA-M3 in the following locations:

- Where the product will be exposed to direct sunlight, or where the operating temperature exceeds the range 0°C to 55°C (32°F to 131°F).
- Where the relative humidity is outside the range 10 to 90%, or where sudden temperature changes may occur and cause condensation.
- Where corrosive or flammable gases are present.
- Where the product will be exposed to direct mechanical vibration or shock.
- Where the product may be exposed to extreme levels of radioactivity.

● Use the correct types of wire for external wiring:

- Use copper wire with temperature ratings greater than 75°C.

● Securely tighten screws:

- Securely tighten module mounting screws and terminal screws to avoid problems such as faulty operation.
- Tighten terminal block screws with the correct tightening torque as given in this manual.

● Securely lock connecting cables:

- Securely lock the connectors of cables, and check them thoroughly before turning on the power.

● Interlock with emergency-stop circuitry using external relays:

- Equipment incorporating the FA-M3 must be furnished with emergency-stop circuitry that uses external relays. This circuitry should be set up to interlock correctly with controller status (stop/run).

● Ground for low impedance:

- For safety reasons, connect the [FG] grounding terminal to a Japanese Industrial Standards (JIS) Class D Ground*1 (Japanese Industrial Standards (JIS) Class 3 Ground). For compliance to CE Marking, use cables such as twisted cables which can ensure low impedance even at high frequencies for grounding.

*1 Japanese Industrial Standard (JIS) Class D Ground means grounding resistance of 100 ohms max.

● Configure and route cables with noise control considerations:

- Perform installation and wiring that segregates system parts that may likely become noise sources and system parts that are susceptible to noise. Segregation can be achieved by measures such as segregating by distance, installing a filter or segregating the grounding system.

● Configure for CE Marking Conformance:

- For compliance to CE Marking, perform installation and cable routing according to the description on compliance to CE Marking in the "Hardware Manual" (IM34M6C11-01E).

● Keep spare parts on hand:

- Stock up on maintenance parts including spare modules, in advance.

- **Discharge static electricity before operating the system:**
  - Because static charge can accumulate in dry conditions, first touch grounded metal to discharge any static electricity before touching the system.

- **Never use solvents such as paint thinner for cleaning:**
  - Gently clean the surfaces of the FA-M3 with a soft cloth that has been soaked in water or a neutral detergent and wringed.
  - Do not use volatile solvents such as benzine or paint thinner or chemicals for cleaning, as they may cause deformity, discoloration, or malfunctioning.

- **Avoid storing the FA-M3 in places with high temperature or humidity:**
  - Since the CPU module has a built-in battery, avoid storage in places with high temperature or humidity.
  - Since the service life of the battery is drastically reduced by exposure to high temperatures, take special care (storage temperature should be from –20°C to 75°C).
  - There is a built-in lithium battery in a CPU module and temperature control module which serves as backup power supply for programs, device information and configuration information. The service life of this battery is more than 10 years in standby mode at room temperature. Take note that the service life of the battery may be shortened when installed or stored at locations of extreme low or high temperatures. Therefore, we recommend that modules with built-in batteries be stored at room temperature.

- **Always turn off the power before installing or removing modules:**
  - Failing to turn off the power supply when installing or removing modules, may result in damage.

- **Do not touch components in the module:**
  - In some modules you can remove the right-side cover and install ROM packs or change switch settings. While doing this, do not touch any components on the printed-circuit board, otherwise components may be damaged and modules may fail to work.

■ Waste Electrical and Electronic Equipment

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC
(This directive is only valid in the EU.)

This product complies with the WEEE Directive (2002/96/EC) marking requirement.
The following marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product.
Do not dispose in domestic household waste.
When disposing products in the EU, contact your local Yokogawa Europe B. V. office.

Introduction

■ Overview of the Manual

This user's manual, "Positioning Module with Multi-channel Pulse Output," explains the specifications and provides information required to operate the positioning modules, F3YP14-0N and F3YP18-0N, with an FA-M3 controller.

■ Other Manuals

Refer to the following manuals.

● For sequence CPU functions:

- Sequence CPU Modules - Functions (for F3SP21, F3SP25 and F3SP35) (IM 34M6P12-02E)
- Sequence CPU Modules - Functions (for F3SP28, F3SP38, F3SP53 and F3SP58) (IM 34M6P13-01E)

● For sequence CPU instructions:

- Sequence CPU Modules - Instructions (IM 34M6P12-03E)

● For commands and responses of the PC Link function:

- Personal Computer Link Command (IM34M6P41-01E)

● For creating programs using ladders:

- FA-M3 Programming Tool WideField (IM 34M6Q14-01E)
- FA-M3 Programming Tool WideField - Application (IM 34M6Q14-02E)

● For the FA-M3 specifications and configurations*1, installation and wiring, test run, maintenance, and module installation limits for the whole system:

*1: Refer to the relevant product manuals for specifications except for power supply modules, base modules, input/output modules, cables and terminal units.

- Hardware Manual (IM 34M6C11-01E) version 8 or later

Copyrights and Trademarks

■ Copyrights

■ Trademarks

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1. Overview

Models F3YP14-0N-and F3YP18-0N are advanced positioning modules (hereinafter referred to as the modules or positioning modules) used to control servo drivers and thereby the speed and position of pulse-driven motors. Driven by commands from the CPU module of the FA-M3 controller, the positioning module generates paths for positioning and outputs positioning command values in the form of pulse trains.

A single module can control different types of motors/drivers. It can control up to 4 (the F3YP14-0N module) or up to 8 (the F3YP18-0N module) pulse-driven motors or servomotors. When in use, the positioning modules are attached to the base module of an FA-M3 controller.

■ Features

- Compared to the earlier positioning module, which allows up to 2 controlled axes per slot, this module allows up to 8 controlled axes per slot.
- With a short startup time (0.1 ms maximum), it can come into action quickly and operate in synchronization with peripheral equipment.
- It can output speed reference pulses as fast as 3.998 Mpps for servomotors, or 499.75 kpps for pulse-driven motors.

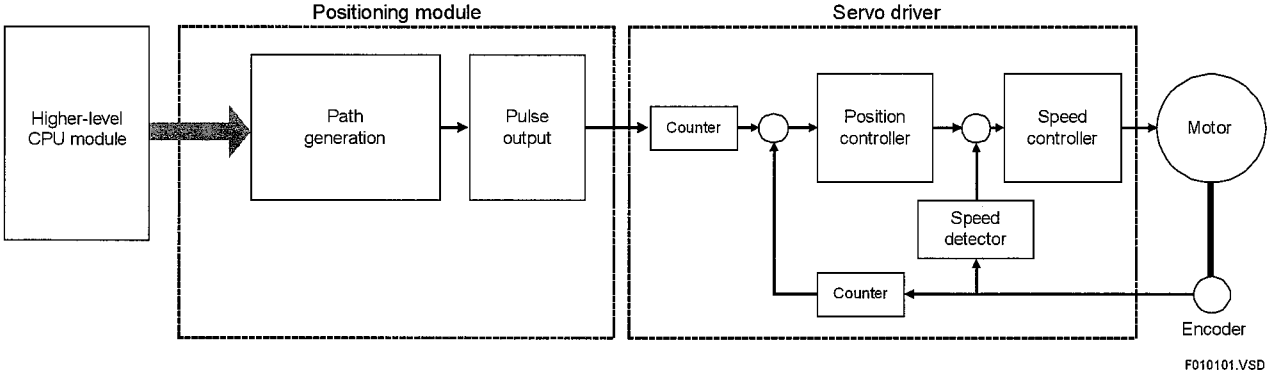

Figure 1.1 Operating Principle of Positioning Module (with Multi-channel Pulse Output)

WARNING

An external emergency stop circuit should be built in, according to the motor manufacturer's recommendations, for turning off the power supply and stopping the motor immediately if it operates in an unexpected manner due to machine fault or misoperation.

CAUTION

- When controlling a servomotor with the positioning module, choose a position-control servo driver. Speed-control or torque-control servo drivers cannot be used with the positioning module.
- The maximum pulse output rate is 499.75 kpps for pulse-driven motors. If the Maximum Speed Selection parameter is set to 3.998 Mpps for pulse-driven motors, the motor performance cannot be guaranteed.

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2 Specifications

2.1 General Specifications

Item		Specifications	
		F3YP14-0N	F3YP18-0N
Number of controlled axes		4	8
Number of axes controlled simultaneously		4	8
Pulse output method		RS-422A compliant differential output Either forward/reverse pulse output or direction/travel pulse output selectable for each axis	
Position control	Interpolation	PTP movement Multi-axis linear interpolation (by CPU module programming)	
	Command pulse range	-2,147,483,648 to 2,147,483,647 pulses	
	Command speed	0.1 to 3,998,000 pps (for servomotor) 0.1 to 499,750 pps (for pulse-driven motor)	
	Positioning functions	Absolute/relative positioning command Target position change during movement Speed change during movement	
Acceleration/deceleration system		Automatic trapezoidal acceleration/deceleration (starting speed programmable) Automatic S-shape acceleration/deceleration (starting speed fixed)	
Acceleration/deceleration time		0 to 32,767 ms (programmable for acceleration and deceleration separately)	
Origin position search method		User-definable using a combination of external contact inputs Normal and automatic origin search operations available	
Origin position search speed		User-definable within the command speed range	
External contact input		Positive and negative limit inputs, home position input, encoder Z-phase input	
External contact output		Deviation pulse clear signal	
Data backup		Using flash memory or CPU module	
Startup time*		0.09 ms for one axis 0.25 ms for four axes	0.09 ms for one axis 0.25 ms for four axes 0.5 ms for eight axes
Current consumption		320 mA	380 mA
External power supply		5 V DC, 350 mA	5 V DC, 700 mA
External wiring		One 48-pin connector	Two 48-pin connectors
External dimensions		28.9 (W) × 100 (H) × 83.2 (D) mm**	
Weight		125 g	145 g

* Up to 1 ms delay may be added if another axis is in motion.
** Not including protrusions (see the external dimension diagram for more details).

2.2 Operating Environment

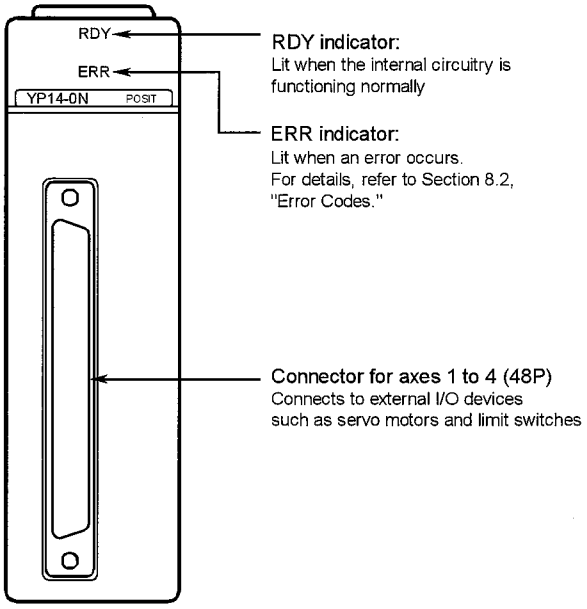
The positioning modules can be used with all models of CPU modules.

2.3 Model and Suffix Codes

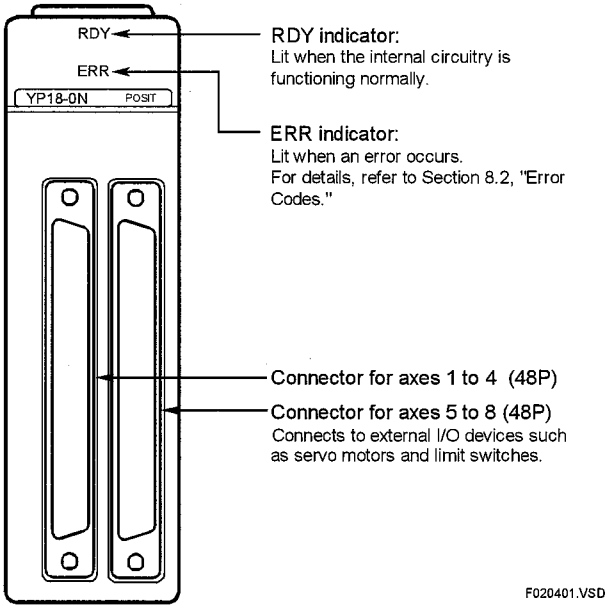
Model	Suffix Code	Style Code	Option Code	Description
F3YP14	-0N	.....	.....	4-axis, multi-channel pulse output 3,998,000 pps max. (for servomotor) or 499,750 pps max. (for pulse-driven motor)
F3YP18	-0N	.....	.....	8-axis, multi-channel pulse output 3,998,000 pps max. (for servomotor) or 499,750 pps max. (for pulse-driven motor)

2.4 Components and Functions

●F3YP14-0N (4-axis module)



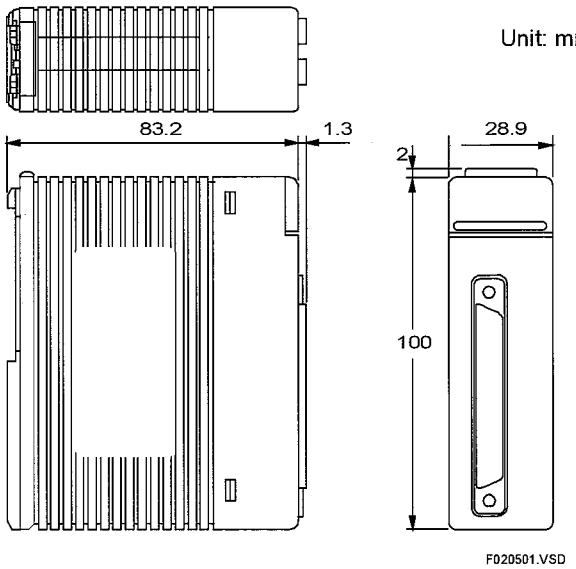
●F3YP18-0N (8-axis module)



F020401.VSD

2.5 External Dimensions

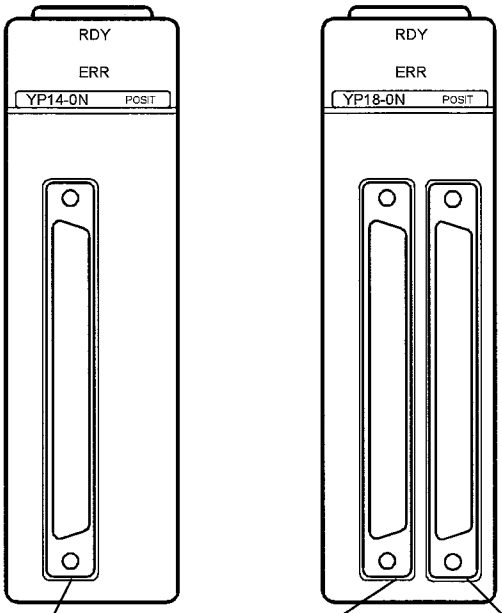
Unit: mm



F020501.VSD

* Diagram shown above is for the F3YP14-0N module

2.6 Terminal Assignments and Connections

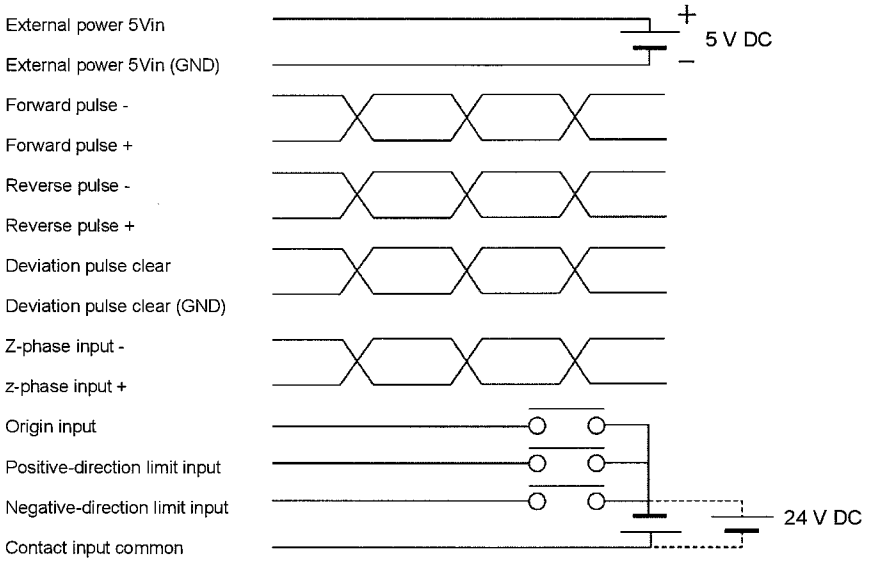


24b	Axis 4 Z-phase input (-)	24a	Axis 2 Z-phase input (-)
23b	Axis 4 Z-phase input (+)	23a	Axis 2 Z-phase input (+)
22b	Axis 4 pulse output A (+)	22a	Axis 2 pulse output A (+)
21b	Axis 4 pulse output A (-)	21a	Axis 2 pulse output A (-)
20b	Axis 4 pulse output B (+)	20a	Axis 2 pulse output B (+)
19b	Axis 4 pulse output B (-)	19a	Axis 2 pulse output B (-)
18b	Axis 4 deviation pulse clear	18a	Axis 2 deviation pulse clear
17b	Axis 4 deviation pulse clear (GND)	17a	Axis 2 deviation pulse clear (GND)
16b	Axis 3 Z-phase input (-)	16a	Axis 1 Z-phase input (-)
15b	Axis 3 Z-phase input (+)	15a	Axis 1 Z-phase input (+)
14b	Axis 3 pulse output A (+)	14a	Axis 1 pulse output A (+)
13b	Axis 3 pulse output A (-)	13a	Axis 1 pulse output A (-)
12b	Axis 3 pulse output B (+)	12a	Axis 1 pulse output B (+)
11b	Axis 3 pulse output B (-)	11a	Axis 1 pulse output B (-)
10b	Axis 3 deviation pulse clear	10a	Axis 1 deviation pulse clear
9b	Axis 3 deviation pulse clear (GND)	9a	Axis 1 deviation pulse clear (GND)
8b	External power 5 Vin	8a	External power 5 Vin (GND)
7b	Axis 4 origin input	7a	Axis 2 origin input
6b	Axis 4 positive limit input	6a	Axis 2 positive limit input
5b	Axis 4 negative limit input	5a	Axis 2 negative limit input
4b	Axis 3 home position input	4a	Axis 1 home position input
3b	Axis 3 positive limit input	3a	Axis 1 positive limit input
2b	Axis 3 negative limit input	2a	Axis 1 negative limit input
1b	Contact input common	1a	Contact input common

24b	Axis 8 Z-phase input (-)	24a	Axis 6 Z-phase input (-)
23b	Axis 8 Z-phase input (+)	23a	Axis 6 Z-phase input (+)
22b	Axis 8 pulse output A (+)	22a	Axis 6 pulse output A (+)
21b	Axis 8 pulse output A (-)	21a	Axis 6 pulse output A (-)
20b	Axis 8 pulse output B (+)	20a	Axis 6 pulse output B (+)
19b	Axis 8 pulse output B (-)	19a	Axis 6 pulse output B (-)
18b	Axis 8 deviation pulse clear	18a	Axis 6 deviation pulse clear
17b	Axis 8 deviation pulse clear (GND)	17a	Axis 6 deviation pulse clear (GND)
16b	Axis 7 Z-phase input (-)	16a	Axis 5 Z-phase input (-)
15b	Axis 7 Z-phase input (+)	15a	Axis 5 Z-phase input (+)
14b	Axis 7 pulse output A (+)	14a	Axis 5 pulse output A (+)
13b	Axis 7 pulse output A (-)	13a	Axis 5 pulse output A (-)
12b	Axis 7 pulse output B (+)	12a	Axis 5 pulse output B (+)
11b	Axis 7 pulse output B (-)	11a	Axis 5 pulse output B (-)
10b	Axis 7 deviation pulse clear	10a	Axis 5 deviation pulse clear
9b	Axis 7 deviation pulse clear (GND)	9a	Axis 5 deviation pulse clear (GND)
8b	External power 5 Vin	8a	External power 5 Vin (GND)
7b	Axis 8 origin input	7a	Axis 6 origin input
6b	Axis 8 positive limit input	6a	Axis 6 positive limit input
5b	Axis 8 negative limit input	5a	Axis 6 negative limit input
4b	Axis 7 home position input	4a	Axis 5 home position input
3b	Axis 7 positive limit input	3a	Axis 5 positive limit input
2b	Axis 7 negative limit input	2a	Axis 5 negative limit input
1b	Contact input common	1a	Contact input common

Pulse output A: Forward pulse output (in forward/reverse mode), or travel pulse output (in travel pulse/direction mode)

Pulse output B: Reverse pulse output (in forward/reverse mode), or direction output (in travel pulse/direction mode)



Contact input common and the external power supply 5Vin/GND terminals are common to all axes (they are connected through the internal circuitry even between different connectors). Other signals are independent for each axis.

CAUTION

Always connect the external power supply (5 V DC) with the correct polarity. The internal circuitry may be damaged otherwise.

For details on the external connection signals, please refer to Chapter 9, "External Interface Signals."

2.7 Applicable External Interface Connectors

Connection	Applicable Connector	Remarks
Soldered	FCN-361J048-AU connector FCN-360C048-B connector cover (Fujitsu Limited)	Purchase the desired connector kit separately.
Crimp-on	FCN-363J048 housing FCN-363J-AU contacts FCN-360C048-B connector cover (Fujitsu Limited)	
Pressure-welded	FCN-367J048-AU/F (Fujitsu Limited)	

2.8 Attaching and Detaching Modules

■ Attaching/Detaching Modules

Figure 2.1 shows how to attach the module to the base module. First, hook the anchor slot at the bottom of the module to be attached onto the anchor pin on the bottom of the base module. Push the top of the module towards the base module until the yellow button clicks into place.

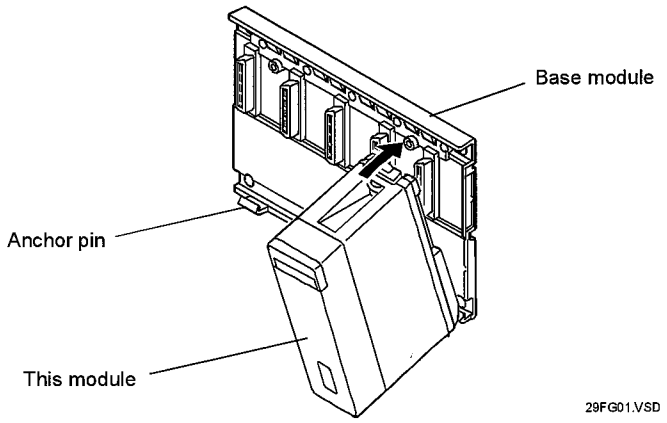


Figure 2.1 Attaching/Detaching Modules

CAUTION

Always switch off the power before attaching or detaching a module.

CAUTION

Do not bend the connector pins on the rear of the module by force during the above operation. If the module is pushed with improper force, the connector pins may bend causing an error.

■ Detaching Modules

To remove the module from the base module, reverse the above operation:

Press the yellow button on the top of the module to unlock it, and tilt the module away from the base module. Then lift the module off the anchor pin at the base.

■ Attaching Module in Intense Vibration Environments

If the module is used in intense vibration environments, fasten the module with a screw as described in the table below by screwing it into the threaded hole at the top of the module with a Phillips screwdriver.

Screws to be used
M4 binder screws, 12-15 mm long (or 14-15 mm long for screws with washer)

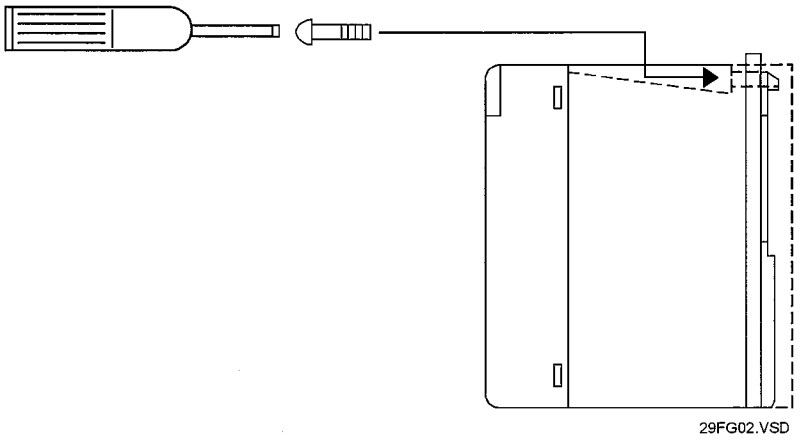


Figure 2.2 Fastening the Module with a Screw

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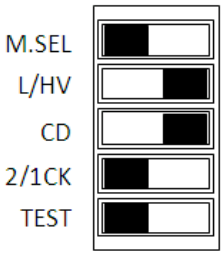
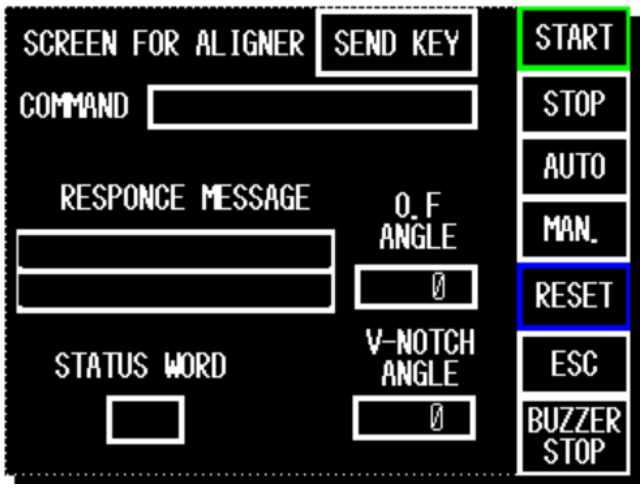
3.2 Pulse motor driver

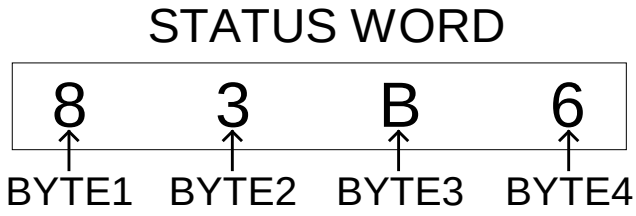
KR-525M (Techno Drive) is used for X, Y, and Θ-axis of the Aligner pulse driver.
The pulse motor switches and volumes are indicted in the list below.
Do not change the switches and volumes.

KR-525M (PD1~3) Setting value

No,	M1	M2	RUN	STOP	DIP-SWITCH
X-AXIS PD1	1 STEP ANGLE 0.36°	1 STEP ANGLE 0.36°	3 RUN CURRENT 0.75A	5 STOP CURRENT 50%	
Y-AXIS PD2	1 STEP ANGLE 0.36°	1 STEP ANGLE 0.36°	3 RUN CURRENT 0.75A	5 STOP CURRENT 50%	
Θ-AXIS PD3	1 STEP ANGLE 0.36°	1 STEP ANGLE 0.36°	3 RUN CURRENT 0.75A	5 STOP CURRENT 50%	M.SEL : OFF(Moter Select) L/HV : ON(High Speed, High Torque) CD : ON(Current Down) 2/1CK : OFF(2Clock) TEST : OFF

4. Aligner individual operation





The aligner individual operation is applied to run individually the aligner or to perform the maintenance.

COMMAND
The command display is used to input and display the command to run the aligner.

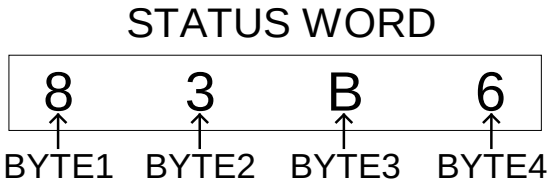
STATUS WORD
The status word display indicates the signal indicating the status of aligner which is sent from the aligner as a 4-digit numeral.

RESPONSE MESSAGE
The response message display indicates the content of BYTE 3 of status work.

[SEND KEY]
The transmission key is used to send the set command to the aligner.

4. (Continued)

The following messages are used for the status codes.



Content of BYTE1				
	Self-test	Vacuum Switch	Pad Position	Preparation Completion or Operation Started
0	OK	OFF	Not in starting position	Preparation completion
1	Error	OFF	〃	〃
2	OK	ON	〃	〃
3	Error	ON	〃	〃
4	OK	OFF	Starting position	〃
5	Error	OFF	〃	〃
6	OK	ON	〃	〃
7	Error	ON	〃	〃
8	OK	OFF	Not in starting position	Operation started
9	Error	OFF	〃	〃
A	OK	ON	〃	〃
B	Error	ON	〃	〃
C	OK	OFF	Starting position	〃
D	Error	OFF	〃	〃
E	OK	ON	〃	〃
F	Error	ON	〃	〃

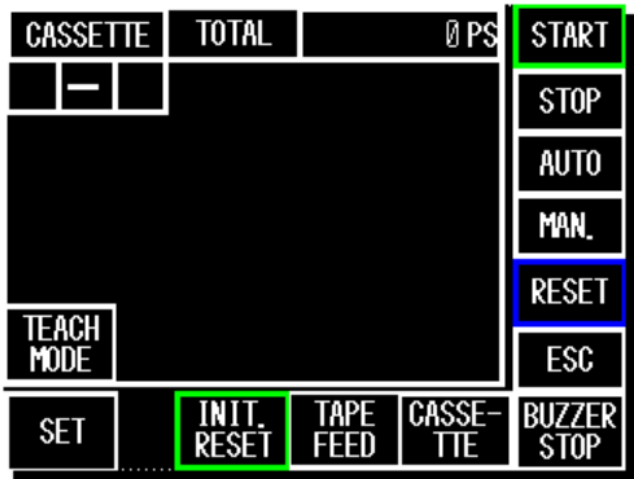
4. (Continued)

Content of BYTE2		
	Detection mode	Recognition of Command
0	Notch detection mode	Recognized
1	OF detection mode	〃
2	Notch detection mode	〃
3	OF detection mode	〃
4	Notch detection mode	Not recognized
5	OF detection mode	〃
6	Notch detection mode	〃
7	OF detection mode	〃

Content of BYTE3	
0	No error
1	CCD measurement error
2	Out of CCD range
3	-
4	-
5	Motor board time-out
6	-
7	-
8	Vacuum sensor error
9	-
A	Aligner data error
B	Aligner X-axis reset error
C	Aligner Y-axis reset error

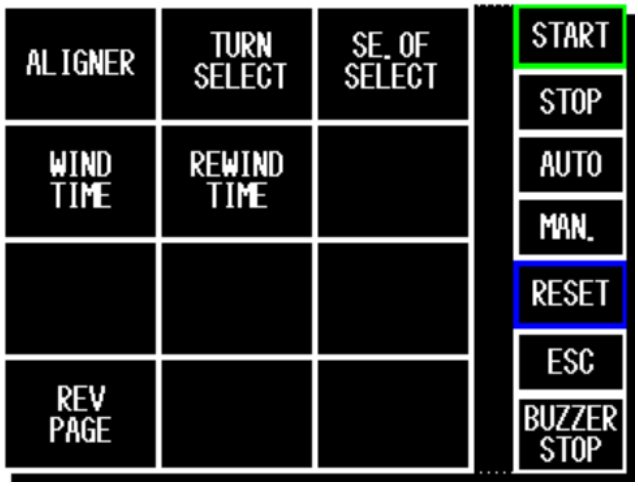
Content of BYTE4	
3	Wafer diameter 3-inch
4	Wafer diameter 4-inch
5	Wafer diameter 5-inch
6	Wafer diameter 6-inch
8	Wafer diameter 8-inch

4. (Continued)

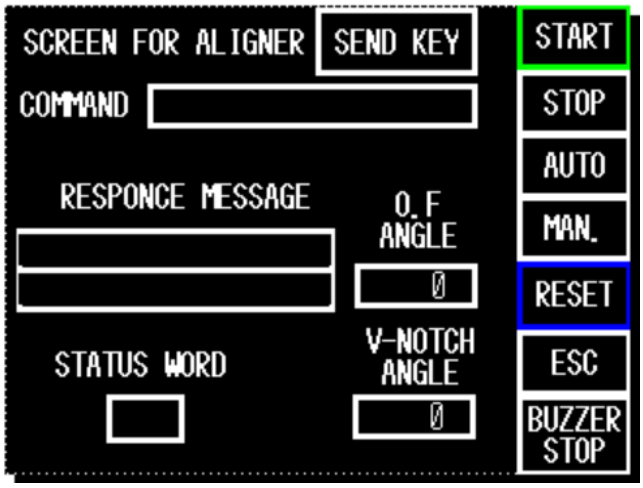


Command Setting Procedure

Step 1:
Press the [MAN.] key on MAIN SCREEN.
1st page of setting screen is displayed.
Press [NXT PAGE] to display 2nd page of setting screen.



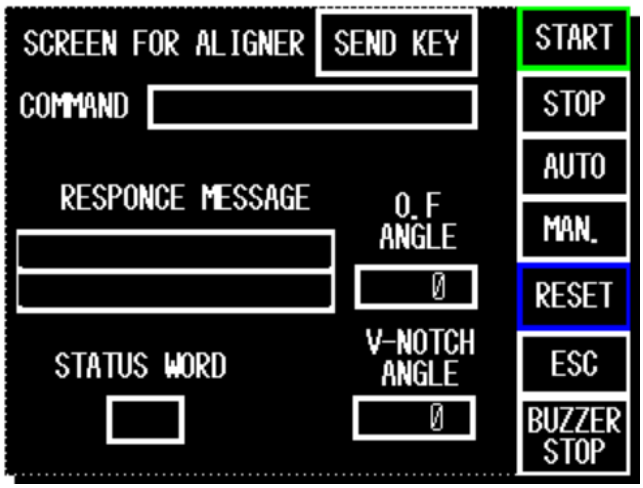
Step 2:
Press the [ALIGNER].
SCREEN FOR ALIGNER is displayed.



Step 3:
Press the COMMAND display.
Keyboard appears on the screen.

Step 4:
Press the [CLR] key on the keyboard.
The command is cleared.

4. (Continued)



Enter the command with the keyboard according to the following procedure. (Refer to the next page about the command)

Step 5:
Input identification byte “P0” (P Zero) and then input a command (Two alphanumeric characters). Enter a numerical value after the command as necessary.

FW△△△

Step 6:
Press the [SPACE] key and then press the [ENT] key.
The machine recognizes the command and the keyboard disappears.

Step 7:
Press the [SEND KEY].
The command is sent to the aligner.

4. (Continued)

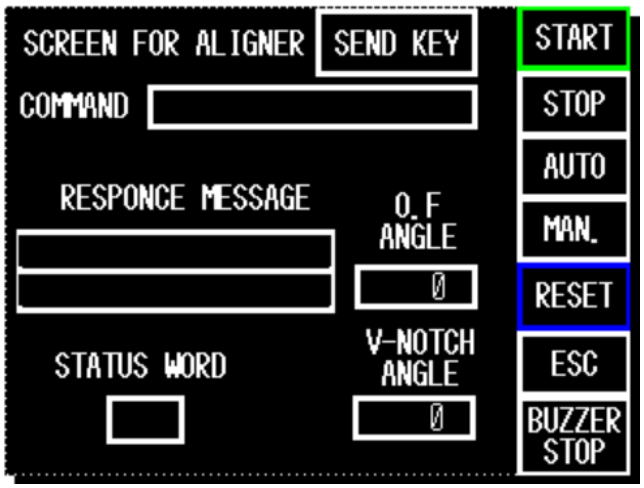
Command type

FW <offset>	Aligns the wafer at an offset angle you input. (The offset angle is 0-degree if the value is not input)
GW:	The offset angle ("SR" command) is read from the battery backup RAM, and aligns the wafer.
RC:	The vacuum pad is moved to the reference position.
RS:	Reset the aligner.
RX <+/- step>:	Moves X-axis direction by an increment of the step. + step: Moves limit sensor direction - step: Moves origin sensor direction
RY <+/- step>:	Moves Y-axis direction by an increment of the step. + step: Moves limit sensor direction - step: Moves origin sensor direction
RW <+/- step>:	Turns the pad by an increment of the step.
SF:	Sets the OF detect mode.
SN:	Sets the Notch detect mode.
SR<Offset>:	It is used with GW command. Inputs the previous offset angle to the battery backup RAM.
SX:	Change the CCD unit size. (Enter the wafer size to "X")
VN:	Turns on vacuum.
VF:	Turns off vacuum.

CCD correction

CB:	Corrects the CCD

4. (Continued)



To back to MAIN SCREEN, perform following procedure.

Step 1:
Press the [ESC] key.
The 2nd page of setting screen is displayed.

Step 2:
Press the [AUTO] key.
MAIN SCREEN is displayed.

5. Calibration

5.1 Calibration for Aligner

By calibration of Aligner, the following data are stored in S-RAM attached in the CPU module.

1) The relative position of the chucking pad against the CCD line sensor
2) 1 pixel length of CCD line sensor.

You should calibrate Aligner in following states.

(1) When the machine have been turned off the power for approximately 10 years or more.
When the error 744 (Aligner data error) occurs.
(2) Another CPU module is used instead of original CPU module.
Also CPU module which is not calibrated is used.
(3) Another CCD module is used instead of original.

<Calibration procedure>

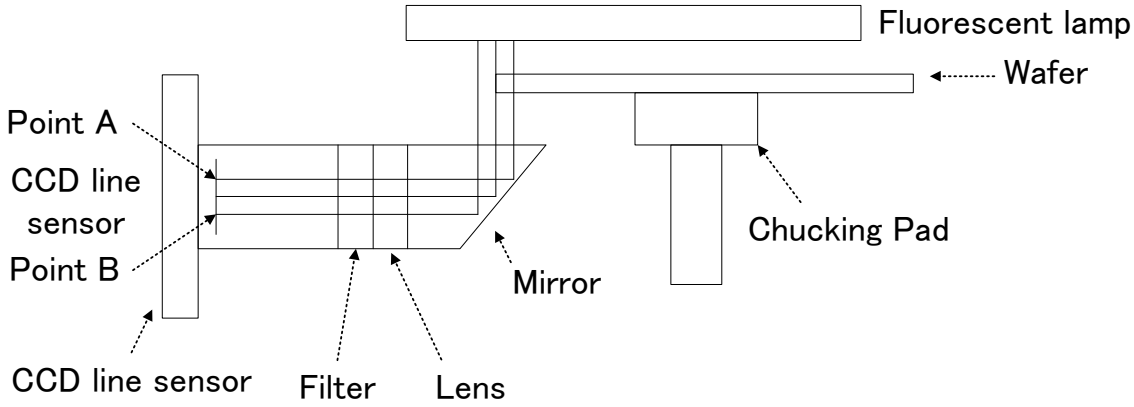
(1) Connect the Teach pendant to the machine.
(2) Turn on the machine power.
(3) Press the [Q. STOP] key.
(4) Press the [MAINTENANCE] key, and the mode switches to MAINTENANCE mode.
(5) Press the [SET] key on the operation panel, and the panel changes INDIVIDUAL screen.
(6) Input the SET No. for Aligner chucking valve.
(7) Press the [ON] key, and the chucking valve becomes ON.
(8) Press the [SET] key, and then press the [MAN.] key.
(9) Press the [ALIGNER] key. (“ALIGNER SCREEN” is displayed)
(10) Set the metal wafer for calibrating on the chucking pad of Aligner.
(11) Input “P0VN” to command area on the Aligner screen
(12) Press the [SEND] key, and the metal wafer chucked by the chucking pad.
(13) Input “P0CB” to command area on the Aligner screen.
(14) Press [SEND KEY] (The calibration is performed)
First, Aligner chucking pad moves in X and Y axes directions, and turns in T-axis direction (6 turns).
Next, Aligner computes the travel, and then the calibrating data gained by the computing writes into S-RAM.
(It takes approximately two minutes to compute and write the data)
After completion of this calibration, the chuck value becomes OFF automatically.
If a mistake is found in a process of calibration, the errors “CCD measurement error” and “Aligner data mistake” are occurred.
The causes are in CCD module, lens section, or CPU module.
Refer to 5.2 CCD module calibration procedures.

(15) Input “P0VF” to command area on the Aligner screen.
(16) Press the [SEND KEY]. (Chucking of the metal wafer is released.)
(17) Remove the metal wafer from the chucking pad.
(18) Press the [ESC] key, and then press the [SET] key.
(19) Input SET No. for Aligner chucking valve.
(20) Press [OFF] key, and the chucking becomes OFF.
(21) Press the [SET] key.
(22) Press the [MAINTENANCE] key on the Teach pendant.
(23) Press the [RESET] key on the operation panel.

5.2 CCD board calibration procedure

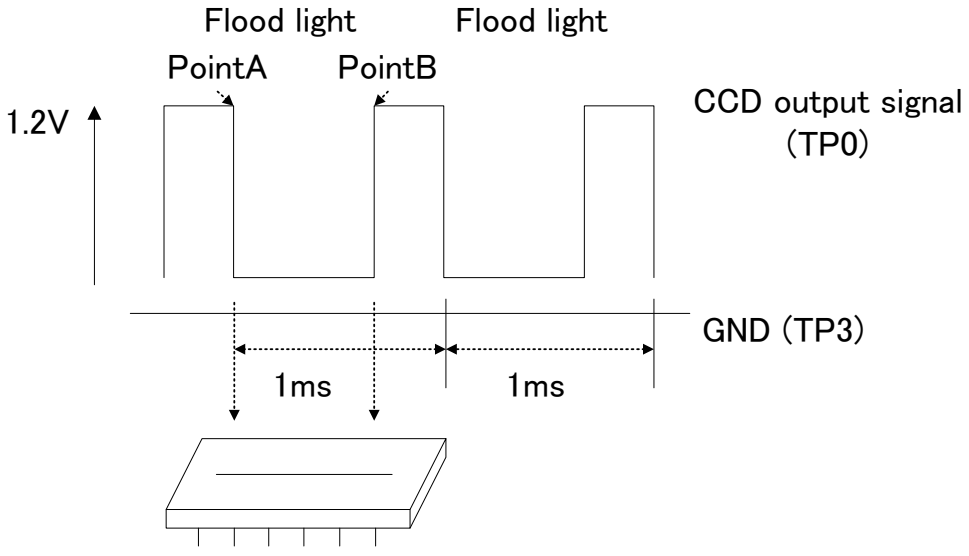
You must calibrate CCD board in following states.
1) When lens section is removed from CCD board
2) When another CCD board is used instead of original CCD board.

<A wafer edge detecting process by CCD line sensor>
As shown below, light from the fluorescent lamp is reflected by the mirror, and pass through lens and filter, and then reaches CCD board.
CCD line sensor can detect the light which passes between point A and B. The CCD line sensor detectable area is the same as allowable range of wafer detection.



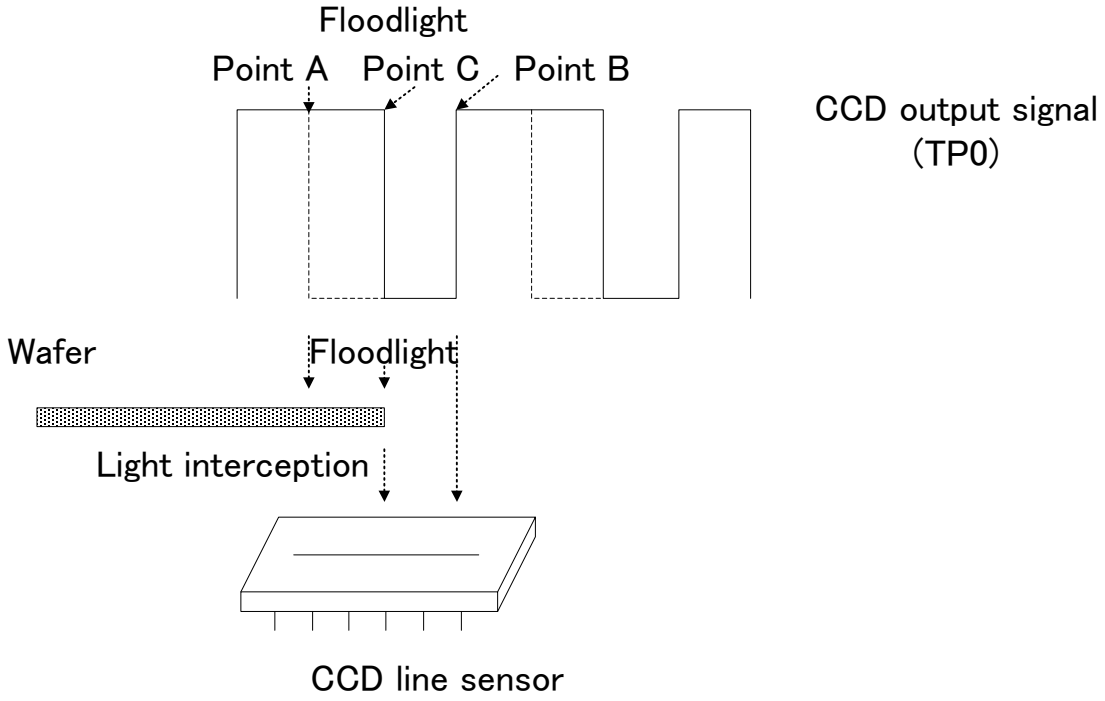
Lens unit optical system

The light which reaches CCD line sensor is converted into electrical change in the CCD line sensor.
CCD output signal which is output by CCD line sensor is shown below.
(This signal's wave-form is shown by oscilloscope)
CCD board circuit diagram (TP0: CCD output and TP3 Terminal: GND)
The cycle of this output signal is 1ms.
The voltage becomes low with the intensity of the lamp increases.

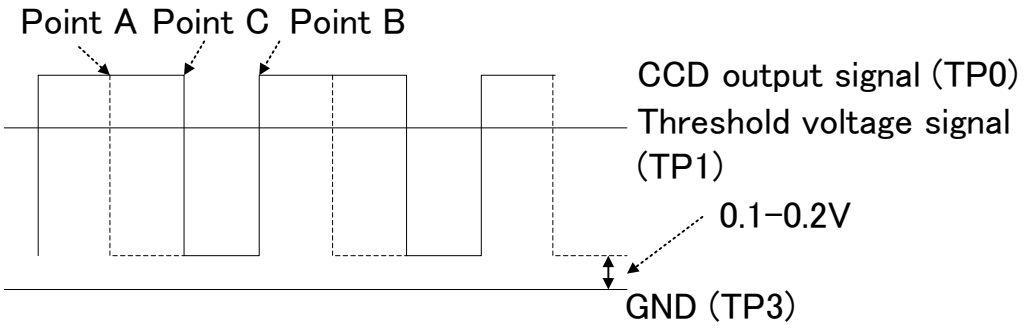


CCD line sensor

When a wafer abstracts the light from the fluorescent lamp, the CCD output is changed as shown below.
The output signal is changed to upper direction when the light is shaded. (Point C)



A threshold voltage (Reference voltage) is used in order to distinguish the shaded area "A-C" from the lighted area "C-B".
Refer to TP1 terminal (Threshold voltage) of the CCD board circuit diagram.

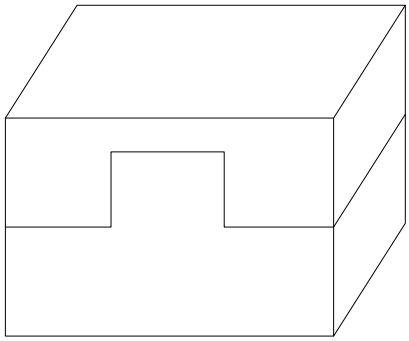


The threshold voltage can be controlled with the adjustment knob (VR1). (5V max)
Adjust the threshold voltage so that the voltage may be in following condition.
(Threshold voltage of C-B) : (Threshold voltage A-B) = 1:2.5 to 1:3.0.

<CCD board replacing procedure>

(1) Turn the machine's power off.

(2) Remove the right side PVC cover of the machine.

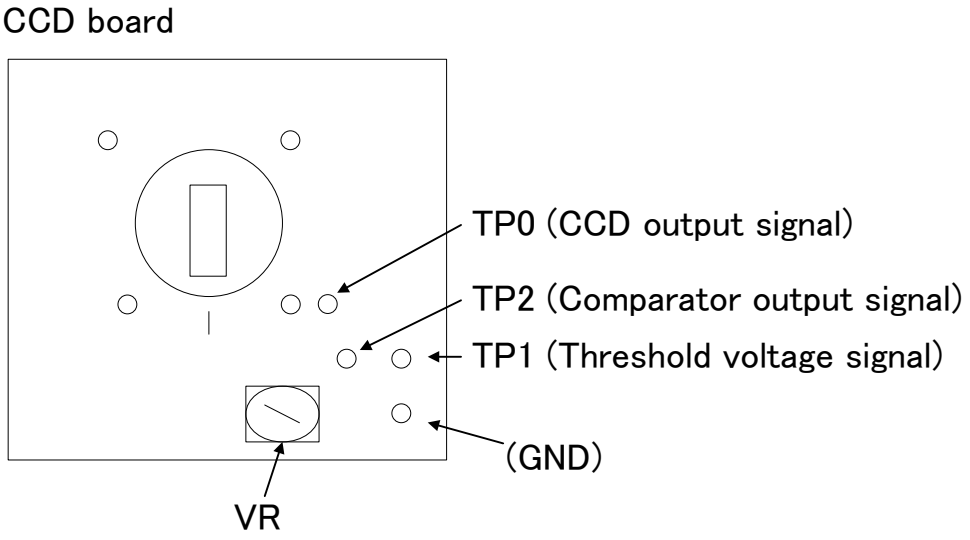


(3) Detach the cover for CCD board in Aligner by loosing the screws.

(4) Detach the CCD board from lens unit by loosing the screws.

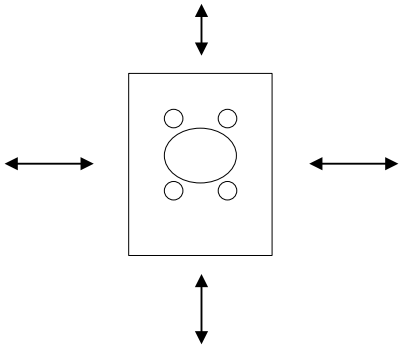
(5) Attach the new CCD board to lens unit with the screws.
(Don't tighten the tightly)

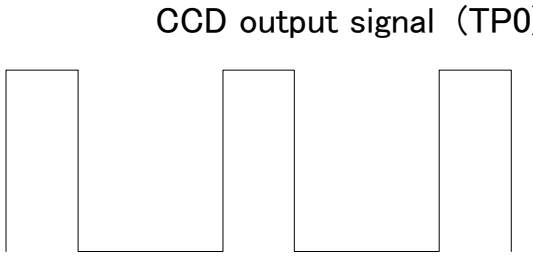
(6) In order to display CCD output signal, connect the probe (CH1) of oscilloscope to TP0 of CCD board, and then turn the oscilloscope power on.



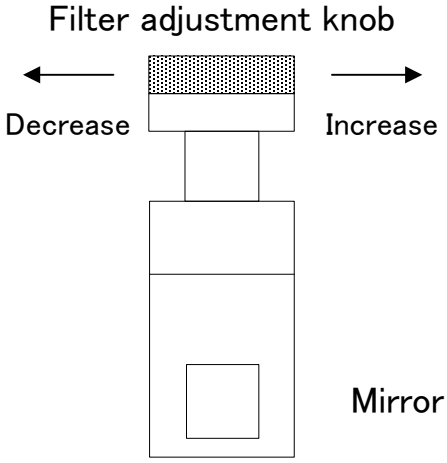
(7) Turn the machine's power on, and the fluorescent lamp comes up, and CCD output signal is displayed on the oscilloscope.

(8) Move the CCD board up and down, right and left and diagonally, and decide the position of CCD board, which makes equal the waveform to the figure below.

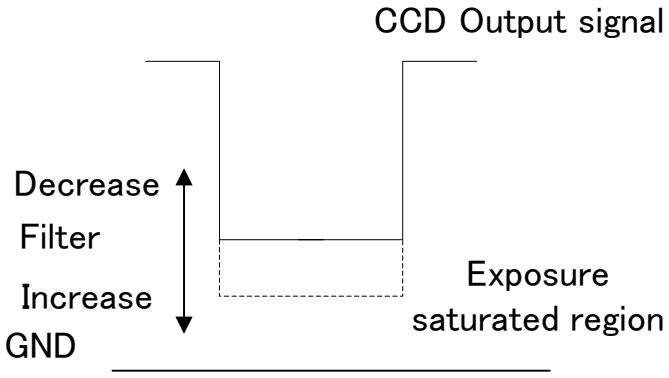




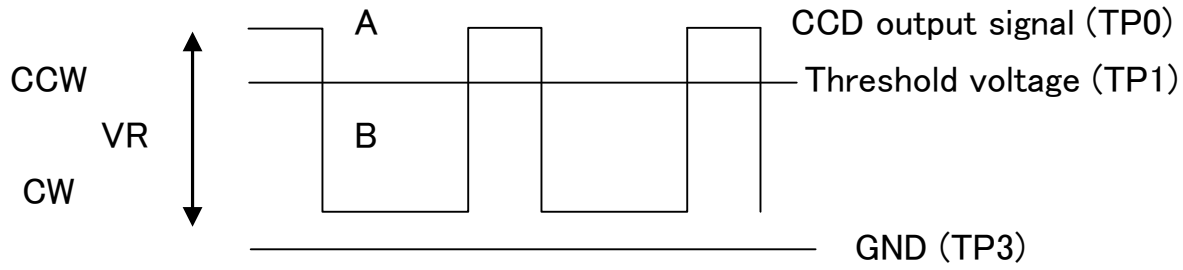
(9) Adjust a light-receptive amount of CCD line sensor by using filter adjustment knob.



When you turn the knob clockwise, the light amount increases.
When you turn the knob counterclockwise, the light amount decreases.
CCD line sensor output signal is changes as shown below by increase or decrease of the light amount
The knob position should be adjusted so that the CCD output signal is just before entering exposure saturation region.

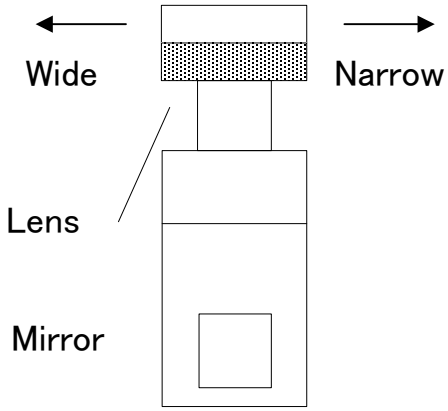


(10) Adjust the threshold voltage according to the following procedure.
Contact the probe (ch1) of oscilloscope to CCD output terminal (TP0).
Connect the probe of the signal ground terminal to Ground (TP3).
Also connect the probe (ch2) of oscilloscope to threshold voltage terminal (TP1).
The waveform shown on the next page is displayed.

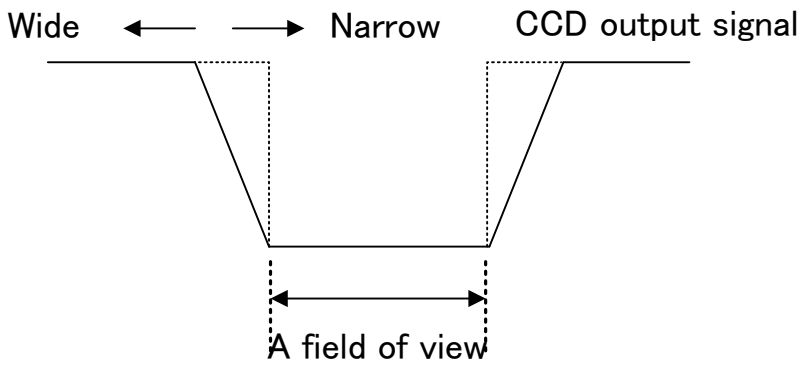


Adjust the threshold voltage so that the ratio A:B may be 1:2.5 to 1:3.0
When you turn the threshold voltage adjustment knob (VR) clockwise, the threshold voltage decreases.
When you turn the threshold voltage adjustment knob (VR) counterclockwise, the threshold voltage increases.

(11) Adjust the light-receptive area of CCD line sensor by using the focus.



When you turn the focus clockwise, the area widens, and when you turn the focus counterclockwise, the area narrows.
CCD line sensor output signal is changed by turning the focus as shown below.
However, a field of view is changed little.
A standard setting value of the focus is 1m.



(12) When you replace CCD board and/or lens unit, you must calibrate them. Perform the calibration according to 5.1.

(13) Put back the oscilloscope, CCD board cover and PVC cover.

6. ALIGNER ERROR LIST

CODE	NAME	Internal code	Remarks
430	ALIGNER COMMAND UNCONFIRMED	430, 436, 442, 452, 453, 735	
431	ALIGNER NO RESPONSE FROM ALIGNER TIME OUT	431, 736	
435	ALIGNER RESPONSE INDICATE “BUSY”	435, 440, 450, 455	
441	ALIGNER VACUUM SENSOR OFF	441	
454	ALIGNER VACUUM SENSOR ON	454	
460	ALIGNER MOTOR BOARD ERROR	460	
469	ALIGNER CCD SENSOR ERROR	463	
464	ALIGNER MIS-SETTING MODE	464	
472	ALIGNER CCD MEASUREMENT ERROR	472	
731	ALIGNER RESPONSE INDICATE “BUSY”	731, 741	
732	ALIGNER COMMAND RECEPTION FAULT	732, 733, 740, 742	
734	ALIGNER VACUUM SENSOR ERROR	734	
744	ALIGNER DATA FAILURE	744	
745	ALIGNER X-AXIS RESETTING FAILURE	745	
746	ALIGNER Y-AXIS RESETTING FAILURE	746	
747	ALIGNER LAMP-AXIS RESETTING FAILURE	747	

430/ALIGNER COMMAND UNCONFIRMED

<Causes>

DR/HR8500-III are controlled with the software for the machine and the software for the Robot/Aligner.

Since the software for the machine issued an incorrect command to the software for the Robot/Aligner, and the software for the Robot / Aligner cannot receive the command, this error occurs.

<Countermeasures>

Find and eliminate the bugs.

431/ALIGNER NO RESPONSE FROM ALIGNER TIME OUT

<Causes>

When the machine issues a command to Aligner, if Aligner does not respond to the command within the specified time, this error occurs.

<Countermeasures>

(1) Press the [RESET] key, and then press the [START] key.

(2) Make sure that PMC (PMC009) module / DSP module (DSP011) is inserted into the base module accurately.

(3) If the ERR LED (Red) located in the upper part of module unit lights up, it indicate error condition.

435/ALIGNER RESPONSE INDICATER “BUSY”

<Cause>

When the machine make an inquiry about Aligner state, Aligner does not become a standby state within the specified time.

<Countermeasures>

Press the [RESET] key, and then press the [START] key.

441/ALIGNER VACUUM SENSOR OFF

<Causes>

Although the Aligner pad chucks a wafer, the vacuum switch does not become ON.

<Countermeasures>

(1) Check the sensitivity of the vacuum switch

(2) Check the connection of air hose for Aligner.

(3) Check the connection of air hose for the vacuum switch.

(4) Check the power supply for vacuum switch.

+12V: Blown

GND: Blue

Signal: Black

(5) Make sure that the solenoid valve attaché in machine side is ON.

(6) Make sure that the DO module LED (for vacuum Sw.) is turned on.

454/ALIGNER VACUUM SENSOR ON

<Causes>

Although the Aligner pad does not chuck, the vacuum switch does not become OFF.

<Countermeasures>

It is the same countermeasures with error code 441.

460/ALIGNER MOTOR BOARD ERROR

<Causes>

CPU cannot communicate with DSP module.

<Countermeasures>

Check the connector of DSP module

469/ALIGNER CCD SENSOR ERROR

<Causes>

A wafer is off center.

<Countermeasures>

(1) Check the LIGHTING TIME of the Aligner lamp.
A normal service life of the lamp is 500 hours.

(2) Put a wafer on the Aligner pad so that the center of wafer is equal to the center Aligner pad.

Check the Robot teaching data. (Stage – Stage 1)

464/ALIGNER MIS-SETTING MODE

<Causes>

A setting about a wafer (wafer size, O.F. or V-notch) is incorrect.

<Countermeasures>

Set the wafer size and /or wafer type correctly by using Aligner screen, and then perform initial reset.

472/

<Causes>

(1) Aligner cannot detect O.F. or V-notch.
(2) A wafer edge is not smooth.
(3) CCD board is incorrect.
(4) DSP module is incorrect.
(5) Theta-axis stepping motor does not run.

<Countermeasures>

(1) Check the LIGHTING TIME of the UV lamp.
A normal service life of the lamp is 500 hours.
(2) Make sure that the length of O.F. confirms to the specifications.
(3) Replace the wafer to a wafer whose edge is smooth.
(4) Check that Aligner lamp is turned on, and check the service life of the lamp.
(5) Check the cable connections among CCD module, DSP module and Aligner interface module.
(6) Check the CCD output signal and threshold voltage.
(7) Replace DSP module.
(8) Check the cable connections among Theta axis motor, Aligner interface module, Stepping motor (PD3) and PMC module (PMC009).

731/ALIGNER RESPONSE INDICATE “BUSY”

It is the same contents with error code 431.

732/ALIGNER COMMAND RECEPTION FAULT

It is the same contents with error code 430.

734/ALIGNER VACUUM SENSOR ERROR

It is the same contents with error code 430.

744/ALIGNER DATA FAILURE

<Causes>

(1) The calibration data of CPU module is erased, because the machine has been turned off the power for approximately 10 years or more.

<Countermeasures>

Calibrate Aligner (Refer to 5.1)

745/ALIGNER X-AXIS RESETTING FAILURE

<Causes>

(1) X-axis origin sensor cannot be detected.

(2) X-axis stepping motor does not run.

<Countermeasures>

(1) Check the LED for X-axis origin sensor.

	Not shaded	Shaded
LED for X-axis origin sensor	Light off	Light on
LED for X-axis + LIMIT LED	Light on	Light off

(2) Check the cable connections among Aligner X-axis sensor board, Aligner interface board and stepping motor control board.

(3) Check the cable connections among stepping motor driver, X-axis motor, Aligner interface board and control board.

746/SLIGNER Y-AXIS RESETTING FAILURE

<Causes>

(1) Y-axis origin sensor cannot be detected.

(2) Y-axis stepping motor does not run

<Countermeasures>

(1) Check the LED for Y-axis origin sensor.

	Not shaded	Shaded
LED for Y-axis origin sensor	Light off	Light on
LED for Y-axis + LIMIT LED	Light on	Light off

(2) Check the cable connections among Aligner Y-axis sensor board, Aligner interface board and stepping motor control board.

(3) Check the cable connections among stepping motor driver, Y-axis motor, Aligner interface board and control board.

747/ALIGNER LAMP-AXIS RESETTING FAILURE

<Causes>

(1) Lamp-axis origin sensor cannot be detected.

(2) In Lamp-axis, each wafer size position cannot be detected.

(3) Lamp-axis motor does not run

<Countermeasures>

(1) In size switching sensor module, check the LED for Lamp-axis origin which is also used as for 3" position and the LED for each wafer size position sensor.

	Not shaded	Shaded
Lamp-axis origin	Light off	Light on
4" position sensor	Light off	Light on
5" position sensor	Light off	Light on
6" position sensor	Light off	Light on
8" position sensor	Light off	Light on

(2) Check the LED for DI module and each wafer size position sensor

	Not shaded	Shaded	
3" position	Light off	Light on	PH00601 LED
4" position	Light off	Light on	PH00602 LED
5" position	Light off	Light on	PH00603 LED
6" position	Light off	Light on	PH00604 LED
8" position	Light off	Light on	PH00605 LED

(3) Check the cable connections among the size switching sensor module, Aligner interface module and DSP module

(4) Check the cable connections among the size switching sensor module, Aligner interface module, brake pack and DSP module.

(5) Check that DO module outputs the signals for normal and reverse rotation of size switching motor.

	LED in DO module
When the sensor is moving toward 3" sensor	M00801 light on
When the sensor is moving toward 8" sensor	M00802 light on

(6) Check that solenoid brake frees from a locking.