Dragon Quest for Intellivision

Password Hacking Guide

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Introduction

I wrote this guide because I enjoyed cracking passwords for 8-bit/16-bit games back in high school and in college. When I discovered that this port used a password instead of Flash to save your progress, I immediately purchased a digital copy of the game and got to work cracking it for my amusement.

Out of respect for fellow Intellivision indie developers, I had planned to share these notes only upon personal request instead of publicly. But when I saw there was a password released on a YouTube video, I thought I would compile my notes, which I am doing here.

I should add here that I did not hack the ROM image. As with all my other game password cracks, this was done by heuristic means. The link above will take you to my website, where you can see a list of my other password cracks, which are posted on GameFAQs.

Getting Started

Your proficiency level with binary arithmetic should not be too great a factor here. I try to explain everything in a manner that most people should understand.

It probably wouldn't hurt to have a calculator handy though, preferably one that can do base conversion, between Binary, Decimal, and Hexadecimal.

If you are having trouble understanding anything here, feel free to reach out to me using the link in the header.

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Basics

I will begin with some basic indoctrination into understanding most video game password systems. If any of this doesn't make sense to you, don't sweat it. Just skip ahead.

Passwords typically have their own "alphabet" whose size (number of characters available) is some power of 2.

Every character you enter into your password is therefore an encoding of a certain number of bits of data. That number of bits is the binary logarithm of the alphabet's size.

In English, that means each character you enter into a password usually contains 5 bits of data, because the Intellivision Dragon Quest password's alphabet contains 32 characters, and the base-2 (binary) logarithm of 32 is 5. In Mathematics, it is written like this:

$\log_2 32 = 5$

There usually will be a character or two set aside for validation. These characters are usually at the end of the password, and must be a certain value, to ensure the password is valid. For the Intellivision port of Dragon Quest, there are two validation characters, but they are not at the end.

The character that does appear at the end is what I call a "password key" or "random seed". Some passwords will use a key value as a rudimentary method to encrypt the other characters. Because this key is randomized when the password is generated, you can end up with multiple different passwords for the same data.

Reference, Part 1

Here is the password's alphabet, with their corresponding "Character values". You might need to refer to this often.

A (0)	B (1)	C (2)	D (3)	E (4)	F (5)	G (6)	H (7)
I (8)	J (9)	K (10)	L (11)	M (12)	N (13)	O (14)	P (15)
Q (16)	R (17)	S (18)	T (19)	U (20)	V (21)	W (22)	X (23)
Y (24)	Z (25)	- (26)	! (27)	? (28)	[(29)	] (30)	@ (31)

Things to Try

These are the easy things you can do, without requiring any further explanation. Feel free to combine any of the following hacks at your leisure.

Change your Name

I will start with this sample password, which is something you might get if you immediately return to the king after starting your quest (go downstairs and back upstairs again):

A A Y D A A A A W A A B D

D A A A A A A A M I K E A

In this password, your name is Mike, and you have 120 Gold, no Experience, and a Torch.

You can easily see the name "MIKE" just prior to the last character. Change it to anything you like. It's just that easy.

Why this sample password displays your name in plain English I will go over later.

A little more Experience

For reasons I will also explain later, you can easily bump your Gold and/or Experience counts in increments of 1,024 units.

Let's start with 1,024 Experience. It's as easy as incrementing the 8th character's value (I highlight the affected characters for easy viewing):

A A Y D A A A B W A A B D

D A A A A A A A M I K E A

A little more Gold

Using the same sample password as before, let's add 1,024 Gold, bringing the total to 1,144. It's as easy as incrementing the 5th character's value:

A A Y D B A A A W A A B D

D A A A A A A A M I K E A

A lot more Experience

You can add 32,768 Experience, also very easily. Just be aware that your Experience and Gold counts max out at 65,535, so you can only do this once.

It's as easy as moving the 1st character "down" 2 positions. Look at the Alphabet in the Reference section earlier. From 'A', 2 positions downward brings us to 'Q'.

Q A Y D A A A A W A A B D

D A A A A A A A M I K E A

A lot more Gold

Just as easily, you can add 32,768 Gold. This time, it's the 2nd character whose value we will move "down" 2 positions.

A Q Y D A A A A W A A B D

D A A A A A A A M I K E A

Have some Magic Keys

Your number of Magic Keys is stored in the 11th character. The maximum is 6 keys. Going higher than this value results in an invalid password.

Just bump the 11th character by the number of keys you would like to have. For 6 keys, you would then go from 'A' to 'G'.

A A Y D A A A A W A G B D

D A A A A A A A M I K E A

Have some Herbs

Similar to the Magic Keys, your number of Herbs is stored in the 10th character. Once again, the maximum is 6. Entering a higher value will cause other things to happen, which you might not want.

A A Y D A A A A W G A B D

D A A A A A A A M I K E A

Putting It All Together

So if we combine everything we learned so far, we get this:

Q Q Y D @ A A @ W G G B D

D A A A A A A A T H O R A

Your name is now Thor, and you have 64,632 Gold and 64,512 Experience. In addition to the Torch, you have 6 Herbs and 6 Magic Keys. But your quest has only begun.

Validation I – Inventory

Many of the side quests in this game affect your inventory. You have 10 inventory slots, the first two of which are dedicated to your Herbs and Magic Keys, as we saw already. That leaves 8 slots that can be filled with other items. We already have a Torch in one of them.

But changing your inventory also requires changing a certain character for validation purposes. The first 8 characters in the bottom row encode your inventory, and the last character in the top row is the validation character, known as a Checksum.

Slots

Notice that in the examples so far, the first 8 characters in the bottom row are:

D A A A A A A A

The characters are:

A. Nothing
B. Herb (Do not use. This is a placeholder value. Setting one of the characters to this value will only waste one of your slots with a dummy Herb that you can't use.)
C. Magic Key (Do not use. Same reason as for the Herb above.)
D. Torch
E. Dragon's Scale
F. Cursed Belt
G. Erdrick's Token
H. Fairy Flute
I. Fairy Water
J. Fighter's Ring
K. Gwaelin's Love
L. Rainbow Drop
M. Silver Harp
N. Staff of Rain
O. Stones of Light
P. Wing of Wyvern
Q. Ball of Light (Do not use. You get this when you defeat the Dragonlord. Getting this item prematurely does not affect gameplay and wastes an inventory slot.)
R. Tablet (Do not use. This is the tablet that you read in Erdrick's Cave. It does not get added to your inventory in normal gameplay. Adding it wastes an inventory slot.)

Entering higher values will result in an invalid password.

Checksum

The last character in the top row is a 'D', matching the 'D' at the beginning of the bottom row. With the other 7 characters set to 'A', these two characters merely have to be the same. But what if you want more than one item?

Each character in the Alphabet has a certain numeric value: 0 for 'A', 1 for 'B', 2 for 'C', and so on, up to 31 for '@'. Using a calculator, add the values of the 8 characters together, and compute the Remainder after Division by 32 (called Modulo, or Mod for short). You would do that by entering the total, pressing the Mod key, entering "32", and pressing the '=' key.

Example

Let's try an example here to see how it all works. Say you want to have the following items in your inventory:

- Dragon's Scale ('E', value 4)
- Cursed Belt ('F', value 5)
- Erdrick's Token ('G', value 6)
- Fairy Flute ('H', value 7)
- Fairy Water ('I', value 8)
- Fighter's Ring ('J', value 9)
- Rainbow Drop ('L', value 11)
- Wing of Wyvern ('P', value 15)

The total value of these items is (4 + 5 + 6 + 7 + 8 + 9 + 11 + 15) = 65

65 Mod 32 = 1

The character whose value is 1 is 'B'. So the last character in the top row has to be 'B', and the first 8 characters in the second row are: "E F G H I J L P".

If we use our starting example, we now have:

A A Y D A A A A W A A B B

E F G H I J L P M I K E A

Or if we combine it with our final "Thor" example from the previous section, we get:

Q Q Y D @ A A @ W G G B B

E F G H I J L P T H O R A

Validation II – Equipment, Quest Progress, and remaining Gold and Experience

Here is where things really start to get interesting.

Your three equipped items (weapon, armor, and shield) are encoded into the first two characters, along with whether you have 32,768 or more Gold and/or Experience.

Weapon

Starting at 'A' (or 'Q', if you have a lot of Experience), bump the 1st Character the following number of times depending on the weapon you want to have:

0. Nothing
1. Bamboo Pole
2. Broad Sword
3. Club
4. Copper Sword
5. Erdrick's Sword
6. Flame Sword
7. Hand Axe

Armor

There are 8 types of armor in the game (7 if you don't count not even having Clothes on, which is how you start the quest 👀). Which type of armor you have is split between the 1st and 2nd Characters. Refer to the following table:

Nothing (0)	Clothes (2)	Full Plate (4)	Leather Armor (6)
Chain Mail (1)	Erdrick's Armor (3)	Half Plate (5)	Magic Armor (7)

The numbers in parentheses are values you will need later.

If your armor is in the bottom row, move the 1st Character "down" one position in the Alphabet. (We will look at the columns in a moment.) So if you want to have Erdrick's Sword, Erdrick's Armor, and 32,768+ Experience, the 1st Character will end up at the open-bracket symbol:

- Starting at 'Q' for 32,768 Experience
- Moved right 5 positions for Erdrick's Sword, arriving at 'V'
- Moved down 1 position for Erdrick's Armor, arriving at '['

Now for the 2nd Character. Starting at 'A' – or 'Q', if you have a lot of Gold – bump the 2nd Character once for the second column in the table above, twice for the third column, or three times for the last column. So for Erdrick's Armor and 32,768+ Gold, the 2nd Character will go to 'R' for now:

- Starting at 'Q' for 32,768 Gold
- Moved right 1 position for Erdrick's Armor, arriving at 'R'

Shield

Here is the table for shields. Again, the values in parentheses you will need later:

Nothing (0)	Large Shield (1)
Silver Shield (2)	Small Shield (3)

If your shield is in the right column, move the 2nd Character 4 positions to the right. If your shield is in the bottom row, move the 2nd Character 1 position down. For the Silver Shield, we will move one position down but not move to the right. From 'R', that brings us to 'Z'.

Remaining Gold

We already know that the 2nd Character indicates whether your Gold is at least 32,768, and that the 5th Character indicates your remaining Gold in increments of 1,024.

The 4th Character indicates your remaining Gold in increments of 32, and the 3rd Character indicates that remainder. Put together, we now know the exact amount of Gold you have.

So yes, we can set the 3rd, 4th, and 5th Characters all to '@', but we waited until now to do so because it's not that easy this time. There is another Validation character, same as the one for Inventory. It is affected by everything we cover in this Section.

Remaining Experience

Same as with Gold, we know that the 1st Character indicates whether your Experience is at least 32,768, and that the 8th Character indicates your remaining Experience in increments of 1,024.

The 7th Character indicates your remaining Experience in increments of 32, and the 6th Character indicates that remainder. Put together, we now have the exact amount of Experience. Just as before, we will set the 6th, 7th, and 8th Characters all to '@', knowing there is more to be done.

Quest Progress

We know that the 10th Character indicates how many Herbs you have and that the 11th Character indicates how many Magic Keys you have. The 12th Character, and part of the 10th Character, are used to flag certain quest-related events that do not necessarily affect your Inventory.

First, we will look at the 12th Character. Up until now, it has always been 'B'. Here is how it goes, starting at 'B':

- Moving one position to the left indicates the quest has not yet begun. This will cause the three chests and the locked door in the Throne Room to respawn, and will make the king re-deliver the opening quest dialogue.
- Moving two positions to the right seems to do nothing. This is the "one bit" I said I couldn't figure out on my Twitch livestream. I had a few ideas, but they all turned out to be false:
    - Reading the Tablet
    - Defeating the Axe Knight in Hauksness
    - Activating the Rainbow Drop
    - Defeating the Dragonlord (no more random fights would happen)
- Move four positions to the right if you have defeated the Dragon in the Swamp Cave.
- Move one position down if you have defeated the Golem outside Cantlin.
- Move two positions down if you have rescued Princess Gwaelin. Make sure you also add Gwaelin's Love to your Inventory if you do this. That is why I didn't choose Gwaelin's Love in our example in the previous Section.

Now for the 10th Character. Up until now, it has been positioned between A-G, indicating how many Herbs you have.

- Moving one position down indicates that you have put on the Fighter's Ring.
- Moving two positions down indicates that you have put on the Cursed Belt. This is the "other thing" that I said earlier could happen that you probably don't want.

Checksum

The 9th Character is the validator for everything in this Section. It's not as straightforward as the other one. That's why I covered Inventory first.

- Start with the value 14.
- Add the value of your Weapon, the number indicated before its name.
- Add the value of your Armor, as indicated in parentheses in the Armor Table.

- Add the value of your Shield, as indicated in parentheses in the Shield Table.
- Divide your Gold count by 16. Round down to the nearest whole number if there is a remainder. Add this value to your current total.
- Divide your Experience by 16. Again, round down if necessary. Add this value.
- Add the character value of the 12th Character ('A'=0, 'B'=1, 'C'=2, etc.)
- Now compute the Remainder after Division by 32, as with the other Checksum.

This final "Mod 32" value lets you know what the 9th Character must be.

Before we continue, I'll answer the question from so long ago as to why you could simply bump your Gold and/or Experience in increments of 1,024 with impunity. It's because every 512 Gold/Experience (16 × 32), this Checksum will happen to be the same value as before.

Example

No way am I going to leave you hanging here.

I already used the example of the best equipped items (Erdrick's Sword, Erdrick's Armor, and the Silver Shield) and we discovered that the first two Characters would be "[Z" if we have 32,768+ Gold as well as Experience. To max out Gold and Experience, we will follow with 6 at-symbols. If we have just begun the quest, the 12th Character will be 'B'. (The 10th Character does not affect this Checksum, and neither does the 11th Character).

So part of our password looks like this:

[Z @ @ @ @ @ @ _ _ _ B _

_ _ _ _ _ _ _ _ _ _ _ _ _

The Checksum is the 9th Character, just after all those at-symbols. What will it be?

- We start with the value 14.
- The value of Erdrick's Sword is 5. 14 + 5 = 19.
- Erdrick's Armor has a value of 3. 19 + 3 = 22.
- The Silver Shield has a value of 2. 22 + 2 = 24.
- We have 65,535 Gold. Dividing by 16 gives us 4,095.9375. Rounding that number down leaves us with 4,095. Adding that value brings us to 4,119.
- Same as with Gold, we have 65,535 Experience. We already know that 4,095 is what we get when we divide by 16 and round down. Adding that value gives us 8,214.
- The 12th Character's value is 1 for 'B'. 8,214 + 1 = 8,215.
- 8,215 Mod 32 = 23.
- 'X' is the character whose value is 23.

If we use the beginning example with "Mike", we get:

[Z @ @ @ @ @ @ X A A B D

D A A A A A A A M I K E A

Combined with our latest "Thor" password with all that inventory, that would be:

[Z @ @ @ @ @ @ X G G B B

E F G H I J L P T H O R A

More Examples

Let's also put on the Fighter's Ring and be rid of the Green Dragon in the Swamp Cave and the Golem outside Cantlin (I re-computed the Checksum for you here):

[Z @ @ @ @ @ @ D O G N B

E F G H I J L P T H O R A

Now that we know about Princess Gwaelin, let's also bring her back and replace the Cursed Belt with Gwaelin's Love.

[Z @ @ @ @ @ @ T O G [G

E K G H I J L P T H O R A

Password Key

There's only one character left to talk about, and that's the last Character, which is the Password Key. You can leave it at 'A' and skip this whole section if you choose.

Whatever you change the last Character's value to, bump all the following other Characters by the amount of that value. Wrap around from '@' back to 'A' if necessary:

- The 10th, 11th, and 12th Characters in the top row
- All other 12 Characters in the bottom row

Now you know why your name has been displayed in plain English this whole time. The game normally uses some other random value besides 'A' so you wouldn't have noticed your name as part of the password.

Example

Building on our final example from before, one such password would be as follows. I'm keeping it relatively simple and going with 'Q' for the final Character, so that all the affected Characters merely move up or down 2 positions.

[Z @ @ @ @ @ @ T] W N G

U - W X Y Z ! @ D X] B Q

Reference, Part 2

Now all has been said, here is everything in one place.

Alphabet (with Character Values)

A (0)	B (1)	C (2)	D (3)	E (4)	F (5)	G (6)	H (7)
I (8)	J (9)	K (10)	L (11)	M (12)	N (13)	O (14)	P (15)
Q (16)	R (17)	S (18)	T (19)	U (20)	V (21)	W (22)	X (23)
Y (24)	Z (25)	- (26)	! (27)	? (28)	[(29)	] (30)	@ (31)

Weapons

0. Nothing
1. Bamboo Pole
2. Broad Sword
3. Club
4. Copper Sword
5. Erdrick's Sword
6. Flame Sword
7. Hand Axe

Armors

Nothing (0)	Clothes (2)	Full Plate (4)	Leather Armor (6)
Chain Mail (1)	Erdrick's Armor (3)	Half Plate (5)	Magic Armor (7)

Shields

Nothing (0)	Large Shield (1)
Silver Shield (2)	Small Shield (3)

Character Descriptions

1. Weapon, part of Armor, and lots of Experience. From 'A':
    - Move right the same number of positions as value of your Weapon.
    - Move down 1 position if your Armor is in the bottom row of the Armor Table.
    - Move down 2 positions if your Experience is 32,768 or above.
2. Other part of Armor, Shield, and lots of Gold. From 'A':
    - Move right the same number of positions as the column in the Armor Table (stay put for the left column, move once for the second column, move twice for the third column, or move three times for the right column).
    - Move right 4 positions if your Shield is in the right column in the Shield Table.
    - Move down 1 position if your Shield is in the bottom row in the Shield Table.
    - Move down 2 positions if your Gold is 32,768 or above.
3. Gold, remainder after division by 32.
4. Gold, remainder after division by 1,024, divided by 32, without the remainder.
5. Gold, remainder after division by 32,768, divided by 1,024, without the remainder.
6. Experience, remainder after division by 32.
7. Experience, remainder after division by 1024, divided by 32, without the remainder.
8. Experience, remainder after division by 32,768, divided by 1,024, with no remainder.
9. Validation II (see next page).
10. Herbs and equipment flags. From 'A':
    - Move right the same number of positions as your Herb count (6 maximum).
    - Move down 1 position to wear the Fighter's Ring.
    - Move down 2 positions to wear the Cursed Belt.
11. Magic Keys. From 'A', move right the same number of positions as how many you want (6 is the maximum). Do not move down.
12. Quest flags. From 'A':
    - Move right 1 position to indicate the quest has begun.
    - Moving right 2 positions raises the "unknown bit".
    - Move right 4 positions if the Green Dragon in the Swamp Cave is defeated.
    - Move down 1 position if the Golem outside Cantlin is defeated.
    - Move down 2 positions if you have rescued Princess Gwaelin (don't forget to also equip Gwaelin's Love; see next page).
13. Validation I (see next page).

Bottom row:

- First 8 Characters: each Inventory slot (see next page).
- Next 4 Characters: your name.
- Last Character: Password Key (see next page).

Validation II

- 14
  + Weapon Value
  + Armor Value
  + Shield Value
  + (Gold ÷ 16), Integer portion (round down to nearest whole number)
  + (Experience ÷ 16), Integer portion
  + Character value of 12th Character (see previous page)
- Mod 32

Inventory (with Character Values)

A. (Value 0) Nothing
B. (Value 1) Herb (Do not use)
C. (Value 2) Magic Key (Do not use)
D. (Value 3) Torch
E. (Value 4) Dragon's Scale
F. (Value 5) Cursed Belt
G. (Value 6) Erdrick's Token
H. (Value 7) Fairy Flute
I. (Value 8) Fairy Water
J. (Value 9) Fighter's Ring
K. (Value 10) Gwaelin's Love
L. (Value 11) Rainbow Drop
M. (Value 12) Silver Harp
N. (Value 13) Staff of Rain
O. (Value 14) Stones of Light
P. (Value 15) Wing of Wyvern
Q. (Value 16) Ball of Light (Do not use)
R. (Value 17) Tablet (Do not use)

Validation I

Add up the values of the 8 Inventory Characters and "Mod 32" the total.

Password Key

Either leave as 'A', or else add the Character Value to each of the affected Character's values, and wrap around from '@' to 'A' as necessary:

- Characters 10-12 in the top row
- Characters 1-12 in the bottom row

This page intentionally left blank. Or it would have been if I hadn't just said so.