



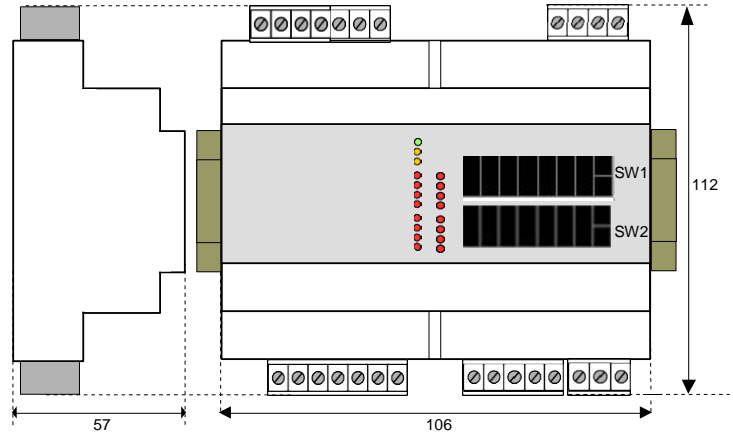
SmartMod+ Digital Input/Output Module HE379DIQ516 8 Digital Inputs 8 Digital Outputs Type PNP Transistor



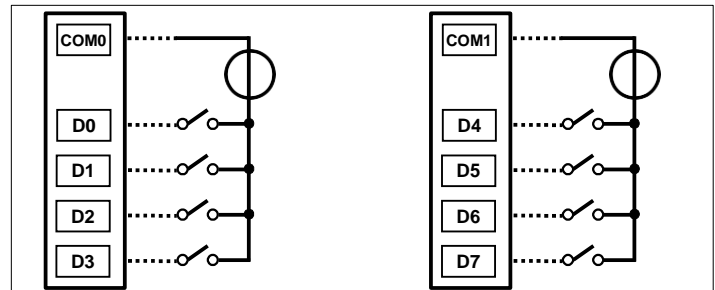
1 Specifications

Input Channels	8	Output Channels	8
Voltage Input (bipolar)	OFF state 0 - 3 V ON state 10 - 30 V	Output Type	PNP
Input Impedance	4.7 K Ω	Storage Temp.	-40° to 85° C
Sample Time (per channel)	5 ms	Output Voltage	10.5 / 30 Vdc
Operating Temp.	-10° to 60° C	Max. Load	500mA per channel 1A per module
Relative Humidity	0 to 90% Non-condensing	Protection Against Over-Current And Temperature	Short circuit current 1.7A
Mounting	DIN Rail standard EN-50022	Inductive load	48 Ω - 2H max
External Power Supply Voltage	10 - 30Vdc	Weight	200g
Required Power (Steady State)	35mA @ 24Vdc 45mA @ 10Vdc	Communications	Modbus/RTU RS-485 half duplex
Reverse Polarity Protection	60 Vdc max	Max. Data Transmission Baud Rate	115.2 Kbps
Isolation	1500 Vac, 50Hz, 1 min	Max. Distance	1200m
CE Compliance	Immunity EN 61000-6-2 Emission EN61000-6-4		

Mechanical Dimensions (mm)

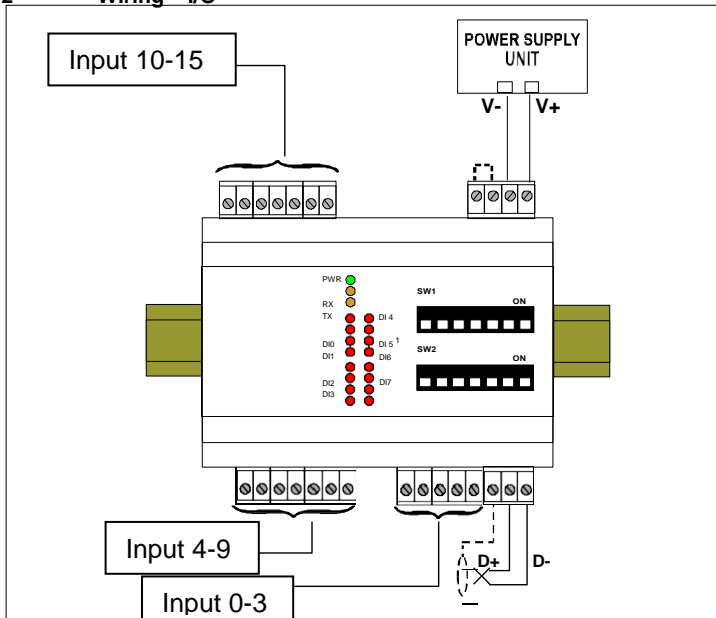


DIGITAL INPUTS CONNECTIONS

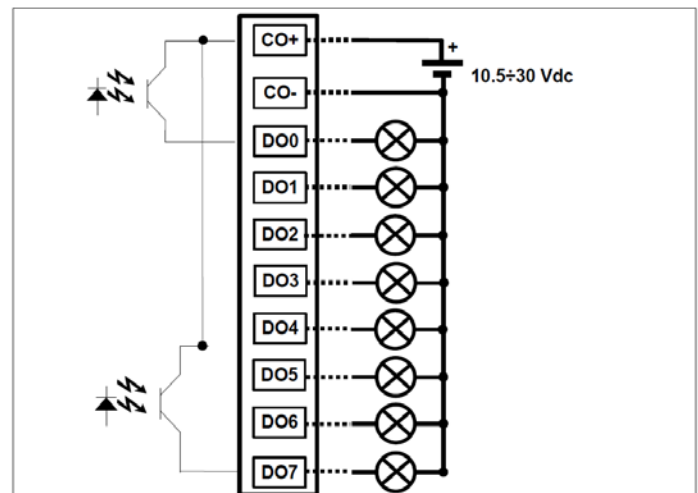


NOTE: the channels DO-D3 and D4-D7 are not isolated between them.
NOTE: the groups DO-D3 and D4-D7 are isolated between them

2 Wiring - I/O

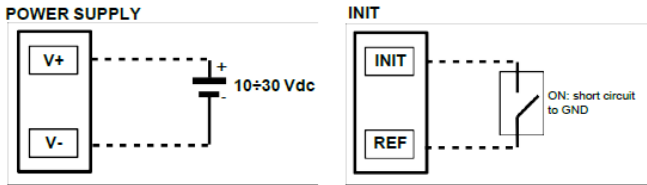
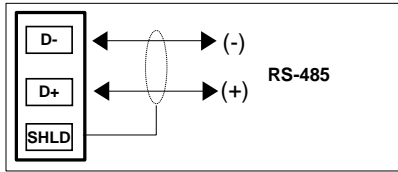


DIGITAL OUTPUTS



NOTE: the output channels are not isolated between them.

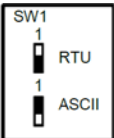
Serial Line RS485



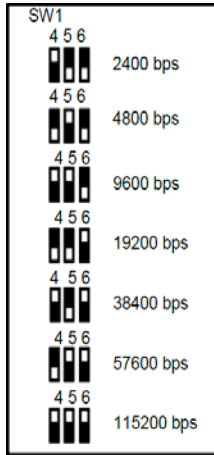
3 DIP Switches: Table of Configuration

Warning: Set all the dip-switches to the OFF position to access the module in EEPROM mode (the module will follow all the communication parameters set by the software) or INIT.
Power-cycle the module to apply the settings of the dip-switches.

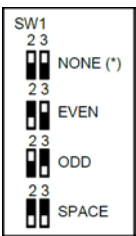
Tab 1: Modality Settings (Pos.1)



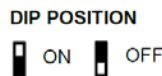
TAB.3 Baud rate settings (Pos.4 LSB; Pos.6 MSB)



TAB.2. Parity settings (Pos.2 LSB; Pos.3 MSB)



Note (*)
 -in Modbus RTU modality the setting is NONE, number of bit = 8
 -in Modbus ASCII modality the setting is MARK, number of bit = 7



4 Communication Protocols

This module is designed to work with the MODBUS RTU/MODBUS ASCII protocol, the standard protocol in fieldbus, and allows the direct interface of HE379 series modules to all Horner X-Series controllers.

5 User Instructions

Before installing this module, please read the **Installation Instructions** section carefully. It is possible to configure the module using the dip-switches located on the front of the module using the INIT mode. Connect the terminal INIT to the terminal REF and, at power-on, the module will be automatically set to the configuration set-up. Connect the power supply, serial bus and analogue inputs as shown in the **Wiring** section. The LEDs state depends on the working condition of the module, see the **LED Indicator** section to verify the modules working state. To perform configuration and calibration operations, read the instructions below.

To simplify handling or replacing the module, it is possible to remove the wired terminals when the module is powered on.

6 Installation Instructions

Attach the HE379DIQ516 to DIN rails in the vertical position. For optimum operation follow these instructions:

When the modules are installed side by side and - If the panel temperature exceeds 45°C and power supply voltage is 10 VDC - it may be necessary to separate them by >5 mm:

Make sure that there is sufficient air flow around the module, avoid placing near cable routing or other objects that can obstruct the ventilation slits. Additionally, avoid mounting modules above appliances that generate heat. Ideally, they should be placed in the lower part of the panel. Install the module in a location without vibration.

It is also recommended to avoid routing conductors near power signal cables (motors, induction ovens, inverters etc...) and to use shielded cables for connecting signals.

7 LED Indicator

LED	COLOUR	STATE	DESCRIPTION
POWER	Green	ON	Device Powered
		OFF	Device Not Powered
		BLINK	1 sec. - Watch-Dog alarm condition occurred
RX	Orange	BLINK	Receiving Data
		OFF	Not receiving data
TX	Orange	BLINK	Transmitting Data
		OFF	Not Transmitting data
Din	Red	ON	Digital Input ON state
		OFF	Digital Input OFF state
DOn	Red	ON	Digital Output ON state
		OFF	Digital Output OFF state

The LED's are located on the front of the model.

8 User Guide- MODBUS Protocol

All of the data shared by modules communicating via Modbus RTU / Modbus ASCII protocol are mapped in tables at defined addresses. Each data point can be one of two types:

- "REGISTER", 2 bytes (word of 16 bits) that can be associated with analogue input or output, variables, set-point, etc...
- "COIL", 1 single bit that can be associated with digital input or output or to a logic state.

A register can contain the image (mirror) of more coils; for example, each of the 16 digital inputs of a module can be read or written as a single bit by addressing the coil related to each input. Alternatively, the 16 bits can be read or written as a single word addressing the associated register where each bit corresponds to a coil.

In the Modbus protocol, registers and coils are divided as per the following groups of addresses:

- 0xxxx and 1xxxx = Coils (bit)
- 3xxxx and 4xxxx = Registers (word)

When read and write functions are performed, use the tables indicated below to address the registers and coils.

9 Supported Modbus Functions Codes

Function	Description
01(**)	Read Coil Status (0xxxx)
02(**)	Read Inputs Status (1xxxx)
03	Read Holding Registers (4xxxx)
04	Read Inputs Registers (3xxxx)
05	Force Single Coil
06	Pre-set Single Register
15 (0F)	Force Multiple Coil
16 (10)	Pre-set Multiple Registers

10 Coil Table

COILS TABLE

(*)Coil (Hex)	(*)Coil (Dec)	Description	Access
0x0001	00001	Input #0	RO
0x0002	00002	Input #1	RO
0x0003	00003	Input #2	RO
0x0004	00004	Input #3	RO
0x0005	00005	Input #4	RO
0x0006	00006	Input #5	RO
0x0007	00007	Input #6	RO
0x0008	00008	Input #7	RO
0x0011	00017	Output #0	R/W
0x0012	00018	Output #1	R/W
0x0013	00019	Output #2	R/W
0x0014	00020	Output #3	R/W
0x0015	00021	Output #4	R/W
0x0016	00022	Output #5	R/W
0x0017	00023	Output #6	R/W
0x0018	00024	Output #7	R/W
0x0021	00033	Watch-dog Enable	R/W
0x0022	00034	Watch-dog Event	R/W
0x0023	00035	Power-Up Event	R/W
0x0024	00036	Short circuit Alarm	R/W
0x0051	00081	Rise Latch #0	R/W
0x0052	00082	Rise Latch #1	R/W
0x0053	00083	Rise Latch #2	R/W
0x0054	00084	Rise Latch #3	R/W
0x0055	00085	Rise Latch #4	R/W
0x0056	00086	Rise Latch #5	R/W
0x0057	00087	Rise Latch #6	R/W
0x0058	00088	Rise Latch #7	R/W
0x0059	00089	Fall Latch #0	R/W
0x005A	00090	Fall Latch #1	R/W
0x005B	00091	Fall Latch #2	R/W
0x005C	00092	Fall Latch #3	R/W
0x005D	00093	Fall Latch #4	R/W
0x005E	00094	Fall Latch #5	R/W
0x005F	00095	Fall Latch #6	R/W
0x0060	00096	Fall Latch #7	R/W

NOTES:

(*) Subtract 1 from the address position number of the register and/or coil. Registers and coils marked as RO in the column 'Access' are Read only registers. Registers and coils marked as R/W in the column 'Access' are Read and Write registers. For HE379 series modules, the group of data 0xxx is the mirror of the group 1xxx, the group of data 3xxx is the mirror of the group 4xxx, therefore the first register can be addressed as either 30001 (with function code 04) or 40001 (with function code 03).

(**) The functions 01, 02 and 15 support a maximum number of 32 consecutive coils for reading and writing.

11 Register Table

REGISTER TABLE

Register Position (*)	Description	Access
40001	Test	R/W
40002	Firmware [0]	RO
40003	Firmware [1]	RO
40004	Name [0]	R/W
40005	Name [1]	R/W
40006	Communication	R/W
40007	Address	R/W
40008	Delay RX/TX	R/W
40009	Digital Inputs	RO
40010	Digital Outputs	R/W
40011	System Flags	R/W
40012	PowerUp/Safe	R/W
40013	Watchdog Timer	R/W
40014	Fall Latch / Rise Latch	R/W

12 Description Modbus Registers

40001: TEST

This register is used for the following function:
-Synchronized Sampling (refer to section "Procedures")

40002 / 40003: FIRMWARE

Field of 2 read only registers; contains the firmware identifier provided by the manufacturer.

40004 / 40005: NAME

Field of 2 read/write registers (4 bytes or 4 ASCII characters) available for the user, it can contain the name of the module or an abbreviation that identifies its function inside the plant. Each one of the 4 bytes can be written by values from 0 to 255, ASCII characters included.

The default value of this field contains the identifier of the module expressed in ASCII characters.

-Default value: "7309" (ASCII).

40006: COMMUNICATION

If the user wants to set the communication parameters, it is necessary to set the bits of this register referring to the table below in order to configure baud-rate, parity and mode. The configuration of the parameters is not necessary if it is done by the dip switches.

-Default of manufacturer: 38400 bps, mode RTU, parity NONE

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Desc.	-	-	-	-	-	-	-	-	-	M	P1	P0	N	B2	B1	B0

Mode	M
MODBUS ASCII	0
MODBUS RTU	1

Parity RTU	Parity ASCII	P1	P0
None	Mark	0	0
Even	Even	0	1
Odd	Odd	1	0
Space	Space	1	1

Baud Rate	B2	B1	B0
2400	0	0	1
4800	0	1	0
9600	0	1	1
19200	1	0	0
38400	1	0	1
57600	1	1	0
115200	1	1	1

No. bit	N
7 bit	0
8 bit	1

NOTE:

-the number of bits is ignored, in ASCII mode is fixed to 7; in RTU mode is fixed to 8.

40007: ADDRESS

Contains the MODBUS address of the module, the values allowed are from 1 to 247 decimal. Each node connected to the same line must have a unique address. The address 255 is used for broadcast function.

-Default value: 01

40008: DELAY RX/TX

Indicates the value of the delay time between the reception of a query and the transmission of the response, expressed as milliseconds.

-Default value: 01(1 ms)

40009: DIGITAL INPUTS

This register shows the state of the digital inputs (0 = OFF, 1 = ON).

It is possible to use this register to read and write at the same time all the bits without implementing the specific functions of read coils (01-02).

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Descr.	Input															
Channel	#7	#6	#5	#4	#3	#2	#1	#0	-	-	-	-	-	-	-	-
Coil	08	07	06	05	04	03	02	01	-	-	-	-	-	-	-	-

40010: DIGITAL OUTPUTS

This register allows to drive directly the state of output transistors (0 = OFF; 1 = ON).

It is possible to use this register to read and write at the same time all the bits without implementing the specific functions of read and write coils (01-02-05-15).

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Channel	#7	#6	#5	#4	#3	#2	#1	#0								
Coil	24	23	22	21	20	19	18	17	-	-	-	-	-	-	-	-

40010: SYSTEM FLAGS

Contains the enable bits and system events of the module. The following parameters are configurable:

WATCHDOG ENABLE

Enables the Watchdog alarm. If the alarm is enabled and the module doesn't receive commands for a time higher than the one specified in register 40009, the Watchdog Alarm will be activated (refer to section "Procedures").

0 = Watchdog disabled.

1 = Watchdog enabled.

WATCHDOG EVENT

Indicates the state of the Watchdog Alarm. If the alarm is enabled and the module doesn't receive commands for a time higher than the one specified in register 40009, this bit is forced to 1. To erase the alarm set this bit to 0. If the bit is forced to 1 by a command of the Master unit, a Watchdog event will be simulated and consequently an alarm condition will be created.

0 = Normal condition

1 = Alarm condition

POWER-UP EVENT

This bit is forced to 1 each time the module is powered-on in order to indicate that the module has been switched-off or a reset has occurred. By setting this bit to 0 and checking its state it is possible to monitor if a reset of the module has occurred.

0 = reset not occurred

1 = reset occurred

It is possible to use this register to read and write all the bits without implementing the specific read and write functions of the coils (01-02-05-15).

SHORT CIRCUIT ALARM EVENT

The module is equipped with a sensor to detect short-circuits (protection against over-currents) on digital outputs.

In the case of a short-circuit on an output, this coil is forced to 1. If this alarm is active check the connections; to exit from the alarm condition the module must be reset.

It is possible to access this register in bit and word format.

Bit	15-13	12	11	10	9	8	7	6	5-0
Coil	-	-	36	35	34	33	-	-	-

40012 : POWERUP/SAFE

Upon power-on (PowerUp) and in the case of Watchdog Alarm (Safe), the state of the outputs is automatically driven to the value set in this register. Each bit corresponds to one digital output, see table below:

- Default value: 0

Bit	15-08	07-00
Channel	#7-#0	#7-#0
Value	Power Up	Safe

40013: WATCHDOG TIMER

Contains the value of the Watchdog timer, expressed in intervals of 0.5 seconds. If the Watchdog is enabled and the module doesn't receive a command for the time set in this register, the Watchdog Alarm will be activated (refer to section "Procedures").

-Default value: 10 (5 sec.)

40014: RISE LATCH / FALL LATCH

Contains the value of the fall latch (event change from logic state 1 to logic state 0) and rise latch (event change from logic state 0 to logic state 1) of the digital inputs.

The event latch signals the single change of state and is not updated by the system, in the case of a latch event it is necessary to monitor this parameter for more than one variation, it is necessary to reset the bit writing its value to 0. Each bit corresponds to a digital input, see the table below:

-Default value: 0

Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Descr.	Rise								Fall							
Channel	#7	#6	#5	#4	#3	#2	#1	#0	#7	#6	#5	#4	#3	#2	#1	#0
Coil	88	87	86	85	84	83	82	81	96	95	94	93	92	91	90	89

13 Procedures

USE OF "INIT" FUNCTION

The "INIT" function allows the module to be set in the default configuration, independently of the register configuration. To use this function the dip-switches must all be in the OFF position.

The INIT forces: mode RTU, parity NONE, baud rate 9600, number of bits = 8, address 1

- Only connect the module to be configured to the RS485 port.
- Switch-off the module.
- Connect the terminal INIT to the terminal REF.
- Power-on the module.
- Check that the green "PWR" LED on the front of the module is on. If not, check the power supply connection (terminals V+ and V-).
- Set the controller communications port with the following values:
 - Mode = Modbus RTU
 - Baud-rate = 9600 bps
 - Parity = None
 - No. bits = 8
 - Stop bits = 1
- the module will respond to the address 01.
- Write the desired settings to the following Module registers:
 - 40006: "Communication" to set the baud-rate.
 - 40007: "Address" to set the address of the module.
- Switch-off the module.
- Disconnect the terminal INIT from the terminal REF.
- Power-on the module with all the dip-switches in the OFF position.
- Set the controllers communication port with the baud-rate configured in the register 40006.
- The module will respond to the address configured in the register 40007.

NOTE:

The default configuration values are the following:

- Address: 01
- Baud-rate: 38400 bps
- Protocol: RTU
- Parity: None

WATCHDOG

HE379 series modules have a Watchdog timer that, if enabled, activates an alarm each time that the communication exceeds the configured time. In the alarm condition, the green PWR LED on the front starts to blink once per second and this forces the coil "Watchdog Event" to 1. To exit the alarm condition, reset the "Watchdog Event" coil. The LED will stop blinking.

SYNCHRONISM

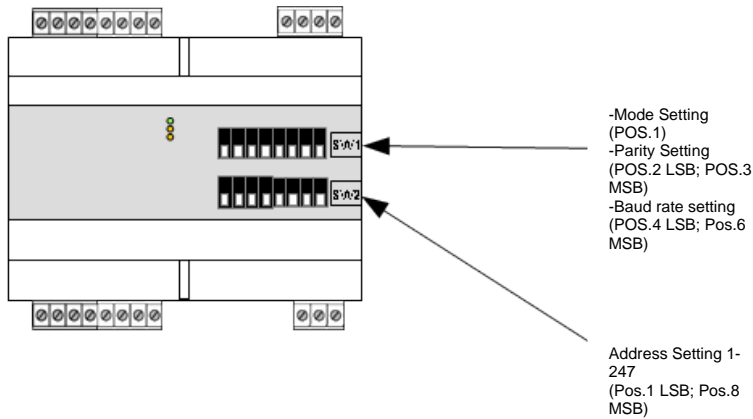
The function of Synchronism is a broadcast command sent to all the modules on the RS-485 network. When the modules receive this command, all the input values measured on receipt are saved to the appropriate registers. To send the command, write the value 10 into the register "Test" (40001), to the address '255'.

NOTE: the values of synchronism are not saved in EEPROM. After each power-on the values in the registers are reset.

CONFIGURATION BY DIP SWITCHES

Note: Set all the dip-switches to the OFF position to access the module in EEPROM mode (the module will follow the configuration parameters set by the registers) and INIT mode.

To program the module using the dip-switches, the module must be reset.



Note (*)

- in **Modbus RTU** mode the setting is **NONE**, number of bits = **8**
- in **Modbus ASCII** mode the setting is **MARK**, number of bits = **7**
- For the table of configuration refer to **TAB 4. Address Selection** (below).

DIP POSITION



14 Installation / safety

Warning: Remove power from the OCS controller, CAN port, and any peripheral equipment connected to this local system before adding or replacing this or any module.

- All applicable codes and standards should be followed in the installation of this product.
- Shielded, twisted-pair wiring should be used for best performance.
- Shields may be terminated at the module terminal strip.
- In severe applications, shields should be tied directly to the ground block within the panel.
- Use the following wire type or equivalent: Belden 8441.

For detailed installation and a handy checklist that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using.

When found on the product, the following symbols specify:



15 Technical support

Technical Support at the following locations:

North America:	Europe:
Tel: 317 916-4274	Tel: +353-21-4321266
Fax: 317 639-4279	Fax: +353-21-4321826
Web: www.hornerautomation.com	Web: http://www.horner-apg.com
Email: techsppt@heapg.com	Email: tech.support@horner-apg.com

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TAB.4 Address Selection 1 - 247 (Pos.1 LSB; Pos.8 MSB)

SW2	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
	EEPROM	Address 38	Address 76	Address 114	Address 152	Address 190	Address 228
Address 1	Address 39	Address 77	Address 115	Address 153	Address 191	Address 229	
Address 2	Address 40	Address 78	Address 116	Address 154	Address 192	Address 230	
Address 3	Address 41	Address 79	Address 117	Address 155	Address 193	Address 231	
Address 4	Address 42	Address 80	Address 118	Address 156	Address 194	Address 232	
Address 5	Address 43	Address 81	Address 119	Address 157	Address 195	Address 233	
Address 6	Address 44	Address 82	Address 120	Address 158	Address 196	Address 234	
Address 7	Address 45	Address 83	Address 121	Address 159	Address 197	Address 235	
Address 8	Address 46	Address 84	Address 122	Address 160	Address 198	Address 236	
Address 9	Address 47	Address 85	Address 123	Address 161	Address 199	Address 237	
Address 10	Address 48	Address 86	Address 124	Address 162	Address 200	Address 238	
Address 11	Address 49	Address 87	Address 125	Address 163	Address 201	Address 239	
Address 12	Address 50	Address 88	Address 126	Address 164	Address 202	Address 240	
Address 13	Address 51	Address 89	Address 127	Address 165	Address 203	Address 241	
Address 14	Address 52	Address 90	Address 128	Address 166	Address 204	Address 242	
Address 15	Address 53	Address 91	Address 129	Address 167	Address 205	Address 243	
Address 16	Address 54	Address 92	Address 130	Address 168	Address 206	Address 244	
Address 17	Address 55	Address 93	Address 131	Address 169	Address 207	Address 245	
Address 18	Address 56	Address 94	Address 132	Address 170	Address 208	Address 246	
Address 19	Address 57	Address 95	Address 133	Address 171	Address 209	Address 247	
Address 20	Address 58	Address 96	Address 134	Address 172	Address 210		
Address 21	Address 59	Address 97	Address 135	Address 173	Address 211		
Address 22	Address 60	Address 98	Address 136	Address 174	Address 212		
Address 23	Address 61	Address 99	Address 137	Address 175	Address 213		
Address 24	Address 62	Address 100	Address 138	Address 176	Address 214		
Address 25	Address 63	Address 101	Address 139	Address 177	Address 215		
Address 26	Address 64	Address 102	Address 140	Address 178	Address 216		
Address 27	Address 65	Address 103	Address 141	Address 179	Address 217		
Address 28	Address 66	Address 104	Address 142	Address 180	Address 218		
Address 29	Address 67	Address 105	Address 143	Address 181	Address 219		
Address 30	Address 68	Address 106	Address 144	Address 182	Address 220		
Address 31	Address 69	Address 107	Address 145	Address 183	Address 221		
Address 32	Address 70	Address 108	Address 146	Address 184	Address 222		
Address 33	Address 71	Address 109	Address 147	Address 185	Address 223		
Address 34	Address 72	Address 110	Address 148	Address 186	Address 224		
Address 35	Address 73	Address 111	Address 149	Address 187	Address 225		
Address 36	Address 74	Address 112	Address 150	Address 188	Address 226		
Address 37	Address 75	Address 113	Address 151	Address 189	Address 227		