2024 *FIRST*® Robotics Competition

AprilTag Images and User Guide

INTRODUCTION

Overview

This document contains printable images for the 16 AprilTag markers included on the 2024 Playing Field as well as some instructions on how to print these tags, verify that they have printed correctly, and apply them to team-version field elements.

The included tag images should print with appropriate minimum white margins for AprilTag detection on either Letter or A4 paper. Note that the targets on the official field have additional white space, see FE-00083 and GE-24224 in the Official Drawings package for more details.

Printing tags

To print the tags, it is recommended, though not necessarily required, to download the document and print using a standalone PDF reader as browsers often re-scale the document and add URLs or other information to the printout. Make sure you set the settings to print at "Actual size", "Scale: 100%" or similar option in your application. You can verify that the tag has printed at the correct size by measuring the black box on the printed tag to ensure it is a 6.5 in. x 6.5 in. square (~16.5cm x 16.5cm)

Applying tags to team field elements

You can apply the printed paper tags directly to the team versions of the field elements. Make sure that the tags remain flat when applied.

If you wish to be able to swap tags on field elements, apply all tags to a cardboard, hardboard, or similar plate which can attach to the field element using hook and loop, screws, or other fasteners. This will result in significantly less reflections than using a sheet protector or similar plastic sleeve for the paper and will ensure the target stays flat.

The team version of the Source has been designed to optimize the use of material and does not have a front face to attach an AprilTag to and has therefore been omitted. If teams wish to design additional structure to support an AprilTag, reference the Official Field Drawings to find the appropriate location information.

A reminder on the location of the various IDs on the field:

- Blue Source (right to left) – ID 1, 2
- Red Speaker (right to left) – ID 3, 4
- Red Amp – ID 5
- Blue Amp – ID 6
- Blue Speaker (right to left) – ID 7, 8
- Red Source (right to left) – ID 9,10
- Red Stage (counter-clockwise starting at Stage Left) – ID 11, 12, 13
- Blue Stage (counter-clockwise starting at Center Stage) – ID 14, 15, 16

Team Stage

The image below illustrates where the tag should be located on the team version of the Stage. The dimension provided is the height from the carpet to the black square in the tag. The Tag should be centered horizontally relative to the opening above it.
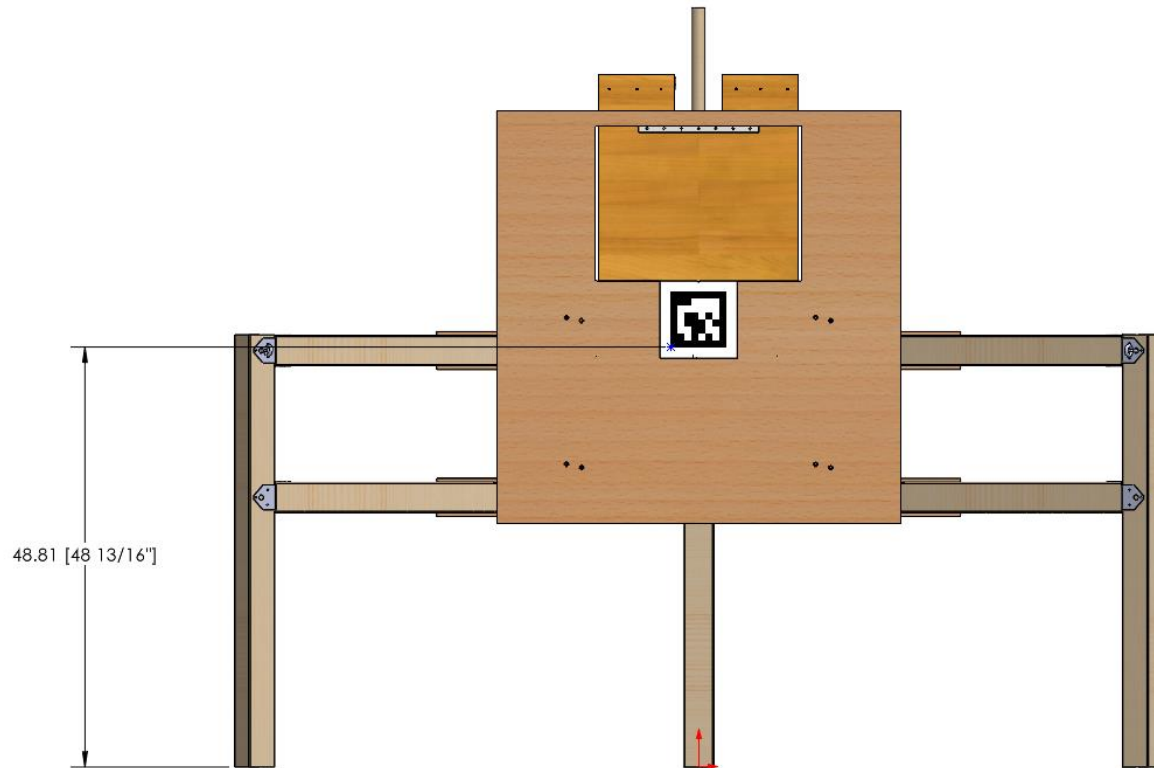
Team Speaker

The image below illustrates where the tags should be located on the team version of the Speaker. The vertical dimension provided is the height from the carpet to the black square in the tag. Horizontal dimensions to the black square of each tag have also been provided.

> The middle tag should be centered on the structure, verify that the dimension provided centers the tag on your structure. If it doesn't, make sure to offset the right tag accordingly as well (22.25 in. between the right edge of the black box on each tag, 15.75 in. between the closest edges of the black boxes).
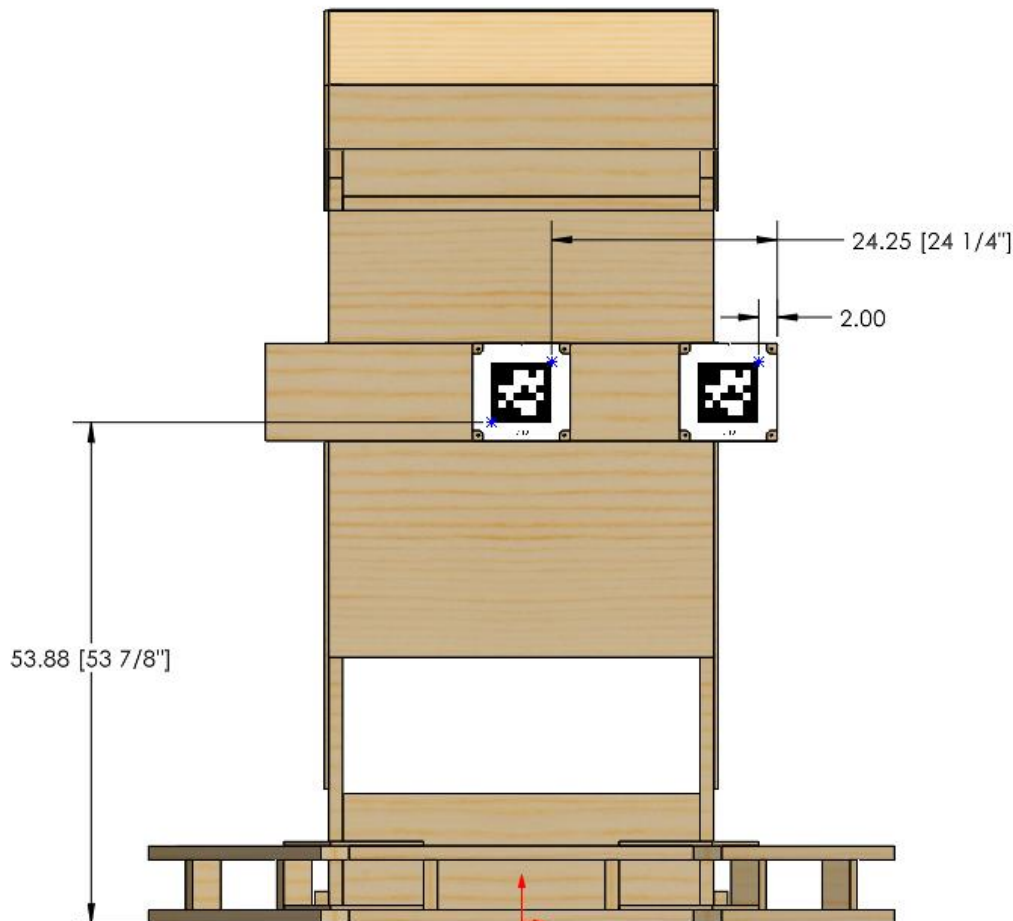
Team Amp

The image below illustrates where the tags should be located on the team version of the Amp. In order to keep the design simple and optimize use of material, the team version of the Amp does not have a support for the AprilTag as part of the base design. Teams can either:

- Extend the whole rectangular face upwards, which will result in additional material around the tag not present on the field
- Extend the face upwards and notch the corners, or
- Add additional structure, fastened to the back of the front face to extend up and support the tag. Depending on how you attach the tag, this may result in the tag being slightly recessed from the Amp face. For many applications, this will be fine as is, but for maximum accuracy, make sure to adjust the tag dimensions in code, or shim the tag forward to be flush with the face.

A vertical dimension to the black box on the tag is provided. Horizontally, the tag should be centered on the opening in the Amp.

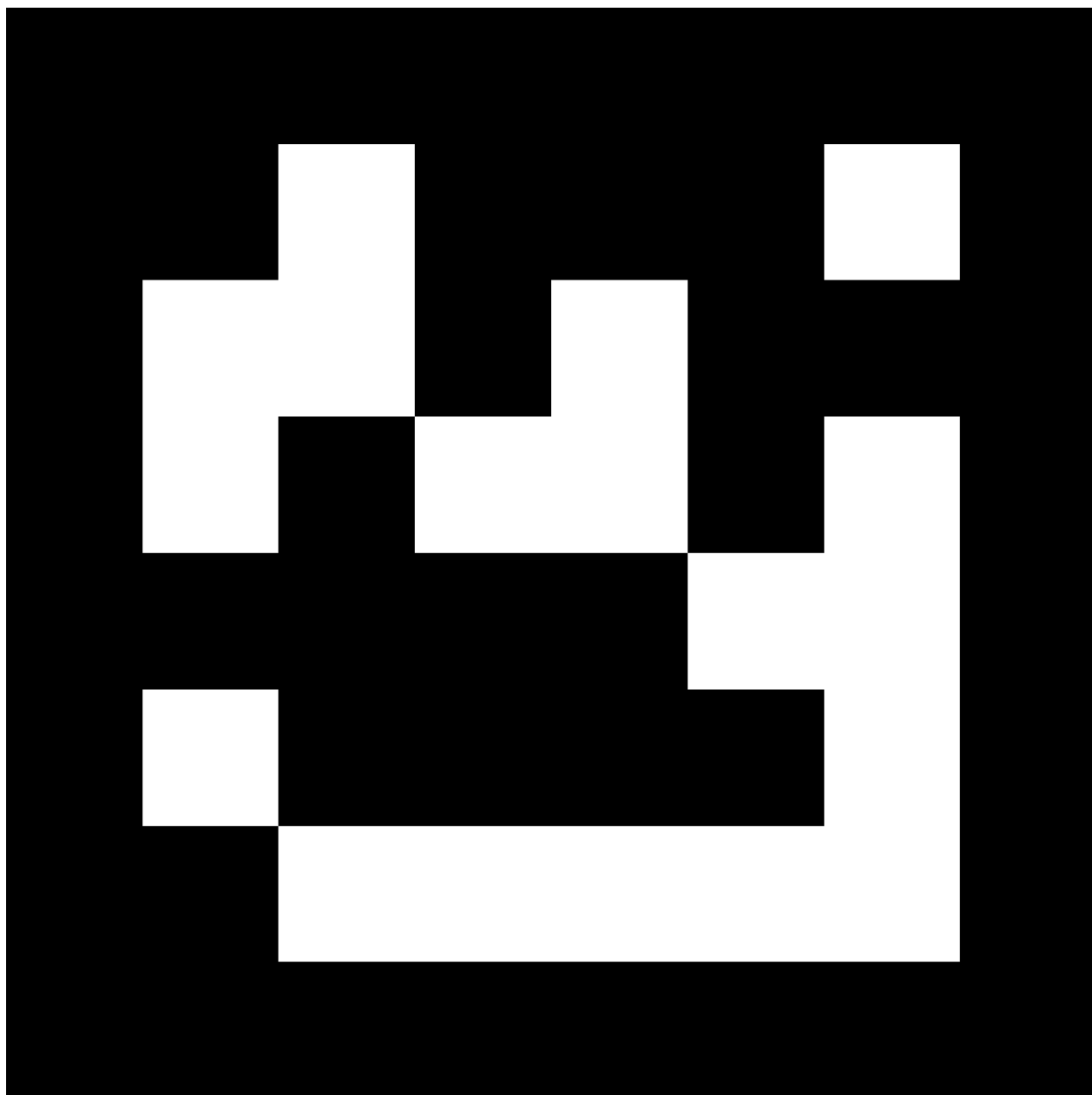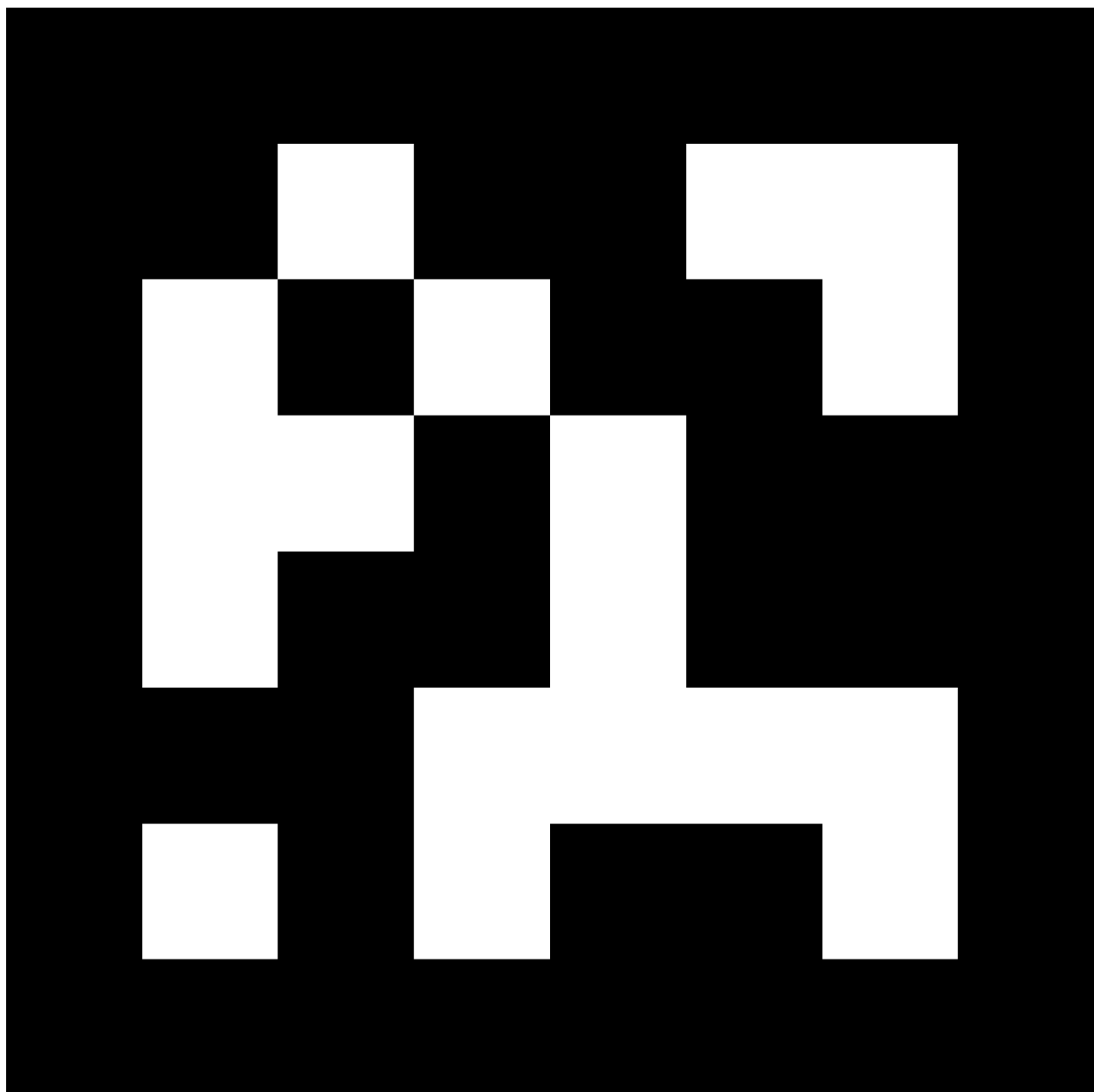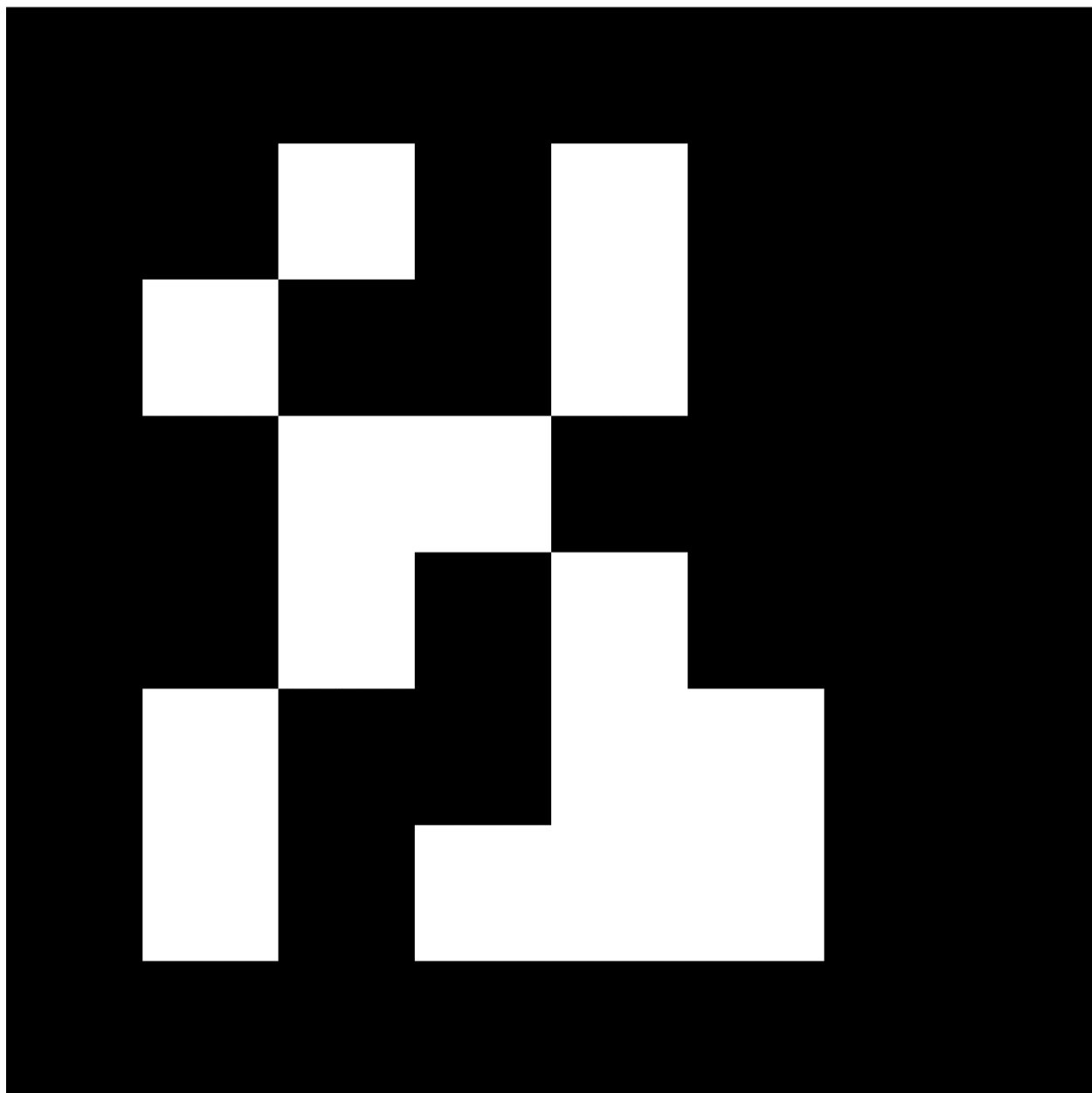50.13 [50 1/8"]
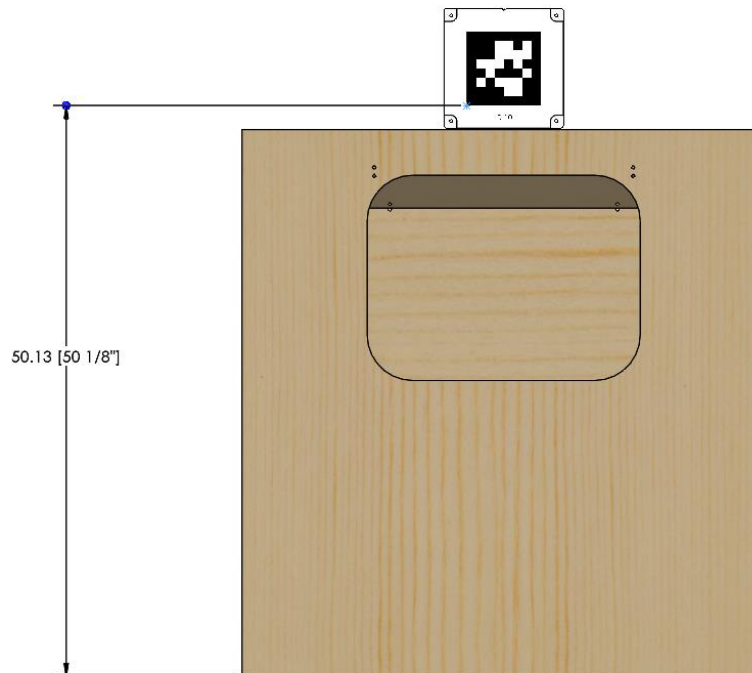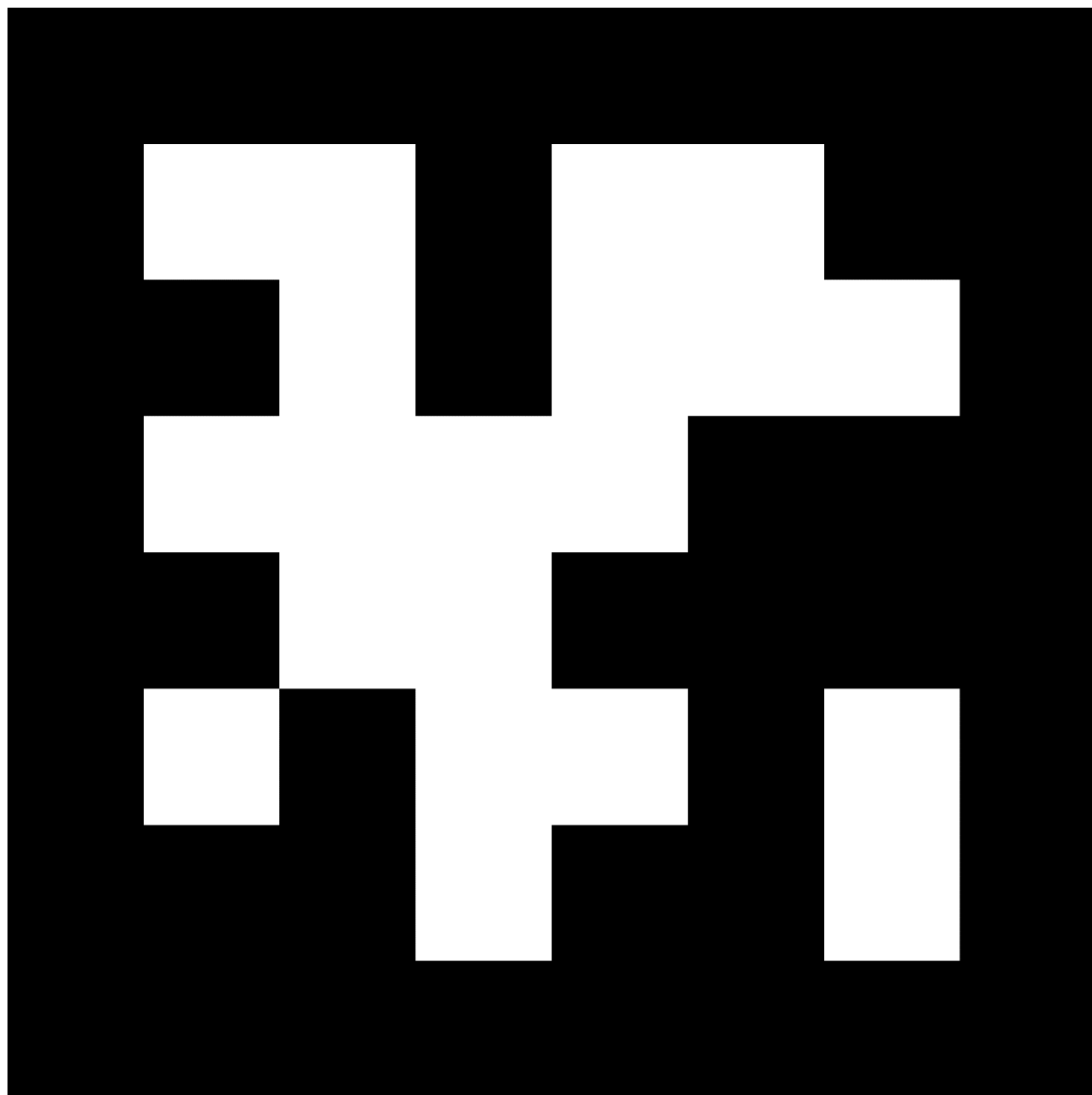
ID 1
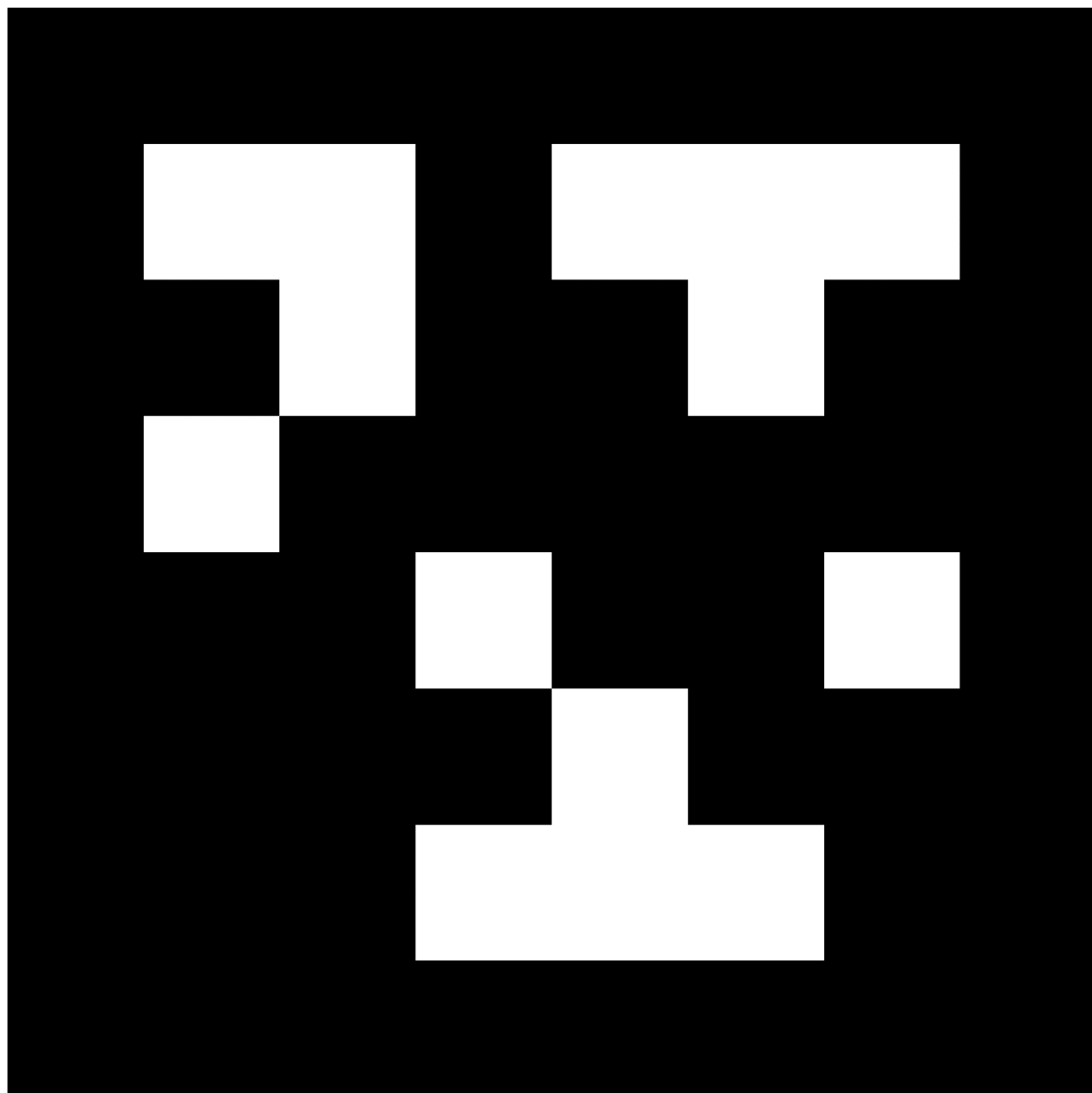
ID 2
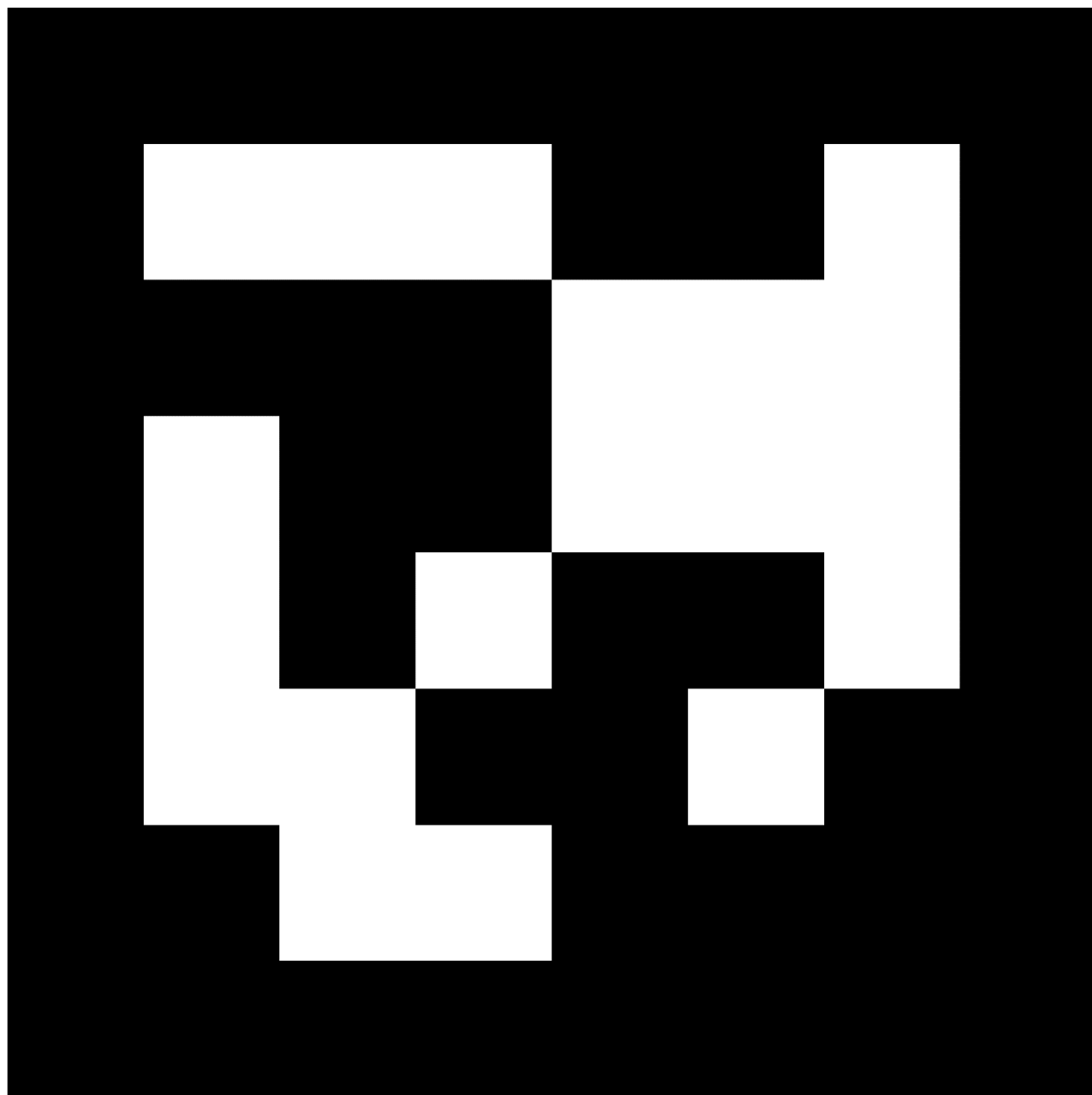
ID 3
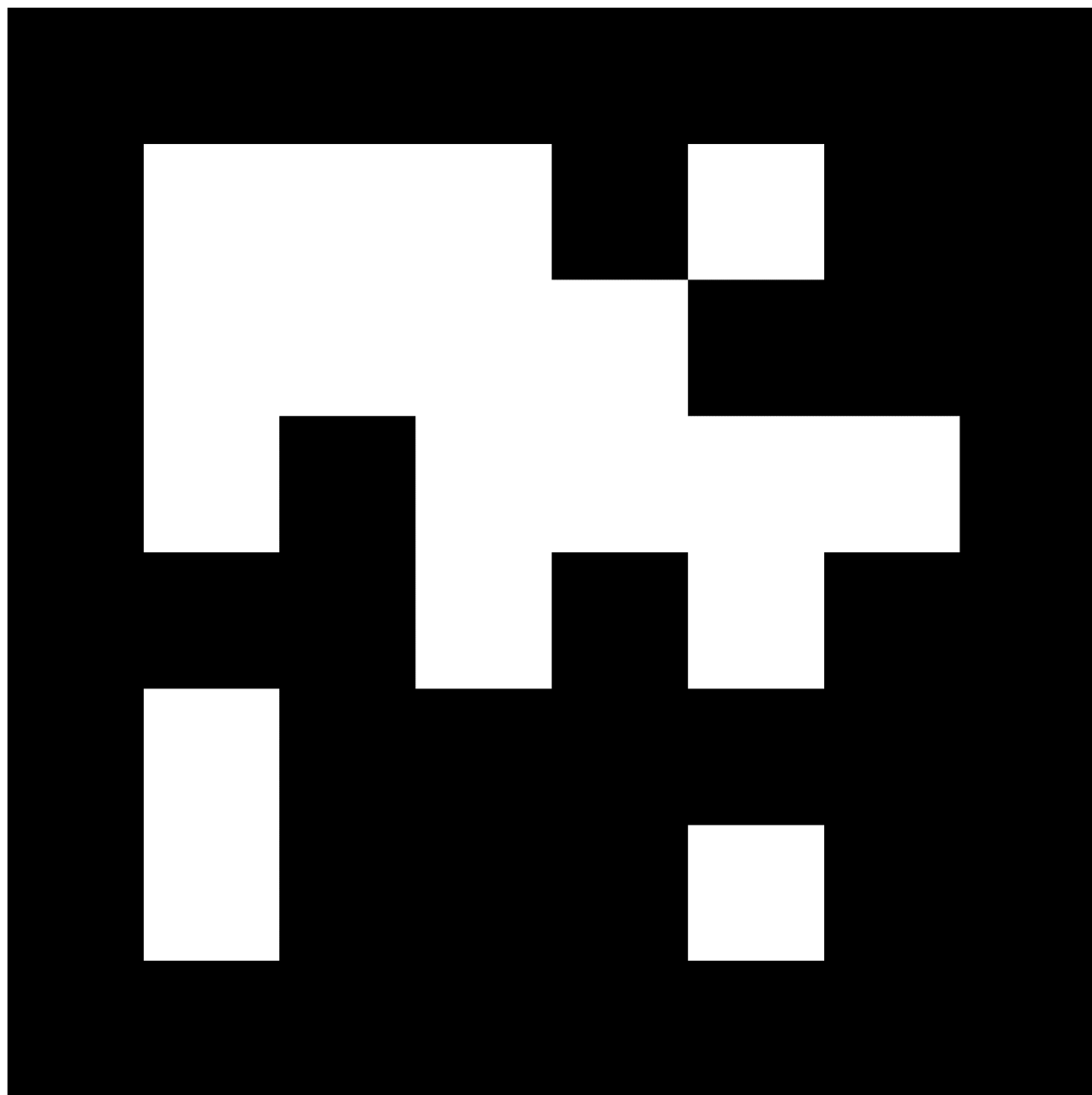
ID 4
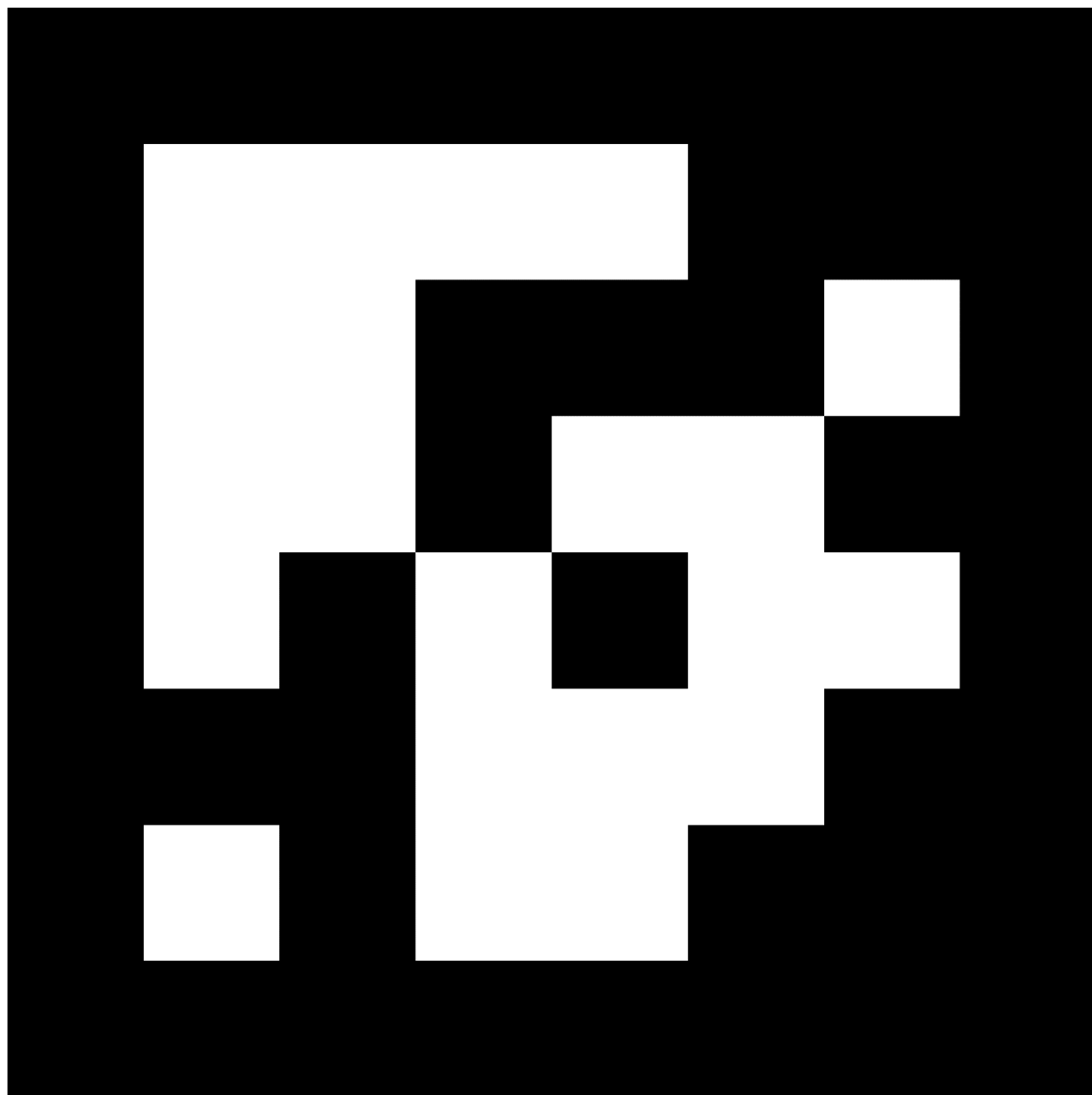
ID 5
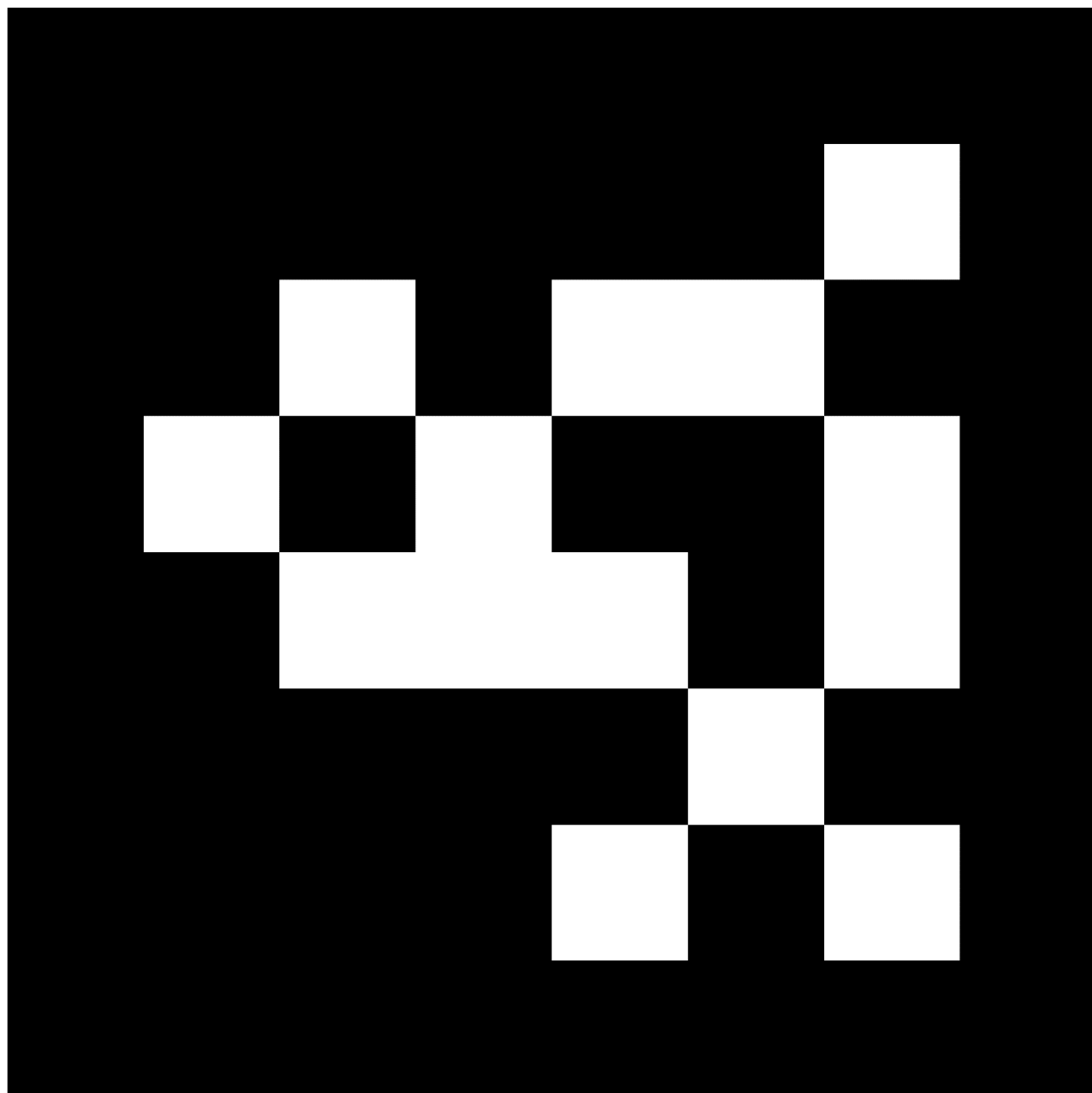
ID 6
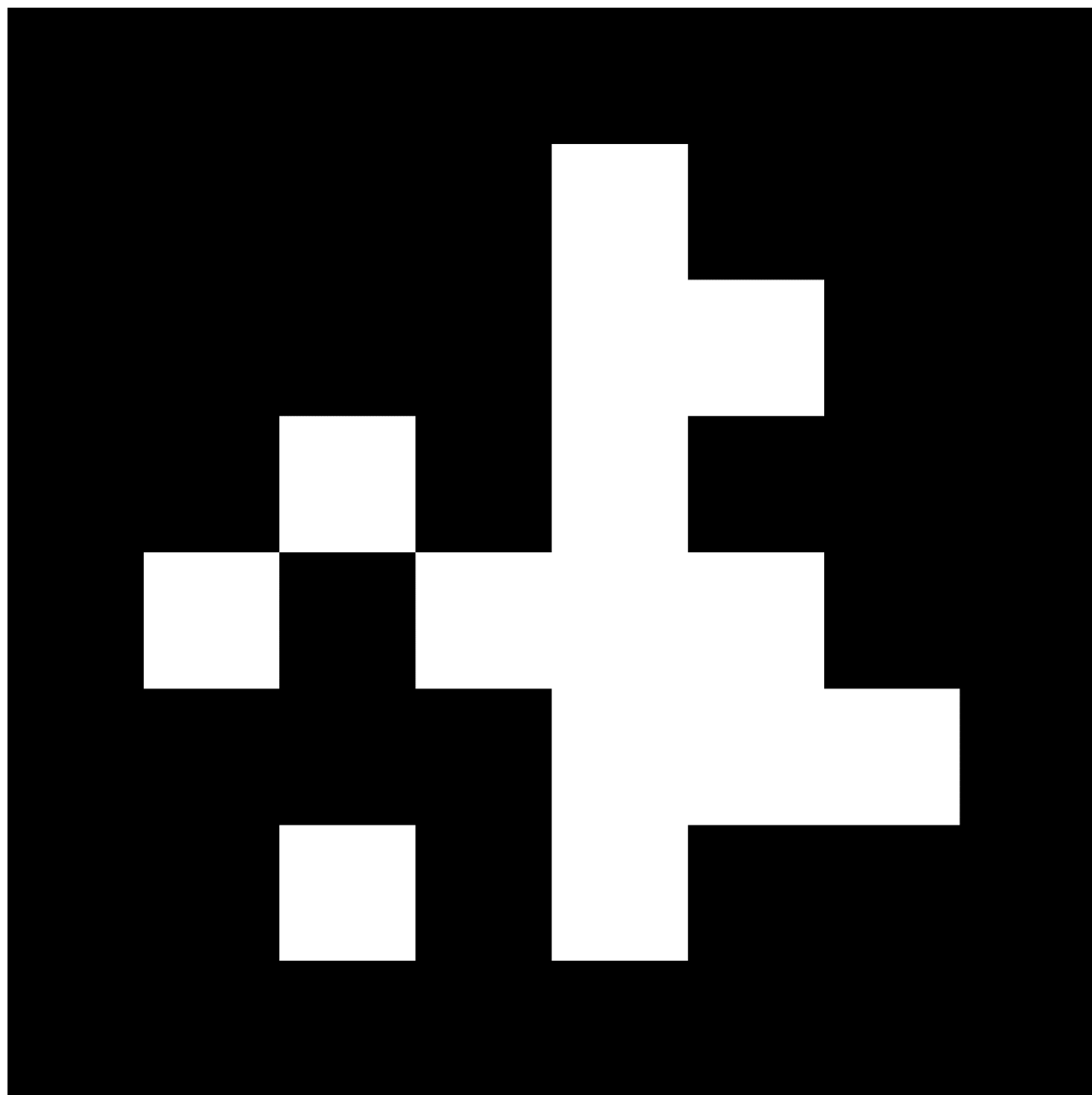
ID 7
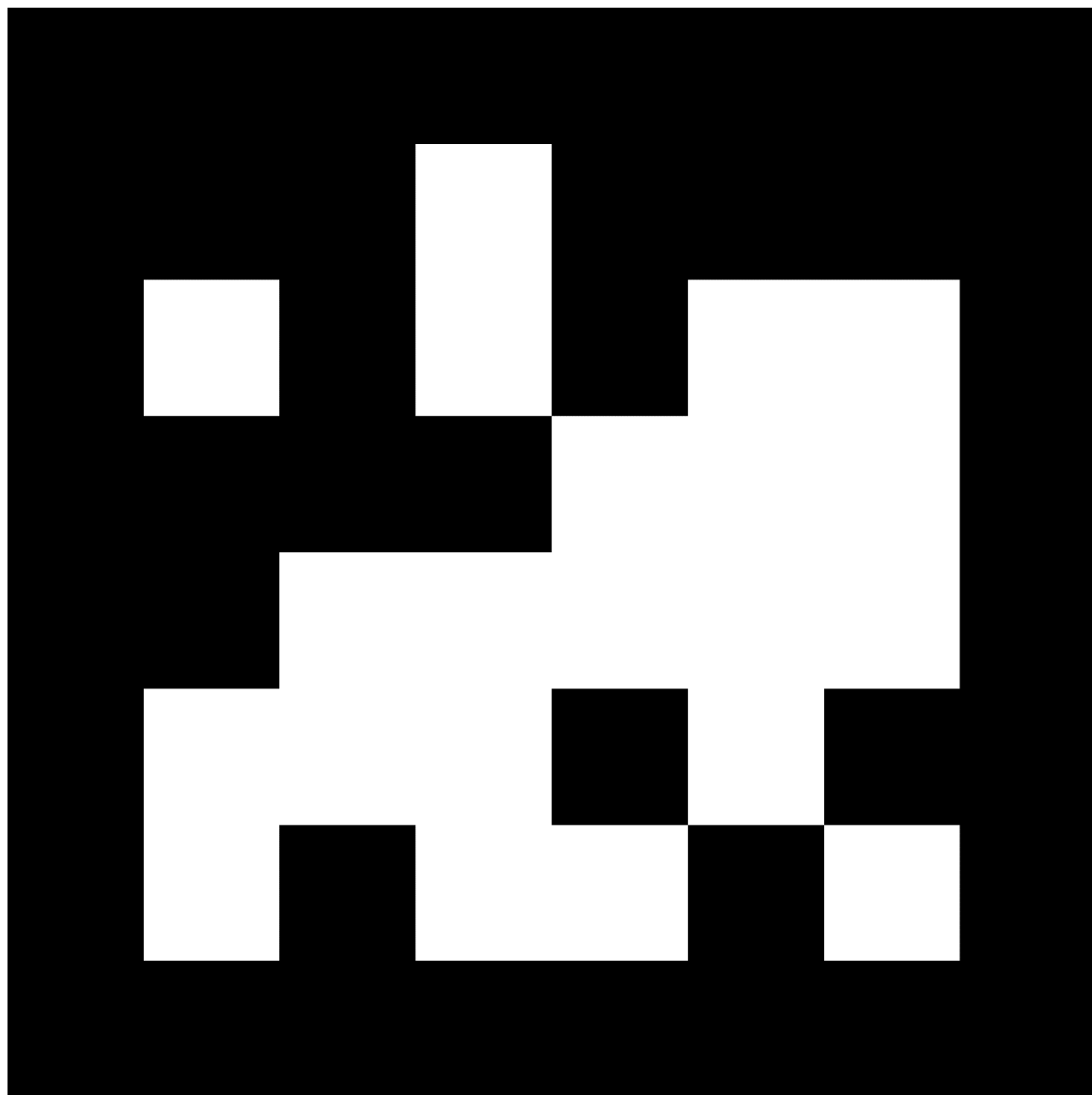
ID 8
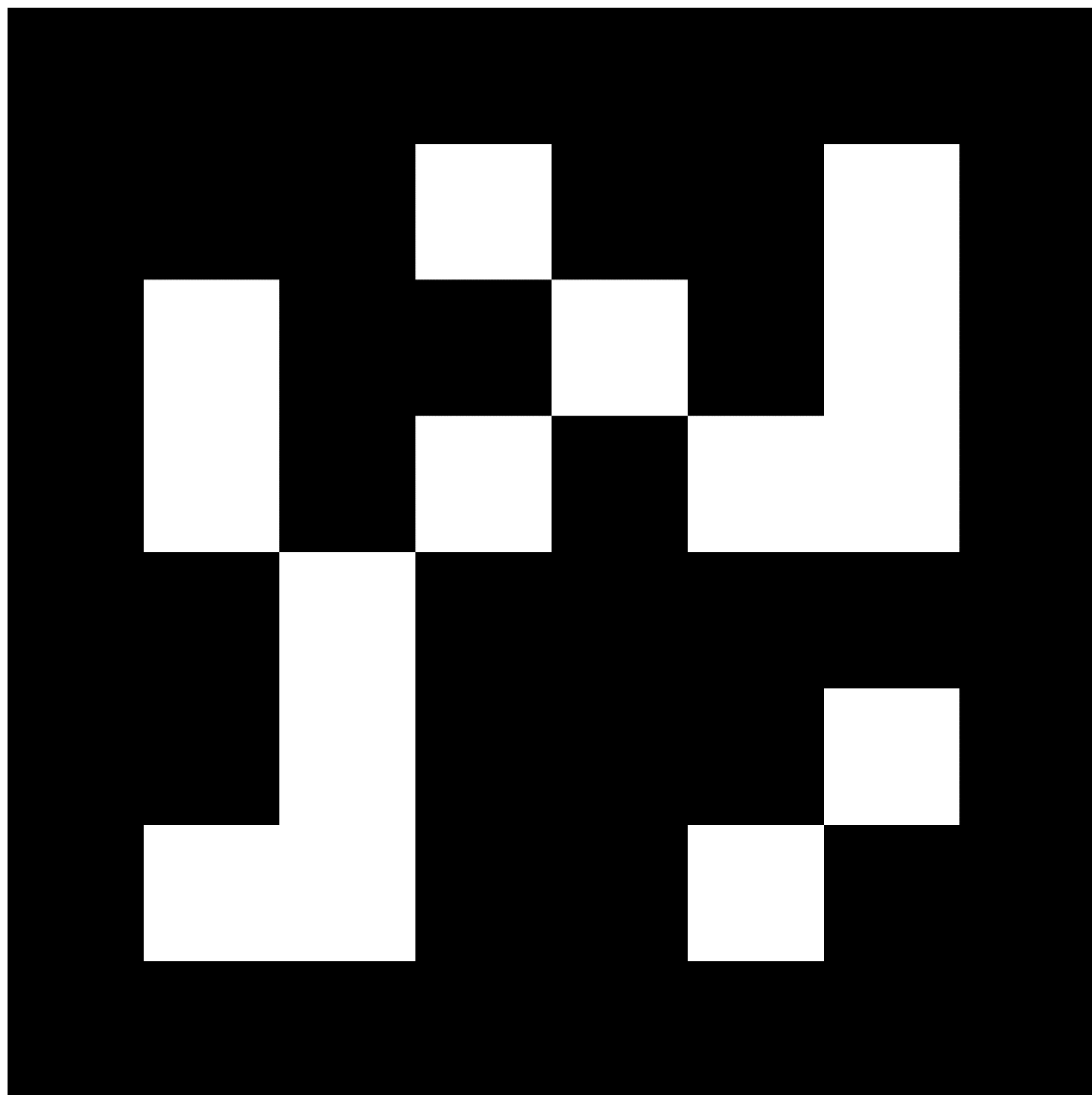
ID 9
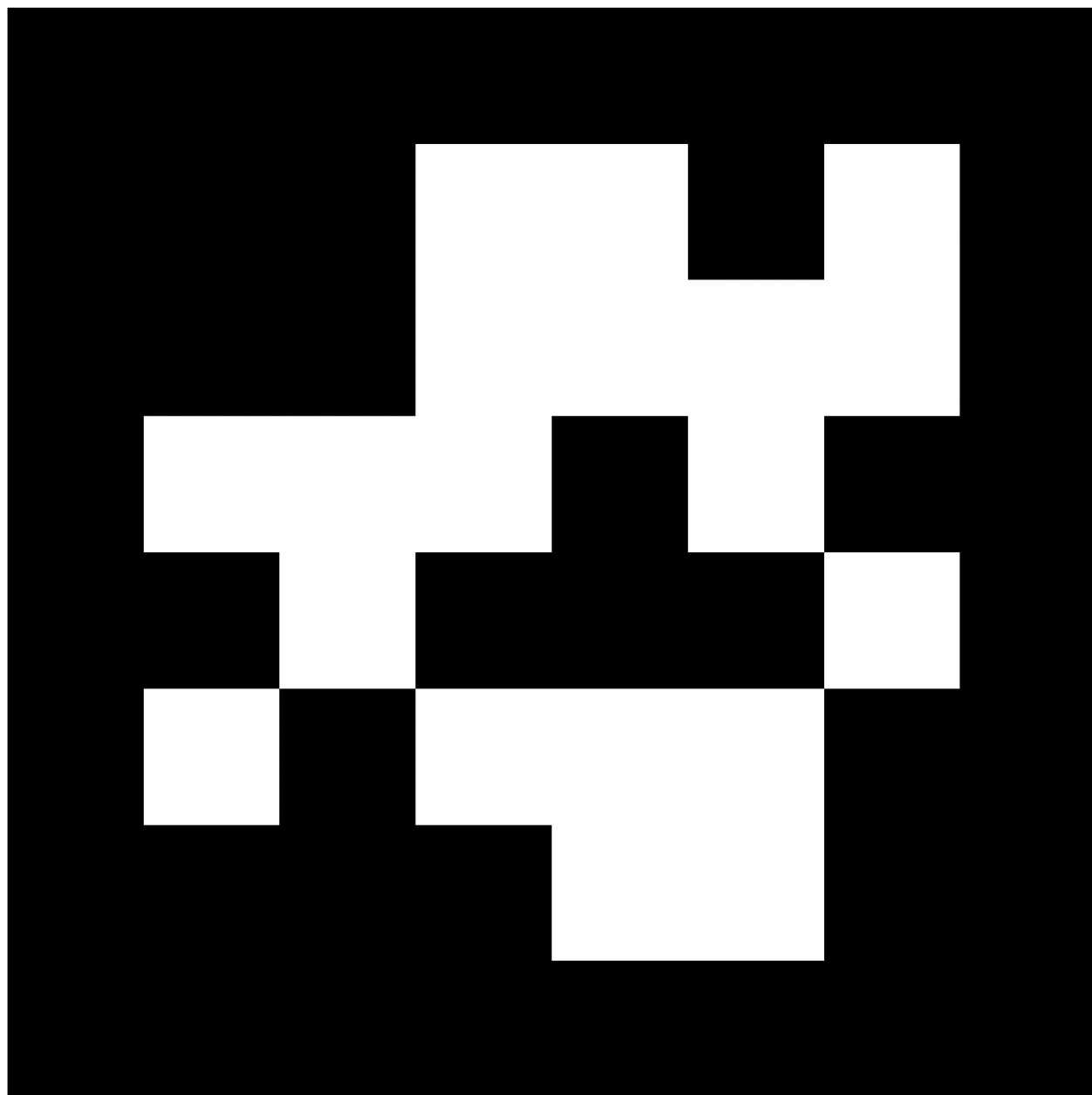
ID 10
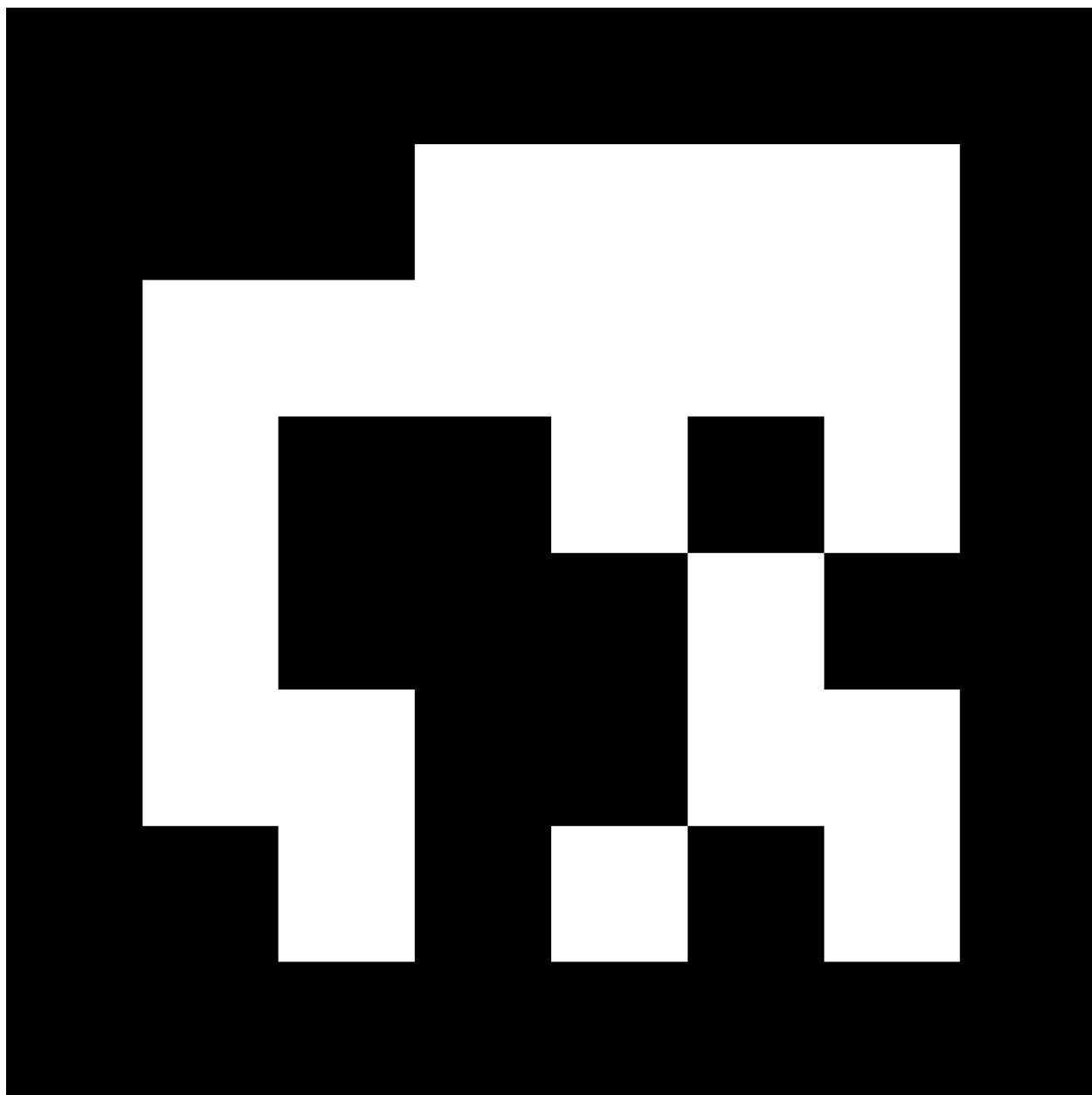
ID 11

ID 12

ID 13

ID 14

ID 15

ID 16