WR77 Wicket Reader

For Cashless Account Based Applications

Rev 8/10/2007

Features:

- **Rejects RFID Tags Failing Authentication Test**
- **Simple Polled or Non-Polled Serial Protocol**
- **Multi-Color Illumination For Status Indication**
- **Reads UserID and Reads/Writes Data Blocks**
- **Small Footprint: .75" Mounting Hole Diameter**
- **Antenna Not Affected By Metal Panel Mount**

General

The WR77 Wicket Reader is an RFID (radio frequency identification) reader for use with IDX Account Based Wickets, which incorporate ISO standard 15693 RFID (radio frequency identification) data tags laminated into the center layer of a tough Teslin based card or key tag. The Reader's emitted RF field is used to both power and communicate with the chip/antenna of the tag. The WR77 reads the Wicket's unique User ID and communicates it to the OEM's equipment for it to access the user's account information stored elsewhere in a database.
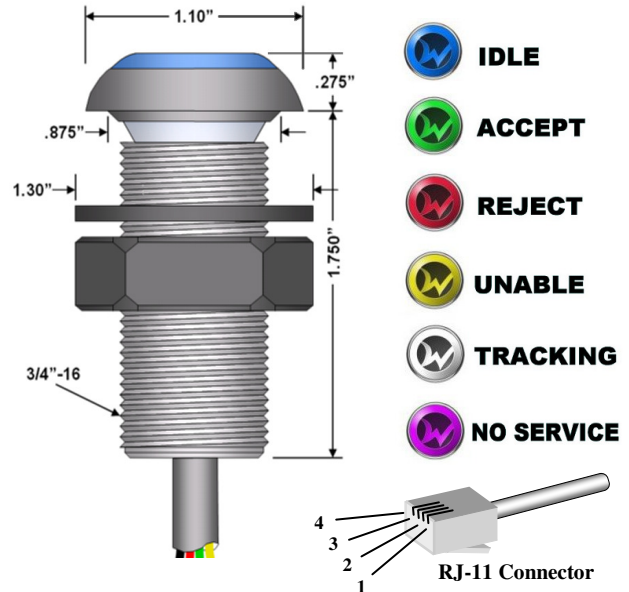
Security

The WR77 reads encrypted data from the RFID tag to authenticate it as an IDX Account Based Wicket. If the read data fails to authenticate the tag, the WR77 will indicate rejection by blinking red for two seconds and will not report the presence of the RFID tag. The OEM is responsible for validation of any data stored on the Wicket and for the security of the database holding user account information.

Protocol

The WR77 has two operating modes: 1) a polling based protocol wherein the WR77 status is always returned, and if a Wicket has just been freshly read then its UserID, Wicket Type, and Sub-Type are also appended to the poll response, and 2) an auto-response protocol wherein the UserID, Wicket Type, and Sub-Type of a freshly read Wicket are immediately reported without polling. Wicket Types include gaming, non-gaming commerce, and employee ID.

The Type and Sub-Type may be used by a local controller to determine if the Wicket applies at the current location. For, example, a maintenance employee ID can be rejected by a arcade game's controller without consulting a remote database as there would be no game play credits associated with a maintenance employees account. The full protocol specification follows in the attached pages.

Wicket Reader Model WR77 Specifications	
Supply operating voltage	+5VDC to +7.5VDC
Supply current – no Wicket	70mA typical
Supply current - w/Wicket	170mA typical
Sensing range to Wicket	0.5" (12.5mm) typical
Operating temperature range	-20 °C to +50 °C
Enclosure materials	Polycarbonate
Fastener materials	Nylon
COM parameters	9600, N, 8, 2
TxD output high, output low, (Note 1)	+5V PNP source 10K sink to 0V
RxD input threshold, input impedance, (Note 1)	1.2V 10K sink to 0V
Wicket Reader connector: ▪ Pin 1, Yellow ▪ Pin 2, Green ▪ Pin 3, Red ▪ Pin 4, Black	RJ-11 (telephone style) ▪ RxD (receive) ▪ +V Supply ▪ TxD (transmit) ▪ Supply Common
Note 1: TxD and RxD are RS-232 compatible with all known common computer COM ports and USB converter dongles.	

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WR77 Wicket Reader Protocol - V1.3e

Rev08/08/2007

Wicket Reader Command Summary	
Command	**Description**
A	**Accept Transaction** – Flashing Green for 2sec.
B	**Binary Mode** – default, cancels Query Mode and Hexadecimal Mode
H	**Humanly Hexadecimal Mode** – All data in hexadecimal format
I	**Inhibit Mode** – Flashes Yellow on Wicket presentation. No UID report is sent.
$L(d_0 d_1)$	**LED Control** - (color)(1/8sec timer)
N	**Normal Mode** – Blue Continuous
n	**Normal Mode** – Blue/Rainbow Continuous
O	**Out Of Service Mode** – Solid Purple Continuous
P	**Pending Transaction** – Flashing White for 30sec.
$Q(r_0)[r_1\text{-}r_8]$	**Query Status Report** – (status byte) [type, UID, subtype], Query Mode set
R	**Rejected Transaction** – Flashing Red for 2sec.
r	**Rainbow Respect** – Rainbow for 2sec.
$S(r_0)[r_1\text{-}r_8]$	**Status Report,** – (status byte) [type, UID, subtype]
T	**Player Tracking Mode** – Solid White Continuous
U	**Unable To Perform** – Flashing Yellow for 2sec.
$V (r_0\text{-}r_4)$	**Version Report for Wicket Reader** - (model)(version)(makeID)(SN-hi/lo)
$v (r_0\text{-}r_3)$	**Version Report for RFID Tag** - (chipMfg)(chipRev)(blocks)(bytes)
W	**Whale Tracking Mode** – Bleached Rainbow Continuous
$Ctrl\text{-}R(d_0, r_0\text{-}r_4)$	**Read Memory Block** – (block#),(data bytes)(status)
$Ctrl\text{-}W(d_0\text{-}d_4, r_0)$	**Write Memory Block** – (block#)(data bytes),(status)
Ctrl-Z	**Reset Wicket Reader**
=	**Resend the data from last message (Binary Mode only)**

Auto Report Messages (disabled in Query Mode)	
$C (d_0\text{-}d_6)$	**Charge Gaming Account** d_0-d_5 w/Denomination Parameter d_6
$c (d_0\text{-}d_6)$	**Charge General Account** d_0-d_5 w/Type Parameter d_6
$D (d_0\text{-}d_6)$	**Display Account Balance** d_0-d_5 w/ Parameter d_6
$I (d_0\text{-}d_6)$	**Identification ID** d_0-d_5 w/ID Class Parameter d_6

Note 1: RS-232 serial port connection configuration parameters are 9600,N,8,1, no handshaking.
Note 2: In the notation above $(r_0\text{-}r_2)$ refers to 3 received bytes and $(d_0\text{-}d_6)$ refers to 7 data bytes from the initiator.

Operating Mode Basics:

Binary vs Hexadecimal: The WR77 powers up in Binary Mode where all data is transferred in binary and a checksum byte must be appended to each command sent to the WR77, and will be appended to any response data bytes by the WR77. All command bytes are echoed, but the command checksum is replaced with an ACK or NAK.

Query vs Auto-Report: The WR77 powers up in Auto-Report mode where the above tabulated messages are automatically sent when a Wicket is first presented. Query mode is a polled communication mode entered with the first use of the Q command, which then suspends any further Auto-Report Messages.

WR77 Wicket Reader Protocol
Command Detailed Descriptions

A: Acceptance Indication
Causes the Wicket Reader to flash GREEN for 1.5 seconds to indicate acceptance of a transaction.

B: Binary Mode
Sets the Wicket Reader to the default Binary communication mode, and cancels Query Mode.

H: Hexadecimal Mode
Sets the Wicket Reader to the Humanly Hexadecimal Mode for diagnostic use with HyperTerminal. When in Binary Mode the command format is "HH".

I: Inhibit Mode
Sets the Wicket Reader to Inhibit Mode where it will normally indicate its usual blue face color, but when a Wicket is presented will indicate a flashing YELLOW color and will not report the event on the serial port. The Inhibit Mode is reset by any of the N, n, T, W, and O commands.

L(d_0d_1): LED Control (color)(1/8sec timer)
The command provides temporary control over the LED color. The bits of the "color" byte are as indicated in the table below. The command effects will persist for a period of time defined by the "timer" byte which is in 1/8 second increments.

Bit	Description
0	1 = Green LED On
1	1 = Red LED On
2	1 = Blue LED On
3	1 = bright, 0 = dim
4	1 = Rainbow Mode
5	These bit control blink rate: 00 = steady,
6	01 = slow, 10 = medium, 11 = fast.
7	1 = bright/dim blinking, 0 = bright/off blinking.

N: Normal Mode
Sets the Wicket Reader to Normal Mode where it will indicate a BLUE color. Read Wickets will be reported normally. The Normal Mode resets any of the Tracking, Wale, Normal-Rainbow, Out-Of-Service, And Inhibit command modes.

n: Normal Mode - Rainbow
Sets the Wicket Reader to Normal Mode where it will indicate a BLUE color with an occasional transition through the colors of the RAINBOW. Read Wickets will be reported normally. Normal Mode resets any of the Tracking, Wale, Normal-Rainbow, Out-Of-Service, And Inhibit command modes.

O: Out Of Service Mode
Sets the Wicket Reader to Out Of Service Mode where it will indicate a solid PURPLE color, but when a Wicket is presented it will indicate a flashing PURPLE color and will not report the event on the serial port. The Out Of Service Mode is reset by any of the N, n, T, and W commands.

P: Pending Transaction Indication

The command causes the Wicket Reader to indicate a flashing WHITE color that lasts for 30 seconds or until it is reset by any of the A, R, N, n, T, W, and O commands. It is intend for use at a gaming table when the player is requested to place his Wicket on the Reader to confirm a pending transaction.

$Q(r_0)[r_1-r_8]$: Query Status Report (status byte) [type, UID, subtype]

The command sets the Wicket Reader to Query Mode wherein all Auto-Report Messages are disabled to operate strictly in polled mode. If previously in Hexadecimal Mode, the command also instantly sets the Wicket Reader to Binary Mode. IDX recommends a polling interval of between 50ms and 200ms for suitable responsiveness. The Query Mode may be exited by use of the Cntrl-Z command.

The command also produces a status report response including a "status byte" as detailed in the table below, and if bit-7 of the status byte is set, indicating a new Wicket has been read, then the "type, UID, and subtype" 8 bytes will be appended to the message automatically. The "type" byte may be a "C", "c", "D", or an "I" as described in the Auto-Report Messages later in this document. The "subtype" byte will correspondingly be the denomination or subtype as also later described for each of the Auto-Report types.

Query Status Byte	
Bit	Description
0	0x00 = device okay 0x01 = device failure
1	0x02 = reserved 0x03 = device inhibited
2-5	Reserved
6	Set = Has Wicket currently present
7	Set = New Wicket available (one-shot report)

R: Rejection Indication

The command causes the Wicket Reader to flash RED for 2 seconds to indicate acceptance of a transaction.

r: Rainbow Respect

The command causes the Wicket Reader to show a Rainbow series of colors for 2 seconds. It is intended for indicating the verification of a patron's status in such places where preferred patrons have shorter queues, preferred seating or the like.

$S(r_0)[r_1-r_8]$: Query Status Report (status byte) [type, UID, subtype]

This command is the same as the Query Status Report command except for two differences. The first difference is that it does not set the Wicket Reader to Query Mode. The second difference is that the "type, UID, and subtype" 8 bytes will only be appended to the message automatically if bit-6 is set indicating that there is a Wicket currently present.

Status Byte	
Bit	Description
0	0x00 = device okay 0x01 = device failure
1	0x02 = reserved 0x03 = device inhibited
2-5	Reserved
6	Set = Has Wicket currently present
7	Set = New Wicket available (one-shot report)

T: Player Tracking Mode

The command causes the Wicket Reader to indicate a solid WHITE color that persists until it is reset by any of the N, n, W, and O commands. It is intend for use on a gaming table or machine to indicate that the credit value in the machine is associated with the Wicket UID and that player tracking points are being awarded, or for use on service equipment to indicate that the equipment is now enabled by the patrons positive account balance.

V($r_0 – r_4$): Reader Version Report (model)(version)(makeID)(SN-hi/lo)

The command produces a report of the model number, the firmware version, the MakeID, and the 16-bit Serial Number of the Wicket Reader. The Hexadecimal Mode version of this report appears as below, while the Binary Mode version contains only the data bytes and a checksum.

```
Reader: WR-77 V1.1  MakeID: B6 SN: ABCD
```

v($r_0 – r_3$): RFID Chip Version Report (chipMfg)(chipRev)(blocks)(bytes)

The command produces a report of the RFID chip manufacturer ID, the chip revision, the number of blocks of writeable memory and the number of bytes per block for the last read RFID tag. The Hexadecimal Mode version of this report appears as below, while the Binary Mode version contains only the data bytes and a checksum.

```
Chip Mfg: 07  Rev: 8B
Blocks: 40  Bytes: 04
```

W: Whale Tracking Mode

The command causes the Wicket Reader to display a series of bleached RAINBOW colors, and persists until it is reset by any of the N, n, T, and O commands. It is intend for use on a gaming machine to indicate that the credit value in the machine is associated with the Wicket UID and that player tracking points are being awarded particularly when the player tracking system determines that the player has special status and deserves favored service attention from casino employees. Use the T command for players without special status.

Cntrl-R(d_0, r_0-r_4): Read Memory Block (block#), (data bytes)(status)

This command reads the block of data bytes specified by the block#. There are 64 blocks with 4 bytes each. Data is ordered most significant byte first and block #0 is the first block. This is an addressed command wherein the RFID tag address is presumed to be the UID of the Wicket most recently read and reported. The bits of the returned status byte have the following definitions:

Bit Set	Description
0	The specified block is locked – information.
1	Addressed Wicket is non-responsive – read fail.
2	RFID Tag communication error – read fail.
3	The specified block is out of range – read fail.

Cntrl-W(d_0-d_4, r_0): Write Memory Block (block#)(data bytes), (status)

This command writes the provided block of data bytes to the specified block#. There are 64 blocks with 4 bytes each. Data is ordered most significant byte first and block #0 is the first block. This is an addressed command wherein the RFID tag address is presumed to be the UID of the Wicket most recently read and reported. The bits of the returned status byte have the following definitions:

Bit Set	Description
0	The specified block is already locked – write fail.
1	Addressed Wicket is non-responsive – write fail.
2	RFID Tag communication error – write fail.
3	Addressed block is out of range – write fail.
4	The specified block was not successfully written – write fail.
5	The specified block was not successfully locked – write fail.

Cntrl-Z: Zee Reset Thing

This command causes the Wicket Reader to do a full reset. It is only available in Binary Mode.

=: Repeat Last Message

This command causes the Wicket Reader to retransmit the last message if it was a binary command with data.

Wicket Reader Auto-Report Descriptions

(disabled in Query Mode)

C(d_0-d_6): Charge Gaming Account (UID account)(denomination)

The "C" report indicates that a Wicket for a gaming account has been read following at least an $1/8^{th}$ second period of time of reading nothing. It implies that the player wishes to have the "denomination" amount of credit charged to his account and transferred to the gaming table or gaming machine. The account number is 6 bytes long, most significant byte first. It is derived from the lower 48 bits of the UID received from the RFID tag's transponder chip. The denomination byte meaning is as detailed in the table below.

Code	Denomination	Code	Denomination
00	Server Choice	08	$200
01	$1	09	$500
02	$2	0A	$1,000
03	$5	0B	$2,000
04	$10	0C	$5,000
05	$25	0D	$10,000
06	$50	0E	$100,000
07	$100	0F	Auto-Context

c(d_0-d_6): Charge General Account (UID account)(subtype)

The "c" report indicates that a Wicket for a non-gaming account has been read following at least an 1/8th second period of time of reading nothing. It implies that the owner wishes to conduct a transaction for an amount determined by an arcade game, a restaurant, or a merchant and have it charged to his account. The account number is 6 bytes long, most significant byte first. It is derived from the lower 48 bits of the UID received from the RFID tag's transponder chip. The subtype byte meaning is as detailed in the table below, and may be used, in part, to determine the applicability of the Wicket for use at that particular location.

Subtype	Debit Account Apps		Subtype	Stored Value Apps
00	Hospitality		08	Hotel Services
01	Carwash		09	Carwash
02	Arcade		0A	Arcade
03	Vending		0B	Vending
04	Laundry		0C	Laundry
05	Tip-1		0D	Theme Parks
06	Tip-2		0E	Parking
07	Tip-5		0F	Multi-Market

D(d_0-d_6): Display Account Balance (UID account)(denomination)

The "D" report indicates that the same Wicket has now been continuously read for 2 seconds and tells us that the player wishes his account balance to be displayed. The "D" report will occur no more than once while the same Wicket remains being continuously read. The denomination provided is as described for the "C" report above.

I(d_0-d_6): Identification (UID)(subtype)

The "I" report indicates that a Wicket for an individual identification application has been read following at least an 1/8th second period of time of reading nothing. The UID is 6 bytes long, most significant byte first and is derived from the lower 48 bits of the UID received from the RFID tag's transponder chip. The Subtype byte meaning is as detailed in the table below.

Subtype	ID Class		Subtype	ID Class
00	Employee - Level 0		08	Customer
01	Employee - Level 1		09	Guest
02	Employee - Level 2		0A	Player
03	Employee - Level 3		0B	TBD
04	Employee - Level 4		0C	TBD
05	Employee - Level 5		0D	Supply Vendor
06	Employee - Level 6		0E	Service Vendor
07	Employee - Level 7		0F	Regulator

Wicket Reader Protocol Application Notes

INTRODUCTION

IDX Wicket Reader WR-77 supports both a human readable **Hexadecimal Mode** protocol mode for use with a "terminal emulator", such as HyperTerminal, and a **Binary Mode** protocol for use in communication with other computing devices such as slot machines, tracking systems, and other controllers. The RS-232 port parameters are 9600,N,8,1 and the protocol rules for each are as follows:

BINARY MODE PROTOCOL

1. Binary Mode protocol is the default communication mode at reset / power up.
2. Commands consist of a command identifier byte, possible data bytes, and a terminating checksum byte which is a simple sum of the preceding bytes. Some commands require response data bytes from the WR77, which also include a terminating checksum byte.
3. If the command identifier byte is recognized, it and the data bytes will be echoed. However, the response to the checksum byte will be either an ACK (acknowledge = $06 = "♠") or a NAK (not-acknowledge = $15 = "§"), depending on the match of the transmitted checksum to the computed checksum. In the case of NAK, the command is ignored.
4. If the command identifier byte is **not** recognized, a NAK response will be generated (instead of an echo), no data will be accepted.
5. While byte echoes are produced usually within 3ms, any data response generated by the command may be delayed considerably longer, but only as necessary for execution of the command. For example, retrieving data from a tag may take 5 to 10ms to begin the reply depending on the specific command.
6. Until there is a final response from a prior command, a new command should not be initiated as its response may collide with that of the prior command and processing may conflict with the operation of the prior command.
7. As an example, the "N" command in Binary Mode is "NN" as the checksum byte is equal to the command identifier byte. The response from the WR77 would be "N♠"
8. The "Terminal" font style is recommended for use with HyperTerminal.
9. Should you loose sync in the flow of command / response characters, we recommend sending a sequence of "B" characters until you receive and ACK response indicating sync has been re-acquired.

ASCII HEXADECIMAL PROTOCOL

1. This is **not** the default communication mode at power up. (see H command)
2. All bytes are echoed and a CR-LF terminates all responses.
3. There is no checksum byte required at the end of each command, nor is one provided with return data.
4. Some nice ASCII text may additionally be part of ASCII Hex mode responses.

Wicket Reader Color Standards

Rev 02/01/2007

Overview
The Wicket Reader was designed to provide visual feedback someone reading a Wicket card through illuminating its face with one of many colors. In order to provide a consistent experience when using the Wicket Reader on a variety of OEM equipment in the same market, IDX requires that OEM equipment designers hold to this standard for use of the color commands.

Color Schema
The below Color Schema will be printed on the back side of all Wickets so that end users can readily grasp the simplicity of the color indication they will see as they read their Wickets.

READY   ACCEPT   REJECT   UNABLE   RATING   DISABLED

Color	Command	When To Use
Blue – Solid	N	Blue indicates the **normal** state where the reader is idle and ready to read a Wicket. The "N" command cancels any other prior state or visual indication.
Green – Blink	A	When a transaction or identification has been **accepted** following the read of a Wicket the "A" command causes the reader to blink green for two seconds and then return to the normal (blue) state.
Red – Blink	R	When a transaction or identification has been **rejected** following the read of a Wicket the "R" command causes the reader to blink red for two seconds and then return to the normal (blue) state.
Yellow – Blink	U	When the system is **unable** to approve a transaction for lack of sufficient funds following the read of a Wicket the "U" command causes the reader to blink yellow for two seconds and then return to the normal (blue) state.
White – Solid	T	When the system as accepted a player and will now be **tracking** or rating their play the "T" command causes the reader to turn solid white. This state will remain until the "N" or "O" command is used.
White – Blink	P	When the system is waiting to complete a **pending** transaction with the player that requires the player to read his Wicket again the "P" command is used to cause the reader to blink white for 30 seconds. If more time is required a subsequent "P" command must be issued. This state may be terminated early with the "N", "T", or "O" command.
Purple – Solid	O	When the system is busy and does not want the reader to read and transmit UID numbers Wicket cards then the "O" command is used to put the unit **out-of-service** and cause the reader to turn purple. This state will remain until the "N" or "T" command is used.
Blu/Grn - Solid	-	When the reader is in the "N" or "T" state, the reader will automatically turn blue-green when a Wicket is close enough to be read.
Blu/Grn - Blink	L A5 FF	When there is a noticeable delay between the time a Wicket is read and the time information may be finally available to use the "A", "R", or "U" commands, this command is used to cause the reader to blink blue-green for up to 30 seconds to provide indication something registered so that the user will not continue to try more reads in the interim.

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How To Order
Wicket Readers

Rev: 08/08/2007

WR 77 A - 1 R U

↕   ↕   ↕   ↕   ↕   ↕

WICKET READER   MODEL   REVISION   CABLE LENGTH   CONNECTOR   SPECIAL OPTIONS

FAMILY
WR = Wicket Reader

MODEL
77 = Account Based Systems
88 = Stored Value – Non Gaming
99 = Stored Value – Gaming

REVISION
A = That's all we have so far.

CABEL LENGTH

0 = 6"	4 = 4'	8 = 8'
1 = 1'	5 = 5'	9 = 9'
2 = 2'.	6 = 6'	A = 10'
3 = 3'	7 = 7'	

CONNECTOR
R = RJ-11 telephone style connector
D = D9 serial with 5x1.2mm power plug
U = D9 serial with US/Can 120VAC to 5V adapter
E = D9 serial with Euro 240VAC to 5V adapter
A = D9 serial with Aus 240VAC to 5V adapter

SPECIAL OPTIONS
   = None
U = USB to D9 adapter
R = RJ11 to D9 adapter with 120V to 5V
     power adapter for US/Can