

Instructions for phase 3 Demo

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Part 1 - Test Program 2

Deliverable description:

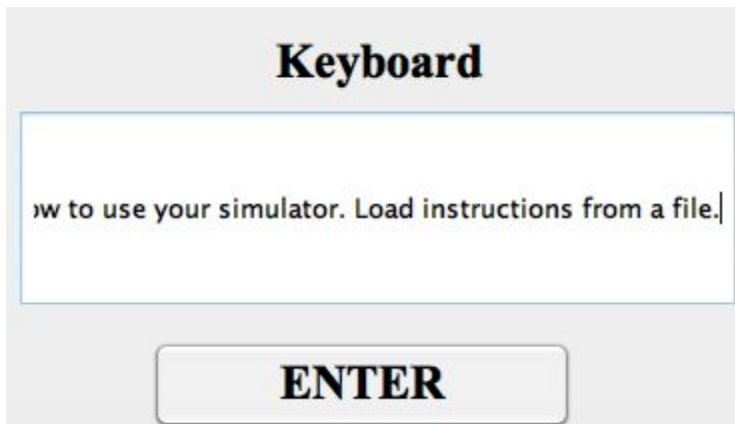
Demonstration that Program 2 works.

Demo Steps:

1. Click on “Test Program 2”



2. (Please use only single-space and single periods) Randomly enter 6 sentences with **period(.)** separated, such as - “**Demonstration that Program 2 works. and how to operate it. Include source code for program 2. what the console layout is and how to operate it. Simple documentation describing how to use your simulator. Load instructions from a file.**” - Click on “ENTER”



3. Enter the **word** what you intend to search for - such as “**instructions**” - then click on “ENTER”

Keyboard

instructions

ENTER

[Expected Result] - Output the first location and sentence number of the searched word in the six sentences. (our program will only find the first one if there are multiple matches to be found. And please reopen the GUI and get it reloaded if the result is not expected)

Match found at word 2 of sentence 6

Part 2 - Demo for Trap/Machine Fault

Deliverable description:

Machine Fault (Part III)

Demo Steps (Please reopen the GUI if the result is not expected):

1. TRAP code

s1. input 100 to PC

PC

[0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]

100

Accept Input

s2. input 10 (between 0 - 15) to GPR0 as the code

GPR0

s3. select relevant values for TRAP (IX = 0; **GPR = 0**; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions

[Expected Result] ->

1. PC = 100 (actually it has changed from 100[current pc] to 20[the address of the user-specified instructions stored elsewhere in memory for trap] to 100[return previous pc after executing routine])

PC

2. MFR = 10 (contains the ID code [trap code] if a machine fault after it occurs)

MFR

3. MSR = 110 (the routine instruction is defined as 100 + trap code to indicate the status of the health of the machine)

MSR

4. Memory location 0 = 20 (contains the address of the specific executed routine) - Click "Accept" close to Memory [0] to get content (20) visible

Memory

2. Machine Fault

2.1. Illegal Memory Address to Reserved Locations

s1. input 100 to PC

s2. select relevant values for LDR (IX = 0; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

[Expected Result] ->

1. PC = 100 (actually it has changed from 100[current pc] to 11[the address of the user-specified instructions stored elsewhere in memory for trap] to 100[return previous pc after executing routine])

2. MFR = 1 (contains the ID code [id for Illegal Memory Address to Reserved Locations] if a machine fault after it occurs)

3. MSR = 101 (the routine instruction is defined as 100 + ID code to indicate the status of the health of the machine)

4. Memory location 1 = 11 (contains the address of the specific executed routine) - Click “Accept” close to Memory [1] to get content (11) visible

2.2. Illegal TRAP code

s1. input 100 to PC

PC

s2. input 20 (out of 0 - 15) to GPR0 as the code

GPR0

s3. select relevant values for TRAP (IX = 0; **GPR = 0**; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions

[Expected Result] ->

1. PC = 100 (actually it has changed from 100[current pc] to 12[the address of the user-specified instructions stored elsewhere in memory for trap] to 100[return previous pc after executing routine])

PC

2. MFR = 2 (contains the ID code [id for Illegal TRAP code] if a machine fault after it occurs)

MFR

3. MSR = 102 (the routine instruction is defined as 100 + ID code to indicate the status of the health of the machine)

MSR

4. Memory location 1 = 12 (contains the address of the specific executed routine) - Click "Accept" close to Memory [1] to get content (12) visible

Memory

2.3. Illegal Operation Code

s1. input 100 to PC

PC	<input type="text" value="[0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>
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s2. select relevant values for Invalid OpCode (IX = 0; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions	Invalid OpCode	No...	GPR0	IA ...	0
	<input type="text" value="[1, 1, 0, 1, 1, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] ->

1. PC = 100 (actually it has changed from 100[current pc] to 13[the address of the user-specified instructions stored elsewhere in memory for trap] to 100[return previous pc after executing routine])

PC	<input type="text" value="[0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>
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2. MFR = 3 (contains the ID code [id for Illegal Operation Code] if a machine fault after it occurs)

MFR	<input type="text" value="[0, 0, 1, 1]"/>
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3. MSR = 103 (the routine instruction is defined as 100 + ID code to indicate the status of the health of the machine)

MSR	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1]"/>
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4. Memory location 1 = 13 (contains the address of the specific executed routine) - Click "Accept" close to Memory [1] to get content (13) visible

Memory	<input type="text" value="1"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1]"/>	<input type="text" value="13"/>	<input type="button" value="Accept"/>
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2.4. Illegal Memory Address beyond 2048 (memory installed)

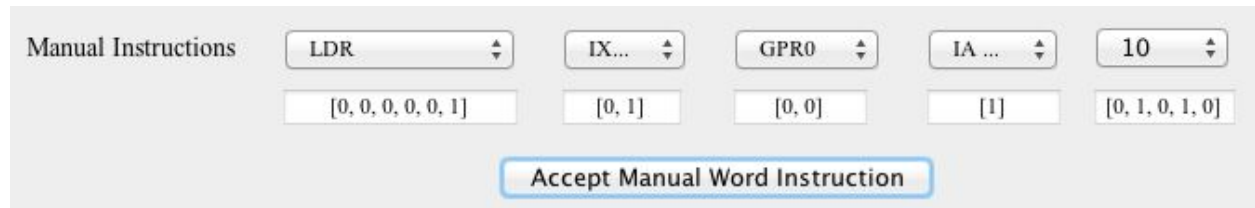
s1. input 100 to PC

PC	<input type="text" value="[0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>
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s2. input 2300 to IX1



s3. select relevant values for LDR (IX = 1; GPR = 0; I = 1; Address = 10) in manual input part -> accept manual word instruction

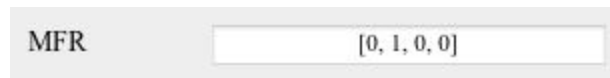


[Expected Result] ->

1. PC = 100 (actually it has changed from 100[current pc] to 14[the address of the user-specified instructions stored elsewhere in memory for trap] to 100[return previous pc after executing routine])



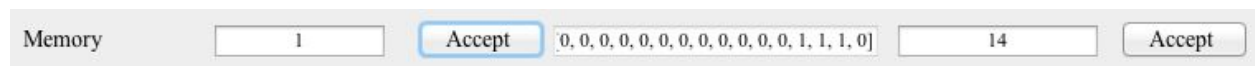
2. MFR = 4 (contains the ID code [id for Illegal Memory Address beyond 2048] if a machine fault after it occurs)



3. MSR = 104 (the routine instruction is defined as 100 + ID code to indicate the status of the health of the machine)



4. Memory location 1 = 14 (contains the address of the specific executed routine) - Click "Accept" close to Memory [1] to get content (14) visible



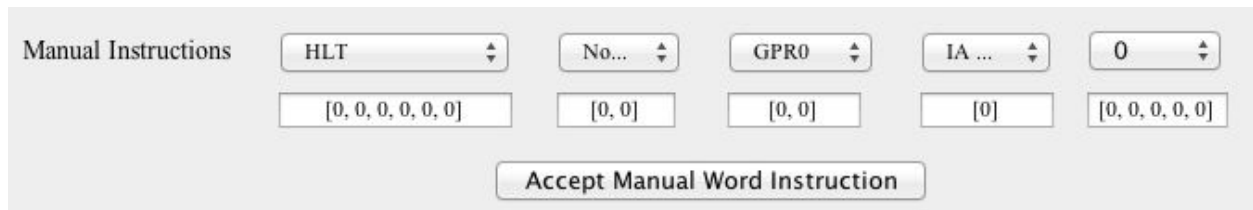
Part 3 - Demonstrate instructions through GUI(updated)

Deliverable description:

Load instructions from a file.

Explanation:

We are not intending to make duplicate load work, so keep having a list of opcode/assembly instructions (as phase 2) that the GUI can “load” from to replace load instructions from a file.



The image shows a GUI for manual instructions. It has a label 'Manual Instructions' on the left. To its right are five dropdown menus: 'HLT', 'No...', 'GPR0', 'IA ...', and '0'. Below these are five text boxes containing '[0, 0, 0, 0, 0, 0]', '[0, 0]', '[0, 0]', '[0]', and '[0, 0, 0, 0, 0]'. At the bottom center is a button labeled 'Accept Manual Word Instruction'.

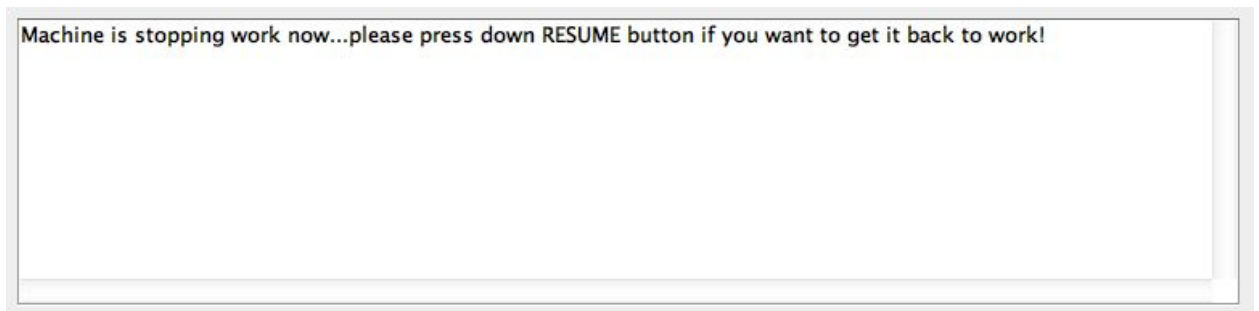
Demo Steps (Please reopen the GUI if the result is not expected):

1. HLT/RESUME

s1. Click on “HALT”



[Expected Result] -> ALU stops working, no more instructions will be executed.



s2. Click on “RESUME”



[Expected Result] -> ALU gets back to work.

Machine is getting back to work!

2. LDR

Case 1 - $IX = 0, I = 0 \rightarrow EA = \text{address}$

s1. input 10 to memory location -> accept

s2. input 100 to memory location's value -> accept

Memory	<input type="text" value="10"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s3. select relevant values for LDR ($IX = 0$; $GPR = 3$; $I = 0$; Address = 10) in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="LDR"/>	<input type="button" value="No..."/>	<input type="button" value="GPR3"/>	<input type="button" value="IA ..."/>	<input type="button" value="10"/>
	<input type="text" value="0, 0, 0, 0, 0, 1"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1, 1]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 0, 1, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR3 is populated with 100

GPR3	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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Case 2 - $IX \neq 0, I = 1 \rightarrow EA = \text{address} + c(IR)$

s1. input 5 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1"/>	<input type="text" value="5"/>	<input type="button" value="Accept"/>
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s2. input 20 to memory location -> accept

s3. input 100 to memory location's value -> accept

Memory	20	Accept	0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100	Accept
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s4. select relevant values for LDR (IX = 1; GPR = 3; I = 1; Address = 15) in manual input part -> accept manual word instruction

Manual Instructions	LDR	IX...	GPR3	IA ...	15
	[0, 0, 0, 0, 0, 1]	[0, 1]	[1, 1]	[1]	[0, 1, 1, 1, 1]
Accept Manual Word Instruction					

[Expected Result] -> GPR3 is populated with 100

GPR3	0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100	Accept
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3. STR

Case 1 - IX = 0, I = 0 -> EA = address

s1. input 100 to GPR3 -> accept

GPR3	0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100	Accept
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s2. select relevant values for STR (IX = 0; GPR = 3; I = 0; Address = 20) in manual input part -> accept manual word instruction

Manual Instructions	STR	No...	GPR3	IA ...	20
	[0, 0, 0, 0, 1, 0]	[0, 0]	[1, 1]	[0]	[1, 0, 1, 0, 0]
Accept Manual Word Instruction					

[Expected Result] -> 100 is stored into memory address 20 (please click Accept close to Memory[20] to get content[100] visible)

Memory	20	Accept	0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100	Accept
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Case 2 - IX != 0, I = 1 -> EA = address + c(IR)

s1. input 5 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1"/>	<input type="text" value="5"/>	<input type="button" value="Accept"/>
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s2. input 100 to GPR3 -> accept

GPR3	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s3. select relevant values for STR (IX = 1; GPR = 3; I = 1; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="STR"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR3"/>	<input type="button" value="IA ..."/>	<input type="text" value="15"/>
	<input type="text" value="0, 0, 0, 0, 1, 0"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[1, 1]"/>	<input type="text" value="[1]"/>	<input type="text" value="[0, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> 100 is stored into memory address 20 (please click
Accept close to Memory[20] to get content[100] visible)

Memory	<input type="text" value="20"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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4. LDA

Case 1 - IX = 0, I = 0 -> EA = address

s1. select relevant values for LDA (IX = 0; GPR = 3; I = 0; Address = 20)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="L..."/>	<input type="button" value="No..."/>	<input type="button" value="GPR3"/>	<input type="button" value="IA ..."/>	<input type="text" value="20"/>
	<input type="text" value="0, 0, 0, 0, 1, 1"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1, 1]"/>	<input type="text" value="[0]"/>	<input type="text" value="[1, 0, 1, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR3 is populated with 20

GPR3	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0"/>	<input type="text" value="20"/>	<input type="button" value="Accept"/>
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Case 2 - $IX \neq 0, I = 1 \rightarrow EA = \text{address} + c(IX)$

s1. input 5 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1"/>	<input type="text" value="5"/>	<input type="button" value="Accept"/>
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s2. select relevant values for LDA ($IX = 1$; $GPR = 3$; $I = 1$; Address = 20)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="L..."/>	<input type="button" value="IX..."/>	<input type="button" value="GPR3"/>	<input type="button" value="IA ..."/>	<input type="button" value="20"/>
	<input type="text" value="[0, 0, 0, 0, 1, 1]"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[1, 1]"/>	<input type="text" value="[1]"/>	<input type="text" value="[1, 0, 1, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR3 is populated with 25

GPR3	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1"/>	<input type="text" value="25"/>	<input type="button" value="Accept"/>
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5. LDX

(Please note here the Index Register and GPR should be worked in pair,
IX1 works with GPR1, IX2 works with GPR2 and IX3 works with GPR3)

s1. input 10 to memory location -> accept

s2. input 100 to memory location's value -> accept

Memory	<input type="text" value="10"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s3. select relevant values for LDX ($IX = 1$; **GPR = 1**; $I = 0$; Address = 10)

in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="LDX"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR1"/>	<input type="button" value="IA ..."/>	<input type="button" value="10"/>
	<input type="text" value="[1, 0, 0, 0, 0, 1]"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 0, 1, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> IX1 is populated with 100

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>
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6. STX

s1. repeat 5. LDX

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>
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s2. select relevant values for STX (IX = 1; GPR = 3; I = 0; Address = 31)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="STX"/>	<input type="text" value="IX..."/>	<input type="text" value="GPR3"/>	<input type="text" value="IA ..."/>	<input type="text" value="31"/>
	<input type="text" value="1, 0, 0, 0, 1, 0"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[1, 1]"/>	<input type="text" value="[0]"/>	<input type="text" value="[1, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> 100 is stored into memory location 31 (please click Accept close to Memory[31] to get content[100] visible)

Memory	<input type="text" value="31"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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7. JZ

Case 1 - If $c(r) = 0$, then $PC \leftarrow EA(\text{address})$

s1. select relevant values for JZ (IX = 0; GPR = 2; I = 0; Address = 15)
in manual input part -> accept manual word instruction

GPR2	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0"/>	<input type="text" value="0"/>	<input type="button" value="Accept"/>
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Manual Instructions	<input type="text" value="JZ"/>	<input type="text" value="No..."/>	<input type="text" value="GPR2"/>	<input type="text" value="IA ..."/>	<input type="text" value="15"/>
	<input type="text" value="0, 0, 1, 0, 0, 0"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC is populated with address 15

PC	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1"/>	<input type="text" value="15"/>
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Case 2 - If $c(r) \neq 0$, then $PC \leftarrow PC + 1$

s1. input 10 to GPR2

GPR2	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>
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s2. PC is populated with 15

PC	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1"/>	<input type="text" value="15"/>
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s3. select relevant values for JZ (IX = 0; GPR = 2; I = 0; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="JZ"/>	<input type="text" value="No..."/>	<input type="text" value="GPR2"/>	<input type="text" value="IA ..."/>	<input type="text" value="15"/>
	<input type="text" value="0, 0, 1, 0, 0, 0"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC is populated with address 16

PC	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0"/>	<input type="text" value="16"/>
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8. JNE

Case 1 - If $c(r) \neq 0$, then $PC \leftarrow EA(\text{address})$

s1. input 100 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s2. select relevant values for JNE (IX = 0; GPR = 0; I = 0; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="JNE"/>	<input type="text" value="No..."/>	<input type="text" value="GPR0"/>	<input type="text" value="IA ..."/>	<input type="text" value="15"/>
	<input type="text" value="0, 0, 1, 0, 0, 1"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC is populated with address 15

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1]"/>	<input type="text" value="15"/>
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Case 2 - If $c(r) \neq 0$, $IX \neq 0$ and $I = 1$ then $PC \leftarrow \text{address} + c(IX)$

s1. input 100 to GPR0

GPR0	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s2. input 5 to IX1

IX1	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1]"/>	<input type="text" value="5"/>	<input type="button" value="Accept"/>
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s3. select relevant values for JNE ($IX = 1$; $GPR = 0$; $I = 1$; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="JNE"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="15"/>
	<input type="text" value="[0, 0, 1, 0, 0, 1]"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1]"/>	<input type="text" value="[0, 1, 1, 1, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC is populated with address 20

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]"/>	<input type="text" value="20"/>
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Case 3 - If $c(r) = 0$, then $PC \leftarrow PC + 1$

s1. input 0 to GPR1

GPR1	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]"/>	<input type="text" value="0"/>
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s2. PC is populated with 20

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]"/>	<input type="text" value="20"/>
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s3. select relevant values for JNE ($IX = 0$; $GPR = 1$; $I = 0$; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions

JNE No... GPR1 IA ... 15

[0, 0, 1, 0, 0, 1] [0, 0] [0, 1] [0] [0, 1, 1, 1, 1]

Accept Manual Word Instruction

[Expected Result] -> PC is populated with 21

PC [0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1] 21

9. JCC

Case 1 - If cc bit = 1, $PC \leftarrow EA(\text{address})$

s1. input 15 to Condition Code

CC [1, 1, 1, 1] 15 Accept Input

s2. select relevant values for JCC (IX = 0; GPR = 1; I = 0; Address = 15)

in manual input part -> accept manual word instruction

Manual Instructions

JCC No... GPR1 IA ... 15

[0, 0, 1, 0, 1, 0] [0, 0] [0, 1] [0] [0, 1, 1, 1, 1]

Accept Manual Word Instruction

[Expected Result] -> PC is populated with 15

PC [0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1] 15

Case 2 - If cc bit = 0, $PC \leftarrow PC + 1$

s1. input 15 to PC

PC [0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1] 15

s2. input 0 to Condition Code

CC	[0, 0, 0, 0]	0
----	--------------	---

s3. select relevant values for JCC (IX = 0; GPR = 1; I = 0; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	JCC	No...	GPR1	IA ...	15
	[0, 0, 1, 0, 1, 0]	[0, 0]	[0, 1]	[0]	[0, 1, 1, 1, 1]
Accept Manual Word Instruction					

[Expected Result] -> PC is populated with 16

PC	[0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0]	16
----	--------------------------------------	----

10. JMA

Case 1 - PC <- EA(address), if I bit not set

s1. select relevant values for JMA (IX = 0; GPR = 1; I = 0; Address = 15)
in manual input part -> accept manual word instruction

Manual Instructions	J...	No...	GPR1	IA ...	15
	[0, 0, 1, 0, 1, 1]	[0, 0]	[0, 1]	[0]	[0, 1, 1, 1, 1]
Accept Manual Word Instruction					

[Expected Result] -> PC is populated with 15

PC	[0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1]	15
----	--------------------------------------	----

Case 2 - PC <- Address + c(IX), if I bit set

s1. input 5 to IX1

IX1	[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1]	5	Accept
-----	---	---	--------

s2. select relevant values for JMA (IX = 1; GPR = 1; I = 1; Address = 15)

in manual input part -> accept manual word instruction

Manual Instructions	J... ▾	IX... ▾	GPR1 ▾	IA ... ▾	15 ▾
	0, 0, 1, 0, 1, 1]	[0, 1]	[0, 1]	[1]	[0, 1, 1, 1, 1]
<div>Accept Manual Word Instruction</div>					

[Expected Result] -> PC is populated with 20

PC	0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]	20
----	-------------------------------------	----

11. RFS - $R0 \leftarrow \text{Immed}$; $PC \leftarrow c(R3)$

s1. input 20 to GPR3

GPR3	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]	20	Accept
------	--	----	--------

s2. select relevant values for RFS (IX = 0; GPR = 3; I = 0; Address = 10)

in manual input part -> accept manual word instruction

Manual Instructions	RFS ▾	No... ▾	GPR3 ▾	IA ... ▾	10 ▾
	0, 0, 1, 1, 0, 1]	[0, 0]	[1, 1]	[0]	[0, 1, 0, 1, 0]
<div>Accept Manual Word Instruction</div>					

[Expected Result] -> GPR0 is populated with 10, PC is populated with 20

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]	10	Accept
------	---	----	--------

PC	0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]	20
----	-------------------------------------	----

12. SOB

Case 1 - $r \leftarrow c(r) - 1$ If $c(r) > 0$, $PC \leftarrow \text{EA}(\text{address})$

s1. input 10 to GPR0

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]	10	Accept
------	---	----	--------

s2. select relevant values for SOB (IX = 0; GPR = 0; I = 0; Address = 10)
in manual input part -> accept manual word instruction

Manual Instructions	SOB	No...	GPR0	IA ...	10
	0, 0, 1, 1, 1, 0]	[0, 0]	[0, 0]	[0]	[0, 1, 0, 1, 0]

Accept Manual Word Instruction

[Expected Result] -> GPR0 = 9; PC = 10

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1]	9
PC	[0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]	10

Case 2 - $r \leftarrow c(r) - 1$ If $c(r) > 0$, $PC \leftarrow \text{Address} + c(\text{IX})$ if $\text{IX} \neq 0$ and $I = 1$

s1. input 10 to GPR0

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]	10	Accept
------	---	----	--------

s2. input 5 to IX1

IX1	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1]	5	Accept
-----	--	---	--------

s3. select relevant values for SOB (IX = 1; GPR = 0; I = 1; Address = 10)
in manual input part -> accept manual word instruction

[Expected Result] -> GPR0 = 9; PC = 15

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1]	9
PC	[0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1]	15

Case 3 - If $c(r) = 0$, $PC \leftarrow PC + 1$

s1. input 0 to GPR0

GPR0	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]	0	Accept
------	---	---	--------

s2. input 20 to PC

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]"/>	<input type="text" value="20"/>
----	---	---------------------------------

s3. select relevant values for SOB (IX = 0; GPR = 0; I = 0; Address = 10)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="SOB"/>	<input type="text" value="No..."/>	<input type="text" value="GPR0"/>	<input type="text" value="IA ..."/>	<input type="text" value="10"/>
	<input type="text" value="0, 0, 1, 1, 1, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 0, 1, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC = 21

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1]"/>	<input type="text" value="21"/>
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13. JGE

Case 1 - If $c(r) \geq 0$, then $PC \leftarrow EA(\text{address})$ if $IX = 0$ and $I = 0$

s1. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	---	---------------------------------	---------------------------------------

s2. select relevant values for JGE (IX = 0; GPR = 0; I = 0; Address = 10)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="JGE"/>	<input type="text" value="No..."/>	<input type="text" value="GPR0"/>	<input type="text" value="IA ..."/>	<input type="text" value="10"/>
	<input type="text" value="0, 0, 1, 1, 1, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 1, 0, 1, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC = 10

PC	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]"/>	<input type="text" value="10"/>
----	---	---------------------------------

Case 2 - If $c(r) \geq 0$, $IX \neq 0$ and $I = 1$, then $PC \leftarrow \text{Address} + c(\text{IX})$

s1. input 5 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1"/>	<input type="text" value="5"/>	<input type="button" value="Accept"/>
-----	--	--------------------------------	---------------------------------------

s2. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	--	---------------------------------	---------------------------------------

s3. select relevant values for JGE (IX = 1; GPR = 0; I = 1; Address = 10)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="JGE"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="text" value="10"/>
	<input type="text" value="0, 0, 1, 1, 1, 1"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[1]"/>	<input type="text" value="[0, 1, 0, 1, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> PC = 15

PC	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1"/>	<input type="text" value="15"/>
----	---	---------------------------------

14. AMR

s1. input 20 to memory location -> accept

s2. input 100 to memory location's value -> accept

Memory	<input type="text" value="20"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>
--------	---------------------------------	---------------------------------------	---	----------------------------------

s3. input 100 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>
------	--	----------------------------------

s4. select relevant values for AMR (IX = 0; GPR = 0; I = 0; Address = 20)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="A..."/>	<input type="button" value="No..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="text" value="20"/>
	<input type="text" value="0, 0, 0, 1, 0, 0"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[1, 0, 1, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 200

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0]"/>	<input type="text" value="200"/>
------	--	----------------------------------

15. SMR

s1. input 200 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0]"/>	<input type="text" value="200"/>
------	--	----------------------------------

s2. input 20 to memory location -> accept

s3. input 100 to memory location's value -> accept

Memory	<input type="text" value="20"/>	<input type="button" value="Accept"/>	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>
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s4. select relevant values for SMR (IX = 0; GPR = 0; I = 0; Address = 20)

in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="S..."/>	<input type="text" value="No..."/>	<input type="text" value="GPR0"/>	<input type="text" value="IA ..."/>	<input type="text" value="20"/>
	<input type="text" value="0, 0, 0, 1, 0, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[1, 0, 1, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 100

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0]"/>	<input type="text" value="100"/>
------	--	----------------------------------

16. AIR

Case 1 - $r \leftarrow c(r) + \text{Immed}$, do nothing if Immed = 0

s1. input 100 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0]"/>	<input type="text" value="100"/>
------	--	----------------------------------

s2. select relevant values for AIR (IX = 0; GPR = 0; I = 0; Address = 0)

in manual input part -> accept manual word instruction

Manual Instructions

AIR	No...	GPR0	IA ...	0
0, 0, 0, 1, 1, 0]	[0, 0]	[0, 0]	[0]	[0, 0, 0, 0, 0]

Accept Manual Word Instruction

[Expected Result] -> GPR0 = 100

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100
---	-----

Case 2 - $r \leftarrow c(r) + \text{Immed}$, loads r with Immed, if $c(r) = 0$

s1. input 0 to GPR0

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]	0
---	---

s2. select relevant values for AIR (IX = 0; GPR = 0; I = 0; Address = 20)

in manual input part -> accept manual word instruction

Manual Instructions

AIR	No...	GPR0	IA ...	20
0, 0, 0, 1, 1, 0]	[0, 0]	[0, 0]	[0]	[1, 0, 1, 0, 0]

Accept Manual Word Instruction

[Expected Result] -> GPR0 = 20

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0]	20
---	----

Case 3 - $r \leftarrow c(r) + \text{Immed}$

s1. input 100 to GPR0

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100
---	-----

s2. select relevant values for AIR (IX = 0; GPR = 0; I = 0; Address = 20)

in manual input part -> accept manual word instruction

Manual Instructions

AIR	No...	GPR0	IA ...	20
0, 0, 0, 1, 1, 0]	[0, 0]	[0, 0]	[0]	[1, 0, 1, 0, 0]

Accept Manual Word Instruction

[Expected Result] -> GPR0 = 120

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0]	120
--	-----

17. SIR

Case 1 - $r \leftarrow c(r)$ - Immed, do nothing if Immed = 0

s1. input 100 to GPR0

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100
--	-----

s2. select relevant values for SIR (IX = 0; GPR = 0; I = 0; Address = 0)

in manual input part -> accept manual word instruction

Manual Instructions

SIR	No...	GPR0	IA ...	0
0, 0, 0, 1, 1, 1]	[0, 0]	[0, 0]	[0]	[0, 0, 0, 0, 0]

Accept Manual Word Instruction

[Expected Result] -> GPR0 = 100

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100
--	-----

Case 2 - $r \leftarrow c(r)$ - Immed

s1. input 100 to GPR0

GPR0

0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]	100
--	-----

s2. select relevant values for SIR (IX = 0; GPR = 0; I = 0; Address = 20)

in manual input part -> accept manual word instruction

s2. input 1 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1"/>	<input type="text" value="1"/>	<input type="button" value="Accept"/>
-----	--	--------------------------------	---------------------------------------

s3. select relevant values for SRC (IX = 1; GPR = 0; I = 0; Address = 1)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="SRC"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="1"/>
	<input type="text" value="0, 1, 1, 0, 0, 1"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 20

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0"/>	<input type="text" value="20"/>
------	---	---------------------------------

Case 2 - right shift

s1. input 20 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0"/>	<input type="text" value="20"/>
------	---	---------------------------------

s2. select relevant values for SRC (IX = 0; GPR = 0; I = 0; Address = 1)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="SRC"/>	<input type="button" value="No..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="1"/>
	<input type="text" value="0, 1, 1, 0, 0, 1"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 10

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>
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20. RRC

(Index Register is used to decide left/right shift, address value is used to decide the bits to shift)

Case 1 - left shift

s1. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>
------	---	---------------------------------

s2. input 1 to IX1

IX1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1"/>	<input type="text" value="1"/>	<input type="button" value="Accept"/>
-----	--	--------------------------------	---------------------------------------

s3. select relevant values for RRC (IX = 1; GPR = 0; I = 0; Address = 1)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="RRC"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="1"/>
	<input type="text" value="0, 1, 1, 0, 1, 0"/>	<input type="text" value="[0, 1]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 20

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="20"/>
------	---	---------------------------------

Case 2 - right shift

s1. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>
------	---	---------------------------------

s2. select relevant values for RRC (IX = 0; GPR = 0; I = 0; Address = 1)
in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="RRC"/>	<input type="button" value="No..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="1"/>
	<input type="text" value="0, 1, 1, 0, 1, 0"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 1]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 = 5

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1"/>	<input type="text" value="5"/>
------	---	--------------------------------

21. MLT

Case 1 - positive * positive

s1. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	--	---------------------------------	---------------------------------------

s2. input 10 to GPR2

GPR2	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	--	---------------------------------	---------------------------------------

s3. input 0 to IX2

IX2	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0"/>	<input type="text" value="0"/>	<input type="button" value="Accept"/>
-----	--	--------------------------------	---------------------------------------

s4. select relevant values for MLT (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions	<input type="text" value="MLT"/>	<input type="text" value="IX..."/>	<input type="text" value="GPR0"/>	<input type="text" value="IA ..."/>	<input type="text" value="0"/>
	<input type="text" value="0, 1, 0, 0, 0, 0"/>	<input type="text" value="1, 0"/>	<input type="text" value="0, 0"/>	<input type="text" value="0"/>	<input type="text" value="0, 0, 0, 0, 0"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR1 is populated with 100 (10*10)

GPR1	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
------	--	----------------------------------	---------------------------------------

Case 2 - positive * negative

s1. input 10 to GPR0

GPR0	<input type="text" value="0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	--	---------------------------------	---------------------------------------

s2. input -10 to GPR2

GPR2	<input type="text" value="1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0"/>	<input type="text" value="-10"/>	<input type="button" value="Accept"/>
------	---	----------------------------------	---------------------------------------

s3. input 0 to IX2

IX2	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]"/>	<input type="text" value="0"/>	<input type="button" value="Accept"/>
-----	---	--------------------------------	---------------------------------------

s4. select relevant values for MLT (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="MLT"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="0"/>
	<input type="text" value="[0, 1, 0, 0, 0, 0]"/>	<input type="text" value="[1, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR1 is populated with -100 (10*-10)

GPR1	<input type="text" value="[1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 0, 0]"/>	<input type="text" value="-100"/>	<input type="button" value="Accept"/>
------	---	-----------------------------------	---------------------------------------

Case 3 - overflow (the result should be less than 65536)

s1. input 32700 to GPR0

GPR0	<input type="text" value="[0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 0]"/>	<input type="text" value="32700"/>	<input type="button" value="Accept"/>
------	---	------------------------------------	---------------------------------------

s2. input 2 to GPR2

GPR2	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0]"/>	<input type="text" value="2"/>	<input type="button" value="Accept"/>
------	---	--------------------------------	---------------------------------------

s3. input 0 to IX2

IX2	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]"/>	<input type="text" value="0"/>	<input type="button" value="Accept"/>
-----	---	--------------------------------	---------------------------------------

s4. select relevant values for MLT (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="MLT"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="0"/>
	<input type="text" value="[0, 1, 0, 0, 0, 0]"/>	<input type="text" value="[1, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> CC is populated with 1 (0001)

CC	<input type="text" value="[0, 0, 0, 1]"/>
----	---

22. DVD

Case 1 - positive / positive

s1. input 100 to GPR0

GPR0	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
------	---	----------------------------------	---------------------------------------

s2. input 10 to GPR2

GPR2	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	---	---------------------------------	---------------------------------------

s3. input 0 to IX2

IX2	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]"/>	<input type="text" value="0"/>	<input type="button" value="Accept"/>
-----	---	--------------------------------	---------------------------------------

s4. select relevant values for DVD (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions	<input type="button" value="DVD"/>	<input type="button" value="IX..."/>	<input type="button" value="GPR0"/>	<input type="button" value="IA ..."/>	<input type="button" value="0"/>
	<input type="text" value="[0, 1, 0, 0, 0, 1]"/>	<input type="text" value="[1, 0]"/>	<input type="text" value="[0, 0]"/>	<input type="text" value="[0]"/>	<input type="text" value="[0, 0, 0, 0, 0]"/>
<input type="button" value="Accept Manual Word Instruction"/>					

[Expected Result] -> GPR0 is populated with 10 (100/10)

GPR0	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0]"/>	<input type="text" value="10"/>	<input type="button" value="Accept"/>
------	---	---------------------------------	---------------------------------------

Case 2 - positive / negative

s1. input 100 to GPR0

GPR0	<input type="text" value="[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]"/>	<input type="text" value="100"/>	<input type="button" value="Accept"/>
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s2. input -2 to GPR2

GPR2

s3. input 0 to IX2

IX2

s4. select relevant values for DVD (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions

[Expected Result] -> GPR0 is populated with -50 (100/-2)

GPR0

Case 3 - division by zero

s1. input 100 to GPR0

GPR0

s2. input 0 to GPR2

GPR2

s3. input 0 to IX2

IX2

s4. select relevant values for DVD (**IX = 2**[have to use this]; GPR = 0; I = 0; Address = 0) in manual input part -> accept manual word instruction

Manual Instructions

DVD	IX...	GPR0	IA ...	0
[0, 1, 0, 0, 0, 1]	[1, 0]	[0, 0]	[0]	[0, 0, 0, 0, 0]

Accept Manual Word Instruction

[Expected Result] -> CC is populated with 4 (0100)

CC	[0, 1, 0, 0]
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23. JSR/TRR/AND/ORR/IN/OUT

Our test program 1 and 2 have covered these SIX instructions, so not intended to demonstrate them again through this step.

End of Document