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Mitsubishi RV-2AJ
Set-up and running
Procedure when connected to a
Denford CIM System

November 2006

RV-2AJ set up notes for CIM integration

15.11.06

Note ?

The parameters that need changing for the RV-2AJ to work in a Denford CIM System are :-

1. CDTR232
2. RLNG
3. SLOTON
4. SLT1
5. START (The controller has to be switched Off and then On again for the change to take effect)

Note ?

When setting up a program, under TEACH you can write the program name you want to construct e.g. ABC, you can then proceed to program position No's. If you turn the Teach pendant Off the program is saved, but when you go back into TEACH you have to type in ABC again. To get round this, the first time you type in ABC for the program name turn Off the Teach pendant and then switch Off the controller. Switch the controller back On and then select TEACH and the name ABC should be there by default.

Note ?

ROBCOMMS does not seem to work until the program name has been set as in the note above

Default RS232 settings

Baud Rate :- 9600 BPS (Parameter CBAU232)

Data Bits :- 8 bit

Parity :- EVEN PARITY (Parameter CPRTY232)

Stop Bits :- 2 BIT (Parameter CSTOP232)

Changing Line Code :- CR (Parameter CTERM232) 0=CR

IMPORTANT

A Baud rate of 2400 was only achievable to get the CIM working, to get a 9600-baud rate. Parameter CDTR232 (The DTR signal) had to be set to 1 (Default / shipping is 0)

The RV-2AJ needs HARDWARE HANDSHAKING (Mitsubishi Germany)

In the Robot.ini file check that Flags=H3

[COMMS]

Port=COM3

Settings=9600,e,8,2

; H3=Hardware handshaking.

; THIS MUST BE SET TO H3 and only the new DMTRS232.DLL implements this

; handshaking. The new DMTRS232.DLL is backward compatible with

; the old version

Flags=H3

For basic programming see: -

"Controller set up, Basic operation and Programming" manual page 2-39

For ORIGIN SETTING: -

"Robot Arm Set Up and Maintenance" manual page 2-14

1. Put in the individual ORIGIN VALUES that come with each Robot into the controller

2. From Teach Pendant select the following sequence

MENU

5. MAINT

4. ORIGIN

1. DATA

1. EXECUTE

INP/EXE Button the turn OFF Servo's

<DATA> D(D)

1: J1 J2

3: J3 J4

5: J5 J6

After inputting all the data press INP Button and the Origin confirmation screen will appear

1. EXECUTE

Press 1 and INP Button to end the origin setting operation

Changing RV-2AJ Parameters

From the Teach Pendant press the MENU button, then MAINT (opt 5) then PARAMETER (opt 1)

Type in the parameter name and then press INP/EXE to get the current setting

Setting Parameters for CIM mode

(Information on PARAMETER settings can be found on page 5-306 of "Detailed explanations of functions and operations" manual)

1. From the Teach Pendant press the MENU button, then MAINT (opt 5) then PARAMETER (opt 1)

3. Parameter **RLNG** needs changing from 1 to 0 to get into Movemaster mode (RLNG) ()
(0)

Press INP/EXE twice to set value

4. Parameter **SLOTON** needs changing from 1 to 3 to maintain the program slot (SLOTON) ()
(3)

Press INP/EXE twice to set value

SLOTON :- This Parameter specifies whether or not the program name in SLT1 parameter at program selection, as well as whether or not to maintain program selection status at the end of cycle operation

0 :- Disable Storage, do not maintain

1 :- Enable Storage, do not maintain (initial value)

2 :- Disable Storage, maintain

3 :- Enable Storage, maintain

5. Parameter **SLT1** needs changing to say ABC (SLT1) ()

ABC,CYC,START,1

Press INP/EXE twice to set value

e.g. ABC.MB4,CYC,START,1 (MB4 IS ADDED BY THE ROBOT CONTROLLER SO JUST TYPE IN ABC WHICH IS THE PROGRAM NAME), REP NEEDS CHANGING TO CYC

6. Parameter **START** needs to be 3,0 (21.4.06) (Use +4 & -4 in Robot programs)(Switch controller OFF the ON to initiate change)
CIM-593 (15 pin), CIM-594 (25 pin), CIM-602, CIM-616

7. Archive Note !!! Parameter **START** needs changing from 3,0 to 3,4 so that the original design cables (CIM-562 & CIM-563) will work, (February 2005) But OUT 0 (Pin 4) is now OUT 4.(Therefore Output 4 from the Cell computer I/O card via the Robot programs starts the program running on the Robot Controller)

Note? on the Balamand (Lebanon) Mini CIM Output 4 was put onto pin 29 (CIM-583) so that the above modification to **START** need not be carried out, also Output 0 from the Interface module (pin 3) as been removed because this signal was only used when I/O controlled the Robot (i.e. subroutine jump)
(Information on START can be found on page 6-371 of Detailed explanations of functions and operations manual)

8. From the NUST CIM 31.3.05
All Robot programs BUSY/IDLE signals will need changing from +0 / -0 to +4 / -4 for the cable changes for NUST
9. The program ABC that you have created above is just a storage place for storing all the positions you need for that Robot and performing position move commands

Teaching Positions (A)

1. Controller key switch set to [TEACH]
2. Teach Pendant key switch set to [ENABLE]
3. Press [DEAD MANS BUTTON] in
4. Press [MENU] button
5. Select [TEACH] (Option No 1)
6. Select program [ABC] (Default) by pressing INP/EXE button
7. Keep pressed the [STEP/MOVE] (Servo's ON) button
8. Press [POS] + [ADD] buttons together
9. Type a position number you want to teach e.g. 11
10. Jog the axes to the correct position
11. Press [STEP/MOVE] (Servo's ON) + [ADD] buttons
12. Press [STEP/MOVE] (Servo's ON) + [ADD] buttons again to confirm REPLACE

Teaching Positions (B)

1. TEACH
2. ABC
3. POS (Release button)
4. 51 (Robot Position No you require to teach)
5. INP/EXE button
6. DEAD MANS HANDLE (PRESS IN HALF WAY ONLY)
7. STEP / MOVE (Servo's on)
8. JOINT / XYZ
9. Jog axes with appropriate buttons
10. STEP / MOVE +ADD buttons
11. STEP / MOVE +ADD buttons (Confirms replacement)

Option (A) Move to a pre taught position

E.g. move to position 11

1. Controller key switch set to [TEACH]
2. Teach Pendant key switch set to [ENABLE]
3. Press [DEAD MANS BUTTON] in
4. Press [MENU] button
5. Select [TEACH] (Option No 1)
6. Select program [ABC] (Default) by pressing [INP/EXE] button
7. Press [STEP/MOVE] (Servo's ON) then RELEASE
8. Press [POS] button
9. Type in the position No you want to move to e.g. 11
10. Press the [DEAD MANS BUTTON] + the [STEP / MOVE] button
(Once the Servo's are on, release the [STEP / MOVE]) button, then press the [INP/EXE] button (Robot beeps if everything is OK) keep the button pressed in until the move has been completed.

Option (B) Move to a pre taught position

E.g. move to position 151

1. Controller key switch set to [TEACH]
2. Teach Pendant key switch set to [ENABLE]
3. Press [DEAD MANS BUTTON] in
4. Press [MENU] button
5. Select [TEACH] (Option No 1)
6. Select program [ABC] (Default) by pressing [INP/EXE] button
7. Press the [BACKWD] button until there is no data visible

8. Press the [RPL] button TWICE until a clear line is opposite the flashing cursor
9. Press [CHAR] (Character) button then press the M & O buttons (These are multifunctional buttons)
10. Release the [CHAR] (Character) button then press the 1, 5 & 1 buttons
11. The screen should now read MO 151
12. Press the [DEAD MANS BUTTON] + the [STEP / MOVE] button (Once the Servo's are on, release the [STEP / MOVE] button, then press the [INP/EXE] button (Robot beeps if everything is OK) keep the button pressed in until the move has been completed.

Opening and Closing the Robot Grippers

1. Press [DEAD MANS BUTTON] in and hold
2. Press the [HAND] button + [+C] button (Gripper CLOSED)
3. Press the [HAND] button + [-C] button (Gripper OPEN)

APPENDIX

1. Bits

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      F   !   F   !   F   !   F
15 14 13 12 ! 11 10 9 8 ! 7 6 5 4 ! 3 2 1 0
 8   4   2   1 ! 8   4   2   1 ! 8 4 2 1 ! 8 4 2 1

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OD = OUTPUT DIRECT (I.e. used for controlling Linear Slide)
 (For OD explanation see page 2-57 Explanation of Movemaster commands manual)

<u>COMMAND</u>	<u>RESPONSE</u>	
OD &F,8,11	&H0F00	Turns bits 8,9,10,11 ON (The 8 is the bit No and the 4 says how many to read to the LEFT of bit 8)
OD &8,8	&H0800	Turns 11 ON (Only)
OD &FF,8,8	&HFF00	Turns bits 8,9,10,11 + 12,13,14,15 ON
OD &FFFF	&HFFFF	Turns bits 0 to 15 ON

2. When checking I/O status on the controller, do a ID before a DR
 When using the Denford RS232 Communicator software, the sequence is:-

ID
OD &F,8,11
DR

Response for this data would be
&HOF00 (Response is really is &HOF02, because 2 comes on when the servo's are active)

(Initial default from controller is &H0000,&H0000)

3. When using the Denford RS232 Communicator software if you send a RS (RESET) this will get the servo drives active
4. Running ROBCOMMS with a RV-2AJ
 - A. When all the PARAMETERS have been changed turn the Robot controller OFF and then ON again
 - B. Teach pendant Keyswitch to OFF
 - C. Robot Controller Keyswitch to AUTO (EXT)
 - D. If you get ERROR L6020 "Operation Disabled" make sure A, B and C have been done above
 - E. If you get ERROR L2000 "SERVO IS OFF", just send a RS (RESET) to the Robot and the SERVOS should click ON
5. PARAMETER CBAU232 changes the BAUD RATE (9600)
6. Running in CIM mode, Robot controller key switch needs to set to AUTO/(EXT) and teach pendant OFF
7. When changing the START parameter, the controller must be switched OFF then ON for the changes to take place
8. Error Logging
On the Teach box from the menu screen press Monitor (4) then Error (4), press the ADD key to see previous errors and the RPL key to see the following errors.
9. Reducing the JOG Speed when running ROBCOMMS
 - A. Set Teach Pendant Keyswitch to DISABLE
 - B. Turn Robot controller Keyswitch to AUTO (Op)
 - C. Press the CHNG DISP button until you get "OVERRIDE" on the STATUS NUMBER display.

Status Number

0	100
---	-----

D. Using the UP and DOWN arrow buttons set the % you require

Status Number

0	10
---	----

Is 10%

10. Jog speed limit value (Parameter JOGSPMX) :- 250.0 (Max)
11. Teach pendant Jog speed change
Press STEP/MOVE button, this displays current position and speed (%) to change the speed
hold down the STEP/MOVE button and press the [+] button to increase the jog speed and [-] to decrease the jog speed.
The jog speed goes up / down in percentages with a HIGH and LOW setting
12. SERVO's ON from Teach Pendant
[MENU] opt2 [RUN] opt1 [SERVO]
SERVO OFF (*)
* = 0 (OFF)
* = 1 (ON)
[INP/EXE] TO CONFIRM CHANGE
13. OUTPUT SIGNAL MONITOR / SET (i.e to check BIT 8)
Press the following buttons [MENU] opt4 [MONITOR] opt 2[OUTPUT]
Press [8] then [INP/EXE]
Use cursor to align up to Bit 8
Press the [1] button then [INP/EXE] to set Bit 8 ON
14. INPUT SIGNAL MONITOR (i.e to check BIT 8)
Press the following buttons [MENU] opt4 [MONITOR] opt 1[INPUT]
Press [8] then [INP/EXE]
This will display the status (On or Off) of bit 8

Programs values for CIM systems (TYPICAL VALUES)

1. RS (Start programs with an RS line (RESET))
2. DL 1,9999 (Delete Lines 1 to 9999)
3. Line No OB +4 (Turn Output Bit 4 ON (Busy Signal))
4. Line No SP 29,H (Set Speed and accel / Deaccel)
5. Line No SP 15,L
6. Line No MT 14,+30,O (Move Tool (Dual gripper))
7. Line No OB -4 (Turn Output Bit 4 OFF (Idle Signal))
8. RN (Run)

Using COSIROP to read the RV-2AJ's parameters after the Robot was running OK gave the following: -

SLOT1 (SLT1) ABC.MB4, CYC, START, 1

(NOTE?) Parameter START was initially set to 3,0 but changed to 3,4 so output 0 was changed to output 4 (Busy / Idle) so we could use the standard robot I/O cable.

SLT=SLOT TABLE

1 to 32 slots (No of ARRAY's)

Character string: - 4

Explanation

Set the operation conditions for each task. These slots are set when the program is reset.

Designate the (PROGRAM NAME, OPERATION MODE, STARTING CONDITIONS AND ORDER OF PRIORITY)

Program Name: Select Program Name

Operation Mode: continuous/1 cycle = REP/CYC

Starting Condition: Normal/Error/Always = START/ERROR/ALWAYS

Order of Priority: 1 to 31 (31 is maximum)

Factory Settings: 1, REP, START, 1

Balamand test positions (2-2-05)

PD 11,-10.85,+183.36,+478.00,-0.81,+179.60,R,A,C
PD 12,+42.09,+375.85,+328.54,+33.51,+135.54,R,A,C
PD 13,-8.88,+375.85,+328.54,+33.51,+135.54,R,A,C
PD 15,-8.88,+267.08,+403.63,+33.51,+135.54,R,A,C
PD 21,-3.86,+163.41,+472.25,-91.49,+178.93,R,A,C
PD 22,-5.52,+423.56,+361.53,-4.53,+91.16,R,A,C
PD 23,-5.52,+423.56,+279.83,-4.53,+91.16,R,A,C
PD 24,-5.52,+423.56,+229.54,-4.53,+91.16,R,A,C
PD 25,-5.35,+320.59,+263.77,-4.33,+91.03,R,A,C
PD 51,-1.42,+183.68,+478.00,+2.13,+179.60,R,A,C
PD 52,+129.56,+405.76,+302.88,+123.77,+68.62,R,A,O
PD 53,-7.88,+405.76,+302.88,+123.77,+68.62,R,A,O
PD 55,-7.88,+332.03,+520.88,+123.77,+68.62,R,A,C
PD 61,-4.14,-183.65,+477.86,+183.50,+179.58,R,A,C
PD 64,-7.28,-322.84,+114.18,+181.75,+168.76,R,A,C
PD 100,+183.69,+0.24,+478.00,+92.50,+179.60,R,A,C

Typical Balamand Robot program

RS (Start programs with an RS line (RESET))
DL 1,9999 (Delete Lines 1 to 9999)
10 OB +4 (Turn Output Bit 4 - ON (Busy Signal))
20 MO 100,O (Move to position 100, gripper open)
30 SP 29 (Speed 29 - Max 29 Min 0)
35 GP 63,63,10 (Grip Pressure)
40 ID (Input Direct - Checks states of IO)
50 TB -11,630 (Test Bit - Test the status of bits)
60 OD &1,8,4 (Output Direct - Outputs a bit pattern)
70 TI 15 (Time Delay)
80 OD &9,8,4
90 TI 15
100 OD &1,8,4
110 TI 20
130 ID
140 TB +8,130
150 ID
160 TB -10,150
170 MO 100,O
180 MO 51,O
190 MO 52,O
200 SP 20,L

210 MO 53,O
 220 GC
 230 TI 10
 240 MO 55,C
 300 SP 29,H
 310 MO 51,C
 320 MO 100,C
 330 OD &07,8,4
 340 OD &0F,8,4
 350 TI 2
 360 OD &07,8,4
 370 TI 20
 390 ID
 400 TB +8, 390
 410 ID
 420 TB -10, 410
 430 MO 21,C
 440 MO 22,C
 445 SP 15,L
 450 MO 23,C
 470 MO 24,C
 530 GO
 540 TI 5
 550 MO 25,O
 555 SP 29,H
 560 MO 22,O
 570 MO 21,O
 590 MO 100,O
 630 OB -4 (Turn Output Bit 4 - OFF (Idle Signal))
 RN (RUN)

RS232 connection details

