

|||ibc
SSLOT-P
Programming Guide

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The Smart Slot P is the world's first portable slot reader, combining the exceptional read rate of IBC's slot readers with portability.

Major features of the SSLOT-P are:

- 128K of memory
- Internal date/time stamp
- multiple transaction levels w/led indicators
- good read led indicator
- RS232 communications
- modem support
- rechargeable internal nicad batteries
- 9V battery capability
- programmable automatic shutoff

Functionality

The SSLOT-P reader is designed to collect data in the field for eventual uploading to a PC or computer. Each barcode which is scanned into the SSLOT-P is saved in the memory of the reader, along with the date and time of the scan, and a 1-character transaction mode indicator (defined below).

There are 5 leds on the front of the reader. The led which is all by itself is the good read led, which lights up whenever a barcode is scanned and read properly. The other four leds are leds which are used either to tell you which mode you are running in, or to display important indications about the status and operation of the portable.

Data which is stored in the portable can be uploaded to a PC or computer using the special upload cable provided by IBC. This cable connects to a special connector found on the underneath of the unit.

The SSLOT-P contains internal nicad batteries which are rechargeable using the AC adaptor provided by IBC. Charging time is approximately 8 hours. The SSLOT-P will run for about 20 hours on a full charge.

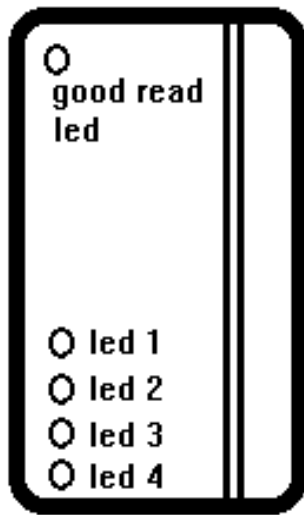
Transaction Modes

There are eight possible Transaction Modes which the portable can be in. Functionally, all of these modes are the same, and the data which is stored for each mode is the same (barcode data and date/time stamp), except that you can distinguish each scan as being within a certain type of transaction.

Say, for example, that you are using the portable for collecting clock ins and clock outs. You might then define transaction mode # 1 to be a clock in, and transaction mode # 2 to be a clock out. When you are in the clock in mode (transaction # 1), all of the scans will be stored in memory along with a transaction type indicator of 1. All of the clockout transactions will be stored in memory with a transaction type indicator of 2. Therefore, when you upload your data into a file in your computer, each record will contain a transaction type indicating what type of transaction it is.

The current transaction mode which the portable is running is identified by the LED which is currently blinking. There are four transaction leds on the portable, each one indicating a particular transaction type (leds 1 thru 4).

The four leds found on the lower side of the diagram below are the leds which indicate the current transaction that the portable is in. The current transaction light will blink for about 1/4 of a second every two seconds, indicating which transaction the portable is in. If led # 1 is blinking, then the portable is in transaction mode 1. If led # 4 is blinking, then the portable is in transaction mode 4. You can reprogram the transaction lights using a software command, so that any of the eight possible transaction modes will light whatever led you have programmed in.



Turning on the SSLOT-P

There is a switch inside of the slot which turns the reader on. If the reader is currently turned off, you can start the reader by simply passing a card through the slot. You will have to pass the card slowly the first time so that the unit will sense the card through the switch, in order to turn on.

Once the unit is turned on, the SSLOT-P will perform its internal diagnostics, and then proceed to test every led. If an error occurred during the startup diagnostics, leds number 1 and 2 will begin to blink alternately, indicating that an error condition exists. This is an indication to you that the unit should be checked.

Once the reader is running, it will continue to run until the programmed timeout period has elapsed. The factory default for a timeout period is 10 minutes. This means that if the reader runs for 10 minutes without scanning a barcode, then it will turn off. You can reprogram this timeout period using a serial command.

Recharging

You can recharge the SSLOT-P by connecting the supplied AC adaptor to the recharging jack on the side of the SSLOT-P. Recharge time is approximately 8 hours to ensure a full recharge of the nicad batteries.

Under NO circumstances should you charge the batteries for more than 20 hours, and always use the AC adaptor supplied by IBC. Do NOT use an AC adaptor from another supplier as damage to the nicad batteries could occur.

Using a 9 Volt Battery

If the internal nicad batteries have lost all of their power, and you must continue to scan in information, then you can run the SSLOT-P with a 9 volt battery, using the special 9V adaptor cable supplied by IBC.

The 9 volt battery should allow the reader to operate for a few hours before draining the 9 volt battery. Be sure to always have a fully charged (new) 9 volt battery available in case you need to use it.

Using the Optional Barcode Pen

The SSLOT-P may be ordered with an optional barcode pen jack which allows the connection of a barcode pen. Barcodes can then be scanned using the pen rather than using the slot.

When a barcode pen is connected, the pen uses a lot of power from the batteries, and therefore should not be used all of the time because there is no way to turn the power off on the pen, unless you have a pen with a switch on it. We therefore recommend that if you are using a barcode pen, that you use it sparingly, and do not connect the pen until you are ready to use it, and disconnect it as soon as you are finished with it.

Memory and Record Sizes

The SSLOT-P contains 128K of internal memory which is backed up by a lithium battery. Memory is therefore not lost when the unit is turned off. It is recommended, however, that you do not leave data in the portable for extended periods of time.

You can program the size of each record in the portable by using a software command. Record sizes can be a minimum of 4 characters and a maximum of 18 characters. You cannot scan barcodes which are less than 4 characters, or greater than 18 characters. Obviously, if you set the record size at 10, then you cannot read barcodes larger than 10 characters.

Each record in the SSLOT-P also contains 4 bytes of overhead information, where the date, time, and transaction indicator is saved for each record. You therefore need to add 4 bytes to your record size in computing the number of transactions that you will be able to store in the portable.

The SSLOT-P will flash certain led sequences when you fill memory to the 90% point, and also will flash additional leds when you are full. Once the memory is full, you cannot scan in any more transactions.

Uploading

Data may be uploaded from the portable to a computer by either sending the portable a command through the RS232 communications port, or by scanning in a barcode instructing the portable to transmit its' data.

You have the option of sending all of the data in the portable, or only the data which pertains to specific transaction types.

Data may be uploaded in a non-protocol mode, or in a special protocol mode which requires an ack/nak acknowledgement by the receiving computer. In both non-protocol mode, and in protocol mode, an LRC character is used to confirm data integrity.

Trickle Mode Cable

For applications where the SSLOT-P will be temporarily mounted at a specific location, and AC power is available, there is a special trickle charge cable available from IBC which will allow you to run the SSLOT-P using the

supplied AC adaptor, without harming the internal nicad batteries. Do not attempt to run the SSLOT-P using the AC adaptor for any period of time greater than 20 hours, or permanent damage to the nicad batteries may occur.

LED Error Indicators

Whenever an error occurs in the portable, the leds are flashed or blinked to tell you what the problem is. If a problem persists, then it is suggested that you upload the data in the portable as quickly as possible, and then attempt to correct the problem.

The LED error indications are as follows:

Battery Low

When the batteries are low, leds 1 and 2 will light together, then leds 3 and 4 will light together, and this pattern will repeat 20 times.

Memory Full

When memory is full, and you cannot scan in any more barcodes, all 4 leds will go on and remain on for about 1/10 of a second. This will happen every time you scan in a barcode. Once the memory becomes full, you must of course upload the data in the portable.

Memory Almost Full

When memory is almost full (lest than 200 scans left), lights 1,2,3, and 4 will light up in succession. This will occur only one time, after a scan.

Bad Startup Sequence

A bad startup sequence is indicated by led 1 and 2 lighting alternately. This can mean any of the following things - bad ram checksum, bad clock, or bad record counts. In order to find out what the exact error is, you must issue the STAT command to the portable, which will return a 1-byte status variable, telling you the error or errors which have occurred.

Transaction LED Programming

As discussed earlier, there are 8 transaction modes which the portable can run in (modes 1 thru 8). Normally, by default, transaction mode 1 will cause led # 1 to blink, and transaction mode 4 will cause led # 4 to blink.

The led which each transaction mode lights, however, is programmable and you can change it using a software command. Transaction mode 1, for example, could light led number 4, if you wish. Any of the 8 transaction levels may light any one of the 4 transaction leds.

Using the Modem Mode

The SSLOT-P has a special mode for connecting to Hayes compatible modems. In the SSLOT-P are three 30 character sequences which contain the modem initialization, dialing, and hangup strings. You can program these strings using serial commands.

To place the SSLOT-P into the modem mode, there are special barcode commands to either send the initialization string to the modem, or send the dialup string to the modem. Scanning in any of these barcodes will place the portable into the "modem" mode, where the portable expects to be talking through a modem. Scanning in a control card to hangup the modem will take the portable out of the modem mode.

While in the modem mode, led 1 will blink faster than usual, to indicate that the portable is in modem mode, or is attempting a modem connection. You cannot scan in any barcodes while in modem mode, other than those barcodes which cause an upload to occur, or take the portable out of the modem mode.

In order for the portable to work with a modem, the modem you are using must be set up to echo all of the commands which are sent to it, and also must be set up to send numeric connect mes-

sages. This is because the portable expects to see an echo of the commands which it is sending to the modem, otherwise it will assume that the modem is not connected, or is not turned on, and will not enter the modem mode. The SSLOT-P operates only at 9600 baud, 8 data bits, 1 stop bit, and no parity. The modem therefore must be able to support this mode.

When the special barcode is scanned to instruct the portable to dial a number through the modem, the portable will send the dial sequence and then wait for up to 30 seconds to receive a status of "12" from the modem, which is the numeric code for a connect at 9600 baud. During the time that the portable is attempting to dial the number, leds 1,2,3, and 4 will blink in order, until the connection is made, or the connection is not made. If the connection is made, then led 1 will blink fast. If a connection is not made, then leds 1,2,3, and 4 will blink together 10 times to warn you that the connection was not made.

While you are in modem mode, the only type of upload which you can initiate locally by scanning in a barcode is a protocol type of upload. You can, however, initiate any type of upload you wish, or send any type of command to the portable, through the serial line (from the computer to the portable through the modem). The modem mode only restricts the type of commands and barcodes which can be read in locally into the portable, not any commands which are sent to the portable serially.

Barcode Prefixes

You can program the SSLOT-P to accept barcodes that start with a specific prefix character only. This allows you to customize the portable for use at different locations, allowing only those cards that belong to that particular installation to be scanned in. The prefix is a one-character prefix only which can be checked for.

Displaying Transaction Counts

You can scan in special barcodes which will cause the SSLOT-P to count the number of transactions which it has stored in its memory, and then tell you the number of transactions by blinking the leds. There are eight specific barcodes, corresponding to transaction levels 1 through 8, which can be scanned in.

After these cards are scanned in, the portable will then blink led 5 (the top led) 1 time for the 10,000 place count, led 1 for the 1000 place count, led 2 for the 100's, led 3 for the 10's, and led 4 for the 1's count. If there are 4012 transactions in memory, for example, then the portable will light led 1- 4 times, then led 3 - 1 time, then led 4 - 2 times, to give you the visual count of the number of transactions.

Special Firmware

IBC can design special firmware, or modify the existing SSLOT-P firmware for OEM applications. One particular OEM, for example, has additional barcode commands which allow for the printing on a portable printer (through the RS232 port), timesheet and production information for each of the employees. Contact IBC if you require special firmware or enhancements for the SSLOT-P.

Communicating with the SSLOT-P

You can communicate with the portable using RS232 communications. In order to do this, you must connect the special cable supplied by IBC to the serial port on the underneath of the unit. Serial communications must be done at 9600 baud, 8 data bits, 1 stop bit, and no parity. This is the only serial mode that the SSLOT-P will operate in.

You can send serial commands to the portable using RS232, and also send

programming commands to the portable.

Please be aware that whenever you connect the serial cable to the jack on the portable, that noise may appear on the line due to the physical connection of the plug. This may cause your computer to see some noise on the line, and also causes the portable to see some noise on the line. It is therefore important to note that if you are writing specialized software to talk with the portable, that you send a few carriage returns (CR) to the portable in order to clear the portables' input buffer, at the start of your application. This will ensure proper synchronization of data.

Status Variable

There is a 1-byte status variable which can be read at any time using an RS232 command. This variable holds important status information relating to any diagnostic problems which may have been found in the portable. The status variable is 1 byte long, and contains the following information:

bit 7	unused
bit 6	unused
bit 5 (set)	bad ram checksum
bit 4 (set)	bad decode buffer
bit 3 (set)	bad ram initialization checksum
bit 2 (set)	bad clock
bit 1 (set)	bad record count verification
bit 0	unused

Symbologies

The SSLOT-P (Version 2.3) will support the following symbologies:

Code 39 (w/o check digits, w/o full ascii)
 Interleaved 2 of 5 (w/o check digits)
 2 of 5 (w/o check digits)
 Matrix 2 of 5 (w/o check digits)
 Industrial 2 of 5 (w/o check digits)
 UPC Version A (w/o supplementals)
 Code 128 (w/o check digits)

Barcode Command Set

The following commands are barcode commands. You can encode the commands you need into a barcode, and then scan these barcode commands into the SSLOT-P in order to cause the SSLOT-P to take specific actions.

%U1

This barcode causes the SSLOT-P to enter transaction mode 1, and blink the light associated with transaction mode 1.

%U2

This barcode causes the SSLOT-P to enter transaction mode 2, and blink the light associated with transaction mode 2.

%U3

This barcode causes the SSLOT-P to enter transaction mode 3, and blink the light associated with transaction mode 3.

%U4

This barcode causes the SSLOT-P to enter transaction mode 4, and blink the light associated with transaction mode 4.

%U5

This barcode causes the SSLOT-P to enter transaction mode 5, and blink the light associated with transaction mode 5.

%U6

This barcode causes the SSLOT-P to enter transaction mode 6, and blink the light associated with transaction mode 6.

%U7

This barcode causes the SSLOT-P to enter transaction mode 7, and blink the light associated with transaction mode 7.

%U8

This barcode causes the SSLOT-P to enter transaction mode 8, and blink the light associated with transaction mode 8.

%UA

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 1.

%UB

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 2.

%UC

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 3.

%UD

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 4.

%UE

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 5.

%UF

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 6.

%UG

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 7.

%UH

This barcode causes the SSLOT-P to give a visual count of the number of transactions saved in the memory with a transaction type of 8.

%UM

Dumps all data in the SSLOT-P out the serial port with a delay after each record. This is used in case you wish to connect a printer to the serial port, to obtain a printout of all of the data in the portable.

%UN

Sends the "initialization" string out the serial port (to the modem).

%UO

Sends the "dial" string out the serial port (to the modem) and waits for a connect.

%UP

Sends the "hangup" string out the serial port (to the modem) and takes the SSLOT-P out of modem mode.

%UQ

Clears all transactions in the SSLOT-P.

%UV

Turns the portable off.

%UW

Tests the "battery low" indicator lights.

%UX

Tests the "memory full" indicator lights.

%UY

Tests the "memory almost full" indicator lights.

%UZ

Gives a visual count of the record size on led # 5.

%A0

Instructs the portable to upload all data in the unit (using protocol mode).

%Ax

Instructs the portable to upload all data in the unit with a transaction type of "x", (using protocol mode).

Serial Command Set

The following commands are commands which can be sent through the RS232 line to the SSLOT-P in order to program the portable, or get information from the portable.

All commands sent to the portable must be followed by a carriage return (CR).

RST

Resets the portable to the factory defaults, clears all of the memory in the SSLOT-P, sets the record size to 18 (factory default), clears the modem initialization, dial, and hangup strings, and sets the transaction mode to type 1.

CLR

Clears all of the transactions in the memory of the portable.

STMymmddhhmmss

Sets the time clock in the portable to yymmddhhmmss (year/month/day/hours/minutes/seconds).

UPL

Initiates a standard upload (see upload formats below).

UPLx

Same as UPL, but uploads only records with transaction type "x", where "x" can be any number between 1 and 8.

NUM

Returns the number of transactions stored in the portables' memory, as a 5-character number followed by a CR.

NUMTx

Returns the number of transaction type "x" records stored in the portables' memory, as a 5-character number followed by a CR.

TMR

Returns the current time stored in the portable, in the format yymmddhhmmss followed by a CR.

RSZxx

Sets the record size in the unit to xx. "xx" must be between 4 and 18, and the memory must be clear in order to use this command. If the command is accepted, the portable responds with an ACK (06 hex), otherwise it will respond with a NAK (15 hex).

SIZ

Returns the current record size set up in the portable, as a 2-character number.

OFFxx

Sets the number of minutes the reader will run before turning off. This time is reset internally every time a barcode is scanned in, so the number you set is the amount of time after a barcode is scanned in. If you set this to 10, for example, then the reader will wait no more than 10 minutes, after the last barcode has been scanned in, before it shuts off.

To disable the automatic shutoff mechanism, set "xx" to "00".

LEDxxxxxxx

This command tells the portable which led lights (1 thru 4) to light up for each of the eight transaction modes.

PREx

Sets the barcode prefix character. If "x", for example, is "5", then every barcode which you scan in must start with a "5", otherwise it will not be accepted. The prefix character data is saved in memory along with the barcode which is read in, so the prefix is considered part of the barcode data for record size purposes.

To disable the prefix character, set "x" to NULL (00 hex), or use the NOPRE command.

VER

Returns the firmware version identification string.

MINITXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Sets the Modem Initialization string, which is sent to the modem when the "init modem" barcode is scanned in. This string must be 30 characters in length, even if it is blank filled, otherwise the portable will not accept it.

MDIALXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Sets the Modem Dialup string, which is sent to the modem when the "dial modem" barcode is scanned in. This string must be 30 characters in length, even if it is blank filled, otherwise the portable will not accept it.

MHANGXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Sets the Modem Hangup string, which is sent to the modem when the "hangup modem" barcode is scanned in. This string must be 30 characters in length, even if it is blank filled, otherwise the portable will not accept it.

ZERO

Zeroes all data records in RAM - used for debugging purposes only.

DPRE

Returns the programmed prefix character.

DMINIT

Returns the 30-character "modem initialization" string.

DMHANG

Returns the 30-character "modem hangup" string.

DMDIAL

Returns the 30-character "modem dialup" string.

SVER

Returns a shortened form of the firmware version identification.

DOFF

Returns the shutoff time which is set in the portable.

DLED

Returns the settings of the LED-Transaction number lights.

PUPLOAD

Tells the portable to upload all of its' data in protocol mode (see below).

PUPLOADx

Uploads (in protocol mode), only those records which are of transaction type "x".

GRTIMEx

Sets the Good Read Indicator (led 5), to light for "x" times 100ms after a good read.

DGRTIME

Returns the good read light time setting.

STAT

Returns the 1-byte Diagnostic Status indicator.

SN

Returns the portables' 7-character serial number.

NOPRE

Turns the prefix character checking off.

Upload Transmission Formats and Protocol

There are two types of uploads - one which is a standard upload in which the portable will transmit all of its' data, with no internal delays, and another type which is an upload using a pre-defined protocol.

In the standard upload, the portable will transmit the following information:

5 character record count (# records to be uploaded), + CR.

data records 1...x (each data record has the format of YYMMDDHHMMSS + transaction type + barcode data (blank filled to the record size)) + CR

LRC character, computed as the exclusive OR of all bytes sent (except for the CR's).

This information is transmitted with no delays, so the receiving computer must be able to receive the data as quickly as the SSLOT-P is sending it.

The Protocol Upload is a little different, because the protocol upload requires than the receiving computer acknowledge receipt of individual data packets. This is done to support modem communications, because sometimes modem lines can have noise in them.

In the Protocol mode, the same data information is sent as in a standard upload, except that data records are sent in packets of 100 records each, with an LRC for each packet, and also an end of packet, or end of file indicator. After each data transmission from the portable, the receiving computer must respond with an ACK or NAK. An ACK signifies that the computer has received the transmission, and the portable can continue sending data. The NAK informs the portable than the transmission was not successful, and the last transmission needs to be repeated. You can NAK the portable only 5 times. After the 5th NAK, the portable will abort the upload.

The Protocol Upload proceeds as follows:

- 1) Protocol Upload is initiated either by the portable, or by the host computer.
- 2) Portable sends "UPLOAD", or "UPLOAD1", etc.. to signify that the portable is starting a protocol upload.
- 3) Host computer must respond with ACK or NAK within 2 seconds.
- 4) Portable sends the 5-digit record count of the number of records (total) which will be uploaded.
- 5) Host computer must respond with ACK or NAK within 2 seconds.
- 6) Portable starts to send data packets of 100 records each (the last packet may be a short one). The data packet format is:

REC1 data + CR + REC2 data + CR.....REC100 data +CR+03hex +LRC

The LRC is calculated as the exclusive or (XOR) of each byte of data (except the CR's and the 03hex). The LRC starts with an initial value of 0.

- 7) After each packet of data information, the host computer must respond with an ACK or NAK. The host has up to 20 seconds to do this, or the portable will abort the upload.
- 8) The last data packet may be short (does not include 100 data records). In the last data packet, rather than a 03hex, a 04hex is used, to signify that this is the last packet.
- 9) The host computer must respond with an ACK or NAK. If an ACK is sent, the upload is completed.

Please note that if you are uploading for a specific transaction type, that the portable may take some time searching

memory for transactions which meet the type you have requested. In extreme cases, it can take up to 20 seconds for the portable to find one of these transactions, and therefore you must be prepared in your software to wait at least 20 seconds for information to be returned to you at any point in time.

Sample Application - Farm Picking

One application of the SSLOT-P is in farming, where the portable is used to collect information such as employee clock ins, employee clock outs, picking information, field production, and spray records.

In the morning, the "clock in" transaction card is scanned in, and then each employee that is clocking in for the day is clocked in by scanning their card through the slot.

After the clock ins are processed, piecework counts are then taken - as an employee picks a bucket of peppers, for example, the employee is given credit for the bucket by scanning his badge in the reader. Piecework rates are calculated by scanning in a special data card, which contains rate information prior to the picking information being scanned in.

Multiple "piecework" rate cards may be scanned in during the day, as the piecework rate changes. These cards are processed by the receiving software on the PC. Since all transactions are uploaded to the PC in date/time order, and each transaction is date/time stamped - it is easy to calculate the piecework rates as well as any changes in hourly rates.

Spray information for the fields is also entered into the SSLOT-P by scanning in a card representing the type and quantity of pesticide applied to a specific field.

At the end of the day, the clock outs are processed in the reader, and then all of

the reader information is uploaded to a PC, where the information is processed using special software. Timesheet, payroll, and yield information for the fields are then computed. It is also possible to see the rate at which product is picked, by examining the length of time between picks.